

**CONTRACT DOCUMENTS  
FOR**

**Bost Road Sewer Improvements**



**City of Morganton**

Prepared by:



301 SOUTH MCDOWELL STREET, SUITE 300  
CHARLOTTE, NC 28204

June 5, 2023

Merrick Project Number 65421092

SECTION 00 01 07  
SEALS PAGE

PART 1 GENERAL

1.1. DESIGN RESPONSIBILITIES FOR THIS PROJECT

- A. Engineering and Design responsibilities for this project were performed by various individuals whose seals appear hereon and on work within this project for which they are responsible as indicated below:
- B. Designing Engineer: Keller Drozdick, PE

1.2. SPECIFICATIONS

- A. Divisions: 00, 01, 02, 07, 09, 31, 32, 33, 40, 41, 43

1.3. DRAWINGS

- A. As indicated on individual drawings

1.4. FIRM

- A. Merrick & Company North Carolina Registered Engineering Firm No. F-0908  
301 South McDowell Street, Suite 300, Charlotte, NC 28204

1.5. DESIGN RESPONSIBILITIES FOR THIS PROJECT

A. Engineering and Design responsibilities for this project were performed by various individuals whose seals appear hereon and on work within this project for which they are responsible as indicated below:

B. Designing Engineer: Robert Earnhardt, PE

1.6. SPECIFICATIONS

A. Divisions: 26

1.7. DRAWINGS

A. As indicated on individual drawings

1.8. FIRM

A. SKA Consulting Engineers, Inc. North Carolina Registered Engineering Firm No. F-0508  
4651 Charlotte Park Drive, Suite 150, Charlotte, NC 28217

1.9. DESIGN RESPONSIBILITIES FOR THIS PROJECT

A. Engineering and Design responsibilities for this project were performed by various individuals whose seals appear hereon and on work within this project for which they are responsible as indicated below:

B. Designing Engineer: Kevin Baczynski, PE

1.10. SPECIFICATIONS

A. Divisions: 03 (03 10 00; 03 20 00; 03 30 00), 05 (05 12 00; 05 50 00; 05 52 13; 05 53 13)

1.11. DRAWINGS

A. As indicated on individual drawings

1.12. FIRM

A. SKA Consulting Engineers, Inc. North Carolina Registered Engineering Firm No. F-0508  
4651 Charlotte Park Drive, Suite 150, Charlotte, NC 28217



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ADVERTISEMENT FOR BIDS

The City of Morganton is soliciting Bids for the construction of the following Project:

Bost Road Sewer Improvements

Sealed Bids must be delivered to the City of Morganton Water Resources Department at 305 East Union Street, Suite A100, Morganton, NC 28655 no later than 2:00 PM, Tuesday, July 18, 2023. The Bids will be publicly opened and read aloud at this time and place. Bids received after this time will be returned unopened. Address Bids to the Owner at address listed below:

Owner: City of Morganton, North Carolina, Water Resources Department, 305 East Union Street, Suite A100, Morganton, NC 28655.

Contact: Mario Sclarandis, City Engineer, (828)-438-5263, [msclarandis@morgantonnc.gov](mailto:msclarandis@morgantonnc.gov)

Engineer: Merrick & Company, 301 South McDowell Street Suite 300, Charlotte, NC 28204.  
Contact: Keller Drozdick, P.E., 210-446-4342, [keller.drozdick@merrick.com](mailto:keller.drozdick@merrick.com)

The Owner reserves the right to waive any informality or to reject any or all Bids. Unless all Bids are rejected, Award will be made to the lowest responsible Bidder, taking into consideration quality, performance and the time specified in the proposals for the performance of the Contract.

A Mandatory Pre-Bid Meeting and Site Visit will be held at 10:00 AM, Thursday, June 22, 2023 at the Catawba Meadows Park 701 Sanford Dr, Morganton, NC 28655.

This Project is generally described as follows:

- Full demolition of existing wastewater pump station, including wet well, pumps, valve vault, valves, pipes, and associated electrical components. Existing lift station shall remain operational until new wet well is operational.
- Construction of new wastewater pump station, including cast-in-place wet well, two submersible non-clog pumps, valve vault, pipes, valves, platform, davit crane for pump removal, canopy, and associated electrical components, including updating the electrical service (by Duke Energy).
- Construction of 2,959 LF of new gravity sewer mains consisting of 8-inch PVC and DI sewer pipe 16 precast manholes, jack and bore casings, and connections to existing sewers.
- Construction of 3,506 LF of new sewer force main consisting 8-inch PVC and DI pipe including connection to an existing manhole, jack and bore casings, and air release valves.
- Construction of 599 LF of new 20-inch HDPE casing installed by horizontal directional drill and 599 LF of new 8-inch HDPE force main carrier pipe within the casing.
- An allowance for communications, controls, and security.

The drawings and specifications may be reviewed and obtained online from the City of Morganton's website at <https://www.morgantonnc.gov/rfps>. Copies can be printed at Contractor's expense.

With request for the Bidding Documents supply the following information: Company name, contact person, street address, and phone and fax numbers for Bidding office; NC contractor's license with limitation and classification; indicate if the firm will be a Bidder, Supplier or Sub-Contractor.

Each bid must be accompanied by a bid security of 5% of the bid amount. Security may be in the form of

cash, certified check or cashier's check made payable to the City of Morganton or a bid bond issued by an insurance company authorized to do business in North Carolina. The deposit shall be retained if the successful bidder fails to execute the contract within (15) days after the award of contract or fails to give satisfactory surety as required herein.

The bidder shall comply with minority business requirements as outlined in N.C.G.S. 143-128 by:

1. Providing the minority businesses that will be utilized on the project with corresponding total dollar value of the bid and affidavit listing good faith efforts or,
2. An affidavit indicating that work will be self-performed.

Failure to comply with these requirements may be grounds for rejection of bid.

The City reserves the right to reject any or all bids or to accept the bid that appears to be in the best interest of the City or provided by law. No bid may be withdrawn for a period of 90 days after the scheduled bid opening.

City of Morganton  
Brad Boris  
Water Resources Director

**INSTRUCTIONS TO BIDDERS**

**CITY OF MORGANTON, NORTH CAROLINA  
DEVELOPMENT AND DESIGN SERVICES DEPARTMENT  
305 E. Union Street, Suite A100  
P.O. Box 3448  
Morganton, NC 28680-3448**

SECTION 00 21 13  
INSTRUCTIONS TO BIDDERS

**For a proposal to be considered, it must be in accordance with the following instructions:**

**1. DEFINED TERMS.**

Terms used in these Instructions to Bidders are generally defined in the General Conditions of the Contract Documents. For the convenience of prospective bidders the following information may be helpful:

- a. The words "Proposal" and "Bid" are used interchangeably to refer to the properly signed response to the Advertisement for Bids, which, if accepted by the City, will bind the Bidder to perform the Construction Contract.
- b. "Bid Form" refers to the form provided by the City of Morganton ("City") so that a prospective Bidder can submit its response to the invitation for bid. It is also called the "Form of Proposal". Only the form provided by the City can be used to submit a Bid.
- c. The word "Bidder" means a properly licensed contractor who submits a Bid in accordance with these instructions. If a Bidder's Proposal is accepted by the City, then the Bidder becomes the Contractor and is required to execute the Construction Agreement and undertake construction of the Project.

**2. PROPOSALS.**

Bids must be submitted on the Bid Form provided by the City. Bid Forms must be completed in ink or by typewriter and all blank spaces for bids, alternates, unit prices or other requested information shall be properly filled in. Prices must be stated in both words and numbers and in case of a conflict, the words will take precedence. Erasures, obvious changes or interlineation may disqualify the Bid. Bids containing confusing or conflicting information may likewise be disqualified.

Photocopied and faxed proposals will only be considered if the original of the Bid Form containing the original signature is delivered to the City by mail, courier or by hand delivery immediately following the bid opening.

Any modifications to the Form of Proposal will disqualify the Bid and cause the Bid to be rejected.

The Bidder shall sign the Form of Proposal as follows:

- a. If the documents are executed by a sole owner, that fact shall be evidenced by the word "Owner" appearing after the name of the person executing them.
- b. If the documents are executed by a partnership, that fact shall be evidenced by the word "Co-Partner" appearing after the name of the partner executing them.
- c. If the documents are executed on the part of a corporation, they shall be executed by either the president or the vice president and attested by the secretary or assistant secretary in either case, and the title of the office of such person shall appear after their signatures. The seal of the corporation shall be impressed on each signature page of the documents.
- d. If the proposal is made by a joint venture, it shall be executed by each member of the joint venture in the above form for sole owner, partnership or corporation, whichever form is applicable.
- e. All signatures shall be properly witnessed.
- f. If the contractor's license of a bidder is held by a person other than an owner, partner or officer of a firm, then the licensee shall also sign and be a party to the proposal. The title "Licensee" shall appear under his/her signature.

Proposals shall be addressed as indicated in the Advertisement for Bids and shall be delivered, enclosed in an opaque sealed envelope, marked "Proposal" or some similar word and bearing the title of the work, name of the bidder, and the contractor's license number of the bidder. Bidders shall clearly mark on the outside of the bid envelope which contract(s) they are bidding.

For projects bid in the single-prime alternative, the names and license numbers of major subcontractors shall be listed on the proposal form.

It shall be the specific responsibility of the bidder to deliver his bid to the proper official (generally the Development and Design Services Department) at the City of Morganton prior to the announced time for the opening of bids. Later delivery of a bid for any reason, including delayed delivery by the United States Postal Service or courier service, shall disqualify the bid.

Modifications of previously deposited bids will be acceptable only if delivered in writing or by telegram or fax to the place of the bid opening prior to the time for opening bids. Telegraphic and fax modifications must be confirmed in writing within 72 hours of the opening of bids.

Unit prices quoted in the proposal shall include overhead and profit and shall be the full compensation for the contractor's cost involved in the work.

### **3. EXAMINATION OF CONDITIONS**

By submitting a Bid, the Bidder acknowledges that all documents pertaining to the Work, the location, accessibility and general character of the site of the Work and all existing buildings and structures within and adjacent to the site has been carefully examined and the Bidder is satisfied as to the nature of the Work, the condition of the existing buildings and structures, the topographic features of the work area, the character, quality and quantity of the material to be encountered, the character of the equipment, machinery, plans and other facilities needed preliminary to and during the prosecution of all Work,

the general and local conditions, the construction hazards, and all other matters, including, but not limited to, the labor situation which can in any way affect the Work under the Contract, and including all safety measures required by the Occupational Safety and Health Act of 1970, as amended, and all rules and regulations issued pursuant thereto.

In submitting a Proposal, the Bidder acknowledges that the available Plans and Specifications, Drawings and other Contract Documents have been reviewed and that the Project described therein is feasible and the Contractor has the means and ability to undertake and complete all Work. By submitting a Bid, the Bidder accepts all the terms, conditions and stipulations contained in the Contract Documents and the Bidder is prepared to work in cooperation with other contractors performing work on the Project Site.

Reference is made to the Contract Documents for the identification of any surveys and investigative reports of subsurface or latent physical conditions at the site or otherwise affecting performance of the Work which have been relied upon by the Engineer in preparing the Drawings and Specifications. The City will make copies of all such surveys and reports, if any, available to the Bidder upon request.

Each Bidder may, at its own expense, make such additional surveys and investigations as the Bidder may deem necessary in order to prepare its Bid and if awarded the bid, perform the Work. Any onsite investigation shall be done at the convenience of the City; however, any reasonable request for access to the site will be honored by the City.

### **4. BULLETINS AND ADDENDA**

Any addenda to specifications issued during the time of bidding are to be considered covered in the proposal and in issuing the contract they will become a part thereof. It shall be the bidder's responsibility to ascertain prior to bid time the addenda issued and to see that its bid includes any changes required by the addenda.

All addenda should be acknowledged by the bidder(s) on the Form of Proposal.



**5. INTERPRETATIONS.** Any questions about the meaning or intent of the Drawings and Specifications shall be submitted to the City and/or the Engineer in writing. Replies will be issued by addenda mailed and delivered to all prospective Bidders recorded by the City and/or the Engineer as having received the bidding documents. Questions received by the City less than five (5) days prior to the date for opening of the bids will not be answered. Only questions answered by formal written addenda will be binding on the City. Each Bidder, before submitting its Bid, shall ascertain that the Bidder has received all addenda issued.

## **6. BID SECURITY**

Each proposal shall be accompanied by either (i) a cash deposit; (ii) a certified check drawn on some bank or trust company insured by the Federal Deposit Insurance Corporation, or (iii) a bid bond issued by a commercial surety in an amount equal to not less than five percent (5%) of the proposal. The Bid Security will be retained by the City of Morganton as liquidated damages in the event of the failure of the successful bidder to execute the contract within ten (10) days after the award and to give satisfactory surety as required by law (G.S. 143-129).

Bid bond shall be conditioned that the surety will, upon demand, forthwith make payment to the obligee upon said bond if the bidder fails to execute the contract. The City may retain bid securities of any bidder(s) who may have a reasonable chance of award of contract for the full duration of time stated in the Notice to Bidders. Other bid securities may be released sooner, at the discretion of the City. All bid securities (cash or certified checks) shall be returned to the bidders promptly after award of contracts and no later than seven (7) days after expiration of the holding period stated in the Notice to Bidders. A Standard Form of Bid Bond acceptable to the City is included with these instructions.

## **7. RECEIPT OF BIDS**

Bids shall be received in strict accordance with the requirements of the General Statutes of North Carolina. Prior to the opening of any Bids for the Project, Bids may be modified or withdrawn provided any modification of a previously submitted Bid shall be executed by the Bidder in the same manner that the original Bid was executed and submitted. Refer to Section 2 above for additional information.

## **8. OPENING OF BIDS**

Upon opening, all bids shall be read aloud. Once any bid is opened, there shall not be any withdrawal of bids by any bidder and no bids may be returned to any bidder. After the bid opening, a bidder may request that his bid be withdrawn from consideration without forfeiture of his bid security in accordance with the provisions of the North Carolina General Statute 143-129.1; however, no bid may be withdrawn, except under

the provisions of General Statute 143-129.1, for a period of thirty days unless otherwise specified. Should the successful bidder default or fail to execute a contract, the contract may be awarded to the next lowest and responsible bidder. The City reserves the unqualified right to reject any and all bids. Reasons for rejection may include, but shall not be limited to, the following:

- a. If the Form of Proposal furnished to the bidder by the City is not used or is altered.
- b. If the bidder fails to insert a price for all bid items, alternate and unit prices requested.
- c. If the bidder adds any provision reserving the right to accept or reject any award, or attempts to condition the bid or impose limitations on the bid.
- d. If there are unauthorized additions or conditional bids, or irregularities of any kind which tend to make the proposal incomplete, indefinite or ambiguous as to its meaning.
- e. If the bidder fails to complete the proposal form where information is requested so that the bid may be properly evaluated by the City.
- f. If the unit prices contained in the bid schedule are unacceptable to the City of Morganton.
- g. If the bidder fails to comply with other instructions stated herein.

## **9. BID EVALUATION**

The award of the contract will be made to the lowest responsible bidder as soon as practical after the bid opening. The City may award on the basis of the base bid and any alternates the City chooses.

Before awarding a contract or in connection with the bidding process, the City may require the apparent low bidder to qualify himself to be a responsible bidder by furnishing any or all of the following data:

- a. The latest financial statement showing assets and liabilities of the company or other information satisfactory to the City.
- b. A listing of completed projects of similar size.
- c. Permanent name and address of place of business.
- d. The number of regular employees of the organization and length of time the organization has been in business under the present name.

- e. The name and home office address of the surety proposed and the name and address of the responsible local claim agent.
- f. The names of members of the firms who hold appropriate trade licenses, together with license numbers.
- g. A listing of other construction contacts involving the bidders default or alleged default.

Failure or refusal to furnish any of the above information, if requested, shall constitute a basis for disqualification of the bidder.

In determining the lowest responsible, responsive bidder, the City shall take into consideration the bidder's compliance with the requirements of G.S. 143-128.2(c); the past performance of the bidder on construction contracts for the City or other public bodies including the State of North Carolina with particular concern given to completion times, quality of work, cooperation with other contractors, and cooperation with the designer and City. Failure of the low bidder to furnish affidavit and/or documentation as required by G.S. 143-128.2(c) may constitute a basis for disqualification of the bid.

Should the City decide that the apparent low bidder is not the lowest responsible, responsive bidder by virtue of the above information or for other valid reasons, the apparent low bidder will be so notified and his bid security shall be returned to him.

#### **10. PERFORMANCE BOND**

The successful bidder, upon award of contract, shall furnish a performance bond in an amount equal to 100 percent of the contract price. See Article 35, General Conditions.

#### **11. PAYMENT BOND**

The successful bidder, upon award of contract, shall furnish a payment bond in an amount equal to 100 percent of the contract price. See Article 35, General Conditions.

#### **12. PAYMENTS**

Payments to the successful bidders (contractors) will be made on the basis of monthly estimates unless some other progress payment schedule is established. See Article 31, General Conditions.

#### **13. PRE-BID CONFERENCE**

Prior to the date set for receiving bids, the City may arrange and conduct a Pre-Bid Conference for all prospective bidders. The purpose of this conference is to review

project requirements and to respond to questions from prospective bidders and their subcontractors or material suppliers related to the intent of bid documents. Attendance by prospective bidders shall be as required by the "Notice to Bidders".

#### **14. SUBSTITUTIONS**

In accordance with the provisions of G.S. 133-3, material, product, or equipment substitutions proposed by the bidders to those specified herein can only be considered during the bidding phase until ten (10) days prior to the receipt of bids when submitted to the Designer with sufficient data to confirm material, product, or equipment equality. Proposed substitutions submitted after this time will be considered only as a potential change order, subject to City approval.

Submittals for proposed substitutions shall include the following information:

- a. Name, address, and telephone number of manufacturer and supplier as appropriate.
- b. Trade name, model or catalog designation.
- c. Product data including performance and test data, reference standards, and technical descriptions of material, product, or equipment. Include color samples and samples of available finishes as appropriate.
- d. Detailed comparison with specified products including performance capabilities, warranties, and test results.
- e. Other pertinent data including data requested by the Designer to confirm product equality.

If a proposed material, product, or equipment substitution is deemed equal by the City to those specified, all bidders of record will be notified by Addendum.

#### **15. QUALIFICATION OF BIDDERS AFTER AWARD**

Bidders should be prepared to submit written documentation to demonstrate the Bidder's qualifications for undertaking the Project. If requested by the City, the Bidder shall be required to submit financial data, previous experience, license information and other evidence of authority to conduct business in the State of North Carolina. See Section 9 for additional information concerning qualifications.

SECTION 00 41 13  
BID FORM

PROJECT: Bost Road Sewer Improvements

BID FROM: \_\_\_\_\_

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**ARTICLE 1 -- BID RECIPIENT**

1.1 This Bid is submitted to:

Mario Sclarandis, City Engineering  
City of Morganton  
305 East Union Street, Suite A100  
Morganton, NC 28655

1.2 The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with Owner in the form included in the Bidding Documents to perform all Work as specified or indicated in the Bidding Documents for the prices and within the times indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents.

**ARTICLE 2 – BIDDER’S ACKNOWLEDGEMENTS**

2.1 Bidder accepts all the terms and conditions of the Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. This Bid will remain subject to acceptance for 90 days after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of Owner.

**ARTICLE 3 – BIDDER’S REPRESENTATIONS**

3.1 In submitting this Bid, Bidder represents that:

A. Bidder has examined and carefully studied the Bidding Documents, other related data identified in the Bidding Documents, and the following Addenda, receipt of which is hereby acknowledged:

No. , dated , 2023.

No. , dated , 2023.

No. , dated , 2023.

No. , dated , 2023.

No. , dated , 2023.

- B. Bidder has visited the Site and become familiar with and is satisfied as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
- C. Bidder is familiar with and is satisfied as to all Laws and Regulations that may affect cost, progress, and performance of the Work.
- D. Bidder has carefully studied all: (1) reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities) that have been identified in Supplemental Conditions - 4.02 as containing reliable "technical data," and (2) reports and drawings of Hazardous Environmental Conditions, if any, at the Site that have been identified in SC-4.06 as containing reliable "technical data."
- E. Bidder has considered the information known to Bidder; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and the Site-related reports and drawings identified in the Bidding Documents, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, including applying the specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents; and (3) Bidder's safety precautions and programs.
- F. Based on the information and observations referred to in Paragraph 3.01.E above, Bidder does not consider that further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of this Bid for performance of the Work at the price(s) bid and within the times required, and in accordance with the other terms and conditions of the Bidding Documents.
- G. Bidder is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents.
- H. Bidder has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and the written resolution thereof by Engineer is acceptable to Bidder.
- I. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work for which this Bid is submitted.

#### **ARTICLE 4 – BIDDER'S CERTIFICATION**

##### 4.1 Bidder certifies that:

- A. This Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any collusive agreement or rules of any group, association, organization, or corporation;
- B. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid;
- C. Bidder has not solicited or induced any individual or entity to refrain from bidding; and

D. Bidder has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for the Contract. For the purposes of this Paragraph 4.01.D:

1. "corrupt practice" means the offering, giving, receiving, or soliciting of anything of value likely to influence the action of a public official in the bidding process;
2. "fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the bidding process to the detriment of Owner, (b) to establish bid prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition;
3. "collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish bid prices at artificial, non-competitive levels; and
4. "coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

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**ARTICLE 5 – BASIS OF BID**

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

A. The following Items as described in 01 20 22 Unit Prices with estimated quantities.

- 1. **Mobilization**  
Lump Sum Price \$ \_\_\_\_\_
- 2. **Demolition of existing wastewater pump station, including wet well, pumps, valve vault, valves, pipes, and associated electrical components.**  
Lump Sum Price \$ \_\_\_\_\_
- 3. **Construction of new wastewater pump station, including cast-in-place wet well, submersible non-clog pumps, valve vault, pipes, valves, platform, davit crane, canopy, and associated electrical components including updating the electrical service (Duke Energy).**  
Lump Sum Price \$ \_\_\_\_\_
- 4. **Construction of pump station site improvements, including driveway, site paving, fill, grading, clearing, fence, and landscaping.**  
Lump Sum Price \$ \_\_\_\_\_
- 5. **Construction of 2,959 LF new 8-inch PVC and DI gravity mains, including 16 precast manholes, jack and bore casings, and connections to existing sewers.**  
Lump Sum Price \$ \_\_\_\_\_
- 6. **Construction of 3,506 LF of new 8-inch PVC and DI force main including connection to an existing manhole, jack and bore casings, and air release valves .**  
Lump Sum Price \$ \_\_\_\_\_
- 7. **Construction of 599 LF of new 20-inch HDPE casing installed by horizontal directional drill and 599 LF of new 8-inch HDPE force main carrier pipe.**  
Lump Sum Price \$ \_\_\_\_\_
- 8. **Allowance for Communication, Controls, Instrumentation, and Security, including RTU, SCADA, and Security Camera System Components and Coordination**  
Lump Sum Price \$ 114,507
  
- Total of All Items** \$ \_\_\_\_\_

B. Bidder acknowledges that the rights of the Owner and the recommendations of the Engineer are not to be questioned in the Award of Contracts.

C. Bidder acknowledges that it is the intention of the Mayor and City Council to let contracts on a basis of the Bids received in accordance with GS 143-129 and in such manner as they deem to be for the best interests of the Owner.

D. Bidder acknowledges that the Owner reserves the right to accept to accept or reject any or all bids and

to waive any informalities in the bidding.

- E. Bidder acknowledges that should the total bid exceed the funds available to construct the project, the Owner reserves the right to reduce the scope of work from the project by deleting certain lump sum bid items prior to awarding the contract to bring the project within the funds available.
- F. Bidder acknowledges that if this contract is awarded to him, he must with every pay request, furnish to the City of Morganton an accurate itemized statement of North Carolina Sales Taxes paid on materials, supplies, equipment, and other items charged to this contract, and attached. A sales tax form must be submitted even if there is no sales tax incurred.
- G. Bidder agrees to begin work within ten (10) days from the date of the Notice to Proceed.
- H. Bidder agrees that if the Owner should reduce the scope of work by 25% or less of the Total Bid price prior to award of the contract, the lump sum price on all bid items shall remain unchanged.
- I. Bidder agrees that in the case of failure on his part to execute the said Contract and the Bonds within fifteen (15) consecutive calendar days after written notice being given of the award of the Contract, the check, cash or Bid Bond accompanying the Bid shall be paid into the funds of the Owner's Account set aside for this Project, as liquidated damages for such failure; otherwise the check, cash or Bid Bond accompanying the Proposal shall be returned to the Bidder.
- J. Bidder agrees to provide all necessary tools, machinery, equipment, apparatus, and all other means necessary to do all the work and will furnish all labor, materials and all else required to complete such Contract as may be entered into, in the manner prescribed in and in accordance with the terms of the Specifications and Contract in accordance with the true intent and meaning thereof, and in accordance with the Plans and/or Drawings and the requirements of the Consulting Engineers under them, in a first class manner.

#### **ARTICLE 6 – TIME OF COMPLETION**

- 6.1 Bidder agrees that the Work will be substantially complete within 450 calendar days after the date when the Contract Times commence to run as provided in Paragraph 2.03 of the General Conditions, and will be completed and ready for final payment in accordance with Paragraph 14.07.B of the General Conditions within 480 calendar days after the date when the Contract Times commence to run.
- 6.2 Bidder accepts the provisions of the Agreement as to liquidated damages in the event of failure to complete the Work within the Contract Times. This amount is agreed upon as the proper measure of liquidated damages the Owner will sustain, per day, by the failure of the undersigned to complete the work, within the stipulated time, and it is not to be construed, in any sense, as a penalty.
- 6.3 Milestone Dates
  - A. The following principal events shall be completed and ready for final payment in accordance with paragraph 14.07 of the General Conditions within days indicated below after the date when the Contract Time commences to run. In accordance with paragraph 3.2 above as liquidated damages for delay (but not as penalty) Contractor shall pay Owner the amounts indicated below for each day that expires after the time specified below for completion and readiness for final payment.

**ARTICLE 7 – ATTACHMENTS TO THIS BID**

7.1 The following documents are submitted with and made a condition of this Bid:

- A. Required Bid security in the form of a Bid Bond or Certified Check (circle type of security provided);
- B. List of Subcontractors;
- C. List of Equipment / Materials Manufacturers;
- D. Non-Collusive Affidavit;
- E. E-Verify Affidavit
- F. Iran Divestment Act Certification
- G. In accordance with GS 143-128.2(c), Bidder shall identify on its bid the minority businesses that it will use on the project and the total dollar value of the bid that will be performed by the minority businesses and list the good faith efforts (Affidavit A) made to solicit participation. A Bidder that will perform all the work with its own workforce may submit an Affidavit (B) to that effect in lieu of the affidavit (A) required above.
  - 1. Identification of Minority Business Participation, and;
  - 2. Affidavit A, Listing of Good Faith Efforts, or Affidavit B, Intent to Perform Contract with Own Workforce.

7.2 After the bid opening the Owner will consider all bids and alternates and determine the lowest responsible, responsive bidder. Upon notification of being the apparent low Bidder, the Bidder shall then file within 72 hours of the notification of being the apparent lowest bidder, the following:

- A. An Affidavit (C) that includes a description of the portion of work to be executed by minority businesses, expressed as a percentage of the total contract price, which is equal to or more than the goal established by the Owner and indicated in the Instruction to Bidders, paragraph Minority Participation Goals. This affidavit shall give rise to the presumption that the bidder has made the required good faith effort; or,
- B. Affidavit (D) of its good faith effort to meet the goal. The document must include evidence of all good faith efforts that were implemented, including any advertisements, solicitations and other specific actions demonstrating recruitment and selection of minority businesses for participation in the contract.

7.3 Bidder understands that if this Bid is accepted by the Owner, Bidder shall not substitute for the subcontractors named in the Bid Documents except as allowed in the Supplementary Conditions.

**ARTICLE 8 – DEFINED TERMS**

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

**ARTICLE 9 – BID SUBMITTAL**

9.1 Bidder’s License

- A. Number: \_\_\_\_\_
- B. Classification: \_\_\_\_\_

- C. Limitation: \_\_\_\_\_
- D. Employer's Tax ID No.: \_\_\_\_\_
- E. Business Address: \_\_\_\_\_
- F. Phone No.: \_\_\_\_\_
- G. Fax No.: \_\_\_\_\_
- H. Contact Person: \_\_\_\_\_
- I. E-mail Address: \_\_\_\_\_
- J. Phone No. w/ Ext.: \_\_\_\_\_

9.2 This Bid is submitted by:

If Bidder is:

An Individual

Name (typed or printed):

By:

(Individual's signature)

Doing business as:

A Partnership

Partnership Name:

The Organization and Internal Affairs of the Partnership are governed by the laws of the State of: \_\_\_\_\_

By: \_

(Signature of general partner -- attach evidence of authority to sign)

Name (typed or printed):

Title (typed or printed):

Attest:

(Signature of Corporate Secretary)

A Corporation

Corporation Name:

(SEAL)

State of Incorporation:

Type (General Business, Professional, Service, Limited Liability):

By:

(Signature -- attach evidence of authority to sign)

Name (typed or printed):

Title (typed or printed):

(CORPORATE SEAL)

Attest:

(Signature of Corporate Secretary)

Date of Qualification to do business in North Carolina is        /        /        .

Limited Liability Company - LLC

Name of LLC:

Name of State under whose Laws the Limited Liability Company was formed:

\_\_\_\_\_

By:  
(Signature of Manager)

Name (typed or printed):

Title (typed or printed)

**BID BOND (PENAL SUM FORM)**

<p><b>Bidder</b>                  Name: <b>[Full formal name of Bidder]</b>                  Address <i>(principal place of business)</i>:  <b>[Address of Bidder’s principal place of business]</b></p>	<p><b>Surety</b>                  Name: <b>[Full formal name of Surety]</b>                  Address <i>(principal place of business)</i>:  <b>[Address of Surety’s principal place of business]</b></p>
<p><b>Owner</b>                  Name: City of Morganton                  Address <i>(principal place of business)</i>:                  304 East Union Street A100                  Morganton, North Carolina 27655</p>	<p><b>Bid</b>                  Project <i>(name and location)</i>:                  Bost Rd Sewer Improvements                  Morganton, North Carolina                    Bid Due Date: July 18, 2023</p>
<p><b>Bond</b>                  Penal Sum: <b>5% of Bid Amount</b>                  Date of Bond: <b>[Date]</b></p>	
<p>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.</p>	
<p>Bidder</p>	<p>Surety</p>
<p style="text-align: center;"><i>(Full formal name of Bidder)</i></p>	<p style="text-align: center;"><i>(Full formal name of Surety) (corporate seal)</i></p>
<p>By: _____  <i>(Signature)</i></p>	<p>By: _____  <i>(Signature) (Attach Power of Attorney)</i></p>
<p>Name: _____  <i>(Printed or typed)</i></p>	<p>Name: _____  <i>(Printed or typed)</i></p>
<p>Title: _____</p>	<p>Title: _____</p>
<p>Attest: _____  <i>(Signature)</i></p>	<p>Attest: _____  <i>(Signature)</i></p>
<p>Name: _____  <i>(Printed or typed)</i></p>	<p>Name: _____  <i>(Printed or typed)</i></p>
<p>Title: _____</p>	<p>Title: _____</p>
<p><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></p>	

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 140 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.



SECTION 00 43 33  
LIST OF EQUIPMENT/MATERIALS MANUFACTURERS

The Bidder, as part of their Bid on the Project, submits the following list of Equipment / Materials Manufacturers to be used in the performance of Work, based on requirements of the Contract Documents. Changes to this list after the Bid opening shall only be as approved by the Owner/Engineer:

EQUIPMENT/MATERIALS

MANUFACTURER

43 25 13 – Submersible Non-Clog Sewage Pumps

\_\_\_\_\_

Bidder's Certification

It is understood and agreed that, if awarded a Contract, the Bidder shall not make any additions, deletions, or substitutions to this certified list without the consent of the Owner / Engineer. Failure to identify a manufacturer for any or all the items listed shall constitute an entry of one of the manufacturers listed in its respective technical specification.

By: \_\_\_\_\_ Date: \_\_\_\_\_

(Signature)

NAME OF SIGNER: \_\_\_\_\_ Title: \_\_\_\_\_

(Please Print or Type)

**END OF SECTION 00 43 33**

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SECTION 00 43 36  
LIST OF SUBCONTRACTORS

Bidders are hereby notified that GS 143-128 (d), requires all bidders on single-prime projects to identify on their Bid Form the contractors they have selected for the subdivisions for branches of work for (1) HVAC, (2) Plumbing, (3) Electrical, and (4) General. Accordingly, bidder shall list below applicable selected contractors for the following branches of work (write "N/A" if not applicable or self-performed).

In accordance with the Instructions to Bidders and other Contract Documents, Bidders are also required to list below other Subcontractors on which their Bid is based, if applicable. All MWBE Subcontractors listed here shall also be listed on the appropriate MWBE forms.

<u>Subcontractor's Work</u>	<u>Subcontractor's Name</u>
Plumbing	_____
Electrical	_____
Horizontal Directional Drill	_____
Other	_____

Bidder's Certification

It is understood and agreed that, if awarded a Contract, the Bidder shall not make any additions, deletions, or substitutions to this certified list without the consent of the Owner.

By: \_\_\_\_\_ Date: \_\_\_\_\_  
(Signature)

NAME OF SIGNER: \_\_\_\_\_ Title: \_\_\_\_\_  
(Please Print or Type)

**END OF SECTION 00 43 36**

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**1.00 GENERAL**

- 1.01** The Statement of Qualifications must be submitted by the apparent most qualified Bidder within 5 calendar days of the bid opening and include, as a minimum, the information as described in this section of the Contract Documents. Failure to submit the required information in the statement of qualifications may result in the Owner considering the Bid non-responsive and result in rejection of the Bid by the Owner. Bidders may be required to provide supplemental information if requested by the Owner to clarify, enhance or supplement the information provided in the statement of qualifications.
- 1.02** Bidders must provide the information requested in the Qualifications Statement using the forms attached to this Section. A copy of these forms may be provided in Microsoft Word to assist with the preparation of the Statement of Qualifications. Information in these forms must be provided completely and in detail. Information that cannot be totally incorporated in the form may be included in an appendix to the form. This appendix must be clearly referenced by appendix number in the form, and the appended material must include the appendix number on every sheet of the appendix. The appendix must include only the information that responds to the question or item number to which the appended information applies.
- 1.03** Bidders may provide supplemental information to the Statement of Qualifications using AIA, AGC or other industry standard statement of qualification forms and / or Bidders may submit additional information such as organizational brochures or other marketing information to help demonstrate the ability to provide best value to the Owner. This information may not be submitted as a substitute to the information specifically requested in this Section, or in the Statement of Qualifications forms. If this information is include as an appendix to the information requested in Paragraph 1.02 above, the reference must include the specific paragraph or section that applies to that question or item.

**Contractor's General Information**

Organization doing business as			
Business address of principle office			
Telephone numbers			
Main number			
Fax number			
Website address			
Form of business (check one)	<input type="checkbox"/> A corporation	<input type="checkbox"/> A partnership	<input type="checkbox"/> An individual
<b>If a corporation</b>			
Date of incorporation			
State of incorporation			
Chief Executive Manager's name			
President's name			
Vice President's name(s)			
Secretary's name			
Treasurer's name			
<b>If a Partnership</b>			
Date of organization			
State whether partnership is general or limited			
<b>If an Individual</b>			
Name			
Business address			
<b>Identify all individuals not previously named which exert a significant amount of business control over the organization</b>			
<b>Indicators of organization size</b>			
Average number of current full time employees		Average estimate of revenue for the current year	

**Contractor’s Organizational Experience**

Organization doing business as		
Business address of regional office		
Name of regional office manager		
Telephone numbers		
Main number		
Fax number		
Website address		
<b>Organization History</b>		
List of names that this organization currently, has or anticipates operating under over the history of the organization, including the names of related companies presently doing business:		
Names of organization	From date	To date
List of companies, firms or organizations that own any part of the organization.		
Name of companies, firms or organization.	Percent ownership	
<b>Construction Experience</b>		
Years experience in projects similar to the proposed project:		
As a utilities contractor		As a joint venture partner
Has this or a predecessor organization ever defaulted on a project or failed to complete any work awarded to it?		
If yes provide full details in a separate attachment. See attachment No.		
Has this or a predecessor organization been released from a bid or proposal in the past ten years?		
If yes provide full details in a separate attachment. See attachment No.		
Has this or a predecessor organization ever been disqualification as a bidder or proposer by any local, state, or federal agency within the last 5 years?		
If yes provide full details in a separate attachment. See attachment No.		
Is this organization or your proposed surety currently in any litigation or contemplating litigation?		
If yes provide full details in a separate attachment. See attachment No.		
Has this or a predecessor organization ever refused to construct or refused to provide materials defined in the contract documents?		
If yes provide full details in a separate attachment. See attachment No.		

**Contractor’s Proposed Key Personnel**

Organization doing business as:		
<b>Proposed project organization</b>		
Provide a brief description of the managerial structure of the organization and illustrate with an organizational chart. Include the title and names of key personnel. Include this chart as an attachment to this description. See attachment No.		
Provide a brief description of the managerial structure proposed for this project and illustrate with an organizational chart. Include the title and names of proposed key personnel and alternates. Include this chart as an attachment to this description. See attachment No.		
<b>Experience of Key Personnel</b>		
Provide information on the key personnel proposed for this project that will provide the following key functions. Provide information for candidates for each of these positions on the pages for each of these key personnel. Also provide biographical information for each primary and alternate candidate as an attachment. The biographical information must include the following as a minimum: technical experience, managerial experience, education and formal training, work history which describes project experience, including the roles and responsibilities for each assignment, and primary language. Additional information highlighting experience which makes them the best candidate for the assignment should also be included.		
Role	Primary candidate	Alternate candidate
Project manager		
Project superintendent		
Project safety manager		
Quality control manager		
If key personnel are to fulfill more than one of the roles listed above, provide a written narrative describing how much time will be devoted to each function, their qualifications to fulfill each role and the percentage of their time that will be devoted to each role. If the individual is not to be devoted solely to this project, indicate how time it to be divided between this project and their other assignments.		



**Proposed Project Managers**

Organization doing business as			
<b>Primary candidate</b>			
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 contacting the named individuals as a reference)			
Name		Name	
Title/ position		Title/ position	
Organization		Organization	
Telephone		Telephone	
Email		Email	
Project		Project	
Candidate role on project		Candidates role on project	
<b>Alternate candidate</b>			
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
<b>Reference contact information (listing names indicates approval to contacting the named individuals as a reference)</b>			
Name		Name	
Title/ position		Title/ position	
Organization		Organization	
Telephone		Telephone	
Email		Email	
Project		Project	
Candidate role on project		Candidate role on project	

**Proposed Project Superintendent**

Organization doing business as			
<b>Primary candidate</b>			
Name of individual			
Years of experience as project superintendent			
Years of experience with this organization			
Number of similar projects as 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 contacting the named individuals as a reference)			
Name		Name	
Title/ position		Title/ position	
Organization		Organization	
Telephone		Telephone	
Email		Email	
Project		Project	
Candidate role on project		Candidate role on project	
<b>Alternate candidate</b>			
Name of individual			
Years of experience as project superintendent			
Years of experience with this organization			
Number of similar projects as 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
<b>Reference contact information (listing names indicates approval to contacting the named individuals as a reference)</b>			
Name		Name	
Title/ position		Title/ position	
Organization		Organization	
Telephone		Telephone	
Email		Email	
Project		Project	
Candidate role on project		Candidate role on project	

**Proposed Project Safety Officer**

Organization doing business as			
<b>Primary candidate</b>			
Name of individual			
Years of experience as project safety manager			
Years of experience with this organization			
Number of similar projects as safety 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 contacting the named individuals as a reference)			
Name		Name	
Title/ position		Title/position	
Organization		Organization	
Telephone		Telephone	
Email		Email	
Project		Project	
Candidate role on project		Candidate role on project	
<b>Alternate candidate</b>			
Name of individual			
Years of experience as project safety manager			
Years of experience with this organization			
Number of similar projects as safety 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
<b>Reference contact information (listing names indicates approval to contacting the named individuals as a reference)</b>			
Name		Name	
Title/ position		Title/ position	
Organization		Organization	
Telephone		Telephone	
Email		Email	
Project		Project	
Candidate role on project		Candidate role on project	

**Proposed Project Quality Control Manager**

Organization doing business as			
<b>Primary candidate</b>			
Name of individual			
Years of experience as quality control manager			
Years of experience with this organization			
Number of similar projects as quality 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 contacting the named individuals as a reference)			
Name		Name	
Title/ position		Title/ position	
Organization		Organization	
Telephone		Telephone	
Email		Email	
Project		Project	
Candidate role on project		Candidate role on project	
<b>Alternate candidate</b>			
Name of individual			
Years of experience as quality control manager			
Years of experience with this organization			
Number of similar projects as quality 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
<b>Reference contact information (listing names indicates approval to contacting the named individuals as a reference)</b>			
Name		Name	
Title/ Position		Title/ Position	
Organization		Organization	
Telephone		Telephone	
Email		Email	
Project		Project	
Candidate role on Project		Candidate role on Project	





**Current Projects and Project Completed within the last 10 Years**

Project owner				Project name		
General description of project:						
Project cost				Date project completed		
Key project personnel	Project manager	Project superintendent	Safety manager	Quality control manager		
Name						
Reference contact information (listing names indicates approval to contacting the named 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 completed		
Key project personnel	Project manager	Project superintendent	Safety manager	Quality control manager		
Name						
Reference contact information (listing names indicates approval to contacting the named 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 completed		
Key project personnel	Project manager	Project superintendent	Safety manager	Quality control manager		
Name						
Reference contact information (listing names indicates approval to contacting the named individuals as a reference)						
	Name	Title/ position	Organization	Telephone	Email	
Owner						
Designer						
Construction manager						

**Project Information**

Project owner		Project name	
General description of project			
<b>Project Budget and Schedule Performance</b>			
Budget history		Schedule performance	
	Amount	% of Bid Amount	Date
			Days
Bid			Notice to Proceed
Change orders			Contract Substantial Completion date at Notice to Proceed
Owner enhancements			Contract final completion date at Notice to Proceed
Unforeseen conditions			Change Order authorized Substantial Completion date
Design issues			Change Order authorized final completion date
Total			Actual / estimated Substantial Completion date
Final cost			Actual / estimated final completion date
<b>Key Project Personnel</b>			
	Project Manager	Project Superintendent	Safety Manager
			Quality Control Manager
Name			
Percentage of time devoted to the project.			
Proposed for this project.			
Did Individual start and complete the project?			
If not, who started or completed the project in their place.			
Reason for change.			
<b>Reference contact information (listing names indicates approval to contacting the named individuals as a reference)</b>			
	Name	Title/ position	Organization
			Telephone
Owner			Email
Designer			
Construction Manager			
Surety			
<b>Issues / disputes resolved or pending resolution by arbitration, litigation or dispute review boards</b>			
Number of issues resolved:	Total amount involved in resolved issues:	Number of issues pending:	Total amount involved in resolved Issues:



**Affidavits**

One of the following four affidavits shall be executed and provided with this information. The individual signing the affidavit shall attach evidence of their authority to bind the organization to an agreement.

AFFIDAVIT FOR CORPORATION

State \_\_\_\_\_) §

County of \_\_\_\_\_) §

\_\_\_\_\_, being duly sworn deposes and says

*(Name)*

that they are \_\_\_\_\_ of the

*(Title)*

\_\_\_\_\_ corporation submitting the foregoing qualification form and related information; have read such documents; and that such documents are true and correct and contain no material misrepresentations; and that they are authorized to make this affidavit on behalf of the Corporation.

\_\_\_\_\_  
*(Signature)*

Signed and sworn to me before this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_.

\_\_\_\_\_  
*(Notary Public)*

My commission expires:

AFFIDAVIT FOR PARTNERSHIP

State \_\_\_\_\_) §

County of \_\_\_\_\_) §

\_\_\_\_\_, being duly sworn deposes and says

*(Name)*

that they are \_\_\_\_\_ of the

*(Title)*

\_\_\_\_\_ company submitting the foregoing qualification form and related information; have read such documents; and that such documents are true and correct and contain no material misrepresentations; and that they are authorized to make this affidavit on behalf of the Partnership.

\_\_\_\_\_  
*(Signature)*

Signed and sworn to me before this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_.

\_\_\_\_\_  
*(Notary Public)*

My commission expires:

AFFIDAVIT FOR INDIVIDUAL

State \_\_\_\_\_) §

County of \_\_\_\_\_) §

\_\_\_\_\_, being duly sworn deposes and says

*(Name)*

that they are \_\_\_\_\_ of the

*(Title)*

\_\_\_\_\_ company submitting the foregoing qualification form and related information; have read such documents; and that such documents are true and correct and contain no material misrepresentations.

\_\_\_\_\_

*(Signature)*

Signed and sworn to me before this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_.

\_\_\_\_\_

*(Notary Public)*

My commission expires:

JOINT VENTURE STATEMENT

We the undersigned do hereby give notice to our agreement to Bid as a joint venture on the Project.

---

*(Name of Joint Venture)*

---

---

*(Name of Firm)*

---

---

*(Signature)*

Signed and sworn to me before this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_.

---

*(Notary Public)*

My commission expires:

---

---

*(Name of Firm)*

---

---

*(Signature)*

Signed and sworn to me before this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_.

---

*(Notary Public)*

My commission expires:

---

**END OF SECTION 00 45 13**

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SECTION 00 45 19  
NON-COLLUSIVE AFFIDAVIT

State of \_\_\_\_\_ )  
County of \_\_\_\_\_ )

First being duly sworn deposes and says that:

- (1) He is the \_\_\_\_\_  
(Owner, Partner, Officer, Representative or Agent)  
of \_\_\_\_\_ the BIDDER that has submitted the attached BID;
- (2) He is fully informed respecting the preparation and contents of the attached BID and of all pertinent circumstances respecting such BID;
- (3) Such BID is genuine and is not a collusive or sham BID;
- (4) Neither the said BIDDER 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 BIDDER, firm, or person to submit a collusive or sham BID in connection with the Contract for which the attached BID has been submitted; or to refrain from bidding in connection with such Contract; or have in any manner, directly or indirectly, sought by agreement or collusion, or communication, or conference with any BIDDER, firm, or person to fix the price or prices in the attached BID or of any other BIDDER, or to fix any overhead, profit, or cost elements of the BID price or the BID price of any other BIDDER, or to secure through any collusion, conspiracy, connivance, or unlawful agreement any advantage against (Recipient), or any person interested in the proposed Contract;
- (5) The price or prices quoted in the attached BID are fair and proper and are not tainted by any collusion, conspiracy, connivance, or unlawful agreement on the part of the BIDDER or any other of its agents, representatives, owners, employees, or parties in interest, including this affidavit.

BY \_\_\_\_\_

ITS \_\_\_\_\_  
(Title)

Subscribed and sworn to before me this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_.

\_\_\_\_\_  
Notary Public

\_\_\_\_\_  
My commission expires

END OF AFFIDAVIT

SECTION 00 45 20  
E-VERIFY AFFIDAVIT

STATE OF NORTH CAROLINA

AFFIDAVIT

COUNTY OF BURKE

NOW COMES Affiant, \_\_\_\_\_, being duly authorized by law and on behalf of \_\_\_\_\_ ("Contractor") after first being duly sworn hereby swears or affirms as follows:

1. Contractor has submitted a bid for contract or desires to enter into a contract with the City of Morganton;

2. As part of his/her duties and responsibilities pursuant to said bid and/or contract, Contractor attests that he/she is aware of and in compliance with the requirements of E-Verify, the federal program operated by the United States Department of Homeland Security, and Article 2 of Chapter 64 of the North Carolina General Statutes, to include (mark which applies):

\_\_\_ After hiring an employee to work in the United States, verifies the work authorization of said employee through E-Verify and retain the record of the verification of work authorization while the employee is employed and for one year thereafter; or

\_\_\_ Employs less than twenty-five (25) employees in the State of North Carolina.

3. As part of his/her duties and responsibilities pursuant to said bid and/or contract, Contractor attests that to the best of his/her knowledge any subcontractors employed as a part of this bid and/or contract are in compliance with the requirements of E-Verify and Article 2 of Chapter 64 of the North Carolina General Statutes.

This the \_\_\_\_\_ day of \_\_\_\_\_, 2023.

\_\_\_\_\_  
Affiant

Sworn to and subscribed before me, this the \_\_\_\_\_ day of \_\_\_\_\_, 2023.

[OFFICIAL SEAL]

\_\_\_\_\_  
\_\_\_\_\_, Notary Public

My Commission Expires: \_\_\_\_\_



SECTION 00 45 21  
IRAN DIVESTMENT ACT

Project Name: Bost Rd Sewer Improvements

Name of Contracting Party or Bidder: \_\_\_\_\_  
\_\_\_\_\_

**IRAN DIVESTMENT ACT CERTIFICATION REQUIRED BY  
N.C.G.S. §147-86.55 et seq. \***

Pursuant to N.C.G.S. §147-86.59, any person identified as engaging in investment activities in Iran, determined by appearing on the Final Divestment List created by the State Treasurer pursuant to G.S. 147-86.58, is ineligible to contract with the State of North Carolina or any political subdivision of the State.

As of the date listed below, the supplier or bidder listed above is not listed on the Final Divestment List created by the State Treasurer pursuant to N.C.G.S. §147-86.58.

The undersigned hereby certifies that he or she is authorized by the contracting party or bidder listed above to make the foregoing statement.



\_\_\_\_\_  
Signature Date

\_\_\_\_\_  
Printed Name Title

N.C.G.S. §147-86.59(a) requires this certification for bids or contracts with the State of North Carolina, a North Carolina local government, or any other political subdivision of the State of North Carolina. The certification is required at the following times:

- When a bid is submitted
- When a contract is entered into (if the certification was not already made when the vendor made its bid)
- When a contract is renewed or assigned

N.C.G.S. § 147-86.59(b) requires that contractors with the State, a North Carolina local government, or any other political subdivision of the State of North Carolina must not utilize any subcontractor found on the State Treasurer’s Final Divestment List.

The State Treasurer’s Final Divestment List can be found on the State Treasurer’s website at the address [www.nctreasurer.com/Iran](http://www.nctreasurer.com/Iran) and will be updated every 180 days.

\* Note: Enacted by Session Law 2015-118 as N.C.G.S. §143C-55 et seq., but has been renumbered for codification at the direction of the Revisor of Statutes.



**AFFIDAVIT A**  
**Listing of Good Faith Effort**  
**\*\*SUBMIT WITH BID\*\***

County of \_\_\_\_\_

Affidavit of \_\_\_\_\_

(Name of Bidder)

**I have made a good faith effort to comply under the following areas checked:**

*(A minimum of 50 points must be obtained in order to have achieved a "good faith effort")*

- 1-Contacted Certified MWBE businesses that reasonably could have been expected to submit a quote and that were known to the contractor or available on State or local government maintained lists, at least 10 days before the bid date and notified them of the nature and scope of the work to be performed.  
**Value= 10 points.**
- 2-Made the construction plans, specifications and requirements available for review by prospective Certified MWBE businesses, or providing these documents to them at least 10 days before the bids are due. **Value=10 points.**
- 3-Broken down or combined elements of work into economically feasible units to facilitate Certified MWBE business participation.  
**Value = 15 points.**
- 4-Worked with Certified MWBE businesses trade, community, or contractor organizations identified by the MWBE Program and included in the bid documents that provide assistance in recruitment of Certified MWBE businesses.  
**Value=10 points.**
- 5-Attended pre-bid meetings schedule by the public owner.  
**Value=10 points.**
- 6-Provided assistance in getting required bonding or insurance or provided alternatives to bonding or insurance for subcontractors.  
**Value=20 points.**
- 7-Negotiated in good faith with interested Certified MWBE businesses and did not reject them as unqualified without sound reasons based on their capabilities. Any rejection of a Certified MWBE business based on lack of qualification should have the reasons documented in writing.  
**Value =15 points.**
- 8-Provided assistance to an otherwise Certified MWBE businesses in need of equipment, loan capital, lines of credit, or joint pay agreements to secure loans, supplies, or letters of credit, including waiving credit that is ordinarily required. Assisted Certified MWBE businesses in obtaining the same unit pricing with the bidder’s suppliers in order to help Certified MWBE businesses in establishing credit.  
**Value=25 points.**
- 9-Negotiated joint venture and partnership arrangements with Certified MWBE businesses in order to increase opportunities for Certified MWBE businesses participation on a public construction or repair project when possible.

**Value =20 points.**

**10-** Provided quick pay agreements and policies to enable Certified MWBE business contractors and suppliers to meet cash flow demands.

**Value=20 points.**

**TOTAL POINTS OBTAINED \_\_\_\_\_.**

In accordance with GS143-128.2 (d) the undersigned will enter into a formal agreement with the firms listed on the Identification of Certified MWBE Participation schedule conditional upon execution of a contract with the Owner. Failure to abide by this statutory provision will constitute a breach of the contract.

The undersigned hereby certifies that he or she has read the terms of the MWBE Program commitment and is authorized to bind the bidder to the commitment herein set forth.

Date: \_\_\_\_\_

Name of Authorized Officer: \_\_\_\_\_

Signature: \_\_\_\_\_

Title: \_\_\_\_\_

State of North Carolina, County of \_\_\_\_\_

Subscribed and sworn to before me this \_\_\_\_\_ day of \_\_\_\_\_ 20\_\_\_\_

Notary Public \_\_\_\_\_ My commission expires \_\_\_\_\_

SEAL

**AFFIDAVIT B**  
**Intent to Perform Contract with Own Workforce**  
**\*\*SUBMIT WITH BID\*\***

County of \_\_\_\_\_  
Affidavit of \_\_\_\_\_  
(Name of Bidder)

I hereby certify that it is our intent to perform 100 % of the work required for the  
\_\_\_\_\_ Contract. **Total Project Bid \$** \_\_\_\_\_ **Bid Date** \_\_\_\_\_  
**(Name of Project)**

In making this certification, the Bidder states that the Bidder does not customarily subcontract elements of this type project, and normally performs and has the capability to perform and will perform all elements of work on this project with his/her own current work forces; and

The Bidder agrees to provide any additional information or documentation requested by the owner in support of the above statement.

The undersigned hereby certifies that he or she has read this certification and is authorized to bind the Bidder to the commitments herein contained.

Date: \_\_\_\_\_ Name of Authorized Officer: \_\_\_\_\_  
Signature: \_\_\_\_\_  
Title: \_\_\_\_\_

State of North Carolina, County of \_\_\_\_\_

Subscribed and sworn to before me this \_\_\_\_\_ day of \_\_\_\_\_ 20\_\_\_\_

Notary Public \_\_\_\_\_ my commission expires \_\_\_\_\_

SEAL

**AFFIDAVIT C**

**Portion of the work to be performed by Certified MWBE Businesses**

**\*\*This form is to be submitted only by the apparent lowest responsible, responsive bidder\*\***

County of \_\_\_\_\_

If the portion of the work to be executed by Certified MWBE Businesses as defined in GS 143-128.2 (g) **is equal to or greater than 15%** of the bidders total contract price, then the bidder must complete this affidavit. *This affidavit shall be provided by the apparent lowest responsible, responsive bidder within **72 hours** after notification of being low bidder.*

Affidavit of \_\_\_\_\_ I do hereby certify that on the  
(Name of Bidder)

\_\_\_\_\_ Total Project Bid \$ \_\_\_\_\_ Bid Date \_\_\_\_\_  
(Project Name)

I will expend a minimum of \_\_\_\_\_% to minority and \_\_\_\_\_% to non-minority women of the total dollar amount of this contract. Total dollar value of Certified MWBE businesses is \$ \_\_\_\_\_ for a total of \_\_\_\_\_% of this contract. The Certified MWBE Businesses will be employed as construction subcontractors, vendors, suppliers or providers of professional services. Such work will be subcontracted to the following firms listed below. Attach additional sheets if required.

Business Name, Phone #, Email	Work Type	*MWBE	CERTIFIED	Dollar Value	%

**\*Certified MWBE Business Program Categories:**

American Indian (AI), Asian American (AA), Black, African American (B), Hispanic (H), Non-minority female (NMF) Socially and Economically Disadvantaged (D)

Pursuant to GS 143-128.2 (d), the undersigned will enter into a formal agreement with Certified MWBE Business Program Firms for work listed in this schedule conditional upon execution of a contract with the Owner. Failure to fulfill this commitment may constitute a breach of the contract.

Bidder must submit the Certified Subcontractor Payment with each payment request and final payment to the Project Manager.

Bidder must submit a Request to Change a Certified MWBE Subcontractor form to the Project Manager if necessary to replace/discontinue a MWBE Subcontractor.

The undersigned hereby certifies that he or she has read the terms of this commitment and is authorized to bind the bidder to the commitment herein set forth.

Date: \_\_\_\_\_ Name of Authorized Officer: \_\_\_\_\_  
Signature: \_\_\_\_\_  
Title: \_\_\_\_\_

State of North Carolina, County of \_\_\_\_\_

Subscribed and sworn to before me this \_\_\_\_\_ day of \_\_\_\_\_ 20\_\_

Notary Public \_\_\_\_\_ my commission expires \_\_\_\_\_

SEAL





- A. Copies of solicitations for quotes to at least three (3) Certified MWBE businesses from the source list provide by the City of Raleigh for each subcontract to be let under this contract (if 3 or more firms are shown on the source list). Each solicitation shall contain a specific description of the work to be subcontracted, location where bid documents can be reviewed, representative of the Prime Bidder to contract, and location, date and time when quotes must be received.
- B. Copies of quotes or responses received from each firm responding to the solicitation.
- C. A telephone log of follow-up calls to each firm sent a solicitation.
- D. For subcontracts where a Certified MWBE business is not considered the lowest responsible sub-bidder, copies of quotes received from all firms submitting quotes for that particular subcontract.
- E. Documentation of any contacts or correspondence to Certified MWBE business. Community or contractor organizations in an attempt to meet the goal.
- F. Copy of the pre-bid letter.
- G. Letter documenting efforts to provide assistance in obtaining required bonding or insurance for Certified MWBE business.
- H. Letter detailing reasons for rejections of Certified MWBE business due to lack of qualification.
- I. Letter documenting proposed assistance offered to Certified MWBE business in need of equipment, loan capital, lines of credit, or joint pay agreements to secure loans, supplies, or letter of credit, including waiving credit that is ordinarily required.

**Failure to provide the documentation as listed in these provisions may result in rejection of the bid and award to the next lowest responsible and responsive bidder.**

Bidder must submit the Certified Subcontractor Payment with each payment request and final payment to the Project Manager.

Bidder must submit a Request to Change a Certified MWBE Subcontractor form to the Project Manager if necessary to replace/discontinue a MWBE Subcontractor.

The undersigned hereby certifies that he or she has read the terms of this commitment and is authorized to bind the bidder to the commitment herein set forth.

Date: \_\_\_\_\_ Name of Authorized Officer: \_\_\_\_\_  
 Signature: \_\_\_\_\_  
 Title: \_\_\_\_\_

State of North Carolina, County of \_\_\_\_\_

Subscribed and sworn to before me this \_\_\_\_\_ day of \_\_\_\_\_ 20\_\_\_\_

Notary Public \_\_\_\_\_ My commission expires \_\_\_\_\_

SEAL

**REQUEST TO CHANGE A CERTIFIED MWBE SUBCONTRACTOR**

Project Name: \_\_\_\_\_  
 Prime Contractor: \_\_\_\_\_ Contact Name: \_\_\_\_\_  
 Phone #: \_\_\_\_\_ Email Address: \_\_\_\_\_  
 Project Manager Name: \_\_\_\_\_ Division: \_\_\_\_\_

Will this request change the dollar amount of the contract? Yes \_\_\_ No \_\_\_ If yes,  
 Original total contract amount \$ \_\_\_\_\_ and proposed total contract: \$ \_\_\_\_\_

The proposed request will do the following to overall MWBE participation (please check one):

Increase \_\_\_ Decrease \_\_\_ No Change \_\_\_

Name current MWBE subcontractor: \_\_\_\_\_

Service provided: \_\_\_\_\_

**Proposed Action:**

\_\_\_ Replace MWBE subcontractor

\_\_\_ Perform work in-house

You must provide one of the following reasons (Please check applicable reason):

\_\_\_ The listed MWBE, after having had a reasonable opportunity to do so, fails or refuses to execute a written contract.

\_\_\_ The listed MWBE is bankrupt or insolvent.

\_\_\_ The listed MWBE fails or refuses to perform his/her subcontract or furnish the listed materials.

\_\_\_ The work performed by the listed subcontractor is unsatisfactory according to industry standards and is not in accordance with the plans and specifications; or the subcontractor is substantially delaying or disrupting the progress of the work.

\_\_\_ Other. Explain on company letter head.

Name of replacement subcontractor: \_\_\_\_\_

Is the subcontractor a certified MWBE? \_\_\_ Yes \_\_\_ No

***If no, please attach documentation of outreach efforts employed by the firm to utilize an MWBE.***

Dollar amount of amended subcontractor \$ \_\_\_\_\_ MWBE \_\_\_\_\_%

\_\_\_\_\_  
 Printed Name

\_\_\_\_\_  
 Title

\_\_\_\_\_  
 Date

**Interoffice Use Only:**

Approval\_Yes\_No

Date\_\_\_\_\_

Signature\_\_\_\_\_

SECTION 00 51 00  
NOTICE OF AWARD

Date of Issuance:

Owner: City of Morganton Owner's Project No.: N/A  
Engineer: Merrick & Company Engineer's Project No.: 65421093  
Project: Bost Rd Sewer Improvements  
Contract Name: Bost Rd Sewer Improvements  
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:

- 1) Demolition of Existing Lift Station and Construction of a Lift Station
- 2) Installation of a Gravity Sewer Line
- 3) Installation of a Force main line and Horizontal Directional Drill

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.

**[Number of copies sent]** 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 the Owner three (3) fully executed counterparts of the Agreement, signed by Bidder (as Contractor). Provide hard copies with signatures.
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 5.
3. Other conditions precedent (if any): **W-9, ACH Authorization, COI, and City Safety Agreement.**

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 Article 2 of the General Conditions.

Owner: City of Morganton

By *(signature)*: \_\_\_\_\_

Name *(printed)*: \_\_\_\_\_

Title: \_\_\_\_\_

Copy: Engineer

SECTION 00 52 13  
CONSTRUCTION AGREEMENT

This Agreement is between the City of Morganton (“Owner”) and \_\_\_\_\_ (“Contractor”).

Owner and Contractor, in consideration of the mutual covenants set forth herein, agree as follows:

**ARTICLE 1 – WORK**

1.1 Contractor shall complete all Work as specified or indicated in the Contract Documents. The Work is generally described as follows:

- Full demolition of existing wastewater pump station, including wet well, pumps, valve vault, valves, pipes, and associated electrical components. Existing lift station shall remain operational until new wet well is operational.
- Construction of new wastewater pump station, including cast-in-place wet well, two submersible non-clog pumps, valve vault, pipes, valves, platform, davit crane for pump removal, canopy, and associated electrical components, including updating the electrical service (by Duke Energy).
- Construction of 2,959 LF of new gravity sewer mains consisting of 8-inch PVC and DI sewer pipe 16 precast manholes, jack and bore casings, and connections to existing sewers.
- Construction of 3,506 LF of new sewer force main consisting 8-inch PVC and DI pipe including connection to an existing manhole, jack and bore casings, and air release valves.
- Construction of 599 LF of new 20-inch HDPE casing installed by horizontal directional drill and 599 LF of new 8-inch HDPE force main carrier pipe within the casing.
- An allowance for communications, controls, and security

**ARTICLE 2 – THE PROJECT**

2.1 The Project for which the Work under the Contract Documents may be the whole or only a part is generally described as follows:

Bost Road Sewer Improvements

**ARTICLE 3 – ENGINEER**

3.1 The Project has been designed by:

Merrick & Company, 301 S. McDowell Street, Suite 300, Charlotte, NC 28204, who is to act as Owner’s representative, assume all duties and responsibilities, and have the rights and authority assigned to Engineer in the Contract Documents in connection with the completion of the Work in accordance with the Contract Documents.

**ARTICLE 4 – CONTRACT TIMES**

4.1 Time of the Essence: All time limits for Milestones, if any, Substantial Completion, and completion and readiness for final payment as stated in the Contract Documents are of the

essence of the Contract.

4.2 Dates for Substantial Completion and Final Payment:

- A. The Work is required to be substantially completed within 450 calendar days after the date when the Contract Times commence to run as provided in Paragraph 3.3 of the General Conditions and completed and ready for final payment in accordance with Paragraph 14.9 of the General Conditions within 480 calendar days after the date when the Contract Times commence to run.

4.3 Liquidated Damages: Contractor and Owner recognize that time is of the essence and that Owner will suffer financial loss if the Work is not completed within the times specified in Paragraph 4.2, plus any extensions of Contract Time allowed in accordance with Article 12 of the General Conditions. 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), Contractor shall pay Owner \$1000.00 for each day that expires after the time specified in Paragraph 4.2 for Substantial Completion until the Work is substantially complete. After Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Time or any proper extension thereof granted by Owner, Contractor shall pay Owner \$1,000.00 for each day that expires after the time specified in Paragraph 4.2 for completion and readiness for final payment until the Work is completed and ready for final payment. In addition, liquidated damages are stipulated in Section 00 72 13 "General Conditions" for failure to meet Milestone completions, if any. The Owner will be the sole judge as to whether the Work has been completed within the allotted time. Assessment of liquidated damages by the Owner shall not constitute a waiver of the Owner's right to sue and collect additional damages which Owner may sustain by the failure of the Contractor to perform in accordance with the terms of its Contract.

**ARTICLE 5 – CONTRACT PRICE**

5.1 Owner shall pay Contractor for completion of the Work in accordance with the Contract Documents for the prices shown below:

Lump Sum Bid Price for Base Bid \$ \_\_\_\_\_

All specified cash allowances and contingencies are included in the price(s) set forth above and have been computed in accordance with Paragraph 11.02 of the General Conditions.

**ARTICLE 6 – PAYMENT PROCEDURES**

6.1 Submittal and Processing of Payments: Contractor shall submit Applications for Payment in accordance with Article 14 of the General Conditions. Applications for Payment will be processed by Engineer as provided in the General Conditions.

6.2 Progress Payments; Retainage:

- A. Owner shall make progress payments on the basis of Contractor's Applications for Payment on or about the 25<sup>th</sup> day of each month during performance of the Work. All such payments will be on the basis of progress of work measured by the Schedule of Values established as provided in Paragraph 6.3 of 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 in the General Requirements.



- B. Progress payments will be made in accordance with Paragraph 14.02 of the General Conditions as amended by the Supplementary Conditions.
  - C. Payment will be less the aggregate of payments previously made and less such amounts as Engineer may determine or Owner may withhold, including but not limited to liquidate damages, in accordance with Paragraph 14.1 of the General Conditions. In addition to the amount retained above, the Owner may retain additional amounts as set forth elsewhere in the Contract Documents.
  - D. At the Owner's option, retainage may be required at a higher percentage rate, or Owner may choose not to reduce retainage if progress on the Project is considered to be unsatisfactory. If retainage in excess of the amount described above is held prior to Substantial Completion, the Owner will place the additional amount in an interest bearing account. Interest will be paid in accordance with Article 7.
  - E. Upon Substantial Completion, Owner may pay an amount sufficient to increase total payments to Contractor to 100 percent of the Work completed, less such amounts as Engineer shall determine in accordance with Paragraph 14.5 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 tentative list of items to be completed or corrected attached to the Certificate of Substantial Completion. If Owner has concerns with the ability of the Contractor to complete the remaining Work in accordance with the Contract Documents or within the time from established by this Agreement, Owner may at its sole discretion, elect to retain retainage if the amounts set forth above for progress payments prior to Substantial Completion. Release or reduction in retainage is contingent upon consent of surety to such reduction in retainage.
- 6.3 Final Payment: Upon final completion and acceptance of the Work in accordance with Paragraph 14.8 of the General Conditions, Owner shall pay the remainder of the Contract Price as recommended by Engineer.

#### **ARTICLE 7 – INTEREST**

- 7.1 Not used.

#### **ARTICLE 8 – CONTRACTOR'S REPRESENTATIONS**

- 8.1 In order to induce Owner to enter into this Agreement, Contractor makes the following representations:
  - A. Contractor has examined and carefully studied the Contract Documents and the other related data identified in the Bid Documents.
  - B. Contractor has visited the Site and become familiar with and is satisfied as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
  - C. Contractor is familiar with and is satisfied as to all federal, state, and local Laws and Regulations that may affect cost, progress, and performance of the Work.
  - D. Contractor has carefully studied all: (1) reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site including Underground Facilities which have been identified in Paragraph SC-4.02 of the Supplementary Conditions and (2) reports and drawings of a Hazardous Environmental Condition, if any, at the Site which has been identified in Paragraph SC-4.06 of the Supplementary Conditions.

- E. Contractor has obtained and carefully studied all additional or supplementary examinations, investigations, explorations, tests, studies, and data concerning conditions including surface, subsurface, and Underground Facilities at or contiguous to the Site which may affect cost, progress, or performance of the Work or which relate to any aspect of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, including any specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bid Documents, and safety precautions and programs incident thereto or assumes responsibility for doing so.
- F. Contractor does not consider that any 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 Documents.
- G. Contractor is aware of the general nature of Work to be performed by Owner and others at the Site that relates to the Work as indicated in the Contract Documents.
- H. Contractor has correlated the information known to Contractor, information and observations obtained from visits to the Site, reports and drawings identified in the Contract Documents, and all additional examinations, investigations, explorations, tests, studies, and data with the Contract Documents.
- I. Contractor has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Contractor has discovered in the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.
- J. The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.

## ARTICLE 9 – CONTRACT DOCUMENTS

### 9.1 Contents

- A. The Contract Documents consist of the following:
  - 1. Specifications, forms, and documents listed in Section 00 01 10 “Table of Contents” except as specifically excluded in Paragraph C.
  - 2. Drawings consisting of 45 sheets bearing the general title: Bost Rd Sewer Improvements
  - 3. Addenda (insert Addenda number, inclusive).
  - 4. Exhibits to this Agreement (enumerated as follows):
    - a. Contractor’s Bid (pages 00 42 23-1 to 00 42 23- insert page number, inclusive).
    - b. Documentation submitted by Contractor prior to Notice of Award (pages x to x, inclusive).
- B. The following are also Contract Documents which may be delivered or issued on or after the Effective Date of the Agreement and are not attached hereto:
  - 1. Notice to Proceed.
  - 2. Written Amendment(s).
  - 3. Change Order(s).
  - 4. Field Order(s).

5. Work Change Directive(s).
  6. Engineers Written Interpretation(s).
- C. These documents are attached to this Agreement as reference but are not part of the Contract Documents:
1. Documents specifically listed in Supplementary Condition SC-4.02 and SC-4.06.
- D. The Contract Documents may only be amended, modified, or supplemented as provided in Article 11 of the General Conditions.

#### **ARTICLE 10 – MISCELLANEOUS**

- 10.1 Terms: Terms used in this Agreement will have the meanings stated in the General Conditions and the Supplementary Conditions.
- 10.2 Assignment of Contract: No assignment by a party hereto of any rights under or interests in the Contract will be binding on another party hereto without the written consent of the party sought to be bound; and, specifically but without limitation, moneys that may become due and moneys that are due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under the Contract Documents.
- 10.3 Successors and Assigns: Owner and Contractor each binds itself, its partners, successors, assigns, and legal representatives to the other party hereto, its partners, successors, assigns, and legal representatives in respect to all covenants, agreements, and obligations contained in the Contract Documents.
- 10.4 Severability: Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation shall be deemed stricken, and all remaining provisions shall continue to be valid and binding upon Owner and Contractor, who agree that the Contract Documents shall be reformed to replace such stricken provision or part thereof with a valid and enforceable provision that comes as close as possible to expressing the intention of the stricken provision.
- 10.5 Contractor's Certifications: Contractor certifies that it has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for or in executing the Contract. For the purposes of this Paragraph 10.5:
- 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 or in the Contract execution.
  - B. "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.
  - 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.

10.6 Other Provisions:

A. List as necessary.

10.7 Venue: Venue shall lie exclusively in Burke County, North Carolina for any legal action.

IN WITNESS WHEREOF, Owner and Contractor have signed this Agreement in duplicate. One counterpart each has been delivered to Owner and Contractor. All portions of the Contract Documents have been signed or identified by Owner and Contractor or on their behalf.

This Agreement will be effective on Date to be inserted at the Time of Contract Execution.

Owner: \_\_\_\_\_  
*(typed or printed)*

Contractor: \_\_\_\_\_  
*(typed or printed)*

By: \_\_\_\_\_  
*(Individual's signature)*

By: \_\_\_\_\_  
*(Individual's signature)*

Name: \_\_\_\_\_  
*(typed or printed)*

Name: \_\_\_\_\_  
*(typed or printed)*

Title: \_\_\_\_\_  
*(typed or printed)*

Title: \_\_\_\_\_  
*(typed or printed)*

Attest: \_\_\_\_\_  
*(Individual's signature)*

Attest: \_\_\_\_\_  
*(Individual's signature)*

Address for giving notice:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Designated representative:

Designated representative:

Name: \_\_\_\_\_

Name: \_\_\_\_\_

Title: \_\_\_\_\_

Title: \_\_\_\_\_

Address: \_\_\_\_\_

Address: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

Phone: \_\_\_\_\_

Phone: \_\_\_\_\_

Email: \_\_\_\_\_

Email: \_\_\_\_\_

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

**END OF SECTION 00 52 13**

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### NOTICE TO PROCEED

Owner: City of Morganton Owner's Project No.: N/A  
 Engineer: Merrick & Company Engineer's Project No.: 65421093  
 Contractor: \_\_\_\_\_ Contractor's Project No.: \_\_\_\_\_  
 Project: Bost Rd Sewer Improvements  
 Contract Name: Bost Rd Sewer Improvements  
 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]**.

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 number of days to achieve Substantial Completion is 450 from the date stated above for the commencement of the Contract Times, resulting in a date for Substantial Completion of **[date, calculated from commencement date above]**; and the number of days to achieve readiness for final payment is 480 from the commencement date of the Contract Times, resulting in a date for readiness for final payment of **[date, calculated from commencement date above]**.

Owner: City of Morganton  
 By (signature): \_\_\_\_\_  
 Name (printed): \_\_\_\_\_  
 Title: \_\_\_\_\_  
 Date Issued: \_\_\_\_\_  
 Copy: Engineer

SECTION 00 61 13.13  
PERFORMANCE BOND

<p><b>Contractor</b> Name: <b>[Full formal name of Contractor]</b> Address (principal place of business): <b>[Address of Contractor's principal place of business]</b></p>	<p><b>Surety</b> Name: <b>[Full formal name of Surety]</b> Address (principal place of business): <b>[Address of Surety's principal place of business]</b></p>
<p><b>Owner</b> Name: City of Morganton Mailing address (principal place of business): 305 E Union St, Suite A100 Morganton, North Carolina 28655</p>	<p><b>Contract</b> Description (name and location): Bost Rd Sewer Improvements Morganton, North Carolina  Contract Price: <b>[Amount from Contract]</b>  Effective Date of Contract: <b>[Date from Contract]</b></p>
<p><b>Bond</b> Bond Amount: <b>[Amount]</b> Date of Bond: <b>[Date]</b> <i>(Date of Bond cannot be earlier than Effective Date of Contract)</i> Modifications to this Bond form: <input type="checkbox"/> None <input type="checkbox"/> See Paragraph 16</p>	
<p>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.</p>	
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: _____
<p><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></p>	



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: None

SECTION 00 61 13.16  
PAYMENT BOND

<p><b>Contractor</b></p> <p>Name: <b>[Full formal name of Contractor]</b></p> <p>Address (<i>principal place of business</i>): <b>[Address of Contractor's principal place of business]</b></p>	<p><b>Surety</b></p> <p>Name: <b>[Full formal name of Surety]</b></p> <p>Address (<i>principal place of business</i>): <b>[Address of Surety's principal place of business]</b></p>
<p><b>Owner</b></p> <p>Name: City of Morganton</p> <p>Mailing address (<i>principal place of business</i>): 305 E. Union St., Suite A100 Morganton, North Carolina 28655</p>	<p><b>Contract</b></p> <p>Description (<i>name and location</i>): Bost Rd Sewer Improvements Morganton, North Carolina</p> <p>Contract Price: <b>[Amount, from Contract]</b></p> <p>Effective Date of Contract: <b>[Date, from Contract]</b></p>
<p><b>Bond</b></p> <p>Bond Amount: <b>[Amount]</b></p> <p>Date of Bond: <b>[Date]</b></p> <p><i>(Date of Bond cannot be earlier than Effective Date of Contract)</i></p> <p>Modifications to this Bond form: <input type="checkbox"/> None <input type="checkbox"/> See Paragraph 18</p>	
<p>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.</p>	
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: _____
<p><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></p>	

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: None

SECTION 00 62 16  
CERTIFICATES OF INSURANCE

PAGE FOR ATTACHING

CERTIFICATES OF INSURANCE



SECTION 00 63 00  
CERTIFICATES

City of Morganton

Attorney’s Certificate

I certify that I have reviewed the attached Contract Documents and that the documents are approved as to form and that the foregoing documents represent valid and binding obligations of the city of Morganton in accordance with the terms thereof.

This the \_\_\_\_\_ day of \_\_\_\_\_, 2023.

\_\_\_\_\_  
City Attorney  
City of Morganton

Finance Officer’s Certificate

I certify that this instrument (the attached Contract Documents) has been pre-audited in the manner required by the Local Government Budget and Fiscal Control Act.

This the \_\_\_\_\_ day of \_\_\_\_\_, 2023.

\_\_\_\_\_  
Finance Director  
City of Morganton

**CITY OF MORGANTON  
CONSTRUCTION CONTRACT  
GENERAL CONDITIONS**

**CITY OF MORGANTON, NC**  
**GENERAL CONDITIONS CONSTRUCTION CONTRACT**

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## **GENERAL CONDITIONS**

### **ARTICLE 1 - DEFINITIONS.**

**1.1 Basic Definitions.** Whenever used in these General Conditions or in the other Contract Documents, the following terms have the meanings indicated which are applicable to both the singular and plural thereof:

#### **1.1.1 City.**

The City of Morganton, North Carolina, a party to the Contract. See also Owner.

#### **1.1.2 Contract.**

It is the entire agreement entered into between the City and the Contractor, and it also includes all of the other documents described in Article 2 as the Contract Documents, including any formal changes to any of those documents by addendum, change order or other written modification. The terms Contract and Contract Documents are synonymous and may be used interchangeably. For purposes of distinguishing documents, the term "Agreement" may be used in place of Contract when referring solely to the separate document signed by the parties.

#### **1.1.3 Contract Amount.**

The Contract Amount is the sum of money stated in the Contract that is payable by the City to the Contractor for the performance of the Work. Normally the Contract Amount is the amount stated in the bid, but it may also include any adjustments authorized by change order or other written modification. Sometimes it is referred to as the contractor's fee or the contract sum and it is generally paid to the Contractor in monthly or periodic progress payments, based on the portion of the Work satisfactorily completed, less any retainage.

#### **1.1.4 Contract Time.**

The number of calendar days allowed for completion of the Work, as stated in the Agreement or other Contract Documents.

### **1.1.5 Contractor.**

The Contractor is the Person entering into the Contract with the City to perform all of the Work required under the Contract Documents. For some projects, more than one Contractor may have a subdivision or branch of the Work requiring a separate contract (i.e. projects involving multiple prime contracts). Where a particular contractor is intended, an adjective may be used to help further define which contractor, such as “general” contractor, “single prime” contractor or “heating” contractor in order to help identify the contractor required to perform all or any specific branch or subdivision of the Work assigned to that contractor. However, the term does not include a “subcontractor” which is meant to be a Person who has entered into a direct contract with a contractor but not the City.

### **1.1.6 Drawings.**

The Drawings are the graphic or pictorial portions of the Contract Documents showing the design, the location and the dimensions of the Work, generally including plans, elevations, sections, details, schedules and diagrams and other visual representations of the Work.

### **1.1.7 Engineer.**

The Person engaged by the City to perform architectural, engineering, design and other related services (but not construction) related to the Project and the Work required to complete the Project. When the City uses an architect for such services, the terms “architect” and “engineer” shall be synonymous. The Engineer may be an independent contractor providing professional services to the City; however, for some projects, the architectural, engineering, design, inspection, testing and other services related to the Project may be provided by a staff person or a department of the City.

### **1.1.8 Owner.**

For this Contract, the term Owner is synonymous with the City.

### **1.1.9 Person.**

The term Person includes an individual, a partnership, corporation or other entity regardless of its organizational structure. Most often, it refers to the Contractor or to the Engineer and depending on its usage, may refer to the individual who is designated to or has apparent authority to act on behalf of the Contractor or the Engineer or the City.

#### **1.1.10 Plans and Specifications.**

A term sometimes used to refer to the Drawings and the Specifications together or to the set of documents which describes the Work and which may include floor plans, elevations, renderings, plats, details of mechanical systems or other pictorial or written descriptions of the Work.

#### **1.1.11 Project.**

The entire construction Project involving the Work provided for in whole or in part by the Contract Documents. It is the intended result of the Work.

#### **1.1.12 Project Expediter.**

The Project Expediter is a responsible, reliable Person appointed by the City under G.S. 143-128(e) for the purpose of expediting the Work on the Project. Not all projects will have a Project Expediter. Unless a specific Project Expediter is appointed by the City, the single prime Contractor or the general Contractor will have the responsibility for coordinating the Work and preparing any schedule of how or when the Work will be completed.

#### **1.1.13 Specifications.**

The written description of the technical requirements for construction such as the written requirements for materials, equipment, systems, standards and workmanship for the Work and the performance of related services.

#### **1.1.14 Supplemental Conditions.**

Those additional or special conditions, when included as a part of the Contract Documents, which contain changes, deletions and additions to the general conditions or clarify the scope of the Work for the particular project. Also called Special Conditions.

#### **1.1.15 Work.**

The term Work means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all labor, materials, equipment and services (including documentation) required to be provided or necessary to be furnished by the Contractor in order to fulfill its obligations under the Contract.

**1.2 Other Definitions.** As required, other words and phrases may be defined when used throughout the Contract Documents as those words and/or phrases are used.

**1.3 Technical Words.** Unless defined, words or phrases having an accepted or recognized technical or construction industry meaning are used throughout the Contract Documents in accordance with those meanings. Likewise, abbreviations shall refer to the technical society, organization, body, code, rules, or standards, generally ascribed to such abbreviation by the building and construction trades.

**1.4 Pronouns.** The pronouns he, she and it, or his, her and their, are used interchangeably to refer to the Contractor, the Engineer or some other person.

## **ARTICLE 2 – CONTRACT DOCUMENTS AND REQUIREMENTS.**

**2.1 Meaning and Intent.** The Contract Documents form the entire Contract for the construction of the Project and the satisfactory completion of all Work required from the Contractor. The Contract Documents include the Advertisement for Bids and any addenda, the Instruction to Bidders, the completed Bid, the Award of Contract, the Agreement (the specific Contract document signed by the parties), the General Conditions, the Supplemental Conditions, if any, the Drawings, the Specifications, and all addenda thereto, all required bonds and insurance certificates as well as all formal changes to any of those documents by addendum, properly issued change order or by other modification in writing.

Any reference to the term “Contract” includes all of the Contract Documents.

The Contract Documents are complementary, each to the other, and any requirement contained in one document is as binding as if it were contained in another or all of the other documents.

The intent of the Contract Documents is to describe and provide for a functionally complete and operational Project to be constructed in accordance with the Contract Documents.

**2.2 Conflicts.** In the event there is a discrepancy in a document or an ambiguity or conflict between documents and such discrepancy, ambiguity or conflict cannot be resolved by reference to all of the documents, the following order of precedence shall apply in reconciling the discrepancy, ambiguity or conflict (listed in order of highest to lowest precedence):

1. Written modifications in inverse chronological order,

2. Properly issued change orders,
3. Supplemental Conditions, if any,
4. The General Conditions,
5. Written amendments or addenda to Drawings and Specifications,
6. The Drawings and the Specifications (Plans and Specifications),
7. The Agreement,
8. Advertisement for Bids and any written addenda thereto,
9. The Bid.

Further, figure dimensions on Drawings govern over scale dimensions and detailed Drawings shall govern over general Drawings. When there is a conflict between existing Project site conditions and information contained on the Drawings or the Specifications, the existing Project site conditions shall govern and the Contractor shall perform the Work and adjust to the existing conditions at no additional cost to the City provided the Contractor could or should have known of such conditions based upon its reasonable investigation of the Project site prior to submitting its Bid in accordance with the Instruction to Bidders.

**2.3 Execution of Contract Documents.** The Contractor shall see that the Agreement and any other Contract Document requiring its signature, is properly executed by an officer having the authority to legally bind the Contractor. Where appropriate, the officer's signature shall be attested to or witnessed and the corporate seal, if any, affixed thereto, although the failure to have a signature witnessed or the seal attached shall not affect the validity of the document. If the Contractor is transacting business under a trade name, then the full legal name and type of entity (sole proprietorship, partnership, corporation, etc.) shall be disclosed and set out on the signature page of the Agreement as well as on the bonds and insurance required by the Contract Documents. If the contractor's license is held by a person other than the owner, partner or officer of the Contractor, then the licensee shall also sign as a party to the Contract and the title "licensee" shall appear under his or her signature.

By executing the Agreement, the Contractor certifies that (i) it has examined the conditions pertaining to the Work as required in Section 3 of the Instructions to Bidder, (ii) it has made diligent inquiry and understands the relationship and role of the various contractors, engineers, inspectors and representatives appointed by the City, if any, and the other persons involved in the Project, (iii) it has made



inquiry about and fully understands the extent and limits of any branch or subdivision of the Work to complete the Project that will be awarded to other contractors, if the Contract is separate or multiple prime contract [see G.S. 143-238(b)] or any portion of the Work that will be retained or completed by the City by its own forces, (iv) the Contractor has given full consideration to the completion date (Contract Time) and the time of performance, (v) the Contractor has the skill, experience, training and ability to complete the Work under the Contract Documents for the Contract Amount and by the Contract Time, and (vi) that it has secured all approvals, corporate resolutions or other actions necessary in order to sign and be bound by the Agreement.

**2.4 Review of Contract Documents and Site Conditions.** The Contract Documents are not complete in every detail, but show the purpose and intent only and the Contractor shall comply with their true intent and meaning, taken as a whole, and shall not avail itself of any manifest error, omission, discrepancy or ambiguity which appears in the Contract Documents, instructions given by the Engineer or the work performed by others.

In such cases where the Contract Documents, the site conditions or the nature of the Work requires clarification, the Contractor shall request written clarification from or by the Engineer or an interpretation of the documents before proceeding with the Work. The Engineer shall promptly provide the Contractor with any requested instructions, interpretation or more detailed Drawings and Specifications so that the Contractor may proceed with its Work in a timely manner.

**2.5 Copies of Drawings and Specifications.** The Engineer shall furnish the Contractor, free of charge, a sufficient number of copies of the Plans and Specifications to complete its Work. Unless otherwise required by the nature of the Project, the Engineer shall:

**2.5.1 General Contractor.** Provide the General Contractor (or single prime contractor) with not less than four (4) full sets of Drawings and Specifications. Each set of Drawings and Specifications shall include the Drawings and Specifications of all other Contracts issued in connection with the Project.

The General Contractor shall also be provided with a suitable set of Drawings upon which the Contractor will clearly and legibly record all work-in-place that is at variance with the Contract Documents or other changes made during the construction process. The Drawings marked to show such changes shall be kept at the Project Site for review by the Engineer and/or the City.

**2.5.2 Other Contractors.** Provide other contractors furnishing Work at the Project with not less than three (3) sets of Drawings and Specifications one of which shall be used to clearly and legibly record all work-in-place that is at variance with the Contract Documents and be made available upon request to the Engineer and/or the City.

Additional sets of Contract Documents shall be furnished at cost, including mailing, to any contractor requesting additional sets of Contract Documents. The cost of additional sets of Plans and Specifications shall be the same as stated in the bidding documents.

**2.6 Shop Drawings, Samples and Product Information.**

Shop drawings are intended to be drawings, diagrams, prints, schedules and other data that is prepared by the Contractor, a subcontractor, manufacturer, supplier or distributor to illustrate a portion of the Work.

Product data sheets are illustrations, standard schedules, charts, instructions, brochures, diagrams and other information provided by the Contractor for the purpose of illustrating materials and equipment to be installed or other supplies to be provided as a part of the Work.

Samples are examples which generally illustrate materials that will be used as a part of the Work or samples of equipment and/or workmanship used to demonstrate the standards by which the Work will be judged.

When the Special Conditions require or for those projects that are sufficiently complex to require shop drawings, the Engineer and the Contractor shall jointly establish a schedule of shop drawings to be prepared by the Contractor. The schedule as to when shop drawings are due will be made a part of the Construction schedule. After checking and verifying all field measurements and reviewing the Drawings, the Contractor will submit to the Engineer for review, at least four (4) copies of all shop drawings which shall have been checked by and stamped with the approval of the Contractor and identified as the Engineer may require. The data shown on the shop drawings will be complete with respect to dimensions, design criteria, materials of construction and other information in order for the Engineer to complete his review.

The Contractor will also submit to the Engineer for review in a timely manner so as to cause no delay in the Work, all samples, required by the Contract Documents. All samples will likewise be checked by and stamped with the approval of the Contractor and identified clearly as to material, manufacturer, any pertinent catalogue numbers and the use for which the sample is intended.

In making such submissions, the Contractor will call the Engineer's attention to any deviations that the shop drawings or samples may have from the requirements of the various Contract Documents, especially those shop drawings and samples at variance with the Drawings or Specifications.

The Engineer will review the submissions with reasonable promptness for conformance with the design concept of the Project and for compliance with the information provided by the Contract Documents. The Contractor will make any corrections required by the Engineer and then provide the Engineer with corrected copies of all shop drawings and new samples and this process will be repeated until the review is satisfactory to the Engineer and final copies are approved.

No work requiring a shop drawing or sample submission shall be commenced by the Contractor until the submission has been reviewed and approved by the Engineer.

The Engineer's review of shop drawings and/or samples shall not relieve the Contractor from its responsibility for any deviations from the requirements of the Contract Documents unless the Contractor has in writing called the Engineer's attention to such deviation at the time of the submission and the Engineer has given written approval (generally in the form of a change order) to the specific deviation, nor shall the review and approval by the Engineer relieve the Contractor from its responsibility for errors and omissions in the shop drawings and/or samples provided.

Shop drawings, samples and product data sheets are not part of the Plans and Specifications nor are they considered as a Contract Document.

**2.7 Ownership of the Plans and Specifications.** The drawings, specifications and other design documents, including those in electronic format prepared by the Engineer are instruments of service and neither the Contractor nor any subcontractor or other person acting on behalf of the Contractor shall have any claim or ownership of such Drawings, Specifications or other instruments of service. If those instruments of service are prepared by the City or any of its employees and departments, the ownership and rights to those documents shall be retained by the City. If the instruments of service are prepared by an architect or other independent consultant employed by the City, then the ownership and rights to those documents shall be subject to the separate agreement between the City and such architect, engineer or consultant. The Contractor may retain a record set of the instruments of service for its own purposes, but the record set of instruments shall not be used by the Contractor on any other project or for additions to this Project outside the scope of the Work without the specific written consent of the City and/or the Engineer.

## **ARTICLE 3 – PRELIMINARY MATTERS.**

**3.1 Delivery of Agreement, Bonds, Insurance, etc.:** Within ten (10) calendar days after written notification of the Award of Contract, the Contractor shall deliver to the City, the signed Agreement, Bond(s), Insurance Certificate(s) and other documentation required for execution of the Contract.

**3.2 Preconstruction Conference.** If the Engineer and/or the City shall schedule a preconstruction conference (not to be confused with any prebid conference), all Contractors and/or major subcontractors shall attend the conference if required. The preconstruction conference may be scheduled at any time after the Award of Contract, but before the commencement of construction. The Engineer shall prepare minutes or a summary of the results of the conference.

At the preconstruction conference, the Engineer shall review the scope of the project and shall be prepared to provide instructions or directions concerning the construction schedule, the progress schedule, the procedure and schedule for handling shop drawings, samples and product information and establish procedures as to how the Contractor may make required submissions to the Engineer, may request interpretations and secure other necessary binding instructions from the City so that the Work will not be unnecessarily delayed. The procedures for issuing change orders and/or securing modifications to the Contract Documents shall be explained. At the preconstruction conference, the Engineer shall identify all representatives of the City involved in the project and the processing of payment applications will be discussed.

The Contractor, if it has not already done so, will be afforded an opportunity to raise questions concerning site conditions and make inquiry about the availability of geotechnical surveys, topographic maps, environmental studies and surveys and other reports and information if such information is available that will benefit the Contractor in performing the Work or if such information was used by the Engineer to prepare the Drawings and Specifications.

**3.3 Commencement of Contract Times; Notice to Proceed:** The Contract Time(s) including any completion date (whether specifically stated or determined by computation) will begin to run on the day indicated in the Notice to Proceed. Notice to Proceed will be given at any time within thirty (30) calendar days after the executed Agreement is delivered to the Contractor.

### **3.4 Before Starting Construction:**

**3.4.1** No Work shall be done at the site prior to the preconstruction conference, if one is scheduled, without the Engineer's approval. Early entry to the site for mobilization, staging and other preparation work

may be granted by the Engineer at any time after the Award of the Contract, but such work is at the expense and risk of the Contractor. Before undertaking each part of the Work, the Contractor shall carefully study the Contract Documents to check and verify that the pertinent figures shown thereon compare accurately to all applicable field measurements. Contractor shall promptly report in writing to the Engineer any conflict, error, ambiguity or discrepancy which Contractor may discover and shall obtain a written interpretation or clarification from Engineer before proceeding with any Work affected thereby. The Contractor shall be liable to the City for failure to report any conflict, error, ambiguity or discrepancy in the Contract Documents of which Contractor knew or reasonably should have known.

**3.4.2** The successful completion of the Work within the Contract Time is of primary importance. Therefore, the Contractor shall submit to the Engineer for review and approval, or acceptance, as appropriate, a Construction Schedule, no later than thirty (30) days after the preconstruction conference, if one is held, or as otherwise required by the Engineer.

The Construction Schedule must indicate the times (number of days or dates) for starting and completing the various stages of the Work, including any milestones specified in the Contract Documents, and must contain sufficient detail to indicate that the Contractor has properly identified required Work elements and tasks; has provided for a sufficient and proper workforce and integration of subcontractors; has provided sufficient resources; and, has considered the proper sequencing of the Work required to result in a successful Project that can be completed within the Contract Time. The times for submitting shop drawings, samples and product data sheets will be included unless set out on a separate schedule.

**3.4.3 Other Information.** Unless the Contractor and the Engineer shall mutually agree to a different time schedule as recorded in the minutes of the preconstruction conference, not later than the commencement of construction, the Contractor will provide the Engineer with the name, address and contact information (mailing address, telephone number, cell phone number, and an emergency or after hours telephone number) for the Superintendent assigned to the Project by the Contractor, the Safety Officer, if one is required by the Engineer, and if different from the Superintendent, as well as a list of all subcontractors.

The Contractor will not employ any subcontractor or any other person or organization, either initially or as a substitute, against whom the City or the Engineer may have reasonable objection nor will the Contractor be required to employ any subcontractor, consultant or other person or organization against whom the Contractor shall have reasonable objection.

#### **ARTICLE 4 – AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; REFERENCE POINTS.**

**4.1 Availability of Lands.** The City will make the site of the Project available to the Contractor and will provide access to all land and interests in land required for the Work and will, through the Engineer, notify the Contractor of any restrictions on such access. The Contractor must obtain any additional temporary construction facilities, stockpiling, staging or storage sites not otherwise provided or available on the Project site.

#### **4.2 Subsurface and Physical Conditions:**

**4.2.1** The Contractor specifically represents that it has carefully examined the Plans and Specifications, the geotechnical report, if any, and the site of the proposed Work (reference is made to Instruction to Bidders) and is thoroughly familiar with all of the conditions surrounding construction of the Project, having had the opportunity to conduct any and all additional inquiry, tests and investigation that the Contractor deems necessary and proper. The Contractor acknowledges the receipt of the geotechnical report, if any, and agrees that the report, while it is an accurate record of the geotechnical conditions at the boring locations, is not a guarantee of specific site conditions which may vary between boring locations.

**4.2.2** The Contractor shall notify The City in writing as soon as reasonably possible, but no later than three (3) calendar days, if unforeseen conditions are encountered at the site which are: (i) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents, or (ii) unknown physical conditions of an unusual nature, that differs materially from those normally encountered in the type of work being performed under this Contract. The Contractor may not disturb the conditions until the Engineer conducts an investigation. The Engineer will promptly investigate such conditions. If it is determined that such conditions differ materially and cause an increase or decrease in the Contractor's cost of or time required for performance of any part of the Work, the Engineer will recommend an equitable adjustment in the

Contract Amount or Contract Time, or both. If it is determined that such conditions are not materially different from those indicated in the Contract Documents, the Engineer will notify the Contractor in writing of such findings and the Contract will not be adjusted.

**4.2.3** Notwithstanding any other provision of this Contract, the Contractor is solely responsible for the location and protection of any and all public utility lines and utility customer service lines in the Work area. "Public utility lines" means the utility distribution and supply system, and "utility customer service lines" means the utility lines connecting customers to the utility distribution and collection system. Generally, existing utility customer service line connections are not shown on the Drawings. The Contractor shall notify "One Call" (or other similar service) and exercise due care to locate, mark, uncover and otherwise protect all such lines in the construction zone and any of the Contractor's work or storage areas. The Contractor's responsibility for the location and protection of utilities is primary and nondelegable. **The Contractor shall indemnify or reimburse such expenses or costs (including fines that may be levied against the City) that may result from unauthorized or accidental damage to all public lines and utility customer service lines in the work area.** The City reserves the right to repair any damage the Contractor causes to such utilities at the Contractor's expense. If a public line and/or customer service line is damaged by the Contractor, the Contractor shall give verbal notice within one (1) hour and written notice within twenty-four (24) hours to the Engineer and likewise promptly notify the owner of any public utility line that is damaged. The coordination and expense of the relocation of all public utility lines (except for those owned by the City) and all utility customer service lines, either temporary or permanent, is the responsibility of the Contractor unless the City has agreed otherwise .

**4.2.4** The Contractor shall take reasonable precaution to avoid disturbing graves, primitive records, artifacts and antiquities of archaeological, paleontological, cultural or historical significance. No objects of this nature shall be disturbed without written permission of the City and the appropriate agency of the State of North Carolina (Office of State Archaeology) . When such objects are uncovered unexpectedly, the Contractor shall stop all Work in close proximity and notify the Engineer and all appropriate North Carolina Agencies of their presence and shall not disturb them until written permission and permit to do so is granted. All primitive records and antiquities uncovered on the City's property shall remain the property of the City and/or the State of North Carolina. If it is

determined by the City, in consultation with the State of North Carolina that exploration or excavation of primitive records or antiquities on the Project site is necessary to avoid loss, the Contractor shall cooperate in salvage work attendant to preservation. If the Work stoppage or salvage work causes an increase in the Contractor's cost of, or time required for, performance of the Work, the Contract Amount and/or Contract Time will be equitably adjusted.

**4.3 Reference Points.** Unless otherwise specified, all control lines and bench marks suitable for use in the layout of the Work will be furnished by City. The City shall furnish the Contractor with any engineering surveys of the site of the project describing the property boundaries, utility lines and other physical characteristics of the property. Controls, bench marks and property boundary markers shall be carefully preserved by the Contractor by use of flags, staffs or other visible devices and in case of destruction or removal by the Contractor or its employees, such controls and bench marks shall be replaced by a Registered Professional Land Surveyor at the Contractor's expense. Any survey monuments damaged by Contractor will be reestablished by the City at the Contractor's expense.

**4.4 Hazardous Materials.** The Contractor shall comply with all federal and state laws, rules, orders and directives concerning possession, use and disposal of any hazardous substances or materials, hazardous waste, toxic pollutants or other dangerous substances (collectively called "hazardous materials") as defined by the United States Environmental Protection Agency (EPA) and/or the North Carolina Department of Environment Management (NCDEM) or any of their respective divisions or by any federal or state law. All activities carried on by the Contractor on the Project Site shall be in full compliance with the rules and regulations issued by any federal and/or state agency regarding discharges, releases, emissions, spills, and the containment or clean up of any pollutant, hazardous material or substance adversely affecting the environment or in any way regulated by the EPA, NCDEM or any other state or federal agency.

**4.4.1** To the extent provided by any applicable law, the City shall be responsible for any hazardous material uncovered or revealed at the site which was not shown, indicated or identified in the Contract Documents to be within the scope of the Work and which may present a substantial danger to persons or property exposed thereto in connection with the Work at the site. The Contractor shall immediately notify the Engineer of any suspected hazardous materials encountered before or during performance of the Work and shall take all necessary precautions to avoid further disturbance of the materials.



**4.4.2** The Contractor shall be responsible for any hazardous materials brought to the site by the Contractor, subcontractor, suppliers or anyone else for whom the Contractor is responsible.

**4.4.3** No asbestos-containing materials shall be incorporated into the Work or brought on Project site without prior approval of the City. The Contractor shall not knowingly use, specify, request or approve for use any asbestos containing materials or lead-based paint without the City's written approval. When a specific product is specified, the Contractor shall endeavor to verify that the product does not include asbestos containing material.

**4.4.4** Unless otherwise expressly provided in the Contract Documents to be part of the Work, the Contractor is not responsible for any hazardous materials and/or conditions uncovered or revealed at the site which was not shown or indicated on the Drawings or identified as part of the Work. Upon encountering any hazardous conditions, the Contractor must stop Work immediately in the affected area, isolate or temporarily contain such condition and duly notify the Engineer and/or the City. If required by applicable law or regulations, any government agency or quasi-government entities with jurisdiction over the Project site or over the hazardous conditions or materials shall be notified.

Upon receiving notice of the presence of suspected hazardous materials or conditions, the City shall take the necessary measures required to ensure that the hazardous materials are remediated or rendered harmless. Such necessary measures shall include the City retaining qualified independent experts to (i) ascertain whether hazardous materials have actually been encountered, and, if they have been encountered, (ii) prescribe the remedial measures that the City must take either to remove the hazardous materials or render the hazardous materials harmless.

The Contractor shall be obligated to resume Work at the affected area of the Project only after the Engineer provides written certification that (i) the hazardous materials have been removed or rendered harmless, and (ii) all necessary approvals have been obtained from all government and quasi-government entities having jurisdiction over the Project or site. The Contractor shall be responsible for continuing the Work in the unaffected portion of the Project and site.

Notwithstanding the preceding provisions of this Section 4.1, the City is not responsible for hazardous materials or conditions created by or brought to the site by the Contractor, subcontractors or anyone for whose acts they may be liable. **The Contractor shall indemnify, defend and hold harmless the City and the City's officers, directors, employees and agents from and against all claims, losses, damages, liabilities and expenses, including attorneys' fees and expenses, arising out of or resulting from those hazardous materials and conditions introduced or caused to the site by the Contractor, subcontractors or anyone for whose acts they may be liable.**

**4.4.5** The Contractor shall be responsible for use, storage and remediation of any hazardous materials or conditions brought to the site by the Contractor, subcontractors, suppliers or anyone else for whom the Contractor is responsible.

## **ARTICLE 5 – BONDS AND INSURANCE.**

**5.1 Bonds.** Unless the Contractor chooses to make a deposit of money, certified checks or government securities for the full amount of the Contract in order to secure the faithful performance of the terms of the Contract Documents in the manner permitted by G.S. 143-129(c), the Contractor shall furnish the City with a performance bond and a separate payment bond in an amount equal to 100% of the Contract Amount as security for the faithful performance and/or the payment of all of the Contractor's obligations under the Contract Documents. In the event the Contract Amount is increased by written modification or change order, the City may require that additional performance and/or payment bonds be issued in the adjusted Contract Amount.

The bonds shall conform to the requirements of Article 3 of Chapter 44A of the General Statutes of North Carolina and shall be provided by a solvent surety or insurance company licensed by the State of North Carolina and authorized to issue bonds in the amount required by the Contract Documents. Original performance and payment bonds properly executed and issued by the Contractor and the surety shall be provided by the Contractor as required by Section 3.1 above, but before the commencement of any construction whatsoever. Any bond signed or issued by an agent must be accompanied by a certified copy of such agent's authority to act on behalf of the surety (i.e., the power of attorney).

If the surety on any bond furnished by the Contractor is declared bankrupt or becomes insolvent or otherwise has its right to do business in the State of North Carolina terminated, the Contractor shall, within ten (10) days thereafter, substitute another bond or surety which must be acceptable to the City.

All bonds shall remain in effect for at least one (1) year after the date of last payment under the Contract Documents or until such bond is released by the City.

**5.2 Insurance.** The Contractor shall procure and maintain in full force and effect for the duration of the Contract insurance against claims for injuries to persons or damages to property which may arise from or in connection with the performance of the Work hereunder by the Contractor, or by the agents, representatives, employees and subcontractors (of any tier).

The Contractor shall maintain insurance limits no less than:

1. General liability: (including operations, products and completed operations)

A combined single limit coverage of not less than one million dollars (\$1,000,000) per occurrence for bodily injury, personal property and property damage shall be maintained. If commercial general liability insurance or other form with a general aggregate limit is used, either the general aggregate limit shall apply separately to this Project or the general aggregate limit shall be not less than two million dollars (\$2,000,000).

2. Automobile liability:

One million dollars (\$1,000,000) per accident for bodily injury and property damage shall be maintained.

3. Worker's Compensation and employer's liability:

Worker's Compensation Insurance shall be maintained in the amount and as required by the law of North Carolina with employer's liability of not less than ONE HUNDRED THOUSAND DOLLARS (\$100,000) per accident, FIVE HUNDRED THOUSAND DOLLARS (\$500,000) aggregate policy limit and disease coverage for each employee in the amount of ONE HUNDRED THOUSAND DOLLARS (\$100,000) unless the law of the State of North Carolina requires more coverage.

4. Course of construction:

The Contractor shall purchase and maintain property insurance written on a builder's risk "all risk" or equivalent policy form in the amount of the initial Contract Amount, plus the value of subsequent contract modifications and change orders on a replacement cost basis without optional deductibles. Builder's risk insurance shall be maintained by the Contractor until such time as the Contractor no longer has an insurable interest in the property.

The deductibles or self-insurance retentions must be declared and approved by the City. The City may require the Contractor to provide proof of ability to pay losses and related investigations, claims, administration and defense expenses in the event the Contractor is self-insured.

The general liability and automobile liability policies shall contain, or be endorsed to contain the following provisions:

1. The City and its officers and employees shall be covered as insureds with respect to liability arising out of the Work or operations performed by or on behalf of a contractor including materials, parts or equipment furnished in connection with such work or operations. General liability coverage can be provided in the form of an endorsement to the Contractor's insurance or as a separate owner's and contractor's protective liability policy.
2. For all claims related to this project, the Contractor's insurance coverage shall be primary insurance. Any insurance or self-insurance maintained by the City, its officers, officials and employees shall be in excess of the Contractor's insurance and shall not contribute with it.

3. Each insurance policy required by this section shall be endorsed to provide that coverage shall not be cancelled by either party, except after thirty (30) days prior written notice by certified mail, return receipt requested, has been given to the City.

The Builder's risk insurance policy shall contain provisions naming the City as the loss payee and all rights of subrogation against the City shall be waived.

Insurance shall be placed with insurers with a current A.M. Best's rating of not less than (a) vii or otherwise acceptable to the City.

In the event any of the policies provided by the Contractor provide claims-made coverage, the coverage shall remain in effect for a period of not less than five (5) years after the completion of the Contract or the applicable statute of limitations, whichever occurs first.

The Contractor shall furnish the City with original certificates and amendatory endorsements providing the coverages required by this section. All certificates, endorsements and policies required by this section shall be provided prior to the commencement of Work; however, the failure to obtain any required evidence of insurance shall not waive the Contractor's obligation to provide them.

The Contractor shall require and verify that all subcontractors (of any tier) maintain insurance of the type, limits and conditions set out above.

**5.3 Indemnification.** The Contractor shall indemnify, save harmless and defend the City, its agents, servants and employees and each of them against and hold it and them harmless from any and all lawsuits, claims, demands, liabilities, losses and expenses, including court costs and attorney fees, for on account of any injury to any person or any death at any time resulting from such injury, or any damage to any property, which may arise or which may be alleged to have arisen out of or in connection with the Work covered by this Contract, except to the extent that such loss results from the sole negligent act of the City or that indemnification is prohibited by the law of North Carolina.

**5.4 City's Insurance.** The City, at its own expense, shall provide and pay for the City's standard and/or customary property and liability insurance on the Project site.

## **ARTICLE 6 – CONTRACTOR’S RESPONSIBILITIES.**

### **6.1 Supervision and Superintendence:**

**6.1.1** The 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. The Contractor shall be solely responsible for the means, methods, techniques, sequences and procedures of construction. The Contractor shall be responsible to see that the completed Work complies accurately with the Contract Documents.

**6.1.2** The Contractor shall have an English-speaking, competent superintendent on the site of the Work at all times that work is in progress. The superintendent will be the Contractor’s representative on the Work and shall have the authority to act on the behalf of and bind the Contractor.

All communications given to the Superintendent shall be as binding as if given to the Contractor. Either the Contractor or the superintendent shall provide a cellular telephone number and an emergency and home telephone number at which one or the other may be reached if necessary when work is not in progress. The superintendent must be an employee of the Contractor, unless such requirement is waived in writing by the Engineer. If the Contractor proposes a management structure with a project manager (or some similarly named person) supervising, directing, and managing construction of the Work in addition to or in substitution of a superintendent, the requirements of these Construction Documents with respect to the superintendent shall likewise apply to any such project manager.

### **6.2 Labor, Materials and Equipment.**

**6.2.1** The Contractor shall maintain a work force adequate to accomplish the Work within the Contract Time. The Contractor agrees to employ only orderly and competent workers, skillful in performance of the type of Work required under this Contract. The Contractor and its subcontractors, as well as their employees may not use or possess any alcoholic or other intoxicating beverages, illegal drugs or controlled substances while on the job or on the City’s property, nor may such workers be intoxicated, or under the influence of alcohol or drugs, on the job. Subject to the applicable provisions of North Carolina law, the

Contractor, subcontractors, sub-subcontractors, and their employees may not use or possess any firearms or other weapons while on the job or on the City's property. If the Engineer notifies the Contractor that any worker or representative of the Contractor is incompetent, disorderly, abusive, or disobedient, has knowingly or repeatedly violated safety regulations, has possessed any firearms in contravention of the applicable provisions of North Carolina law, or has possessed or was under the influence of alcohol or drugs on the job, the Contractor shall immediately remove such worker or representative, including an officer or owner of the Contractor, from performing Contract Work, and may not employ such worker or representative again on the project without the City's prior written consent. The Contractor shall at all times maintain good discipline and order on or off the site in all matters pertaining to the Project.

**6.2.2** The Contractor shall provide and pay for all 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 furnishing, performance testing, start-up and completion of the Work including corrections to the Work, punch list items and any warranty work.

**6.2.3** All materials and equipment shall be of good quality and new (including new products made of recycled materials), except as otherwise provided in the Contract Documents. If required by the Engineer, the Contractor shall, at its own expense, furnish satisfactory evidence (reports of required tests, manufacturer's certificates or compliance with material requirements, mill reports, etc.) as to the kind and quality of materials and equipment. All materials and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned in accordance with instructions of the applicable supplier, except as otherwise provided in the Contract Documents.

**6.2.4 Substitutes and "Approved Equal" Items:**

1. Substitutions. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular supplier, the specification or description is intended to establish the type, function and quality required. Unless the specification

or description contains words reading that no like, equivalent or “approved equal” item or no substitution is permitted, other items of material or equipment of other suppliers may be submitted by the Contractor, at the Contractor’s sole risk.

**2. “Approved Equal”.** If in the Engineer’s sole discretion an item of material or equipment proposed by the Contractor is functionally equal to that named and specifically similar so that no change in related Work will be required, it may be considered by the Engineer as an “approved equal” item, in which case review of the proposed item may, in the Engineer’s sole discretion, be accomplished without compliance with some or all of the requirements for evaluation of proposed substitute items. The Contractor shall provide the Engineer with the documentation required for the Engineer to make its determination.

**3. Substitute Items.** If in the Engineer’s sole discretion an item of material or equipment proposed by the Contractor does not qualify as an “approved equal” item, it will be considered a proposed substitute item. The Contractor shall submit sufficient information as provided in the Contract Documents to allow the Engineer to determine that the item of material or equipment proposed is essentially equivalent to that named and a substitute therefore.

**4. Substitute Construction Methods and Procedures.** If a specific means, method, technique, sequence or procedure of construction is shown or indicated in and expressly required by the Contract Documents, Contractor may, at Contractor’s sole expense and risk, including disruptions to the progress schedule, with prior approval of the Engineer, furnish or utilize a substitute means, method, technique, sequence, or procedure of construction. The Contractor shall submit sufficient information to the Engineer to allow the Engineer, in the Engineer’s sole discretion, to determine that the substitute proposed is equivalent to that expressly called for by the Contract Documents.

**5. Engineer’s Evaluation.** The Engineer will be allowed a reasonable time within which to evaluate each proposal or submittal made pursuant to section 6.2.4. The Engineer will be the sole judge of acceptability. No “approved equal”



or substitute shall be ordered, installed, or utilized until the Engineer's review is complete, which will be evidenced by either a Change Order or completion of the Shop Drawing review procedure. The City may require the Contractor to furnish at the Contractor's expense a special performance guarantee or other surety bond with respect to any "approved equal" or substitute or for any other delay or disruption to the progress schedule of the Project Schedule attributable to any such substitution. The City shall not be responsible for any delay due to review time for any "approved equal" or substitute.

6. Contractor's Expense. All data and documentation to be provided by the Contractor in support of any proposed "approved equal" or substitute item will be at the Contractor' expense.

The approval of the Engineer will not relieve the Contractor from primary responsibility and liability for the suitability and performance of any proposed substitute item, method or procedure and will not relieve the Contractor from its primary responsibility and liability for curing defective Work and performing warranty work, which the Contractor shall cure and perform, regardless of any claim the Contractor may choose to advance against the Engineer or manufacturer.

**6.3 Progress Schedule.** Unless otherwise provided, the Contractor shall adhere to the Construction Schedule established in accordance with Paragraph 3.3.2 as it may be adjusted from time to time as provided below. As required by the Engineer, the Contractor shall also maintain throughout the Contract Time a progress schedule which shall record the actual progress of all Work, the completion date for each phase or subsection of the Work and any deviations or discrepancies between the actual progress of the Work and the Construction Schedule. All information set out on the progress schedule shall be accurate and subject to review by the Engineer.

**6.3.1** The Contractor shall submit to the Engineer for review and approval on a monthly basis any proposed adjustments in the Construction Schedule that will not change the Contract Times or milestones. Any such proposed adjustments must be substantiated with documentation of any changes to the underlying logic of the Construction Schedule. The Contractor's progress schedule must show how the Contractor will consistently advance the progress of the Work in accordance with the Construction Schedule. Such adjustments will conform generally to the Construction Schedule then in effect.

**6.3.2** Proposed adjustments in the Construction Schedule that will change the Contract Times or milestones shall be submitted in accordance with the requirements of Article 12. Any such proposed adjustments must be substantiated with documentation of any changes to the underlying logic of the progress schedule. Such adjustments may only be made by a Change Order or Time Extension Request in accordance with Article 12.

#### **6.4 Concerning Subcontractors, Suppliers and Others:**

**6.4.1 Assignment.** The Contractor shall retain direct control of and give direct attention to fulfillment of this Contract. The Contractor shall not, by Power of Attorney, or otherwise, assign the Contract without the prior written consent of the City. In addition, without the City's written consent, the Contractor will not subcontract the performance of the entire Work or the supervision and direction of the Work nor will the Contractor bid the Project and/or agree to the Work either directly or indirectly for an unlicensed contractor.

**6.4.2 Award of Subcontracts for Portions of the Work:** The Contractor shall not employ any subcontractor, supplier or other person or organization, whether initially or as a substitute, against whom the City may have reasonable objection. The City will communicate such objections by written notice. If the City requires a change without good cause of any subcontractor, person or organization previously accepted by the City, the Contract Amount shall be increased or decreased by the difference in the cost occasioned by any such change, and the appropriate Change Order shall be issued. The Contractor shall not substitute any subcontractor, person or organization that has been accepted by the City, unless the substitute has been accepted in writing by the City. No acceptance by the City of any subcontractor, supplier or other person or organization shall constitute a waiver of any right of the City to reject defective work.

**6.4.3** The Contractor shall enter into written agreements with all subcontractors and suppliers which specifically binds the subcontractors or suppliers to the applicable terms and conditions of the Contract Documents for the benefit of the City and the Engineer. The City reserves the right to specify that certain requirements shall be adhered to by all subcontractors as indicated in other portions of the Contract Documents and these requirements shall be made a part of the agreement between the Contractor and subcontractor or supplier.

**6.4.4** The Contractor shall be fully responsible to the City for all acts and omissions of the subcontractors, suppliers and other persons and organizations performing or furnishing any of the Work under a direct or indirect contract with the Contractor just as the Contractor is responsible for the Contractor's own acts or omissions. Nothing in the Contract Documents shall create for the benefit of any such subcontractor, supplier or other person or organization any contractual relationship between the City and any such subcontractor, supplier or other person or organization, nor shall it create any obligation on the part of the City or the Engineer to pay or to see to the payment of any monies due any such subcontractor, supplier or other person or organization except as may otherwise be required by laws.

**6.4.5** The Contractor shall be solely responsible for efficiently scheduling and coordinating the Work of subcontractors, suppliers and other persons and organizations performing or furnishing any of the Work under a direct or indirect contract with the Contractor in order to avoid any delays or inefficiencies in the prosecution of the Work. The Contractor shall require all subcontractors, suppliers and such other persons and organizations performing or furnishing any of the Work to communicate with the Engineer through the Contractor unless the Engineer and Contractor agree otherwise.

**6.4.6** The divisions and sections of the Specifications and the identifications of any Drawings shall not control the Contractor in dividing or delineating the Work to be performed by any specific trade.

**6.4.7** The Contractor shall promptly pay each subcontractor and supplier their appropriate share of payments made to the Contractor.

**6.4.8** To the extent allowed by North Carolina law, the City shall be deemed to be a third party beneficiary to each subcontract and may, but only if the City elects, following a termination of the Contractor, require that the subcontractor(s) perform all or a portion of unperformed duties and obligations under its subcontract(s) for the benefit of the City, rather than the Contractor; however, if the City requires any such performance by a subcontractor for the City's direct benefit, then the City shall be bound and obligated to pay such subcontractor the reasonable value for all Work performed by such subcontractor to the date of the termination of the Contractor, less previous payments, and for all Work performed thereafter. In the event that the City elects to invoke its right under this section, the City will provide notice of such election to the Contractor and the affected subcontractor(s).

## **6.5 Patent Fees and Royalties:**

**6.5.1** The Contractor shall be responsible at all times for compliance with applicable patents or copyrights encompassing, in whole or in part, any design, device, material, or process utilized, directly or indirectly, in the performance of the Work or other formulation or presentation of its Bid.

**6.5.2** The Contractor shall pay all royalties and license fees and shall provide, prior to commencement of Work hereunder and at all times during the performance of same, for lawful use of any design, device, material or process covered by letters, patent or copyright by suitable legal agreement with the patentee, copyright holder, or their duly authorized representative whether or not a particular design, device, material, or process is specified by the City.

**6.5.3** The Contractor shall defend all suits or claims for infringement of any patent or copyright and shall save the City harmless from any loss or liability, direct or indirect, arising with respect to Contractor's process in the formulation of its Bid or the performance of the Work or otherwise arising in connection therewith. The City reserves the right to provide its own defense to any suit or claim of infringement of any patent or copyright in which event the Contractor shall indemnify and save harmless the City from all costs and expenses of such defense as well as satisfaction of all judgments entered against the City.

**6.5.4** The City shall have the right to stop the Work and/or terminate this Agreement at any time in the event the Contractor fails to disclose to the City that the Contractor's work methodology includes the use of any infringing design, device, material or process.

**6.6 Permits, Fees.** Unless otherwise agreed to in writing, the Contractor shall obtain and pay for all construction permits, licenses and fees required for performance of the Work including any permits, licenses and fees normally charged by the City.

## **6.7 Laws and Regulations.**

**6.7.1** The Contractor shall give all notices and comply with all laws and regulations applicable to furnishing and performing the Work, including arranging for and obtaining any required inspections, tests, approvals or certifications from any public body including departments and agencies

of the City, having jurisdiction over the Work or any part thereof. Except where otherwise expressly required by applicable laws and regulations, neither the City nor the Engineer shall be responsible for monitoring the Contractor's compliance with any laws and regulations. The Contractor should not assume that permits and approvals by the Inspection and/or the Planning Departments of the City or any other board or agency of the City will be issued except in accordance with standard procedures and as permitted by law or ordinance.

**6.7.2** Maintaining clean water, air and earth or improving thereon shall be regarded as of prime importance. The Contractor shall plan and execute all land disturbing activity in compliance with the Sedimentation Pollution Control Act of 1973 and all applicable Federal, State and local laws and regulations concerning control and abatement of water pollution and prevention and control of air pollution and the control of surface or storm water runoff.

**6.7.3** If the Contractor performs any Work contrary to laws or regulations, the Contractor shall bear all claims, costs, losses and damages arising therefrom; however, it shall not be the Contractor's primary responsibility to make certain that the Specifications and Drawings are in accordance with laws and regulations, but this does not relieve the Contractor of the Contractor's obligation to review the Specifications and Drawings for errors and discrepancies and to call those matters to the attention of the Engineer.

## **6.8 Taxes.**

**6.8.1** The cost of all payroll taxes, sales and use taxes or any other taxes for which the Contractor is liable shall be included in the contract amount (the Bid) and the Contractor shall be solely liable for the payment of all such taxes.

**6.8.2** The Contractor shall pay only those sales, consumer, use and other similar taxes required to be paid by the Contractor in accordance with the laws and regulations of the State of North Carolina in the performance of its public works contract.

**6.8.3** The City is an exempt organization as defined by the General Statutes of North Carolina and is thereby exempt from the payment of sales and use taxes. The City will provide the Contractor with its sales tax exemption number and the Contractor will apply for the exemption in accordance with the state law for all required purchases made by the Contractor.

In the event the sales and use taxes are nevertheless payable at the time of purchase, the Contractor shall keep adequate records of all sales and/or use taxes paid and shall cooperate fully with the City in seeking any sales tax reimbursement due to the City including making any written claim required by the State of North Carolina. The Contractor shall provide the City with a sworn affidavit itemizing the quantity and value of the materials and rentals it has used on the Project and the amount of any sales and/or use taxes that has been paid on such materials or rentals in a timely manner so that the City may seek reimbursement for the calendar year or other taxable year as required by law.

## **6.9 Use of Premises:**

**6.9.1** The Contractor shall confine construction equipment, the storage of materials and equipment and the operations of workers to the site and land and areas identified in and permitted by the Contract Documents and other land and areas permitted by laws and regulations, right-of-way, permits and easements, and shall not unreasonably encumber the premises with construction equipment or other materials or equipment. The Contractor shall assume full responsibility for any damage to any such land or area, or to the owner or occupant thereof or of any adjacent land or areas, resulting from the performance of the Work. Should any claim be made by any such owner or occupant because of or in connection with the performance of the Work, the Contractor shall promptly settle with such other party by negotiation or otherwise resolve the claim. The Contractor shall indemnify, defend and hold harmless the City and the Engineer and anyone directly or indirectly employed by any of them from and against all claims, costs, losses and damages (including court costs and reasonable attorney's fees) arising out of or resulting from any claim or action, legal or equitable, brought by any such owner or occupant against the City and/or the Engineer or any other party indemnified hereunder to the extent caused by or based upon performance of the Work or failure to perform the Work.

**6.9.2** During the progress of the Work and on a daily basis, the Contractor shall keep the premises free from unnecessary accumulations of waste materials, rubbish and other debris resulting from the Work. At the completion of the Work, the Contractor shall remove all waste materials, rubbish and debris from and about the premises as well as all tools, appliances, construction equipment and machinery and surplus materials. The Contractor shall leave the site clean and ready for occupancy by the City at substantial completion of the Work. The

Contractor shall, at a minimum, restore to original condition all property not designated for alteration by the Contract Documents. If the Contractor fails to clean up at the completion of the Work, the City may do so and the cost thereof will be charged against the Contractor.

**6.9.3** The Contractor shall not load or permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall the Contractor subject any part of the Work or adjacent property to stresses or pressures that will endanger it.

**6.10 Record Documents.** The Contractor shall maintain in a safe place at the Project site, or other location acceptable to the Engineer at least one (1) record copy of all Drawings, Specifications, Addenda, change orders, change directives, field orders and written interpretations and clarifications in good order and annotated to show all changes made during construction. Those record documents together with all final samples and all final Shop Drawings will be available to the Engineer and/or the City for reference during performance of the Work. Upon Substantial Completion of the Work, a copy of record documents, samples and Shop Drawings shall be promptly delivered to the City.

**6.11 Safety and Protection:**

**6.11.1** The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. If requested by the Engineer, the Contractor shall submit a site security plan for approval by the Engineer. By reviewing the plan or making recommendations or comments, neither the City nor the Engineer will assume liability nor will the Contractor be relieved of liability for damage, injury or loss. The 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 Work 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, but not limited to, trees, shrubs, lawns, walks, pavements, roadways, structures, utilities and underground facilities not designated for removal, relocation or replacement in the course of construction.

**6.11.2** The Contractor shall comply with all applicable laws and regulations of any public body having jurisdiction for safety of persons or property or to protect them from damage, injury or loss; and shall erect and maintain all necessary safeguards for such safety and protection. The Contractor shall notify owners of adjacent property and of underground facilities, and utility owners when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation and replacement of their property. All damage, injury or loss to any property caused, directly or indirectly, in whole or in part, by the Contractor, subcontractor, supplier or any person or organization directly or indirectly employed by any of them to perform or furnish any of the Work or anyone for whose acts, any of them, may be liable, shall be remedied by the Contractor.

It shall be the duty and responsibility of the Contractor and all of its subcontractors to be familiar with and comply with 29 USC Section 651, et seq., the Occupational Safety and Health Act of 1970, as amended (“OSHA”) and to enforce and comply with all provisions of the Act as well as any state counterpart to the Act. All rules and regulations, orders, and directives, either general or specific to the project, issued by the U.S. Department of Labor and/or the North Carolina Department of Labor or any agencies thereof shall be observed by the Contractor to the satisfaction of the department or agency issuing the same.

Before commencing any excavation which will exceed a depth of five (5) feet, unless some law or regulation establishes a lesser depth, the Contractor shall provide the Engineer with detailed plans and specifications regarding the safety systems to be utilized.

**6.11.3 Safety Representative.** The Contractor shall designate in writing a qualified and experienced safety representative at the site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs. Upon request of the Engineer, the Contractor shall provide certifications or other documentation of the safety representative’s qualifications.

**6.11.4 Hazard Communication Programs.** The Contractor shall be responsible for coordinating any exchange of material safety data sheets or other hazard communication information required to be made available to or exchanged between or among the various subcontractors, suppliers and other employers at the site in accordance with laws and regulations.



### **6.11.5 Emergencies:**

- 1.** In emergencies affecting the safety or protection of persons or the Work at the site or adjacent thereto, the Contractor shall act reasonably to prevent threatened damage, injury or loss and to mitigate damage or loss to the Work. The Contractor shall give the Engineer telephone notification as soon as reasonably practical and a prompt written notice if the Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby. If the Engineer determines that a change in the Contract Documents is required because of the action taken by the Contractor in response to such an emergency, a Change Order will be issued to document the consequences of such action; otherwise the City will not be responsible for the Contractor's emergency action.
- 2.** The Superintendent, the safety representative and/or other authorized agents of the Contractor shall respond immediately to call-out at any time of any day or night when circumstances warrant the presence on the Project site of the Contractor or his agent to protect the Work or adjacent property from damage, restriction or limitation or to take such action or measures pertaining to the Work as may be necessary to provide for the safety of the public. Should the Contractor and/or its agent fails to respond and take action to alleviate such an emergency situation, the City may direct other forces to take action as necessary to remedy the emergency condition, and the City will deduct any cost of such remedial action from the funds due to the Contractor under this Contract.
- 3.** In the event there is an accident involving injury to any individual or damage to any property on or near the Work, the Contractor shall provide to the Engineer verbal notification within one (1) hour and written notification within twenty-four (24) hours of the event and shall be responsible for recording the location of the event and the circumstances surrounding the event through photographs, interviewing witnesses, obtaining

medical reports, police accident reports and other documentation that describes the event. Copies of such documentation shall be provided to the Engineer for the City's records within forty-eight (48) hours of the event. The Contractor shall cooperate with the City on any City investigation of any such incident.

**6.12 Continuing the Work.** The Contractor shall carry on the Work and adhere to the Construction Schedule during all disputes or disagreements with the City. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, except as the City and the Contractor may otherwise agree in writing.

**6.13 The Contractor's General Warranty and Guarantee.**

**6.13.1** The Contractor warrants and guarantees to the City that all Work will conform to the Plans and Specifications, be performed in a good and workmanlike manner in accordance with the Contract Documents and will not be defective. Materials and equipment furnished will be new and of good quality unless otherwise required or permitted by the Contract Documents. This warranty will survive the termination or expiration of the Contract and continue for a period of twelve (12) months following the date of final acceptance of the Work or beneficial occupancy. The Contractor's warranty and guarantee hereunder excludes defects or damage caused by:

1. Abuse, modification or improper maintenance or operation by persons other than the Contractor, subcontractors or suppliers; or
2. Normal wear and tear under normal usage.

**6.13.2** The Contractor's obligation to perform and complete the Work in a good and workmanlike manner in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of Contractor's obligation to perform the Work in accordance with the Contract Documents.

1. Observations by the City and/or the Engineer;
2. Recommendation of any progress or final payment by the Engineer;

3. The issuance of a certificate of substantial completion or any payment by the City to the Contractor under the Contract Documents;
4. Use or occupancy of the Work or any part thereof by the City;
5. Any acceptance by the City or any failure to do so;
6. Any review of Shop Drawings or sample submittal;
7. Any inspection, test or approval by others; or
8. Any correction of defective Work by the City.

#### **6.14 Indemnification.**

**6.14.1** The Contractor shall defend, indemnify and hold harmless the City and/or the Engineer (the "Indemnified Parties") 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 resulting from the performance of the Work, provided that any such claim, cost, loss or damage:

1. Is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the work itself), including the loss of use resulting therefrom, and
2. Is caused in whole or in part by any negligent act or omission of the Contractor, any subcontractor, any supplier, any person or organization directly or indirectly employed by any of them to perform or furnish any of the work or anyone whose acts any of them may be liable.

**6.14.2** In the event the Contractor unreasonably delays progress of the Work being done by others on the site so as to cause loss for which the City becomes liable, then the Contractor shall indemnify the City from and reimburse the City for such loss.

**6.15 Survival of Obligations.** All representations, indemnifications, warranties and guarantees made in, required by or given in accordance with the Contract Documents, as well as all continuing obligations indicated in the Contract Documents, will survive final payment, completion and acceptance of the Work and termination or completion of the Agreement.

**6.16 Losses from Natural Causes.** Unless otherwise specified, all loss or damage to the Contractor arising out of the nature of the Work to be done or from action of the elements, floods or from unforeseeable circumstances in prosecution of the Work or from unusual obstructions or difficulties which may be encountered in prosecution of the Work, shall be sustained and borne by the Contractor at its own cost and expense.

**6.17 Notice of Claim.** Should the Contractor suffer injury or damage to person or property because of any error, omission or act of the City or its Engineer or others for whose acts the City is liable, a Claim must be made to the other party within thirty (30) calendar days of the event giving rise to such injury or damage. The provisions of this paragraph 6.17 shall not be construed as a substitute for or a waiver of the provisions of any applicable statute of limitations or statute of repose.

**6.18 Liquidated Damages.** The Contractor shall be liable for liquidated damages for the failure of the Contractor to timely complete the Work or any portion thereof within the Contract Time.

## **ARTICLE 7 – CITY’S RESPONSIBILITIES.**

**7.1** Prior to the start of construction, the City will designate in writing a person or entity to act as the City’s representative during construction. Generally it will be the Engineer, but the City shall have the right to appoint a Project Expediter as its representative or may appoint its own Project Manager. Except as otherwise provided in these General Conditions, the City shall issue all communications to the Contractor through the City’s representative. Notices required by the Contractor to be given to the City will be deemed effective if given in writing to the Engineer or the other person designated as the City’s representative. Likewise, the Contractor shall be entitled to rely upon notices required to be issued by the City if such notices are issued by the Engineer or by the City’s Representative.

**7.2** The City will not supervise, direct, control or have authority over or be responsible for the Contractor’s means, methods, techniques, sequences or procedures of construction or the safety precautions and programs incident thereto. The City is not responsible for any failure of the Contractor to comply with laws and regulations applicable to furnishing or performing the Work. The City is not responsible for the Contractor’s failure to perform or furnish the Work

in accordance with the Contract Documents. Failure or omission of the City to discover, or object to or condemn any defective Work or material shall not release the Contractor from the obligation to properly and fully perform the Contract.

**7.3** The City is not responsible for the acts or omissions of the Contractor, or of any subcontractor, any supplier, or of any other person or organization performing or furnishing any of the Work. The Contractor acknowledges and agrees that the City's direction to perform Work in accordance with the approved Construction Schedule is not a demand for acceleration or a dictation of the Contractor's means or methods.

**7.4** Information or services under the City's control shall be furnished by the City with reasonable promptness to avoid delay in orderly progress of the Work. The City shall have a reasonable amount of time to investigate site conditions, review submittals, analyze requests for changes, and to make other decisions in the orderly administration of the Contract. The Contractor must notify the City in writing, if the time for the investigation, review, analysis of any submittals, required for changes or otherwise required for the City's decision, impacts in any way the critical path of the approved Construction Schedule.

**7.5** The foregoing are in addition to other duties and responsibilities of the City enumerated herein and especially those in respect to Article 4 (Availability of Lands; Subsurface and Physical Conditions; Reference Points), Article 7 (Other Work) and Article 14 (Payments to Contractor and Completion).

## **ARTICLE 8 – OTHER WORK.**

**8.1** The City may perform other work related to the Project at the site by the City's own forces, or let other contracts therefore, or have other work performed by utility owners. The Contractor and the City agree to and shall use best efforts to cooperate and coordinate the Work with others performing work and other work related to the Project in order to avoid conflicts and delays in the Work.

**8.2** The Contractor shall afford other contractors who are in a contract with the City and each utility owner (and the City, if the City is performing the additional work with the City's employees) proper and safe access to the site and a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work and shall properly connect and coordinate the Work with theirs. Unless otherwise provided in the Contract Documents, the Contractor shall do all cutting, fitting and patching of the Work that may be required to make its several parts come together properly and integrate with such other work. The Contractor shall not endanger any work of others by cutting, excavating or otherwise altering their work and will only cut or

alter their work with the written consent of the Engineer and the other contractors whose work will be affected. The Contractor shall promptly remedy damage wrongfully caused by the Contractor to completed or partially completed construction or to property of the City or separate contractors.

**8.3** If the proper execution or results of any part of the Contractor's Work depends upon work performed by others under this Article 7, the Contractor shall inspect such other work and promptly report to the 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 the Contractor's Work. The Contractor's failure to report will constitute an acceptance of such other work as fit and proper for integration with the Contractor's Work except for latent or non-apparent defects and deficiencies in such other work.

**8.4** The City shall provide for coordination of the activities of the City's own forces and of each separate contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with other separate contractors and the Engineer in reviewing their Construction Schedules when directed to do so. On the basis of such review, the Contractor shall make any revisions to the Construction Schedule deemed necessary after a joint review and mutual agreement. The agreed upon Construction Schedules shall then constitute the Construction Schedules to be used by the Contractor, separate contractors and the City until subsequently revised.

**8.5** Costs caused by delays or by improperly timed activities or defective construction shall be borne by the party responsible.

## **ARTICLE 9 – ENGINEER.**

### **9.1 Engineer's Authority and Responsibilities.**

**9.1.1** The duties and responsibilities as well as any limitations on the authority of the Engineer during construction, as set forth in the Contract Documents, may either be assigned by the City to an outside (non-employee) professional engineer, architect, etc., or may be assumed by the City or an employee of the City. The authority and responsibilities of the Engineer, if the Engineer is an outside or non-employee of the City shall be established and governed by the separate written agreement between the City and the Engineer who is an outside, non-employee of the City. The assignment of any authority, duties or responsibility to an Engineer by a separate agreement between the City and such Engineer, or any undertaking, exercise or performance of such authority, duties or responsibilities by the outside Engineer, is intended to be for the sole and exclusive benefit of the City and is not intended to be for the benefit of the Contractor.

**9.1.2** The Engineer will not supervise, direct, control or have authority over or be responsible for the Contractor's means, methods, techniques, sequences or procedures of construction, or for the safety precautions and programs incident thereto. The Engineer is not responsible for any failure of the Contractor to comply with laws and regulations applicable to the furnishing or performing the Work. The Engineer is not responsible for the Contractor's failure to perform or furnish the Work in accordance with the Contract Documents. The failure or omission of the Engineer to discover, to object to or to condemn any defective Work or material shall not release the Contractor from the obligation to properly and fully perform the Contract and to comply with all laws.

**9.1.3** The Engineer is not responsible for the acts or omissions of the Contractor, or of any subcontractor, of any tier, or any supplier, or any other person or organization performing or furnishing any of the Work.

**9.1.4** If permitted by the City, the Engineer will review the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds and certificates of inspection, tests and approvals and other documentation required to be delivered by Article 14, for the purpose of determining, in general, 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.

**9.2 City's Representative.** The Engineer, if the Engineer is a direct employee of the City, will be the City's Representative for all purposes under the Contract Documents. If, however, the Engineer is an independent contractor and not a direct employee of the City (i.e. an outside architect, design professional or engineer), then the Engineer may be the City's representative under the Contract Document, but the City also reserves the right to appoint some other person in addition to the Engineer in addition to or in lieu of the Engineer as the City's representative for receiving notices and approving change orders. The City's representative will normally be identified and the contact information provided in the written notice to proceed. However, the Contractor may assume that the Engineer is the City's representative for all purposes until such time as the Contractor is otherwise advised in writing.

**9.3 Inspections.** The Engineer will make visits to the site at intervals appropriate to the various stages of construction and in accordance with normal

professional standards 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 the Contractor's completed Work. If the Engineer is an outside consultant, the extent of such observation, investigation and inspection will be governed by the separate agreement between the City and such consultant. Based upon information obtained by the Engineer during such visits, observations, investigations and inspections, the Engineer will endeavor for the benefit of the City to determine if the Work is proceeding in accordance with the Contract Documents. While the Engineer may not be required to make exhaustive or continuous onsite inspections to check the quality or quantity of the Work, the Engineer's efforts will be directed towards providing the City with a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and on-site observations, the Engineer will keep the City informed of the progress of the Work and using his professional expertise will endeavor to protect the City from defective Work. The Engineer's visits and onsite observations are subject to the limitations on the Engineer's authority and responsibility in the event the Engineer is an outside consultant.

**9.4 Resident Project Representative.** If the City and the Engineer agree, the Engineer will furnish a Resident Project Representative to assist the Engineer in providing more continuous observation, investigation and inspection of the Work. The responsibilities and the authority as well as the limitations of any such Resident Project Representative or any assistants will be determined by the separate agreement with the Engineer who is an outside consultant.

**9.5 Clarifications and Interpretations.** The Engineer may determine that written clarifications or interpretations of the requirements of the Contract Documents (in the form of drawings or otherwise) are necessary. Such written clarifications or interpretations will be consistent with the intent of and reasonably inferable from the Contract Documents, will be issued with reasonable promptness and will be binding on the City and the Contractor.

**9.6 Rejecting Defective Work.** The Engineer will recommend that the City disapprove or reject Work which the Engineer believes to be defective, or believes will not produce a completed Project that conforms to the Contract Documents or will prejudice the integrity of the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.

**9.7 Shop Drawings.** As provided in Section 2.6, the Engineer shall coordinate and approve all shop drawings, product data sheets and samples as set forth therein.



## **ARTICLE 10 – CHANGES IN THE WORK.**

### **10.1 Changes.**

**10.1.1** Without invalidating the Contract and without notice to any surety, the City may, at any time or from time to time, order additions, deletions or revisions in the Work. Such changes in the Work will be authorized by Change Order, Change Directive or Field Order. In the event that the City and the Contractor are unable to negotiate the terms of a Change Order for the performance of additional Work, the City may, at its election, perform such additional Work with its own forces or with another contractor and such work will be considered “Other Work” in accordance with Article 8.

**10.1.2** Changes in the Work shall be performed under applicable provisions of the Contract Documents, and the Contractor shall proceed promptly, unless otherwise provided in the Change Order, Change Directive or Field Order. The Contractor’s proposals for changes in the Contract Amount and/or Contract Time shall be submitted within ten (10) calendar days of request by the Engineer, including impacts to the approved Progress Schedule, unless the Engineer grants an extension. The City will review each proposal and respond to the Contractor within ten (10) calendar days. After review by the City, the Contractor shall provide any supporting data requested by the Engineer within seven (7) calendar days, unless the Engineer grants an extension. The City will determine within seven (7) calendar days whether to pursue the change in Work.

**10.1.3** The Contractor shall not be entitled to an increase in the Contract Amount or an extension of the Contract Time with respect to any Work performed that is not required, authorized by a written amendment or except in the case of an emergency as provided in Paragraph 6.11.5 or in the case of uncovering Work as provided in Paragraph 13.4.3.

**10.1.4** Except in the case of an emergency as provided in Paragraph 6.11.5, a Change Order or Change Directive is required before the Contractor commences any activities associated with a change in the Work which, in the Contractor’s opinion, will result in a change in the Contract Amount and/or Contract Times.

**10.1.5** If notice of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Amount or Contract Times) is required by the provisions of any Bond to be given to a surety, the giving of any such notice will be the Contractor's responsibility, and the amount of each applicable Bond will be adjusted accordingly.

## **10.2 Change Orders.**

**10.2.1** The City and the Contractor will execute appropriate written Change Orders covering:

1. Approved changes in the Work;
2. The amount of the adjustment in the Contract Amount, if any, for approved changes in the Work.
3. The extent of the adjustment in the Contract Time, if any, for approved changes in the Work.

**10.2.2** An executed Change Order shall represent the complete, equitable, and final amount of adjustment in the Contract Amount and/or Contract Time owed to the Contractor or the City as a result of the occurrence or event causing the change in the Work encompassed by the Change Order.

## **10.3 Field Order.**

**10.3.1** The Engineer may authorize minor variations in the Work from the requirements of the Contract Documents which do not involve an adjustment in the Contract Amount or the Contract Times and are compatible with the design concept of the completed Project as functioning whole as indicated by the Contract Documents. Normally minor changes may be accomplished by written Field Order and shall be binding on the City and on the Contractor who shall perform the Work involved promptly.

**10.3.2** If the Contractor believes that a Field Order would require an adjustment in the Contract Amount and/or Contract Times, the Contractor shall make a prompt written request to the City's Representative for a Change Order. Any request by the Contractor for an adjustment in Contract Amount and/or Contract Times must be made in writing prior to the beginning of the work covered by the Field Order.

**10.4 No Damages for Delay.** The Contractor shall receive no compensation for delays or hindrances to the Work, except when direct and unavoidable extra cost to the Contractor is caused by failure of the City to provide information or material, if any, which is to be furnished by the City or access to the Work and only to the extent that such acts continue after the Contractor furnishes the City with written notice of such failure. When such extra compensation is claimed a written statement thereof shall be presented by the Contractor to the Engineer and if by the City is found correct, shall be approved. If delay is caused by specific orders given by the City to stop work or by performance of extra Work, or by failure of the City to provide material or necessary instructions for carrying on the Work, then such delay will entitle the Contractor to an equivalent extension of time, the Contractor's application for which shall, however, be subject to approval of the City. No such extension of time shall release the Contractor or surety on its performance bond from all of the Contractor's obligations hereunder which shall remain in full force until discharge of the Contract. In no event shall the Contractor be entitled to any compensation or recovery of any special damages in connection with any delays, including, without limitation: consequential damages, loss opportunity costs, impact damages, or other similar damages. The City's exercise of any of its rights or remedies under the Contract Documents (including, without limitation, ordering changes in the Work, or directing suspension, rescheduling, or correction of the Work), regardless of the extent or frequency of the City's exercise of such rights or remedies, shall not be construed as active interference in the Contractor's performance of the Work. Except as otherwise provided herein, an extension of the Contract Time, to the extent permitted under Article 12, shall be the sole remedy of the Contractor for any acknowledged delays.

## **ARTICLE 11 – CHANGE OF CONTRACT AMOUNT.**

**11.1** The Contract Amount is stated in the Bid and the Agreement and, including adjustments approved in writing (i.e. change order), is the total amount payable by the City to the Contractor for the performance of the Work under the Contract Documents.

**11.2** The Contract Amount shall only be changed by a Change Order. Any claim for an adjustment in the Contract Amount shall be made by written notice delivered by the party making the claim to the other party promptly (but in no event later than thirty (30) calendar days) after the start of the occurrence or event giving rise to the claim and stating the general nature of the claim. Notice of the amount of the claim with supporting data shall be delivered within thirty (30) calendar days after written notice of claim is delivered by claimant, and shall represent that the adjustment claimed covers all known amounts to which claimant is entitled as a result of said occurrence or event. If the City and the Contractor cannot otherwise agree, all claims for adjustment in the Contract Amount shall be determined as set out in Article 16.

### **11.3 Determination of Value of Work.**

**11.3.1** The value of any Work covered by a Change Order for an adjustment in the Contract Amount will be determined by one or more of the following methods:

1. By application of unit prices contained in the Contract Documents to the quantities of the items involved.
2. By a mutually agreed lump sum properly itemized and supported by sufficient substantiating data to permit evaluation.
3. By cost of Work plus the Contractor's fee for all overhead costs and profit as may be agreed upon.

**11.3.2** When unit prices have been agreed upon in the Contract Documents, those unit prices shall be used to determine the value of any Work required by a Change Order. Otherwise, the City and the Contractor agree to determine the value of the Work using the methods described above except that no costs will be included in the value of the Work for the time spent preparing the Change Order nor for negotiating the Change Order.

### **ARTICLE 12 – TIMES.**

**12.1 Change of Time.** The Contract Time may only be changed by a Change Order or by a written modification of the Agreement. In submitting a bid, the Contractor has had the opportunity to review the complexity of the Work, the field conditions and other normal conditions, including weather and delays in the delivery of materials and supplies and agreed that the Contract Time was reasonable for this Project. The ability to complete the Work within the Contract Time is a material part of the Agreement and the award of the Contract to the Contractor.

**12.2 Claim for Extension of Time.** A Claim by the Contractor for an adjustment or extension in the Contract Time shall be based upon written notice submitted by the Contractor to the Engineer. The notice shall set forth in detail the justification for the adjustment for extension of the Contract Time. Extensions will not be granted due to matters within the control of the Contractor including such matters as normal or expected days of inclement weather, delays in the commencement of construction, normal delivery times for materials and supplies, the normal lost time due to weather. Delays attributable to and within the control of a subcontractor or supplier shall be deemed to be delays within the control of the Contractor.

**12.3 Delays beyond Contractor's Control.** An extension of the Contract Time may be warranted in those situations where the Contractor is prevented from completing any part of the Work within the Contract Time due to a delay, duly recorded at the time of the delay, which is beyond the control of the Contractor. The Contract Time may, in the discretion of the Engineer, be extended in an amount equal to the time lost due to such delay if a claim is made under this section in a timely manner. Delays beyond the control of the Contractor include, among other things, acts or neglect by the City, acts or neglect of utility owners or other contractors (but not subcontractors, of any tier, working under the supervision of the Contractor), performing other work on the project, fires, floods, epidemics, abnormal weather conditions or acts of God.

**12.4** Notwithstanding the extension or the denial of an extension of the Contract Time, the Contractor shall not be entitled to damages or any increase in the Contract Amount or any additional payments of any kind due to a delay in the completion of the Work by the Contractor. However, this section shall not be construed to prevent a claim for change in the Contract Amount pursuant to Article 11 due to delay, interference or disruption directly attributable to the actions or the inactions of the City or anyone for whom the City is responsible.

**12.5 Procedure.** A request for the extension of the Contract Time shall be submitted to the Engineer immediately following the event which the Contractor believes to justify an extension. The Engineer shall promptly review the request and within seven (7) days submit its recommendation to the City. Within seven (7) days from the time the City receives the request and the Engineer's recommendation, the City shall either authorize the issuance of a Change Order extending the Contract Time or if the request is denied, provide the Engineer and Contractor with the reasons for the denial. Requests for extensions of time accumulated and not submitted in a timely manner or not submitted until the end of the Contract Time will not be granted.

### **ARTICLE 13 – TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK.**

**13.1 Notice of Defects.** Prompt notice of all defective Work of which the City or the Engineer has actual knowledge will be given to the Contractor. All defective Work may be rejected, corrected or accepted as provided herein. The Contractor must give the City and the Engineer prompt notice of any defective Work of which the Contractor has actual knowledge.

**13.2 Access to Work.** The City, and its consultants, the Engineer and other representatives and personnel of the City, independent testing laboratories and governmental agencies having jurisdiction will have access to the Work at all

reasonable times for observing, inspecting and testing. The Contractor shall provide them proper and safe conditions for such access, and advise them of the Contractor's site safety procedures and programs so that they may comply therewith as applicable.

### **13.3 Tests and Inspections.**

**13.3.1** The Contractor shall give timely notice of readiness of the Work for all required inspections, test or approvals, and shall cooperate with inspection and testing personnel to facilitate required inspections or tests.

**13.3.2** The City shall employ and pay for services of an independent testing laboratory to perform all inspections, tests or approvals required by the Contract Documents except:

1. For inspections, tests or approvals covered by Paragraph 13.3.3 below;
2. Those costs incurred with tests or inspections conducted pursuant to Paragraph 13.4.3 below shall be paid as provided in Paragraph 13.4.3;
3. For reinspecting or retesting defective Work; and
4. As otherwise specifically provided in the Contract Documents. All testing laboratories shall meet the requirements of ASTM E-329.

**13.3.3** 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, the Contractor shall assume full responsibility for arranging and obtaining such inspections, tests or approvals, pay all costs in connection therewith and furnish the Engineer the required certificates of inspection or approval.

**13.3.4** The Contractor shall also be responsible for arranging and obtaining and shall pay all costs in connection with any inspections, tests or approvals required for the City's and the Engineer's review of materials or equipment to be incorporated in the Work, or of materials, mix designs or equipment submitted for review prior to the Contractor's purchase thereof for incorporation in the Work.

### **13.4 Uncovering Work:**

**13.4.1** If any Work (or the work of others) that is to be inspected, tested or approved is covered by the Contractor without written concurrence of the Engineer, or if any Work is covered contrary to the written request of the Engineer, it must, if requested by the Engineer, be uncovered and recovered at the Contractor's expense.

**13.4.2** Uncovering Work as provided in Paragraph 13.4.1 shall be at the Contractor's expense unless the Contractor has given the Engineer timely notice of the Contractor's intention to cover the same and the Engineer has not acted within five (5) working days to such notice.

**13.4.3** If the Engineer considers it necessary or advisable that covered Work be observed, inspected or tested, the Contractor shall uncover, expose or otherwise make available for observation, inspection or testing that portion of the Work in question, furnishing all necessary labor, material and equipment. If it is found that such Work is defective, the Contractor shall pay all claims, costs, losses and damages caused by, arising out of or resulting from 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 the City shall be entitled to an appropriate decrease in the Contract Amount, and may make a claim as provided in Article 11. If, however, such Work is not found to be defective, the Contractor shall be allowed an increase in the Contract Amount or an extension of the Contract Times (or Milestones), or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement and reconstruction.

### **13.5 City May Stop the Work.**

**13.5.1** If the Work is defective, or the Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to furnish or perform the Work in such a way that the completed Work will conform to the Contract Documents, the City may order the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of the City to stop the Work shall not give rise to any duty on the part of the City to exercise this right for the benefit of the Contractor or any surety or other party.

**13.5.2** If the Contractor fails to correct defective Work or submit a satisfactory plan to take corrective action, with procedure and time schedule, the City may order the Contractor to stop the Work, or any portion thereof, until cause for such order has been eliminated, or take any other action permitted by this Contract. A notice to stop the Work, based on defects, shall not be the basis for extending the Contract Time.

**13.6 Correction or Removal of Defective Work.** If required by the City, the Contractor shall promptly, as directed, either correct all defective Work, whether or not fabricated, installed or completed, or, if the Work has been rejected by the Engineer, remove it from the site and replace it with Work that is not defective. The Contractor shall correct or remove and replace defective Work, or submit a plan of action detailing how the deficiency will be corrected, within the time frame identified in the notice of defective Work. The Contractor shall pay all claims, costs, losses and damages caused by or resulting from such correction or removal (including, but not limited to, all costs of repair or replacement of work of others).

**13.7 Warranty period.**

**13.7.1** If within one year after the date of Substantial Completion or such longer period of time as may be prescribed by laws or regulations or by the terms of any applicable special guarantee required by the Contract Documents or by any specific provision of the Contract Documents (e.g. Paragraph 14.11.2), any Work, including work performed after the Substantial Completion date, is found to be defective, the Contractor shall promptly, without cost to the City and in accordance with the City's written instructions:

- (i) correct such defective Work, or, if it has been rejected by the City, remove it from the site and replace it with Work that is not defective, and
- (ii) satisfactorily correct or remove and replace any damage to other Work or the work of others resulting therefrom.

If the Contractor does not promptly comply with the terms of such instructions, or in an emergency where delay would cause serious risk of loss or damage, the City may have the defective Work corrected or the rejected Work removed and replaced, and all claims, costs, losses and damages caused by or resulting from such removal and



replacement (including, but not limited to, all costs of repair or replacement of work of others) will be paid by the Contractor. The warranty period will be deemed to be renewed and recommended in connection with the completed items of Work requiring correction.

**13.7.2** In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all of the Work, the warranty period for that item may start to run from an earlier date if so provided in the Contract Documents.

**13.7.3** If correction of defective Work will affect the function or use of the facility, the Contractor shall not proceed with correction of defective Work without prior coordination and approval of the City.

**13.7.4** The obligations of the Contractor to perform warranty work will survive the acceptance of the Work and any termination of the Contract.

**13.8 Acceptance of Defective Work.** If, instead of requiring correction or removal and replacement of defective Work, the City may in its discretion, accept the defective Work at some reduced value or subject to some special condition applicable to the particular defective Work. The Contractor shall pay all claims, costs, losses and damages attributable to the City's evaluation of and determination to accept such defective Work. If any such acceptance occurs prior to recommendation of final payment, a Change Order will be issued incorporating the necessary revisions of the Contract Documents and compensating the City for the diminished value of the defective Work. If the acceptance occurs after such recommendation, an appropriate amount will be paid by the Contractor to the City after a calculation by the City of the diminution in value of the defective Work.

**13.9 The City May Correct Defective Work.** If the Contractor fails within a reasonable time after Written Notice of the City to correct defective Work, or to remove and replace rejected Work, or if the Contractor fails to perform the Work in accordance with the Contract Documents, or if the Contractor fails to comply with any other provision of the Contract Documents, the City may, after seven (7) calendar days' Written Notice to the Contractor, correct and remedy any such deficiency. If, in the opinion of the Engineer, significant progress has not been made during this seven (7) calendar day period to correct the deficiency, the City may exercise any actions necessary to remedy the deficiency. In exercising the rights and remedies under this paragraph, the City shall proceed expeditiously. In connection with such corrective and remedial action, the City may exclude the Contractor from all or part of the site, take possession of all or part of the Work, and suspend the Contractor's services related thereto, and incorporate in the

Work all materials and equipment stored at the site or for which the City has paid the Contractor, but which are stored elsewhere. The Contractor shall allow the City, its agents and employees, the City's other contractors, the Engineer and the Engineer's consultant's access to the site to enable the City to exercise the rights and remedies under this paragraph. All claims, costs, losses and damages incurred or sustained by the City in exercising such rights and remedies will be charged against the Contractor and a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work. The Contractor shall not be allowed an extension of the Contract Times (or Milestones), or claims of damage because of any delay in the performance of the Work attributable to the exercise by the City or the City's rights and remedies hereunder.

## **ARTICLE 14 - PAYMENTS TO THE CONTRACTOR AND COMPLETION.**

### **14.1 Application for Progress Payments.**

**14.1.1** No more often than once a month unless otherwise agreed to in writing by the City, the Contractor shall submit to the Engineer (unless some other representation is approved by the City to process progress payment applications) for review an application for payment, in a form acceptable to the City, filled out and signed by the 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.

**14.1.2** Such applications shall not include requests for payment on account of changes in the Work which have been properly authorized by Change Directives, but not yet included in Change Orders.

**14.1.3** Such applications shall not include requests for payment of amounts the Contractor does not intend to pay to a subcontractor or supplier because of a dispute or other reason.

**14.1.4** If payment is requested on the basis of materials or equipment not incorporated in the Work but delivered and suitably stored at the site or at another location agreed to in writing, the application for payment shall be accompanied by such bills of sale, data and other procedures satisfactory to the City substantiating the City's title to such materials or equipment or otherwise protecting the City's interest. Payment on account of such materials or equipment will not include any amount for the Contractor's overhead or profit or relieve the Contractor of its obligation to protect and install such materials or equipment in accordance with the requirements of the

Contract and to restore damaged or defective Work. If materials or equipment are stored at another location, at the direction of the City, they shall be stored in a bonded and insured facility, accessible to the Engineer and the City, and shall be clearly marked as property of the City. Title to materials delivered to the site of the Work or a staging area will pass to the City upon payment by the City without the necessity for further documentation. Risk of loss will not pass to the City until acceptance.

**14.1.5** The City will pay to the Contractor the total amount of the approved application for payment less a five percent (5%) retainage; provided, however, that after fifty percent (50%) of the Work has been satisfactorily completed on schedule, with the approval of the City and with written consent of the surety, further requirements for retainage will be waived so long as the Work continues to be completed in a satisfactory manner and on schedule, but subject to the provisions of 14.4. Notwithstanding this section, any payment under this Contract is subject to the provisions of G.S. 143-134.1 including restrictions on the retainage on any periodic or final payment and/or the payment of interest on a final payment. Likewise, the Contractor is subject to the provisions of G.S. 143-134.1(b) and (b1) governing payments by the contractor to subcontractors (of any tier).

**14.1.6** Applications for payment shall include the following documentation:

1. Updated Progress Schedule;
2. Monthly subcontractor report;
3. Any other documentation required under the Supplemental General Conditions.

**14.2 Contractor's Warranty of Title.** The Contractor warrants and guarantees that title to all Work, materials and equipment covered by any application for payment, whether incorporated in the Project or not, will pass to the City free and clear of all liens no later than the time of payment to the Contractor.

### **14.3 Review of Applications for Progress Payments.**

**14.3.1** The Engineer will, within seven (7) calendar days after receipt of each application for payment, either indicate a recommendation for payment and forward the application for processing by the City, or return the application to the Contractor indicating the Engineer's reasons for refusing to recommend payment. In the latter case, the Contractor shall make the necessary corrections and resubmit the application.

**14.3.2** The Engineer's recommendation of any payment requested in an application for payment will constitute a representation by the Engineer, based upon the Engineer's on-site observations of the executed Work and on the Engineer's review of the application for payment and the accompanying data and schedules, that to the best of the Engineer's knowledge, information and belief:

1. The Work has progressed to the point indicated; and
2. 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, to the results of any subsequent tests called for in the Contract Documents, to a final determination of quantities and classifications for unit price Work, and to any other qualifications stated in the recommendation).

**14.3.3** By recommending any such payment, the Engineer will not thereby be deemed to have represented that:

1. Exhaustive or continuous on-site inspections have been made to check the quality or the quantity of the Work, unless the City and the Engineer have agreed otherwise;
2. Examination has been made to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Amount;
3. The Contractor's construction means, methods, techniques, sequences or procedures have been reviewed; or

4. That there may not be other matters or issues between the parties that might entitle the Contractor to be paid additionally by the City or entitle the City to withhold payment to the Contractor.

#### **14.4 Decisions to Withhold Payment.**

**14.4.1** The City may withhold or nullify the whole or part of any payment to such extent as may be necessary on account of:

1. Defective Work not remedied;
2. Third party claims filed or reasonable evidence indicating probable filing of such claims;
3. Failure of the Contractor to make payments properly to subcontractors or for labor, materials or equipment;
4. Reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Amount;
5. Damage to the City or another contractor;
6. Reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay;
7. Failure of the Contractor to submit a schedule of values in accordance with the Contract Documents;
8. Failure of the Contractor to submit a submittal schedule in accordance with the Contract Documents;
9. Failure of the Contractor to submit and update a construction Progress Schedule in accordance with the Contract Documents;
10. Failure of the Contractor to maintain a record of changes on drawings and documents;

11. Failure of the Contractor to maintain weekly payroll reports and, as applicable, provide copies of reports in a timely manner upon request of the City;

12. Failure of the Contractor to submit monthly subcontractor reports;

13. The Contractor's neglect or unsatisfactory prosecution of the Work, including failure to clean up;

14. Failure of Contractor to comply with the Morganton City Code, Chapter \_\_\_\_\_, as amended, "Minority-Owned and Women-Owned Business Enterprise Program", or

15. Failure of Contractor to comply with any Minority Business Enterprise requirements.

14.4.2 When the above reasons for withholding payment are removed, the Contractor shall resubmit a statement for the value of the Work performed. Payment will be made within thirty (30) calendar days of receipt of approved application for payment.

#### **14.5 Substantial Completion:**

14.5.1 When the Contractor considers that the Work, or a portion thereof which the City agrees to accept separately, is substantially complete, the Contractor shall notify the City's Representative and request a determination as to whether the Work or designated portion thereof is substantially complete. If the City's Representative does not consider the Work substantially complete, the City's Representative will notify the Contractor giving reasons therefor. After performing any required Work, the Contractor shall then submit another request for the City's Representative to determine Substantial Completion. If the City's Representative considers the Work substantially complete, the City's Representative will prepare and deliver a certificate of Substantial Completion which shall establish the date of Substantial Completion, shall include a punch list of items to be completed or corrected before final payment, shall establish the time within which the Contractor shall finish

the punch list, and shall establish responsibilities of the City and the Contractor for security, maintenance, heat, utilities, damage to the Work, warranty and insurance. Failure to include an item on the punch list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents. If a Certificate of Occupancy is required by public authorities having jurisdiction over the Work, said certificate shall be issued before the Work or any portion thereof is considered substantially complete. The certificate of Substantial Completion shall be signed by the City and the Contractor to evidence acceptance of the responsibilities assigned to them in such certificate.

**14.5.2** The City shall have the right to exclude the Contractor from the Work after the date of Substantial Completion, but the City will allow the Contractor reasonable access to complete or correct items on the punch list and complete warranty work.

**14.6 Partial Utilization.** Use by the City, at the City's option, of any substantially completed part of the Work which: (i) has specifically been identified in the Contract Documents, or (ii) the City and the Contractor agree constitutes a separately functioning and usable part of the Work that can be used by the City for its intended purpose without significant interference with the Contractor's performance of the remainder of the Work, may be accomplished prior to Substantial Completion of all the Work in accordance with the following:

**14.6.1** The City at any time may request the Contractor to permit the City to use any such part of the Work which the City believes to be ready for its intended use and substantially complete. If the Contractor agrees that such part of the Work is substantially complete, the Contractor shall certify to the Engineer that such part of the Work is substantially complete and request the Engineer to issue a certificate of substantial completion for that part of the Work. The Contractor at any time may notify the Engineer that the Contractor considers any such part of the Work ready for its intended use and substantially complete and request the Engineer to issue a certificate of Substantial Completion for that part of the Work. The provisions of paragraphs 14.6.1 and 14.6.2 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.

**14.6.2** Such partial utilization is authorized by public authorities having jurisdiction over the Work.

**14.7 Final Inspection.** Upon written notice from the Contractor that the entire Work or an agreed portion thereof is complete, the City's Representative will make a final inspection with the Contractor and provide written notice of all particulars in which this inspection reveals that the Work is incomplete or defective. The Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

**14.8 Final Application for Payment.** The Contractor may make application for final payment following the procedure for progress payments after the Contractor has completed all such corrections to the satisfaction of the City's Representative and delivered the following documents:

**14.8.1** Affidavit by the Contractor certifying the payment of all debts and claims;

**14.8.2** Three (3) complete operating and maintenance manuals, each containing maintenance and operating instructions, schedules, guarantees, and other documentation required by the Contract Documents;

**14.8.3** Record documents (as provided in Paragraph 6.10);

**14.8.4** Consent of surety, if any, to final payment. If surety is not provided, complete and legally effective releases or waivers (satisfactory to the Owner) of all claims arising out of or filed in connection with the Work;

**14.8.5** Certificate evidencing that insurance required by the Supplemental General Conditions will remain in force after final payment and through the warranty period;

**14.8.6** Non-Use of Asbestos Affidavit (after construction);

**14.8.7** Subcontractor report and all other documentation necessary for evaluation of the Contractor's fulfillment of the Contract goals;

**14.8.8** Documentation of notice to claimants, to the extent applicable and subject to subparagraph 14.11.4; and



**14.8.9** Any other documentation called for in the Contract Documents.

#### **14.9 Final Payment and Acceptance.**

**14.9.1** If, on the basis of observation of the Work during construction, final inspection, and review of the final Application for Payment and accompanying documentation as required by the Contract Documents, the Engineer is satisfied that the Work has been completed and the Contractor's other obligations under the Contract Documents have been fulfilled and there are no outstanding claims, the Engineer will recommend the final Application for Payment and thereby notify the City, who will pay to the Contractor the balance due the Contractor under the terms of the Contract.

**14.9.2** If the Contract measures Contract Time to Final Completion, rather than Substantial Completion, the Engineer will issue a letter of final acceptance to the Contractor which establishes the Final Completion date and initiates the one-year warranty period, unless the sole remaining unfinished items include such things as landscaping or the re-establishment of vegetation, then the Engineer may issue a letter of conditional acceptance to the Contractor which establishes a final completion date and initiates the one year warranty period, provided further, the Contractor has executed a letter committing to the unfinished items and securing such letter through retainage, letter of credit or some other security acceptable to the City.

**14.9.3** Final payment is considered to have taken place when the Contractor or any of its representatives negotiates the City's final payment check, whether labeled final or not, for cash or deposits check in any financial institution for its monetary return.

**14.9.4** The City may withhold funds sufficient to cover the amount of any unresolved contract claims from the final payment.

**14.10 Waiver of Claims.** The making and acceptance of final payment will constitute:

**14.10.1** A waiver of claims by the City against the Contractor, except claims arising from unsettled claims, from defective Work appearing after final inspection, from failure to comply with the Contract Documents or the terms of any warranty specified therein, or from the Contractor's continuing obligations under the Contract Documents; and

**14.10.2** A waiver of all claims by the Contractor against the City other than those previously made in writing and still unsettled.

## **ARTICLE 15 – SUSPENSION OF WORK AND TERMINATION.**

**15.1 The City may Suspend Work Without Cause.** At any time and without cause, the City may suspend the Work or any portion thereof for a period of not more than ninety (90) calendar days by written notice to the Contractor which will fix the date on which the Work will be resumed. The Contractor shall resume the Work on the date so fixed. The Contractor shall be allowed an adjustment in the Contract Amount or an extension of the Contract Times, or both, directly attributable to any such suspension, if the Contractor makes an approved claim therefor as provided in Articles 11 and 12.

**15.2 The City May Terminate Without Cause.** Upon seven (7) calendar days' written notice to the Contractor, the City may, without cause and without prejudice to any right or remedy of the City, elect to terminate the Agreement. In such case, the Contractor shall be paid (without duplication of any items):

**15.2.1** For completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination;

**15.2.2** For reasonable demobilization costs;

**15.2.3** For anticipated profits on completed and accepted Work not previously paid and not included in separate pay items calculated to date of termination, but not for anticipated profit on the entire Contract not previously paid, unabsorbed overhead, or lost opportunity; and

**15.2.4** Where Contractor's services have been so terminated by the City, the termination will not affect any rights or remedies of the City against the Contractor and surety then existing or which may thereafter accrue. Any retention or payment of monies due the Contractor by the City will not release the Contractor from liability. In the event the City terminates the Contract with cause, the City may reject any and all bids submitted by the Contractor for up to three (3) years. In addition, in the event of a termination for cause, the Contractor and its principals shall not submit any further bids to the City for three (3) years after the date of such termination.

**15.4 The Contractor May Stop Work or Terminate.** If through no act or fault of the Contractor, the Work is suspended for a period of more than ninety (90) calendar days by the City or under an order of court or other public authority, or (except during disputes) the City's Representatives fails to forward for processing any mutually acceptable application for payment within thirty (30) calendar days after it is submitted, or (except during disputes) the City fails for sixty (60) calendar days after it is submitted to pay the Contractor any sum finally determined by the City to be due, then the Contractor may, upon seven (7) calendar days' written notice to the City, and provided the City does not remedy such suspension or failure within that time, terminate the Agreement and recover from the City payment on the same terms as provided in Paragraph 15.2. In lieu of terminating the Agreement and without prejudice to any other right or remedy, if (except during disputes) the Engineer has failed to forward for processing any mutually acceptable application for payment within thirty (30) calendar days after it is submitted, or (except during disputes), the City has failed for sixty (60) calendar days after it is submitted to pay the Contractor any sum finally determined by the City to be due, the Contractor may upon seven (7) calendar days' written notice to the City stop the Work until payment of all such amounts due the Contractor, including interest thereon. The provisions of this Paragraph 15.4 are not intended to preclude the Contractor from making a claim under Articles 11 and 12 for an increase in the Contract Amount or Contract Times or otherwise for expenses or damage directly attributable to the Contractor's stopping work as permitted by this paragraph.

**15.5 Discretionary Notice to Cure.** In its complete discretion, the City may, but is not required to, provide a notice to cure to the Contractor and its surety to cure an event of default described above and/or an anticipatory breach of contract and, if required by the City, to attend a meeting with the City, regarding the notice to cure, the event of default, and/or the anticipatory breach of contract. The notice to cure will set forth the time limit in which the cure is to be completed or commenced and diligently prosecuted. Upon receipt of any notice to cure, the Contractor shall prepare a report describing its program and measures to affect the cure of the event of default and/or anticipatory breach of contract within the time required by the notice to cure. The Contractor's report must be delivered to the City at least three (3) days prior to any requested meeting with the City and surety.

**15.6 Bankruptcy.** If the Contractor declares bankruptcy or is adjudged bankrupt or makes an assignment for the benefit of creditors or if a receiver (trustee) is appointed for the benefit of creditors or if a receiver is appointed by reason of the Contractor's insolvency, the Contractor may be unable to perform this Contract in accordance with the Contract requirements. In such event, the City may demand the Contractor or its successor in interest provide the City with adequate

assurance of the Contractor's future performance in accordance with the terms and conditions of the Contract. If the Contractor fails to provide adequate assurance of future performance to the City's reasonable satisfaction within ten (10) days of such a request, the City may terminate the Contractor's services for cause or without cause, as set forth above. If the Contractor fails to provide timely adequate assurance of its performance and actual performance, the City may prosecute the Work with its own forces or with other contractors on a time and material or other appropriate basis and the costs of which will be charged against the Contract balance.

**15.7 Duty to Mitigate.** In the event of any termination or suspension under this Contract, the Contractor agrees to and shall take all reasonable actions to mitigate its damages and any and all claims which may be asserted against the City.

**15.8 Responsibility during Demobilization.** While demobilizing, the Contractor will take all necessary and reasonable actions to preserve and protect the Work, the site and other property of the City or others at the site.

## **ARTICLE 16 – DISPUTE RESOLUTION.**

**16.1 Disputes.** Disputes between the City and the Contractor, or involving the Engineer, who is not an employee of the City, shall be resolved in accordance with this article. Furthermore, the Contractor agrees to attempt to resolve all disputes between the Contractor and other contractors (where there are multiple prime contractors) or between the Contractor and subcontractors or between the subcontractors utilizing the procedures of this article. Disputes shall be resolved as quickly as possible and as informally as possible so that the Work will not be delayed or unnecessarily interrupted and so that additional costs involved in resolving the dispute can be minimized. All parties agree to continue performing their portion of the Work not involved in the dispute throughout the process of resolving any dispute. Contract Times will not be extended nor will the Contract Amount be increased as a result of frivolous disputes, the abuse of the dispute resolution process, failure to participate in good faith in the dispute resolution process or the failure to proceed with the Work that is not involved in the particular dispute.

**16.2 Informal Process.** Prior to the submission of a written request for mediation in accordance with Section 16.3 below, the Contractor, any other prime contractor issued a contract by the City for this project, or any subcontractor must first submit its claim to the Engineer for review. If the dispute is not resolved through the involvement and instructions of the Engineer, then the parties to the dispute may use the formal dispute resolution process described below.

If the claim is against the City, and if the Engineer is an employee of the City, the Engineer may select an outside architect, engineer or other design professional to review the dispute and resolve the issue and any costs of retaining the outside architect, engineer or design professional shall be shared equally between the parties to the dispute regardless of the results of the meeting. In an effort to resolve the dispute informally, the parties shall, to the extent feasible, secure the attendance at the meeting of at least one previously uninvolved senior level decision maker for each party to the dispute.

**16.3 Formal Dispute Resolution Process.** If the amount in controversy is at least fifteen thousand dollars (\$15,000) and if the effort to resolve the claim using the informal process described above is unsuccessful, the party may submit a request for mediation in writing to the other party or parties involved with a written copy of the request provided to the City unless the City is the other party involved in the claim.

The parties shall then select a mediator, enter into a mediation agreement, schedule the mediation conference and make a good faith effort to resolve the claim or dispute in accordance with subchapter 30H(01NCAC3H.0101 through 01NCAC3H.1001) of the North Carolina Administrative Code, Dispute Resolution Process Adopted by the State Building Commission all in accordance with the requirements of G.S. 143-128(f1), as amended or superseded.

By written agreement, the parties to the dispute may agree upon a different mediation process; however, as a condition of this Contract, the Contractor shall, in good faith, participate in the mediation process either adopted by the State Building Commission or a dispute resolution process, including mediation, as an alternative to the mediation process required above prior to the commencement of the filing of any lawsuit against the City.

## **ARTICLE 17 – MISCELLANEOUS.**

**17.1 Venue.** In the event of any suit or in equity involving the Contract, venue shall be exclusively in Burke County, North Carolina and the laws of the State of North Carolina shall apply to the interpretation and enforcement of the Contract.

**17.2 Extent of Agreement.** This Contract represents the entire and integrated agreement between the City and the Contractor with respect to the subject matter hereof and supersedes all prior negotiations, representations or agreements, either written or oral.

**17.3 Cumulative Remedies.** The rights and remedies available to the parties 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 guarantees or by other provisions of the Contract Documents, and 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. Specifically, the City is not required to only assess liquidated damages, the City may elect to pursue its actual damages resulting from the failure of the Contractor to complete the Work in accordance with the requirements of the Contract Documents.

**17.4 Severability.** If any word, phrase, clause, sentence or provision of the Contract, or the application of same to any person or set of circumstances is for any reason held to be unconstitutional, invalid or unenforceable, that finding shall only effect such word, phrase, clause, sentence or provision, and such finding shall not effect the remaining portions of this Contract; this being the intent of the parties in entering into the Contract; and all provisions of the Contract are declared to be severable for this purpose.

**17.5 Independent Contractor.** The Contract shall not be construed as creating an employer/employee relationship, a partnership, or a joint venture. The Contractor is an independent contractor and the Contractor's services shall be those of an independent contract. The Contractor agrees and understands that the Contract does not grant any rights or privileges established for employees of the City.

**17.6 Prohibition of Gratuities.** The City may, by written notice to the Contractor, terminate the Contract without liability if it is determined by the City that gratuities were offered or given by the Contractor or any agent or representative of the Contractor to any officer or employee of the City with a view toward securing the Contract or securing favorable treatment with respect to the awarding or amending or the making of any determinations with respect to the performing of such Contract. In the event the Contract is terminated by the City pursuant to this provision, the City shall be entitled, in addition to any other rights and remedies, to recover or withhold the amount of the cost incurred by the Contractor in providing such gratuities.

**17.7 Prohibition Against Personal Interest in Contracts.** No officer, employee, independent consultant, or elected official of the City who is involved in the development, evaluation, or decision-making process of the performance of any solicitation shall have a financial interest, direct or indirect, in the Contract resulting from that solicitation. Any violation of this provision, with the knowledge, expressed or implied, of the Contractor shall render the Contract voidable by the City.

## **17.8 City's Right to Audit.**

**17.8.1** Records means all records generated by or on behalf of the Contractor and each subcontractor and supplier of the Contractor, whether paper, electronic, or other media, which are in any way related to performance of or compliance with this Contract, including, without limitation:

1. Accounting records;
2. Written policies and procedures;
3. Subcontract files (including proposals of successful and unsuccessful bidders, bid recaps, etc.);
4. Original estimates and estimating work sheets;
5. Correspondence;
6. Change Order files (including documentation covering negotiated settlements);
7. Back charge logs and supporting documentation;
8. General ledger entries detailing cash and trade discounts earned, insurance rebates and dividends;
9. Lump sum agreements between the Contractor and any subcontractor or supplier;
10. Records necessary to evaluate: The Contract compliance, Change Order pricing, and any claim submitted by the Contractor or any of its payees; and
11. Any other Contractor record that may substantiate any charge related to this Contract.

**17.8.2** The Contractor shall allow the City's agent or its authorized representative to inspect, audit, and/or reproduce, or all three, all records generated by or on behalf of the Contractor and each subcontractor and supplier, upon the City's written request. Further, the Contractor shall allow the City's agent or authorized representative to interview any of the Contractor's employees, all subcontractors and all suppliers, and all their respective employees.

**17.8.3** The Contractor shall retain all its records, and require all its subcontractors and suppliers to retain their respective records, during this Contract and for three (3) years after final payment, until all audit and litigation matters that the City has brought to the attention of the Contractor are resolved, or as otherwise required by law, whichever is longer. The City's right to inspect, audit, or reproduce records, or interview employees of the Contractor or its respective subcontractors or suppliers exists during this Contract, and for three (3) years after final payment, until all audit and litigation matters that the City has brought to the Contractor's attention are resolved, or as otherwise required by law, whichever is longer, and at no cost to the City, either from the Contractor or any of its subcontractors or suppliers that may furnish records or make employees available for interviewing.

**17.8.4** The Contractor must provide sufficient and accessible facilities during its normal business hours for the City to inspect, audit, or reproduce records, or all three, and to interview any person about the records.

**17.8.5** The Contractor shall insert these requirements in each written contract between the Contractor and any subcontractor or supplier and require each subcontractor and supplier to comply with these provisions.

**17.9 Survival.** The terms and conditions of this Contract, which contemplate a period of time beyond completion or termination will survive such completion or termination and not be merged therein or otherwise terminated.

**17.10 No Waiver.** The waiver of any provision of this Contract will not be deemed to be a waiver of any other provision of this Contract. No waiver of any provision of this Contract will be deemed to constitute a continuing waiver unless expressly provided in writing, nor will a waiver of any default be deemed a waiver of any subsequent defaults of the same type. The failure at any time to enforce this Contract, whether the default is known or not, shall not constitute a waiver or estoppel of the right to do so.



SECTION 00 73 00  
SUPPLEMENTARY CONDITIONS

These Supplementary Conditions amend or supplement Section 00 72 13 – General Conditions of the City of Morganton and other provisions of the Contract Documents as indicated below. All provisions which are not amended or supplemented in these Supplementary Conditions remain in full force and effect.

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

**ARTICLE 1 - DEFINITIONS**

**1.1 Basic Definitions**

**Amend the paragraph and insert the following definitions:**

“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.

Agreement - The written instrument which is evidence of the agreement between Owner and Contractor covering the Work.

Application for Payment - The form acceptable to Engineer which is to be used by Contractor during the course of the Work in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.

Asbestos - Any material that contains more than one percent asbestos and is friable or is releasing asbestos fibers into the air above current action levels established by the United States Occupational Safety and Health Administration.

Bid - The offer or proposal of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.

Bidder - The individual or entity who submits a Bid directly to Owner.

Bidding Documents - The Bidding Requirements and the proposed Contract Documents (including all Addenda).

Bidding Requirements - The advertisement or invitation to bid, Instructions to Bidders, Bid security of acceptable form, if any, and the Bid Form with any supplements.

Change Order - A document recommended by Engineer 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, issued on or after the Effective Date of the Agreement.

Claim - A demand or assertion by Owner or Contractor seeking an adjustment of Contract Price or Contract Times, or both, or other relief with respect to the terms of the Contract. A demand for money or services by a third party is not a Claim.

Contract Documents - Those items so designated in the Agreement. Only printed or hard copies of the items listed in the Agreement are Contract Documents. Approved Shop Drawings, other Contractor submittals, and the reports and drawings of subsurface and physical conditions are not Contract Documents.

Contract Price - The moneys payable by Owner to Contractor for completion of the Work in accordance with the Contract Documents as stated in the Agreement (subject to the provisions of Paragraph 11.03 in the case of Unit Price Work).

Effective Date of the Agreement - The date indicated in the Agreement on which it becomes effective, but if no such date is indicated, it means the date on which the Agreement is signed and delivered by the last of the two parties to sign and deliver.

Field Order - A written order issued by Engineer which requires minor changes in the Work but which does not involve a change in the Contract Price or the Contract Times.

General Requirements - Sections of Division 1 of the Specifications.

Hazardous Environmental Condition - The presence at the Site of Asbestos, PCBs, Petroleum, Hazardous Waste, or Radioactive Material in such quantities or circumstances that may present a substantial danger to persons or property exposed thereto.

Hazardous Waste - The term Hazardous Waste shall have the meaning provided in Section 1004 of the Solid Waste Disposal Act (42 USC Section 6903) as amended from time to time.

Laws and Regulations - Any and all applicable laws, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.

Liens - Charges, security interests, or encumbrances upon Project funds, real property, or personal property.

Milestone - A principal event specified in the Contract Documents relating to an intermediate completion date or time prior to Substantial Completion of all the Work.

Notice of Award - The written notice by Owner to the Successful Bidder stating that upon timely compliance by the Successful Bidder with the conditions precedent listed therein, Owner will sign and deliver the Agreement.

Notice to Proceed - A written notice given 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 under the Contract Documents.

PCBs - Polychlorinated biphenyls.

Petroleum - Petroleum, including crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute), such as oil, petroleum, fuel oil, oil sludge, oil refuse, gasoline, kerosene, and oil mixed with other non-Hazardous Waste and crude oils.

Progress Schedule - A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising the Contractor's plan to accomplish the Work within the Contract Times.

Project Manual - The bound documentary information prepared for bidding and constructing the Work. A listing of the contents of the Project Manual, which may be bound in one or more volumes, is contained in the table(s) of contents.

Radioactive Material - Source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954 (42 USC Section 2011 et seq.) as amended from time to time.

Resident Project Representative - The authorized representative of Engineer who may be assigned to the Site or any part thereof.

Samples - Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and which establish the standards by which such portion of the Work will be judged.

Schedule of Submittals - A schedule, prepared and maintained by Contractor, of required submittals and the time requirements to support scheduled performance of related construction activities.

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.

Shop Drawings - All drawings, diagrams, illustrations, schedules, and other data or information which are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work.

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 for access thereto, and such other lands furnished by Owner which are designated for the use of Contractor.

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 at the Site.

Substantial Completion - The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms "substantially complete" and "substantially completed" as applied to all or part of the Work refer to Substantial Completion thereof.

Supplier - A manufacturer, fabricator, supplier, distributor, materialman, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or Subcontractor.

Underground Facilities - All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.

Unit Price Work - Work to be paid for on the basis of unit prices.

Work Change Directive - A written statement to Contractor issued on or after the Effective Date of the Agreement and signed by Owner and recommended by Engineer ordering an addition, deletion, or revision in the Work, or responding to differing or unforeseen subsurface or physical conditions under which the Work is to be performed or to emergencies. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the change ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order following negotiations by the parties as to its effect, if any, on the Contract Price or Contract Times.

Written Amendment – A written statement modifying the Contract Documents, signed by Owner and Contractor on or after the Effective Date of the Agreement and normally dealing with the non-engineering or non-technical rather than strictly construction-related aspects of the Contract Documents.”

## **ARTICLE 2 – CONTRACT DOCUMENTS AND REQUIREMENTS.**

### **2.1 Meaning and Intent**

#### **Add the following to Paragraph 2.1:**

“2.1.1. Drawings and Specifications do not indicate or describe all of the Work required to complete the Project. Additional details required for the correct installation of selected products are to be provided by the Contractor and coordinated with the Engineer. Provide any work, materials or equipment required for a complete and functional system even if they are not detailed or specified.

The Contract requirements described in the General Conditions, Supplementary Conditions and General Requirements apply to each and all Sections of the Specifications unless specifically noted otherwise.

Organization of Contract Documents is not intended to control or to lessen the responsibility of the Contractor when dividing Work among Subcontractors, or to establish the extent of Work to be performed by any trade, Subcontractor or Supplier. Specifications or details do not need to be indicated or specified in each specification or drawing. Items shown in the Contract Documents are applicable regardless of location in the Contract Documents.

Standard paragraph titles and other identifications of subject matter in the Specifications are intended to aid in locating and recognizing various requirements of the Specifications. Titles do not define, limit, or otherwise restrict specification text.”

“2.1.2 Comply with the most stringent requirements where compliance with two or more standards is specified, and they establish different or conflicting requirements for minimum quantities or quality levels, unless Contract Documents indicate otherwise.

1. Quantity or quality level shown or indicated shall be the minimum to be provided or performed in every instance.
2. Actual installation must meet or exceed the minimum quality indicated.
3. In complying with these requirements, indicated numeric values are minimum or maximum values, as noted, or appropriate for context of requirements.
4. Refer instances of uncertainty to the Engineer for a decision before proceeding.”

“2.1.3 Provide materials and equipment comparable in quality to similar materials and equipment incorporated in the Project or as required to meet the minimum requirements of the application if the materials and equipment are shown in the Drawings but are not included in the Specifications.”

“2.1.4 The Contract Documents comprise the entire Agreement between Owner and Contractor. The Contract Documents may be modified only by Field Order, Change Order or Written Amendment.”

**Add the following new paragraphs after Paragraph 2.1:**

**“2.2 Reference Standards**

Standards, Specifications, Codes, Laws, and Regulations Reference to standards, specifications, manuals, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, shall mean the standard, specification, manual, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Agreement if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.

No provision of any such standard, specification, manual, or code, or any instruction of a Supplier, shall be effective to change the duties or responsibilities of Owner, Contractor, or Engineer, or any of their subcontractors, consultants, agents, or employees, from those set forth in the Contract Documents. No such provision or instruction shall be effective to assign to Owner, Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the Contract Documents. Comply with applicable construction industry standards as if bound or copied directly into the Contract Documents regardless of lack of reference in the Contract Documents. Apply provisions of the Contract Documents where Contract Documents include more stringent requirements than these referenced standards.

Standards referenced directly in the Contract Documents take precedence over standards that are not referenced but recognized in the construction industry as applicable.

Comply with standards not referenced but recognized in the construction industry as applicable for performance of the Work except as otherwise limited by the Contract Documents. The Engineer determines whether code or standard is applicable, or which of several are applicable.

Make copies of reference standards available as requested by Engineer or Owner.”

#### **2.4 Review of Contract Documents and Site Conditions**

##### **Add the following to Paragraph 2.4:**

##### **“2.4.1 Amending and Supplementing Contract Documents**

The Contract Documents may be amended to provide for additions, deletions, and revisions in the Work or to modify the terms and conditions thereof by either a Change Order or a Work Change Directive.

The requirements of the Contract Documents may be supplemented, and minor variations and deviations in the Work may be authorized, by one or more of the following ways:

1. A Field Order;
2. Engineer’s approval of a Shop Drawing or Sample (subject to the provisions of Paragraph 2.6);  
or
3. Engineer’s written interpretation or clarification”

##### **“2.4.2 Reuse of Documents**

Contractor and any Subcontractor or Supplier shall not:

1. have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or its consultants, including electronic media editions; or
2. 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.

The prohibitions of this Paragraph 2.10.2 will survive final payment, or termination of the Contract. Nothing herein shall preclude Contractor from retaining copies of the Contract Documents for record purposes, unless specifically prohibited in writing by the Owner for security reasons. If the Owner so directs, Contractor shall surrender all copies of the construction Contract Documents and other related documents, in paper or digital format and remove these documents from computer equipment or storage devices as a condition of final payment.”

##### **“2.4.3 Electronic Data**

Unless otherwise stated in the Supplementary Conditions, the data furnished by Owner or Engineer to Contractor, or by Contractor to Owner or Engineer, that may be relied upon are limited to the printed copies (also known as hard copies). Files in electronic media format of

text, data, graphics, or other types are furnished only for the convenience of the receiving party. Any conclusion or information obtained or derived from such electronic files will be at the user's sole risk. If there is a discrepancy between the electronic files and the hard copies, the hard copies govern.

Because data stored in electronic media format can deteriorate or be modified inadvertently or otherwise without authorization of the data's creator, the party receiving electronic files agrees that it will perform acceptance tests or procedures within 60 days, after which the receiving party shall be deemed to have accepted the data thus transferred. Any errors detected within the 60-day acceptance period will be corrected by the transferring party.

When transferring documents in electronic media format, the transferring party makes no representations as to long term compatibility, usability, or readability of documents resulting from the use of software application packages, operating systems, or computer hardware differing from those used by the data's creator."

### **2.5 Copies of Drawings and Specifications**

**Delete Paragraph 2.5 in its entirety and insert the following in its place:**

"2.5 Contractor may make as many prints of the documents downloaded for bidding as they require for construction. Engineer will not provide printed or hard copies to the Contractor."

### **2.6 Shop Drawings, Samples and Product Information.**

**Delete Paragraph 2.6 after definitions of shop drawings, product sheets, and samples, in its entirety and insert the following in its place:**

"Shop drawings are intended to be drawings, diagrams, prints, schedules, and other data that is prepared by the Contractor, a subcontractor, manufacturer, supplier or distributor to illustrate a portion of the Work.

Product data sheets are illustrations, standard schedules, charts, instructions, brochures, diagrams, and other information provided by the Contractor for the purpose of illustrating materials and equipment to be installed or other supplies to be provided as a part of the Work.

Samples are examples which generally illustrate materials that will be used as a part of the Work or samples of equipment and/or workmanship used to demonstrate the standards by which the Work will be judged.

Contractor shall submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals (as required by Paragraph 2.07). Each submittal will be identified as Engineer may require."

"2.6.1 Shop Drawings:

1. Submit number of copies specified in the General Requirements. Data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials,

and equipment Contractor proposes to provide and to enable Engineer to review the information for the limited purposes required by Paragraph 6.17.D.”

“2.6.2 Samples:

1. Submit number of Samples specified in the Specifications.
2. 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 2.6.5.”

“2.6.3 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.

“2.6.4 Submittal Procedures:

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

“2.6.5 Engineer’s Review:

1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the Schedule of Submittals acceptable to Engineer. Engineer’s review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract



Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.

2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction (except where a particular means, method, technique, sequence, or procedure of construction is specifically and expressly called for by the Contract Documents) or to safety precautions or programs incident thereto. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.
3. Engineer's review and approval shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 2.6.4 - 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's review and approval shall not relieve Contractor from responsibility for complying with the requirements of Paragraph 2.6.4 - 1"

**"2.6.6 Resubmittal Procedures:**

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. Re-submittals shall reference and respond directly to Engineer's previous comments. Any variations from strict compliance with the Contract Documents will be identified in the same manner as required in Paragraph 2.6.4 - 3 and will require the same approvals."

**ARTICLE 3 – PRELIMINARY MATTERS.**

**3.3 Commencement of Contract Times; Notice to Proceed**

**Amend the Paragraph and insert the following:**

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

**Add the following new paragraphs immediately after Paragraph 3.4.1:**

**"3.4.2 Preliminary Schedules:** Within 10 days after the Effective Date of the Agreement (unless otherwise specified in the General Requirements), 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 Documents;
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.”

### **“3.4.3 Preconstruction Conference; Designation of Authorized Representatives**

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 3.4.2 – 1, procedures for handling Shop Drawings and other submittals, processing Applications for Payment, and maintaining required records.

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 instructions, receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.”

### **Add the following new paragraphs immediately after Paragraph 3.4.3:**

“3.4.5 Contractor’s Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.

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 component parts of the Work.”

## **ARTICLE 4 – AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; REFERENCE POINTS.**

### **4.1 Availability of Lands**

#### **Amend the Paragraph with the following:**

“A copy of the written agreements for the use of such land shall be provided to the Owner for record purposes.”

### **4.2 Subsurface and Physical Conditions**

#### **Add the following new paragraphs immediately after Paragraph 4.2.1:**

“4.2.2 Limited Reliance by Contractor on Technical Data Authorized: Contractor may rely upon the accuracy of the “technical data” contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such “technical data” is identified in the Supplementary Conditions. Except for such reliance on such “technical data,” Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:

1. the completeness of such reports and drawings for Contractor’s purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto; or

2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or
3. any Contractor interpretation of or conclusion drawn from any “technical data” or any such other data, interpretations, opinions, or information.”

**Add the following new paragraphs immediately after Paragraph 4.2.2:**

“4.2.3 Possible Price and Times Adjustments:

1. The Contract Price or the Contract Times, or both, will be equitably adjusted to the extent that the existence of such differing subsurface or physical condition 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 meet any one or more of the categories described in Paragraph 4.2; and
  2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times if:
    - a. Contractor knew of the existence of such conditions at the time Contractor made a final 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
    - b. the existence of such condition could reasonably have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor’s making such final commitment; or
    - c. Contractor failed to give the written notice as required by Paragraph 4.2.3.
  3. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, a formal dispute resolution may be made therefore as provided in Paragraph 16.3. However, neither Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors shall be liable to Contractor for any claims, costs, losses, or 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) sustained by Contractor on or in connection with any other project or anticipated project.”

**Add the following new paragraphs immediately after Paragraph 4.3:**

“4.4 Underground Facilities

4.4.1 Shown or Indicated: The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or contiguous to the Site is based on information and data furnished to Owner or Engineer by the owners of such Underground Facilities, including Owner, or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:

1. Owner and Engineer shall not be responsible for the accuracy or completeness of any such information or data provided by others; and

2. the cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:

- a. reviewing and checking all such information and data;
- b. locating all Underground Facilities shown or indicated in the Contract Documents;
- c. coordination of the Work with the owners of such Underground Facilities, including Owner, during construction; and
- d. the safety and protection of all such Underground Facilities and repairing any damage thereto resulting from the Work.
- e. Following the North Carolina General Statutes, Chapter 87, Article 8 Underground Damage Prevention.
- f. Notifying Owners of underground facilities prior to start of Work.
- g. Investigating ahead of the Work to verify the existence of Underground Facilities.
- h. Assuming risks and repairing damage caused by the Work to the existing Underground Facilities whether indicated or not in the Contract Documents. Repairs to Underground Facilities shall be done to the satisfaction of the Underground Facility Owner and may require material and methods, which are better than the existing Facility. Underground Facility Owner reserves the right to repair damage by the Contractor to their underground Facilities. If the Owner exercises this right, the Owner's cost of this Work shall be deducted from the money due the Contractor.
- i. Uncovering Underground Facilities, with that Owners approval, that are located within the Work as necessary for Engineer to determine the requirements for the change in the work."

**4.4.2 Not Shown or Indicated:**

1. If an Underground Facility is uncovered or revealed at or contiguous to the Site which was not shown or indicated, or not shown or indicated with reasonable accuracy in the Contract Documents, 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 6.11.5), identify the owner of such Underground Facility and give written notice to that owner and to Owner and Engineer. Engineer will promptly review the Underground Facility and determine the extent, if any, to which a change is required in the Contract Documents to reflect and document the consequences of the existence or location of the Underground Facility. During such time, Contractor shall be responsible for the safety and protection of such Underground Facility."

**4.4 Hazardous Materials**

**Add the new paragraph immediately following Paragraph 4.4.4**

"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. If Owner and Contractor cannot agree as to entitlement

to or on the amount or extent, if any, of an adjustment in Contract Price or Contract Times as a result of deleting such portion of the Work, then either party may follow dispute resolution as provided in Article 16. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 8."

## **ARTICLE 6 – CONTRACTOR'S RESPONSIBILITIES**

### **6.2 Labor, Materials and Equipment**

**Delete Paragraph 6.2.4 – 1 (Substitutes and "Approved Equal" Items) and insert the following in its place:**

"Where equipment and products are specified by name, no substitutes or "or prior approved equal" will be considered or approved unless the term "or prior approved equal" is included in the individual Specification. If substitutes or "or prior approved equals" are specifically permitted for consideration by the individual Specifications, they must be submitted at least 15 days prior to the bid date and will be reviewed and evaluated in accordance with the provisions established in Paragraph 6.2.4 and in the General Requirements of the Specifications, with a decision announced at least 7 days prior to the bid date."

**Amend Paragraph 6.2.4 – 2 and add the following:**

"a. in the exercise of reasonable judgment Engineer determines that:

- 1) it is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;
- 2) it will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole; and
- 3) it has a proven record of performance and availability of responsive service.

b. Contractor certifies that, if approved and incorporated into the Work:

- 1) there will be no increase in cost to the Owner or increase in Contract Times; and
- 2) it will conform substantially to the detailed requirements of the item named in the Contract Documents."

**Amend Paragraph 5 and add the following:**

"c. The requirements for review by Engineer will be as set forth in Paragraph 6.2.4, as supplemented by the General Requirements, and as Engineer may decide is appropriate under the circumstances.

d. Contractor shall make written application to Engineer for review of a proposed substitute item of material or equipment that Contractor seeks to furnish or use. The application:

1) shall certify that the proposed substitute item will:

- a) perform adequately the functions and achieve the results called for by the general design,

b) be similar in substance to that specified, and

c) be suited to the same use as that specified;

2) will state:

a) the extent, if any, to which the use of the proposed substitute item will prejudice Contractor's achievement of Substantial Completion on time,

b) 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

c) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty;

3) will identify:

a) all variations of the proposed substitute item from that specified, and

b) available engineering, sales, maintenance, repair, and replacement services; and

4) shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including costs of redesign and claims of other contractors affected by any resulting change."

#### **6.4 Concerning Subcontractors, Suppliers and Others:**

**Add a new paragraph immediately Paragraph 6.4.8 as follows:**

"6.4.9 Owner or Engineer may furnish to any such Subcontractor, Supplier, or other person or organization, to the extent practicable, information about amounts paid to Contractor in accordance with Contractor's Application for Payment on account of the particular Subcontractor's, Supplier's, other person's or other organization's Work."

#### **6.7 Laws and Regulations:**

**Delete Paragraph 6.7.3 and insert the following in its place:**

"If Contractor performs any Work that it is contrary to Laws or Regulations, Contractor shall bear 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."

**Add a new paragraph immediately Paragraph 6.7.3 as follows:**

"6.7.4 Changes in Laws or Regulations not known at the time of opening of Bids (or, on the Effective Date of the Agreement if there were no Bids) having an effect on the cost or time of performance of the Work shall be the subject of an adjustment in Contract Price or Contract Times. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a formal dispute may be made per paragraph 16.3.

Contractor shall be responsible for conforming to the requirements of the approved sedimentation control plan, the rules and regulations of the Erosion Control Laws of the State of North Carolina, specifically the Sedimentation Pollution Control Act of 1973 (G.S. 113A) as amended, and the local jurisdiction where the project is located as it relates to land disturbing activities undertaken by Contractor. Contractor shall be responsible to Owner for any fines imposed on Owner as a result of Contractor's failure to comply with the above as it is further described in the Erosion Control Section of the Specifications.

Should the Contractor cause the Owner to receive a Notice of Violation from a governmental agency, Contractor shall pay costs associated with Notice of Violation within ten (10) days of receipt of written notification. Costs shall include, but not be limited to:

1. Fines imposed on the Owner by the agency.
2. Required legal newspaper publications concerning violation.
3. Required mailings to customers concerning notification of violation.
4. Administrative and engineering costs associated with resolving the Notice of Violation.
5. Notice of Violation may include, but not be limited to, the following problems:
6. Inadequate erosion control measures.
7. Equipment failure during the warranty period."

#### **6.11 Safety and Protection:**

##### **Add paragraphs to 6.11.2**

"Contractor's duties and responsibilities for safety and for protection of the Work shall continue until such time as all the Work is completed and Engineer has issued a notice to Owner and Contractor in accordance with Paragraph 14 that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).

The Contractor's duties and responsibilities for the safety or protection of persons or the Work or property at the Site or adjacent thereto shall be reinstated when any additional efforts are required during the one-year correction period to correct defects in the Work."

#### **6.12 Continuing the Work.**

##### **Add the following to Paragraph 6.12**

"Contractor assumes and bears responsibility for all costs and time delays associated with any variation from the requirements of the Contract Documents."

#### **ARTICLE 9 – ENGINEER.**

##### **9.6 Rejecting Defective Work.**

##### **Add the following to Paragraph 9.6**

“Engineer will also have authority to require special inspection or testing of the Work as provided in Paragraph 13.04, whether or not the Work is fabricated, installed, or completed.”

**ARTICLE 10 CHANGES IN THE WORK**

**Add the following to Paragraph 10.3.1**

“The Contractor shall notify the Engineer in writing prior to beginning any Work addressed in a Field Order if the Contractor does not agree that the Work involved represents no additional cost and/or time change in the Contract Documents.”

**ARTICLE 12 – TIMES.**

**Add the following to Paragraph 12.3:**

“No time extensions will be allowed for weather conditions for Projects using calendar days for the Contract Time.”

**ARTICLE 13 – TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK.**

**Add the paragraph to Paragraph 13.3.2**

“5. Owner reserves the right to approve of any independent testing laboratory before inspections, tests, or approvals are performed.”

**Amend Paragraph 13.7.1 by adding:**

“When early acceptance of a Substantially Completed portion of the Work is accomplished in the manner indicated, the correction period for that portion of the Work shall commence at the time of substantial completion of that Work.”

**ARTICLE 14 – PAYMENTS TO THE CONTRACTOR AND COMPLETION**

**Amend Paragraph 14.1.1 and insert the following:**

Sales Tax forms shall be submitted along with payment applications.

**ARTICLE 15 – SUSPENSION OF WORK AND TERMINATION.**

**Add the following paragraph immediately after 15.2:**

“15.3 Owner May Terminate for Cause

A. The occurrence of any one or more of the following events will 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 established under Paragraph 6.3;
2. Contractor’s disregard of Laws or Regulations of any public body having jurisdiction;
3. Contractor’s repeated disregard of the authority of Engineer; or



4. Contractor's violation in any substantial way of any provisions of the Contract Documents.
  5. If Contractor fails to provide the replacement bond required by General Conditions, Section 5.1 or insurance coverage as required by General Conditions Article 5 and as amended by Supplemental Conditions.
  6. If any petition of bankruptcy is filed by or against Contractor, or if Contractor is adjudged as bankrupt or insolvent or makes a general assignment for the benefit of creditors, or if a receiver is appointed for the benefit of Contractor's creditors, or if a receiver is appointed on account of Contractor's insolvency, upon the occurrence of any such event, Owner shall be entitled to request of Contractor or its successor in interest adequate assurance of future performance in accordance with the terms and conditions hereof. Failure to comply with such request within 7 days of delivery of the request shall entitle Owner to terminate this agreement and to the accompanying rights set forth in Paragraphs 15.2 and 15.3 hereof. In all events pending receipt of adequate assurance of performance and actual performance in accordance therewith, Owner shall be entitled to proceed with the Work with its own forces or with other contractors on a time and material or other appropriate basis. The cost of work by Owner or other contractors will be back charged against the Contract Sum hereof.
- B. If one or more of the events identified in Paragraph 15.3.A occur, Owner may, after giving Contractor (and surety) seven days written notice of its intent to terminate the services of Contractor:
1. exclude Contractor from the Site, and take possession of the Work and of all Contractor's tools, appliances, construction equipment, and machinery at the Site, and use the same to the full extent they could be used by Contractor (without liability to Contractor for trespass or conversion);
  2. 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
  3. complete the Work as Owner may deem expedient.
- C. If Owner proceeds as provided in Paragraph 15.3.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 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) sustained by Owner arising out of or relating to completing the Work, such excess will be paid to Contractor. If such claims, costs, losses, and damages exceed 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.
- D. Notwithstanding Paragraphs 15.3.B and 15.3.C, Contractor's services will not be terminated if Contractor begins within seven days of receipt of notice of intent to terminate to correct its

failure to perform and proceeds diligently to cure such failure within no more than 30 days of receipt of said notice.

E. 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.

Any retention or payment of moneys due Contractor by Owner will not release Contractor from liability."

**Add a new paragraph to Paragraph 15.4 as follows:**

"15.4.1. This Contract may not be assigned in whole or in part by the Contractor without the previous written consent of the Owner."

SECTION 00 73 00.01  
PROCEDURE FOR REPORTING NORTH CAROLINA SALES TAX  
EXPENDITURES ON CITY OF MORGANTON CONTRACTS

1. The following procedure in handling the North Carolina Sales Tax is applicable to this project. Contractors shall comply fully with the requirements outlined hereinafter, in order that the owner may recover the amount of the tax permitted under the law. For the purposes of this section, "Sales Taxes" shall mean sales and use taxes paid to the State of North Carolina or to local governments in North Carolina.
  - (a) Reimbursable Sales Taxes are to be excluded from the bid price for this project.
  - (b) The City is entitled to refunds from the State of North Carolina for these reimbursable sales taxes. The Contractor that performs work under this contract is allowed to obtain a reimbursement from the City for those Sales Taxes for which the State will grant a refund to the City. The City will reimburse the Contractor, and the City later obtains a refund from the State.
  - (c) It shall be the contractor's responsibility to furnish the City documentary evidence showing the materials used and sales tax paid by the contractor and each of his subcontractors. Any county sales tax included in the contractor's statements must be shown separately from the state sales tax. If more than one county is shown, each county shall be listed separately.
  - (d) The documentary evidence shall be the attached Reimbursable Sales and Use Tax Statement. This evidence shall consist of a certified statement, by the contractor and each of his subcontractors individually, showing total purchases of materials from each separate vendor and total sales taxes by each county paid each vendor. The certified statement must show the invoice number (s) covered and inclusive dates of such invoices. State sales tax shall be listed separately from county sales tax. If more than one county is shown, each county shall be listed separately. The invoices shall be provided to substantiate the information on the statement.
  - (e) Materials used from contractor's or subcontractor's warehouse stock shall be shown in a certified statement at warehouse stock prices.
  - (f) The contractor shall not be required to certify the subcontractor's statements. However, the subcontractor may submit for reimbursement by certifying a Reimbursable Sales and Use Tax Statement, submitting it to the contractor for the contractor to submit with the pay application for the properties listed on that form. The City will make the reimbursement payable to the Contractor.
  - (g) The documentary evidence to be furnished to owners eligible for Reimbursable Sales Tax refunds covers sales and/or use taxes paid on building materials used by contractors and subcontractors in the performance of contracts with churches, orphanages, hospitals not for profit, educational institutions not operated for profit and other charitable or religious institutions or organizations not operated for profit and incorporated cities, towns and counties in this State. The documentary evidence is to be submitted to the

above-named institutions, organizations and governmental units to be included in claims for refunds to be prepared and submitted by them to obtain refunds provided by G.S. 105-164.14 and is to include the purchase of building materials, supplies, fixtures and equipment which become a part of or annexed to buildings or structures being erected, altered or repaired under contracts with such institutions, organizations or governmental units.

- (h) The Contractor may seek reimbursement separately from, but at the same time as, the application for payment is made for the properties that were taxed. The Contractor shall not file for reimbursement for Sales Taxes before the Contractor has the right to file an application for payment for the properties that were taxed.
2. If the State refuses to refund any such Sales Tax to the City, or if after a refund is made, the City is told to return a refund to the State, the Contractor shall upon demand repay the City for the amount of the failed refunds.
  3. The contractor or contractors to whom an award is made on this project will be required to follow the procedure outlined above.
  4. The contractor is advised that all requests for payment, partial or final, for work completed under this contract must include a sales tax report submitted in accordance with the procedures outlined above.





**SUBCHAPTER 30H – MEDIATED SETTLEMENT CONFERENCES****SECTION .0100 – INITIATING MEDIATED SETTLEMENT CONFERENCES****01 NCAC 30H .0101 PURPOSE OF MANDATORY SETTLEMENT CONFERENCES**

Pursuant to G.S. 143-128 (f1) and 143-135.26(11), these Rules are promulgated to implement a system of settlement events which are designated to focus the parties' attention on settlement rather than on claim preparation and to provide a structured opportunity for settlement negotiations to take place. Nothing herein is intended to limit or prevent the parties from engaging in settlement procedures voluntarily at any time prior to or during commencement of the dispute resolution process.

*History Note: Authority G.S. 143-135.26 (10), (11); S.L. 2001-496, s. 14(b);  
Temporary Adoption Eff. July 1, 2002;  
Eff. August 1, 2004;  
Pursuant to G.S. 150B-21.3A, rule is necessary without substantive public interest Eff. July 22,  
2018.*

**01 NCAC 30H .0102 INITIATING THE DISPUTE RESOLUTION PROCESS**

(a) Any party to a public construction contract governed by G.S. 143, Article 8 and identified in G.S. 143-128 (f1) and who is a party to a dispute arising out of the construction process in which the amount in controversy is at least fifteen thousand dollars (\$15,000) may submit a written request to the public owner for mediation of the dispute.

(b) Prior to submission of a written request for mediation to the public owner, the party requesting mediation:

- (1) If a prime contractor, it must first submit its claim to the Project Designer for review. If the dispute is not resolved through the Project Designer's instructions, then the dispute becomes ripe for mediation in the Formal Dispute Resolution Process, and the party may submit his written request for mediation to the public owner.
- (2) If the party requesting mediation is a subcontractor, it must first submit its claim to the prime contractor with whom it has a contract. If the dispute is not resolved through the Prime Contractor's informal involvement, then the dispute becomes ripe for mediation in the Formal Dispute Resolution Process, and the party may submit its written request for mediation to the public owner.
- (3) If the party requesting mediation is the Project Designer, then it must first submit its claim to the public owner to resolve. If the dispute is not resolved with the public owner's informal involvement, then the Project Designers' dispute is ripe for mediation in the Formal Dispute Resolution Process, and the Project Designer may submit its written request to the public owner for mediation.

*History Note: Authority G.S. 143-135.26(10) and (11); S.L. 2001-496, Sec. 14(b);  
Temporary Adoption Eff. July 1, 2002;  
Eff. August 1, 2004;  
Pursuant to G.S. 150B-21.3A, rule is necessary without substantive public interest Eff. July 22,  
2018.*

**SECTION .0200 – SELECTION OF MEDIATOR****01 NCAC 30H .0201 SELECTION OF MEDIATOR**

(a) The parties may select a mediator certified pursuant to Paragraph (b) of this Rule. The requesting party shall file with the State Construction Office (hereinafter collectively referred to as the "SCO") if a State project or public owner, if a non-State project, a Notice of Selection of Mediator by Agreement within 10 days of the request; however, any party may file the notice. Such notice shall state the name, address and telephone number of the mediator selected; state the rate of compensation of the mediator; state that the mediator and opposing counsel have agreed upon the selection and rate of compensation; and state that the mediator is certified pursuant to these Rules.

(b) All mediators in the Formal Dispute Resolution Program shall be certified in accordance with the rules certifying mediators in Superior Court in North Carolina except when otherwise allowed by the SCO or public owner upon the request of the parties to the mediation. When selecting mediators, the parties may designate a

preference for mediators with a background in construction law or public construction contracting. Such preferences are not mandatory under these Rules.

(c) The parties may select a mediator who does not meet the certification requirements of these Rules. However, all mediators gain the consent of the SCO or public owner in accordance with these Rules to mediate any dispute.

(d) If the parties cannot agree upon the selection of a mediator, the party or party's attorney shall so notify the SCO or public owner and request, on behalf of the parties, that the SCO or public owner appoint a mediator. The request for appointment shall state that the parties have had a full and frank discussion concerning the selection of a mediator and have been unable to agree. The request shall state whether any party prefers a certified attorney mediator, and if so, the SCO or public owner shall appoint a certified attorney mediator. If no preference is expressed, the SCO or public owner may appoint a certified attorney mediator or a certified non-attorney mediator.

*History Note:* Authority G.S. 143-135.26(10) and (11); S.L. 2001-496, Sec. 14(b);  
Temporary Adoption Eff. July 1, 2002;  
Eff. August 1, 2004;  
Pursuant to G.S. 150B-21.3A, rule is necessary without substantive public interest Eff. July 22, 2018.

#### **01 NCAC 30H .0202 MEDIATION AGREEMENT**

(a) Upon selection of the mediator, the parties shall enter into a mediation agreement. The mediation agreement shall include terms governing the time, place, and scope of the mediation. The agreement shall also include terms regarding the compensation, disqualification, and removal of the mediator.

(b) The deadline for completion of the mediation shall be 60 days after the execution of the mediation agreement. Parties are free to extend the mediation deadline by mutual agreement.

*History Note:* Authority G.S. 143-135.26 (10) and (11); S.L. 2001-496, Sec. 14(b);  
Temporary Adoption Eff. July 1, 2002;  
Eff. August 1, 2004;  
Pursuant to G.S. 150B-21.3A, rule is necessary without substantive public interest Eff. July 22, 2018.

#### **01 NCAC 30H .0203 APPOINTMENT OF MEDIATOR BY THE SCO** **01 NCAC 30H .0204 MEDIATOR INFORMATION DIRECTORY** **01 NCAC 30H .0205 DISQUALIFICATION OF MEDIATOR**

*History Note:* Authority G.S. 143-135.26(11); S.L. 2001-496, s. 14(b);  
Temporary Adoption Eff. July 1, 2002;  
Temporary Adoption Expired November 20, 2003.

### **SECTION .0300 – THE MEDIATED SETTLEMENT CONFERENCE**

#### **01 NCAC 30H .0301 WHERE CONFERENCE IS TO BE HELD**

Unless all parties and the mediator otherwise agree, the mediated settlement conference shall be held in the county where the project is located. The mediator shall be responsible for reserving a place for the conference and for giving notice of the time and location of the conference to all attorneys, unrepresented parties and other persons and entities required to attend.

*History Note:* Authority G.S. 143-135.26(10) and (11); S.L. 2001-496, Sec. 14(b);  
Temporary Adoption Eff. July 1, 2002;  
Eff. August 1, 2004;  
Pursuant to G.S. 150B-21.3A, rule is necessary without substantive public interest Eff. July 22, 2018.

#### **01 NCAC 30H .0302 WHEN CONFERENCE IS TO BE HELD**

The deadline for completion of the mediation shall be not less than 30 days nor more than 60 days after the naming of the mediator.



*History Note:* Authority G.S. 143-135.26(10), (11); S.L. 2001-496, s. 14(b);  
Temporary Adoption Eff. July 1, 2002;  
Eff. August 1, 2004;  
Pursuant to G.S. 150B-21.3A, rule is necessary without substantive public interest Eff. July 22, 2018.

**01 NCAC 30H .0303 REQUEST TO EXTEND DEADLINE FOR COMPLETION**  
**01 NCAC 30H .0304 RECESSES**  
**01 NCAC 30H .0305 NO CAUSE FOR DELAY**

*History Note:* Authority G.S. 143-135.26(11); S.L. 2001-496, s. 14(b);  
Temporary Adoption Eff. July 1, 2002;  
Temporary Adoption Expired November 20, 2003.

#### **SECTION .0400 – DUTIES OF PARTIES AND OTHER PARTICIPANTS IN FORMAL DISPUTE RESOLUTION PROCESS**

##### **01 NCAC 30H .0401 ATTENDANCE**

- (a) All parties to the dispute originally presented to the Designer or Prime Contractor for initial resolution shall attend the mediation. Failure of a party to a construction contract dispute to attend the mediation shall result in the public owner's withholding of monthly payment to that party until such party attends the mediation.
- (b) Only physical attendance, and not attendance by telephone or other electronic means, shall constitute attendance. Any attendee on behalf of a party must have authority from that party to bind it to any agreement reached as a result of the mediation.
- (c) Attorneys on behalf of parties may attend the mediation but are not required to do so.
- (d) Sureties or insurance company representatives are not required to attend the mediation unless any monies paid or to be paid as a result of any agreement reached as a result of mediation require their presence or acquiescence. If such agreement or presence is required, then authorized representatives of the surety or insurance company must attend the mediation.

*History Note:* Authority G.S. 143-135.26(10), (11); S.L. 2001-496, s. 14(b);  
Temporary Adoption Eff. July 1, 2002;  
Eff. August 1, 2004;  
Pursuant to G.S. 150B-21.3A, rule is necessary without substantive public interest Eff. July 22, 2018.

##### **01 NCAC 30H .0402 FINALIZING AGREEMENT**

If an agreement is reached in the conference, parties to the agreement shall reduce its terms to writing and sign it along with their counsel, insurance carriers and bonding companies, if any.

*History Note:* Authority G.S. 143-135.26(10), (11); S.L. 2001-496, s. 14(b);  
Temporary Adoption Eff. July 1, 2002;  
Eff. August 1, 2004;  
Pursuant to G.S. 150B-21.3A, rule is necessary without substantive public interest Eff. July 22, 2018.

##### **01 NCAC 30H .0403 PAYMENT OF FEE**

The mediation fee shall be paid in accordance with G.S. 143-128 (f1).

*History Note:* Authority G.S. 143-135.26(10), (11); S.L. 2001-496, s. 14(b);  
Temporary Adoption Eff. July 1, 2002;  
Eff. August 1, 2004;  
Pursuant to G.S. 150B-21.3A, rule is necessary without substantive public interest Eff. July 22, 2018.

##### **01 NCAC 30H .0404 FAILURE TO COMPENSATE MEDIATOR**

- (a) Any party's failure to compensate the mediators shall subject that party to a withholding of said amount of money from the party's monthly payment by the public owner.
- (b) If the public owner is a party to the mediation and it fails to compensate the mediator, it shall be subject to a civil cause of action from the mediator.

*History Note:* Authority G.S. 143-135.26(10) and (11); S.L. 2001-496, Sec. 14(b);  
Temporary Adoption Eff. July 1, 2002;  
Eff. August 1, 2004;  
Pursuant to G.S. 150B-21.3A, rule is necessary without substantive public interest Eff. July 22, 2018.

## **SECTION .0500 – AUTHORITY AND DUTIES OF MEDIATORS**

### **01 NCAC 30H .0501 AUTHORITY OF MEDIATOR**

- (a) Control of Conference. The mediator shall be in control of the conference and the procedures to be followed.
- (b) Private Consultation. The mediator may communicate privately with any participant or counsel prior to and during the conference. The fact that private communications with a participant may occur shall be disclosed to all other participants at the conclusion of the communications.
- (c) Scheduling the Conference. The mediator shall make a good faith effort to schedule the conference at a time that is convenient with the participants, attorneys and mediator. In the absence of agreement, the mediator shall select the date for the conference.

*History Note:* Authority G.S. 143-135.26(10), (11); S.L. 2001-496, s. 14(b);  
Temporary Adoption Eff. July 1, 2002;  
Eff. August 1, 2004;  
Pursuant to G.S. 150B-21.3A, rule is necessary without substantive public interest Eff. July 22, 2018.

### **01 NCAC 30H .0502 DUTIES OF MEDIATOR**

- (a) The mediator shall define and describe the following at the beginning of the conference:
- (1) The process of mediation;
  - (2) The difference between mediation and other forms of conflict resolution;
  - (3) The costs of the mediated settlement conference;
  - (4) That the mediated settlement conference is not a trial, the mediator is not a judge, and the parties retain their legal rights if they do not reach settlement;
  - (5) The circumstances under which the mediator may meet and communicate privately with any of the parties or with any other person;
  - (6) Whether and under what conditions communications with the mediator shall be held in confidence during and after the conference;
  - (7) The inadmissibility of conduct and statements as provided by G.S. 7A-38.1(1);
  - (8) The duties and responsibilities of the mediator and the participants; and
  - (9) That any agreement reached shall be reached by mutual consent.
- (b) Disclosure. The mediator has a duty to be impartial and to advise all participants of any circumstance bearing on possible bias, prejudice or partiality.
- (c) Declaring Impasse. It is the duty of the mediator to determine that an impasse exists and that the conference shall end.
- (d) Reporting Results of Conference. The mediator shall report to the SCO or public owner within 10 days of the conference whether or not an agreement was reached by the parties. If an agreement was reached, the report shall state the nature of said agreement. The mediator's report shall inform the SCO or public owner of the absence of any party to have been absent from the mediated settlement conference without permission. The SCO or public owner may require the mediator to provide statistical data for evaluation of the mediated settlement conference program.
- (e) Scheduling and Holding the Conference. It is the duty of the mediator to schedule the conference and conduct it prior to the deadline of completion set by the rules. Deadlines for completion of the conference shall be observed by the mediator unless said time limit is changed by a written order of the SCO or public owner.

*History Note:* Authority G.S. 143-135.26(10), (11); S.L. 2001-496, s. 14(b);

*Temporary Adoption Eff. July 1, 2002;  
Eff. August 1, 2004;  
Pursuant to G.S. 150B-21.3A, rule is necessary without substantive public interest Eff. July 22,  
2018.*

#### **SECTION .0600 – COMPENSATION OF THE MEDIATOR**

##### **01 NCAC 30H .0601      COMPENSATION OF THE MEDIATOR**

*History Note:      Authority G.S. 143-135.26(11); S.L. 2001-496, Sec. 14(b);  
Temporary Adoption Eff. July 1, 2002;  
Temporary Adoption Expired November 20, 2003.*

#### **SECTION .0700 – MEDIATOR CERTIFICATION**

##### **01 NCAC 30H .0701      MEDIATOR CERTIFICATION**

*History Note:      Authority G.S. 143-135.26(11); S.L. 2001-496, s. 14(b);  
Temporary Adoption Eff. July 1, 2002;  
Temporary Adoption Expired November 20, 2003.*

#### **SECTION .0800 – RULE MAKING**

##### **01 NCAC 30H .0801      RULE MAKING**

*History Note:      Authority G.S. 143-135.26(11); S.L. 2001-496, s. 14(b);  
Temporary Adoption Eff. July 1, 2002;  
Temporary Adoption Expired November 20, 2003.*

#### **SECTION .0900 – DEFINITIONS**

##### **01 NCAC 30H .0901      DEFINITIONS**

*History Note:      Authority G.S. 143-135.26(11); S.L. 2001-496, s. 14(b);  
Temporary Adoption Eff. July 1, 2002;  
Temporary Adoption Expired November 20, 2003.*

#### **SECTION .1000 – TIME LIMITS**

##### **01 NCAC 30H .1001      TIME LIMITS**

*History Note:      Authority G.S. 143-135.26(11); S.L. 2001-496, s. 14(b);  
Temporary Adoption Eff. July 1, 2002;  
Temporary Adoption Expired November 20, 2003.*

SECTION 00 73 00.01  
AMERICAN RESCUE PLAN ACT (ARPA) CONTRACT ADDENDUM

**Notice:** The contract or purchase order to which this addendum is attached is made using federal assistance provided to the City of Morganton by the US Department of Treasury under the American Rescue Plan Act (“ARPA Funds”), Sections 602(b) and 603(b) of the Social Security Act, Pub. L. No. 117-2 (March 11, 2021). In using such funds, the City must comply with the terms of ARPA, regulations issued by the U.S. Department of the Treasury (“Treasury”) governing the expenditure of monies distributed from the ARPA Funds (including, without limitation, the Interim Final Rule (86 Fed. Reg. 26,786 (May 17, 2021) and Final Rule (87 Fed. Reg. 4,338 (Jan. 27, 2022)), the Award Terms and Conditions applicable to the ARPA Funds, and such other guidance as Treasury has issued or may issue governing the expenditure of monies distributed from the ARPA Funds (collectively, the “Regulatory Requirements”). Additionally, pursuant to the Regulatory Requirements, the City must comply with the Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards, 2 C.F.R. Part 200 other than such provisions as Treasury has determined or may determine are inapplicable to the ARPA Funds and pursuant to 2 C.F.R. §200.327 the City must include within any contract applicable provisions described in Appendix II to 2 C.F.R. Part 200, each of which is contained in this Addendum.

The following terms and conditions apply to you, the contractor or vendor, as a contractor of the City of Morganton, according to the City’s Award Terms and Conditions signed on [date]; by ARPA and its implementing regulations; and as established by the Treasury Department.

- A. **Equal Employment Opportunity.** If this contract is a Federally Assisted Construction Contract (as defined in 41 C.F.R. §60-1.3) exceeding \$10,000, during the performance of this contract, contractor agrees as follows:
1. Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, sexual orientation, gender identity, or national origin. Contractor will take affirmative action to ensure that applicants are employed and that employees are treated during employment without regard to their race, color, religion, sex, sexual orientation, gender identity, or national origin. Such action shall include, but not be limited to, the following: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this nondiscrimination clause.
  2. Contractor will, in all solicitations or advertisements for employees placed by or on behalf of Contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, sexual orientation, gender identity, or national origin.
  3. Contractor will not discharge or in any other manner discriminate against any employee or applicant for employment because such employee or applicant has inquired about, discussed, or disclosed the compensation of the employee or applicant or another employee or applicant. This provision shall not apply to instances in which an employee who has access to the compensation information of other employees or applicants as a part of such employee’s essential job functions discloses the compensation of such other employees or applicants to individuals who do not otherwise have access to such information, unless such disclosure is in response to a formal complaint or charge, in furtherance of an investigation, proceeding, hearing, or action, including an investigation

conducted by the employer, or is consistent with Contractor's legal duty to furnish information.

4. Contractor will send to each labor union or representative of workers with which it has a collective bargaining agreement or other contract or understanding, a notice to be provided advising the said labor union or workers' representatives of contractor's commitments under this section, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.
5. Contractor will comply with all provisions of Executive Order 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.
6. Contractor will furnish to the Administering Agency (as specified in 41 C.F.R. §60- 1.3) and the Secretary of Labor all information and reports required by Executive Order 11246 of September 24, 1965, and by rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to its books, records, and accounts by the Administering Agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.
7. In the event of contractor's noncompliance with the nondiscrimination clauses of this contract or with any of the said rules, regulations, or orders, this contract may be canceled, terminated, or suspended, in whole or in part, and contractor may be declared ineligible for further government contracts or Federally Assisted Construction Contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965. Such other sanctions may be imposed, and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.
8. Contractor will include the portion of the sentence immediately preceding paragraph A.1. of this section and the provisions of paragraphs A.1. through A.7. in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. Contractor will take such action with respect to any subcontract or purchase order as the Administering Agency may direct as a means of enforcing such provisions, including sanctions for noncompliance. Provided, however, that in the event contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the Administering Agency, contractor may request the United States to enter into such litigation to protect the interests of the United States. The City further agrees that it will be bound by the above equal opportunity clause with respect to its own employment practices when it participates in federally assisted construction work. Provided, that if the City so participating is a state or local government, the above equal opportunity clause is not applicable to any agency, instrumentality, or subdivision of such government which does not participate in work on or under the Contract.
9. The City agrees that it will assist and cooperate actively with the Administering Agency and the Secretary of Labor in obtaining the compliance of contractor and any subcontractors with the equal opportunity clause and the rules, regulations, and relevant orders of the Secretary of Labor; that it will furnish the Administering Agency and the Secretary of Labor such information as they may require for the supervision of such compliance; and that it will otherwise assist the Administering Agency in the discharge of the agency's primary responsibility for securing compliance.

10. The City further agrees that it will refrain from entering into any contract or contract modification subject to Executive Order 11246 of September 24, 1965, with a contractor debarred from, or who has not demonstrated eligibility for, Government contracts and Federally Assisted Construction Contracts pursuant to the Executive Order and that it will carry out such sanctions and penalties for violation of the equal opportunity clause as may be imposed upon contractor and any subcontractors by the Administering Agency or the Secretary of Labor pursuant to Part II, Subpart D of the Executive Order. In addition, the City agrees that if it fails or refuses to comply with these undertakings, the Administering Agency may take any or all of the following actions: cancel, terminate, or suspend, in whole or in part, this grant (contract, loan, insurance, guarantee); refrain from extending any further assistance to the applicant under the program with respect to which the failure or refund occurred until satisfactory assurance of future compliance has been received from such applicant; and refer the case to the Department of Justice for appropriate legal proceedings.

**A. Copeland “Anti-Kickback” Act.** Contractor and any subcontractors performing work under the contract shall comply with 18 U.S.C. §874. The City shall report all suspected or reported violations to Treasury.

**B. Suspension and Debarment.**

1. This contract is a covered transaction for purposes of 2 CFR §180.210 and 31 CFR §19.2103000. Therefore, this Contract is a lower-tier covered transaction for purposes of 2 C.F.R. Part 180 and 31 C.F.R. Part 19 if (1) the amount of this Contract is greater than or equal to \$25,000 (2 C.F.R. § 180.220(b)(1); 31 C.F.R. § 19.220(b)(1)); (2) the Contract requires the consent of an official of the Department of the Treasury (2 C.F.R. § 180.220(b)(2); 31 C.F.R. § 19.220(b)(2)); or (3) this Contract is for federally required audit services (2 C.F.R. § 180.220(b)(3); 31 C.F.R. § 19.220(b)(3)).
2. As such, the contractor is required to verify that contractor’s principals (defined at 2 CFR § 180.995) or its affiliates (defined at 2 CFR § 180.905) of both contractor and contractor’s principals are not excluded (defined at 2 CFR § 180.935) and are not disqualified (defined at 2 CFR § 180.935). If any of the foregoing persons are excluded or disqualified and the Secretary of the Treasury has not granted an exception pursuant to 31 C.F.R. §19.120(a) (a) this contract shall be void; (b) City shall not make any payments of federal financial assistance to contractor; and (c) City shall have no obligations to contractor under this contract.
3. The contractor must comply with 2 CFR pt. 180, subpart C and 31 CFR pt. 19, and must include a requirement to comply with these regulations in any lower tier covered transaction it enters into. This certification is a material representation of fact relied upon by the City and all liability arising from an erroneous representation shall be borne solely by the contractor.
4. If it is later determined that the contractor did not comply with 2 CFR pt. 180, subpart C and 31 CFR pt. 19, in addition to remedies available to the City, the Federal Government may pursue available remedies, including but not limited to suspension and/or debarment.

**C. Byrd Anti-Lobbying Amendment, 31 U.S.C. § 1352, as amended.**

1. Contractor certifies 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 any Federal contract, grant, or any other award covered by 31 U.S.C. §1352. Contractor shall 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 recipient who in turn will forward the certification(s) to the awarding agency. This certification is a material representation of fact upon which City has relied when entering into this contract, and all liability arising from an erroneous representation shall be borne solely by contractor.

2. \*Purchases over \$100,000 - Contractors must sign the certification on the last page of this addendum and shall cause any subcontractors with a subcontract (at any tier) exceeding \$100,000 to file with the tier above it the same certification.

**D. Access to Records.**

1. Contractor agrees to provide the City of Morganton, the U.S. Department of Treasury, the Comptroller General of the United States, or any of their authorized representatives access to any books, documents, papers, and records of the Contractor which are directly pertinent to this contract for the purposes of making audits, examinations, excerpts, investigations and transcriptions. The Contractor agrees to permit any of the foregoing parties to reproduce by any means or to copy excerpts and transcriptions as reasonably needed, and agrees to cooperate with all such requests. No language in this contract is intended to prohibit audits or internal reviews by the Treasury Department or the Comptroller General of the United States.
2. Contractor agrees to retain all records covered by this section through December 31, 2031, or such longer period as is necessary for the resolution of any litigation, claim, negotiation, audit or other inquiry involving the contract.

**E. Rights to Inventions Made Under a Contract or Agreement.**

1. The Government reserves a royalty-free, non-exclusive and irrevocable license to reproduce, publish, or otherwise use, and to authorize others to use for "Government purposes," any subject data or copyright described below. "Government purposes" means use only for the direct purposes of the Government. Without the copyright owner's consent, the Government may not extend its federal license to any other party.
  - (a) Any subject data developed under the contract, whether or not a copyright has been obtained, and
  - (b) Any rights of copyright purchased by contractor using federal assistance funded in whole or in part by the Department of the Treasury.
2. Unless Treasury determines otherwise, a contractor performing experimental, developmental, or research work required as part of this contract agrees to permit Treasury to make available to the public either (a) Treasury's license in the copyright to any subject data developed in the course of the Contract or (b) a copy of the subject data first produced under the contract for which a copyright has not been obtained. If the experimental, developmental, or research work which is the subject of this contract is not completed for any reason whatsoever, all data developed under the contract shall become subject data as

defined herein and shall be delivered as the Government may direct.

3. Unless prohibited by North Carolina law, upon request by the Government, contractor agrees to indemnify, save, and hold harmless the Government, its officers, agents, and employees acting within the scope of their official duties against any liability, including costs and expenses, resulting from any willful or intentional violation by contractor of proprietary rights, copyrights, or right of privacy arising out of the publication, translation, reproduction, delivery, use, or disposition of any data furnished under the contract. Contractor shall be required to indemnify the Government for any such liability arising out of the wrongful act of any employee, official, or agent of the contractor.
4. Nothing contained in this clause shall imply a license to the Government under any patent or be construed as affecting the scope of any license or other right otherwise granted to the Government under any patent.
5. Data developed by contractor and financed entirely without using federal assistance provided by the Government that has been incorporated into work required by the underlying contract is exempt from the requirements herein, provided that contractor identifies that data in writing at the time of delivery of the contract work. Contractor agrees to include these requirements in each subcontract for experimental, developmental, or research work financed in whole or in part with federal assistance.
6. For the purposes of this section "subject data" means "recorded information, whether or not copyrighted, . . . that is delivered or specified to be delivered as required by the contract." Examples of "subject data" include, but are not limited to, "computer software, standards, specifications, engineering drawings and associated lists, process sheets, manuals, technical reports, catalog item identifications, and related information, but do not include financial reports, cost analyses or other similar information used for performance or administration of the contract."

**F. Contract Work Hours and Safety Standards Act (40 U.S.C. §§ 327 through 333) (applies only to purchases over \$100,000, when laborers or mechanics are used.)**

Where applicable, all contracts in excess of \$100,000 that involve the employment of mechanics or laborers shall include a provision for compliance with 40 U.S.C. §3702 and

§3704 of the Contract Work Hours and Safety Standards Act, as supplemented by Department of Labor regulations (29 CFR part 5). Under §3702 of the Act, each contractor shall be required to compute the wages of every mechanic and laborer on the basis of a standard workweek of 40 hours. Work in excess of the standard workweek is permissible provided that the worker is compensated at a rate of not less than 1 1/2 times the basic rate of pay for all hours worked in excess of 40 hours in the workweek. The requirements of 40

U.S.C. §3704 are applicable to construction work and provides that no laborer or mechanic shall 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.

**G. Clean Air Act & Federal Water Pollution Control Act (applies to purchases of more than \$150,000).**



1. The contractor agrees to comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act, as amended, 42 U.S.C. § 7401 et seq.
2. The contractor agrees to comply with all applicable standards, orders, or regulations issued pursuant to the Federal Water Pollution Control Act, as amended, 33 U.S.C. §1251 et seq.
3. The Contractor agrees to report each violation of the Clean Air Act and the Water Pollution Control Act to the City of Morganton and understands and agrees that the City will, in turn, report each violation as required to assure notification to the Federal Emergency Management Agency, and the appropriate Environmental Protection Agency Regional Office.
4. Contractor agrees to include these requirements in each subcontract exceeding \$150,000 financed in whole or in part with Federal assistance.

#### **H. Prohibition on Contracting for Covered Telecommunications Equipment or Services.**

1. Definitions. Unless otherwise defined in this contract, capitalized terms used in this section shall have the meanings ascribed thereto in this section.
  - (a) "Backhaul" means intermediate links between the core network, or backbone network, and the small subnetworks at the edge of the network (e.g., connecting cell phones/towers to the core telephone network). Backhaul can be wireless (e.g., microwave) or wired (e.g., fiber optic, coaxial cable, Ethernet).
  - (b) "Covered Foreign Country" means the People's Republic of China.
  - (c) "Covered Telecommunications Equipment or Services" means (i) telecommunications equipment produced by Huawei Technologies Company or ZTE Corporation (or any subsidiary or affiliate of such entities); (ii) for the purpose of public safety, security of Government facilities, physical security surveillance of critical infrastructure, and other national security purposes, video surveillance and telecommunications equipment produced by Hytera Communications Corporation, Hangzhou Hikvision Digital Technology Company, or Dahua Technology Company (or any subsidiary or affiliate of such entities); (iii) telecommunications or video surveillance services provided by such entities or using such equipment; or (iv) telecommunications or video surveillance equipment or services produced or provided by an entity that the Secretary of Defense, in consultation with the Director of National Intelligence or the Director of the Federal Bureau of Investigation, reasonably believes to be an entity owned or controlled by, or otherwise connected to, the government of a Covered Foreign Country.
  - (d) "Critical Technology" means (i) defense articles or defense services included on the United States Munitions List set forth in the International Traffic in Arms Regulations under subchapter M of chapter I of title 22, Code of Federal Regulations; (ii) items included on the Commerce Control List set forth in Supplement No. 1 to part 774 of the

Export Administration Regulations under subchapter C of chapter VII of title 15, Code of Federal Regulations and controlled

(a) pursuant to multilateral regimes, including for reasons relating to national security, chemical and biological weapons proliferation, nuclear nonproliferation, or missile technology, or (b) for reasons relating to regional stability or surreptitious listening; (iii) specially designed and prepared nuclear equipment, parts and components, materials, software, and technology covered by part 810 of title 10, Code of Federal Regulations (relating to assistance to foreign atomic energy activities); (iv) nuclear facilities, equipment, and material covered by part 110 of title 10, Code of Federal Regulations (relating to export and import of nuclear equipment and material); (v) select agents and toxins covered by part 331 of title 7, Code of Federal Regulations; part 121 of title 9 of such Code; or part 73 of title 42 of such Code; or (vi) emerging and foundational technologies controlled pursuant to §1758 of the Export Control Reform Act of 2018 (50 U.S.C. §4817).

(e) "Interconnection Arrangements" means arrangements governing the physical connection of two or more networks to allow the use of another's network to hand off traffic where it is ultimately delivered (e.g., connection of a customer of telephone provider A to a customer of telephone company B) or sharing data and other information resources.

(f) "Roaming" means cellular communications services (e.g., voice, video, data) received from a visited network when unable to connect to the facilities of the home network either because signal coverage is too weak or because traffic is too high.

(g) "Substantial or Essential Component" means any component necessary for the proper function or performance of a piece of equipment, system, or service.

(h) "Telecommunications Equipment or Services" means telecommunications or video surveillance equipment or services, such as, but not limited to, mobile phones, land lines, internet, video surveillance, and cloud services.

## 2. Prohibitions.

(a) Section 889(b) of the John S. McCain National Defense Authorization Act for Fiscal Year 2019, Pub. L. No. 115-232, and 2 C.F.R. § 200.216 prohibit the head of an executive agency on or after August 13, 2020, from obtaining or expending grant, cooperative agreement, loan, or loan guarantee funds on certain telecommunications products or from certain entities for national security reasons.

(b) Unless an exception in applies, contractor and any subcontractors may not use grant, cooperative agreement, loan, or loan guarantee funds (including, without limitation, Fiscal Recovery Funds) received from a federal government to:

i Procure or obtain any equipment, system, or service that uses Covered Telecommunications Equipment or Services as a Substantial or Essential Component of any system or as Critical Technology of any system;

ii Enter into, extend, or renew a contract to procure or obtain any equipment, system, or service that uses Covered Telecommunications Equipment or Services as a Substantial or Essential Component of any system or as Critical Technology of any system;

ii. Enter into, extend, or renew contracts with entities that use Covered Telecommunications Equipment or Services as a Substantial or Essential Component of any system or as Critical Technology as part of any system; or

iv. Provide, as part of its performance of this contract, any subcontract; any other contractual instrument; or any equipment, system, or service that uses Covered Telecommunications Equipment or Services as a Substantial or Essential Component of any system or as Critical Technology as part of any system.

### 3. Exceptions.

(a). This clause does not prohibit contractor or subcontractors from providing:

i. A service that connects to the facilities of a third party, such as Backhaul, Roaming, or Interconnection Agreements, or

ii. Telecommunications equipment that cannot route or redirect user data traffic or permit visibility into any user data or packets that such equipment transmits or otherwise handles.

(b). By necessary implication and regulation, the prohibitions also do not apply to:

i. Covered telecommunications equipment that:

(a) Is not used as a Substantial or Essential Component of any system and

(b) Is not used as Critical Technology of any system.

ii. Other telecommunications equipment or services that are not considered Covered Telecommunications Equipment or Services.

### 4. Reporting Requirement.

(a). In the event contractor identifies, during contract performance, covered Telecommunications Equipment or Services used as a Substantial or Essential Component of any system or as Critical Technology as part of any system, or if contractor is notified of such by a subcontractor at any tier or by any other source, contractor shall report the information in paragraph 4(b) of this section to City, unless procedures for reporting the information are established elsewhere in this contract.

(b). Contractor shall report the following information to City pursuant to paragraph 4(a) of this section:

i. Within one business day from the date of such identification or notification: contract number; order number(s), if applicable; supplier name; supplier unique entity identifier (if known); supplier Commercial and Government Entity (CAGE) code (if known); brand; model number (original equipment manufacturer number, manufacturer part number, or wholesaler number); item description; and any readily available information about mitigation actions undertaken or

recommended.

- ii. Within ten business days of submitting the information in paragraph 4(b)(i) of this section, any further available information about mitigation actions undertaken or recommended. In addition, contractor shall describe.

- (1) the efforts it undertook to prevent use or submission of Covered Telecommunications Equipment or Services and (2) any additional efforts that will be incorporated to prevent future use or submission of Covered Telecommunications Equipment or Services.

5. Subcontractor. Contractor shall cause to be inserted into all subcontracts and other contractual instruments relating to the performance of this contract the substance of this Section I, including this paragraph 5.

**I. Buy USA - Domestic preference for certain procurements using federal funds.**

Contractor should, to the greatest extent practicable under a Federal award, provide a preference for the purchase, acquisition, or use of goods, products, or materials produced in the United States (including but not limited to iron, aluminum, steel, cement, and other manufactured products). The requirements of this section must be included in all sub-awards including all contracts and purchase orders for work or products under this award. For purposes of this section:

“Produced in the United States” means, for iron and steel products, that all manufacturing processes, from the initial melting stage through the application of coatings, occurred in the United States.

“Manufactured products” means items and construction materials composed in whole or in part of non-ferrous metals such as aluminum; plastics and polymer-based products such as polyvinyl chloride pipe; aggregates such as concrete; glass, including optical fiber; and lumber.

**J. Procurement of Recovered Materials.**

1. This section shall apply if (1) this contract involves the purchase of an item designated by the Environmental Protection Agency (“EPA”) in 40 C.F.R. Part 247 that exceeds \$10,000 or (2) the total value of such designated items acquired during the City’s preceding fiscal year exceeded \$10,000.
2. In the performance of this contract, the contractor shall make maximum use of products containing recovered materials that are EPA-designated items unless the product cannot be acquired:
  - a. Competitively within a timeframe providing for compliance with the contract performance schedule;
  - b. Meet contract performance requirements; or
  - c. Be acquired at a reasonable price.
3. Information about this requirement, along with the list of EPA- designated items, is available at EPA’s Comprehensive Procurement Guidelines website. The contractor also agrees to comply with all other applicable requirements of Section 6002 of the Solid Waste Disposal Act.

**K. Minority and Women Business Enterprises.**

Contractor hereby agrees to comply with the following when applicable: The requirements of Executive Orders 11625 and 12432 (concerning Minority Business Enterprise), and 12138 (concerning Women's Business Enterprise), **when applicable**. Accordingly, the contractor hereby agrees to take affirmative steps to assure that women and minority businesses are utilized when possible as sources of supplies, equipment, construction and services. Affirmative steps shall include the following: Including qualified women's business enterprises and small and minority businesses on solicitation lists;

1. Assuring that women's enterprises and small and minority businesses are solicited whenever they are potential sources;
2. When economically feasible, dividing total requirements into smaller tasks or quantities so as to permit maximum participation by small and minority business, and women's business enterprises;
3. Where the requirement permits, establishing delivery schedules which will encourage participation by women's business enterprises and small and minority business; and
4. Using the services and assistance of the Small Business Administration, and the U.S. Office of Minority Business Development Agency of the Department of Commerce; and the North Carolina Office for Historically Underutilized Businesses.

For the purposes of these requirements, a Minority Business Enterprise (MBE) is defined as an enterprise that is at least 51 percent owned and controlled in its daily operation by members of the following groups: Black, Hispanic, Asian or Pacific Islander, American Indian, or Alaskan Natives. A Women Business Enterprise (WBE) is defined as an enterprise that is at least 51 percent owned and controlled in its daily operation by women. Additionally, an MBE or WBE qualifies if it is currently certified as a North Carolina "historically underutilized business" under N.C.G.S. §143-128.4(a) and qualifies as a "small business" if it is independently owned and operated and is qualified under the Small Business Administration criteria and size standards at 13 C.F.R. Part 21.

**L. Assurances of Compliance with Title VI of the Civil Rights Act of 1964.** Contractor and any subcontractor, or the successor, transferee, or assignee of contractor or any subcontractor, shall comply with Title VI of the Civil Rights Act of 1964, which prohibits recipients of federal financial assistance from excluding from a program or activity, denying benefits of, or otherwise discriminating against a person on the basis of race, color, or national origin (42 U.S.C. §§ 2000d *et seq.*), as implemented by the Department of the Treasury's Title VI regulations, 31 C.F.R. Part 22, which are herein incorporated by reference and made a part of this contract. Title VI also provides protection to persons with "Limited English Proficiency" in any program or activity receiving federal financial assistance, 42 U.S.C. §§ 2000d *et seq.*, as implemented by Treasury's Title VI regulations, 31 C.F.R. Part 22, and herein incorporated by reference and made a part of this contract.

**M. Publications.** Any publications produced with funds from this award must display the following language: "This project [is being] [was] supported, in whole or in part, by federal award number [enter project FAIN] awarded to [name of Recipient] by the U.S. Department of the Treasury."

**N. Increasing Seat Belt Use in the United States.** Pursuant to Executive Order 13043, 62 Fed. Reg.19216 (Apr. 18, 1997), contractor is encouraged to adopt and enforce on-the-job seat belt policies and programs for your employees when operating company-owned, rented or personally

owned vehicles.

- O. Reducing Text Messaging While Driving.** Pursuant to Executive Order 13513, 74 Fed.Reg. 51225 (Oct. 6, 2009), contractor is encouraged to adopt and enforce policies that ban text messaging while driving, and establish workplace safety policies to decrease accidents caused by distracted drivers.
- P. Conflicts and Interpretation.** To the extent that any portion of this Addendum conflicts with any term or condition of this contract expressed outside of this Addendum, the terms of this Addendum shall govern.
- Q. Other Non-Discrimination Statutes.** Contractor acknowledges that City is bound by and agrees, to the extent applicable to contractor, to abide by the provisions contained in the federal statutes enumerated below and any other federal statutes and regulations that may be applicable to the expenditure of Fiscal Recovery Funds: The Fair Housing Act, Title VIII of the Civil Rights Act of 1968 (42 U.S.C. §§ 3601 *et seq.*), which prohibits discrimination in housing on the basis of race, color, religion, national origin, sex, familial status, or disability; Section 504 of the Rehabilitation Act of 1973, as amended (29U.S.C. § 794), which prohibits discrimination on the basis of disability under any program or activity receiving federal financial assistance; The Age Discrimination Act of 1975, as amended (42 U.S.C. §§ 6101 *et seq.*), and Treasury’s implementing regulations at 31 C.F.R. Part 23, which prohibit discrimination on the basis of age in programs or activities receiving federal financial assistance; and Title II of the Americans with Disabilities Act of 1990, as amended (42 U.S.C. §§ 12101 *et seq.*), which prohibits discrimination on the basis of disability in programs, activities, and services provided or made available by state and local governments or instrumentalities or agencies thereto.
- R. Conflicts of Interest; Gifts and Favors.**
1. Contractor understands that (1) City will use ARPA Funds to pay for the cost of this contract and (2) the expenditure of ARPA Funds is governed by the *Conflict of Interest Policy* of the City, the Regulatory Requirements (including, without limitation, 2 C.F.R. § 200.318(c)(1)), and North Carolina law (including, without limitation, G.S. 14-234(a)(1) and -234.3(a)).
  2. Contractor certifies to City that as of the date hereof, to the best of its knowledge after reasonable inquiry, no employee, officer, elected official, or agent of City involved in the selection, award, or administration of this contract (each a “Covered Individual”); no member of a Covered Individual’s immediate family; no partner of a Covered Individual; and no organization (including contractor) which employs or is about to employ a Covered Individual has a financial or other interest in, or has received a tangible personal benefit from, contractor. Should contractor obtain knowledge of any such interest or any tangible personal benefit described in the preceding sentence after the date hereof, contractor shall promptly disclose the same to City in writing.
    1. Contractor certifies to City that it has not provided, nor offered to provide, any gratuities, favors, or anything of value to an officer, employee, elected official or agent of City. Should contractor obtain knowledge of the provision, or offer of any provision, of any gratuity, favor, or anything of value to an officer, employee, elected official or agent described in the preceding sentence after the date hereof, contractor shall promptly disclose the same to City in writing.

**CONTRACTOR:**

By: \_\_\_\_\_

Name: \_\_\_\_\_

Title: \_\_\_\_\_

**CITY:**

By: \_\_\_\_\_

Name: \_\_\_\_\_

Title: \_\_\_\_\_

*- This form is required only for purchases of more than \$100,000 -*

**31 CFR Part 21 – New Restrictions on Lobbying –  
CERTIFICATION REGARDING LOBBYING**

The undersigned certifies, to the best of their 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 an 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, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.
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, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.
3. The undersigned shall require that the language of this certification be included in the award documents for all sub awards at all tiers (including subcontracts, sub grants, and contracts under grants, loans, and cooperative agreements) and that all contractors shall certify and disclose accordingly.
4. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

The contractor, \_\_\_\_\_, certifies or affirms the truthfulness and accuracy of each statement of its certification and disclosure, if any. In addition, the contractor understands and agrees that the provisions of 31 U.S.C. Ch. 38, Administrative Remedies for False Claims and Statements, apply to this certification and disclosure, if any.

\_\_\_\_\_  
Signature of Contractor’s authorized official

Date: \_\_\_\_\_

\_\_\_\_\_  
(Print name and title of person signing above)



SECTION 00 94 39  
FIELD ORDER

**FIELD ORDER NO.: [Number of Field Order]**

Owner:	City of Morganton	Owner's Project No.:	N/A
Engineer:	Merrick & Company	Engineer's Project No.:	65421093
Contractor:		Contractor's Project No.:	
Project:	Bost Rd Sewer Improvements		
Contract Name:	Bost Rd Sewer Improvements		
Date Issued: [Date]		Effective Date of Field Order: [Date]	

Contractor is hereby directed to promptly perform the Work described in this Field Order, issued in accordance with Paragraph 10.3 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: \_\_\_\_\_

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

Owner:	City of Morganton	Owner's Project No.:	N/A
Engineer:	Merrick & Company	Engineer's Project No.:	65421093
Contractor:		Contractor's Project No.:	
Project:	Bost Rd Sewer Improvements		
Contract Name:	Bost Rd Sewer Improvements		
Date Issued: [Date]	Effective Date of Work Change Directive:		[Date]

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:

**Notes to User—Check one or both of the following**

- 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:	\$ _____	<b>[increase] [decrease] [not yet estimated].</b>
Contract Time:	_____ days	<b>[increase] [decrease] [not yet estimated].</b>

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:	City of Morganton	Owner's Project No.:	N/A
Engineer:	Merrick & Company	Engineer's Project No.:	65421093
Contractor:		Contractor's Project No.:	
Project:	Bost Rd Sewer Improvements		
Contract Name:	Bost Rd Sewer Improvements		
Date Issued:		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: _____
<b>[Increase] [Decrease]</b> from previously approved Change Orders No. 1 to No. <b>[Number of previous Change Order]</b> : \$ _____	<b>[Increase] [Decrease]</b> from previously approved Change Orders No.1 to No. <b>[Number of previous Change Order]</b> : 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: _____
<b>[Increase] [Decrease]</b> this Change Order: \$ _____	<b>[Increase] [Decrease]</b> 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: \_\_\_\_\_

\_\_\_\_\_

SECTION 01 11 00  
SUMMARY OF WORK

PART 1 GENERAL

1.1. SUMMARY

- A. The General Conditions, Supplementary Conditions, and General Requirements apply to each Section of the Specifications.
- B. Comply with all applicable state and local codes and regulations pertaining to the nature and character of the Work being performed.

1.2. SUMMARY

- A. Construct Work as described in the Contract Documents.
  - 1. Provide the materials, equipment, labor, tools, incidentals, and consumable supplies required for a complete Project consistent with the Contract Documents.
  - 2. Test and place the completed Project in operation.
  - 3. Provide the special tools, spare parts, lubricants, supplies, or other materials as indicated in Contract Documents for the operation and maintenance of the Project.
  - 4. The Contract Documents do not indicate or describe all the activities required to complete the Project. Additional details required for the correct installation of selected products are to be provided by the Contractor and coordinated with the Engineer.
- B. Description of the Work
  - 1. Work is described in general, non-inclusive terms as:
    - a. Full demolition of existing wastewater pump station, including wet well, pumps, valve vault, valves, pipes, and associated electrical components. Existing lift station shall remain operational until new wet well is operational.
    - b. Construction of new wastewater pump station, including cast-in-place wet well, two submersible non-clog pumps, valve vault, pipes, valves, platform, davit crane for pump removal, canopy, and associated electrical components, including updating the electrical service (by Duke Energy).
    - c. Construction of 2,959 LF of new gravity sewer mains consisting of 8-inch PVC and DI sewer pipe 16 precast manholes, jack and bore casings, and connections to existing sewers.
    - d. Construction of 3,506 LF of new sewer force main consisting 8-inch PVC and DI pipe including connection to an existing manhole, jack and bore casings, and air release valves.
    - e. Construction of 599 LF of new 20-inch HDPE casing installed by horizontal directional drill and 599 LF of new 8-inch HDPE force main carrier pipe within the casing.
    - f. An allowance for communications, controls, and security.

1.3. ADMINISTRATIVE REQUIREMENTS

- A. Meetings
  - 1. Owner shall hold a Pre-Construction meeting with the Contractor prior to any construction activities to review project requirements and review details of project.
  - 2. Contractor shall schedule progress meetings every two weeks in coordination with the Owner and

Engineer for the duration of the project.

B. Schedule

1. Contractor shall prepare and submit a schedule of work no later than the Pre-Construction meeting.
2. Contractor's schedule shall show all portions of the work as described in the Drawings.

C. Work Hours

1. Construction activities are limited to Monday through Friday from 7:00 AM to 7:00 PM, unless otherwise approved in writing by the Owner.

1.4. PROJECT SITE

- A. The project site is within private property within easements and public property within rights-of-way and a public park.
- B. Plan and execute work in close coordination with Owner so that all site requirements (safety, environmental, etc.) are complied with, and to minimize disruptions to Owner's operations and the public.
- C. Contractor is responsible for locating additional suitable sites for storing and staging material and equipment outside of the provided easements and laydown yards.
- D. No alcoholic beverages or illegal substances shall be permitted on the site at any time.
- E. No concealed or illegal weapons shall be permitted on the site at any time.

1.5. WARRANTY

- A. Provide a two (2) year warranty on all work and material. The period of the warranty shall begin on the date of final acceptance.
- B. Owner may notify Contractor in writing of any defects discovered during the warranty period.
- C. Contractor shall respond promptly to any notification of defects and shall repair all defects of which notification was sent during the warranty period at no cost to the Owner.

PART 2 PRODUCTS

2.1. MATERIALS

- A. Provide materials and products per the individual Sections of the Specifications.
- B. All products incorporated in the work shall be new, unused, and first quality.

PART 3 EXECUTION

- A. Perform all work in strict compliance with the Contract Documents.
- B. All work shall be performed in a professional manner by properly trained and qualified personnel under supervision of the Contractor's representative.

- C. All work under this Contract shall conform to all local ordinances. Contractor shall arrange and pay for all costs associated with permits and inspection fees and shall confine his/her operations to the limits set by law.
- D. Contractor shall comply with all local and state rules and regulations that govern the Owner.

END OF SECTION

SECTION 01 12 00  
WORK SEQUENCE

PART 1 GENERAL

1.1. SUMMARY

- A. The Project interfaces with existing facilities in multiple locations and manners, which will require sequence planning by the Contractor and coordination with the Owner to minimize disruptions. These locations include:
1. Connections of new gravity sewers to existing gravity sewers, and rerouting flows to new sewers at North Green Street and the pump station site.
  2. Commissioning a new wastewater pump station and decommissioning old pump station on Bost Road.
  3. Connecting new force main to existing gravity sewer on Stanford Drive.

1.2. ADMINISTRATIVE REQUIREMENTS

- A. Coordination
1. Contractor must coordinate with Owner in advance of all work impacting existing facilities.
- B. Sequencing
1. All constructed facilities must be fully tested and accepted before connecting to existing facilities. This includes pipeline pressure and leak tests and lift station pumping tests.

1.3. SUBMITTALS

- A. Provide detailed outage and time schedule plan for each work item that may impact existing facilities. Provide long-range and short-range plans, as appropriate for coordinating work with Owner.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION



SECTION 01 20 05  
MEASUREMENT AND PAYMENT GENERAL

1.1. SUMMARY

- A. Description of work: The bid form includes all items necessary for completion of the Work.
- B. Authority: Take all measurements and compute quantities to estimate percent complete of each item listed in the schedule of values. The Engineer will verify measurements, quantities, and percent complete.

1.2. PRICE AND PAYMENT PROCEDURES

- A. Measurement and Payment for the bid items listed shall be based on the description in the Technical Specifications and Drawings.
- B. Unless the work to be done is so specifically called out to be measured and paid for in the bid schedule, payment for such work shall be included in other applicable items and there shall be no separate measurement and payment for the work.
- C. Items listed as lump sum (L.S. or LS) shall include all work for the complete installation as generally described in the Drawings and the Technical Specifications.
- D. Payment shall be made at the contract bid price listed in the Bid Form.
- E. Partial payment for unit price bid items and lump sum bid items only partially completed at the end of monthly pay periods shall be made based upon the Engineers interpretation of the percentage of work completed. Partial payment for materials delivered and stored will be considered, if said materials have been submitted to the Engineer for review and supporting invoices and documentation have been provided.
- F. Quantities indicated in the Bid Form are for bidding and contract purposes only, unless specified otherwise in the Technical Specifications.
- G. If the actual work requires more or fewer quantities than those quantities indicated in the Bid Form, the Contractor shall provide the required quantities.
- H. Payment includes: Full compensation for all required labor, products, tools, equipment, materials, transportation, services, incidentals, erection, application and/or installation of an item of the work, including mobilization, demobilization, supervision, overhead, and profit.
- I. Final payment for work governed by unit prices will be made based on the actual measurements and quantities accepted by the Engineer multiplied by the unit price for work which is incorporated in or made necessary by the work unless specified otherwise.

1.3. DEFECT ASSESSMENT

- A. Replace the Work, or portions of the Work, not conforming to specified requirements.
- B. If, in the opinion of the Engineer, it is not practical to remove and replace the Work, the Owner will

direct one of the following remedies:

1. The defective Work may remain, but the unit sum will be adjusted to a new sum at the discretion of the Engineer.
  2. The defective Work will be partially repaired to the instructions of the Owner, and the unit sum will be adjusted to a new sum at the discretion of the Engineer.
- C. The individual specification sections may modify these options or may identify a specific formula or percentage sum/price reduction.
- D. The authority of the Engineer to assess the defect and identify payment adjustment, is final.

1.4. NON-PAYMENT FOR REJECTED PRODUCTS

- A. Payment will not be made for any of the following:
1. Products wasted or disposed of in a manner that is unacceptable.
  2. Products determined as unacceptable before or after placement.
  3. Products not completely unloaded from the transporting vehicle.
  4. Products placed beyond the lines and levels of the required Work.
  5. Products remaining on hand after completion of the Work.
  6. Loading, hauling, and disposing of rejected Products.
  7. Removing rejected materials and/or work and replacing with materials and/or work in compliance with these specifications.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 20 22  
UNIT PRICE SUMMARY

- A. This section includes administrative and procedural requirements for unit prices.

1.2. DEFINITIONS

- A. Unit price is a price per unit of measurement for materials, equipment, or services, or a portion of the Work, added to or deducted from the Contract Sum by appropriate modification, if the scope of Work or estimated quantities of Work required by the Contract Documents are increased or decreased.
- B. The listed items are intended to include all materials and work required to complete the project as included in the Contract Documents. Any material or work not explicitly listed is subsidiary to other items listed.

1.3. MEASUREMENT AND PAYMENT

- A. See Part 3 for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in this section.
- B. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have Engineer determine actual quantity of work.
- C. Specification sections referenced in Part 3 contain requirements for materials described under each unit price.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1. ITEM 1 – MOBILIZATION

- A. Description
1. Initiation of work including mobilization of personnel and equipment, initial preparation of right-of-way for construction activities, procurement of necessary performance and payment bonds and insurance, and related costs, according to the General Conditions and Supplementary Conditions.
  2. Includes all temporary erosion and sedimentation control measures as indicated in the Drawings and consistent with the requirements of specification section 01 57 13 "Temporary Erosion and Sediment Control."
  3. Includes all temporary facilities and controls, except for project signage, consistent with the requirements of specification section 01 50 00 "Temporary Facilities and Controls."
  4. Includes preparation of administrative documentation including response plans such as those consistent with the requirements of specification section 01 35 29.19 "Wastewater Emergency Response Plan" and record documents consistent with the requirements of specification section 01 78 39 "Project Record Documents."
- B. Unit of Measure
1. Lump Sum

## C. Payment

1. Percent complete progress payments as acceptable to the Owner and per the General Conditions for retainage, etc.

## 3.2. ITEM 2 – DEMOLITION OF EXISTING WASTEWATER PUMP STATION

## A. Description

1. Furnish all equipment, personnel, and material necessary to demolition of the existing wastewater pump station including the wet well, pumps, valve valve, pipes, valves, and electrical components, consistent with the requirements of specification section 02 41 00 “Demolition and Deconstruction”.

## B. Unit of Measure

1. Lump Sum

## C. Payment

1. Percent complete progress payments as acceptable to the Owner and per the General Conditions for retainage, etc.

## 3.3. ITEM 3 –WASTEWATER PUMP STATION

## A. Description

1. Furnish and install all components necessary to construct a new wastewater pump station including cast-in-place wet well, precast valve vault, pumps, pipes, valves, platform, davit crane, canopy, and associated electrical components as indicated in the Drawings and consistent with the requirements of specification sections 03 30 00 “Cast-in-Place Concrete, 05 12 00 “Structural Steel”, 07 72 34 “Hatches”, 30 05 05.01 “Buried Piping (Pressure Service)”, 40 05 05 “Exposed Piping”, 40 05 50 “Valves and Accessories”, 41 22 13.21 “Davit Cranes”, 43 25 13 “Submersible Non Clog Wastewater Pumps”, and the entirety of Division 26 “Electrical”.
1. Includes as subsidiary to this line item is all supporting work such as excavation, trenching, and fill consistent with the requirements of specification sections 31 23 00 “Excavation and Fill” and 31 23 23 “Backfilling Structures”, as well as any other work covered by other relevant specification sections not listed above.

## B. Unit of Measure

1. Lump Sum

## C. Payment

1. Percent complete progress payments as acceptable to the Owner and per the General Conditions for retainage, etc.

## 3.4. ITEM 4 –PUMP STATION SITE IMPROVEMENTS

## A. Description

1. Furnish and install all components necessary to construct site improvements including a driveway with storm culvert, site paving, fence, and landscaping as indicated in the Drawings and consistent with the requirements of specification sections 32 12 16 “Asphalt Paving”, 32 31 00 “Fences and Gates”, and 32 92 00 “Turf & Grasses”.
2. Includes as subsidiary to this line item is all supporting work such as clearing, grading, and fill consistent with the requirements of specification sections 31 10 00 “Site Clearing” and 31 23 00

“Excavation and Fill”, as well as any other work covered by other relevant specification sections not listed above.

B. Unit of Measure

1. Lump Sum

C. Payment

1. Percent complete progress payments as acceptable to the Owner and per the General Conditions for retainage, etc.

3.5. ITEM 5 – GRAVITY MAINS

A. Description

1. Furnish and install all components necessary to construct approximately 2,959 feet of new 8-inch PVC and DI gravity main, precast manholes, jack and bore casings, and connections to existing sewers as indicated in the Drawings and consistent with the requirements of specification sections 33 05 05.03 “Buried Piping (Gravity Service)”, 33 05 07.23 “Utility Boring and Jacking”, and 33 05 61 “Concrete Sanitary Manhole”.
2. Includes as subsidiary to this line item supporting work such as excavation, trenching, and fill consistent with the requirements of specification sections 31 23 00 “Excavation and Fill”, 31 23 23 “Flowable Fill”, 31 23 33 “Trenching and Backfilling for Buried Pipelines”, and 33 05 98 “Identification of Buried Piping”.
3. Includes subsidiary to this item supporting work such as surface restoration including work consistent with the requirements of specification section 32 92 00 “Turf and Grasses”, as well as any other work covered by other relevant specification sections not listed above.

B. Unit of Measure

1. Lump Sum

C. Payment

1. Percent complete progress payments as acceptable to the Owner and per the General Conditions for retainage, etc.

3.6. ITEM 6 – PVC AND DI FORCE MAINS

A. Description

1. Furnish and install all components necessary to construct approximately 3,506 feet of new 8-inch PVC and DI gravity main, jack and bore casings, air release valves, and connections to existing sewers as indicated in the Drawings and consistent with the requirements of specification sections 33 05 05.01 “Buried Piping (Pressure Service)”, 33 05 07.23 “Utility Boring and Jacking”, and 40 05 50 “Valves and Accessories”.
2. Includes as subsidiary to this line item supporting work such as excavation, trenching, and fill consistent with the requirements of specification sections 31 23 00 “Excavation and Fill”, 31 23 23 “Flowable Fill”, 31 23 33 “Trenching and Backfilling for Buried Pipelines”, and 33 05 98 “Identification of Buried Piping”.
3. Includes subsidiary to this item supporting work such as surface restoration including work consistent with the requirements of specification section 32 92 00 “Turf and Grasses”, as well as any other work covered by other relevant specification sections not listed above.

B. Unit of Measure

1. Lump Sum

C. Payment

1. Percent complete progress payments as acceptable to the Owner and per the General Conditions for retainage, etc.

3.7. ITEM 7 – HORIZONTAL DIRECTIONAL DRILL HDPE CASING AND HDPE FORCE MAIN

A. Description

1. Furnish and install all components necessary to construct approximately 599 feet of new 20-inch HDPE casing pipe installed by horizontal directional drill and an approximately equal length of 8-inch HDPE force main installed as a carrier pipe within the casing as indicated in the Drawings and consistent with the requirements of specification sections 33 05 05.03 "Buried Piping (Gravity Service)" and "33 05 23.13 Utility Horizontal Directional Drilling".
2. Includes as subsidiary to this line item supporting work such as excavation, trenching, and fill consistent with the requirements of specification sections 31 23 00 "Excavation and Fill", 31 23 23 "Flowable Fill", and 31 23 33 "Trenching and Backfilling for Buried Pipelines".
3. Includes subsidiary to this item supporting work such as surface restoration including work consistent with the requirements of specification section 32 92 00 "Turf and Grasses", as well as any other work covered by other relevant specification sections not listed above.

B. Unit of Measure

1. Lump Sum

C. Payment

1. Percent complete progress payments as acceptable to the Owner and per the General Conditions for retainage, etc.

3.8. ITEM 8 – ALLOWANCE FOR COMMUNICATION, CONTROLS, INSTRUMENTATION, AND SECURITY

A. Description

1. Provide an allowance in the amount listed to provide for construction of communication, controls, instrumentation, and security components, including RTU, SCADA, and system coordination, based on the applicable proposal from the designated subcontractor, CITI, as described in specification section 40 70 00 "Instrumentation and Control for Process Systems".

B. Unit of Measure

1. Lump Sum

C. Payment

1. Percent complete progress payments as acceptable to the Owner and per the General Conditions for retainage, etc.

END OF SECTION

SECTION 01 31 00  
PROJECT MANAGEMENT AND COORDINATION

PART 1 GENERAL

1.1. SUMMARY

A. Work Include:

1. Furnish equipment, labor, products, and other items necessary to complete the Project with an acceptable standard of quality and within the Contract time. Construct Project in accordance with current safety practices.
2. Manage Site to allow access to Site and control construction operations.
3. Provide labor, materials, equipment, and incidentals necessary to construct temporary facilities to provide and maintain control over environmental conditions at the Site. Remove temporary facilities when no longer needed.
4. Cost for Project Management and Coordination as described in this section are to be included in the Contract Price.

1.2. REFERENCES

- A. Perform Work to comply with local, State, and Federal ordinances and regulations.

1.3. ADMINISTRATIVE REQUIREMENTS

A. Coordination

1. Coordinate the Work of various trades having interdependent responsibilities for installing, connecting to, and placing equipment in service.
2. Coordinate requests for substitutions to provide compatibility of space, operating elements, effect on the Work of other trades, and on the Work scheduled for early completion.
3. Coordinate the use of Project space and the sequence of installation of equipment, walks, mechanical, electrical, plumbing, or other Work that is indicated diagrammatically on the Drawings.
  - a. Follow routings shown for tubes, pipes, ducts, conduits, and other items as closely as practical, with due allowance for available physical space.
  - b. Utilize space efficiently to maximize accessibility for Owner's maintenance and repairs.
  - c. Schematics are diagrammatic in nature. Adjust routing of piping, ductwork, utilities, and location of equipment as needed to resolve spatial conflicts between the various trades. Document the actual routing on the Record Drawings.

B. Scheduling

1. Schedule construction activities in sequence required to obtain best results where installation of one (1) part of the Work is dependent on installation of other components, either before or after its own installation.
2. Make adequate provisions to accommodate items scheduled for later installation, including:
  - a. Accepted alternates.
  - b. Installation of products purchased with allowances.
  - c. Work by others.
  - d. Owner-supplied, Contractor-installed items.
3. Sequence, coordinate, and integrate the various elements of mechanical, electrical, and other

systems, materials, and equipment. Comply with the following requirements:

- a. Coordinate mechanical and electrical systems, equipment, and materials installation with other components.
- b. Verify all dimensions by field measurements prior to commencing work.
- c. Arrange for chases, slots, and openings in other components during progress of construction.
- d. Coordinate the installation of required supporting devices and sleeves to be set in cast-in-place concrete and other structural components as they are constructed.
- e. Coordinate the connection of systems with exterior underground and overhead utilities and services. Comply with the requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.

#### 1.4. SUBMITTALS

- A. Provide submittals in accordance with Section 01 33 00 "Submittal Procedures."
  1. Provide copies of Supplier's printed storage instructions prior to furnishing materials or products and installation instructions prior to beginning the installation. Maintain one copy of these documents at the Site until the Project is complete. Incorporate this information into submittals.
  2. Incorporate field notes, sketches, recordings, and computations made by the Contractor in Record Drawings.

#### 1.5. QUALITY ASSURANCE

- A. Employ competent workers, skilled in the occupation for which they are employed.
- B. Provide Work meeting quality requirements of the Contract Documents as determined by the Engineer and Owner.
- C. Remove defective Work from the Site immediately unless provisions have been made and approved by the Engineer to allow repair of the product at the Site. Clearly mark the Work as "defective" until it is removed or allowable repairs have been completed.

#### 1.6. DELIVERY AND STORAGE

- A. When practical, factory-assemble materials and equipment. Mark or tag separate parts and assemblies to facilitate field assembly. Cover machined and unpainted surfaces that may be damaged by the elements or climate with a strippable, protective coating.
- B. Deliver products and materials to the Site in time to prevent delays in construction.
- C. Deliver packaged products to Site in original undamaged containers with identifying labels attached. Open cartons as necessary to check for damage and to verify invoices. Reseal cartons and store properly until used. Leave products in packages or other containers until installed.
- D. Deliver products that are too large to fit through openings to the Site in advance of the time enclosing walls and roofs are erected. Set in place, raised above floor on cribs.
- E. Assume full responsibility for the protection and safekeeping of products stored at the Site.



- F. Store products at locations acceptable to the Engineer and to allow Owner access to maintain and operate existing facilities.
- G. Store products in accordance with the Supplier's storage instructions immediately upon delivery. Leave seals and labels intact. Arrange storage to allow access for maintenance of stored items and for inspection. Store unpacked and loose products on shelves, in bins, or in neat groups of like items.
- H. Obtain and pay for the use of any additional storage areas as needed for construction. Store products subject to damage by elements in substantial weather-tight enclosures or storage sheds. Provide and maintain storage sheds as required for the protection of products. Provide temperature, humidity control and ventilation within the ranges stated in the Supplier's instructions. Remove storage facilities at the completion of the Project.
- I. Protect the pipe interior. Keep all foreign materials such as dirt, debris, animals, or other objects out of the pipe during the Work. Cap or plug ends of installed pipe in an approved manner when pipe is not being installed. Clean or wash out pipe sections that become contaminated before continuing with installation. Take precautions to prevent the pipe from floating or moving out of the proper position during or after laying operations. Immediately correct any pipe that moves from its correct position.
- J. Provide adequate exterior storage for products that may be stored out-of-doors.
  - 1. Provide substantial platforms, blocking, or skids to support materials and products above ground; slope to provide drainage. Protect products from soiling or staining.
  - 2. Cover products subject to dislocation or deterioration from exposure to the elements, with impervious sheet materials. Provide ventilation to prevent condensation below covering.
  - 3. Store loose, granular materials on clean, solid surfaces, or on rigid sheet materials, to prevent mixing with foreign matter.
  - 4. Provide surface drainage to prevent erosion and ponding of water.
  - 5. Prevent mixing of refuse or chemically injurious materials or liquids with stored materials.
  - 6. Pipes and conduits stored outdoors are to have open ends sealed to prevent the entrance of dirt, moisture, and other injurious materials. Protect PVC pipe from ultraviolet light exposure.
  - 7. Store light weight products to prevent wind damage.
- K. Protect and maintain mechanical and electrical equipment in storage.
  - 1. Provide Supplier's service instructions on the exterior of the package.
  - 2. Service equipment on a regular basis as recommended by the Supplier. Maintain a log of maintenance services. Submit the log as Record Data at the completion of the Project.
  - 3. Provide power to and energize space heaters for all equipment for which these devices are provided.
  - 4. Provide temporary enclosures for all electrical equipment, including electrical systems on mechanical devices. Provide and maintain heat in the enclosures until equipment is energized.
- L. Maintain storage facilities. Inspect stored products on a weekly basis and after periods of severe weather to verify that:
  - 1. Storage facilities continue to meet specified requirements.
  - 2. Supplier's required environmental conditions are continually maintained.
  - 3. Surfaces of products exposed to the elements are not adversely affected.
- M. Replace any stored item damaged by inadequate protection or environmental controls.
- N. Payment may be withheld for any products not properly stored.

## 1.7. COMMUNICATION

- A. The Engineer or other designated Owner's representative is to be the first point of contact for all parties on matters concerning this project.
- B. Contractor shall coordinate correspondence with the Engineer concerning:
  - 1. Submittals, including Applications for Payment.
  - 2. Clarification and interpretation of the Contract Documents.
  - 3. Contract modifications.
  - 4. Observation of Work and testing.
  - 5. Claims.
- C. The Engineer will normally communicate only with the Contractor. Any required communication with Subcontractors or Suppliers will only occur with the direct involvement of the Contractor.
- D. Direct written communications to the Engineer at the address indicated at the Pre-construction Conference. Include the following with communications as a minimum:
  - 1. Name of the Owner.
  - 2. Project name.
  - 3. Contract title.
  - 4. Project number.
  - 5. Date.
  - 6. A reference statement.
- E. Submit communications on the forms referenced in this Section or in Section 01 33 00 "Submittal Procedures" where applicable.

## 1.8. PROJECT MEETINGS

- A. Pre-construction Conference:
  - 1. Attend a pre-construction conference.
  - 2. The location of the conference will be determined by the Engineer.
  - 3. The time of the meeting will be determined by the Engineer after the Notice of Award is issued, but not later than 15 days after the Notice to Proceed is issued, unless agreed upon by the Contractor and the Engineer.
  - 4. The Owner, Engineer, Contractor's project manager and superintendent, representatives of impacted utility companies, and representatives from major Subcontractors and Suppliers may attend the conference.
  - 5. Provide and be prepared to discuss:
    - a. Preliminary construction schedule per Section 01 32 16 "Construction Progress Schedule."
    - b. Preliminary submittal schedule per Section 01 33 00 "Submittal Procedures."
    - c. List of Subcontractors and Suppliers.
    - d. Contractor's organizational chart as it relates to this Project.
    - e. Letter indicating the agents of authority for the Contractor and the limit of that authority with respect to the execution of legal documents, contract modifications and payment requests.
- B. Progress Meetings:
  - 1. Attend meetings with the Engineer and Owner.

- a. Meet on a monthly basis or as requested by the Engineer to discuss the Project.
  - b. Meet at the Site or other location as designated by the Engineer.
  - c. Contractor's superintendent and other key personnel are to attend the meeting. Other individuals may be requested to attend to discuss specific matters.
  - d. Notify the Engineer of any specific items to be discussed a minimum of 1 week prior to the meeting.
2. Provide information as requested by the Engineer or Owner concerning this Project. Prepare to discuss:
    - a. Status of overall project schedule.
    - b. Contractor's detailed schedule for the next month.
    - c. Anticipated delivery dates for equipment.
    - d. Coordination with the Owner.
    - e. Status of submittals.
    - f. Information or clarification of the Contract Documents.
    - g. Claims and proposed modifications to the Contract.
    - h. Field observations, problems, or conflicts.
    - i. Maintenance of quality standards.
  3. Engineer will prepare minutes of meetings. Review the minutes of the meeting and notify the Engineer of any discrepancies within seven (7) days of the date of the meeting memorandum. The minutes will not be corrected after the seven (7) days have expired. Corrections will be reflected in the minutes of the following meeting or as an attachment to the minutes.
- C. Pre-submittal and Pre-installation Meetings:
1. Conduct pre-submittal and pre-installation meetings as required in the individual technical Specifications or as determined necessary by the Engineer (for example, instrumentation, concrete mix design, etc.).
  2. Set the time and location of the meetings when ready to proceed with the associated Work. Submit a Notification by Contractor for the meeting two (2) weeks before the meeting. Engineer and Owner must approve of the proposed time and location.
  3. Attend the meeting and require the participation of appropriate Subcontractors and Suppliers in the meeting.
  4. Prepare minutes of the meeting and submit to the Engineer and Owner for review. Owner and Engineer will review the minutes of the meeting and notify the Contractor of any discrepancies within seven (7) days of the date of the meeting memorandum. The minutes will not be corrected after the seven (7) days have expired. Corrections will be reflected in a revised set of meeting minutes.

#### 1.9. REQUESTS FOR INFORMATION

- A. Submit Request for Information (RFI) to the Engineer to obtain additional information or clarification of the Contract Documents.
1. Submit a separate RFI for each item on the form provided or approved by the Engineer.
  2. Attach adequate information to permit a written response without further clarification. Engineer will return requests that do not have adequate information to the Contractor for additional information. Contractor is responsible for all delays resulting from multiple submittals due to inadequate information.
  3. A response will be made when adequate information is provided. Response will be made on the RFI form or in attached information.

- B. Response to an RFI is given to provide additional information, interpretation, or clarification of the requirements of the Contract Documents, and does not modify the Contract Documents.
- C. Engineer will initiate a Contract Modification Request per this specification if the RFI indicates that a contract modification is required.
- D. Use the Project Issues Log to document decisions made at meetings and actions to be taken.

#### 1.10. PROJECT ISSUES LOG

- A. Engineer will maintain a project issues log to document key decisions made at construction meetings and track action on these issues: The Contractor will:
  - 1. Review the log prior to each regular progress meeting.
  - 2. Report actions taken subsequent to the previous progress meeting on items in the log assigned to the Contractor or through the Contractor to a Subcontractor or Supplier.
  - 3. Be prepared to discuss the status at each meeting.
- B. Decisions or action items in the log that require a change in the Contract Documents will have the preparation of a contract modification as an action item if appropriate. The Contract Documents can only be changed by a Change Order or Field Order.

#### 1.11. NOTIFICATION BY CONTRACTOR

- A. Notify the Owner / Engineer of:
  - 1. Need for testing.
  - 2. Intent to work outside regular working hours.
  - 3. Request to shut down facilities or utilities.
  - 4. Proposed utility connections.
  - 5. Required observation by Engineer or inspection agencies prior to covering Work.
  - 6. Training.
- B. Provide notification a minimum of two (2) weeks in advance in order to allow Owner and Engineer time to respond appropriately to the notification.
- C. Use "Notification by Contractor" form provided by or approved by the Engineer.

#### 1.12. REQUESTS FOR MODIFICATIONS

- A. Submit a request to the Engineer for any change in the Contract Documents.
  - 1. Use the "Contract Modification Request" (CMR) form provided by the Engineer or other form approved by the Engineer.
  - 2. Assign a number to the Contract Modification Request when issued.
  - 3. Include with the Contract Modification Request:
    - a. A complete description of the proposed modification.
    - b. The reason the modification is requested.
    - c. A detailed breakdown of the cost of the change (necessary only if the modification requires a change in contract amount). The itemized breakdown is to include:
      - 1) List of materials and equipment to be installed.
      - 2) Hours for labor by classification.
      - 3) Equipment used in construction.

- 4) Consumable supplies, fuels, and materials.
  - 5) Royalties and patent fees.
  - 6) Bonds and insurance.
  - 7) Overhead and profit.
  - 8) Field office costs.
  - 9) Home office cost.
  - 10) Other items of cost.
- d. Provide the level of detail outline in the paragraph above for each Subcontractor or Supplier actually performing the Work if the Work is to be provided by a Subcontractor or Supplier. Indicate appropriate Contractor mark-ups for Work provided through Subcontractors and Suppliers. Provide the level of detail outline in the paragraph above for self-performed Work.
  - e. Provide a revised schedule indicating the effect on the critical path for the Project and a statement of the number of days the Project may be delayed by the modification.
4. Submit a Contract Modification Request to the Engineer to request a field change.
  5. A Contract Modification Request is required for all substitutions or deviations from the Contract Documents.
  6. Engineer will evaluate the request for a contract modification.
- B. Owner will initiate changes through the Engineer.
1. Engineer will prepare a description of proposed modifications to the Contract Documents.
  2. Engineer will use the Contract Modification Request form. Engineer will assign a number to the Contract Modification Request when issued.
  3. Return the Contract Modification Request with a proposal to incorporate the requested change. Include a breakdown of costs into materials and labor in the detail outlined above to allow evaluation by the Engineer.
- C. Engineer will issue a Field Order or a Change Order per the General Conditions if a contract modification is appropriate.
1. Modifications to the contract can only be made by a Field Order or a Change Order.
  2. Changes in the Project will be documented by a Field Order or by a Change Order.
  3. Field Orders may be issued by the Engineer for contract modifications that do not change the Contract Price or Contract Time.
  4. Any modifications that require a change in Contract Price or Contract Time can only be approved by Change Order.
    - a. Proposals issued by the Contractor in response to a Contract Modification Request will be evaluated by the Engineer.
    - b. If a Change Order is recommended, the Engineer will prepare the Change Order.
    - c. The Change Order will be sent to the Contractor for execution with a copy to the Owner recommending approval.
    - d. Change Orders can only be approved by the Owner.
      - 1) Work performed on the proposed contract modifications prior to the approval of the Change Order will be performed at the Contractor's risk.
      - 2) No payment will be made for Work on Change Orders until approved by the Owner.
- D. The Contractor may be informed that the Contract Modification Request is not approved and construction is to proceed in accordance with the Contract Documents.

### 1.13. PERMITS

- A. Obtain and pay for applicable building permits for the Project from the local authorities having jurisdiction. Building permit fees will be waived for those permits in the Owner's jurisdiction.
- B. Retain copies of permits and licenses at the Site and observe and comply with all regulations and conditions of the permit or license, including additional insurance requirements.
- C. Obtain and pay for all other necessary permits including any and all necessary highway, street, and road permits for transporting pipe and/or heavy equipment necessary for construction of the Project.
- D. Obtain and pay for other permits necessary to conduct any part of the Work.
- E. Arrange for inspections and certification by agencies having jurisdiction over the Work.
- F. Make arrangements with private utility companies and pay for fees associated with obtaining services, or for inspection fees.

#### 1.14. SAFETY REQUIREMENTS

- A. Assume sole responsibility for safety at the Site. Protect the safety and welfare of persons at the Site.
- B. Provide safe access to move through the Site. Provide and maintain barricades, guardrails, covered walkways, and other protective devices to warn and protect from hazards at the Site.
- C. Comply with latest provisions of the Occupational Health and Safety Administration and other regulatory agencies in performing Work.
- D. Cooperate with accident investigations related to the Site. Provide two (2) copies of all reports, including insurance company reports, if requested by the Owner, prepared concerning accidents, injury, or death on the Site to the Engineer as Record Data per Section 01 33 00 "Submittal Procedures."

#### 1.15. CONTRACTOR'S USE OF SITE

- A. Coordinate the use of the premises with the Owner and Engineer.
- B. Repair or correct any damage to existing facilities, including contamination, caused by the Contractor's personnel, visitors, materials, or equipment.
- C. Do not permit alcoholic beverages or illegal substances on the Site. Do not allow persons under the influence of alcoholic beverages or illegal substances to enter or remain on the Site at any time. Persons on Site under the influence of alcoholic beverages or illegal substances will be permanently prohibited from returning to the Site. Criminal or civil penalties may also apply.
- D. Park construction equipment in designated areas only and provide hazardous material and oil spill control measures as applicable.
- E. Park employees' vehicles in designated areas only.
- F. Obtain written permission of the Owner before entering privately-owned land outside of the Owner's property, rights-of-way, or easements.

- G. Do not allow the use of excessively loud audio devices, obnoxious, vulgar or abusive language, or sexual harassment in any form. These actions will cause immediate and permanent removal of the offender from the premises. Criminal or civil penalties may apply.
- H. Require Workers to wear clothing that is inoffensive and meets safety requirements. Do not allow sleeveless shirts, shorts, exceedingly torn, ripped or soiled clothing to be worn on the project.

#### 1.16. ACCESS TO THE SITE

- A. Maintain access to the facilities at all times. Do not obstruct roads, pedestrian walks, or access to the various buildings, structures, stairways, or entrances. Provide safe temporary walks or other structures to allow access for normal operations during construction.
- B. Provide adequate and safe access for inspections. Leave ladders, bridges, scaffolding and protective equipment in place until inspections have been completed. Construct additional safe access if required for inspections.
- C. Provide security at the Site as necessary to protect against vandalism and loss by theft.
- D. Use State, County, or City roadways for construction traffic only with written approval of the appropriate representatives of each entity. State, County, or City roadways may not all be approved for construction traffic. Obtain written approval to use State, County, City, or private roads to deliver pipe and/or heavy equipment to the Site. Copies of the written approvals must be furnished to the Owner as Record Data before Work begins. No additional compensation will be paid because the Contractor is unable to gain access to the easement from public roadways.

#### 1.17. PROPERTY PROVISIONS

- A. Make adequate provisions to maintain the flow of storm sewers, sanitary sewers, drains and water courses encountered during the construction. Provide temporary service around the construction or otherwise construct the structure in a manner that the flow is not curtailed.
- B. Restore structures which may have been disturbed during construction to their original position as soon as construction in the area is completed.
- C. Protect trees, fences, signs, poles, guy wires, and all other property unless their removal is authorized. Restore any property damaged to equal or better condition.

#### 1.18. PROTECTION OF EXISTING STRUCTURES AND UTILITIES

- A. Examine the Site and review the available information concerning the Site. Locate utilities, streets, driveways, fences, drainage structures, sidewalks, curbs, and gutters. Verify the elevations of the structures adjacent to excavations. Report these to the Engineer before beginning construction.
- B. Determine if existing structures, poles, piping, or other utilities at excavations will require relocation or replacement. Coordinate Work with local utility company and others. Include cost of demolition and replacement, restoration or relocation of these structures in the Cost of Work.
- C. Protect the buildings, utilities, street surfaces, driveways, sidewalks, curb and gutter, fences, wells, drainage structures, piping, valves, manholes, electrical conduits, and other systems or structures

unless they are shown to be replaced or relocated on the Drawings. Restore damage to items to be protected to the satisfaction of the Engineer, utility owner, and Owner without additional compensation from the Owner.

- D. Carefully support and protect all structures and/or utilities so that there will be no failure or settlement where excavation or demolition endangers adjacent structures and utilities. Do not take existing utilities out of service unless shown in the Contract Documents or approved by the Engineer. Notify and cooperate with the utility owner if it is necessary to move services, poles, guy wires, pipelines or other obstructions. Include the cost of relocation and permits required to move existing utilities in the Cost of Work.
- E. Protect existing trees and landscaping at the site.
  - 1. Visit the Site with Engineer to identify trees that may be removed during construction.
  - 2. Mark trees to be removed with paint.
  - 3. Protect trees to remain from damage by wrapping trunks with 2 x 4 timbers around the perimeter, securely wired in place, where machinery must operate around existing trees. Protect branches and limbs from damage by equipment.

#### 1.19. DISRUPTION TO SERVICES / CONTINUED OPERATIONS

- A. Existing facilities are to continue in service by the Owner as usual during the construction unless noted otherwise. Owner or utilities must be able to operate and maintain the facilities. Disruptions to existing utilities, piping, process piping, or electrical services shall be kept to a minimum.
  - 1. Do not restrict access to critical valves, operators, or electrical panels.
  - 2. Do not store material or products inside or on top of structures.
  - 3. Limit operations to the minimum amount of space needed to complete the specified Work.
  - 4. Maintain storm sewers and sanitary sewers in service at all times. Provide temporary service around the construction or otherwise construct the structure in a manner that the flow is not restricted.
- B. Coordinate shutdowns with the Owner and the Engineer. When possible, combine multiple tie-ins into a single shutdown to reduce impacts on the Owner's operations.
- C. Operation of Existing Systems and Equipment during the Work:
  - 1. Do not shut off or disconnect existing operating equipment or systems, unless accepted by the Owner.
  - 2. Operation of existing systems and equipment will be by the Owner.
  - 3. Where necessary, the Contractor shall seal or bulkhead Owner-operated gates and valves to prevent leakage that may affect the work, Owner's operations, or both.
  - 4. Provide temporary watertight plugs, bulkheads, and line stops as required. After completing the work, remove seals, plugs, bulkheads, and line stops to the satisfaction of the Engineer.
- D. General constraints associated with operational shutdowns include the following:
  - 1. Owner's personnel shall have access to equipment and areas that remain in operation.
  - 2. Provide temporary partitions and enclosures necessary to maintain dust-free, ventilated spaces in areas that are adjacent to the work that must be kept operational.
  - 3. Provide blind flanges and bulkheads shall be suitable for the service and braced and blocked, as required or otherwise restrained as directed by the Engineer. Temporary valves shall be suitable for their intended service.
  - 4. The Contractor shall remove liquids and be responsible for their disposal at appropriate locations



approved by the Owner.

5. All draining is to be controlled. Spillage shall be brought to the Engineer's attention immediately and is to be properly reported in accordance with current regulations.

#### 1.20. FIELD MEASUREMENTS

- A. Perform complete field measurements for products required to fit existing conditions prior to purchasing products or beginning construction.
- B. Verify property lines, control lines, grades, and levels indicated on the Drawings.
- C. Verify pipe class, equipment capacities, existing electrical systems, and power sources for existing conditions.
- D. Check Shop Drawings and indicate the actual dimensions available where products are to be installed.
- E. Include field measurements in Record Drawings.

#### 1.21. REFERENCE DATA AND CONTROL POINTS

- A. The Engineer will provide the following control points.
  1. Base line or grid reference points for horizontal control.
  2. Benchmarks for vertical control.
  3. Designated control points may be on an existing structure or monument.
- B. Locate and protect control points prior to starting the Work and preserve permanent reference points during construction. Do not change or relocate points without prior approval of the Engineer. Notify Engineer when the reference point is lost, destroyed, or requires relocation. Replace Project control points on the basis of the original survey.
- C. Provide complete engineering layout of the Work needed for construction.
  1. Provide competent personnel. Provide equipment including accurate surveying instruments, stakes, platforms, tools, and materials.
  2. Record data and measurements per standards.

#### 1.22. ARCHAEOLOGICAL REQUIREMENTS

- A. Cease operations immediately and contact the Owner for instructions if an historical or archaeological find is made or suspected during construction. Contract time will be modified to compensate for delays caused by such archaeological finds. No additional compensation shall be paid for delays.

### PART 2 PRODUCTS

#### 2.1. MATERIALS (NOT USED)

### PART 3 EXECUTION

#### 3.1. PERFORMANCE OF WORK

- A. Perform the Work per the Supplier's published instructions. Do not omit any preparatory step or

installation procedure unless specifically exempted or modified by Field Order.

B. Field Coordination

1. Install systems, materials, and equipment as permitted by codes to provide the maximum headroom possible where mounting heights are not detailed or dimensioned.
2. Install systems, materials, and equipment to conform with approved submittal data, including coordination drawings, to the greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the Work are shown only in diagrammatic form.
3. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components.
4. Install systems, materials, and equipment to facilitate servicing, maintenance, and repair or replacement of components. As much as practical, connect for ease of disconnecting, with minimum of interference with other installations. Extend grease fittings to accessible locations.
5. Install access panel or doors where units are concealed behind finished surfaces.
6. Install systems, materials, and equipment giving right-of-way priority to systems required to be installed at a specified slope.

3.2. CLEANING DURING CONSTRUCTION

- A. Provide positive methods to minimize raising dust from construction operations and provide positive means to prevent air-borne dust from dispersing into the atmosphere. Control dust and dirt from demolition, cutting, and patching operations.
- B. Clean the Project as Work progresses and dispose of waste materials, keeping the Site free from accumulations of waste or rubbish. Provide containers on Site for waste collection. Do not allow waste materials or debris to blow around or off the Site. Control dust from waste materials. Transport waste materials with as few handlings as possible.
- C. Comply with codes, ordinances, regulations, and anti-pollution laws. Do not burn or bury waste materials. Remove waste materials, rubbish, and debris from the Site and legally dispose of these at public or private dumping areas.

3.3. MAINTENANCE OF ROADS, DRIVEWAYS, AND ACCESS

- A. Maintain roads and streets in a manner that is suitable for safe operations of public vehicles during all phases of construction unless the Owner approves a street closing. Submit a written request for Owner's approval of a street closing. The request shall state:
  1. The reason for closing the street.
  2. How long the street will remain closed.
  3. Procedures to be taken to maintain the flow of traffic.
  4. Do not close public roads overnight.
- B. Construct temporary detours, including by-pass roads around construction, with adequately clear width to maintain the free flow of traffic at all times. Maintain barricades, signs, and safety features around the detour and excavations.
- C. Maintain barricades, signs, and safety features around the Work in accordance with all provisions of the latest edition of the Manual on Uniform Traffic Control Devices (MUTCD).

- D. Clean mud, dirt, and debris from traveled roadways daily.
- E. Assume responsibility for any damage resulting from construction along roads or drives.

### 3.4. BLASTING

- A. Blasting is not allowed for any purpose.

### 3.5. CUTTING AND PATCHING

- A. Perform cutting, fitting, and patching as required to complete the Work or to:
  - 1. Uncover Work to provide for installation of new Work or the correction of defective Work.
  - 2. Provide routine penetrations of non-structural surfaces for installation of mechanical, electrical, and plumbing Work.
  - 3. Uncover Work that has been covered prior to observation by the Engineer.
- B. Submit written notification to the Engineer in advance of performing any cutting which affects:
  - 1. Work of any other Contractor or the Owner.
  - 2. Structural integrity of any structure or system of the project.
  - 3. Integrity or effectiveness of weather exposed or moisture resistant structures or systems.
  - 4. Efficiency, operational life, maintenance, or safety of any structure or system.
  - 5. Appearance of any structure or surfaces exposed occasionally or constantly to view.
- C. The notification shall include:
  - 1. Identification of the Project.
  - 2. Location and description of affected Work.
  - 3. Reason for cutting, alteration, or excavation.
  - 4. Effect on the Work of any separate contractor or Owner.
  - 5. Effect on the structural or weatherproof integrity of the project.
  - 6. Description of proposed Work, including:
    - a. Scope of cutting, patching, or alteration.
    - b. Trades that will perform the Work.
    - c. Products proposed for use.
    - d. Extent of refinishing to be performed.
    - e. Cost proposal, when applicable.
  - 7. Alternatives to cutting and patching.
  - 8. Written authorization from any separate Contractor whose Work would be affected.
  - 9. Date and time Work will be uncovered or altered.
- D. Examine the existing conditions, including structures subject to damage or to movement during cutting or patching.
  - 1. Inspect conditions affecting installation of products or performance of the Work after uncovering the Work.
  - 2. Provide a written report of unacceptable or questionable conditions to the Engineer. The Contractor shall not proceed with the Work until the Engineer has provided further instructions. Beginning the Work will constitute acceptance of existing conditions by the Contractor.
- E. Protect the structure and other parts of the Work and provide adequate support to maintain the structural integrity of the affected portions of the Work. Provide devices and methods to protect adjacent Work and other portions of the Project from damage. Provide protection from the weather

for portions of the Project that may be exposed by cutting and patching Work.

- F. Execute cutting and demolition by methods which will prevent damage to other Work and will provide proper surfaces to receive installation of repairs.
- G. Execute fitting and adjustment of products to provide a finished installation to comply with specified products, functions, tolerances, and finishes.
- H. Cut, remove, and legally dispose of selected mechanical equipment, components, and materials as indicated, including but not limited to, the removal of mechanical piping, heating units, plumbing fixtures and trim, and other mechanical items made obsolete by the modified Work.
- I. Restore Work which has been cut or removed. Install new products to provide completed Work per the Contract Documents.
- J. Fit Work air-tight to pipes, sleeves, ducts, conduit, and other penetrations through the surfaces.
- K. Patch finished surfaces and building components using new products specified for the original installation.
- L. Refinish entire surfaces as necessary to provide an even finish to match adjacent finishes:
  - 1. For continuous surfaces, refinish to the nearest intersection.
  - 2. For an assembly, refinish the entire unit.

### 3.6. INITIAL MAINTENANCE AND OPERATION

- A. Maintain equipment until the Project is accepted by the Owner. Ensure that mechanical equipment is properly maintained as recommended by the Supplier.
- B. Provide maintenance and start-up services prior to acceptance of equipment, per Section 01 75 00 "Starting and Adjusting."
- C. Remove and clean screens and strainers in piping systems.
- D. Provide documentation of maintenance and operations when Owner takes over operation and control of the Project.

END OF SECTION

SECTION 01 32 16  
CONSTRUCTION PROGRESS SCHEDULE

PART 1 GENERAL

1.1. SUMMARY

- A. This Section describes the Contractor's requirements to develop, maintain, and communicate the project schedule.

1.2. SUBMITTALS

- A. Submit Progress Schedules in accordance with Section 01 33 00 "Submittal Procedures." Submit schedules within the following times:
1. Preliminary schedule within 30 days after the Notice of Award. The schedule is to be available at the pre-construction conference.
  2. Detailed schedule is due prior to the first payment request.
- B. Submit Progress Schedules with Applications for Payment, if so requested by the Engineer or Owner. Schedules may be used to evaluate the Applications for Payment. Failure to submit the schedule may cause delay in the review and approval of Applications for Payment.

1.3. PURPOSE AND ACCEPTANCE

- A. The purpose of the Baseline Construction Schedule is to allow the Contractor to prepare an orderly plan of execution built upon logically sequenced construction activities and all necessary resources to successfully accomplish the timely completion of the project and to identify, via the Critical Path Method, which chain of activities drive the completion date of the project.
- B. The accepted schedule shall be used to plan and execute the Work, coordinate and communicate Work priorities with sub-contractors, to measure progress of the Work, aid in evaluating time extensions, and provide the basis for all progress payments.
- C. Failure to maintain the Construction Schedule in an acceptable manner may result in the Owner imposing a monetary penalty against the Contractor until the schedule is accepted.

1.4. REQUIREMENTS

- A. Plant shutdown requirements shall be incorporated into the schedule and require a minimum of 2 weeks' notice.
- B. The Contractor shall provide a schedule in adequate detail to allow the Owner and the Engineer to monitor the Work progress, to anticipate the time and amount of the Applications for Payment and to relate submittal processing to sequential activities of the Work.
- C. The Contractor shall incorporate and specifically designate anticipated submission dates of submittals and the dates when those submittals must be returned into the schedule.
- D. The Contractor shall assume complete responsibility for maintaining the progress of the Work per the submitted schedule.

### 1.5. SCHEDULE SOFTWARE

- A. The computer software used by the Contractor to produce the project schedule shall be Microsoft Project, Primavera, or equivalent dedicated project scheduling software

### 1.6. SCHEDULE REQUIREMENTS

- A. The schedule shall utilize the Critical Path Network method.
- B. Schedule shall contain adequate detail to:
  - 1. Assure adequate planning, scheduling, and reporting during the execution of the Work.
  - 2. Coordinate the Work of the Contractor and the various Subcontractors and Suppliers.
  - 3. Assist in monitoring the progress of the Work.
  - 4. Assist in evaluating proposed changes to Contract Time and project schedule.
  - 5. Assist the Owner in the review of the Contractor's Application for Payment.
- C. Provide activity duration data to assist in the review of the schedule. As a minimum, activity duration data shall include:
  - 1. The proposed number of working days per week for each activity.
  - 2. The holidays to be observed during the life of the contract by day, month, and year.
  - 3. The planned number of shifts per day.
  - 4. The number of hours per shift.
  - 5. The Contractor shall break up the work into activities that have durations no longer than twenty (20) workdays each, except as to non-construction activities (i.e. submittal review, procurement of materials, delivery of equipment) and any other activities for which the Owner may accept a longer duration.
- D. Workload data should include:
  - 1. The average number of workers per day that are expected to be used to complete an activity.
  - 2. Identification of any manpower, material, or equipment restrictions, as well as any activity requiring unusual shift work, such as two (2) shifts per day, six (6) day work week, or specified overtime. Work times other than regular workdays shall be clearly identified.
  - 3. Critical paths resulting from the use of manpower or equipment restraints are to be kept to a minimum. Critical paths are defined as paths having five (5) days or less of total float.
- E. Cost Loading:
  - 1. All activities shall be cost-loaded in a logical manner tying to each item in the Contractor Bid Form and subdivided into major materials to identify impacts to stored materials.
  - 2. The Contractor shall submit a projection of estimated monthly payments through the life of the project based on cost-loading of the accepted baseline schedule. These projections are to be updated monthly based on reported progress.
- F. Responsibility
  - 1. All activities in the Construction Schedule shall be coded by an activity code and resource code to identify the party and craft responsible to perform the work. Responsibility includes, but is not limited to, the Contracting Firm, the Subcontracting Firm, Contractor Workforce, or Agency performing a given task. Activities shall not belong to more than one responsible party. The responsible party for each activity shall be identified by the Responsibility Code in the schedule.
- G. Work Areas

1. The Contractor shall arrange the schedule to show each major area of construction for each major category or unit of work.
  2. All activities shall be identified in the Construction Schedule by the work area in which the activity occurs. Activities shall not be allowed to cover more than one work area. The work area of each activity shall be identified by the Work Area Code in the schedule.
- H. Modification or Change Order Number
1. Any activity that is added or changed by a Change Order shall be identified by the Change Order code that changed the activity. Activities shall not belong to more than one Change Order.
- I. Milestones
1. Milestone dates are defined in calendar days following the date set forth in the Notice to Proceed and are required to be met by the Contractor. Time is of the essence for the completion of milestones and for the Contract Completion date.
  2. A Finish Milestone shall be added within the schedule to represent the completion of each major area or system. These milestones shall be coded in the milestone activity code field for the purpose of organizing completion milestones on the first page of the schedule.
  3. A Start Milestone shall be added to the schedule for Submittals, Major Equipment, Material, etc. and the related Work shall be driven by these milestones.
- J. Project Calendar
1. The project calendar shall be defined within the schedule and accurately reflect the work plan. In addition, it shall not allow work to be scheduled on non-workdays (i.e. holidays, weekends, etc.).
  2. If any Work Crews are to work a schedule different from the rest of the project, then a separate calendar shall be defined for that Work Crew and the Work shall be scheduled utilizing that special calendar. The use of or requirement for special work hours or calendars shall be communicated to the Owner's representative via the narrative in standard reporting and within the Schedule.

#### 1.7. CONSTRUCTION SCHEDULE SUBMISSION

- A. The preliminary construction schedule shall be submitted for acceptance within 30 days of the Notice of Award. The schedule is to be available at the pre-construction conference.
- B. Schedule Review and Comments
1. Comments made by the Owner on the Construction Schedule during review shall not relieve the Contractor from compliance with the requirements of the Contract Documents.
  2. Following the Contractor's receipt of the Owner's review comments, the Contractor shall revise the schedule to identify missing activities and relationships relevant to the Scope of Work. Time extensions will not be granted to complete this process.
  3. To the extent that there are any conflicts between the accepted Construction Schedule and the requirements of the Contract Documents, the Contract Documents shall prevail.
- C. Resubmittal of Project Schedule Following Non-Acceptance
1. Should the Owner not accept the Contractor's submission of the Construction Schedule; the Contractor shall comply with the Owner's instructions and shall re-submit the Construction Schedule and all associated submittals within seven (7) calendar days.
- D. Construction Schedule Submission Requirements
1. The Final Construction Schedule shall be submitted for approval within 30 calendar days after Notice to Proceed is issued. It shall provide a reasonable sequence of activities which represents

- the Work through the entire project and a reasonable level of detail.
2. The Construction Schedule shall show the sequence and interdependence of activities required for complete performance of the Work, beginning with Contractor's receipt of the Notice to Proceed and concluding with the date of Final Completion of the Contract. The Project Schedule shall show all activities in Calendar days.
  3. The Construction Schedule shall comply with all limits imposed by the Scope of Work, with all contractually specified intermediate milestones and completion dates, and with all constraints, restraints, or sequences included in the Contract.
  4. The Construction Schedule network (graphic presentations) and computer tabulations shall be submitted to the Owner for acceptance.
  5. The following reports shall be required as part of the Preliminary Construction and Final Construction Schedule submittals:
    - a. Activity ID report.
    - b. Total float/early start report.
    - c. Coding dictionary.
  6. The schedule network (graphic presentation) shall include:
    - a. Activity ID.
    - b. Activity description.
    - c. Original durations.
    - d. Remaining durations.
    - e. Early start and finish dates.
    - f. Baseline start and finish dates.
    - g. Total float.
    - h. Percent complete.
    - i. The schedule activities should be organized by major work groupings or structures and sorted by Early Start and Total Float and should show both the early schedule and the target schedule.
- E. Monthly Schedule Updates – The following reports are to be submitted with the monthly pay applications.
1. Contractor's monthly narrative report.
  2. Contractor's graphic presentation of the schedule.

#### 1.8. SCHEDULE REVISIONS

- A. Submit a written report if the schedule indicates that the Project is more than 30 days behind schedule. The report is to include:
1. Number of days Project is behind schedule.
  2. Narrative description of the steps to be taken to bring the Project back on schedule.
  3. Anticipated time required to bring the Project back on schedule.
  4. Submit a revised schedule indicating the action that the Contractor proposes to take to bring the Project back on schedule.
- B. Revise the schedule to indicate any adjustments in Contract Time approved by Change Order.
1. Revised schedule is to be included with Contract Modification Request for which an extension of time is requested.
  2. Failure to submit a revised schedule indicates that the modification shall have no impact on the ability of the Contractor to complete the Project on time and that the cost associated with the change of additional plant or work force have been included in the cost proposed for the



modification.

- C. Updating the project schedule to reflect actual progress is not considered a revision to the project schedule.
- D. Applications for Payment will not be recommended for payment without a revised schedule and if required, the report indicating the Contractor's plan for bringing the Project back on schedule.

#### 1.9. FLOAT TIME

- A. Define float time as the amount of time between the earliest start date and the latest start date of a chain of activities on the construction schedule.
- B. Float time is not for the exclusive use or benefit of either the Contractor or Owner.
- C. Contract time cannot be changed by the submission of this schedule. Contract Time can only be modified by approved Change Order.
- D. Schedule completion date must be the same as the contract completion date. Time between the end of construction and the contract final completion date is to be indicated as float time.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 32 23  
PHOTOGRAPHIC DOCUMENTATION

PART 1 GENERAL

1.1. SUMMARY

- A. Provide photographic and video recording of the Site prior to the beginning of construction.
  - 1. Record the condition of existing site throughout the construction area(s).
  - 2. Provide electronic copies of the recording(s), dated and labeled with location information, to the Engineer before the start of construction. Provide additional recordings, as directed by the Engineer, if the recording provided is not considered suitable for the purpose of recording pre-existing conditions.
- B. All photographs and video recordings and a digital copy of this media are to become the property of the Owner. Photographs or recordings may not be used for publication, or public or private display without the written consent of the Owner.

1.2. PRICE AND PAYMENT PROCEDURES

- A. All work related to work in this specification is considered subsidiary to other bid items. There is no separate pay item.

1.3. SUBMITTALS

- A. Submit two (2) copies of USB drives of the photo and video recordings or submit through other approved electronic means.
- B. All construction area recordings shall be submitted promptly after recording.

1.4. QUALITY ASSURANCE

- A. Provide clear recordings taken with proper exposure. View recordings in the field and take new recordings immediately if video quality is not adequate.

PART 2 PRODUCTS

2.1. RECORDINGS

- A. Provide digital format on USB drives, or other approved electronic means, that can be played with Windows Media Player in common format in full screen mode.
- B. Recorded media shall be labeled with project name, date, time, and location in construction area.
- C. Videos
  - 1. Video file size should not exceed 500 MB.

2. Video resolution shall be 1080p.

D. Photos

1. Photos shall be 360 degree panoramic photographs that include geolocation data, except any supplemental photos to document detailed features.
2. Photos shall be compatible with mapping software so that a map of the project area can be viewed and individual photos will be indicated on the map for easier location and selection for viewing.
3. Mapping software to organize and select photos, as well as the panoramic photo viewer, shall be included in the deliverable with the photos.

### PART 3 EXECUTION

#### 3.1. RECORDING

- A. The quality of the video and photograph must be sufficient to determine the existing conditions of the construction area.
- B. Identify Project by audio or visual means in each in each video file and in each set of photographs
- C. Identify construction area by audio or visual means in each in each video file and in each set of photographs.
- D. Videos
  1. Video camera panning must be performed while at rest, do not pan the camera while walking or driving. Pans should be performed at intervals sufficient to clearly view the entire construction area.
- E. Photos
  1. Photos shall be taken at intervals of not more than 200 feet and shall collectively document the entire construction area.
  2. Pay special attention to driveways, yards, mailboxes, landscaping, public parks, and areas of disturbance or staging and storage.

END OF SECTION

SECTION 01 33 00  
SUBMITTALS

PART 1 GENERAL

1.1. SUMMARY

- A. This Section addresses responsibilities and requirements for submittals that are applicable to all Sections within the project documents.
- B. Engineer's review of, or comments on, submittals do not relieve Contractor of responsibility for full compliance with the Contract Documents or of supplying and installing materials and equipment properly designed and manufactured to produce the quality, efficiency, and capability specified or implied. Contract modifications can only be approved by Change Order or Field Order.

1.2. PRICE AND PAYMENT PROCEDURES

- A. Procurement, fabrication, or installation of any products prior to the approval of submittal is at the Contractor's risk.
- B. Payment will not be made for materials or products for which submittals are required until the submittals have been received.
- C. Payment will not be made for products for which Shop Drawings or Samples are required until these are approved by the Engineer.

1.3. ADMINISTRATIVE REQUIREMENTS

- A. Scheduling
  - 1. Prepare a comprehensive list of required submittals including a schedule indicating the approximate date submittals will be sent to the Engineer and proposed dates that the product will be incorporated into the Project.
  - 2. Allow adequate time in schedule for the submission, review, potential resubmission, ordering, fabrication, and delivery of the product to not delay progress on the Project.
  - 3. Schedule to provide all information for interrelated Work at one time. Submittals requiring coordination with other submittals will not be reviewed until all related submittals have been submitted.
  - 4. Submit schedule to the Engineer for review and approval.
  - 5. Submit documents promptly in accordance with the schedule to avoid delay in the Project.
  - 6. Send submittals to the Engineer allowing a reasonable time for delivery, review, and preparing and returning comments.

1.4. QUALITY ASSURANCE

- A. Submit legible, accurate, complete documents presented in a clear and easily understood manner. Submittals not meeting these criteria will not be reviewed.
- B. Furnish and install products that are consistent with the submittal.

1.5. REQUIREMENTS

- A. Submit documentation as required by the Contract Documents and as reasonably requested by the Owner and/or Engineer to:
  1. Record the products incorporated into the Project for the Owner,
  2. Provide information for operation and maintenance of the Project,
  3. Provide information for the administration of the Contract, and
  4. Allow the Engineer to advise the Owner if products proposed for the Project by the Contractor conform, in general, to the design concepts of the Contract Documents.
- B. Determine and verify
  1. Field measurements,
  2. Field construction requirements,
  3. Location of all existing structures, utilities, and equipment related to the submittals,
  4. Conflicts between the submittals have been resolved, and
  5. Quantities and dimensions shown on the submittals.
- C. Furnish the following submittals:
  1. As specified in the individual specification sections or the submittal schedule.
  2. Schedules, data, and other documentation as described in detail in this section or referenced in the General Conditions and other Contract Documents.
  3. Documents required for the administration of the Contract.
  4. Shop drawings, product documentation, and other information as required for consideration of a contract modification as described below.

#### 1.6. ORGANIZATION AND FORMAT

- A. Specification Sections per Submittal
  1. Only one Specification section shall be addressed in each submittal.
  2. Where multiple sections are interrelated, submit a package consisting of one submittal for each interrelated section.
- B. Submit information for all the components and related equipment required for a complete and operational system in the same package.
  1. Include electrical, mechanical, and other information required to indicate how the various components of the system function.
  2. Provide certifications, warranties, and written guarantees with the submittal package for review when they are required.
- C. Submittal Numbering
  1. Include as part of each submittal clear identifying information including a submittal number.
  2. Assign the submittal number consisting of a sequence number and a letter suffix.
    - a. Issue sequence numbers in chronological order for each type of submittal.
    - b. Issue numbers for resubmittals that have the same number as the original submittal followed by a sequential alphabetical suffix indicating the number of times the same submittal has been sent to the Engineer for processing. For example: 025-A represents submittal number 25 and the letter "A" designates this is the first resubmittal.
- D. Organization
  1. Where submittal consists of more than ten (10) pages or consists of multiple separate documents, a table of contents will be provided.

- E. Electronic Format
1. Submit all documentation in an electronic format unless otherwise required by the submittal type below or approved by Engineer in advance.
  2. The complete contents of each submittal, including associated drawings, product data, etc., shall be submitted in Portable Document Format (PDF).
  3. Submit document with adequate resolution to allow documents to be viewed or printed in a legible format equivalent to the document original. Documents are to be scalable to allow printing on standard 8-1/2 x 11 or 11 x 17 paper size.
  4. Documents shall have searchable text; photographic scans of text without searchable text are not acceptable.
  5. Create and submit color PDF documents where color is important to the evaluation of the submittal and / or where comments will be lost if only black and white PDF documents are provided.
  6. Where submittal consists of more than ten (10) pages or consists of multiple separate documents, bookmarks shall be included in the PDF document reflecting the table of contents.
- F. Physical Format
1. When physical submittals are necessary or requested:
    - a. a minimum of four (4) identical copies shall be submitted, one (1) of which shall be returned with comments, unless otherwise stated for individual submittal.
    - b. Paper documents shall be compiled in a protective binder or similar.
    - c. Physical samples of products, colors, textures, etc. shall be adequately protected during shipment.
- G. Transmittal Form
1. Transmit all submittals, with a properly completed Transmittal Form as provided by or approved by the Engineer.
  2. Include on submittal form
    - a. Project name,
    - b. Contractor name,
    - c. Supplier name
    - d. Applicable Drawing and/or Specification,
    - e. Intended installation location, where applicable
    - f. Contractor Acknowledgement
      - 1) Examine the details and data on each submittal to ensure that it complies with the requirements of the Contract Documents including Drawings and Specifications as modified by Addenda, Field Orders, and Change Orders.
      - 2) Include with each submittal a review acknowledgement that the Contractor has reviewed the submittal and it
        - a) meets the specification requirements, or
        - b) deviates from the specification requirements and include a list of where the submittal does not meet the requirements and a justification for each deviation.
      - 3) Submittals received by the Engineer without Contractor review acknowledgement will be rejected and returned immediately for completion and resubmittal.
  3. Use a separate transmittal form for each submittal, and for each specific product, class of material, and equipment system.
  4. Submit items specified in different sections of the Specifications separately. Integrated systems referencing multiple Specification sections shall be submitted as a concurrent packet of multiple submittals.

- H. Submit documents with uniform markings to:
  - 1. Highlight Contractor's corrections.
  - 2. Indicate items pertinent to the products being furnished with highlighting, circling, or boxing when the Supplier's standard drawings or information sheets are provided. Delete or strikethrough items that are not pertinent
  - 3. Cloud items and highlight where selections by the Engineer or Owner are required and add specific text identifying the need for selection.

## 1.7. TYPES

- A. Product Data
  - 1. Product data can include
    - a. Catalog cuts,
    - b. Illustrations,
    - c. Schedules,
    - d. Diagrams,
    - e. Performance charts,
    - f. Instructions, and
    - g. Brochures.
  - 2. Information submitted shall be sufficient to define the size, physical appearance, and other characteristics of materials, systems, or equipment for some portion of the work.
- B. Shop Drawings
  - 1. Shop drawings include
    - a. Drawings, diagrams, and schedules specifically prepared to illustrate some portion of the work.
    - b. Diagrams and instructions from a manufacturer or fabricator for use in producing the product and as aids to the Contractor for integrating the product or system into the project.
    - c. Drawings prepared by or for the Contractor to show how multiple systems and interdisciplinary work will be coordinated.
  - 2. Shop drawings are required for those products that cannot adequately be described in the Contract Documents to allow fabrication, erection, or installation of the product without additional detailed information from the Supplier.
  - 3. Shop Drawings are requested so that the Engineer can:
    - a. Assist the Owner in selecting colors, textures, or other aesthetic features.
    - b. Compare the proposed features of the product with the specified features to advise the Owner that the product does, in general, conform to the Contract Documents.
    - c. Compare the performance features of the proposed product with those specified to advise the Owner that it appears that the product will meet the designed performance criteria.
    - d. Review required certifications, guarantees, warranties, and service agreements for compliance with the Contract Documents.
  - 4. Submit shop drawings for:
    - a. Products as specified in the individual Specification Sections.
    - b. When a substitution or equal product is proposed.
  - 5. Include a complete description of the material or equipment to be furnished. Information is to include:
    - a. Type, dimensions, size, arrangement, model number, and operational parameters of

- the components.
  - b. Weights, gauges, materials of construction, external connections, anchors, and supports required.
  - c. Performance characteristics, capacities, engineering data, motor curves, and other information necessary to allow a complete evaluation of mechanical components.
  - d. All applicable standards such as ASTM.
  - e. Fabrication and installation drawings, setting diagrams, manufacturing instructions, templates, patterns, and coordination drawings.
  - f. Wiring and piping diagrams and related controls.
  - g. Complete and accurate field measurements for products which must fit existing conditions. Indicate on the submittal that the measurements represent actual dimensions obtained at the Site.
6. Format
- a. Shop drawings will be formatted for no smaller than 8.5 x 11 inch paper, and preferably for no smaller than 11 x 17 inch, but no larger than 24 x 36 inch.
  - b. Drawings shall be drawn to a standard scale except for diagrams and schematics.
7. Define abbreviations and symbols used in shop drawings.
- a. Use terms and symbols in shop drawings consistent with the Contract Drawings.
  - b. Provide a list of abbreviations and their meaning as used in the shop drawings.
  - c. Provide a legend for symbols used on shop drawings.
- C. Samples
- 1. Samples include all physical material such as the following:
    - a. Fabricated or unfabricated physical examples of materials, equipment, or workmanship that illustrate functional and aesthetic characteristics of a material or product and establish standards by which the work can be judged.
    - b. Color samples from the manufacturer's standard line (or custom color samples if specified) to be used in selecting or approving colors for the project.
    - c. Field samples and mock-ups constructed on the project site establish standards ensuring work can be judged. Includes assemblies or portions of assemblies that are to be incorporated into the project and those that will be removed at conclusion of the work.
  - 2. Samples shall be of sufficient size and quantity to clearly illustrate the functional characteristics of the product, with integrally related parts and attachment devices.
  - 3. Indicate the full range of color, texture, and patterns. Where variations in color, finish, pattern, or texture are unavoidable due to nature of the materials, submit sets of samples of not less than three units showing extremes and middle of range. Mark each unit to describe its relation to the range of the variation.
  - 4. Dispose of Samples when related Work has been completed and approved, and disposal is requested by the Engineer. At Owner's option Samples will become the property of the Owner.
  - 5. Submit color charts and samples for every product requiring color, texture, or finish selection.
    - a. Submit all color charts and Samples at one time.
    - b. Do not submit color charts and Samples until shop drawings for the products have been approved.
- D. Certificates
- 1. Certificates include all official statements attesting to quality, compliance, applicability, qualification, authorization, or similar. These can include the following
    - a. Statements printed on the manufacturer's letterhead and signed by responsible



- officials of manufacturer of product, system or material attesting that the product, system, or material meets specification requirements. Must be dated after award of project contract and clearly name the project.
- b. Document required of Contractor, or of a manufacturer, supplier, installer, or Subcontractor through Contractor whose purpose is to further promote the orderly progression of a portion of the work by documenting procedures, acceptability of methods, or personnel qualifications.
  - c. Confined space entry permits
  - d. Text of posted operating instructions
  - e. Certification of Local Field Service: A certified letter stating that field service is available from a factory or supplier approved service organization located within a 300-mile radius of the Site. List names, addresses, and telephone numbers of approved service organizations on or attach it to the certificate.
  - f. Service Agreement: A contract to provide maintenance beyond that required to fulfill requirements for warranty repairs, or to perform routine maintenance for a definite period beyond the warranty period. Example service agreement may be part of initial submittal to review proposed agreement. Final effective service agreement should be issued in the name of the Owner.
  - g. Certification of Adequacy of Design: A certified letter from the manufacturer of the equipment stating that they have designed the equipment to be structurally stable and to withstand all imposed loads without deformation, failure, or adverse effects to the performance and operational requirements of the unit. The letter shall state that mechanical and electrical equipment is adequately sized to be fully operational for the conditions specified or normally encountered by the product's intended use.
  - h. Certification of Applicator/Subcontractor: A certified letter stating that the Applicator or Subcontractor proposed to perform a specified function is duly designated as factory authorized and trained for the application of the specified product.
- E. Delegated Design Submittals
1. Delegated design submittals include all submittals related to portions of the Work to be designed by the Contractor, including
    - a. Calculations,
    - b. Drawings,
    - c. Mix designs, and
    - d. Analyses.
  2. All design submittals shall be sealed by a Professional Engineer as required by the local jurisdiction.
- F. Test and Evaluation Reports
1. Report signed by authorized official of testing laboratory that a material, product, or system identical to the material, product, or system to be provided has been tested in accord with specified requirements. Unless specified in another section, testing must have been within three years of date of contract award for the project.
  2. Report that includes findings of a test required to be performed on an actual portion of the work or prototype prepared for the project before shipment to job site.
  3. Report that includes finding of a test made at the job site or on sample taken from the job site, on portion of work during or after installation.
  4. Test reports for material fabricated for this Project with Shop Drawings for that product.
  5. Test reports produced at the point of production for standard production products with the

- record data for that product.
6. Factory test reports.
  7. Documentation of the testing and verification actions taken by manufacturer's representative at the job site, in the vicinity of the job site, or on a sample taken from the job site, on a portion of the work, during or after installation, to confirm compliance with manufacturer's standards or instructions. The documentation must be signed by an authorized official of a testing laboratory or agency and state the test results; and indicate whether the material, product, or system has passed or failed the test.
  8. Daily logs and checklists (maybe site quality control instead?)
  9. Quality Control Reports from suppliers and manufacturers.
  10. Site Quality Control Reports.
  11. Investigation reports.
  12. Final acceptance test and operational test procedure.
- G. Manufacturers' Installation Instructions
1. Preprinted material describing installation of a product, system, or material, including special notices and concerning impedances, hazards and safety precautions, including any Safety Data Sheets (SDS).
- H. Warranties And Guarantees
1. Submit warranties and guarantees required by the Contract Documents with product data, show drawings, and other associated submittal documents for review.
  2. Include additional copies of all warranties and guarantees in a separate manual as part of the Operation and Maintenance Manuals
    - a. Provide a log of all products and equipment for which warranties or guarantees are provided.
    - b. Index the log by Specification section number on forms provided by the Engineer.
    - c. Indicate the start date, warranty or guarantee period, and the date upon which the warranty or guarantee expires for products or equipment for which a warranty or guarantee is required.
    - d. Indicate the date for the start of the correction period specified in the General Conditions for each piece of equipment and the date on which the specified correction period expires.
    - e. Provide a copy of the warranty or guarantee under a tab indexed to the log.
- I. Action Submittals: Where used, action submittals are those that require review and approval and/or selection of colors, textures, dimensions, or similar to be completed.
- J. Informational Submittals: Where used, informational submittals are submittals that do not require approval or other action but are for the Owner/Engineer's informational purposes only.
- 1.8. REVIEW PROCEDURES
- A. Submittals are reviewed in the order received unless Contractor requests that a different priority be assigned.
  - B. Mark a submittal as "Priority" to place the review for the marked submittal ahead of submittals previously delivered. Priority submittals will be reviewed before other submittals for this Project which have been received but not reviewed. Use discretion in the use of "Priority" submittals as this may delay the review of submittals previously submitted.

- C. Submittals that are reviewed will be returned with one or more of the following designations:
  - 1. Approved as Submitted: Submittal is found to be acceptable as submitted.
  - 2. Approved as Noted: Submittal is acceptable with corrections or notations made by Engineer and may be used as corrected.
  - 3. Revise and Resubmit: Submittal has substantial deviations from the Contract Documents, significant errors, or is inadequate and must be revised and resubmitted for subsequent review.
  - 4. Not Approved: Products are not acceptable.
- D. Submittals not required will not be reviewed.

#### 1.9. RESUBMISSION REQUIREMENTS

- A. Make all corrections or changes in the submittals required by the Engineer and resubmit until approved.
- B. For Shop Drawings:
  - 1. Revise initial drawings or data and resubmit as specified for the original submittal.
  - 2. Highlight those revisions which have been made in response to the first review by the Engineer.
  - 3. Highlight a second color any new revisions which have been made or additional details of information that has been added since the previous review by the Engineer.
- C. For Samples:
  - 1. Submit new Samples as required for the initial Sample.
  - 2. Remove Samples which have been rejected if requested.
- D. Pay for excessive review of submittals.
  - 1. Excessive review of submittals is defined as any review required after the original review has been made and the first resubmittal has been checked to see that corrections have been made.
  - 2. Cost for additional review time will be billed to the Owner by the Engineer for the actual hours required for the review and marking of Shop Drawings by Engineer.
  - 3. Pay cost for the additional review to the Owner monthly as billed by the Owner.
  - 4. Need for more than one resubmission or any other delay of obtaining Engineer's review of submittals will not entitle the Contractor to an extension of Contract Time. All costs associated with such delays shall be at the Contractor's expense.

#### 1.10. REQUESTS FOR DEVIATION

- A. Submit requests for deviation from the Contract Documents for any product that does not fully comply with the Contract Documents.
- B. Submit request by Change Proposal. Identify the deviations and the reason the change is requested.
- C. Include the amount of cost savings to the Owner for deviations that result in a reduction in cost.
- D. A Change Order or Field Order will be issued for approved deviations. Deviations from the Contract Documents may only be approved by Change Order or Field Order.

#### 1.11. EQUAL NON-SPECIFIED PRODUCTS

- A. Contractor may submit other manufacturers' products that are in full compliance with the specification

- where the section lists one or more manufacturers followed by the phrase “or approved equal.”
1. Submit Shop Drawings of adequate detail to document that the proposed product is equal or superior to the specified product.
  2. Prove that the product is equal; it is not the Engineer’s responsibility to prove the product is not equal.
    - a. Indicate on a point-by-point basis for each specified feature that the product is equal to the Contract Document requirements.
    - b. Clearly detail in writing all exceptions or differences between the product and the Contract Document requirements.
    - c. Make a direct comparison with the specified manufacturer’s published data sheets and available information. Provide this printed material with the submittal.
    - d. The decision of the Engineer regarding the acceptability of the proposed product is final.
  3. Provide a written certification that, in furnishing the proposed product as an equal, the Contractor:
    - a. Has thoroughly examined the proposed product and has determined that it is equal or superior in all respects to the product specified.
    - b. Has determined that the product will perform in the same manner and result in the same process as the specified product.
    - c. Will provide the same warranties and/or bonds as for the product specified.
    - d. Will assume all responsibility to coordinate any modifications that may be necessary to incorporate the product into the construction and will waive all claims for additional Work which may be necessary to incorporate the product into the Project which may subsequently become apparent.
    - e. Will maintain the same time schedule as for the specified product.
  4. If any of the listed manufacturer’s product does not meet the respective specification in its entirety, a deviation request is also required as described above.
- B. The products of the listed manufacturers are to be furnished where Specifications list several manufacturers but do not list “or approved equal” products. Use of any products other than those specifically listed is a substitution and must be approved as indicated below.

#### 1.12. SUBSTITUTIONS

- A. Substitutions are defined as any product that the Contractor proposes to provide in lieu of the specified product.
- B. Submit the following for consideration of approval of a manufacturer or product which is not specified:
1. Contract Modification Request for deviation from the Contract Documents as indicated herein.
  2. Prove that the product is acceptable as a substitute; it is not the Engineer’s responsibility to prove the product is not acceptable as a substitute.
    - a. Indicate on a point-by-point basis for each specified feature that the product is acceptable to meet the intent of the Contract Documents requirements.
    - b. Make a direct comparison with the specified Suppliers published data sheets and available information. Provide this printed material with the submittal.
    - c. The decision of the Engineer regarding the acceptability of the proposed substitute product is final.
  3. Provide a written certification that, in making the substitution request, the Contractor:
    - a. Has determined that the substituted product will perform in substantially the same

manner and result in the same ability to meet the specified performance as the specified product.

- b. Will provide the same warranties and/or bonds for the substituted product as specified or as would be provided by the Manufacturer of the specified product.
  - c. Will assume all responsibility to coordinate any modifications that may be necessary to incorporate the substituted product into the Project and will waive all claims for additional Work which may be necessary to incorporate the substituted product into the Project which may subsequently become apparent.
  - d. Will maintain the same time schedule as for the specified product.
- C. Pay engineering cost for review of substitutions.
1. Cost for additional review time will be billed to the Owner by the Engineer for the actual hours required for the review and marking of Shop Drawings by Engineer.
  2. Cost for the additional review shall be paid to the Owner by the Contractor monthly.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 35 29  
HEALTH AND SAFETY

PART 1 GENERAL

1.1. SUMMARY

- A. This section specifies procedures for complying with applicable laws and regulations related to safety and health of the worker and the public. It is not the intent of the Owner or the Engineer to develop and/or manage the safety and health programs of Contractors or in any way assume the responsibility for the safety and health of their employees. It is required that all Contractors adhere to applicable Federal, State, and local safety and health standards.
- B. This section describes the Accident Prevention Program that is a subset of the Safety Program.

1.2. REFERENCES

A. Definitions

1. A hazardous substance is defined as follows:
  - a. A substance classified as "dangerous waste" in accordance with WAC 173-303 and 49 CFR 173.127 or that in sufficient quantities would be classified as "dangerous wastes."
  - b. A solid waste, or combination of solid wastes, that, because of its quantity, concentration, or physical, chemical, or infectious characteristics, may:
    - 1) cause or significantly contribute to an increase in mortality or increase in serious, irreversible, or incapacitating reversible illness; or
    - 2) pose substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed or otherwise managed.
  - c. Asbestos material.
  - d. Polychlorinated biphenyls (PCBs), polynuclear aromatic hydrocarbons (PHAs), explosives, radioactive materials, and other materials designated as hazardous by regulating agencies having jurisdiction over such matters.
2. A contaminated substance is defined as follows:
  - a. A substance containing materials in sufficient quantities as hydrocarbons, PCBs, diesel fuels, gasoline, heavy metals, solvents, and other types of fuel oils present in the soil, water, or air.
  - b. An element, compound, mixture, solution, or substance designated under Section 102 of CERCLA and/or applicable parts of MTCA.
  - c. A hazardous waste having the characteristics identified under or listed pursuant to Section 3001 of Solid Waste Disposal Act (i.e., RCRA) except those suspended by an act of Congress.
  - d. A toxic pollutant listed under Section 307 (a) of the Federal Water Pollution Control Act (FWPCA).
  - e. A hazardous air pollutant listed under Section 112 of the Clean Air Act.
  - f. An imminently hazardous chemical substance or mixture with respect to which the EPA administrator has taken action pursuant to Section 7 of the Toxic Substance Control Act.
3. Confined space is defined as follows:
  - a. It is large enough and so configured that a person can bodily enter and perform assigned work.

- b. It has limited or restricted means of entry or exit.
- c. It is not designed for continuous employee occupancy.
- 4. Permit-Required Confined Space. A confined space that has one or more of the following characteristics:
  - a. Contains or has potential to contain a hazardous atmosphere.
  - b. Contains material that has potential for engulfing an entrant.
  - c. Is shaped inside in such a way that someone entering could be trapped or asphyxiated.
  - d. Contains other recognized serious safety or health hazards.

**B. Reference Standards**

- 1. Comply with and enforce on-the-job site current applicable local, State, and Federal Health and Safety Standards, including, but not limited to, the following:

Reference	Title
29 USC 651 et seq.	Federal Occupational Safety and Health Act
29 CFR 1910	OSHA General Health and Safety Standards
29 CFR 1926	OSHA Construction Safety and Health Standards
	North Carolina Occupational Safety and Health Act
SARA Title III	Emergency Planning and Community Right-to-Know

**1.3. ADMINISTRATIVE REQUIREMENTS**

**A. Coordination**

- 1. Coordinate with the Engineer and Owner to obtain approval to disconnect or reconnect utilities.
- 2. Coordinate with the Engineer and Owner regarding the shutdown and safety tagout/lockout of pressurized systems, electrical, mechanical, pneumatic, hydraulic, etc. systems, and other equipment and utilities.

**1.4. SUBMITTALS**

**A. Accident Prevention Program**

- 1. This program shall outline the anticipated hazards and safety controls necessary to safeguard Contractor’s employees, the public, and other personnel.
- 2. Program shall be specific to the job and site, meet federal, state and local jurisdictional requirements.
- 3. The program will be reviewed for compliance with this Section prior to the start of work.
- 4. Revisions: Revise the accident prevention program prior to the start of work to accommodate changes requested by City and/or regulatory agencies or jurisdiction.
- 5. Post a copy of the accepted program at the Contractor’s job site office, and each of the subcontractor’s offices. Additional copies shall be provided to the Engineer.

**B. Health and Safety equipment and/or training material as specified in this section.**

**1.5. QUALITY ASSURANCE**

- A. Ensure that subcontractors receive a copy of this Specification section. The Contractor is responsible for ensuring compliance with the Accident Prevention Program.

- B. Maintain good housekeeping in work areas.
- C. Ensure that all health and safety submittals are reviewed and approved by a Certified Safety Professional (CSCP) and/or Certified Industrial Hygienist (CIH).
- D. Provide a qualified health and safety supervisor, with responsibility and full authority to coordinate, implement and enforce the Contractor's accident prevention program for the duration of this Contract. The name and telephone number of the safety supervisor shall appear in the accident prevention program.

#### 1.6. SPECIAL CONSIDERATIONS

- A. This article describes certain minimum precautions for consideration in developing an Accident Prevention Program. It supplements the regulatory requirements. Failure to comply with safety and health regulations may result in work suspension until adequate safety and health measures are implemented.
  - 1. Hazard Communication
    - a. Provide a written Hazard Communication Program and emergency management plan addressing the potential hazardous substances on site.
    - b. Prior to commencing work, provide a list and corresponding Material Safety Data Sheets (MSDS) for hazardous chemicals to be used on site. If no hazardous chemicals are to be used, provide statement to that effect.
  - 2. Confined Space
    - a. The nature of work under this Contract may expose workers to permit-required confined spaces having possible toxic and oxygen fluctuation conditions.
    - b. Prior to execution of work in confined spaces, submit a written confined space safety program that meets the requirements 29 CFR 1910.146 and applicable Colorado regulations.
  - 3. Other Site Safety Considerations: Supply to Engineer for review prior to commencing work on this Contract, a comprehensive written Accident Prevention Program covering the Contractor's activities on site. As a minimum, the program shall include the following:
    - a. Respiratory Protection
    - b. Accident/Injury Reporting
    - c. Emergency Plan (SARA Title III—Community Right-to-Know)
    - d. Personal Protective Equipment
    - e. Fall Restraint and Fall Arrest
    - f. Fire Safety and Prevention
    - g. Hand and Power Tools
    - h. Welding and Cutting
    - i. Electrical
    - j. Vehicles and Other Motorized Equipment
    - k. Tagout/Lockout Hearing Conservation
  - 4. Special Hazards
    - a. Infectious Disease. Sewers carry a wide spectrum of disease-producing organisms. Submit a written hazard communication and biological blood borne pathogen program detailing the preventive measures to be taken by the Contractor to provide an appropriate work environment for its employees as well as other employees on site. These may include, but are not limited to the following:
      - 1) Instruction in appropriate measures to avoid contamination.



- 2) A preventative inoculation program (tetanus/diphtheria, etc.) available to all personnel.
- 3) Clothing to protect against infection, including rubber boots with full sole and heel steel insert-liners, safety glasses or goggles, and gloves.
- 4) Facilities for workers to clean up and wash.
- b. Containment Gases. Contaminant gases that may be encountered include but are not limited to Hydrogen Sulfide, Methane, Carbon Monoxide, Carbon Dioxide and Sulfur Dioxide. Provide a written Emergency Management Plan to address these and other potential hazardous substances on site.
- c. Fall Protection. Work activities on this project may expose employees to fall hazards. Contractor must provide a written Fall Protection Plan for each fall hazard encountered throughout the project.
5. Utilities: Take appropriate precautions in working near or with utilities and dangerous substances during the performance of work to protect the health and safety of the worker, the public, property, and the environment.

## PART 2 PRODUCTS (NOT USED)

## PART 3 EXECUTION

### 3.1. SAFETY AND HEALTH COMPLIANCE

- A. Occasionally, the Owner may audit the Contractor's Accident Prevention Program. The Owner reserves the right to stop that portion of the Contractor's work that is determined to be a serious health and safety violation. Ongoing work that is considered a safety or health risk by the Owner shall be corrected immediately.
  1. Ensure that necessary air monitoring, ventilation equipment, protective clothing, and other supplies and equipment as specified are available to implement the Accident Prevention Program.
  2. Notify the Engineer and Owner immediately of accidents resulting in any serious injury or immediate or probable fatality to any employees or public, or which result in hospitalization of any employees.

### 3.2. ACCIDENT PREVENTION PROGRAM REVISIONS

- A. If involved regulatory agencies or jurisdictions determine the Accident Prevention Program or associated documents, organizational structure, or Comprehensive Work Plan to be inadequate to protect employees and the public:
  1. Modify the Program to meet the requirements of said regulatory agencies or jurisdictions, and;
  2. Provide the Engineer and the Owner with the revisions to the Program within 7 days of the notice of deficiency.

END OF SECTION

SECTION 01 35 29.19  
WASTEWATER EMERGENCY RESPONSE PLAN

PART 1 GENERAL

1.1. SUMMARY

- A. Development of a Wastewater Discharge Emergency Response Plan by Contractor, to be implemented in the event of a wastewater discharge.

1.2. PRICE AND PAYMENT PROCEDURES

- A. All work related to work in this specification is considered subsidiary to other bid items. There is no separate pay item.

1.3. SUBMITTALS

- A. Submit detailed plan and receive approval from the Engineer prior to beginning any bypass.
- B. The Emergency Response Plan shall be coordinated and submitted simultaneously with the Temporary Bypass Pumping Plan required in Section 01 51 42.

1.4. EMERGENCY RESPONSE PLAN DEVELOPMENT

- A. Develop and submit to Engineer at least 14 working days prior to the start of construction, a written Emergency Response Plan (ERP). The ERP shall be developed to respond to any flood occurrence which presents the risk of impacting the temporary bypass piping and the risk of a construction related wastewater discharge. Contractor's ERP shall not rely on Owner's personnel for emergency response, but they may be dispatched, at the Owner's discretion, to provide additional assistance. If Owner's personnel are utilized, Contractor shall be responsible for all associated costs.
- B. The ERP shall include at minimum, the following:
  - 1. Identification of nearby environmentally sensitive areas such as waterways, channels, catch basins and entrances to existing storm drains or drainage conveyances.
  - 2. Development of an emergency notification procedure. Contractor shall designate primary and secondary representatives, their respective mobile phone numbers. Owner and Engineer contacts shall also be listed. The North Carolina Department of Environmental Quality and City of Morganton shall also be notified of a wastewater discharge.
  - 3. Identify an emergency response team including personnel and equipment/tools that will be utilized in the event of a wastewater discharge, a flood in excess of the 100-year occurrence, or any other flood related issues which pose a risk to the project. Include for the emergency response team arrangements for backup personnel and equipment. The emergency response team shall be able to dispatch to the site 24 hours a day, 7 days a week, including weekends and holidays to respond immediately to any wastewater discharge related to the Work or as required to prevent damage because of flooding.
  - 4. Identify any property owners who may be affected by a spill of any nature. Identify local and state agencies requiring notification upon a discharge.
  - 5. Identify step-by-step procedures to follow to contain, control, and minimize wastewater discharge.

- C. At the preconstruction meeting, Contractor will be provided with a list of Owner's representatives to contact in case of a wastewater discharge. These contacts shall be added to the ERP.
- D. Contractor shall not begin work until Engineer and Owner have approved the ERP. An approved copy of the ERP shall always be available on the job site.
- E. It shall be the Contractor's responsibility to ensure that all employees, including subcontractors, know and obey all emergency procedures included in the ERP.

## PART 2 PRODUCTS (NOT USED)

## PART 3 EXECUTION

### 3.1. WASTEWATER DISCHARGE EVENT

- A. In the event of a wastewater discharge Contractor shall immediately:
  - 1. Implement the ERP to control and contain the discharge, without direction from Engineer or Owner.
  - 2. Contact Owner's personnel identified at the pre-construction meeting. Contact to include at a minimum, the following:
    - a. Location of discharge
    - b. Estimated volume
    - c. Time discharge began
    - d. Duration (if already controlled)
    - e. Cause (if known)
    - f. Control measures implemented
    - g. Type of remedial measures and/or cleanup measures taken
  - 3. Based on this information, Contractor, Engineer, and Owner's Project Manager will determine if the discharge is contained, and whether the Owner's personnel should be dispatched to the site.
  - 4. Contact the local and state agencies requiring notification of a discharge.
- B. Contractor shall, within three (3) working days of the wastewater discharge, submit to Engineer and Owner a written Wastewater Discharge Incident Report. Report shall document characteristics of the spill listed above as well as any changes needed to prevent future spills.
- C. Engineer and Owner will evaluate the suggested changes to avoid further discharges and will instruct Contractor on changes. Engineer and Owner may institute further corrective actions, as deemed necessary.
- D. Contractor shall be fully responsible for preventing wastewater discharges, containing the sewage, recovery and legal disposal of sewage, any fines, penalties, claims, and liability arising from negligent or willful discharge of wastewater; and any violation of any law, ordinance, code, order, or regulation as a result of the event. Contractor shall be responsible for replacement or repair of damaged or failed equipment as a direct result of the event. Contractor shall be responsible for payment of any fines assessed against Owner and Engineer.

### 3.2. FLOOD EVENT

- A. Placement of the temporary bypass piping shall be above the elevation of the 100-year floodplain wherever possible. At the crossing of tributaries to a river, the temporary bypass piping shall be

supported above the 100-year flood water elevation and anchored in place.

- B. Contractor shall monitor National Oceanic and Atmospheric (NOAA), National Weather Service (NWS), and local weather forecasts to anticipate flood events affecting the project and place remedial resources on standby.
- C. If the water level should reach an elevation approaching the 100-year flood level, Contractor shall cease bypass pumping and mobilize resources necessary to remove bypass piping from drainage crossings or otherwise act as necessary to protect against backup of flood waters caused by the bypass piping or damage to the piping resulting from flood water.

END OF SECTION

SECTION 01 40 00  
QUALITY REQUIREMENTS

PART 1 GENERAL

1.1. SUMMARY

- A. This Section describes the Contractor's responsibilities for quality assurance and quality control.

1.2. REFERENCES

A. Standards

1. Provide a testing laboratory that complies with the ACIL (American Council of Independent Laboratories) "Recommended Requirements for Independent Laboratory Qualifications."
2. Perform testing per recognized test procedures as listed in the various sections of the Specifications, standards of the State of North Carolina Department of Transportation, American Society of Testing Materials (ASTM), or other testing associations. Perform tests in accordance with published procedures for testing issued by these organizations.

1.3. SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00 "Submittal Procedures" and shall include:
1. A written Quality Management Plan that establishes the methods of assuring compliance with the Contract Documents. Submit this program as Record Data.
  2. Statement of Qualifications for the proposed testing laboratory: The statement of qualifications is to include a list of the engineers and technical staff that will provide testing services on the Project, descriptions of the qualifications of these individuals, list of tests that can be performed, equipment used with date of last certification and a list of recent projects for which testing has been performed with references for those projects.
  3. Test reports per this Specification: Reports are to certify that products or constructed Works are in full compliance with the Contract Documents or indicate that they are not in compliance and describe how they are not in compliance.
  4. Provide Certified Test Reports on materials or products to be incorporated into the Project. Reports are to indicate that material or products are in full compliance with the Contract Documents or indicate that they are not in compliance and describe how they are not in compliance.

1.4. CONTRACTOR'S RESPONSIBILITIES

- A. Control the quality of the Work and verify that the Work meets the standards of quality established in the Contract Documents.
1. Inspect the Work of the Contractor, Subcontractors and Suppliers. Correct defective Work.
  2. Inspect products and materials to be incorporated into the Project. Ensure that Suppliers of raw materials, parts, components, assemblies, and other products have adequate quality control system to ensure that quality products are produced. Provide only products that comply with the Contract Documents.
  3. Provide all facilities and calibrated equipment required for quality control tests.
  4. Provide consumable construction materials of adequate quality to provide a finished product that complies with the Contract Documents.
  5. Perform tests as indicated in this and other sections of the Specifications. Schedule the time and

- sequence of testing with the Engineer. All quality control testing is to be observed by the Engineer or designated representative.
6. Maintain complete inspection and testing records at the Site and make them available to Owner, Engineer and Engineer.
- B. Retain the services of a professional materials testing laboratory selected and approved by the Owner and Engineer to ensure that Work fully complies with the Contract Documents. Provide services of a testing laboratory capable of performing a full range of testing procedures complying with the standards for testing procedures specified, with personnel certified to perform the tests required.
1. Coordinate scheduling of testing laboratory.
  2. Provide access to the Work at all times that Work is in progress.
  3. Cooperate fully in the performance of sampling, inspection, and testing.
  4. Furnish labor and facilities to:
    - a. Provide access to the Work to be tested.
    - b. Obtain and handle Samples for testing at the Site or at the source of the product to be tested.
    - c. Facilitate inspections and tests.
    - d. Provide adequate lighting to allow observations.
    - e. Store and cure test Samples.
  5. Furnish copies of the tests performed on materials and products.
  6. Provide adequate quantities of representative product to be tested to the laboratory at the designated location.
  7. Give the Engineer or Owner's representative adequate notice before proceeding with Work that would interfere with testing.
  8. Notify the Engineer or Owner's representative and the testing laboratory prior to the time that testing is required. Lead time is to be adequate to allow arrangements to be made for testing.
  9. Do not proceed with any Work until testing services have been performed and results of tests indicate that the Work is acceptable.
  10. Provide complete access to the Site and make Contract Documents available.
  11. Provide personnel and equipment needed to perform sampling or to assist in making the field tests.
- C. Technical specifications govern if any requirements of this section conflicts with the requirements of the technical specifications.

#### 1.5. QUALITY ASSURANCE ACTIVITIES BY THE OWNER

- A. Owner may perform its own quality assurance test independent of the work performed under the testing allowance described above. Assist the Owner, Engineer, and testing organizations in performing quality assurance activities. Quality assurance testing performed by the Owner will be paid for by the Owner.
- B. Quality assurance activities of the Owner through their own forces or through contracts with materials testing laboratories and survey crews are for the purpose of monitoring the results of the Contractor's Work to see that it is in compliance with the requirements of the Contract Documents.
- C. Quality assurance activities of the Owner or non-performance of quality assurance activities:
  1. Do not relieve the Contractor of its responsibility to perform Work and furnish materials and products and constructed Work conforming to the requirements of the Contract Documents.

2. Do not relieve the Contractor of its responsibility for providing adequate quality control measures.
  3. Do not relieve the Contractor of its responsibility for damage to or loss of the material, product or Work before Owner's acceptance.
  4. Do not constitute or imply Owner's acceptance.
  5. Do not affect the continuing rights of the Owner after Owner's acceptance of the completed Work.
- D. The presence or absence of the Owner's Resident Representative or Engineer does not relieve the Contractor from any contract requirement, nor is the Owner's Resident Representative or Engineer authorized to change any term or condition of the Contract Documents without the Owner's written authorization in a Field Order or Change Order.
- E. Failure on the part of the Owner or Engineer to perform or test products or constructed Works in no way relieves the Contractor of the obligation to perform Work and furnish materials conforming to the Contract Documents.
- F. All materials and products are subject to Owner's quality assurance observations or testing at any time during preparation or use. Material or products which have been tested or observed or approved by Owner at a supply source or staging area may be re-observed or re-tested by Owner before or during or after incorporation into the Work, and rejected if they do not comply with the Contract Documents.

#### 1.6. VERIFICATION TESTING

- A. Provide verification testing when tests indicate that materials or the results of construction activities are not in conformance with Contract Documents.
- B. Verification testing is to be provided at the Contractor's expense to verify products or constructed works are in compliance after corrections have been made.
- C. Tests must comply with recognized methods or with methods recommended by the testing laboratory and approved by the Engineer.

#### 1.7. TEST REPORTS

- A. Test reports are to be prepared for all tests.
  1. Tests performed by testing laboratories may be submitted on their standard test report forms. These reports must include the following:
    - a. Name of the Owner, project title and number, equipment installer and contractor.
    - b. Name of the laboratory, address, and telephone number.
    - c. Name and signature of the laboratory personnel performing the test.
    - d. Description of the product being sampled or tested.
    - e. Date and time of sampling, inspection, and testing.
    - f. Date the report was issued.
    - g. Description of the test performed.
    - h. Weather conditions and temperature at time of test or sampling.
    - i. Location at the Site or structure where the test was taken.
    - j. Standard or test procedure used in making the test.
    - k. A description of the results of the test.
    - l. Statement of compliance or non-compliance with the Contract Documents.
    - m. Interpretations of test results, if appropriate.

2. Submit reports on tests performed by Contractor or his suppliers or vendors on the forms provided by or acceptable to the Engineer.
  3. Engineer will prepare test reports on test performed by the Engineer.
- B. Distribute copies of the test reports to the Engineer within 24 hours of completing the test. Flag tests reports with results that do not comply with Contract Documents for immediate attention.
- C. Payment for Work subject to testing may be withheld until the Contractor's quality control test reports of the Work are submitted to the Engineer or the Owner's Resident Representative.

#### 1.8. NON-CONFORMING WORK

- A. Immediately correct any Work that does not comply with the Contract Documents or submit a written explanation of why the Work is not to be corrected immediately and when corrective action to the Work will be performed.
- B. Payment for non-conforming Work shall be withheld until Work is brought into compliance with the Contract Documents.

#### 1.9. LIMITATION OF AUTHORITY OF THE TESTING LABORATORY

- A. The testing laboratory representatives are limited to providing consultation on the test performed and to an advisory capacity.
- B. The testing laboratory is not authorized to:
1. Alter the requirements of the Contract Documents.
  2. Accept or reject any portion of the Work.
  3. Perform any of the duties of the Contractor.
  4. Stop the Work.

#### 1.10. QUALITY CONTROL PLAN

- A. Submit Contractor's Quality Control Plan that identifies personnel, procedures, control, instructions, tests, records, and forms to be used. Construction will be permitted to begin only after acceptance of the Quality Control Plan or acceptance of an interim plan applicable to the particular feature of Work to be started. Work outside of the features of Work included in an accepted interim plan will not be permitted to begin until acceptance of a Quality Control Plan or another interim plan containing the additional features of Work to be started.
- B. Content of the Quality Control Plan. The Quality Control Plan shall include, as a minimum, the following to address all construction operations, both on-site and off-site, including work by Subcontractors and Suppliers:
1. A description of the quality control organization, including a chart showing lines of authority and acknowledgement that the quality control staff shall implement the quality control program for all aspects of the Work specified.
  2. The name, qualifications (in resume format), duties, responsibilities, and authorities of each person assigned a quality control function.
  3. A copy of the letter to the Quality Control Manager signed by an authorized official of the firm which describes the responsibilities and delegates sufficient authorities to adequately perform the functions of the Quality Control Manager, including authority to stop Work which does not



comply with the Contract Documents or will result in Work that does not comply with the Contract Documents. The Quality Control Manager shall issue letters of direction to all other various quality control representatives outlining duties, authorities, and responsibilities. Copies of these letters shall also be furnished to the Engineer.

4. Procedures for scheduling, reviewing, certifying, and managing submittals, including those of Subcontractors and Suppliers.
  5. Control, verification, and acceptance testing procedures for each specific test is to include the test name, specification paragraph requiring test, feature of Work to be tested, test frequency, person responsible for each test, applicable industry testing standards and laboratory facilities to be used for the test.
  6. Procedures for tracking phases of quality control, verification, and acceptance tests including documentation.
  7. Procedures for tracking construction deficiencies from identification through acceptable corrective action. Indicate how documentation of the verification process for deficiencies will be made.
  8. Reporting procedures, including proposed reporting formats.
  9. The name of the proposed testing laboratory along with documentation of qualifications, a list of tests that can be performed, and a list of recent projects for which similar testing has been performed with references from those projects.
- C. Notification of Changes: After submittal of the Quality Control Plan, the Contractor shall notify the Owner in writing of any proposed changes.
- D. Coordination Meeting: After the Pre-construction Meeting and before start of construction, the Contractor shall meet with the Owner and Engineer to discuss the Contractor's Quality Control Plan. The Quality Control Plan shall be submitted a minimum of 14 calendar days prior to the Coordination Meeting. During the meeting, a mutual understanding of the system details shall be developed, including the forms for recording the Quality Control operations, testing, administration of the system for both on-site and off-site Work, and the interrelationship of Contractor's management and control with the Owner's Quality Assurance. Revise the Quality Management Plan to reflect comments and recommended changes resulting from this meeting.

#### 1.11. DELIVERY AND STORAGE

- A. Handle and protect test specimens of products and construction materials at the Site in accordance with recognized test procedures.

### PART 2 PRODUCTS

#### 2.1. TESTING APPARATUS

- A. Furnish testing apparatus and related accessories necessary to perform any required tests.

### PART 3 EXECUTION

#### 3.1. QUALITY CONTROL PROGRAM

- A. Perform quality control observations and testing as required in each section of the Specifications and where indicated on the Drawings.

- B. Provide a quality control program that includes the following phases for each definable Work task. A definable Work task is one which is separate and distinct from other tasks, has separate control requirements, may be provided by different trades or disciplines, or may be Work by the same trade in a different environment.
1. Planning Phase: Perform the following before beginning each definable Work task:
    - a. Review the contract drawings.
    - b. Review submittals and determine that they are complete in accordance with the Contract Documents.
    - c. Check to assure that all materials and/or equipment have been tested, submitted, and approved.
    - d. Examine the work area to assure that all required preliminary Work has been completed and complies with the Contract Documents.
    - e. Examine required materials, equipment, and sample Work to assure that they are on hand, conform to submittals, and are properly stored.
    - f. Review requirements for quality control inspection and testing.
    - g. Discuss procedures for controlling quality of the Work. Document construction tolerances and workmanship standards for the Work task.
    - h. Check that the portion of the plan for the Work to be performed incorporates submittal comments.
    - i. Discuss results of planning phase with the Engineer. Conduct a meeting attended by the Quality Control Manager, the Engineer, superintendent, other quality control personnel as applicable, and the foreman responsible for the Work task. Instruct applicable workers as to the acceptable level of workmanship required in order to meet the requirements of the Contract Documents. Document the results of the preparatory phase actions by separate meeting minutes prepared by the Quality Control Manager and attached to the quality control report.
    - j. Do not move to the next phase unless results of investigations required for the planning phase indicate that requirements have been met.
  2. Work Phase: Complete this phase after the Planning Phase:
    - a. Notify the Engineer at least 24 hours in advance of beginning the Work and discuss the review of the planning effort to indicate that requirements have been met.
    - b. Check the Work to ensure that it is in full compliance with the Contract Documents.
    - c. Verify adequacy of controls to ensure full compliance with Contract Documents. Verify required control inspection and testing is performed.
    - d. Verify that established levels of workmanship meet acceptable workmanship standards. Compare with required sample panels as appropriate.
    - e. Repeat the Work phase for each new crew to work on-site, or any time acceptable specified quality standards are not being met.
  3. Follow-up Phase: Perform daily checks to assure control activities, including control testing, are providing continued compliance with contract requirements:
    - a. Make checks daily and record observations in the quality control documentation.
    - b. Conduct follow-up checks and correct all deficiencies prior to the start of additional Work tasks that may be affected by the defective Work. Do not build upon nor conceal non-conforming Work.
    - c. Conduct a review of the Work 1 month prior to the expiration of the correction period prescribed in the General Conditions with the Owner and Engineer. Correct defects as noted during the review.
- C. Conduct additional Planning and Work phases if:

1. The quality of on-going Work is unacceptable.
2. Changes are made in applicable quality control staff, on-site production supervision or work crew.
3. Work on a task is resumed after a substantial period of inactivity.
4. Other quality problems develop.

END OF SECTION

SECTION 01 43 33  
MANUFACTURERS' FIELD SERVICES

PART 1 GENERAL

1.1. SUMMARY

- A. This Section describes the requirements for field services performed by Manufacturers of equipment and other components. These field services include certification, training, and other services as may be required in the Contract Documents.

1.2. REFERENCES

A. Definitions

1. Person-Day: One person for 8 hours within regular Contractor working hours at the Project Site. Travel time is specifically excluded.

1.3. SUBMITTALS

A. Informational Submittals

1. Training Schedule: Submit, in accordance with requirements of this specification, not less than 21 days prior to start of equipment installation and revise as necessary for acceptance.
2. Lesson Plan: Submit, in accordance with requirements of this specification, proposed lesson plan not less than 21 days prior to scheduled training and revise as necessary for acceptance.
3. Training Session Tapes: Furnish Owner with two complete sets of tapes fully indexed and cataloged with printed label stating session and date taped.

1.4. QUALITY ASSURANCE

A. Qualifications

1. Manufacturer's Representative shall be an authorized representative of the manufacturer, factory trained, and experienced in the technical applications, installation, operation, and maintenance of respective equipment, subsystem, or system, with full authority by the equipment manufacturer to issue the certifications required of the manufacturer. Additional qualifications may be specified elsewhere.
2. Representative subject to acceptance by Owner and Engineer. No substitute representatives will be allowed unless prior written approval by such has been given.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1. FULFILLMENT OF SPECIFIED MINIMUM SERVICES

- A. Furnish manufacturers' services when required by an individual specification section, to meet the requirements of this section.
- B. Where time is necessary more than that stated in the Specifications for manufacturers' services, or when a minimum time is not specified, the time required to perform the specified services shall be considered incidental.

- C. Schedule manufacturer' services to avoid conflict with other onsite testing or other manufacturers' onsite services.
- D. Determine, before scheduling services, that all conditions necessary to allow successful testing have been met.
- E. Only those days of service approved by Engineer will be credited to fulfill the specified minimum services.
- F. When specified in individual specification sections, manufacturer's onsite services shall include:
  - 1. Assistance during product (system, subsystem, or component) installation to include observation, guidance, instruction of Contractor's assembly, erection, installation, or application procedures.
  - 2. Inspection, checking, and adjustment as required for product (system, subsystem, or component) to function as warranted by manufacturer and necessary to furnish Manufacturer's Certificate of Proper Installation.
  - 3. Providing, daily, copies of all manufacturers' representatives' field notes and data to Engineer.
  - 4. Revisiting the Site as required to correct problems and until installation and operation are acceptable to Engineer.
  - 5. Resolution of assembly or installation problems attributable to, or associated with, respective manufacturer's products and systems.
  - 6. Assistance during functional and performance testing, and facility startup and evaluation.
  - 7. Training of Owner's personnel in the operation and maintenance of respective product as required.
  - 8. Additional requirements may be specified elsewhere.

### 3.2. MANUFACTURER'S CERTIFICATE OF COMPLIANCE

- A. Unless otherwise specified, a Manufacturer's Certificate of Compliance, a copy of which is attached to this section, shall be completed in full, signed by the entity supplying the product, material, or service, and submitted prior to shipment of product or material or the execution of the services.
- B. Engineer may permit use of certain materials or assemblies prior to sampling and testing if accompanied by accepted certification of compliance.
- C. Such form shall certify that the proposed product, material, or service complies with that specified. Attach supporting reference data, affidavits, and certifications as appropriate.
- D. May reflect recent or previous test results on material or product, if acceptable to Engineer.

### 3.3. MANUFACTURER'S CERTIFICATE OF PROPER INSTALLATION

- A. Unless otherwise specified, a Manufacturer's Certificate of Proper Installation form, a copy of which is attached to this section, shall be completed and signed by the equipment manufacturer's representative.
- B. Such form shall certify that the signing party is a duly authorized representative of the manufacturer, is empowered by the manufacturer to inspect, approve, and operate their equipment and is authorized to make recommendations required to assure that the equipment is complete and operational.

### 3.4. TRAINING

- A. General:
1. Furnish manufacturers' representatives for detailed classroom and hands-on training to Owner's personnel on operation and maintenance of specified product (system, subsystem, component) and as may be required in applicable Specifications.
  2. Furnish trained, articulate personnel to coordinate and expedite training, to be present during training coordination meetings with Owner and familiar with operation and maintenance manual information.
  3. Manufacturer's representative shall be familiar with facility operation and maintenance requirements as well as with specified equipment.
  4. Furnish complete training materials, to include operation and maintenance data, to be retained by each trainee.
- B. Training Schedule:
1. List specified equipment and systems that require training services and show:
    - a. Respective manufacturer.
    - b. Estimated dates for installation completion.
    - c. Estimated training dates.
  2. Allow for multiple sessions when several shifts are involved.
  3. Adjust schedule to ensure training of appropriate personnel as deemed necessary by Owner, and to allow full participation by manufacturers' representatives. Adjust schedule for interruptions in operability of equipment.
- C. Lesson Plan: When manufacturer or vendor training of Owner's personnel is specified, prepare a lesson plan for each required course containing the following minimum information:
1. Title and objectives.
  2. Recommended attendees (e.g., managers, engineers, operators, maintenance).
  3. Course description, outline of course content, and estimated class duration.
  4. Format (e.g., lecture, self-study, demonstration, hands-on).
  5. Instruction materials and equipment requirements.
  6. Resumes of instructors providing the training.
- D. Pre-startup Training:
1. Coordinate training sessions with Owner's operating personnel and manufacturers' representatives, and with submission of operation and maintenance manuals.
  2. Complete at least 14 days prior to beginning of facility startup.
- E. Post-startup Training: If required in Specifications, furnish and coordinate training of Owner's operating personnel by respective manufacturer's representatives.
- F. Taping of Training Sessions:
1. Furnish audio and color video taping of pre-startup and post-startup instruction sessions, including manufacturers' representatives' hands-on equipment instruction and classroom sessions.
  2. Use USB flash drive with Windows Media compatible video format, suitable for playback on standard equipment available commercially in the United States.

### 3.5. SUPPLEMENTS

- A. The supplements listed below, following "End of Section", are part of this Specification.
1. Form: Manufacturer's Certificate of Compliance.

2. Form: Manufacturer's Certificate of Proper Installation.

END OF SECTION

**MANUFACTURER'S CERTIFICATE OF COMPLIANCE**

**Owner:**

**Product, Material, or Service  
Submitted:**

**Project Name:**

**Project No:**

Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

I hereby certify that the above-referenced product, material, or service called for by the Contract for the name project will be furnished in accordance with all applicable requirements. I further certify that the product, material, or service are of the quality specified and conform in all respects with the contract requirements, and are in the quantity shown.

Date of Execution: \_\_\_\_\_, 20\_\_\_\_.

Manufacturer: \_\_\_\_\_

Manufacturer's Authorized Representative (*print*): \_\_\_\_\_

Authorized Signature: \_\_\_\_\_



**MANUFACTURER'S CERTIFICATE OF PROPER INSTALLATION**

**OWNER:** \_\_\_\_\_

**EQPT SERIAL NO.** \_\_\_\_\_

**EQPT TAG NO.:** \_\_\_\_\_

**EQPT/SYSTEM:** \_\_\_\_\_

**PROJECT NO.:** \_\_\_\_\_

**SPEC. SECTION** \_\_\_\_\_

I hereby certify that the above-referenced equipment/system has been:

(Check Applicable)

- Installed in accordance with manufacturer's recommendations.
- Inspected, checked, and adjusted.
- Serviced with proper initial lubricants.
- Electrical and mechanical connections meet quality and safety standards.
- All applicable safety equipment has been properly installed.
- Functional tests.
- System has been performance tested and meets or exceeds specified performance requirements. (When complete system of one manufacturer).

Note: Attach any performance test documentation from manufacturer.

Comments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

I, the undersigned manufacturer's representative, hereby certify that I am (i) a duly authorized representative of the manufacturer, (ii) empowered by the manufacturer to inspect, approve, and operate his equipment and (iii) authorized to make recommendations required to assure that the equipment furnished by the manufacturer is complete and operational, except as may be otherwise indicated herein. I further certify that all information contained here is true and accurate.

Date: \_\_\_\_\_, 20\_\_\_\_.

Manufacturer: \_\_\_\_\_

By Manufacturer's Authorized Representative: \_\_\_\_\_  
(Authorized Signature)

SECTION 01 50 00  
TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.1. SUMMARY

- A. Furnish temporary facilities, storage sheds, temporary utilities, and temporary controls needed to complete the work.
- B. Furnish, install, and maintain temporary project identification signs to identify key elements of the construction facilities. Do not allow other signs to be displayed.
- C. Cost for Temporary Facilities and Controls as described in this section and provided by Suppliers and Subcontractors as described in this section are to be included in the Cost of Work.

1.2. PRICE AND PAYMENT PROCEDURES

- A. All work related to work in this specification is considered subsidiary to other bid items. There is no separate pay item.

1.3. DELIVERY AND STORAGE

- A. Arrange transportation, loading, and handling of temporary buildings, sheds, and other facilities and controls.

PART 2 PRODUCTS

2.1. SIGNAGE

- A. Provide new or used signs, wood or metal with structure and framing in sound condition. Materials are to be structurally adequate and suitable for extended exterior installation.
- B. Arrange for a professional sign painter or printer to prepare a sign for the project site.
- C. Sign will include identification of the Owner, Engineer, Major Engineering Subconsultants, and Contractor (including appropriate logos, as required) and other project information as determined by the Engineer.
- D. Paint sign on a 4-foot by 8-foot by 3/4-inch exterior grade plywood board. Frame plywood with 2 x 4 wood frame and mount on not less than two 4 x 4 posts. House plywood board in a channel routed 1/2-inch-deep in the 2 x 4 frame. Shoulder, glue, and screw corners.
- E. Bolts, brackets, fasteners, and other hardware are to be galvanized or stainless steel.

2.2. TEMPORARY STORAGE BUILDINGS

- A. Storage sheds may be prefabricated buildings on skids or truck trailers.
- B. Furnish storage buildings of adequate size to store any materials or equipment delivered to the Site

that might be affected by weather. Locate temporary buildings at least 30 feet from new and existing facility structures.

### 2.3. TEMPORARY SANITARY FACILITIES

- A. Provide sanitary facilities at the Site from the commencement of the Project until project conclusion. Maintain these facilities in a clean and sanitary condition at all times and comply with the requirements of the local health authority. On large sites, provide portable toilets at such locations that no point in the Site shall be more than 600 feet from a toilet.
- B. Use these sanitary facilities. Do not use rest rooms within existing buildings.

### 2.4. TEMPORARY HEAT

- A. Provide heating devices needed to protect Work during construction.
  - 1. Provide fuel needed to operate the heating devices.
  - 2. Attend heating devices at all times they are in operation, including overnight operations.

### 2.5. TEMPORARY UTILITIES

- A. Provide the temporary utilities for administration, construction, testing, disinfection, and start-up of the Work, including electrical power and water. Pay all costs associated with furnishing temporary utilities.
  - 1. Provide a source of temporary electrical power of adequate size for the construction procedures. Any connections shall be submitted to the Owner and Engineer for approval prior to installation.
    - a. Electrical pole and service shall comply with OSHA and other safety requirements and the requirements of the electric utility.
  - 2. Provide temporary water. Potable water may be used from the City by obtaining temporary fire hydrant access at a location selected by the City, and after inspection of the water tank truck. Non-potable water may be used for hydraulic testing.

### 2.6. TRAFFIC CONTROL

- A. Any signs, cones, barrels, barriers, or other equipment used for traffic control shall comply with City, County, and State requirements.

## PART 3 EXECUTION

### 3.1. GENERAL

- A. Prepare the Site by removing trees, brush, or debris and performing demolition or grubbing needed to clear a space adequate for the structures, as necessary.
- B. Pay for the utilities used during construction.
- C. Provide each temporary service and facility ready for use at each location when the service or facility is first needed to avoid delay in the performance of the Work.
- D. Maintain, expand as required, and modify temporary services and facilities as needed throughout the progress of the Work.

- E. Remove services and facilities when approved by the Engineer.
- F. Operate temporary facilities in a safe and efficient manner.
  - 1. Restrict loads on temporary services or facilities to within their designed or designated capacities.
  - 2. Provide sanitary conditions. Prevent public nuisance, or hazardous conditions from developing or existing at the Site.
  - 3. Prevent freezing of pipes, flooding, or the contamination of water.
  - 4. Maintain site security and protection of the facilities.

### 3.2. LOCATION

- A. Locate all temporary facilities as indicated in Drawings or as approved by the Owner/Engineer.
- B. Construct and install signs at locations approved by the Owner. Install informational signs so they are clearly visible by the public.

### 3.3. TEMPORARY LIGHTING

- A. Lighting shall be adequate to perform Work within any space.
  - 1. Lights shall be left in position in such a manner that every space has temporary light at all times.
  - 2. Temporary lights may be removed once the permanent lighting is in service.
- B. Provide portable flood lights at any time that Work will be performed outside the structure at night. Provide adequate lighting to provide sufficient light at any location Work is being performed.
- C. Work outside the hours of 7:00 a.m. to 7:00 p.m. will not normally be permitted. Obtain prior authorization from the Owner and Engineer for any night work.

### 3.4. CONSTRUCTION FENCE

- A. Install and maintain a construction security fence around the construction site and/or around the storage yard. Provide gates with padlocks.

### 3.5. SAFETY AND SECURITY

- A. Contractor is responsible for maintaining adequate site safety and security measures for all portions of the Work and for any temporary facilities or stored materials.
- B. Contractor shall ensure that temporary fences, steel plates, and other temporary facilities are installed and maintained as needed to protect the public from equipment, materials, excavations, open manholes, and other hazards.
- C. Whenever possible all open storage facilities, excavations, manholes, etc. shall be closed, covered, and/or filled at the end of work every day to prevent any hazards to the public during non-work hours

### 3.6. STAGING AREA

- A. The Contractor may utilize a staging area as indicated in the Drawings, or may obtain their own staging area outside the project area.
- B. If the Contractor uses a staging area outside the project area that is not owned by the Contractor, the

Contractor must have a written agreement with the property owner for use of the property. The City shall be provided a copy of this agreement.

### 3.7. TRAFFIC CONTROL

- A. Develop a traffic control plan to ensure that traffic is maintained at all times on public roads and that access is maintained to all properties within and adjacent to the project area.
- B. Coordinate with all property owners to inform them of any changes to their access at least two (2) weeks in advance of the planned work. Temporary disruptions to properties may be allowed if agreed to in advance with property owner, and if a method of access by emergency vehicles is provided.
- C. Install all necessary traffic control devices prior to beginning any work within public rights of way.

### 3.8. MAINTENANCE AND WASTE DISPOSAL

- A. Maintain signs and supports in a neat, clean condition. Repair damage to structures, framings, existing improvements, or signs.
- B. Provide trash receptacles at all times.
- C. Ensure project area is cleaned of trash and debris at the end of each work day.
- D. Dispose of all waste in a manner compliant with local, state, and federal regulations.

### 3.9. REMOVAL OF TEMPORARY FACILITIES

- A. Remove temporary buildings, sheds, and utilities at the conclusion of the Project and restore the Site to original condition or finished in accordance with the Drawings.
- B. Remove informational signs upon completion of construction.
- C. Remove project identification signs, framing, supports, and foundations upon completion of the Project.

END OF SECTION

SECTION 01 51 42  
TEMPORARY SEWER BYPASSING

PART 1 GENERAL

1.1. SUMMARY

- A. This Section covers furnishing, maintaining, and operating a temporary bypass pumping system or gravity systems to maintain sewer flows during construction. Furnish all materials, labor, equipment, power, maintenance, etc., to successfully implement temporary pumping and control systems. This includes but is not limited to the installation and operation of bulkheads, plugs, temporary sumps, hoses, piping, pumps, power, alarms, instrumentation, and controls.
- B. The purpose of bypassing is to provide continuous, reliable wastewater service at all times and prevent wastewater surcharging. Maintain sewage flow around the construction area and convey it to a downstream manhole, primarily through pumps and pipelines, to facilitate the Work, and shall contain all sewage within the temporary and permanent sewer system.

1.2. PRICE AND PAYMENT PROCEDURES

- A. All work related to work in this specification is considered subsidiary to other bid items. There is no separate pay item.

1.3. REFERENCES

- A. Standards
  - 1. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.
  - 2. American Society for Testing and Materials (ASTM)
    - a. F2164 (2021) – Standard Practice for Field Leak Testing of Polyethylene (PE) and Crosslinked Polyethylene (PEX) Pressure Piping Systems Using Hydrostatic Pressure
  - 3. American Water Works Association (AWWA)
    - a. M55 (2020) – PE Pipe Design and Installation

1.4. SUBMITTALS

- A. The Contractor or Bypass Firm Subcontractor shall prepare a specific, detailed description of the proposed pumping system(s) required for each location and submit it within two weeks following Notice to Proceed. No disruption of sewer service will be allowed until approval of the submittals specified herein.
- B. Submit detailed plans, scaled drawings, and descriptions of all provisions and precautions to be taken by the Contractor regarding the handling of existing wastewater flows in accordance with the submittal section. This plan must be specific and complete, including such items as schedules, locations, elevations, capacities of equipment, pump and drive control selection and design, monitoring and alarm systems, materials, and all other incidental items necessary and/or required to ensure proper protection of the facilities. The plan shall include but not be limited to details of the following:
  - 1. Staging areas for pumps.
  - 2. Sewer or structure plugging method and types of plugs.
  - 3. Number, size, material, location, and method of installation of suction piping.
  - 4. Number, size, material, method of installation and location of installation of discharge piping.

5. Bypass pump sizes, capacity, power requirements, and number of each pump to be on site
6. Motor control package design, including wiring diagrams, voltage and amperage requirements, control logic description.
7. Calculations for selection of bypass pumping pipe size.
8. Calculations of static lift, friction losses, and flow velocity, along with pump curves showing pump operating range, all demonstrating adequacy of the bypassing system and selected equipment.
9. Standby power provisions.
10. Thrust and restraint block sizes or mechanical restraints and locations as applicable.
11. Sections showing suction and discharge pipe depth, embedment, select fill and special backfill.
12. Any temporary pipe supports and anchoring required.
13. Design plans and access provisions to bypass pumping and generator fueling locations.
14. Sound Abatement Plan demonstrating compliance with local jurisdictional requirements for sound limitations. Include a copy of the applicable local jurisdictional requirement.
15. Schedule for installation and maintenance of bypass pumping lines.
16. Continuous monitoring and alarm plan, including Manufacturer's literature on the proposed low and high-water alarm system. Also indicate the proposed methods of installation and elevations for activation.
17. Operating plan.
18. Sewer Service Interruption Notification Plan.
19. Wastewater Emergency Response Plan.
  - a. Refer to 01 35 29.19 WASTEWATER EMERGENCY RESPONSE PLAN for requirements for the Wastewater Emergency Response Plan. The Wastewater Emergency Response Plan may be included as a part of the overall Temporary Bypass Pumping plan or as a separate document, but in either case shall be prepared and submitted concurrently.

C. Submit pressure test results of temporary bypass pipelines.

#### 1.5. QUALITY ASSURANCE

- A. The Contractor shall be or shall employ the services of a firm specializing in bypass pumping (Bypass Firm) who can demonstrate to the Engineer that it specializes in the design and operation of temporary bypass pumping systems. The Bypass Firm shall submit qualifications as specified in the Special Construction Provisions. The bypass system shall meet the requirements of all codes and regulatory agencies having jurisdiction.
- B. The design, installation, and operation of the temporary bypass pumping system shall be the Contractor's sole responsibility, subject to Engineer's approval as specified. The intent of the Engineer's review and approval is limited to confirming that the project requirements are being met, and for informational purposes and the coordination of Owner's continuing operations. The Contractor remains solely responsible for the means and methods necessary for successful implementation of bypassing systems.

#### 1.6. SEWER SERVICE INTERRUPTIONS

- A. If sanitary sewer service interruptions are proposed, the Contractor shall prepare and submit a Sewer Service Interruption Plan that describes proposed interruptions of sewer service to each affected customer.
- B. Update as necessary for the progress meetings and include the addresses of affected business/property owners and the estimated dates that sewer service will be interrupted.

- C. Submit Sewer Service Interruption Plan within 14 days of the effective date of the Notice to Proceed. Provide an updated Notification Schedule to maintain sewer service for adjacent or affected properties and businesses for weekly Contract meetings.
- D. Notification Plan and Schedule shall include:
  - 1. Address of affected property.
  - 2. Estimated dates of service interruption of affected property.
  - 3. Provide specific plans and special issues for maintaining sewer service, if applicable.
- E. Request and obtain written approval from the Engineer and the Owner before interrupting sewer service.
- F. Place door hangers to directly inform individual residents and business occupants at least 48 hours in advance of beginning the work to minimize or eliminate inconveniences to the public. Inform residents and business occupants of work which blocks the sewer service connections.
- G. Contractor's notifications regarding work performed shall be in such detail as to give the time of commencement and completion of the work.
- H. On the day that sewer service is interrupted, notify in person each resident or business occupant served by the sewer. The resident or occupant(s) shall be advised that sewer service will be interrupted and the occupant(s) are to refrain from discharge to the sewer. The notification shall provide the estimated time of service restoration. The Contractor shall maintain a record of the residences and businesses that were visited, the time of the visit, and whether or not personal contact was made with the occupant(s).
- I. Service interruptions shall not exceed a period of four (4) hours.

#### 1.7. EXISTING SEWER FLOW

- A. The Owner has not monitored the sections of pipe to be rehabilitated to estimate existing rates of flow. The Contractor may review inspection videos and examine the site to make observations of existing flows.
- B. The Contractor will be responsible for determining the existing sewer flows and the required bypass pumping capacity.

### PART 2 PRODUCTS

#### 2.1. DESIGN AND PERFORMANCE REQUIREMENTS

- A. The design, installation, and operation of the temporary pumping system shall be the Contractor's responsibility.
- B. Provide all necessary means to safely convey sewage past the work area. The Contractor will not be permitted to stop or impede the main flows under any circumstances without an approved service interruption plan.
- C. Maintain sewer flow around the work area in a manner that will not cause surcharging of or damage to sewers. For purposes of this section, surcharging of sewers is considered any depth above the 90% full in the sewer mains.
- D. Bypass systems shall have sufficient capacity for required flows. The Contractor shall provide all pumps of



adequate size to handle the full range of flow events plus 10% extra capacity, and temporary piping to ensure that the total flow can be safely diverted around the work area.

- E. Have adequate standby equipment available onsite and ready for immediate operation and use in the event of an emergency or breakdown.
- F. Provide means for controlling pump activation and pumping rates, and independent floats for low, high and higher-high water alarms.
- G. Carefully coordinate construction activities with data from local weather agencies and National Weather Service Forecasts to reduce the probability of high flows and/or surcharging from stormwater during construction.
- H. Take all necessary precautions including constant monitoring of bypass pumping and at a minimum monitor the manhole immediately upstream of the bypass lateral to ensure that no private residences or properties are subjected to a sewage backup or spill. The Contractor shall be liable for all cleanup, damages, and resultant fines in the event of a spill. After the work is completed, flow shall be restored.
- I. All engine generators and engine pump drives shall be equipped with mufflers and housed in sound attenuating enclosures to provide the highest level of sound reduction available for such systems and appropriate for use in residential neighborhoods.
- J. The bypass system shall meet the requirements of all codes and regulatory agencies having jurisdiction.
- K. Sewer Bypassing shall not damage property or create a nuisance or public menace. The pumped sewage shall be in an enclosed hose or pipe that is adequately protected from traffic and shall discharge into the sanitary sewer system. Dumping or free flow of sewage outside the sewer is prohibited. No wastewater shall be allowed to drain or stand in earthen sump pits.
- L. Protect water resources, wetlands, and other natural resources within the limits of construction or areas affected by its activities.

## 2.2. BYPASS EQUIPMENT

### A. Pumps

- 1. All pumps used shall be fully-automatic self-priming units in good working order that do not require the use of foot-valves or vacuum pumps in the priming system.
- 2. The pumps may be electric or diesel powered.
- 3. The Contractor shall pay all costs of energy required to operate the bypass system.
- 4. Provide a working pressure gauge on the discharge.
- 5. All pumps used must be constructed to handle low-flow events for long periods of time to accommodate the cyclical nature of the wastewater flows.
- 6. Provide the necessary stop/start and variable speed controls for each pump. The motor controls shall use a PLC-based or equivalent level control system with a submersible level transducer or ultrasonic sensor to initiate start and stop and rate signals to the motor controls.
- 7. For purposes of setting a standard, the pumps should be Godwin Dri-Prime pumps as manufactured by Xylem US, Inc., or approved equal.

### B. Manifold

- 1. Discharge manifold systems shall be constructed of high-density polyethylene (HDPE) as specified in

the paragraph below.

2. Each pump, including redundant pump(s), shall have a connection to the bypass pipeline manifold, and be isolated from the manifold with a shutoff valve and check valve.

### 2.3. BYPASS PIPELINES

#### A. Pipe

1. Temporary bypass pipelines and fittings shall consist of high density polyethylene (HDPE).
2. All joints shall be heat fused, completely watertight, and fully restrained against thrust.
3. The pipeline pressure rating shall be at least twice the maximum system pressure, or a minimum of 50 psi, whichever is greater.
4. Pipeline sizing shall be determined by the Contractor based on the anticipated flow rates. A velocity of at least 2.5 feet per second shall be attained at least once per day. Maximum pipe size shall be 18-inches. If additional capacity is required, provide parallel pipelines.

#### B. Air Valves

1. Combination air valves suitable for sewage service shall be provided at all high points along the bypass pipeline route.
2. Valves shall be connected via upward facing heat-fused taps or tees on the main.
3. Provide isolation ball valves between the main and the air valve.
4. Air valve discharges shall be routed with flexible hose to adjacent watertight buckets or plastic trash cans suitably weighted to prevent tipping in wind.
5. Buckets or trash cans shall be covered and protected from public access.
6. Valves shall be designed for wastewater service, as manufactured by A.R.I. Flow Control Accessories, Vent-O-Mat valves manufactured by RF Valves, or equal.

### 2.4. STANDBY EQUIPMENT

#### A. Provide the following standby equipment on-site, at a minimum:

1. Sufficient equipment and materials to ensure continuous and successful operation of the bypass and dewatering systems, even upon the event of failure of any primary equipment or material.
2. Sufficient valves, tees, elbows, connections, tools, sewer plugs, pipe repair sleeves, piping and other parts or system hardware to ensure immediate repair or modification of any part of the system.
3. A back-up pump / motor of the same capacity as the primary pump(s) shall be maintained on site at all times to be used in the event that the primary pump(s) fail. Back-up or standby means not normally used, including during periods of peak flow and during storm events.
  - a. For engine-driven pumps, provide a full standby engine-power unit on site.
  - b. For electric motor-driven pumps, provide a redundant standby generator.
4. A redundant control system, including level instruments and logic control units, or provide a full-time dedicated operator to monitor and control pumps manually until automated systems can be repaired.

#### B. Keep pumps and generators fueled and operational at all times.

#### C. Provide emergency sewage spill containment equipment, including containment booms, adsorbents, and disinfectants.

## PART 3 EXECUTION

### 3.1. INSTALLATION

- A. Contractor shall ensure that no damage will be caused to private property as a result of bypassing operations.
- B. Locate and operate pumping systems where they do not adversely impact or cause a menace to the public. When possible, locate engine drives away from homes or where homes are shielded from them by solid fencing materials to minimize noise nuisance to adjacent residents. Surround pumping systems with fencing to exclude the public or provide full-time personnel to monitor the equipment. Locations of pumping systems shall be submitted and approved by the Owner and Engineer.
- C. Construct watertight containment around pumping systems and manifolds to capture nuisance spills of wastewater or fuel. Containment may consist of plastic-covered earthen berms or sandbags and shall be at least 12 inches high on all sides. A layer of earth or adsorbent may be used within the containment area to manage spills, provided such material is properly and legally disposed after use.
- D. Alignment of bypass pipelines shall be determined by the Contractor and submitted for approval by the Engineer and Owner. Pipelines shall minimize or avoid disturbance to existing utilities, flatwork, and other existing improvements to the maximum extent practical. Alignment shall not impede traffic flow or use of sidewalks, trails, and bike paths. Access may be maintained using ramps or similar method to facilitate traffic over surface piping only upon the approval of the Engineer and authority having jurisdiction. Otherwise, crossings shall require burial, with flush steel plates or temporary asphalt provided at the crossing to facilitate access.
- E. Repair all damage that may result from installation and operation of bypass systems.
- F. Contractor shall not intentionally damage, alter, or remove portions of existing wastewater system structures for the purpose of installing a bypass pumping system without specific approval from the Engineer. If a structure is damaged, it shall be reconstructed or replaced to the satisfaction of the Engineer at no additional cost to the Owner.
- G. Plugs
  1. Whenever plugs are used, they shall be securely restrained against anticipated operating conditions.
  2. Plugs shall have multiple tie-off locations.
  3. Restraint and tie-off shall prevent escape of plug into adjoining sewers should plug fail.
  4. Any additional costs due to failed plugs, plugs that escape into adjoining sewers, etc. shall be sole responsibility of Contractor.

### 3.2. DEMONSTRATION TESTING

- A. Pressure and Leak Testing
  1. Pressure test all bypass and manifold piping using clean water prior to actual operation.
  2. Test in accordance with ASTM F2164 and AWWA M55.
  3. The test duration shall be four hours at a pressure of twice the design pressure or 50 psig, whichever is greater.
  4. Testing shall indicate zero leakage prior to acceptance.
- B. Full Scale Test
  1. Perform a full-scale test of the proposed sewer bypassing system, before the scheduled date of the actual need for sewer bypassing. Demonstrate that the proposed methods of sewer bypassing are fully functional, reliable, and capable of continuously diverting all flow to the pump station. Notify the Engineer at least 48 hours in advance of the date and time of the test.

2. Test duration: 4 hours during peak flows, generally between 7:00 am and noon Monday through Friday. Do not conduct the test on a Saturday, Sunday, or a holiday.
  3. The full-scale test shall be deemed to have failed if at any time during the test all wastewater flows are not accommodated for whatever reason and for whatever length of time.
  4. If the full-scale test fails, determine and correct the deficiencies that caused the test to fail and conduct another full-scale test.
  5. Full scale tests shall be performed until all wastewater flow is accommodated for the entire 4-hour time of the test.
- C. Do not begin bypassing until a successful full-scale test has been completed and the Engineer has given approval to proceed.

### 3.3. OPERATION AND MAINTENANCE

- A. Operate the bypass system continuously, twenty-four (24) hours per day, seven days a week. Full time on-site and experienced operator(s) shall be present any time bypass pump(s) are operating to monitor and adjust the operation to meet requirements of this section, such as adjust pump speed, valves, etc.; make repairs to the system; and report problems.
- B. High water alarm shall provide a dial-out notification with audio or text message to the Contractor's and the Owner's designated contact person. Contractor shall provide the name and contact information for the responsible individual, who shall be available for alarm telephone notification twenty-four (24) hours per day, seven days per week for the duration of the bypass pumping. The Owner shall provide the name and phone number for the Owner's designated responsible individual to the Contractor for use in the auto-dialer system.
- C. Protect the bypass system from damage throughout its use. The Contractor shall be responsible for mitigating and repairing all damage that results directly or indirectly from the interference of storm water runoff by bypassing equipment, piping, and/or appurtenances.
- D. Contractor shall provide all fuel and power for the temporary pumping facility. If needed, Contractor shall make arrangements for a power meter and pay all associated fees.
- E. Inspect the bypass pipeline every two hours to ensure that the system is meeting the requirements of this Section. Check water levels resulting from air valve discharge and empty containers into the sewer system as often as necessary.
- F. Spare equipment and materials shall be kept on site as specified. Adequate hoisting equipment and tools for each pump and accessories shall be maintained on the site to facilitate immediate maintenance and repairs.
- G. During bypass pumping, do not allow wastewater to be leaked, dumped, or spilled in or onto any area outside of the existing wastewater system.
- H. In the event of accidental spill or overflow, immediately stop the discharge and take action to clean up and disinfect the spill. Promptly notify the Engineer so that required reporting can be made to proper regulatory agencies by the Owner. Cleanup shall be in accordance with the approved Emergency Cleanup Plan. Contractor is responsible for any damages that may have occurred to public or private property including cleaning, disinfection, and other corrections to the satisfaction of the Engineer at no additional cost to the Owner. Contractor shall be responsible for fines imposed by regulatory agencies resulting from

spills.

- I. Where bypassing is needed to perform the Work, ensure that the location of connecting laterals and side sewers are identified and service is not disrupted, unless approved by the Engineer.
- J. Discharge all bypassed flow to downstream sewers that connect to the project sewers, as approved by the Engineer.
- K. No bypass discharge to the ground surface, receiving waters, or which results in groundwater contamination or potential health hazards shall be permitted.
- L. Monitor upstream and downstream manholes for flow backup and obstructions.
- M. Do not shut down the bypassing systems at any time, including between shifts, on holidays or weekends, or during work stoppages without permission from the Engineer.
- N. Install and maintain the bypass system within existing easements and public right-of-way. Where the work cannot be accomplished within the existing easements and right-of-way, the Contractor shall be responsible for identifying the additional area needed and coordinating with landowners to obtain its use.

#### 3.4. COMPLETION AND RESTORATION

- A. Contractor shall complete the Work as quickly as possible and satisfactorily pass all tests, inspections, and repair all deficiencies prior to discontinuing bypass pumping operations and returning flow to the permanent conveyance.
- B. When bypass pumping operations are complete, piping shall be drained and flushed clean into the sanitary sewer prior to disassembly.
- C. Repair any damage and restore areas affected by bypassing systems to pre-existing or better conditions, to the satisfaction of the Engineer, Owner, or agency having jurisdiction.

END OF SECTION

SECTION 01 57 00  
TEMPORARY CONTROLS

PART 1 GENERAL

1.1. SUMMARY

- A. Provide labor, materials, equipment, and incidentals necessary to construct temporary facilities to provide and maintain control over environmental conditions at the Site. Remove temporary facilities when no longer needed.
- B. Construct temporary impounding works, channels, diversions, furnishing and operation of pumps, installing piping and fittings, and other construction for control of conditions at the Site. Remove temporary controls at the end of the Project.
- C. Provide labor, materials, equipment, and incidentals necessary to prevent storm water pollution for the duration of the Project. Provide and maintain erosion and sediment control structures as required to prevent sediment and other pollutants from the Site from entering any storm water system, including open channels. Remove pollution control structures when no longer required to prevent storm water pollution.
- D. Cost for Temporary Controls as described in this Section and provided by Suppliers and Subcontractors as described in this Section are to be included in the Cost of Work.

1.2. REFERENCES

- A. Provide a storm water pollution prevention plan that complies with Local, State, and Federal requirements.
- B. Comply with all requirements of the North Carolina Department of Environmental Quality for storm water discharges from construction activities.

1.3. SUBMITTALS

- A. Provide copies of notices, records and reports required by the Contract Documents or regulations as Record Data.
- B. Provide documents requiring approval by the Owner or Engineer as Shop Drawings.

1.4. QUALITY ASSURANCE

- A. Construct and maintain temporary controls with adequate work quality using durable materials to provide effective environmental management systems meeting the requirements of the Contract Documents and requiring minimal maintenance that will disrupt construction activities while providing adequate protection of the environment.
- B. Periodically inspect systems to determine that they are meeting the requirements of the Contract Documents.

PART 2 PRODUCTS

## 2.1. MATERIALS

- A. Provide materials meeting regulatory requirements.

## PART 3 EXECUTION

### 3.1. STORM WATER POLLUTION CONTROL

- A. See Section 01 57 13

### 3.2. POLLUTION CONTROL

- A. Prevent the contamination of soil, water or atmosphere by the discharge of noxious substances from construction operations. Provide adequate measures to prevent the creation of noxious air-borne pollutants. Prevent dispersal of pollutants into the atmosphere. Do not dump or otherwise discharge noxious or harmful fluids into drains or sewers, nor allow noxious liquids to contaminate public waterways in any manner.
- B. Provide equipment and personnel and perform emergency measures necessary to contain any spillage.
  - 1. Contain chemicals in protective areas and do not dump on soil. Dispose of such materials at off-site locations in an acceptable manner.
  - 2. Excavate contaminated soil and dispose at an off-site location if contamination of the soil does occur. Fill resulting excavations with suitable backfill and compact to the density of the surrounding undisturbed soil.
  - 3. Provide documentation to the Owner which states the nature and strength of the contaminant, method of disposal, and the location of the disposal site.
  - 4. Comply with local, State and Federal regulations regarding the disposal of pollutants.
- C. Groundwater or run-off water which has come into contact with noxious chemicals, sludge, or sludge-contaminated soil is considered contaminated. Contaminated water must not be allowed to enter streams or water courses, leave the Site in a non-contained form or enter non-contaminated areas of the Site.
  - 1. Pump contaminated water to holding ponds constructed by the Contractor for this purpose, or discharge to areas on the interior of the Site, as designated by the Engineer.
  - 2. Construct temporary earthen dikes or take other precautions and measures as required to contain the contaminated water and pump to a designated storage area.
  - 3. Wash any equipment used for handling contaminated water or soil within contaminated areas three times with uncontaminated water prior to using such equipment in an uncontaminated area. Dispose of wash water used to wash such equipment as contaminated water.

### 3.3. EARTH CONTROL

- A. Remove excess soil, spoil materials and other earth not required for backfill at the time of generation. Control stockpiled materials to eliminate interference with Contractor and Owner's operations.
- B. Dispose of excess earth off the Site. Pay cost for disposal unless otherwise noted. Provide written approval by the property owner for all disposal on private property, and approval by the Owner if such disposal affects the use of Site or other easements.

### 3.4. MANAGEMENT OF WATER

- A. Manage water resulting from rains or ground water at the Site. Maintain trenches and excavations free of water at all times.
- B. Lower the water table in the construction area by acceptable means if necessary, to maintain a dry and workable condition at all times. Provide drains, sumps, casings, well points, and other water control devices as necessary to remove excess water.
- C. Provide continuous operation of water management actions. Maintain standby equipment to provide proper and continuous operation for water management.
- D. Ensure that water drainage does not damage adjacent property. Divert water into the same natural watercourse in which its headwaters are located, or another natural stream or waterway as approved by the Owner. Assume responsibility for the discharge of water from the Site.
- E. Remove the temporary construction and restore the Site in a manner acceptable to the Engineer and to match surrounding material at the conclusion of the Work.

### 3.5. CONSTRUCTING, MAINTAINING AND REMOVING TEMPORARY CONTROLS

- A. Construct temporary controls in accordance with regulatory requirements.
- B. Maintain controls in accordance with regulatory requirements where applicable, or in accordance with the requirements of the Contract Documents.
- C. Remove temporary control when no longer required, but before the Project is complete. Correct any damage or pollution that occurs as the result of removing controls before the point where they are no longer required.

END OF SECTION



SECTION 01 57 13  
TEMPORARY EROSION AND SEDIMENT CONTROL

PART 1 GENERAL

1.1. SUMMARY

- A. The work of this section consists of temporary measures for the control of erosion, sedimentation, and other pollutants during construction. Work includes installation of such measures in accordance with the Drawings and any permits for the project, maintenance during the contract period to assure proper function, and removal of temporary measures in coordination with installation of permanent erosion control measures.
- B. The Contractor shall provide and maintain adequate erosion control measures during all phases of construction to protect surface waters from run-off transporting eroded materials. The erosion control measures shall be inspected during and after each run-off event, with repairs being made and excess sediment removed as needed. The Contractor is responsible for preventing sediment from traveling off-site or to nearby water sources.
- C. The Contractor shall be responsible for following the sedimentation and erosion control plans and securing associated permits necessary to execute the work from the agencies having jurisdiction. Provide all needed coordination and payment of fees associated therewith.

1.2. PRICE AND PAYMENT PROCEDURES

- A. All work related to work in this specification is considered subsidiary to other bid items. There is no separate pay item.

1.3. REFERENCES

- A. Erosion control details and practices may be obtained from the "Erosion and Sediment Control Planning and Design Manual" from the North Carolina Sedimentation Control Commission or the "Erosion and Sediment Control Design and Construction Manual" by the North Carolina Department of Transportation.

1.4. SUBMITTALS

- A. Submit any proposed best management practices from referenced manuals, apart from the sedimentation and erosion control plans. In addition, the Contractor may submit details, sketches, and descriptions of other soil erosion and sediment control measures he wishes to utilize during construction (or modifications to the specified practices).
- B. Submit samples of all materials specified in this section and submittals demonstrating these materials meet the Specification requirements.

PART 2 PRODUCTS

2.1. CHANNEL SLOPES AND OTHER DISTURBED AREAS

- A. Materials for use as temporary measures include straw bales, loose mulch, mulch blankets, silt fence,

sod buffer strips, and other stabilization materials as described in the referenced manuals. Reference sedimentation and erosion control Drawings.

## 2.2. ACTIVE FLOWING STREAM OR DIVERSION:

- A. Material for use as temporary measures to stabilize the invert or toe of slope zone of a live stream or diversion channel include pipe, concrete rubble, riprap, plastic sheeting, synthetic erosion control matting or other functional material that is not hazardous to water quality., as described in the referenced manuals. Reference sedimentation and erosion control Drawings.

## 2.3. STORM SEWER OUTFALLS/POINT DISCHARGES

- A. Materials for temporary erosion control on slopes downstream of storm sewer or swale outfalls may be pipe, concrete rubble, riprap, cast-in-place concrete, plastic sheeting, synthetic erosion control matting or other functional material that is not hazardous to water quality, as described in the referenced manuals. Reference sedimentation and erosion control Drawings.

## PART 3 EXECUTION

### 3.1. GENERAL

- A. Procedures for installation, maintenance and removal of temporary erosion control measures shall generally conform to the guidelines contained in the manuals referenced above. The specific practices and measures to be implemented depend on the contractor's construction procedures, sequencing, and general approach to the project.

### 3.2. CONSTRUCTION IN WATERWAYS

- A. To the extent possible, movement of construction equipment within the flowing portion of channels or waterways shall be minimized. Frequent fording of the stream shall be avoided. Isolate or divert stream flows so construction equipment, materials and earthwork are not exposed (vulnerable) to flow. Reference sedimentation and erosion control Drawings.

### 3.3. TEMPORARY CONTROLS DURING SITE WORK

- A. All dewatering flows that carry sediment or other deleterious material shall not be directly introduced to existing drainage conveyances. Such flows shall be routed to a sediment basin(s) or trap(s) for treatment prior to discharge. The intent is to trap material disturbed by construction activities and prevent the discharge of this material into the stream. Sediment basins or traps shall be monitored and maintained no less than weekly (including removal of sediment and/or repair of basin dike or filter material) or whenever the basin fills with sediment to 50 percent of capacity.
- B. Properties and roadways adjacent to the site shall be protected from sediment deposition. This may be accomplished by leaving a sod buffer strip around the lower perimeter of the land disturbance, by installing perimeter controls such as sediment barriers, filters, or dikes, or by a combination of such measures.
- C. Construction ingress and egress routes shall be stabilized by rock or other means to prevent tracking sediment, mud, or debris onto adjacent thoroughfares. Promptly remove soil, sediment, or debris from paved roadways and keep them clean throughout the construction period.

- D. Sediment basins and traps, perimeter dikes, sediment barriers (such as straw bale barriers or silt fencing), and other measures intended to trap sediment on-site, must be constructed as a first step in grading and be made functional before upslope land disturbance takes place.
- E. Diversion channels must be stabilized against erosion by use of riprap or other measures.
- F. Roughened soil surfaces are preferred to smooth surfaces on slopes during initial grading operations. Diversion dikes or ditches shall be constructed at the top of long or steep slopes which have significant drainage areas above the slope. Diversions or terraces may also be used to reduce slope length.
- G. Concentrated storm water shall not be allowed to flow down cut or fill slopes unless contained within a stabilized temporary or permanent channel, flume or slope drain structure.
- H. Wherever a slope face crosses a water seepage plane which endangers the stability of the slope, adequate drainage or other protection shall be provided.
- I. All storm drain inlets within or near the site that are operable during construction shall be protected with filter fabric or a similar approach to remove sediment from stormwater runoff prior to entering the storm drain system.

#### 3.4. DUST ABATEMENT

- A. During the performance of the work required by these Specifications or of any operation appurtenant thereto, the Contractor shall furnish all the labor, equipment, materials and means required, and shall carry out proper and efficient measures whenever and as often as necessary to reduce the dust nuisance and to prevent dust which has originated from their operations from damaging dwellings or causing a nuisance to persons.
- B. The Contractor shall be liable for any damage resulting from dust originating from their operations under these Specifications. The cost of sprinkling or of other methods for dust control shall be included in the cost for erosion and sediment control.

#### 3.5. DISPOSITION OF TEMPORARY MEASURES

- A. Temporary erosion and sediment control measures can only be removed following inspection by NCDEQ. Once approved, all temporary erosion and sediment control measures shall be removed and disposed of as permanent measures are being installed. Both operations shall be coordinated to prevent erosion or other damage to the channel or finished grading. Trapped sediment or other disturbed soil areas shall be permanently stabilized to prevent further erosion and sedimentation.

END OF SECTION

SECTION 01 60 00  
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.1. SUMMARY

- A. Provide products for this Project that comply with the requirements of this section. Specific requirements of the detailed equipment specification govern in the case of a conflict with the requirements of this Section.
- B. Comply with applicable specifications and standards.

1.2. REFERENCES

- A. The applicable industry standards referenced in the Specifications shall apply as if written here in its entirety.
- B. Except where otherwise indicated, structural and miscellaneous fabricated steel used in items of equipment shall conform to the Standards of the American Institute of Steel Construction.

1.3. SUBMITTALS

- A. Provide the following Submittals:
  - 1. Certificates of Adequacy of Installation
  - 2. Equipment Installation Reports
  - 3. Other documentation as required by detailed equipment specifications.

1.4. QUALITY ASSURANCE

- A. Design Criteria
  - 1. Assume responsibility for the design of the products to include structural stability and operational capability.
  - 2. Design members to withstand all loads imposed by installation, erection, and operation of the product without deformation, failure, or adversely affecting the operational requirements of the product. Size and strength of materials for structural members are specified as minimums only.
  - 3. Design mechanical and electrical components for all loads, currents, stresses, and wear imposed by start-up and normal operations of the equipment without deformation, failure, or adversely affecting the operation of the unit. Mechanical and electrical components specified for equipment are specified as the minimum acceptable for the equipment.
- B. Coordination
  - 1. Provide coordination of the entire Project, including verification that structures, piping, and equipment components to be furnished and installed for this Project are compatible.
  - 2. Determine that the equipment furnished for this Project is compatible with the Contract Document requirements and with the equipment and materials furnished by others.
  - 3. Electrical components provided for equipment shall comply with all provisions of the Contract Documents.
  - 4. Protective coatings and paints applied to equipment shall be fully compatible with the final coatings to be field applied in accordance with the Contract Documents.

C. Adaptation of Equipment

1. Drawings and Specifications are prepared for the specified products. Make modifications to incorporate the products into the Project at no cost to the Owner, if a substitution for a product is requested and approved in accordance with Section 01 31 00 "Project Management and Coordination."
2. Do not provide a product with a physical size that exceeds the available space. Consideration may be given to the acceptance of these products or equipment if the Contractor assumes all costs necessary to incorporate the item and the Engineer approves such revisions.
3. Coordinate electrical requirements for the products to be installed in the Project, including revisions in electrical equipment components wiring and other factors necessary to incorporate the component.

1.5. GUARANTEES AND WARRANTIES

- A. Guarantee and or Warranty products furnished by the Contractor under this Contract against:
1. Faulty or inadequate design.
  2. Improper assembly or erection.
  3. Defective workmanship or materials.
  4. Leakage, breakage, or other failure.
- B. Guarantee and or Warranty the products installed under this Contract, including products furnished by the Owner, against leakage, breakage, or other failure due to improper assembly or erection and against improper installation of the equipment. The guarantee and or warranty period shall be as defined in the General Conditions. Individual specification sections may have more stringent warranty requirements than stated in the General Conditions. The most stringent warranty will be required in the event of any difference in the two aforementioned locations.

PART 2 PRODUCTS

2.1. MATERIALS

- A. Design, fabricate, assemble, deliver and install according to normally accepted engineering and shop practices, except where a higher standard of quality is required by the Contract Documents.
- B. Manufacture like parts of duplicate units to standard sizes and gages. Like parts are to be interchangeable.
- C. Two or more items of the same kind are to be identical and made by the same Supplier.
- D. Provide products suitable for the intended service.
- E. Adhere to the equipment capacities, sizes, and dimensions indicated by the Contract Documents.
- F. Do not use products for any purpose other than that for which it is designed.
- G. Provide new products unless previously used products are specifically allowed in the Contract Documents.
- H. Equipment shall not have been in service at any time prior to delivery, except as required by tests.

- I. Materials shall be suitable for service conditions.
- J. Iron castings shall be tough, close-grained gray iron free from blowholes, flaws, or excessive shrinkage and shall conform to ASTM A48.
- K. Structural members shall be considered as subject to shock or vibratory loads.
- L. Unless otherwise indicated, steel which will be submerged, all or in part, during normal operation of the equipment shall be at least 1/4-inch thick. All edges are to be chamfered to preclude any sharp exposed edges.

## 2.2. EQUIPMENT APPURTENANCES

- A. Cover belt or chain drives, fan blades, couplings, and other moving or rotating parts on all sides by a safety guard.
  - 1. Fabricate safety guards from 16 gauge or heavier galvanized or aluminum-clad sheet steel or 1/2-inch mesh galvanized expanded metal.
  - 2. Design guards for easy installation and removal.
  - 3. Provide galvanized supports and accessories for each guard.
  - 4. Provide stainless steel bolts and hardware.
  - 5. Provide safety guards in outdoor locations designed to prevent the entrance of rain and dripping water.

## 2.3. ANCHOR BOLTS

- A. Provide suitable anchor bolts for each product.
- B. Provide anchor bolts, with templates or setting drawings, sufficiently early to permit setting the anchor bolts when the structural concrete is placed.
- C. Provide two nuts for each bolt.
- D. Provide anchor bolts for products mounted on baseplates that are long enough to permit 1- 1/2 inches of grout beneath the baseplate and to provide adequate anchorage into structural concrete.
- E. Provide stainless steel anchor bolts, nuts, and washers.

## 2.4. SPECIAL TOOLS AND ACCESSORIES

- A. Furnish tools, instruments, lifting and handling devices, and accessories necessary for proper maintenance and adjustment that are available only from the Product Vendor or are not commonly available.

## 2.5. LUBRICATION SYSTEMS FOR EQUIPMENT

- A. Provide equipment lubricated by systems which:
  - 1. Require attention no more frequently than weekly during continuous operation.
  - 2. Do not require attention during start up or shut down.
  - 3. Do not waste lubricants.
- B. Provide lubricants to fill lubricant reservoirs and to replace lubricant consumed during testing, start

up, and operation prior to acceptance of equipment by the Owner.

## 2.6. INSULATION OF PIPING

- A. Insulate all piping on or related to equipment as required to prevent freezing under any condition. Insulate piping per the Supplier's written instruction.

## PART 3 EXECUTION

### 3.1. INSTALLATION

- A. Install equipment including equipment pre-selected or furnished by the Owner. Assume responsibility for proper installation, start-up and making the necessary adjustments so that the equipment is placed in proper operating condition per Section 01 75 00 "Starting and Adjusting."

### 3.2. LUBRICATION

- A. Lubricate all products provided or installed for this Project, including products furnished by the Owner, per the Supplier's written recommendations until the product is accepted by the Owner.

END OF SECTION

SECTION 01 70 00  
EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.1. SUMMARY

- A. Comply with requirements of the General Conditions and specified administrative procedures in closing out the Construction Contract.

1.2. SUBMITTALS

- A. Submit affidavits and releases on forms provided by the Engineer or as otherwise agreed to.

1.3. SUBSTANTIAL COMPLETION

- A. Submit written notification that the Work or designated portion of the Work is substantially complete to the Engineer when the Work is considered to be substantially complete per the General Conditions. Include a list of the items remaining to be completed or corrected before the Project will be considered to be complete.
- B. Engineer and City Inspector shall visit the Site to observe the Work within a reasonable time after notification is received to determine the status of completion.
- C. Engineer shall issue notification to the Contractor that the Work is either substantially complete or that additional Work must be performed before the Project may be considered substantially complete.
1. Engineer shall notify the Contractor in writing of items that must be completed before the Project can be considered substantially complete.
    - a. Contractor shall correct the noted deficiencies in the Work.
    - b. Issue a second written notice with a revised list of deficiencies when Work has been completed.
    - c. Engineer shall revisit the Site and the procedure shall begin again.
  2. Engineer shall issue a Certificate of Substantial Completion to the Owner when the Project is considered to be substantially complete. Certificate shall include a tentative list of items to be corrected before final payment.
    - a. Owner will review and revise the list of items and notify the Engineer of any objections or other items that are to be included in the list.
    - b. Engineer shall prepare and send to the Contractor a definite Certificate of Substantial Completion with a revised tentative list of items to be corrected or completed.
    - c. Review the list and notify the Engineer in writing of any objections within 10 days of receipt of the Certificate of Substantial Completion.

1.4. FINAL INSPECTION

- A. Submit written certification in the form provided by the Engineer when the Project is complete and:
1. Contract Documents have been reviewed.
  2. Work has been completed in compliance with the Contract Documents.
  3. Equipment and systems have been tested per Contract Documents and are fully operational.
  4. Final Operations and Maintenance Manuals have been provided to the Owner and all operator



- training has been completed.
- 5. Specified spare parts and special tools have been provided.
- 6. Work is complete and ready for final inspection.

- B. Engineer shall inspect with the Owner and appropriate regulatory agencies to determine the status of completeness within a reasonable time after the receipt of the Certificate.
- C. Engineer shall issue notice that the Project is complete or notify the Contractor that Work is not complete or is defective.
  - 1. Submit the request for final payment with Closeout submittals if notified that the Project is complete, and the Work is acceptable.
  - 2. Upon receipt of notification from the Engineer that Work is incomplete or defective, take immediate steps to remedy the stated deficiencies. Send a second certification to the Engineer when Work has been completed or corrected.
  - 3. Engineer shall re-visit the Site and the procedure will begin again.

#### 1.5. REINSPECTION FEES

- A. Pay fees to the Owner to compensate the Engineer for reinspection of the Work required by the failure of the Work to comply with the claims of status of completion made by the Contractor.
- B. Owner may withhold the amount of these fees from the Contractor's final payment.
- C. Cost for additional inspections will be billed to the Owner by the Engineer for the actual hours required for the reinspection and preparation of related reports in accordance with the rates provided in the Supplemental Conditions.

#### 1.6. CLOSEOUT SUBMITTALS TO THE ENGINEER

- A. Project Record Drawings
- B. Keys and keying schedule.
- C. Warranties and bonds.
- D. Evidence of payment or release of liens on the forms provided by the Engineer and as required by the General Conditions.
- E. Consent from Surety to Final Payment.
- F. Equipment installation reports on equipment.
- G. Shop drawings, record data, Operations and Maintenance Manuals, and other submittals as required by the Contract Documents.
- H. Specified spare parts and special tools.
- I. Certificates of Occupancy, operating certificates, or other similar releases required to allow the Owner unrestricted use of the Work and access to services and utilities.
- J. Evidence of final, continuing insurance, and bond coverage as required by the Contract Documents.

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### 1.7. FINAL APPLICATION FOR PAYMENT REQUEST

- A. Submit a preliminary final Application for Payment. This application is to include adjustments to the Contract Amount for:
  - 1. Approved Change Orders.
  - 2. Allowances not previously adjusted by Change Order.
  - 3. Unit prices.
  - 4. Deductions for defective Work that has been accepted by the Owner.
  - 5. Penalties and bonuses.
  - 6. Deductions for liquidated damages.
  - 7. Deductions for reinspection payments
  - 8. Other adjustments.
- B. Engineer shall prepare a final Change Order, reflecting the approved adjustments to the contract amount which have not been covered by previously approved Change Orders.
- C. Submit the final Application for Payment per the General Conditions, including the final Change Order.

### 1.8. WARRANTIES, BONDS, AND SERVICES AGREEMENTS

- A. Provide warranties, bonds, and service agreements required by Section 01 33 00 "Submittal Procedures" or by the individual sections of the Specifications.
- B. The date for the start of warranties, bonds, and service agreements is established per the General Conditions.
- C. Compile warranties, bonds, and service agreements and review these documents for compliance with the Contract Documents.
  - 1. Each document is to be signed by the respective Supplier or Subcontractor.
  - 2. Each document is to include:
    - a. The product or Work item description.
    - b. The firm, with the name of the principal, address, and telephone number.
    - c. Scope of warranty, bond or services agreement.
    - d. Date, duration, and expiration date for each warranty bond and service agreement.
    - e. Procedures to be followed in the event of a failure.
    - f. Specific instances that might invalidate the warranty or bond.
- D. Submit three (3) hard copies and one (1) digital copy on a USB flash drive of each document to the Engineer for review and transmittal to the Owner.
  - 1. Documents are to be formatted for 8-1/2 x 11 paper, with hard copies punched for a standard three-ring binder.
  - 2. Submit each hard copy set in a commercial quality three-ring binder with a durable and cleanable plastic cover. The title "Warranties, Bonds, and Services Agreements", the Project name and the name of the Contractor are to be typed and affixed to the cover.
- E. Submit warranties, bonds and services agreements:
  - 1. At the time of final completion and before final payment.
  - 2. Within 10 days after inspection and acceptance for equipment or components placed in service during the progress of construction.

1.9. CLAIMS AND DISPUTES

- A. Claims and disputes must be resolved prior to recommendations of final Application for Payment. Acceptance and final payment by the Contractor will indicate that any outstanding claims or disputed issues have been resolved to the full satisfaction of the Contractor.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01 71 23  
FIELD ENGINEERING

PART 1 GENERAL

1.1. SUMMARY

- A. Contractor shall provide necessary field surveying and engineering services required for construction of the Project. Such work shall include survey work to transfer lines and levels and to locate and lay out all improvements, structures, and controlling lines for the Work. Also included are such services as are specified or required to execute Contractor's construction methods.

1.2. PRICE AND PAYMENT PROCEDURES

- A. Survey controls and other survey and field engineering items shall be considered subsidiary to the work as a whole.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1. CONTRACTOR'S FIELD ENGINEER

- A. 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 include, but are not limited to, the following:
1. Daily reports of Project activity shall be uploaded by the end of the month that are related to work in the monthly application with all pertinent information pertaining to the Project as follows:
    - a. Numbers of employees.
    - b. Subcontractor employees.
    - c. Breakdown of employees by trade.
    - d. Major equipment and materials installed.
    - e. Major construction equipment utilized.
    - f. Location of all areas in which construction was done.
    - g. Materials and equipment received.
  2. Work performed:
    - a. Provide all surveying equipment required including transit, level, stakes and required surveying accessories.
    - b. Furnish all required lines and grades for construction. Check all formwork, reinforcing, inserts, structural steel, bolts, sleeves, piping, and other materials and equipment.
    - c. Maintain field office files and drawings, record drawings, and coordinate engineering services with Subcontractors. Prepare layout and coordination drawings for construction operations.
    - d. Check and coordinate Work for conflicts and interferences and immediately advise Owner of all discrepancies noted.
    - e. Cooperate with Owner in field inspections as required.

3.2. CONSTRUCTION STAKING

- A. Engineer's Responsibility
1. Engineer will provide project control and benchmark information to Contractor from pre-

performed design survey information.

B. Contractor's Responsibility

1. At the beginning of work, Contractor shall provide construction staking delineating the Project as to line and grade using benchmark information provided by Owner. Construction staking to be performed to construct new well and install pipelines and appurtenances at the horizontal locations and profile elevations shown on the plans.
2. The Contractor shall hire a licensed surveyor, at his expense, for field staking and any other surveying requirements pertinent to the Work.
3. Well in advance of construction, provide surveys as required to verify location of new well, pipeline profile, minimum depth of installation, clearance at crossing utilities and structure, and for other purposes.
4. Notify Owner of discrepancies and concerns in writing at least 3 weeks in advance of Work, and as much in advance of construction operations as required to request, coordinate, address and effect field changes where required.
5. Indicate utility locations, from survey data, on the Pipeline Layout Drawings.
6. Transfer of data from Construction stakes to the Work in terms of locations, elevation, line, and grade.
7. When construction stakes and benchmarks have been set, the preservation of such as to position, elevation, and marking shall remain as the responsibility of the Contractor. Should any of the original stakes or benchmarks be destroyed by the Contractor's operations, or by any other non-Owner related third parties or means whatsoever, replacement/reestablishment of same will be at Contractor's expense.
8. Submit documentation of calibration of all survey equipment used on this project. Equipment shall be calibrated just prior to use on this project and re-calibrated as required or requested.

C. Pipelines

1. As a minimum, the following standards shall be used in establishing construction stakes for the Work:
  - a. Construction stakes shall consist of a single line of stakes spaced at minimum 25-foot intervals and at special features with guard laths or stakes showing the stationing, offset, and cut to top of pipe (where applicable). Contractor shall maintain the construction stakes during the Work and replace any stakes that are removed or damaged.
  - b. Labels shall be provided on laths with permanent marker made for such purposes.
  - c. Staking shall also be provided at confirmed utility crossings and updated throughout the project as utility information and locations are updated.
2. Laser Leveling Equipment
  - a. The use of laser leveling equipment for vertical control of recycled water mains, potable water mains, and sanitary sewers shall be permitted provided the Contractor makes available to the Owner's Representative when requested, a level and rod of sufficient sensitivity to accurately determine differences in elevation between points 300 feet apart with one instrument setup.

D. Field Measurements

1. Perform complete field measurements of the dimensions at the site for products required to fit existing conditions prior to purchasing products affected by that measurement or beginning construction.
2. Verify property lines, control lines, grades, and levels indicated on the drawings.

3. Verify pipe class, equipment capacities, existing electrical systems and power sources for existing conditions.
4. Check shop drawings and indicate the actual dimensions available where products are to be installed.
5. The alignment of pipelines may be changed due to unanticipated variations in existing conditions with written approval of the Consultant.

END OF SECTION

SECTION 01 74 00  
WARRANTIES AND BONDS

PART 1 GENERAL

1.1. SUMMARY

- A. This Section describes submittal requirements related to bonds and warranties to be provided by the Contractor.

1.2. SUBMITTALS

- A. Assemble warranties, bonds, and service and maintenance contracts, executed by each of the respective manufacturers, suppliers, and subcontractors.
- B. Number of original signed hard copies required: three (2) each; and a digital copy on a USB flash drive.
- C. Table of Contents: Neatly typed, in orderly sequence. Provide complete information for each item.
1. Product of work item.
  2. Firm, with name of principal, address, and telephone number.
  3. Scope.
  4. Date of beginning of warranty, bond or service and maintenance contract.
  5. Duration of warranty, bond, or service maintenance contract.
  6. Provide information for Owner's personnel:
    - a. Proper procedure in case of failure.
    - b. Instances which might affect the validity or warranty or bond.
  7. Contractor, name of responsible principal, address, and telephone number.
- D. Hard Copy Format:
1. Size 8-1/2 inches by 11 inches, punch sheets for standard three (3) ring binder.
    - a. Fold larger sheets to fit into binders.
  2. Cover: Identify each packet with typed or printed title "WARRANTIES AND BONDS". List:
    - a. Title of Project.
    - b. Name of Contractor.
- E. Binders:
1. Commercial quality, three (3) D-ring type binders with durable and cleanable white plastic covers and maximum D-ring width of two (2) inches. Binders shall be presentation type with clear vinyl covers on front, back, and spine. Binders shall include two sheet lifters and two horizontal inside pockets.
- F. For all major pieces of equipment, submit a warranty from the equipment manufacturer. The term "major piece of equipment" shall be defined as any equipment or system having a list price of \$1,000 or more. Unless specified otherwise in the detailed equipment specification sections each warranty shall cover a period of twenty-four (24) months beginning at the time the equipment is placed into service and used by the Owner. The Owner shall incur no labor or equipment cost during the warranty period.
- G. The equipment warranty described above is in separate from to the warranty provided by the Contractor under the General Conditions.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION



SECTION 01 75 00  
STARTING AND ADJUSTING

PART 1 GENERAL

1.1. SUMMARY

- A. This section includes the general requirements for in-place testing of individual pieces of equipment and systems, startup of unit processes, and startup of the entire facility to demonstrate the intended overall functionality. Additional testing and startup requirements may be included in individual specification sections and shall be required in addition to the requirements below.
- B. Provide step-by-step procedures for starting provided systems, including equipment, pumps, and processes.
- C. Provide pre-start up inspections by equipment manufacturers.
- D. Provide instruction and demonstration of operation, adjustment, and maintenance of each system and the component parts.
- E. Place each system in service and operate the system to prove performance and to provide for initial correction of defects in workmanship, calibration, and operation.
- F. Provide for initial maintenance and operation.
- G. Cost for Starting and Adjusting provided by Suppliers and Subcontractors as described in this section are to be included in the Cost of Work.

1.2. REFERENCES

- A. Comply with any standards associated with the testing or startup of equipment, as listed in the various sections of the Specifications.

1.3. SUBMITTALS

- A. Submittals shall include:
  - 1. A Plan of Action for testing, checking, and starting major equipment and process piping systems in coordination with the equipment manufacturer.
  - 2. Equipment Installation Reports on the form provided by the Engineer, or otherwise agreed to.
  - 3. Operation and Maintenance Manuals per Section 01 78 23 "Operation and Maintenance Data."

PART 2 PRODUCTS

2.1. TESTING INSTRUMENTATION

- A. Furnish any instrumentation or other testing devices needed to conduct tests.

PART 3 EXECUTION

3.1. GENERAL

- A. Facility Startup Meetings: Schedule facility startup meetings with Owner, Engineer and other stakeholders as appropriate to discuss test schedule, test methods, materials, chemicals and liquids required, facilities operations interface, involvement of other prime contractors on site, and Owner involvement.
- B. Contractor's Testing and Startup Representative:
  1. Designate and furnish one or more personnel to coordinate and expedite testing and facility startup.
  2. Representative(s) shall be present during startup meetings and shall be available at all times during testing and startup.
- C. Provide temporary valves, gauges, piping, test equipment, piping plugs, and other materials and equipment required for testing and startup.
- D. Schedule personnel, subcontractor personnel and equipment manufacturers' representatives as appropriate to ensure that all necessary personnel are available and prepared at the designated times to prevent delays. Schedule ongoing work so as not to interfere with or delay testing and startup.
- E. Owner will:
  1. Furnish assistance of manufacturer's representative(s) for Owner-furnished products.
  2. Make available spare parts, special tools, and operation and maintenance information for Owner-furnished products.

### 3.2. STARTUP AND PERFORMANCE DEMONSTRATION PLAN OF ACTION

- A. Develop a written plan, in conjunction with the Engineer and Owner's operations personnel; to include the following:
  1. Step-by-step instructions for startup of each unit process and the complete facility.
  2. Unit Process Startup Plan, to minimally include the following:
    - a. Description of the unit process, including equipment numbers/nomenclature of each item of equipment and all included devices.
    - b. Detailed procedure for startup of the unit process, including valves and gates to be opened/closed, order of equipment startup, etc.
    - c. Startup requirements for each unit process, including water, power, chemicals, etc., and requirements for other instrumentation, equipment or systems to be in operation prior to startup. Also include requirements related to involvement of work being installed by another prime contractor.
    - d. Operation in hours or days to demonstrate proper operation.
    - e. Space for evaluation comments.
  3. Facility Performance Demonstration/Certification, to minimally include the following:
    - a. Description of unit processes included in the facility startup.
    - b. Sequence of unit process startup to achieve facility startup.
    - c. Description of computerized operations, if any, included in the facility.
    - d. Contractor certification facility is capable of performing its intended function(s), including fully automatic operation.
  4. Overall schedule for facility startup process.

### 3.3. SERVICES OF SUPPLIER'S REPRESENTATIVES

- A. The Supplier's representative for inspection, supervision of installation, and training must be an

experienced and competent technical (not sales) representative of the Manufacturer or Supplier.

- B. Perform installation, adjustment, and testing of the equipment under the direct supervision of the Supplier's representative where specified.
- C. The Supplier's representative is to instruct the Owner or his authorized personnel on operational procedures and maintenance requirements.
- D. Include the cost of the services of the Supplier's representative in the equipment price.

#### 3.4. INSPECTION AND START UP

- A. Inspect equipment prior to placing any equipment or system into operation. Make adjustments as necessary for proper operation.
  - 1. Check for adequate and proper lubrication.
  - 2. Determine that parts or components are free from undue stress from structural members, piping or anchorage.
  - 3. Adjust equipment for proper balance and operations.
  - 4. Determine that vibrations are within acceptable limits.
  - 5. Determine that equipment operates properly under full load conditions.
  - 6. Determine that the equipment is in true alignment.
- B. The Supplier's representative must be present when the equipment is placed in operation.
  - 1. The Representative is to be on-site as indicated in the individual product specification sections, and as often as necessary for proper and trouble-free operation.
  - 2. Ensure that the proper procedure is employed in startup of systems.
- C. Provide Equipment Installation Reports for Equipment on a form acceptable to the Engineer.
  - 1. Manufacturer must provide certification that installed equipment and related appurtenances have been thoroughly examined and approved for start-up and operation.
  - 2. Manufacturer certification of the equipment shall be witnessed by the Engineer and/or Owner.
  - 3. Include the date when Owner's personnel were instructed in the proper operation and maintenance of the equipment in the report.
- D. Do not start or test any apparatus until the complete unit has been installed, thoroughly checked, and subsequently certified by the Supplier's representative.
- E. A representative of the Supplier shall be in attendance of tests and start-up procedures when required by these Specifications.

#### 3.5. STARTING REQUIREMENTS

- A. Refer to the individual sections of the specifications for specific start up procedures.

#### 3.6. INITIAL OPERATION

- A. When, in the opinion of Engineer and Owner, startup of all unit processes has been satisfactorily achieved, sequence each unit process to the point that facility is fully operational. Under no circumstances will the Project be considered substantially complete until full function facility performance has been demonstrated as determined by the Engineer and Owner.

- B. Start, test, and place equipment and systems into operation for 30 days to allow the Owner and Engineer to observe the operation and overall performance of the equipment and to determine that controls function as intended.
- C. Equipment which operates on a limited or part-time basis shall be operated in the presence of the Owner and Engineer to demonstrate that controls function as specified.
- D. Perform acceptance test as specified in individual specification sections. Demonstrate that equipment and systems meet the specified performance criteria.
- E. Unless specifically stated otherwise in the individual equipment specifications, equipment and systems are not substantially complete until the end of this initial operation period. If an exception to this requirement is specifically noted in an individual equipment specification, the exception shall only apply to that particular piece of equipment and not to the remaining components provided under the Project.

### 3.7. OPERATOR TRAINING

- A. Provide instruction and demonstration of the care and operation of the equipment to the Owner's personnel for minimum times specified in individual product specification sections. Instruction is to include classroom and hands-on training.
- B. Provide training in adequate detail to ensure that the trainees who complete the program will be qualified and capable of operating and maintaining the equipment, products, and systems provided.
- C. Operations Training is to include but not be limited to:
  - 1. Orientation to provide an overview of system/subsystem configuration and operation.
  - 2. Terminology, nomenclature, and display symbols.
  - 3. Operations theory.
  - 4. Equipment appearance, functions, concepts, and operation.
  - 5. Operating modes, practices and procedures under normal, diminished, and emergency conditions.
  - 6. Start-up and shutdown procedures.
  - 7. Safety Precautions.
  - 8. On-the-job operating experience for monitoring functions, supervisory, or command activities. Include functions and activities associated with diminished operating modes, failure recognition, and responses to system/subsystem and recovery procedures.
  - 9. Content and use of Operation and Maintenance manuals and related reference materials.
- D. Provide training for performing on-site routine, preventive, and remedial maintenance of the equipment, product, or system. Maintenance training is to include but not be limited to:
  - 1. Orientation to provide an overview of system/subsystem concept, configuration, and operation.
  - 2. Operations theory and interfaces.
  - 3. Instructions necessary to ensure a basic theoretical and practical understanding of equipment appearance, layout and functions.
  - 4. Safety precautions.
  - 5. Use of standard and special tools and test equipment.
  - 6. Adjustment, calibration, and use of related test equipment.
  - 7. Detailed preventive maintenance activities.
  - 8. Troubleshooting, diagnostics, and testing.

9. Equipment assembly and disassembly.
  10. Repair and parts replacement.
  11. Parts ordering practices and storage.
  12. Failure and recovery procedures.
  13. Cabling and/or interface connectors.
  14. Content and use of Operation and Maintenance manuals and related reference materials.
  15. Procedures for warranty repairs.
  16. Lubrication.
  17. Procedures, practices, documentation, and materials required to commence system maintenance.
- E. Provide a training plan that indicates the schedule and sequence of the training programs. The training plan is to include for each course:
1. Number of hours for the course.
  2. Agenda and narrative description, including the defined objectives for each lesson.
  3. Draft copy of training handbooks.
  4. A descriptive listing of suggested reference publications.
  5. Audio-visual equipment required for training.
  6. Type and number of tools or test equipment required for each training session.
- F. Provide and use training aids to complement the instruction and enhance learning.
1. Provide training handbooks for use in both the classroom and the hands-on phases of training for each course.
  2. Instructional materials shall include references to the Operation and Maintenance Manuals and identify and explain the use of the manual.
  3. Provide a copy of all audio/visual training materials used in the presentations.
- G. Provide qualified instructors to conduct the training.
1. Instructors must have knowledge of the theory of operation and practical experience with the equipment, product, or system.
  2. Instructors must have successfully conducted similar training courses.
- H. Schedule for training is to be approved by Owner.
1. Schedule training and start-up operations for no more than one piece of equipment or system at a time.
  2. Owner may require re-scheduling of training if operations personnel are not available for training on a scheduled date.
  3. Provide a minimum of 2 weeks' notice if training must be rescheduled.
  4. Time required for training is to be considered in the development of the Project schedule.
  5. Manufacturer's Training Schedule shall be coordinated with and approved by the Owner, incorporating the information incorporated in the individual technical specification sections and the date/time restrictions necessary to capture staff training from all shifts.
- I. Schedule and coordinate training for equipment, products, or systems which depend upon other equipment or systems for proper operation so that trainees can be made familiar with the operation and maintenance of the entire operating system.
- J. Conduct a training course for the equipment products and systems provided for the Project. Training is to be adequate to meet the training objectives described above. Details for training will be

established in the project specifications for that equipment. Cost for training and startup will be included in the Cost of Work for each equipment package.

### 3.8. INITIAL MAINTENANCE

- A. Maintain equipment until the Project is accepted by the Owner.
  - 1. Ensure that mechanical equipment is properly greased, oiled, or otherwise cared for as recommended by the Supplier.
  
- B. Service equipment per the Supplier's instructions immediately before releasing the equipment to the Owner.
  - 1. Replace replaceable filters and clean permanent filters associated with air handling units or other packaged equipment.
  - 2. Remove and clean screens at strainers in piping systems.
  - 3. Clean insects from intake louver screens.

END OF SECTION

SECTION 01 78 23  
OPERATION AND MAINTENANCE DATA

PART 1 GENERAL

1.1. SUMMARY

- A. Prepare a complete and detailed Operation and Maintenance Manual for each type and model of equipment or product furnished and installed under this Contract in accordance with this section and the relevant technical specification sections.
- B. Prepare the manuals in the form of an instruction manual for the Owner. The manual is to be suitable for use in providing operation and maintenance instruction as required by Section 01 75 00 STARTING AND ADJUSTING.
- C. Provide complete and detailed information specifically for the products or systems provided for this Project. Include the information required to operate and maintain the product or system.
- D. Manuals are to be in addition to any information packed with or attached to the product when delivered. This information is to be taken from the product and provided as an attachment to the manual.
- E. Cost for O&M Manuals provided by Contractor, Suppliers and Subcontractors as described in this section are to be included in the Cost of Work.

1.2. SUBMITTALS

- A. Submit in accordance with Section 01 33 00 SUBMITTAL PROCEDURES manuals including the following:
  - 1. Operation and Maintenance manuals (O&M) for all equipment, mechanical devices, or components described in the Contract Documents. Include copies of approved Shop Drawings in the manual.
  - 2. Data provided by the manufacturer, or the system provider, including manufacturer's help and product line documentation, necessary to maintain and install equipment, for operating and maintenance use by facility personnel.
  - 3. Data required by operating and maintenance personnel for the safe and efficient operation, maintenance and repair of the item.
  - 4. Data incorporated in an operations and maintenance manual or control system.
  - 5. Copies of the Manufacturer's warranties, guarantees, or service agreements

PART 2 PRODUCTS

2.1. MATERIALS

- A. Print manuals on heavy, first quality paper.
  - 1. In general, print manuals on 8-1/2 x 11 paper.
    - a. Reduce drawings and diagrams to 8-1/2 x 11 paper size, if practical.
    - b. When reduction is not practical, fold drawings and place each separately in a clear, super heavy weight, top loading polypropylene sheet protector designed for ring binder use. Provide a typed identification label on each sheet protector.
  - 2. Punch paper for standard three-ring binders.

- B. Place manuals in heavy duty, highest quality D-Ring Presentation Binders.
  - 1. Binders are to have clear front, back, and spine covers.
  - 2. Sheet lifters are to be provided.
  - 3. Maximum size is 3-inch capacity.
- C. Provide tab indexes for each section of the manual.
  - 1. Indexes are to be constructed of heavy-duty paper with a reinforced binding edge and punched with 9/32-inch holes to fit the binders.
  - 2. Index is to have clear insertable tabs for a typed insert.

## 2.2. ELECTRONIC MANUAL FORMAT

- A. Manual contents to be provided on a USB flash drive.
- B. Provide individual electronic files for each manual.
  - 1. Acceptable file types for written documents are Portable Document File (PDF) or Microsoft Word formats. Acceptable file types for drawing files are PDF format. All files shall be compatible with the latest software version available.
  - 2. Filename shall identify the site, equipment manufacturer, and date equipment placed in service. i.e. BostRd-Manufacturer-202306.pdf.
  - 3. Each electronic file shall contain a table of contents at the beginning of the file which includes hypertext links or bookmarks to navigate the file contents per section/chapter.
  - 4. Scanned images of written documents are not acceptable. Document must allow character selection. Text within a file shall be transferable to other documents.
  - 5. Drawing files shall have the ability to turn on/off drawing layers within the file.
  - 6. Submit a preliminary version of the electronic format of the manual for review. Upon approval of the preliminary submittal, the Contractor shall provide three copies of the electronic manual to the Owner.

## PART 3 EXECUTION

### 3.1. MANUAL ORGANIZATION AND CONTENTS

- A. Provide a Table of Contents listing each section of the manual for each product or system.
  - 1. Identify each product or system using the nomenclature shown in the Contract Documents.
  - 2. Assign a number and letter to each section in the manual.
    - a. Assign a number to each product or system. The number is to correspond to the Owner's equipment numbering system or other system designated by or acceptable to the Engineer.
    - b. A cross reference is to be provided for the Owner's numbering system and designations for equipment indicated in the Contract Documents.
    - c. The letter assigned will represent the part of the manual, consistent with the manual contents.
  - 3. Provide index tabs for each section in the manual.
  - 4. The designation on each index tab is to correspond to the number and letter assigned in the Table of Contents.
- B. Include only the information that pertains to the product described. Annotate each sheet to:
  - 1. Clearly identify the specific product or component installed.
  - 2. Clearly identify the data applicable to the installation.



3. Delete reference to inapplicable information.
- C. Supplement manual information with drawings as necessary to clearly illustrate relations of component parts of equipment and systems, and control and flow diagrams.
- D. Identify each manual by placing a printed cover sheet in the front cover of the binder, the first page in the manual, and in the spine of each manual. The first page is to be placed in a clear polypropylene sheet protector. The information on first page and the cover page are to include:
  1. Name of Owner.
  2. Project Name.
  3. Volume number.
  4. The Table of Contents for that volume.
- E. Manuals for several products or systems may be provided in the same binder.
  1. Sections for each product or system must be included in the same binder.
  2. Sections must be in numerical order from volume to volume.
- F. Correlate the data into related groups when multiple binders are used.
- G. Fill binders to only three-fourths of its indicated capacity to allow for addition of materials to each binder by the Owner.

### 3.2. EQUIPMENT AND SYSTEMS MANUAL CONTENT

- A. Manual shall provide the following information:
  1. A description of the unit and component parts.
  2. Operating instructions for startup, normal operations, regulation, control, shutdown, emergency conditions, and limiting operating conditions.
  3. Maintenance instructions including assembly, installation, alignment, adjustment, and checking instructions.
  4. Lubrication schedule and lubrication procedures. Include a cross reference for recommended lubrication products.
  5. Troubleshooting guide.
  6. Schedule of routine maintenance requirements.
  7. Description of sequence of operation by the Control Manufacturer.
  8. Warnings for detrimental maintenance practices.
  9. Parts lists including:
    - a. Part numbers for ordering new parts.
    - b. Assembly illustrations showing an exploded view of the complex parts of the product.
    - c. Predicted life of parts subject to wear.
    - d. List of the Manufacturer's recommended spare parts, current prices with effective date and number of parts recommended for storage.
    - e. Directory of a local source of supply for parts with company name, address, and telephone number.
    - f. Complete nomenclature and list of commercial replacement parts.
  10. Outline, cross section and assembly drawings, engineering data, test data, and performance curves.
  11. Control schematics and point to point wiring diagrams prepared for field installation, including circuit directories of panel boards and terminal strips.
  12. List of identification nameplates installed on equipment and valve identification per the Contract

Documents.

13. Other information as may be required by the individual sections of the Specifications.

### 3.3. ELECTRICAL AND ELECTRONICS SYSTEMS MANUAL

A. Manual shall provide the following information:

1. A description of the systems and component parts.
2. Control schematics and point to point wiring diagrams prepared for field installation. Include circuit directories of panel boards and terminal strips and as installed color-coded wiring diagrams.
3. Operating procedures, maintenance procedures, and the Manufacturer's printed operating and maintenance instructions.
4. List of the Manufacturer's recommended spare parts, current prices with effective date, and number of parts recommended for storage.
5. Other information as may be required by the individual sections of the Specifications.

### 3.4. LIST OF SERVICE ORGANIZATIONS

- A. Provide a directory of authorized service organizations with company name, address, telephone number, e-mail address and the contact person for warranty repair.

END OF SECTION

SECTION 01 78 39  
PROJECT RECORD DOCUMENTS

PART 1 GENERAL

1.1. SUMMARY

- A. Scope of Work: Maintain at the site for the Owner one (1) record copy of:
  - 1. Drawings
  - 2. Specifications
  - 3. Addenda
  - 4. Change Orders and other modifications of the Contract
  - 5. Engineer's Field Orders or written instructions
  - 6. Requests for Information and responses
  - 7. Approved Shop Drawings, Working Drawings, and Samples
  - 8. Field test records
  - 9. Construction photographs
  
- B. Store documents and Samples in the Contractor's field office.
  - 1. Documents are to remain separate from documents used for construction. Do not use these documents for construction.
  - 2. Provide files and racks for the storage of documents.
  - 3. Provide a secure storage space for the storage of Samples.
  - 4. Maintain documents in clean, dry, legible conditions, and in good order.
  - 5. Make documents and Samples available at all times for inspection by the Engineer and Owner.

1.2. SUBMITTAL

- A. At Contract closeout, deliver Record Documents to the Engineer for the Owner.
  
- B. Accompany submittal with transmittal letter, containing:
  - 1. Date
  - 2. Project title and number
  - 3. Contractor's name and address
  - 4. Title and number of each Record Document
  - 5. Signature of Contractor or his authorized representative
  
- C. Submit a list of Suppliers and Subcontractors as record data
  
- D. Submit record data to provide information to allow the Owner to adequately identify the products incorporated into the Project and allow replacement or repair at some future date.
  - 1. Provide record data for all products per the submittal schedule or as specified in the individual Specification Sections. Record data is not required for items for which Shop Drawings and/or operations and maintenance manuals are required.
  - 2. Provide information only on the specified products. Submit a Contract Modification Request for approval of deviations or substitutions and obtain approval by Field Order or Change Order prior to submitting record data.
  - 3. Provide the same information required for Shop Drawings.
  - 4. Record data will be received by the Engineer, logged, and provided to Owner for the Project record.

- a. Record data may be reviewed to see that the information provided is adequate for the purpose intended. Inadequate drawings may be returned as unacceptable.
  - b. Record data is not reviewed for compliance with the Contract Documents. Comments may be returned if deviations from the Contract Documents are noted during the cursory review performed to see that the information is adequate.
- E. Submit marked up Drawings showing facilities as constructed (i.e. Plans of Record, As-Builts)

### 1.3. RECORDING

- A. Label each document "PROJECT RECORD".
- B. Applications for Payment will not be recommended for payment if record documents are found to be incomplete or not in order. Final payment will not be recommended without complete record documents.
- C. Record information on Drawings concurrently with construction progress.
  1. Do not conceal any work until required information is recorded.
- D. Plans of Record: Legibly and clearly mark, to scale, each drawing to record actual construction:
  1. Depths of various elements of foundation in relation to finish first floor datum.
  2. All underground piping with elevations and dimensions. Changes to piping location. Horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements. Actual installed pipe material, class, etc.
  3. Location of internal utilities and appurtenances concealed in the construction, referenced to visible and accessible features of the structure.
  4. Field changes of dimension and detail.
  5. Changes made by Field Order or by Change Order.
  6. Details not on original Contract Drawings.
  7. Equipment and piping relocations.
  8. Major architectural and structural changes including relocation of doors, windows, etc.
  9. Material schedule changes according to Contractor's records and shop drawings.
- E. Specifications and Addenda: Legibly mark each section to record:
  1. Manufacturer, trade name, catalog number of Supplier of each product and item of equipment installed.
  2. Changes made by Field Order or by Change Order.
- F. Shop Drawings (after final review and approval): Provide two (2) sets of record shop drawings with the Operation and Maintenance Manual on a single USB flash drive, for each process equipment, piping, electrical system, and instrumentation system.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 02 41 00  
DEMOLITION AND DECONSTRUCTION

PART 1 GENERAL

1.1. SUMMARY

- A. The work to be performed in accordance with this Specification consists of furnishing all materials, equipment, supplies, and accessories and of performing all operations required in connection with the demolition and deconstruction work shown on the Drawings and specified herein.

1.2. REFERENCES

A. Definitions

1. Demolition

- a. Demolition is the process of wrecking or taking out a facility together with any related handling and disposal operations.

2. Demolition Plan

- a. Demolition Plan is the planned steps and processes for managing demolition activities and identifying the required sequencing activities and disposal mechanisms.

B. Standards

1. The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.
2. American Association of State Highway and Transportation Officials (AASHTO)
- a. AASHTO M 145 - (1991; R 2012) Standard Specification for Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes

1.3. SUBMITTALS

A. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

1. Demolition Plan

- a. Prepare a Demolition Plan and submit proposed demolition and removal procedures for approval before work is started.
- b. Include in the plan procedures for careful removal and disposition of materials specified to be salvaged, coordination with other work in progress a detailed description of methods and equipment to be used for each operation and of the sequence of operations.
- c. Identify components and materials to be salvaged for reuse or recycling with reference to paragraph Existing Facilities to be Removed.
- d. Plan shall be approved by the Engineer prior to work beginning.

1.4. QUALITY ASSURANCE

- A. Comply with federal, state, and local hauling and disposal regulations. Use of explosives will not be permitted.

B. Dust and Debris Control

1. Prevent the spread of dust and debris and avoid the creation of a nuisance or hazard in the

surrounding area. Do not use water if it results in hazardous or objectionable conditions such as, but not limited to, ice, flooding, or pollution.

#### 1.5. EXISTING CONDITIONS

- A. Before beginning any demolition work, survey the site and examine the drawings and specifications to determine the extent of the work. Record existing conditions showing the condition of structures and other facilities adjacent to areas of alteration or removal. Photographs will be acceptable as a record of existing conditions.

### PART 2 PRODUCTS

#### 2.1. FILL MATERIAL

- A. Comply with excavating, backfilling, and compacting procedures for soils used as backfill material to fill voids, depressions or excavations resulting from demolition or deconstruction of structures.
- B. Fill material shall conform to the definition of satisfactory soil material as defined in AASHTO M 145, Soil Classification Groups A-1, A-2-4, A-2-5 and A-3. In addition, fill material shall be free from roots and other organic matter, trash, debris, frozen materials, and stones larger than 2 inches in any dimension.

### PART 3 EXECUTION

#### 3.1. GENERAL REQUIREMENTS

- A. Do not begin demolition until authorization is received.
- B. The work includes demolition, salvage of identified items and materials, and removal of resulting rubbish and debris. Remove rubbish and debris daily, unless otherwise directed.
- C. Store materials that cannot be removed daily in areas approved by the Owner.

#### 3.2. ITEMS TO REMAIN IN PLACE

- A. Take necessary precautions to avoid damage to existing items to remain in place, to be reused, or to remain the property of the Owner. Repair or replace damaged items as approved by the Owner.
- B. Coordinate the work of this section with all other work indicated.
- C. Construct and maintain shoring, bracing, and supports as required.
- D. Existing Construction Limits and Protection
  - 1. Do not disturb existing construction beyond the extent indicated or necessary for installation of new construction.
- E. Trees
  - 1. Protect trees within the project site where indicated in the Drawings in the manner shown.

### 3.3. EXISTING FACILITIES TO BE REMOVED

- A. Existing construction scheduled to be removed for reuse shall be disassembled. Dismantled and removed materials are to be separated, set aside, and prepared as specified, and stored or delivered to a collection point for reuse, remanufacture, recycling, or other disposal, as specified.
- B. Structures
  - 1. Remove existing structures indicated to be removed to three (3) feet below grade.
- C. Utilities and Related Equipment
  - 1. Disconnecting Existing Utilities
    - a. Remove existing utilities, as indicated, and terminate in a manner conforming to the nationally recognized code covering the specific utility and approved by the Owner. When utility lines are encountered but are not indicated on the drawings, notify the Owner prior to further work in that area. Remove meters and related equipment and deliver to a location in accordance with instructions of the Owner.
- D. Paving and Slabs
  - 1. Remove concrete and asphaltic concrete paving and slabs to a depth of twelve (12) inches below existing adjacent grade.
- E. Mechanical Equipment and Fixtures
  - 1. Disconnect mechanical hardware at the nearest connection to existing services to remain, unless otherwise noted.
  - 2. Disconnect mechanical equipment and fixtures at fittings.
  - 3. Remove service valves attached to the unit.
  - 4. Salvage each item of equipment and fixtures as a whole unit; listed, indexed, tagged, and stored. Salvage each unit with its normal operating auxiliary equipment. Transport salvaged equipment and fixtures, including motors and machines, to a designated storage area. Do not remove equipment until approved.
  - 5. Piping
    - a. Disconnect piping at unions, flanges and valves, and fittings.
- F. Electrical Equipment and Fixtures
  - 1. Electrical Devices
    - a. Remove switches, switchgear, transformers, conductors including wire and nonmetallic sheathed and flexible armored cable, regulators, meters, instruments, plates, circuit breakers, panelboards, outlet boxes, and similar items.
  - 2. Conduit and Miscellaneous Items
    - a. Remove and dispose of conduit and miscellaneous items.
- G. Items With Unique / Regulated Disposal Requirements
  - 1. Remove and dispose of items with unique or regulated disposal requirements in the manner dictated by law or in the most environmentally responsible manner.

### 3.4. RELOCATIONS

- A. Perform the removal and reinstallation of relocated items as indicated with workers skilled in the trades involved. Repair or replace items to be relocated which are damaged by the Contractor with

new undamaged items as approved.

### 3.5. CONCURRENT EARTH-MOVING OPERATIONS

- A. Do not begin excavation, filling, and other earth-moving operations that are sequential to demolition work in areas occupied by structures to be demolished until all demolition and deconstruction in the area has been completed and debris removed. Fill holes and other hazardous openings.

### 3.6. DISPOSITION OF MATERIAL

#### A. Title to Materials

- 1. Except for salvaged items specified in related Sections, and for materials or equipment scheduled for salvage, all materials and equipment removed and not reused or salvaged, shall become the property of the Contractor and shall be removed from property. Title to materials resulting from demolition and deconstruction, and materials and equipment to be removed, is vested in the Contractor upon approval by the Owner of the Contractor's demolition, removal procedures, and authorization by the Owner to begin demolition.
- 2. The Owner will not be responsible for the condition or loss of, or damage to, such property after contract award.
- 3. Showing for sale or selling materials and equipment on site is prohibited.

#### B. Reuse of Materials and Equipment

- 1. Remove and store materials and equipment indicated to be reused or relocated to prevent damage and reinstall as the work progresses.

#### C. Salvaged Materials and Equipment

- 1. Coordinate with the Owner ahead of demolition for all equipment and materials to be salvaged. All items to be salvaged by the Owner are to remain property of the Owner and delivered to a storage site by the Contractor, as directed.
  - a. Remove salvaged items to remain the property of the Owner in a manner to prevent damage and packed or crated to protect the items from damage while in storage or during shipment.
  - b. Items damaged during removal or storage must be repaired or replaced to match existing items. Properly identify the contents of containers.

#### D. Unsalvageable and Non-Recyclable Material

- 1. All items not salvaged by the Owner become property of the Contractor.
- 2. Dispose of unsalvageable and non-recyclable material off the site.

### 3.7. CLEANUP

- A. Remove and transport the debris in a manner that prevents spillage on streets or adjacent areas. Apply local regulations regarding hauling and disposal.

### 3.8. BURNING

- A. The use of burning at the project site for the disposal of refuse and debris will not be permitted.

### 3.9. DISPOSAL OF REMOVED MATERIALS



- A. Regulation of Removed Materials
  - 1. Dispose of debris, rubbish, scrap, and other non-salvageable materials in a manner consistent with all applicable federal, state, and local regulations. Storage of removed materials on the project site is prohibited.
- B. Removal from Owner Property
  - 1. Transport waste materials removed from demolished structures, except waste soil, from property for legal disposal. Dispose of waste soil as directed.

### 3.10. REUSE OF SALVAGED ITEMS

- A. Recondition salvaged materials and equipment designated for reuse before installation. Replace items damaged during removal and salvage operations or restore them as necessary to usable condition.

END OF SECTION

SECTION 03 10 00  
CONCRETE FORMWORK

PART 1 GENERAL

1.1 RELATED DOCUMENTS:

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

1.2 SCOPE:

A. Related Work Specified Elsewhere:

1. Concrete Reinforcement and Accessories (Section 03 20 00).
2. Cast-In-Place Concrete (Section 03 30 00).

a. Work Included In This Section:

- 1) Extent of formwork is indicated by the concrete structures shown on the contract drawings and as required to place concrete.
- 2) Work shall include (except as specified elsewhere in the contract documents) providing formwork and shoring for all cast-in-place concrete and installation into the formwork items furnished by others, such as anchors, plates, inserts, and any other items embedded in concrete.

1.3 INDUSTRY STANDARDS:

- A. Reference: Some products and execution are specified in this section by reference to published specifications of standards of the following (latest edition, with respective abbreviations used):

American Concrete Institute (ACI)  
The American Society for Testing and Materials (ASTM)  
U. S. Product Standards (PS)  
American Plywood Association (APA)

- B. Standard Specifications and Codes: The following specifications and codes form a part of this specification:

Publications of the American Concrete Institute:

ACI 347	"Recommended Practice for Concrete Formwork"
ACI 117	"Standard Tolerances for Concrete Construction and Materials"
ACI 301	"Specifications for Structural Concrete for Buildings"

- C. Qualifications of Workers: Provide at least one person who shall be present at all times during execution of this portion of the work and who shall be thoroughly familiar with the types of materials being installed, the referenced standards and the requirements of this work, and who shall direct work performed under this section.

#### 1.4 DELIVERY, STORAGE AND HANDLING:

- A. Protection: Use all means necessary to protect formwork materials before, during, and after installation and to protect the installed work and materials of all other trades.
- B. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of Architect and at no additional cost to the Owner.

#### 1.5 SUBMITTALS:

- A. Manufacturer's Data: Submit (for information only) manufacturer's specifications for proprietary materials and items as required, including form coatings, formwork facing material, jointing, reveals, etc., ties, and accessories.
- B. Shop drawings for formwork structure, including the location of shoring and reshoring, are the responsibility of the Contractor and shall not be submitted to the Engineer.

### PART 2 PRODUCTS

#### 2.1 FORM MATERIALS AND ACCESSORIES:

- A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
1. Plywood, metal, or other approved panel materials.
  2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
    - a. High-density overlay, Class 1 or better.

- b. Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.
  - c. Structural 1, B-B or better; mill oiled and edge sealed.
  - d. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that will produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.
- D. Pan-Type Forms: Glass-fiber-reinforced plastic or formed steel, stiffened to resist plastic concrete loads without detrimental deformation.
- E. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
- 1. Furnish units that will leave no corrodible metal closer than 1 1/2 inches to the plane of exposed concrete surface.
  - 2. Furnish ties that, when removed, will leave holes no larger than 1 inch in diameter in concrete surface.
  - 3. Furnish ties with integral water-barrier plates to walls indicated to receive damp-proofing or waterproofing.
- F. Facing materials shall be such as to provide specified surface tolerance and finish, and to meet requirements of Chapter 10 of ACI 301.

### PART 3 EXECUTION

#### 3.1 EXAMINATION:

- A. Prior to all work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.
- B. Prior to the start of the work, examine all conditions where the formwork will be required to be constructed into existing surfaces. Verify the condition of these surfaces prior to constructing the formwork.

- C. Verify that forms may be constructed in accordance with all pertinent codes and regulations, the referenced standards, and the original design.
- D. In the event of discrepancy, immediately notify the Architect.
- E. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

### 3.2 DESIGN OF FORMWORK:

- A. The Contractor shall be responsible for the design of all concrete formwork. Formwork shall be designed in accordance with ACI 347 unless noted.
- B. Design, erect, support, brace, and maintain formwork so that it will safely support vertical and lateral loads that might be applied until such loads can be supported by the concrete structure. Construct formwork so that concrete members and structures are of correct size, shape, alignment, elevation, and position.
- C. Design forms and falsework to include assumed values of live load, dead load, weight of moving equipment operated on formwork, concrete mix, height of concrete drop, vibrator frequency, ambient temperature, stresses, lateral stability, and other factors pertinent to safety of structure during construction.
- D. Support form facing materials by structural members spaced sufficiently close to prevent deflection. Fit forms placed in successive units for continuous surfaces to accurate alignment, free from irregularities, and within allowable tolerances.
- E. Provide formwork sufficiently tight to prevent leakage of cement paste during concrete placement. Solidly butt joints and provide backup material at joints as required to prevent leakage and fins.
- F. Provide for openings, offsets, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in work.
- G. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, and the like, for easy removal.
- H. Provide temporary openings where interior area of formwork is inaccessible for cleanout, for inspection before concrete placement, and for placement of concrete. Securely brace temporary

openings and set tightly to forms to prevent loss of concrete mortar. Locate temporary openings on forms at inconspicuous locations.

- I. Chamfer exposed corners and edges unless otherwise indicated, or specified, using wood, metal, PVC or rubber strips fabricated to produce uniform lines and tight edge joints.
  - J. Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses and chases from trades providing such items. Accurately place and securely support items built into forms.
- 3.3 TOLERANCES: Formwork shall be constructed so as to ensure that the concrete surfaces will conform to the tolerances of Section 203.1 "Recommended Practice for Concrete Formwork" (ACI 347).
- 3.4 REUSE OF FORMS:
- A. Clean and repair surfaces of forms to be reused in the work. Split, frayed, delaminated, or otherwise damaged form facing material will not be acceptable. Apply new form coating compound material to concrete contact surfaces as specified for new formwork.
  - B. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close all joints. Align and secure joints to avoid offsets. Do not use "patched" forms for exposed concrete surfaces.
- 3.5 CLEANING AND TIGHTENING: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before concrete is to be placed. Tighten forms immediately after concrete placement as required to eliminate mortar leaks.
- 3.6 FORM COATINGS:
- A. Coat form contact surfaces with form-coating compound before reinforcement is placed. Provide commercial formulation form-coating compounds that will not bond with, stain, nor adversely affect concrete surfaces, and will not impair subsequent treatment of concrete surfaces requiring bond of adhesion, nor impede the wetting of surfaces to be cured with water or curing compounds.
  - B. Do not allow excess form coating material to accumulate in the forms or to come into contact with concrete surfaces against which fresh concrete will be placed. Apply in compliance with manufacturer's instructions.

- 3.7 EMBEDDED ITEMS: Set and build into the work anchorage devices and other embedded items required for other work that is attached to, or supported by cast-in-place concrete. Use setting drawings or instructions, and directions provided by suppliers of the items to be attached.
- 3.8 FORM REMOVAL: Formwork, not supporting concrete, may be removed 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form removal operations, and provided that curing and protection operations are maintained. Formwork for surfaces specified to be "rubbed" is to be removed within 24 hours after placement. Immediately after rubbing, curing is to be reinstated.
- 3.9 CONCRETE IN EARTH: Where trench excavation is used, and where sides of excavations are cut neatly in good, firm soil, side-forms may be omitted.

END OF SECTION

SECTION 03 20 00  
CONCRETE REINFORCEMENT

PART 1 GENERAL

1.1 RELATED DOCUMENTS: Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to work of this Section.

1.2 SCOPE:

A. Related Work Specified Elsewhere:

1. Concrete Formwork (Section 03 10 00)
2. Cast-In-Place Concrete (Section 03 30 00)

B. Work Included in this Section: Reinforcement for cast-in-place concrete (including bars, welded wire fabric, ties, and supports) as shown on drawings, and as specified herein.

1.3 QUALITY ASSURANCE:

A. References: Some products and execution are specified in this section by reference to published specifications or standards of the following (latest edition, with respective abbreviations used):

American Concrete Institute (ACI)

The American Society for Testing and Materials (ASTM)

American Welding Society (AWS)

Concrete Reinforcing Steel Institute (CRSI)

American Iron and Steel Institute (AISI)

B. Standard References:

1. The current edition of the following standard references shall apply to the work of this section. Suffixes indicating date of issue are omitted from reference numbers used in the text of this section.

2. Publications of the American Concrete Institute:



ACI-117 "Standard Specifications for Tolerances for Concrete Construction and Materials"

ACI-301 "Specification for Structural Concrete for Buildings."

ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures."

ACI 318 "Building Code Requirements for Reinforced Concrete."

3. Publications of the AWS:

AWS D1.4 "Recommended Practice for Welding, Reinforcing Steel, Metal Inserts, and Connections in Reinforced Concrete Construction."

AWS D1.1 "Structural Welding Code"

4. Publications of the CRSI:

"Manual of Standard Practice"

5. Publications of the ASTM:

ASTM A82 "Specification for Cold Drawn Steel Wire for Concrete Reinforcement."

ASTM A184 "Specification for Steel Bar Mats for Concrete Reinforcements."

ASTM A185 "Specification for Welded Steel Wire Fabric for Concrete Reinforcement."

ASTM A615 "Specification for Deformed Billet-Steel Bars for Concrete Reinforcement."

ASTM A617 "Specifications for Axle-Steel Deformed and Plain Bars for Concrete Reinforcement"

ASTM A706 "Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement."

C. Building Code: North Carolina State Building Code, current edition with all amendments.

#### 1.4 SUBMITTALS:

##### A. Shop Drawings:

1. Shop drawings shall be in accordance with ACI 315.
2. Only shop drawings checked and stamped "Approved by Contractor" will be accepted for review.
3. Show details, bar clearances, notes, and necessary information for placing of reinforcing steel.
4. Show wall and pier reinforcing in elevation. Include all pertinent details and schedules required to specify the reinforcing. Show welding requirements for welded bars.
5. Submit reinforcing shop drawings for review. Shop drawings shall include, but not be limited to, reinforcing layout, size location, quantities, lap lengths, required bends and other pertinent information related to the installation of the reinforcing steel.

- ##### B. Submit manufacturer's technical data methods and procedures for installing mechanical splices. Data shall include a complete description of the splice method, installation instructions and certification that the splicing method meets the performance requirements of this specification.

##### C. Reinforcing Test Reports:

1. Furnish certified mill test reports on reinforcing steel used in work

##### D. Welding Certificates.

#### 1.5 DELIVERY, STORAGE, HANDLING:

- ##### A. Reinforcing steel shall be delivered to project site properly tagged, bundled, and ready to place.
- ##### B. Reinforcing steel and welded wire mesh delivered to project site (and not immediately placed in forms), shall be protected from mud, excessive rust-producing conditions, oil, grease, or distortion.
- ##### C. Use all necessary precautions to maintain identification after bundles are broken.

## PART 2 PRODUCTS

### 2.1 MATERIALS

- A. Reinforcing Bars: New, deformed bars, conforming to ASTM A615- S1, Grade 60 as required on drawings. ASTM A706 for bars in welded applications.
- B. Welded Wire Fabric: Welded wire fabric shall be electrically-welded, wire fabric of cold-drawn wire, of gauge and mesh as shown on drawings, or as required. Fabric shall conform to ASTM A185, Grade 60 or Grade 70. Provide in mat form.
- C. Plain Smooth Dowels: Plain smooth dowels shall conform to ASTM A306 with a minimum yield stress of 40,000 psi.
- D. Tie Wire: Shall be 16 gage, or heavier, black annealed, steel wire.
- E. Accessories: Fabricate accessories from concrete, metal, plastic, or other materials accepted by the Engineer. Include spacers, ties, chairs, bolsters, and other devices required to properly support, space, and secure the reinforcing steel in its proper position in accordance with the Drawings and recommendations of the CRSI "Manual of Standard Practice". Chairs and other accessories shall be Class I or Class II in accordance with CRSI. Parts in contact with exposed concrete surfaces shall be either stainless steel (AISI 302 or 304) or have plastic coated legs. Locations and types of accessories shall be shown on the shop drawings. Chairs for all concrete reinforcing steel to be supported on soil shall be continuous high chairs with continuous longitudinal wires, or individual square plates, welded to the bottom of the chair legs. Use "Z" spacer bars between adjacent vertical reinforcing mats in walls. Use standees between top and bottom mats of reinforcing in footings.

## 2.2 FABRICATION:

- A. Reinforcing steel shall be fabricated to shapes and dimensions indicated on drawings, and in compliance with applicable provisions of ACI 315 and ACI 318.
- B. Bars shall be bent cold in shop. No bars shall be bent in field, unless specifically indicated on drawings.
- C. Tolerances: Bars used for concrete reinforcement shall meet the following requirements for fabricating tolerances:
  - 1. Sheared length: + one inch.
  - 2. Stirrups and ties: + one-quarter inch.
  - 3. All other bends: + one inch
- D. Fabrication of reinforcing steel prior to review and approval of shop drawings by Project Engineer shall be solely the responsibility of the Contractor.

### 2.3 ACCESSORIES:

- A. Fabricate accessories from concrete, metal, plastic, or other materials accepted by the Architect. Include spacers, ties, chairs, bolsters and other devices required to properly support, space, and secure the reinforcing steel in their proper places in accordance with the Drawings and recommendations of the CRSI "Manual of Standard Practice." Chairs and other accessories shall be Class I or Class II in accordance with CRSI. Parts in contact with exposed concrete surfaces shall be stainless steel (AISI 302 or 304). The locations and types of accessories shall be shown on the shop drawings. Accessories required by other trades shall be furnished by other trades and included under this section.

## PART 3 EXECUTION

### 3.1 GENERAL REQUIREMENTS FOR REINFORCING:

- A. Reinforcing shall be free from scale, loose rust, mud, or coatings which will reduce bond to concrete.
- B. Bars with kinks or bends not shown on drawings shall not be placed. Heating of reinforcement for bending or straightening will not be permitted.
- C. For minimum concrete cover for reinforcement, refer to the Reinforcing Steel General Notes in the construction drawings. If concrete cover is not listed, refer to ACI 318 standards:
- D. Reinforcing steel shall be fabricated to shapes and dimensions indicated on Drawings, and in compliance with applicable provisions of ACI 301, ACI 318, and ACI 117.
- E. Bars may not be bent or re-bent in the field, unless specifically indicated on Drawings or accepted in writing by the Architect.

### 3.2 PLACING OF REINFORCEMENT:

- A. Tolerances: Reinforcing bars shall be fabricated and placed to meet the tolerances of ACI 117 except as noted herein.
  - 1. Bars used for concrete reinforcement shall meet the following requirements for fabricating tolerances:
    - a. Sheared length: + 1 inch.
    - b. Overall dimension of stirrups and ties: + 1/4 inch.
    - c. All other bends: + 1 inch.

2. Bars and wire fabric shall be placed to the following tolerances:
    - a. Concrete cover to formed surfaces: + 1/4 inch.
    - b. Top bars in beams, joists and slabs:
      - 1) Members more than 8 inches deep: + 1/2 inch.
      - 2) Members 8 inches deep or less: + 1/4 inch.
    - c. Horizontal tolerance from vertical surfaces: + 1/4 inch.
    - d. Vertical bars in columns: + 1/2 inch.
    - e. Vertical and horizontal bars in walls: + 1/2 inch.
    - f. Lengthwise of member: + 2 inches.
    - g. Wire fabric: + 1.5 inches from tops of slabs-on-grade or topping slabs.
  3. Bars may be moved as necessary to avoid interference with other reinforcing steel, conduits or embedded items where approved by the Architect. If the bars are moved more than one bar diameter or enough to exceed the specified tolerances, the resulting arrangement of bars shall be subject to approval by the Architect.
- B. Dowels: Place steel dowels as required on drawings by means of plywood templates. Place and anchor dowels securely before placing concrete.
- C. Accessories:
1. Nails shall not be driven into formwork to support reinforcement. Turn tie wires into concrete, not toward exposed surfaces.
  2. Space bar supports in accordance with ACI 315, ACI 301, and CRSI Manual of Standard Practice. Chairs for reinforcing steel to be supported on soil shall be spaced as necessary to prevent the legs from pressing into the soil, but no more than 5'-0" on center.
  3. In walls, provide continuous slab bolsters spaced at 4'-0" o.c. maximum to support reinforcing off formwork. Use #4 "Z" spacer bars at 4'-0" o.c. each way between wall mats.
- D. Securing Reinforcement:
1. Reinforcing bars shall be supported and wired together to prevent displacement by construction loads, or by placing of concrete, beyond tolerances as set forth hereinbefore.
  2. Maintain metal reinforcement securely and accurately in place until concrete is placed.
  3. Any and all disturbances of reinforcement from any cause whatsoever shall be corrected fully prior to placing of concrete. Damaged bar-supports and spacers shall be repaired or shall be removed and replaced.

4. Bars shall not be bent after being embedded in hardened concrete, unless indicated so on drawings.
  5. When approved, welding of reinforcing steel shall conform to AWS D1.4. Do not weld at bend in a bar. Welding of cross bars shall not be permitted unless authorized by Project Engineer.
- E. Welded Wire Mesh:
1. Install in longest practical lengths. Welded wire fabric shall be lapped at least 1 mesh plus end extension of wires, but not less than 6". Lace splices with tie wire. Offset end laps in adjacent widths to prevent continuous laps in either direction.
  2. Wire mesh shall be placed so as to secure it positively at a position as indicated on Drawings.

### 3.3 SPLICES OF REINFORCEMENT:

- A. Splices and offsets in reinforcements shall not be made at points of maximum stress.
- B. Splices shall be approved by Engineer. Splices shall provide sufficient lap to transfer required stress.
- C. Character and design of each splice shall conform to requirements of ACI 318. Minimum splice length shall be 36 bar diameters. See also plans for splice lengths.

### 3.4 FIELD QUALITY CONTROL:

- A. Inspection of Placement of Reinforcing Steel:
  1. Project Engineer shall be given advanced notice of not less than 24 hours prior to placing concrete to allow inspection of reinforcing steel.
  2. Inspection of placement of reinforcement in a section will be made only after placement is complete for that section to be poured.
  3. Such inspections shall not relieve Contractor of his responsibility to provide work in accordance with requirements of contract documents. Such inspections are for purpose of minimizing errors in field work.

END OF SECTION

SECTION 03 30 00  
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to work of this Section.

1.2 SCOPE

- A. Related Work Specified Elsewhere:

1. Concrete Formwork (Section 0310000)
2. Concrete Reinforcement (Section 032000)

- B. Work Included This Section:

1. Cast-in-place concrete as shown on Drawings and as specified herein. The extent of cast-in-place concrete work includes, but is not limited to: concrete footings, slab-on-grade, walls, pilasters, post-tensioned slab and beams, columns, composite slab, stairs, grout, and other elements as detailed.
2. In general, this work includes providing cast-in-place concrete consisting of portland cement, fine and coarse aggregate, selected admixtures, mixing, transporting, placing, consolidating, finishing and curing as herein specified.
3. This section further includes related items of quality control, testing and evaluation of concrete strength.

1.3 CODES AND INDUSTRY STANDARDS

- A. Some products and execution are specified in this section by reference to published specifications or standards of the following (with respective abbreviations used). Reference is to the latest edition of the standard referenced.

1. American Concrete Institute (ACI)
2. The American Society for Testing and Materials (ASTM)
3. North Carolina Department of Transportation (NCDOT)

- B. Standard References:

1. The current edition of the following standard references shall apply to the work of this Section as indicated. Concrete work shall comply with the following standards and codes except as indicated otherwise on the Drawings or herein.

- a. ACI 117, "Standard Specifications for Tolerances for Concrete Construction and Materials"
  - b. ACI 301, "Specifications for Structural Concrete for Buildings"
  - c. ACI 302.1R, "Guide for Concrete Floor and Slab Construction"
  - d. ACI 304R, "Guide for Measuring, Mixing, Transporting, and Placing Concrete"
  - e. ACI 305R, "Hot Weather Concreting"
  - f. ACI 306R, "Cold Weather Concreting"
  - g. ACI 308, "Standard Practice for Curing Concrete"
  - h. ACI 309R, "Guide for Consolidation of Concrete"
  - i. ACI 311.4R, "Guide for Concrete Inspection"
  - j. ACI 318, "Building Code Requirements for Reinforced Concrete"
  - k. ACI 214, "Recommended Practice for Evaluation of Strength Test Results of Concrete"
  - l. ACI 211.1, "Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete"
  - m. ACI 212.2, "Guide for Use of Admixtures in Concrete"
  - n. ACI 504, "Guide to Joint Sealants for Concrete Structures"
- C. Building Code:
1. North Carolina State Building Code - 2018 Edition with current amendments.
- D. Standard Specifications:
1. NCDOT Standard Specifications for Roads and Structures - current Edition with all current amendments.
- E. Ready-mix concrete production facilities shall be certified by the National Ready-Mix Concrete Association, or the producer shall demonstrate, to the satisfaction of the Architect, ability to comply with this Section.

#### 1.4 SUBMITTALS REQUIRED

- A. Manufacturer's Data, Concrete Work:
1. Submit manufacturer's product data with application and installation instructions for proprietary materials and items, including admixtures, grouts, patching compounds, joint fillers and systems, and other as requested by the Architect.
- B. Mix Design:
1. Submit the mix design for each type of concrete with complete test reports for approval. Mix designs shall be prepared by a party other than the testing agency responsible for quality assurance testing of concrete on this project. Mix designs shall be proportional to minimize effects of thermal and drying shrinkage. Include



admixture data and quantities, reports of mill tests on cement, recent sieve analyses on fine and coarse aggregate and physical and chemical tests on materials as required by the Engineer. Do not begin concrete production until the mix designs have been reviewed and are acceptable to the Architect. The cost of the mix designs shall be paid for by the Contractor. Include the following information for each mix design:

- a. Method used to determine proposed mix design, (ACI 301, Article 3.9).
  - b. Gradation of fine and coarse aggregates.
  - c. Proportions of all ingredients including all admixtures added either at time of batching or at job site.
  - d. Water/cementitious materials ratio.
  - e. Slump, ASTM C143.
  - f. Certification of the chloride content of admixtures.
  - g. Air Content of freshly mixed concrete by pressure method, ASTM C231, or volumetric method, ASTM C173.
  - h. Unit weight of concrete, ASTM C138.
  - i. Strength at 7 and 28 days, ASTM C39.
  - j. Water soluble chloride ion content of concrete.
  - k. Shrinkage (length change).
- C. Submit records to the Architect each month of concrete placed showing exact location of placement, date of placement, quantity of placement and class of concrete placed. Air and mix temperatures at time of placement shall also be recorded.
- D. Submit written certification from the admixture manufacturers that the admixtures used in the concrete mix meet the requirements of these Specifications.
- E. Submit certification specified hereinafter for liquid concrete curing compound.
- F. Mass Concrete Thermal Control Plan: The Contractor shall provide Heat of Hydration thermal control plan in accordance with ACI 301 Section 8 that demonstrates:
1. Temperature within concrete of 160 degrees F will not be exceeded during curing.
  2. Difference between inner and outer, exposed surface of concrete will not exceed 35 degrees F.
  3. Also refer to the Contract Drawing Structural General Notes for additional requirements and submittals.
- G. Shrinkage Testing: The Contractor shall submit test results demonstrating that the shrinkage strain of the concrete mix will not exceed  $400 \times (10^{-6})$  [0.000400"/"] when tested in accordance with ASTM C596. In lieu testing, contractor may include a shrinkage reducing admixture at a rate necessary to reduce shrinkage of mix by 40 percent.

- H. Submit test results indicating Coarse and Fine aggregates are non-ASR reactive based on ASTM C1260.
- I. Submit written certification from the waterstop manufacturer that the waterstops used meet the requirements of these Specifications.

#### 1.5 PRECONSTRUCTION CONCRETE CONFERENCE

- A. At least 10 days prior to submittal of the concrete mix designs, the Contractor shall hold a meeting to review the detailed requirements for preparing the concrete mix designs and to instruct all parties on the proper procedures for producing concrete, placing, consolidating, finishing and curing concrete, and placing reinforcing steel.
- B. The Contractor shall require responsible representatives of every party who is concerned with the concrete work to attend the conference, including but not limited to the following:
  - 1. Contractor's superintendent, Laboratory responsible for the concrete mix design, Laboratory responsible for field quality assurance testing, Subcontractors, Ready-mix concrete producer, reinforcing installers, Formwork installer, Concrete placement and finishing installed, and Architect.
- C. Minutes of the meeting shall be recorded, typed, and printed by the Contractor and distributed by him to all parties concerned within 5 days after the meeting.

#### 1.6 QUALITY ASSURANCE

- A. For additional quality assurance requirements, see Part 2 and 3 of this section.

#### 1.7 TRANSPORTATION AND DISCHARGE

- A. Concrete transported by truck mixer or agitator shall be completely discharged within 1.5 hours after water has been added to cement or cement has been added to aggregates. This time will be reduced to one hour during hot weather.
- B. Additional water added to the mix at the site is prohibited except as noted in Article 2. 4 of this Specification.
- C. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

### PART 2 PRODUCTS

#### 2.1 MATERIALS

- A. Portland cement shall be fresh stock of an approved standard brand meeting the requirements of ASTM C 150, of Type II and Type IV (low heat of hydration for concrete greater than 30" thick) and low-alkali (<0.4% equivalent Na<sub>2</sub>O). Only one brand of cement shall be used except when otherwise approved by the Engineer, and the Contractor shall inform the Engineer of the brand name of the cement proposed for use. The Contractor shall submit a copy of mill test reports on all cement delivered to the job 7 days prior to use of the cement. Cube strength from mill tests shall have a tolerance of ±600 psi. The fineness of cement used shall not have more than 10 percent retained on a no. 325 mesh screen when tested in accordance with ASTM C 430. Samples of cement from each shipment shall be retained by the Concrete Supplier until completion of the project.
- B. Coarse and fine aggregates shall contain no clay, mud, loam, foreign matter, or other deleterious substances.
1. Coarse aggregate for normal weight concrete shall be clean, uncoated, crushed stone, processed from natural rock or stone conforming to ASTM C33.
  2. Coarse aggregate for sand-lightweight concrete shall be shale, clay, or a cellular, stable and inert material, conforming to ASTM C330, "Specifications for Lightweight Aggregates for Structural Concrete."
  3. Fine aggregate shall be clean, sharp, natural or manufactured sand, free of lumps and conforming to ASTM C33, having preferred gradation shown for normal weight aggregate in ACI 302.1R, Table 4.2.1.
  4. Maximum aggregate size shall not exceed 1/5 the narrowest dimension between sides of forms, 1/3 the depth of a slab, or 3/4 the minimum clear spacing between individual reinforcing bars or bundles of bars. Size of coarse aggregate shall be NCDOT No. 57 for slabs on grade, and NCDOT No. 67 for all other concrete except as required above.
  5. Coarse aggregate shall be certified by testing to be non-ASR and non-ACR reactive. 14-day expansion shall not exceed 0.10% for ASTM C 1260. 1-year expansion shall not exceed 0.040% for ASTM C 1293.
  6. Fine aggregate shall consist of sand, stone screening, or other inert materials with similar characteristics having clean, strong, durable, uncoated grains and free from lumps, soft or flaky particles, clay, shale, alkali, organic matter or other deleterious substances with reactivity to alkali in cement. Fine aggregate shall be submitted for testing and approval to the testing laboratory. The laboratory shall verify that fine aggregate conforms to ASTM standards by making standard colormetric, sediment, and comparative tensile tests, and by sieve analysis. The fineness modules of the sand shall not vary by more than ±0.2 percent. Color shall be standard as determined from colormetric tests. Fine aggregate shall be certified by applicable ASTM test to be non-alkali silicate reactive (non-ASR). Provide certified test results of ASTM C1260.
- C. Fly Ash:

1. Fly ash shall have high fineness and low carbon contents and shall exceed the requirements of ASTM C618, "Specification for Fly Ash and Raw or Calcined Natural Pozzolan for use in Portland Cement Concretes", for Class F, except that the loss on ignition shall be less than 4 percent and fly ash shall be a classified process material. Fly ash shall be obtained from one source for the concrete delivered to the project. Complete chemical and physical analysis of the fly ash shall be submitted to the Architect prior to use. During the concrete production for the duration of the Project, such reports shall be made periodically, but no less than once per month. The maximum substitution of fly ash for portland cement shall be no more than 20 percent by weight of the required portland cement. Substitution shall be at rate of 1.2 pounds of fly ash per pound of cement. Fly ash will not be permitted for concrete exposed to the weather or the exterior, or concrete mixed with entrained air.
- D. Water shall be clean, potable, fresh, free from oil, organic matter or other deleterious substances.
- E. Concrete admixtures, when required or permitted, shall conform to the appropriate specification listed. Do not use admixtures which have not been incorporated and tested in the accepted mixes unless otherwise authorized in writing by the Architect. Admixtures containing more than 0.05 percent chloride ions or calcium chlorides are not permitted. Additionally, each admixture shall not contribute more than 5 ppm, by weight, of chloride ions to total concrete constituents.
1. Air-entraining admixtures shall exceed the requirements of ASTM C260, "Specifications for Air-Entraining Admixtures for Concrete."
  2. Use air-entraining admixture in all exterior exposed concrete. Add air-entraining admixture at the manufacturer's prescribed rate in the plant to result in concrete at the point of placement having air content within the limits of Chapter 19 of ACI 318-14. Dosage rates shall be determined using temperature and slump ranges expected and specified herein.
  3. Water-reducing admixtures shall exceed the requirements of ASTM C494, Type A. Water-reducing admixtures shall be chloride-free and non-corrosive.
  4. Use admixtures for water-reduction in strict compliance with the manufacturer's directions. Do not use set-control admixtures.
  5. The use of calcium chlorides or admixtures which retard or accelerate the set of concrete is not permitted.
  6. High-Range Water-Reducers (Superplasticizers):
    - a. High-range water-reducers shall be either a sulfonated naphthalene formaldehyde condensate or a sulfonated melamine formaldehyde condensate conforming to ASTM C494 Type F. In concrete mixes containing other chemical admixtures, water reducers and air entrainment, the compatibility between these admixtures and the high-range water-reducers shall have been investigated by the manufacturer and the results found to

be satisfactory. Dosage rates of normal Type A water reducers and air-entraining admixtures shall be adjusted in concrete mixes with high-range water-reducers in accordance with the recommendations of the manufacturer of the admixtures. High-range water-reducers may be used in concrete mixes for columns, foundation systems and walls. High-range water-reducers will not be permitted for slabs-on-grade, suspended slabs, and beams except as approved in writing by the Architect.

7. Use amounts of admixtures as recommended by the manufacturer for climatic conditions prevailing at the time of placement. Adjust quantities and types of admixtures as required to maintain quality control.
- F. Prefomed expansion-joint fillers shall conform to ASTM D1751 and shall be non-extruding, resilient-type, non-asphaltic, 1/4 inch thick, unless otherwise shown on the Drawings.
- G. Joint-Sealing Compounds for Joints in Concrete Slabs:
1. Joint-sealing compound for control and construction joints in slabs-on-grade shall be a two-part, pourable, self-leveling, moisture-curing polyurethane joint sealant. Compound shall have properties that equal the following: Shore A Hardness of  $35 \pm 5$ , and a compressibility/extensibility factor of 25 percent.
  2. Joint-sealing compound for joints between slab edges and vertical surfaces, such as walls or columns, shall be a premium-grade, two-component, polyurethane-base, non-sag, elastomeric joint sealant. Compound shall have properties that meet the following: Shore A Hardness of  $30 \pm 5$ , and a compressibility/extensibility factor of 25 percent.
- H. Abrasive aggregate for non-slip finish shall be fused aluminum oxide grit. Material shall be factory-grade, packaged, rust-proof and non-glazing, and shall be unaffected by freezing, moisture and cleaning materials. Abrasive aggregate shall be provided on concrete steps in exterior or non-weather-tight areas.
- I. Dovetail slots shall be 20-gauge galvanized similar to products by Hohman and Bernard, Heckmann, or other equivalent accepted by the Architect. Dovetail slots shall be designed to receive ties and anchors as shown on the Drawings.
- J. Under-slab membrane for floor slabs-on-grade shall be not less than 15-mils thick with the following properties: water vapor retarder: ASTM E-1745 - meets or exceeds Class A; minimum permeance: ASTM E-96 – 0.012 Perms; tensile strength, ASTM D882 – 76.6 lbf./in; puncture resistance, ASTM E154 – 2445 grams.
- K. Vapor Retarders:

1. Sheet Vapor Barrier shall be minimum 10-mil polyethylene film that complies with ASTM C171 and meets or exceeds test for water retention, ASTM C 156.
- L. Granular Fill below Slabs on Grade:
1. No. 67 washed stone which conforms to NCDOT Specifications, unless otherwise noted on the Drawings.
- M. Crushed Stone Fill:
1. Crushed Stone Fill shall be uniform 1-inch stone, no fines, in conformance to ASTM C 33.
  2. Subgrade materials beneath labyrinth base mat shall be as specified in Geotechnical Reports, Drawings and Specifications.
- N. Embedded Shapes:
1. Embedded steel plates, angles and other shapes shown on the Drawings shall conform to ASTM A36. Reinforcing bars welded to embedded shapes shall be Grade 40 weldable. All embedded shapes shall be cleaned in accordance with SSPC SP-10 "Near White Blast Cleaning" and receive a shop coat of inorganic zinc primer 3.0 mils, DFT except embedded shapes that are exposed or that support lintels that support exterior walls. These shapes shall be hot dipped galvanized in accordance with ASTM A153, Class B. Surface preparation and painting shall occur on all surfaces including the embedded anchors.
- O. Liquid Floor Treatments:
1. Penetrating Liquid Floor Treatment: Clear, chemically reactive, waterborne solution of inorganic silicate or silicate materials and proprietary components; odorless; that penetrates, hardens, and densifies concrete surfaces.
    - a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to the following:
      - 1) ChemMasters, Inc; Chemisil Plus.
      - 2) ChemTec Int'l; ChemTec One.
      - 3) Curecrete Distribution Inc.; Ashford Formula.
      - 4) Dayton Superior; Sure Hard Densifier J17.
      - 5) Euclid Chemical Company (The); an RPM company; Euco Diamond Hard.
      - 6) Kaufman Products, Inc; SureHard.
      - 7) L&M Construction Chemicals, Inc; Seal Hard.
      - 8) Metalcrete Industries; Floorsaver.
      - 9) Nox-Crete Products Group; Duro-Nox.
      - 10) PROSOCO, Inc; Consolideck LS by PROSOCO.

- 11) SpecChem, LLC; SpecHard.
- 12) US SPEC, Division of US MIX Company; US SPEC Industraseal.
- 13) Vexcon Chemicals Inc.; Vexcon StarSeal PS Clear.

P. Curing Materials:

1. Liquid curing material for concrete shall exceed the requirements of ASTM C 309, Type I. Products acceptable shall provide water retention not exceeding a loss of 0.020 grams per sq. cm. when tested at a coverage of 200 sq. ft. per gallon and tested in accordance with ASTM C 156. Submit test data verifying these requirements for approval.
2. Burlap shall be free of sizing or any substance that is injurious to cement or can cause discoloration. Burlap shall be rinsed in water prior to use. Burlap shall be sufficient thickness to retain water without requiring wetting.

2.2 MIX DESIGNS

- A. Mix designs shall be prepared and reported by a testing laboratory engaged by, and at the expense of the Contractor. The Contractor shall not use the Owner's testing laboratory for mix design. The cost of the mix designs shall be paid for by the Contractor.
- B. Proportions of materials for concrete shall be established in the mix designs to provide:
  1. Workability and consistency to permit concrete to be placed and worked readily into forms and around reinforcement under conditions of placement employed by the Contractor without segregation or excessive bleeding.
  2. Resistance to special exposures for concrete exposed to freezing and thawing in a moist condition.
  3. Average compressive strength as required in Section 5.3.2 of ACI 318-05 for the strength class of concrete specified.
  4. Water/cement ratios shall not exceed 0.45 for all concrete.
  5. The minimum cement content of concrete mixes shall be 520 lb. of cement per cu. yd.
- C. Design mixes shall be proportioned on the basis of trial mixtures only in accordance with the requirements set forth in Chapter 5 of ACI 318-05
- D. The required average strength for each class of concrete shall be established in accordance with Section 5.3.2 of ACI 318-05.
- E. Design mixes shall be prepared using the maximum slumps and temperature of fresh concrete permitted in these Specifications.
- F. Mix Designs shall include a letter prepared by a Registered Engineer of an independent testing laboratory certifying compliance of design mix with appropriate ACI standards

and procedures and list all the materials and exact proportions of each material for each design mix. A recent sieve analysis of both the fine and coarse aggregates shall be submitted with the design mix.

- G. Mix designs shall be submitted on the form included in these Specifications. All blank spaces on this form shall be filled in.

### 2.3 SLUMP LIMITS

- A. Proportions in mix designs and concrete placed in the field shall result in concrete slumps at the point of placement for all concrete of 3 inch minimum, not to exceed 4 inch maximum, unless otherwise accepted in writing by the Architect. Concrete having a slump in excess of 4 inches shall be removed from the job site. The addition of water to the concrete mix at the job site to increase the slump to the 4 inch maximum slump permitted will not be permitted except as accepted by the Architect in writing. Concrete mixes used in walls or columns containing a high-range water-reducer (super-plasticizer) shall have a maximum slump of 6 inches.
- B. The acceptance criteria for slumps shall be as follows:
  - 1. Any slump that exceeds the 4 inch maximum specified slump prior to the addition of the super-plasticizer shall be rejected.
  - 2. A tolerance up to 1 inch above the specified slump will be permitted for one truck in any five consecutive trucks tested. If trucks are not tested, these tolerances shall not be permitted.
  - 3. Slumps less than 3 inches shall not be allowed.
  - 4. Slumps that exceed the 5 inches maximum shall not be allowed.
  - 5. For concrete placed with a pump, the slump limits shall apply at the discharge end of the pump.

### 2.4 CONCRETE MIXES

- A. Concrete shall be mixed at batch plants or it may be transit-mixed as specified herein. Concrete batch plants must comply with the requirements of ACI 304 with sufficient capacity to produce concrete of the quantity and quality as specified herein. Plant facilities are subject to inspection by the Architect or his Agent.
- B. Ready-mix concrete shall comply with the requirements of ASTM C94 and as specified herein. During hot weather or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C 94 will be required as follows: When air temperatures are between 80 degrees F and 90 degrees F, reduce the mixing and delivery time from 1.5 hours to 1 hour. When temperatures are above 90 degrees F, reduce the mixing and delivery time from 1.5 hours to 45 minutes.
- C. Addition of water at job site, when approved in writing by the Architect, shall not be



permitted unless the delivery ticket states the amount of water that can be added without exceeding (the mix-design water amount less 1 gallon) per cubic yard and the slump of the mix, and the amount of water and mix proportions shown on the delivery ticket are based on a computer printout of the proportions of materials used in each truck. Water shall not be added on the job site if this requirement is not met and if not accepted in writing by the Architect. The addition of water shall also be done under the direct supervision of a certified concrete technician employed by the concrete supplier. Addition of water exceeding these requirements shall be cause for rejection of concrete.

- D. Maintain equipment in proper operating condition, with drums cleaned before charging of each batch. Schedule delivery of trucks in order to prevent delay of placing after mixing.
- E. Concrete shall be mixed at batch plants or it may be transit mixed as specified herein. Concrete batch plants must comply with the requirements of ASTM C 94 and ACI-304 with sufficient capacity of producing concrete of the quantity and quality as specified herein. All plant facilities are subject to inspection by the Engineer. Ready-mix concrete shall comply with requirements of ASTM C 94, and as specified herein, unless otherwise noted. During hot weather or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C 94 will be required as follows:
  - 1. When air temperatures are between 80 degrees F and 90 degrees F, reduce the mixing and delivery time from 1.5 hours to 1 hour till time of placement.
  - 2. When outside air temperatures are above 90 degrees F, reduce the mixing and delivery time from 1.5 hours to 45 minutes till time of placement.
- F. Addition of water at the site for concrete mix with insufficient slumps, slumps less than the maximum specified herein, will not be permitted. Concrete delivered to the project with slump less than the minimum or greater than the maximum specified shall be rejected and discarded off site.
- G. Batch tickets for each load of concrete shall be submitted to the Engineer. The following information shall be provided on each batch ticket:
  - 1. Design mix designation
  - 2. Exact time cement, water and aggregate were discharged into the mix
  - 3. Compressive strength of mix
  - 4. Amount of water added to the mix
- H. Maintain equipment in proper operating condition, with drums cleaned before charging of each batch. Schedule delivery of trucks in order to prevent delay of placing after mixing.
- I. Slump: All concrete shall be proportioned and produced to have a maximum slump of 4

inches and a minimum slump of 2 inches. A tolerance of up to, but not exceeding, 1 inch above the indicated maximum shall be allowed for individual batches in any one day's pour provided the average of the most recent ten batches within the same pour does not exceed the maximum limits. No tolerance will be permitted for individual batches when less than 10 batches are delivered for one day's pour.

J. Concrete Type and Strengths:

Location	Type Strength	28-Day Compressive
All	Normal Weight	4,500 psi

\*28-day strength shall be as determined from concrete sampled in accordance with ASTM C 172 and 4-inch diameter x 8-inch cylinders tested in accordance with ASTM C 31 and C 39.

- K. Mass Concrete Thermal Control Plan: Contractor shall provide Heat of Hydration thermal control plan in accordance with ACI 301 Section 8 that demonstrates:
1. Temperature within concrete of 150 degrees F will not be exceeded during curing.
  2. Difference between inner and outer, exposed surface of concrete will not exceed 35 degrees F.
- L. See Concrete General Notes on Structural Drawings for additional requirements.

## 2.5 ACCESSORIES

- A. Fabricate accessories from concrete, metal, plastic, or other materials accepted by the Architect. Include spacers, ties, chairs, bolsters and other devices required to properly support, space, and secure the reinforcing steel in their proper places in accordance with the Drawings and recommendations of the CRSI "Manual of Standard Practice." Chairs and other accessories shall be Class I or Class II in accordance with CRSI. Parts in contact with exposed concrete surfaces shall be either stainless steel (AISI 302 or 304). The locations and types of accessories shall be shown on the shop drawings. Accessories required by other trades shall be furnished by other trades and included under this section.

## 2.6 WATERSTOPS

- A. Self-Expanding Butyl Strip Waterstops: Manufactured rectangular or trapezoidal strip, butyl rubber with sodium bentonite or other hydrophilic polymers, for adhesive bonding to concrete, 3/4 by 1 inch (19 by 25 mm).
1. Products: Subject to compliance with requirements, provide the following:
    - a. Greenstreak; Swellstop.

- b. Henry Company, Sealants Division; Hydro-Flex.
    - c. JP Specialties, Inc.; Earth Shield Type 20.
    - d. SIKA Corp.; SikaSwell A2010.
  - B. Flexible PVC Waterstops: CE CRD-C 572, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.
    1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      - a. BoMetals, Inc.
      - b. Greenstreak.
      - c. Meadows, W.R., Inc.
      - d. Progress Industries, Inc.
      - e. Tamms Industries, Inc.
      - f. Vinylex Corp.
    2. Profile: Flat, dumbbell with center bulb.
    3. Dimensions: 4 inches by 3/16 inch thick.

### PART 3 EXECUTION

#### 3.1 PREPARATION OF EQUIPMENT AND PLACE OF DEPOSIT

- A. Before placing concrete, equipment for mixing and transporting and placing concrete shall be cleaned, debris and ice removed from spaces to be occupied by the concrete, forms thoroughly cleaned of soil, ice or other coatings which will prevent proper bond; reinforcement shall be securely tied in place and expansion joint material, anchors and other embedded items shall be securely positioned.
- B. Semi-porous sub-grade shall be sealed in an approved manner.
- C. Hardened concrete and foreign materials shall be removed from the conveying equipment.

#### 3.2 REVIEW PRIOR TO PLACEMENT

- A. Before placing concrete, inspect and complete the formwork installations, reinforcing steel, post-tensioning tendons, and items to be embedded or cast-in. Notify other crafts to permit the installation of their work; cooperate with other trades in setting such work, as required.
- B. Soil or rock at the bottoms of foundation systems shall be reviewed by a representative of the Architect prior to placement of the concrete.

- C. Coordinate the installation of joint materials with placement of forms and reinforcing steel.
- D. Notify the Architect at least 24 hours in advance of each placement of concrete in the elevated beams and slabs.

### 3.3 CONCRETE PLACEMENT

- A. Place concrete in compliance with the practices and recommendations of ACI 304 or as herein specified.
- B. Concrete shall be handled from the mixer to the place of final deposit as rapidly as practical by methods which will prevent separation or loss of ingredients and in a manner which will assure that the required quality concrete is obtained.
- C. Conveying equipment shall be of size and design to insure a continuous flow of concrete at the delivery end. Competent personnel shall be employed to handle and place the concrete.
- D. Concrete shall be deposited continuously or in layers of such thickness that no concrete will be deposited on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness within the section. If a section cannot be placed continuously, construction joints as herein specified shall be located at points as provided for in the Drawings or as accepted by the Architect. To avoid cold joints, placement shall be carried on at such a rate that the concrete which is being integrated with fresh concrete is still plastic. Deposit concrete as near as possible to its final location to avoid segregation due to re-handling or flowing. Do not subject concrete to any procedure which will cause segregation.
- E. Concrete shall not be allowed to "free fall" a distance greater than 4 feet – 0 inches. Use accepted tremies for placement where conveying equipment cannot deposit concrete within this distance above its final location.
- F. Screed concrete which is to receive other construction to the proper level to avoid excessive skimming or grouting.
- G. Do not use concrete which has become non-plastic and unworkable or does not meet the required quality-control limits, or which has become contaminated by foreign material. Remove rejected concrete from the Project Site and dispose of in an acceptable location.
- H. Deposit concrete in forms in horizontal layers not deeper than 24 inches and in a manner to avoid inclined construction and cold joints.
- I. Remove temporary spreaders in forms when concrete placing has reached the elevation

of such spreaders.

- J. Consolidate concrete placed in forms by mechanical vibrating equipment supplemented by hand-spading, rodding and tamping. Vibration of forms and reinforcing steel will not be permitted. The use and type of vibrator shall be in accordance with ACI 309R. Low-frequency vibrators shall be used with concrete containing high-range water-reducers while the concrete is in a fluid state. Consolidation of concrete shall be by electric- or pneumatic-drive immersion-type vibrators of sufficient power and capacity to consolidate the concrete effectively and quickly. Immersion-type vibrators shall maintain a frequency, when immersed in concrete, of not less than 8000 rpm and shall have a minimum amplitude of not less than 0.02 inches (0.5 mm). An adequate number of units capable of handling the rate and volume of concrete placed shall be provided. The duration of vibration shall be limited to that necessary to produce satisfactory consolidation.
- K. In consolidating each layer of concrete, the vibrator shall be operated in a near vertical position, and the vibrating head shall penetrate and re-vibrate the concrete in the upper portion of the underlying layer. The vibrator shall be inserted such that it quickly penetrates the layer and shall be slowly withdrawn such that the concrete layer is consolidated from the bottom upward. Vibration shall be performed in a systematic pattern to ensure overlap of the radius of action of the vibration and complete coverage. Additional concrete shall not be placed until concrete previously placed has been vibrated thoroughly as specified. Special attention shall be given to the consolidation of concrete at construction joints, against forms, and around embedded items.
- L. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther apart than the visible effectiveness of the vibrators. At each insertion, limit the duration of vibration to the time necessary to consolidate the concrete and complete embedment of reinforcement and other embedded items without causing segregation of the mix.
- M. Do not place concrete in supported elements until the concrete previously placed in columns and walls is no longer plastic.
- N. Deposit and consolidate concrete in slabs using a continuous operation, within the limits of construction joints, until the placing of the entire section is complete.
- O. Bring surface of slabs to the correct elevations with a straight edge and strike off. Rescreed surface with a "highway" straightedge to remove all humps and hollows. Do not sprinkle water or dry cement on the plastic surface during the finishing operations. Do not disturb the surface prior to beginning the finishing operations.
  - 1. The use of a laser-screed system for concrete consolidation in the slabs on grade and elevated floor slabs will be permitted. Test-data results on depth of

consolidation shall be submitted prior to final acceptance of the laser-screed system.

- P. Concrete mixes may be pumped to point of deposit in conformance with the following provisions:
1. Concrete pumps shall be of the positive piston-type. No squeeze pumps will be permitted.
  2. Concrete slumps shall not exceed 5 inches at the truck or be less than 3 inches at the discharge end of the nozzle. Concrete containing high-range water-reducers shall have slumps not greater than 5 inches or less than 3 inches at the discharge end of the nozzle. Slumps for each truck shall be tested at the truck and at the discharge end of the nozzle by the Contractor.
  3. The submitted concrete mix design shall indicate that the mix is designed to be pumped. Once mix designs are accepted by the Architect, changes in the mix to accommodate pumping will be prohibited unless new mix designs are submitted for review by the Architect.
  4. The ratio of coarse aggregate to total aggregate by weight shall not be less than 62 percent in mix designs.

#### 3.4 PREPARATIONS FOR INTERIOR SLABS-ON-GRADE

A. Under-slab Membrane:

1. Install membrane below granular fill, lapping joints 6 inches.
2. Tape or seal laps in the membrane in a manner approved by the Architect.
3. Installation requirements as recommended in ASTM E1643 shall be strictly followed.

B. Edge Treatment:

1. Turn up membrane at edges of slabs behind the pre-molded expansion joints filler, unless otherwise detailed.

#### 3.5 CONSTRUCTION, ISOLATION AND CONTROL JOINTS

- A. Construction joints not shown on the Drawings shall be made at locations that will least impair the strength of the structure and shall be accepted by the Architect prior to construction. In general, they shall be located near the middles of the spans of members. Joints in walls and columns shall be located at the undersides of floors, slabs, or beams, and the tops of foundation walls. Place construction joints perpendicular to the main reinforcement across construction joints unless shown otherwise on the Drawings.
- B. Roughen surfaces of hardened concrete to expose bonded coarse aggregate at construction joints. Clean surfaces of laitance, coatings, loose particles and foreign matter to expose aggregate.

- C. Prepare for bonding of fresh concrete to new concrete that has hardened as follows:
1. At joints between foundation systems and walls or columns, and between walls or columns and beams or slabs they support, and elsewhere unless otherwise specified herein, dampen, but do not saturate, the roughened and cleaned surface of hardened concrete immediately before placing fresh concrete.
  2. At joints in exposed work, at vertical joints in exposed work, saturate the roughened and cleaned surface of hardened concrete and apply a liberal coating of neat cement grout. Grout shall consist of equal parts of cement and fine aggregate by weight and shall contain not more than 6 gallons of water per bag of cement. Apply grout with a stiff brush to a minimum thickness of 1/16 inch. Deposit fresh concrete before grout has attained its initial set.
  3. In lieu of neat cement grout, bonding grout may be a commercial bonding agent. Apply to cleaned concrete surfaces in accordance with the printed instructions of the bonding-material manufacturer.
  4. Construction joints in slabs-on-grade shall be located at Control Joints. See typical details on the Drawings.
  5. Provide keyways at least 1.5 inch deep in construction joints in walls, beams, supported slabs, and between walls and foundation systems. See typical details on the Drawings.
- D. Provide isolation joints in slabs-on-grade at points of contact between slabs-on-ground and vertical surfaces, such as columns, walls, grade beams and elsewhere as indicated. Provide isolation joints in concrete slabs on grade around all columns.
- E. Control joints shall be 1/5 the depth of the slab. Spacing of control joints (feet) shall not exceed 3.5 times the thickness of the slab (inches) unless shown otherwise on the Drawings. Slabs shall be in place for a minimum of 30 days before sealant is placed in the saw cut control and construction joints.
- F. After joints have been cleaned and accepted for sealing, provide sealants as specified herein and shown on the Drawings for joints.

### 3.6 MISCELLANEOUS CONCRETE ITEMS

- A. Provide equipment bases and pads as shown on the Drawings. Set anchor bolts for equipment with templates at correct spacings and elevations complying with certified diagrams or templates of the manufacturers furnished with equipment.
- B. Set and build into the work, anchorage devices and other embedded items required for other work that is attached to, or supported by, cast-in-place concrete. Use setting drawings and directions provided by the suppliers of the items to be attached thereto.
- C. Filling-In:

1. Fill-in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place as specified in the Concrete Finishes Section.

### 3.7 LIQUID FLOOR TREATMENT APPLICATION

- A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment according to manufacturer's written instructions.
  1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
  2. Do not apply to concrete that is less than 28 days' old.
  3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous.

### 3.8 WATERSTOPS

- A. Flexible Waterstops: Install in construction joints and at other locations indicated to form a continuous diaphragm. Install in longest lengths practicable. Support and protect exposed waterstops during progress of the Work. Field fabricate joints in waterstops according to manufacturer's written instructions.
- B. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated, according to the manufacturer's written instructions, adhesive bonding, and mechanically fastening, and firmly pressing into place. Install in longest lengths practicable.

### 3.9 TESTING AND QUALITY CONTROL

- A. The Owner will employ an accredited (Class I) testing laboratory to perform concrete testing during construction. Concrete testing shall be performed by a laboratory meeting the requirements of ASTM E-329, Standard Recommended Practice for Testing Agencies for Concrete as Used in Construction. Specimens shall be taken as follows:
  1. A set of four test cylinders shall be taken on each type and class of concrete for each day's pour up to 100 cubic yards, not less than one for each 4000 sf of surface area for walls or slabs. A second set shall be taken for 100 cy to 200 cy, and a third set for more than 200 cy poured in any one sequence. One cylinder out of each set shall be tested at seven days, two, at twenty-eight days, and one held in reserve. Cylinders for compressive strength test shall be molded and cured in accordance with ASTM C31 and tested in accordance with ASTM C39.
- B. In addition to the strength tests on standard test cylinders, the following additional tests



shall be made by the Owner's testing laboratory.

1. Slump – 1 test for each load at point of discharge made in accordance with ASTM C143. Slump tests other than those made by the Owner's testing laboratory from concrete sampled for test cylinders shall be made by the Contract.
  2. Air Content - one test for each set of test cylinders made in accordance with ASTM C173 or ASTM C231 and random tests on loads as directed by the Architect.
  3. Concrete Temperature - one test for each truck when outside air temperature is 50 degrees F and below, or 80 degrees F and above, and one for each set of standard test cylinders.
  4. Unit Weight - one test for each set of test cylinders.
- C. Test results shall be reported in writing to Architect, Owner and Contractor on the same day that tests are made. Reports of compressive-strength tests shall contain project identification name and number, date of concrete placement, name of contractor, name of concrete supplier and truck number, name of concrete-testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7-day tests and 28-day tests, slump, air content, unit weight, and concrete temperature. List types and amounts of admixtures on report.

### 3.10 WORKMANSHIP

- A. Concrete work which does not conform to the specified requirements, including strength, tolerances and finishes, shall be corrected as directed by the Architect, at the Contractor's expense, without extension of time therefore. The Contractor shall also be responsible for the cost of corrections to any other work affected by or resulting from corrections to the concrete work.

### 3.11 EVALUATION AND ACCEPTANCE CRITERIA OF CONCRETE

- A. The strength level of an individual class of concrete shall be considered satisfactory if both of the following requirements are met:
1. Average of all sets of three consecutive strength tests equals or exceeds the specified 28-day compressive strength.
  2. No individual strength test (average of two cylinders) falls below the specified 28-day compressive strength by more than 500 psi.
- B. If either of these requirements is not met, steps shall be taken to increase the average of subsequent strength tests. If any individual strength test falls more than 500 psi below the specified 28-day strength tests or if tests of field-cured cylinders indicated deficiencies in protection and curing, the Architect will direct the Contractor to perform additional tests at the Contractor's expense to assure that the load-carrying capacity of the structure is not jeopardized. These tests shall consist of core tests, load tests, or an

analytical analysis using the lower-strength tests. The acceptance criteria for either core tests or load tests shall be in accordance with the requirements set forth in ACI 318-02.

- C. As data becomes available during construction, the amount, by which the specified 28-day compressive strength must be exceeded, may be reduced provided the following criteria are met:
1. The results of 30 or more strength-tests are available and the average of the results exceeds that required by Section 5.3.2.1 of ACI 318-05 using the standard deviation calculated in accordance with Section 5.3.1.1 of ACI 318-05.
  2. The results of 15 to 29 strength tests are available and the average of these results exceeds that required by Section 5.3.2.1 of ACI 318-05 using the standard deviation calculated in accordance with Section 5.3.1.2 of ACI 318-05.
  3. Exposure requirements of these Specifications are met.

### 3.12 PROTECTION OF LIQUID FLOOR TREATMENTS

- A. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.

END OF SECTION

CONCRETE MIX DESIGN FORM

PROJECT: \_\_\_\_\_ CITY \_\_\_\_\_

CONTRACTOR: \_\_\_\_\_

MIX DESIGN NO: \_\_\_\_\_ SPECIFIED CONCRETE CLASS: \_\_\_\_\_

METHOD SELECTED FOR MIX DESIGN PREPARATION:

A. Field Experience Data:

B. Trial Mixture Data:

- 1. Standard Deviation \_\_\_\_\_
- 2. Comp. Strength (7da) \_\_\_\_\_psi
- 3. Comp. Strength (28da) \_\_\_\_\_psi
- 4. No. of Consec. Tests \_\_\_\_\_
- 5. Overstrength Required \_\_\_\_\_psi

- 1. Standard Plant Deviation \_\_\_\_\_
- 2. No. of Consecutive Tests \_\_\_\_\_
- 3. Overstrength Required \_\_\_\_\_psi

MIX PROPERTIES:

Density \_\_\_\_\_ pcf  
 7-Day Strength \_\_\_\_\_ psi  
 28-Day Strength \_\_\_\_\_ psi

Air \_\_\_\_\_ %  
 Temperature \_\_\_\_\_ °F  
 Slump (max.) \_\_\_\_\_ inches

AGGREGATES:

Coarse: Type \_\_\_\_\_  
 Size \_\_\_\_\_  
 Source \_\_\_\_\_  
 ASTM Spec \_\_\_\_\_

Fine: Type \_\_\_\_\_  
 Source \_\_\_\_\_  
 ASTM Spec \_\_\_\_\_  
 F.M. \_\_\_\_\_  
 Colorimetric \_\_\_\_\_

CEMENT: Type \_\_\_\_\_  
 Source \_\_\_\_\_  
 ASTM Spec \_\_\_\_\_

Fly Ash: Type \_\_\_\_\_  
 Source \_\_\_\_\_  
 L.O.I. \_\_\_\_\_

WATER REDUCER:

Type \_\_\_\_\_  
 ASTM Spec \_\_\_\_\_  
 Source \_\_\_\_\_

HIGH-RANGE WATER REDUCER:

Type \_\_\_\_\_  
 ASTM Spec \_\_\_\_\_  
 Source \_\_\_\_\_

AIR ENTRAINMENT:

Type \_\_\_\_\_  
ASTM Spec \_\_\_\_\_  
Source \_\_\_\_\_

RATIOS

Water\*\*\* \_\_\_\_\_ lbs.  
Cement \_\_\_\_\_ lbs. = \_\_\_\_\_ %  
Fine Agg. \_\_\_\_\_ lbs.  
Total Agg. \_\_\_\_\_ lbs. = \_\_\_\_\_ %

CEMENT:  
FINE\*\*  
AGGREGATE:

MIX PROPORTIONS\*

WEIGHT (LBS.)  
ABSOLUTE VOL. (Cu.Ft.)

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

SPECIFIC GRAVITIES

Fine Agg. \_\_\_\_\_  
Coarse Agg. \_\_\_\_\_  
(Other) \_\_\_\_\_

COARSE\*\*  
AGGREGATE:  
WATER\*\*\*

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

ADMIXTURES

W.R. \_\_\_\_\_ oz. per 100# cement  
A.E. \_\_\_\_\_ oz. per 100# cement  
OTHER \_\_\_\_\_ oz. per 100# cement  
HRWR \_\_\_\_\_ oz. per 100# cement

OTHER:  
TOTALS:

\_\_\_\_\_  
\_\_\_\_\_

\* Proportions per cubic yard      \*\*\*Includes free water contained on aggregates  
\*\* Saturated surface dry weights

STANDARD DEVIATION ANALYSIS:

Number of Test Cylinders Evaluated: \_\_\_\_\_ Standard Deviation: \_\_\_\_\_

Mix Designs Proportioned to Achieve  $f'_{cr} = f'_c + \text{_____ psi}$

$f'_{cr} = f'_c + 1.34s$  or  $f'_{cr} = f'_c + 2.33s - 500$

TRIAL MIXTURE TEST DATA:

Age (days)	Mix #1 (comp. str.)	Mix #2 (comp. str.)	Mix #3 (comp. str.)
7	_____	_____	_____
7	_____	_____	_____
28	_____	_____	_____
28	_____	_____	_____

Mix #1

Initial Slump = \_\_\_\_\_ in., Final Slump = \_\_\_\_\_ in., Air Content = \_\_\_\_\_ in.  
 Unit Wet Wt. = \_\_\_\_\_ pcf, Unit Dry Wt. = \_\_\_\_\_ pcf Temperature = \_\_\_\_\_ °F

Mix #2

Initial Slump = \_\_\_\_\_ in., Final Slump = \_\_\_\_\_ in., Air Content = \_\_\_\_\_ in.  
 Unit Wet Wt. = \_\_\_\_\_ pcf, Unit Dry Wt. = \_\_\_\_\_ pcf Temperature = \_\_\_\_\_ °F

Mix #3

Initial Slump = \_\_\_\_\_ in., Final Slump = \_\_\_\_\_ in., Air Content = \_\_\_\_\_ in.  
 Unit Wet Wt. = \_\_\_\_\_ pcf, Unit Dry Wt. = \_\_\_\_\_ pcf Temperature = \_\_\_\_\_ °F

REMARKS:

---



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Note: Fill in all blank spaces. Use -0- (zero) or N.A. (Not Applicable).

Submitted by:

Ready Mix Supplier:

Name

---

Address

---

---

Telephone

---

Date

---

SECTION 05 12 00  
STRUCTURAL STEEL

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to work of this Section.

1.2 SCOPE

A. Related Work Specified Elsewhere:

1. Miscellaneous Metals (Section 055000)
2. Pipe and Tube Railings (Section 055213)
3. Bar Gratings (Section 055313)

B. Work Included This Section:

1. The extent of the structural steel work is shown on the Drawings, including schedules, notes and details to show size and location of members, typical connections and type of steel required and as specified herein. The extent of structural steel work includes furnishing, fabricating, delivering, and erecting structural steel shapes and anchor bolts; setting plans; shop cleaning; surface preparation and painting; touch-up painting in the field; and detail material as required to complete the job.

C. Responsibilities of Contractor:

- 1.3 The Contractor shall provide all structural steel as shown on the Drawings. The Contractor shall provide all corrosion protection coatings, including touch-up coatings. The Contractor shall be solely responsible for the safe execution of the work in the shop and field.

1.4 INDUSTRY STANDARDS

- A. Some products and execution are specified in this section by reference to published specifications or standards of the following (with respective abbreviations used). Reference is to the latest edition of the standard referenced.
1. American Institute of Steel Construction (AISC)
  2. The American Society for Testing and Materials (ASTM)
  3. American Welding Society (AWS)
  4. North Carolina State Building Code (NCSBC)

B. Codes and Standards:

1. The work shall comply with the provisions set forth in the following codes except as otherwise indicated. However, no provisions of any referenced code, standard or specification shall be effective to change the duties and responsibilities of Owner, Contractor, Engineer, or any of the Consultants, Agents, or Employees from those set forth in the Contract Documents, nor shall it be effective to assign to the Engineer or any of his Consultants or Agents any duty or authority to supervise or direct the furnishing or performance of the work or authority to undertake any responsibility for safety precautions or programs incidental to safety nor for the Contractor's failure to perform work in accordance with the intent of the Contract Documents.
  - a. AISC, "Code for Standard Practice for Steel Buildings and Bridges"
  - b. AISC, "Specification for Structural Steel Buildings - Allowable Stress Design and Plastic DeSign", including the Commentary and Supplements thereto as issued.
  - c. AISC "Specification for Structural Joints Using ASTM A325 or A490 Bolts" approved by the Research Council on Structural Connections of the Engineering Foundation.
  - d. AWS D1.1 "Structural Welding Code"
  - e. ASTM A6, "General Requirements for Rolled Steel Plates, Shapes, Sheet Piling and Bars for Structural Use"
  - f. North Carolina State Building Code - 2018 Edition with latest amendments.

1.5 QUALITY ASSURANCE

A. Qualifications for Welding Work:

Qualify welding processes and welding operators in accordance with the AWS "Standard Qualification Procedure." Provide certification that welders to be employed in the work have satisfactorily passed AWS qualification tests within the previous 12 months. Submit original signed certificate to the Engineer. If recertification of welders is required, retesting shall be the steel supplier's and/or steel erector's responsibility.

- B. The steel fabricator and steel erector shall demonstrate experience in the fabrication and erection of similar structures. The fabricator shall maintain a Quality Control Program under AISC guidelines.
- C. Erector shall have been in structural steel erection business no less than five years and shall have erected structures of similar design and complexity. Project names, locations, dates, and owners' names and contact persons for referenced projects shall be submitted upon request.
- D. Steel fabricator shall be an AISC Certified Building Fabricator Type BU. Certification shall be submitted for record.



- E. Steel erector shall be an AISC Certified Erector Type CSE. Certification shall be submitted for record.

#### 1.6 MEMBER CONNECTION DESIGN

- A. Details shown on the Contract Drawings are for typical conditions. Similar details shall apply to similar conditions except as indicated otherwise.
- B. The design of standard connections shall be designed by the fabricator in accordance with the design criteria specified in the Contract Documents. Submit design calculations where requested by the Engineer.
- C. Whenever the design of member connections is not clearly indicated, submit details of the proposed connection for approval by the Engineer. Submit to the Engineer for approval all design notes and complete calculations for all Contractor-designed connections.
- D. The design of connections and members for temporary bracing and shoring shall be the responsibility of the Contractor.
- E. The design of all connections not specifically called for on the Drawings shall be in accordance with the AISC Specifications and shall safely support the full design dead, live, wind, and/or temperature reactions of the members.
- F. All shop drawings showing connections, which are designed by the fabricator, are required to be sealed by a professional structural engineer registered in the state of North Carolina.

#### 1.7 SUBMITTALS

- A. Shop Drawings:
  - 1. The Engineer shall review the Contractor's submittals for general compliance with the Contract Documents for strength and serviceability only. This review will not be for accuracy of dimensions, fit-up, constructability, or for coordination of shop drawings with the shop drawings of other trades.
  - 2. Submit shop drawings showing complete details and schedules for fabrication and shop assembly of members. Include details, schedules, procedures, and diagrams showing the sequence of erection. Furnish exact sections, weights, and kinds of material shown or specified, and follow exact details and methods required to their full extent and purpose, unless otherwise agreed to in writing. Substitution of other shapes of equivalent strength and no greater dimensions than shown may be allowed, when accepted by Engineer. Substitutions shall be flagged for acceptance on the shop drawings.
  - 3. The Contractor shall allow for the shop drawings to remain in the Engineer's

possession for at least two weeks.

4. Prepare shop drawings in advance of fabrication. Give complete information necessary for fabrication of component parts of structure including location, type, and size of bolts and welds. Clearly distinguish between shop and field bolts and welds. Make shop drawings in conformity with best current practice and with due regard to speed and economy in fabrication and erection, all as set forth in the AISC "Structural Shop Drafting."
5. The Contractor shall allow in his schedule for the likelihood that some shop drawing submittals may have to be submitted more than once for review by the Engineer.
6. Shop drawings shall be carefully reviewed by the Contractor prior to submittal to the Engineer for review. Contractor shall be responsible for checking all dimensions and coordination of the structural steel work with the work of other trades. Shop drawings, which do not bear the Contractor's stamp of approval, shall be returned to the Contractor.
7. Submit erection drawings prior to submitting fabrication drawings. Erection drawings shall clearly indicate all piece marks, total dimension, temporary connection sequence of erection and other pertinent information. Detail shop drawings shall not be submitted until the erection drawings have been reviewed.
8. The Contractor shall immediately make all corrections to his drawings as noted by the Engineer in his review or as required by changes ordered or authorized by the Owner. The Contractor shall keep a satisfactory history of all changes by noting all revisions with separately noted and dated revision marks on each sheet.
9. Update all shop and erection drawings as required through the fabrication and erection of the work. Upon completion, submit two sets of "as-built" drawings to the Engineer for record purposes.

B. Manufacturer's Data:

1. Submit two copies of manufacturer's specifications and installation instructions for the following products. Include laboratory test reports and other data by transmittal form. Submit certification that a copy of each applicable installation instruction form has been distributed to installers, fabricators and erectors.
  - a. Structural steel, including certified copies of mill reports covering chemical and physical properties for each type, if requested.
  - b. High-strength bolts, including nuts and washers, if requested.
  - c. Electrodes for welding, if requested.
  - d. Structural steel paint.

- C. Submit copies of welder certification for welders. Welders shall be certified by test in accordance with AWS standards to perform the type of work required. Welding certification shall be passed within the previous 12 months.

D. Proof of Compliance:

1. The Contractor shall furnish a certificate from the producers of all material, steel and fasteners certifying that the material meets the minimum requirements specified. The Contractor shall pay for any tests required to demonstrate compliance.

## 1.8 PRODUCT HANDLING AND STORAGE

### A. Delivery:

1. Deliver materials to the site at such intervals to insure uninterrupted progress of the work. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place concrete, in ample time to not delay that work.

### B. Storage:

1. Store materials to permit easy access for inspection and identification.

### C. Protect structural steel members and packaged materials from corrosion and deterioration. In the event of damage to the steel, immediately make all repairs and/or replacements necessary for approval of the Engineer at no additional cost to the Owner.

### D. Do not handle materials during fabrication, transportation, or erection, and do not store materials on the structure in a manner that might cause distortion or damage to the members or the supporting structures. Any material or welding rejected by the Engineer or the Construction Testing Agency either in the shop or field shall be promptly repaired or replaced to meet the requirements of the Contract Documents at no additional cost to the Owner. All 3<sup>rd</sup> party testing agencies are subject to approval by the Owner.

### E. Structural steel shapes shall be unloaded and placed directly on dunnage to prevent contact with the ground. Any structural steel allowed to become muddy or otherwise soiled shall be cleaned prior to erection.

## 1.9 ERECTION

### A. The Contractor shall be solely responsible for the procedures, means and methods of erection and for all safety measures requires for the execution of this work. The Contractor shall be solely responsible for compliance with all pertinent statutes, regulations, and/or ordinances with respect to the erection of the work.

### B. The Contractor shall be solely responsible for the design of temporary shoring towers, braces, and/or temporary guys that may be required to execute the work.

## PART 2 GENERAL

### 2.1 MATERIALS

- A. Rolled steel shapes shall conform to ASTM A992 Grade 50,  $F_y = 50$  ksi.
- B. Plates and bars shall conform to ASTM A36,  $F_y = 36$  ksi.
- C. Structural steel tubular products shall be structural quality steel, welded or seamless as follows:
  - 1. Square, rectangular and special shapes shall conform to ASTM A500, Grade B or C.
  - 2. Structural steel pipe shall conform to ASTM A53, Type E, Grade B.
- D. Unfinished Threaded Fasteners:
  - 1. ASTM A307, Grade A, regular low-carbon steel bolts and nuts.
- E. High-Strength Threaded Fasteners:
  - 1. Heavy hexagon structural bolts, heavy hexagon nuts, and hardened washers shall conform to ASTM A325. Bolts, nuts and washers exposed to the exterior shall be hot-dipped galvanized.
- F. Anchor Bolts:
  - 1. ASTM A307 or ASTM F1554 GR36.
- G. Electrodes for Manual Shielded and Metal-Arc Welding:
  - 1. AWS Code, E70XX low-hydrogen.
- H. Structural Steel Primer Paint - Exterior Steel - includes all masonry lintels, and other steel exposed to the exterior:
  - 1. Formulation of zinc-rich polyamide epoxy. Solids (by volume) shall not be less than 51%. Total dry-film thickness shall be not less than 3.0 mils.
- I. Structural Steel Primer Paint - Interior Steel - includes all steel not defined as exterior steel:
  - 1. Formulation of zinc-chromate and red iron-oxide in an alkyd vehicle. Solids (by volume) shall be not less than 42%. Total dry-film thickness shall not be less than 2.5 mils.
- J. Galvanizing:
  - 1. Hot dipped conforming to the requirements of ASTM A153, Class B.
- K. Headed studs:

1. Headed anchors shall be Nelson shear studs, flux filled, welded to plates as shown on drawings. Studs shall be made from cold drawn steel grades C1010 to C1020 per ASTM A-108, and shall be welded per manufacturer's recommendation.
- L. Non-Metallic Shrinkage-Resistant Grout: Group shall be non-corrosive, non-metallic, and shall not release gases. Grout shall comply with the Corps of Engineers Specification for Non-Shrink Grout CRD-C261.

## 2.2 FABRICATION

### A. General:

#### 1. Measurements:

- a. Prior to beginning the work and fabrication of the structural steel, the Contractor shall conduct a field survey of all the dimensions, elevations, and member sizes pertinent to or affected by his work. The results of the field survey shall be submitted to the steel fabricator and Engineer. Clearly identify all dimensions, elevations, member sizes, and verification of those shown on the Contract Documents.
  - b. The dimensions and locations of members are indicated on the Drawings, sections and details, all which are believed to be correctly laid down; but the fabricator and Contractor shall verify all dimensions for themselves.
  - c. The Contractor shall verify field dimensions and elevations of anchor bolts, embedded plates, etc. and shall notify the Engineer and steel fabricator of any discrepancies from the plan dimensions or elevations.
2. Fabricate items of structural steel in accordance with the AISC Specifications and as indicated on the final shop drawings. Fabrication shall be complete before surfaces are prepared for painting.
  3. Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence, which will expedite erection and minimize field handling of materials.
  4. Fabricator shall provide holes or cuts as called for on the Drawings and necessary for the connections or clearance cut as part of the fabrication of the structural steel. Under no circumstances shall holes or cuts be made in structural steel members in the field without prior approval from the Engineer. If required, mis-fabricated members shall be returned to the fabricator for replacement or modification.
  5. Holes for Other Work:
    - a. Provide holes required for securing other work to structural steel framing. Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame-cut holes or enlarge holes by burning.

### B. Connections:

1. Weld or bolt shop connections unless otherwise shown.

2. Bolt field connections except where welded connections or other connections are shown or specified.
  3. Provide high-strength threaded fasteners for bolted connections unless otherwise specifically noted on the Drawings.
  4. Install high-strength-threaded fasteners in accordance with AISC "Specification for Structural Joints Using ASTM A325 or A490 Bolts." Use A325 Type "N", unless otherwise noted on the drawings.
  5. Connections:
    - a. A combination of bolts and welds in the same connection is not permitted unless otherwise detailed. Connections not detailed shall be designed for loads shown on Drawings or for loads given in Standard AISC Load Tables for spans, sections and strengths specified.
  6. Connections for members, except where otherwise detailed on the Drawings, shall be fabricated with double-angle connection clips shop-welded or shop-bolted to the member and bolted to the supporting members.
  7. Members meeting at a point shall have their gravity axes intersecting at a common point unless otherwise permitted.
  8. Connections to a pipe or tube column shall be made with plates extending through the column and welded on each side, unless otherwise noted.
- C. Welding:
1. Welds shall be made by welders who have been certified by tests in accordance with AWS standards to perform the type of work required.
  2. Welds shall comply with the procedures, appearance and quality required in AWS D1.1. Methods employed to correct welds must comply with AWS D1.1.
  3. Assemble and weld built-up members and sections which will produce true alignment of axes without warp.

## PART 3 EXECUTION

### 3.1 EXAMINATION OF THE SITE AND SURVEY

#### A. Surveys:

1. The Contractor shall use qualified personnel to layout, locate and set correct elevations on embedded plates and bolts to receive steel members. Notify the Engineer immediately of any discrepancies that exist between the final locations and the plan location.

### 3.2 FABRICATION

- A. All members when finished shall be true and free of twists, bends, and open joints between the component parts. Members shall be thoroughly straightened in the shop by methods which will not injure them, before being worked on in any way.
- B. Connections:
1. Connections shall be as indicated on the Drawings. When details are not shown, the connections shall be designed by the Contractor to meet the criteria shown on the Drawings or specified herein and to conform to the requirements of the AISC Manual. One-sided or other type of eccentric connections shall not be used except where indicated on the Contract Drawings.
  2. Combination of bolts and welds in a connection of any two components is not permitted, unless otherwise shown on the Contract Drawings.
  3. Welded Connections:
    - a. Operators: Welds shall be made only by operators who have been previously qualified by tests, as prescribed in AWS D1.1 to perform the type of work required.
    - b. All welders working on the project will be assigned an identifying symbol or mark. Each welder will be required to mark or stamp his symbol on each weldment completed for identification.
    - c. Welding equipment shall be of sufficient capacity and maintained in good working condition, capable of adjustment in a full range of current settings. Welding cables shall be of adequate size for the currents involved and grounding methods shall be such as to ensure proper machine operation.
    - d. No welding shall begin until joint elements are clamped in proper alignment and adjusted to dimensions shown on the Drawings with allowance for any weld shrinkage that is expected. Welding procedures shall be such as to minimize residual stresses and distortion.
    - e. Where field welding is acceptable, all standards for shop welding, including rod drying and pre-heat temperatures, shall apply, except as noted. All field welds shall be inspected by the 3<sup>rd</sup> party Construction Testing Agency as stated under 3.5.a using suitable non-destructive testing methods or directed by the Engineer.
    - f. All welding shall be done in accordance with the reference specifications, with the following modifications and additions:
      - 1) All shop welding shall be done by either submerged arc welding or manual shielded metal-arc welding pursuant to the requirements of AWS D1.1, or other welding process approved by the Engineer.
      - 2) All field welding, where allowed, shall be done by manual shielded metal arc welding to AWS D1.1.
      - 3) All groove and butt welds shall have complete penetration unless otherwise specified on the Drawings.

4)The minimum preheat and interpass temperatures shall be maintained during all welding operations per AWS D1.1.

4. Bolted Connections:
  - a. Fasteners shall be tightened in properly aligned holes. Tighten bolts to the minimum tension specified. Tightening shall be by turn of the nut procedure.
  - b. Single bolt connections are not permitted except where shown on the Drawings.
  - c. Flame cut holes will not be permitted.

C. Oxygen (Flame) Cutting:

1. Manual oxygen cutting shall be done only with a mechanically-guided torch. Alternatively, an unguided torch may be used provided the cut is not within 0.5 inches, of the finished dimension and the final removal is completed by chipping or grinding to produce a surface quality equal to that of the base metal at cut edges.
2. Control process to prevent excessive hardening of edges of grade 50 and higher strength steel where material is to be welded. Hardness value must not exceed that which will impair the fatigue and or tensile performance of the material.
3. Machine the edges of all steel cut by flame which will subjected to dynamic or fatigue loading or liable to brittle fracture. Allow for the metal to be removed in dimensioning, not less than 0.125 inches.
4. Clean all cut edges by grinding to remove all gouges, cut burrs, and jags.
5. Re-entrant cuts shall have as large a radius as possible without overcutting.
6. Oxygen cutting of structural steel in the field by the Contractor shall not be done except by the written consent and approval of the Engineer. The use of oxygen-cut holes for bolted connections will under no circumstances be permitted, and violation of this clause will be sufficient cause for the rejection of any pieces in which oxygen-cut holes exist.

### 3.3 ERECTION

A. General:

1. The erector shall examine the site and conditions under which structural steel work is to be installed and shall notify the Engineer and the Contractor in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the erector.
2. Erection shall be in accordance with the AISC "Specification" and "Code of Standard Practice", and as herein specified. Maintain work in a safe and stable condition during erection.
3. The erector shall establish permanent bench marks as necessary for the accurate erection of the structural steel. The erector shall check elevations of concrete and



masonry bearing surfaces and report measurement or elevation discrepancies to the Contractor. Do not proceed with erection until discrepancies have been corrected or until the Engineer has approved adjustments to the structural steel work.

B. Temporary Shoring and Bracing:

1. Provide temporary shoring and bracing members as required with connections of sufficient strength to bear imposed loads. Remove temporary members and connections when permanent members are in place and final connections are made. Provide temporary guy lines to achieve proper alignment of the structures as erection proceeds.

C. Anchor Bolts:

1. Furnish anchor bolts and other connectors required for securing structural steel to in-place work.
2. Furnish templates and/or other devices for setting bolts and other anchors to accurate locations.

D. Field Assembly:

1. Set structural members accurately to the lines and elevations indicated. Align and adjust the various members forming a part of a complete frame or structure before permanently fastening. Clean bearing surfaces and other surfaces, which will be in permanent contact before assembly. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
2. Level and plumb individual members of the structure within specified AISC tolerances.
3. Do not enlarge unfair holes in members by burning or by the use of drift pins. Ream holes that must be enlarged to admit bolts.

E. Comply with AISC Specification for bearing, adequacy of temporary connections, alignment and the removal of paint on surfaces adjacent to field welds.

F. Gas Cutting:

1. Do not use gas cutting torches in the field for correcting fabrication errors in the structural framing unless specifically accepted by the Engineer. If gas-cutting is permitted, cut edges shall be finished to a sheared appearance.

### 3.4 PAINTING OF STRUCTURAL STEEL

A. Surface Preparation:

1. Thoroughly clean all steel surfaces (whether to receive paint or not) of all loose mill scale, loose rust, spatter, slag and flux deposit, oil, dirt, grease, and other foreign matter. Use the following methods of cleaning:
  - a. All grease and oil shall be removed in accordance with SSPC-SP1, "Solvent Cleaning."
  - b. All steel shapes that are exposed to moisture or the weather, including lintels and embedded shapes and plates in concrete members adjacent to the exterior walls shall be hot dipped galvanized. Hot dip galvanizing shall conform to ASTM A153, Class B.
  - c. Clean all surfaces that are not exposed to the exterior or moisture in accordance with SSPC-SP2 "Hand Tool Cleaning" with all oil, grease, and similar contaminants removed.
  - d. Remove all surface defects likely to be detrimental to the painting system. Re-blast after grinding as required.
  - e. All surfaces shall be brushed and vacuum cleaned to remove all dust, shot, grit, etc.

B. Shop Painting:

1. Immediately after surface preparation, apply shop paint system to the nominal dry film thickness specified. Minimum nominal coating dry film thickness for the primer shall be 3.0 mil.
  - a. Procedure:
    - 1) Apply paint by brush, spray, roller or other means approved by paint manufacturer to provide the minimum dry film thickness specified. No painting shall be done when the surface temperature of the steel is below 50 degrees F (8 degrees C) or below the temperature at which condensation will occur, or the minimum temperature specified by the paint manufacturer.
    - 2) Apply paint thoroughly and evenly to dry surfaces in accordance with manufacturer's directions. Follow manufacturer's recommendations for minimum drying time of each coat prior to handling and/or overcoat application.
    - 3) Do not paint the faying surfaces of friction bolted connections or top flanges of beams that are to receive field applied shear connections welded thru the composite deck. Mask these surfaces prior to painting, leaving masking in place to protect against corrosion until immediately prior to making connection.
    - 4) Do not paint within 2.0 inches of field welds.
    - 5) Paint all exposed portions of non-galvanized bolts and nuts.
    - 6) All surfaces not painted shall be cleaned as per surface preparation methods noted above.

7) Steel permanently within the interior conditioned space does not require coating.

C. Field Touch-up Painting:

1. Touch-up painting shall comply with the requirements specified in "Shop Painting".
2. After erection, power tool clean exposed surfaces of field connections including exposed bolts, unpainted areas adjacent to field connections and damaged areas in the shop coat and paint as required with all paint system components or galvanized system components specified herein.

3.5 FIELD QUALITY CONTROL

- A. The Contractor will engage an independent qualified commercial testing laboratory to inspect full penetration welded connections, slip-critical and direct tension bolted connections, and to perform tests and prepare test reports during fabrication and erection. Coordination of the testing is the responsibility of the Contractor. The Engineer will be responsible for directing the Testing Laboratory during the testing. All 3<sup>rd</sup> party testing agencies are subject to approval by the Owner.
- B. The testing laboratory will conduct and interpret tests and will state in each report whether the test specimens comply with the specified requirements.
- C. The Contractor shall provide access for the testing laboratory representative where steel is being fabricated and erected so that the required inspection and testing can be accomplished.
- D. Correct all deficiencies in structural steel work, which inspections and laboratory test reports indicate are not in compliance with the specified requirements, as directed by the Engineer. Additional testing as required for inspection of corrected work shall be at the Contractor's expense. In addition to the previous testing, the Owner may have tests performed after the Engineer has reviewed the work.

END OF SECTION

## SECTION 05 50 00

## MISCELLANEOUS METALS

## PART 1 GENERAL

## 1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

## 1.2 SECTION INCLUDES

- A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the miscellaneous metal work as indicated on the drawings and/or specified herein, including, but not limited to, the following:
  - 1. Rough hardware
  - 2. Vertical steel ladders and ship's ladders
  - 3. Open riser steel service stairs
  - 4. Steel pipe handrails and railings not part of steel pan stair assemblies
  - 5. Loose steel lintels
  - 6. Light steel framing and supports, not included as part of work of other trades
  - 7. Steel gratings and frames
  - 8. Steel plate covers and frames
  - 9. Cast thresholds
  - 10. Elevator divider beams, guide rail beams and elevator pit hold down beams
  - 11. Steel dunnage beams
  - 12. Furnishing stair nosings for interior concrete stairs
  - 13. Steel bollards
  - 14. Miscellaneous steel trim and channels
  - 15. Countertop supports
  - 16. Trench drains
  - 17. Masonry support steel
  - 18. Sleeves in concrete walls and slabs
  - 19. Steel framing, bracing, supports, anchors, bolts, shims, fastenings, and all other supplementary parts indicated on drawings or as required to complete each item of work of this Section
  - 20. Prime painting, touch-up painting, galvanizing, and separation of dissimilar metals for work of this Section
  - 21. Cutting, fitting, drilling, and tapping work of this Section to accommodate work of other Sections and of concrete, masonry or other materials as required for attaching and installing work of this Section

### 1.3 RELATED SECTIONS

- A. Structural Steel (Section 051200)

### 1.4 QUALITY ASSURANCE

- A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication, where possible. Do not delay job progress; allow for trimming and fitting where taking field measurements before fabrication might delay work.
- B. Shop Assembly: Pre-assemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for re-assembly and coordinated installation.
- C. Reference Standards: The work is subject to requirements of applicable portions of the following standards:
  - 1. "Manual of Steel Construction," American Institute of Steel Construction
  - 2. AWS D1-1 "Structural Welding Code," American Welding Society
  - 3. AWS D1-3 "Structural Welding Code – Sheet Steel," American Welding Society
  - 4. SSPC SP-3 "Surface Preparation Specification No. 3, Power Tool Cleaning," Steel Structures Painting Council
  - 5. SSPC PA-1 "Painting Application Specification," Steel Structures Painting Council.
  - 6. "Handbook on Bolt, Nut and Rivet Standards," Industrial Fasteners Institute
- D. Steel Materials: For steel to be hot dip-galvanized, provide steel chemically suitable for metal coatings complying with the following requirements: carbon below 0.25 percent, silicon below 0.24 percent, phosphorous below 0.05 percent, and manganese below 1.35 percent. Notify galvanizer if steel does not comply with these requirements to determine suitability for processing.
- E. Engage the services of a galvanizer who has demonstrated a minimum of five years' experience in the successful performance of the processes outlined in this specification in the facility where the work is to be done and who will apply the galvanizing and coatings within the same facility as outlined herein. The Engineer has the right to inspect and approve or reject the galvanizer/galvanizing facility.
- F. The galvanizer/galvanizing facility must have an ongoing Quality Control/Quality Assurance program which has been in effect for a minimum of five years and shall provide the Engineer with process and final inspection documentation. The galvanizer/galvanizing facility must have an on-premise testing facility capable of measuring the chemical and metallurgical composition of the galvanizing bath and pickling tanks.

- G. Inspection and testing of hot-dip galvanized coating shall be done under the guidelines provided in the American Hot-Dip Galvanizers Association (AGA) publication "Inspection of Products Hot-Dip Galvanized After Fabrication."

#### 1.5 PERFORMANCE STANDARDS

- A. Stairs and railings shall be constructed to conform to the following performance standards:

1. Stairs and platforms shall support a live load of 100 psf and a concentrated live load of 300 lbs. and shall have a live load deflection limited to 1/360 of the span. Loads shall not apply simultaneously.
2. Railings shall be designed to resist loads per North Carolina 2018 Building Code.

#### 1.6 SUBMITTALS

- A. Manufacturer's Literature: Submit manufacturer's specifications, load tables, dimension diagrams, anchor details and installation instructions for products to be used in the fabrication of miscellaneous metal work, including paint products.
- B. Shop Drawings: Shop drawings for the fabrication and erection of all assemblies of miscellaneous iron work which are not completely shown by manufacturer's data sheets. Include plans and elevations at not less than 1-inch to 1 foot-0-inch scale, and include details of sections and connections at not less than 3-inch to 1-foot-0-inch scale. Show anchorage and accessory items.
- C. Engineering Data
  1. Before any stairs, ladders and railings are fabricated, submit engineering data drawings to the Engineer for review indicating how performance standards specified here shall be met. The Contractor is responsible for the structural design and supports for these systems and must show his proposed systems on these drawings.
  2. These drawings must show all load conditions and design calculations relative to connections, fastening devices and anchorage, as well as size and gauge of members. Calculations and drawings must be prepared by a Structural Engineer licensed in the State of North Carolina and shall be signed and sealed by this Engineer.
- D. Welding shall be indicated on shop drawings using AWS symbols and showing length, size and spacing (if not continuous). Auxiliary views shall be shown to clarify all welding. Notes such as 1/4-inch weld, weld and tack weld are not acceptable.
- E. Certification: For items to be hot-dip galvanized, identify each item galvanized and to show compliance of application. The Certificate shall be signed by the galvanizer and shall contain a detailed description of the material processed and the ASTM standard

used for the coating and, the weight of the coating. In addition, and as attachment to Certification, submit reports of testing and inspections indicating compliance with the provisions of this Section.

## PART 2 PRODUCTS

### 2.1 MATERIALS

#### Metals

- A. 1. Metal Surfaces, General: For fabrication of miscellaneous metal work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness.
2. Steel Plates, Shapes and Bars: ASTM A 36
3. Steel Bar Grating: ASTM A 1011/A or ASTM A 36
4. Steel Tubing: Cold formed, ASTM A 500; or hot rolled, ASTM A 501
5. Structural Steel Sheet: Hot rolled, ASTM A 570; or cold rolled, ASTM A 611, Class 1; of grade required for design loading
6. Galvanized Structural Steel Sheet: ASTM A 924, of grade required for design loading. Coating designation G90
7. Steel Pipe: ASTM A 53, type and grade as selected by fabricator and as required for design loading; galvanized unless black finish is indicated; standard weight (Schedule 40), unless otherwise indicated
8. Gray Iron Castings: ASTM A 48, Class 30, unless another class is indicated or required by structural loads
9. Malleable Iron Castings: ASTM A 47, grade as selected by fabricator
10. Brackets, Flanges and Anchors: Cast or formed metal of the same type material and finish as supported rails, unless otherwise indicated
- B. 11. Concrete Inserts: Threaded or wedge type; galvanized ferrous castings, either malleable iron, ASTM A 47, or cast steel, ASTM A 27. Provide bolts, washers and shims as required, hot-dip galvanized, ASTM A 153.

- C. Grout: Non-shrink, non-metallic grout conforming to the requirements of Section 033000.

#### Fasteners

1. General: Provide zinc-coated fasteners for exterior use or where built into exterior walls. Select fasteners for the type, grade and class required
2. Bolts and Nuts: Regular hexagon head type, ASTM A 307, Grade A
3. Anchor Bolts: ASTM F 1554, Grade 36
4. Lag Bolts: ASME B18.2.1

5. Machine Screws: ASME B18.6.3
6. Plain Washers: Round, carbon steel, ASME B18.22.1
7. Masonry Anchorage Devices: Expansion shields, FS FF-S-325
8. Toggle Bolts: Tumble-wing type, FS FF-B-588, type, class and style as required
9. Lock Washers: Helical spring type carbon steel, ASME B18.21.1

Shop Paint: Shop prime all non-galvanized miscellaneous metal items using Series 88 Azeron Primer made by Tnemec, ICI Devoe "Rust Guard" quick dry alkyd shop coat No. 41403, or "Interlac 393" by International Protection Coatings

- D. 1. If steel is to receive high performance coating as noted in Section 099000, shop prime using primer noted in Section 099000.

Bituminous Paint: Cold applied asphalt emulsion complying with ASTM D 1187

- E. Galvanize Repair Coating: For touching up galvanized surfaces after erection, provide repair coating that is V.O.C. compliant, equal to "Silver Galv" made by Z.R.C. Worldwide
- F. or approved equal. Apply to a dry film thickness of 1.5 to 3.0 mils.

## 2.2 PRIME PAINTING

- A. Scope: All ferrous metal (except galvanized steel) shall be cleaned and shop painted with one coat of specified ferrous metal primer. No shop prime paint required on galvanized steel or aluminum work.
- B. Cleaning: Conform to Steel Structures Painting Council Surface Preparation Specification SP 3 (latest edition) "Power Tool Cleaning" for cleaning of ferrous metals which are to receive shop prime coat.
- C. 1. Steel to get high performance coating as noted in Section 09 90 00 shall be cleaned as per SSPC SP.6, "Commercial Blast Cleaning."

### Application

1. Apply shop prime coat immediately after cleaning metal. Apply paint in dry weather or under cover. Metal surfaces shall be free from frost or moisture when painted. Paint all metal surfaces including edges, joints, holes, corners, etc.
2. Paint surfaces which will be concealed after shop assembly prior to such assembly. Apply paint in accordance with approved paint manufacturer's printed instructions, and the use of any thinners, adulterants or admixtures shall be only as stated in said instructions.
3. Paint shall uniformly and completely cover the metal surfaces, 2.0 mils minimum dry film thickness. No work shall be shipped until the shop prime coat thereon



has dried.

Touch-Up: In the shop, after assembly and in the field, after installation of work of this Section, touch-up damaged or abraded portions of shop prime paint with specified ferrous metal primer.

- D. Apply one shop coat to fabricated metal items, except apply two coats of paint to surfaces inaccessible after assembly or erection. Change color of second coat to distinguish it from the first.

E. 2.3 GALVANIZING

- A. Scope: All ferrous metal exposed to the weather, and all ferrous metals indicated on drawings or in specifications to be galvanized, shall be cleaned and then hot-dipped galvanized after fabrication as provided by Duncan Galvanizing or approved equal.

- B. Avoid fabrication techniques that could cause distortion or embrittlement of steel items to be hot-dip galvanized. Fabricator shall consult with hot-dip galvanizer regarding potential warpage problems or handling problems during the galvanizing process that may require adjustment of fabrication techniques or design before finalizing shop drawings and beginning of fabrication.

- C. Cleaning: Thoroughly clean metal surfaces of all mill scale, rust, dirt, grease, oil, moisture and other contaminants prior to galvanizing.

- D. Application: Hot-dip galvanizing shall conform to the following:

1. ASTM A 143: Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel
2. ASTM A 123: Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
3. ASTM A 153: Galvanized Coating on Iron and Steel Hardware - Table 1
4. ASTM A 384: Practice for Safeguarding Against Warpage and Distortion During Hot-Dip Galvanizing of Steel Assemblies
- E. 5. ASTM A 385: Practice for Providing High Quality Zinc Coatings
- F. 6. ASTM A 924: Galvanized Coating on Steel Sheets
7. Minimum weight of galvanized coating shall be 2 oz. per square foot of surface.

Fabricate joints which will be exposed to weather in a manner to exclude water or provide weep holes where water may accumulate.

All galvanized materials must be inspected for compliance with these specifications and marked with a stamp indicating the name of the galvanizer, the weight of the coating, and the appropriate ASTM number.

To minimize surface imperfection (eg: flux inclusions), material to be galvanized shall be dipped into a solution of Zinc Ammonium Chloride (pre-flux) immediately prior to galvanizing. The type of galvanizing process utilizing a flux blanket overlaying the molten zinc will not be permitted.

- G. After galvanizing all materials not exposed to view must be chromated by dipping material in a 0.2% chromic acid solution.

Galvanized surfaces, where exposed to view, must have a smooth, level surface finish.

- H. Where this does not occur, piece shall be rejected and replaced to the acceptance of the Engineer.

I.

#### 2.4 PROTECTIVE COATINGS

Whenever dissimilar metals will be in contact, separate contact surfaces by coating each contact surface prior to assembly or installation with one coat of specified bituminous paint, which shall be in addition to the specified shop prime paint. Mask off those surfaces not required to receive protective coating.

A.

#### 2.5 WORK QUALITY

##### A. General

1. Miscellaneous metal work shall be fabricated by an experienced fabricator or manufacturer and installed by an experienced trades worker.
2. Materials, methods of fabrication, fitting, assembly, bracing, supporting, fastening, operating devices, and erection shall be in accordance with drawings and specifications, approved shop drawings, and best practices of the industry, using new and clean materials as specified, having structural properties sufficient to safely sustain or withstand stresses and strains to which materials and assembled work will be subjected.
3. All work shall be accurately and neatly fabricated, assembled and erected.

B.

Shop Assembly: Insofar as practicable, fitting and assembly of work shall be done in shop. Shop assemble work in largest practical sizes to minimize field work. It is the responsibility of the miscellaneous metal subcontractor to assure himself that the shop-fabricated miscellaneous metal items will properly fit the field condition. In the event that shop-fabricated miscellaneous metal items do not fit the field condition, the item shall be returned to the shop for correction.

Cutting: Cut metal by sawing, shearing, or blanking. Flame cutting will be permitted only if cut edges are ground back to clean, smooth edges. Make cuts accurate, clean, sharp and free of burrs, without deforming adjacent surfaces or metals.

Holes: Drill or cleanly punch holes; do not burn.

- C. Connections: Make connections with tight joints, capable of developing full strength of member, flush unless indicated otherwise, formed to exclude water where exposed to weather. Locate joints where least conspicuous. Unless indicated otherwise, weld or bolt shop connections; bolt or screw field connections. Provide expansion and contraction joints to allow for thermal movement of metal at locations and by methods approved by Engineer.
- D.
- E.

1. Welding

- a. Shall be in accordance with AWS D1.1 Structural Welding Code of the American Welding Society, and shall be done with electrodes and/or methods recommended by the manufacturer of the metals being welded.
- b. Welds shall be continuous, except where spot welding is specifically permitted. Welds exposed to view shall be ground flush and dressed smooth with and to match finish of adjoining surfaces; undercut metal edges where welds are required to be flush.
- c. All welds on or behind surfaces which will be exposed to view shall be done so as to prevent distortion of finished surface. Remove weld spatter and welding oxides from all welded surfaces.

2. Bolts and Screws: Make threaded connections tight with threads entirely concealed. Use lock nuts. Bolts and screw heads exposed to view shall be flat and countersunk. Cut off projecting ends of exposed bolts and screws flush with nuts or adjacent metal.
- F.

- G. Operating Mechanism: Operating devices (i.e. pivots, hinges, etc.) mechanism and hardware used in connection with this work shall be fabricated, assembled, installed and adjusted after installation so that they will operate smoothly, freely, noiselessly and without excessive friction.

- H. Built-In Work: Furnish anchor bolts, inserts, plates and any other anchorage devices, and all other items specified under this Section of the Specifications to be built into concrete, masonry or work of other trades, with necessary templates and instructions, and in ample time to facilitate proper placing and installation.

Supplementary Parts: Provide as necessary to complete each item of work, even though such supplementary parts are not shown or specified.

Coordination: Accurately cut, fit, drill and tap work of this Section to accommodate and fit work of other trades. Furnish or obtain, as applicable, templates and drawings to or from applicable trades for proper coordination of this work.

#### Exposed Work

- I. 1. In addition to requirements specified herein and shown on drawings, all surfaces exposed to view shall be clean and free from dirt, stains, grease, scratches, distortions, waves, dents, buckles, tool marks, burrs, and other defects which mar appearance of finished work.
- J. 2. Metal work exposed to view shall be straight and true to line or curve, smooth arrises and angles as sharp as practicable, miters formed in true alignment, profiles accurately intersecting, and with joints carefully matched to produce continuity of line and design.
- 3. Exposed fastenings, where permitted, shall be of the same material, color and finish as the metal to which applied, unless otherwise indicated, and shall be of the smallest practicable size.

- K. Preparation for Hot-Dip Galvanizing: Fabricator shall correctly prepare assemblies for galvanizing in consultation with galvanizer and in accordance with applicable Reference Standards and applicable AGA publications for the "Design of Products to be Hot-Dip galvanized After Fabrication." Preparation shall include but not be limited to the following:

- 1. Remove welding flux.
- 2. Drill appropriate vent holes and provide for drainage in inconspicuous locations of hollow sections and semi-enclosed elements. After galvanizing, plug vent holes with shaped lead and grind smooth.

#### A. 2.6 MISCELLANEOUS METALS ITEMS

##### Rough Hardware

- B. 1. 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. Straight bolts and other stock rough hardware items are specified in Division 6 Sections.
- 2. Fabricate items to sizes, shapes and dimensions required. Furnish malleable iron washers for heads and nuts which bear on wood connections; elsewhere, furnish steel washers.

##### Ladders

1. Vertical steel ladders shall be 18 inches wide with 3/4-inch diameter non-slip steel rungs spaced 12 inches on center. Stringers shall be 3/8-inch thick by 2-1/2-inch wide steel bars; rungs welded to bars. Attach ladders to walls 6 inches from top and bottom and maximum 36 inches on center. from these points. At the roof, gooseneck the rails back to the structure to provide secure ladder access.
2. Provide sloping ladders (ship's ladders) where noted. Fabricate open type construction with structural steel channel or steel plate stringers, pipe handrails, and open steel grating treads. Provide all necessary brackets and fittings for installation.
3. Ladders shall be fabricated to support a live load of 100 lbs. per square foot and a concentrated load of 300 lbs. per rung; loads not to act simultaneously.

#### Open Riser Service Stairs

- c.
1. General: Construct stairs to conform to sizes and arrangements shown; joint pieces together by welding. Provide complete stair assemblies, including metal framing, hangers, railings, newels, balusters, struts, clips, brackets, bearing plates and other components necessary for the support of stairs and platforms and as required to anchor and contain the stairs on the supporting structure.
  2. Stair Framing: Fabricate stringers of structural steel channels, or plates, or a combination thereof. Provide closures for exposed ends of stringers. Construct platforms of structural steel channel headers and miscellaneous framing members as shown. Bolt or weld headers to strings and newels and framing members to strings and headers; fabricate and join so that bolts, if used, do not appear on finish surfaces.
  3. Attach treads to stringers by means of brackets made of steel and angles or bars. Weld brackets to strings and attach metal treads to brackets by welding, riveting or bolting.
  4. Provide platforms of same metal as treads and in thicknesses required to support design loading. Attach platform to platform framing members with welds.
  5. Steel Floor Plate Treads and Platforms: Provide raised pattern steel floor plate complying with FS QQ-F-461, Class I. Provide diamond pattern.
    - a. Form treads of 1/4-inch thick steel floor plate with integral nosing and back edge stiffener. Weld steel supporting brackets to strings and treads to brackets.
    - b. Fabricate platforms of steel floor plate. Provide nosing matching that on treads at all landings. Secure to platform framing members with welds.
- D.

#### Steel Pipe Handrails

1. Steel pipe of size shown on Drawings, Schedule 40. Fittings shall be flush type, malleable of cast iron. Brackets shall be malleable iron, design as selected by the

Engineer.

2. Construction: Form direction changes in rails using solid bar stock or elbows. Connections shall be shop welded and ground smooth and flush, except where field connections and expansion joints are required. Field connections may be welded, internal sleeve and plug weld, or internal sleeve and set screw.
3. Secure handrails to walls with wall brackets. Provide brackets of malleable iron castings, with not more than 3 inches clearance from inside face of handrail to wall surface. Neatly drill wall plate portion of the bracket into concrete or masonry to receive bolts for concealed anchorage. For installation at drywall, drywall trades shall provide plate to receive wall plate portion of bracket and anchor or bolt wall plate through drywall to supporting steel plate. Locate brackets at not more than 4 feet-0 inches on center, unless otherwise shown.
4. Provide wall return fittings of cast iron, flush type, with the same projection as that specified for wall brackets.
5. Longitudinal members shall be parallel with each other and with floor surface or shape of stair to a tolerance of 1/8-inch in 10 feet-0 inches linear feet. Center line of members within each run of railing shall be in the plane.
6. For steel pipe posts where indicated, anchor posts in concrete by means of steel base plates with epoxied galvanized F1554 A36 steel (min.) anchor rods into concrete. Posts shall be set plumb within 1/8-inch vertical tolerance.
7. Steel pipe handrails shall be capable of resisting a 200 lb. force applied to rail from any direction and a uniformly distributed load of 50 lbs. per linear foot applied downward or horizontally, loads not to act simultaneously.

E.

#### Miscellaneous Light Steel Framing

1. Light steel framing, bracing, supports, framing, clip angles, shelf angles, plates, etc., shall be of such shapes and sizes as indicated on the drawings and details or as required to suit the condition and shall be provided with all necessary supports and reinforcing such as hangers, braces, struts, clip angles, anchors, bolts, nuts, welds, etc., as required to properly support and rigidly fasten and anchor same in place and to steel, concrete, masonry and all other connecting and adjoining work.
2. All light steel framing steel shall be furnished and erected in accordance with the applicable requirements of the "Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings" by the American Institute of Steel Construction and as specified herein.

F.

#### Steel Gratings and Frames

1. Provide hot dipped galvanized steel gratings complying with FS RR-G-661 with rectangular cross bars welded to bearing bars. Bars to have plain wearing surface.

2. Manufacturer: Provide gratings manufactured by Reliance, Borden, Irving Subway Grating, or approved equal.
3. Hinged Section: Provide hinged sections in areaway gratings where required by the drawings. Each hinged section up to 4-foot-0 inch wide shall be provided with two, 5-knuckle, fast pin, regular weight, plain bearing, wrought bronze butt hinges. Each hinged section over 4 feet-0 inches wide shall be provided with three butt hinges. Hinged sections shall have provisions for padlocking on the underside.
4. Furnish grating frames, with corners mitered, welded and ground smooth, and with welded-on straps for secure anchorage into concrete. Frames and anchors to be galvanized.
5. Structural Performance: Provide gratings capable of withstanding the following structural loads without exceeding the allowable design working stress of the materials involved, including anchors and connections:
  - a. Floors: Capable of withstanding a uniform load of 250 lbf/sq. ft. or a concentrated load of 3000 lbf, whichever produces the greater stress.
  - b. Walkways and Elevated Platforms Other Than Exits: Capable of withstanding a uniform load of 60 lbf/sq. ft. Limit deflection to L/360 or 1/4 inch, whichever is less.
  - c. Walkways and Elevated Platforms Used as Exits: Capable of withstanding a uniform of 100 lbf/sq. ft. or a concentrated load of 300 lbf on an area of 4 sq. in., whichever produces the greater stress. Limit deflection to L/360 or 1/4 inch, whichever is less.
  - d. Sidewalks and Vehicular Driveways: Capable of withstanding a uniform load of 250 lbf/sq. ft. or a concentrated load of 8000 lbf, whichever produces the greater stress.

G.

Pit Covers and Frames: Provide minimum 1/2-inch thick steel checkered plate cover, reinforced as required to limit deflection to 1/360 of span, with two recessed lifting handles capable of supporting 500 lbs. each. Furnish covers with steel angle frames, with corners mitered, welded and ground smooth, and with welded-on straps for secure anchorage into concrete. Frames and anchors to be galvanized. Plate covers shall be capable of supporting same loads as adjacent floor surfaces.

H.

#### Cast Thresholds

1. Fabricate of sizes and configurations as shown. Provide cast iron units with integral abrasive finish. Furnish in lengths as required to accurately fit each opening or condition.
  - a. Cast units with an integral abrasive grit consisting of aluminum oxide, silicone carbide, or a combination of both.
2. Provide anchors for embedding units in concrete, either integral or applied to

units, as standard with manufacturer.

- a. Provide 2 rows of holes for units over 5 inches wide, with two holes aligned at ends and staggered intermediate holes.
3. Apply black asphaltic coating to concealed bottoms, sides and edges of cast iron units set into concrete.
4. Provide a diamond surface texture.

#### Safety Nosings for Interior Concrete Steps

- I.
  1. Provide 3-inch wide, Style A cast iron safety nosing with hatched abrasive surface extending to end of stringers, manufactured by American Abrasive Metals Co., or equal made by Wooster Products Inc., American Mason Safety Tread Co., or approved equal.
  2. Provide anchors spaced not more than 4 inches from each end and not more than 12 inches on center. Furnish nosings to concrete trades for installation.
  3. Apply asphaltic coating to surfaces in contact with concrete.

J. Steel Bollards: Provide 6-inch O.D. extra strong (Schedule 80) steel pipe, concrete filled, with base of steel plate for mounting to anchor bolts in concrete foundation. Rabbet top of steel pipe and insert 1/4-inch steel plate cap, flush with top of pipe. Weld top of cap to pipe and grind smooth and flush.

K. Miscellaneous Steel Trim: Provide shapes and sizes for profiles shown. Except as otherwise indicated, fabricate units from structural steel shapes and plates and steel bars, with continuously welded joints and smooth exposed edges. Use concealed field splices wherever possible. Provide cutouts, fittings and anchorages as required for coordination of assembly and installation with other work.

M. Countertop Supports: Steel framing as indicated or required to support countertops. Conceal framing under countertops and within wall behind countertops. Provide supports to withstand a concentrated load of not less than 300 lbs. applied at any point with a deflection not to exceed  $L/240$  for the length of the countertop.

N. Trench Drains: Provide Series R-4999 trench frame with Type A grated cover, heavy duty, made of ductile iron as manufactured by Neenah Foundry Co., or approved equal, sizes as shown on drawings. Assembly shall have asphalt coating. Grate shall be bolted in place with stainless steel hex head cap screws.

Steel Floor Access Door: Provide Series JD steel floor access door for interior use with checkered plate top, angle iron frame and manufacturer's standard hardware as



manufactured by Bilco or equal made by Babcock-Davis, Dur-Red Products or approved equal; size as shown on drawings.

#### Masonry Support Steel

- O. 1. Provide galvanized steel, relieving angles, plates, accessories and other steel shapes for masonry support steel; for lintels refer to Para. E. herein.
2. Fabricate masonry support steel to allow final adjustment with the closest tolerances possible. Relieving angles which require cutting to fit masonry flashing shall be straightened without deflections.
3. Coordinate masonry support system with concrete work for locations of wedge inserts.
4. Install to meet requirements of building masonry work, face brick coursing and stone placement. Coordinate final adjustments with masonry work as work progresses.

#### Sleeves in Concrete Walls and Slabs

- P. 1. Sleeves through concrete walls shall be of Schedule 40 steel pipe with i.d. 2 inches larger than o.d. of pipe or conduit (including insulation, if any) to be accommodated. Sleeves shall project 1/2-inch on each side of finished wall. Provide rectangular 1/4-inch steel plate collar at center, continuously welded to the perimeter of the sleeve, and 6 inches wider than the o.d.
2. Slots in slabs shall be 12 gauge steel sheet, galvanized, of dimensions indicated, with strap anchors welded in place not more than 12 inches on centers.

### PART 3 EXECUTION

A.

#### 3.1 INSPECTION

Examine the areas and conditions where miscellaneous metal is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

A.

#### 3.2 ERECTION

B.

Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction; including threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors as required.

Cutting, Fitting and Placement: Perform cutting, drilling and fitting required for installation of miscellaneous metal fabrications. Set work accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established

lines and levels. Provide temporary bracing or anchors in formwork for items which are to be built into concrete, masonry, or similar construction.

- C. Fitting Connections: Fit exposed connections accurately together to form tight hairline joints. Weld connections which are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Grind exposed joints smooth and touch up shop paint coat. Do not weld, cut or abrade the surfaces of exterior units which have been hot dip galvanized after fabrication, and are intended for bolted or screwed field connections.

- D. Field Welding: Comply with AWS Code for procedures of manual shielded metal-arc welding, appearance, and quality of welds made, and methods used in correcting welding work.

- E. Touch-Up 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. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils.

- F. Field Touch-Up of Galvanized Surfaces: Touch-up shop applied galvanized coatings damaged during handling and installation. Use galvanizing repair coating specified herein for galvanized surfaces.

END OF SECTION

SECTION 05 52 13  
PIPE AND TUBE RAILINGS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

1. Steel pipe and tube railings.
2. Aluminum pipe and tube railings.
3. Stainless-steel pipe and tube railings.

- B. Related Requirements:

1.3 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 for railings. 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.
- C. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

1.4 ACTION SUBMITTALS

- A. Product Data: For the following:

1. Manufacturer's product lines of mechanically connected railings.

2. Railing brackets.
  3. Grout, anchoring cement, and paint products.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
- C. Samples: For each type of exposed finish required.
1. Sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters.
  2. Fittings and brackets.
  3. Assembled Sample of railing system, made from full-size components, including top rail, post, handrail, and infill. Sample need not be full height.
    - a. Show method of connecting and finishing members at intersections.
- D. Delegated-Design Submittal: For railings, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Welding certificates.
- C. Mill Certificates: Signed by manufacturers of stainless-steel products certifying that products furnished comply with requirements.
- D. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.
- E. Product Test Reports: For pipe and tube railings, for tests performed by a qualified testing agency, according to ASTM E 894 and ASTM E 935.
- F. Evaluation Reports: For post-installed anchors, from ICC-ES.

#### 1.6 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to the following:
1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
  2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
  3. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

## 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

## 1.8 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

## PART 2 PRODUCTS

### 2.1 MANUFACTURERS

- A. Steel Pipe and Tube Railings:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. VIVA Railings, LLC.
- b. Wagner, R & B, Inc.

- B. Aluminum Pipe and Tube Railings:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. ATR Technologies, Inc.
- b. Blum, Julius & Co., Inc.
- c. Braun, J. G., Company; The Wagner Companies.
- d. CraneVeyor Corp.
- e. Hollaender Manufacturing Company.
- f. Kee Industrial Products, Inc.
- g. Sterling Dula Architectural Products, Inc. / KaneSterling.
- h. Superior Aluminum Products, Inc.
- i. Thompson Fabricating, LLC.
- j. Tri Tech, Inc.
- k. Tubular Specialties Manufacturing, Inc.
- l. Tuttle Railing Systems.
- m. Wagner, R & B, Inc.

C. Stainless-Steel Pipe and Tube Railings:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

- a. Blum, Julius & Co., Inc.
- b. Paragon Aquatics.
- c. Stainless Fabricators, Inc.
- d. Sterling Dula Architectural Products, Inc. / KaneSterling.
- e. Tri Tech, Inc.
- f. Tubular Specialties Manufacturing, Inc.
- g. Tuttle Railing Systems.
- h. VIVA Railings, LLC.
- i. Wagner, R & B, Inc.

D. Source Limitations: Obtain each type of railing from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design railings, including attachment to building construction.

B. Structural Performance: Railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Handrails and Top Rails of Guards:

- a. Uniform load of 50 lbf/ ft. applied in any direction.
- b. Concentrated load of 200 lbf applied in any direction.
- c. Uniform and concentrated loads need not be assumed to act concurrently.

2. Infill of Guards:

- a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft..
- b. Infill load and other loads need not be assumed to act concurrently.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 deg F, ambient; 180 deg F.

## 2.3 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
- B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.
  1. Provide type of bracket with predrilled hole for exposed bolt anchorage and that provides 1-1/2-inch clearance from inside face of handrail to finished wall surface.

## 2.4 STEEL AND IRON

- A. Tubing: ASTM A 500 (cold formed) or ASTM A 513.
- B. Pipe: ASTM A 53/A 53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.
  1. Provide galvanized finish for exterior installations and where indicated.
- C. Plates, Shapes, and Bars: ASTM A 36/A 36M.
- D. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.
- E. Expanded Metal: ASTM F 1267, Type I (expanded), Class 1 (uncoated).
  1. Style Designation: 1-1/2 number 10.
- F. Perforated Metal: Cold-rolled steel sheet, ASTM A 1008/A 1008M, or hot-rolled steel sheet, ASTM A 1011/A 1011M, commercial steel Type B, 0.060 inch thick, with 1/4-inch holes 3/8 inch o.c. in staggered rows.
  1. Basis-of-Design Product: Provide product with perforations matching product indicated on Drawings.
- G. Perforated Metal: Galvanized-steel sheet, ASTM A 653/A 653M, G90 coating, commercial steel Type B, 0.064 inch thick, with 1/4-inch holes 3/8 inch o.c. in staggered rows.

1. Basis-of-Design Product: Provide product with perforations matching product indicated on Drawings.

H. Woven-Wire Mesh: Intermediate-crimp, diamond pattern, 2-inch woven-wire mesh, made from 0.134-inch-diameter wire complying with ASTM A 510.

## 2.5 ALUMINUM

A. Aluminum, General: Provide alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of alloy and temper designated below for each aluminum form required.

B. Extruded Bars and Tubing: ASTM B 221, Alloy 6063-T5/T52.

C. Extruded Structural Pipe and Round Tubing: ASTM B 429/B 429M, Alloy 6063-T6.

1. Provide Standard Weight (Schedule 40) pipe unless otherwise indicated.

D. Drawn Seamless Tubing: ASTM B 210, Alloy 6063-T832.

E. Plate and Sheet: ASTM B 209, Alloy 6061-T6.

F. Die and Hand Forgings: ASTM B 247, Alloy 6061-T6.

G. Castings: ASTM B 26/B 26M, Alloy A356.0-T6.

H. Perforated Metal: Aluminum sheet, ASTM B 209, Alloy 6061-T6, 0.063 inch thick, with 1/4-inch holes 3/8 inch o.c. in staggered rows.

1. Basis-of-Design Product: Provide product with perforations matching product indicated on Drawings.

I. Woven-Wire Mesh: Intermediate-crimp, diamond pattern, 2-inch woven-wire mesh, made from 0.162-inch-diameter wire complying with ASTM B 211, Alloy 6061-T94.

## 2.6 STAINLESS STEEL

A. Tubing: ASTM A 554, Grade MT 304.

B. Pipe: ASTM A 312/A 312M, Grade TP 304.

C. Castings: ASTM A 743/A 743M, Grade CF 8 or CF 20.



- D. Plate and Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304.
- E. Expanded Metal: ASTM F 1267, Type I (expanded), Class 3 (corrosion-resistant steel), made from stainless-steel sheet, ASTM A 240/A 240M or ASTM A 666, Type 304.
  - 1. Style Designation: 3/4 number 13.
- F. Perforated Metal: Stainless-steel sheet, ASTM A 240/A 240M or ASTM A 666, Type 304, 0.062 inch thick, with 1/4-inch holes 3/8 inch o.c. in staggered rows.
  - 1. Basis-of-Design Product: Provide product with perforations matching product indicated on Drawings.
- G. Woven-Wire Mesh: Intermediate-crimp, diamond pattern, 2-inch woven-wire mesh, made from 0.141-inch-diameter wire complying with ASTM A 580/A 580M, Type 304.

## 2.7 FASTENERS

- A. General: Provide the following:
  - 1. Ungalvanized-Steel Railings: Plated steel fasteners complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5 for zinc coating.
  - 2. Hot-Dip Galvanized Railings: Type 304 stainless-steel or hot-dip zinc-coated steel fasteners complying with ASTM A 153/A 153M or ASTM F 2329 for zinc coating.
  - 3. Aluminum Railings: Type 304 stainless-steel fasteners.
  - 4. Stainless-Steel Railings: Type 304 stainless-steel fasteners.
  - 5. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.
- B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.
- C. Fasteners for Interconnecting Railing Components:
  - 1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless otherwise indicated.
  - 2. Provide head machine screws for exposed fasteners unless otherwise indicated.
- D. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors capable of sustaining, without failure, a load equal to 6 times the load imposed when installed in unit masonry and 4 times the load imposed when installed in concrete, as

determined by testing according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.

1. Material for Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.
2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.

## 2.8 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
  1. For aluminum and stainless-steel railings, provide type and alloy as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.
- B. Etching Cleaner for Galvanized Metal: Complying with MPI#25.
- C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- D. Shop Primers: Provide primers that comply with Section 099600 "High-Performance Coatings."
- E. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
  1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
- F. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.
- G. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.
- H. Intermediate Coats and Topcoats: Provide products that comply with [Section 099600 "High-Performance Coatings."
- I. Epoxy Intermediate Coat: Complying with MPI #77 and compatible with primer and topcoat.
- J. Polyurethane Topcoat: Complying with MPI #72 and compatible with undercoat.

- K. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.
- L. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- M. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.
  - 1. Water-Resistant Product: At exterior locations and where indicated provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.

## 2.9 FABRICATION

- A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.
- B. Shop assemble railings to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
- C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- D. Form work true to line and level with accurate angles and surfaces.
- E. Fabricate connections that are exposed to weather in a manner that excludes water. Provide weep holes where water may accumulate.
- F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
- G. Connections: Fabricate railings with either welded or nonwelded connections unless otherwise indicated.

- H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
  - 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 flux immediately.
  - 4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.
- I. Welded Connections for Aluminum Pipe: Fabricate railings to interconnect members with concealed internal welds that eliminate surface grinding, using manufacturer's standard system of sleeve and socket fittings.
- J. Nonwelded Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
  - 1. Fabricate splice joints for field connection using an epoxy structural adhesive if this is manufacturer's standard splicing method.
- K. Form Changes in Direction as Follows:
  - 1. By bending or by inserting prefabricated elbow fittings.
- L. For changes in direction made by bending, use jigs to produce uniform curvature for each repetitive configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- M. Close exposed ends of railing members with prefabricated end fittings.
- N. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch or less.
- O. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.
- P. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.

- Q. For railing posts set in concrete, provide stainless-steel sleeves not less than 6 inches long with inside dimensions not less than 1/2 inch greater than outside dimensions of post, with metal plate forming bottom closure.
- R. For removable railing posts, fabricate slip-fit sockets from stainless-steel tube or pipe whose ID is sized for a close fit with posts; limit movement of post without lateral load, measured at top, to not more than one-fortieth of post height. Provide socket covers designed and fabricated to resist being dislodged.
1. Provide chain with eye, snap hook, and staple across gaps formed by removable railing sections at locations indicated. Fabricate from same metal as railings.
- S. Expanded-Metal Infill Panels: Fabricate infill panels from expanded metal made from same metal as railings in which they are installed.
1. Edge panels with U-shaped channels made from metal sheet, of same metal as expanded metal and not less than 0.043 inch thick.
  2. Orient expanded metal with long dimension of diamonds parallel to top rail.
- T. Perforated-Metal Infill Panels: Fabricate infill panels from perforated metal made from same metal as railings in which they are installed.
1. Edge panels with U-shaped channels made from metal sheet, of same metal as perforated metal and not less than 0.043 inch thick.
  2. Orient perforated metal with pattern parallel to top rail.
- U. Woven-Wire Mesh Infill Panels: Fabricate infill panels from woven-wire mesh crimped into 1-by-1/2-by-1/8-inch metal channel frames. Make wire mesh and frames from same metal as railings in which they are installed.
1. Orient wire mesh with diamonds vertical.
- V. Toe Boards: Where indicated, provide toe boards at railings around openings and at edge of open-sided floors and platforms. Fabricate to dimensions and details indicated.
- 2.10 STEEL AND IRON FINISHES
- A. Galvanized Railings:
1. Hot-dip galvanize exterior steel railings, including hardware, after fabrication.
  2. Comply with ASTM A 123/A 123M for hot-dip galvanized railings.
  3. Comply with ASTM A 153/A 153M for hot-dip galvanized hardware.

4. Fill vent and drain holes that are exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.
- B. For galvanized railings, provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.
- C. Preparing Galvanized Railings for Shop Priming: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with etching cleaner.
- D. For nongalvanized-steel railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves; however, galvanize anchors to be embedded in exterior concrete or masonry.
- E. Primer Application: Apply shop primer to prepared surfaces of railings unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Shop, Field, and Maintenance Painting of Steel," for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.
  1. Do not apply primer to galvanized surfaces.

#### 2.11 ALUMINUM FINISHES

- A. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are unacceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- B. Clear Anodic Finish: AAMA 611, AA-M12C22A31.
- C. High-Performance Organic Finish: Two-coat fluoropolymer finish complying with [AAMA 2604] [AAMA 2605] and containing not less than [50] [70] percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
  1. Color and Gloss: [As indicated by manufacturer's designations] [Match Architect's sample] [As selected by Architect from manufacturer's full range] <Insert color and gloss>.
- D. High-Performance Organic Finish: [Three] [Four]-coat fluoropolymer finish complying with AAMA 2605 and containing not less than [50] [70] percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

1. Color and Gloss: [As indicated by manufacturer's designations] [Match Architect's sample] [As selected by Architect from manufacturer's full range] <Insert color and gloss>.

## 2.12 STAINLESS-STEEL FINISHES

- A. Remove tool and die marks and stretch lines, or blend into finish.
- B. 180-Grit Polished Finish: Oil-ground, uniform, directionally textured finish.
- C. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

## PART 3 EXECUTION

### 3.1 EXAMINATION

### 3.2 INSTALLATION, GENERAL

- A. Fit exposed connections together to form tight, hairline joints.
- B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
  1. Do not weld, cut, or abrade surfaces of railing components that are coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
  2. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
  3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.
- C. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.
  1. Coat, with a heavy coat of bituminous paint, concealed surfaces of aluminum that are in contact with grout, concrete, masonry, wood, or dissimilar metals.
- D. Adjust railings before anchoring to ensure matching alignment at abutting joints.

- E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

### 3.3 RAILING CONNECTIONS

- A. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.
- B. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches beyond joint on either side, fasten internal sleeve securely to one side, and locate joint within 6 inches of post.

### 3.4 ANCHORING POSTS

- A. Use metal sleeves preset and anchored into concrete for installing posts. After posts are inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.
- B. Form or core-drill holes not less than 5 inches deep and 3/4 inch larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.
- C. Leave anchorage joint exposed with 1/8-inch buildup, sloped away from post.
- D. Anchor posts to metal surfaces with oval flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:
  - 1. For aluminum pipe railings, attach posts using fittings designed and engineered for this purpose.
  - 2. For stainless-steel pipe railings, weld flanges to post and bolt to supporting surfaces.
  - 3. For steel pipe railings, weld flanges to post and bolt to metal supporting surfaces.
- E. Install removable railing sections, where indicated, in slip-fit metal sockets cast in concrete.



### 3.5 ATTACHING RAILINGS

- A. Anchor railing ends at walls with round flanges anchored to wall construction and welded to railing ends or connected to railing ends using nonwelded connections.
- B. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces and welded to railing ends or connected to railing ends using nonwelded connections.
- C. Attach railings to wall with wall brackets, except where end flanges are used. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
- D. Secure wall brackets and railing end flanges to building construction as follows:
  - 1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
  - 2. For hollow masonry anchorage, use toggle bolts.
  - 3. For wood stud partitions, use hanger or lag bolts set into studs or wood backing between studs. Coordinate with carpentry work to locate backing members.

### 3.6 ADJUSTING AND CLEANING

- A. Clean aluminum and stainless steel by washing thoroughly with clean water and soap and rinsing with clean water.
- B. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the 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 minimum 2.0-mil dry film thickness.
- C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas, and repair galvanizing to comply with ASTM A 780/A 780M.

### 3.7 PROTECTION

- A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

END OF SECTION

SECTION 05 53 13  
BAR GRATINGS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes metal bar gratings.
- B. Related Requirements:
1. Section 051200 "Structural Steel Framing" for structural-steel framing system components.
  2. Section 055213 "Pipe and Tube Railings" for metal pipe and tube handrails and railings.

1.3 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written instructions to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorages for gratings, grating frames, and supports. 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.

1.4 ACTION SUBMITTALS

- A. Product Data: For the following:
1. Clips and anchorage devices for gratings.
  2. Paint products.
- B. Shop Drawings: Include plans, sections, details, and attachments to other work.

- C. Delegated-Design Submittal: For gratings, including manufacturers' published load tables.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Mill Certificates: Signed by manufacturers of stainless steel certifying that products furnished comply with requirements.
- B. Welding certificates.
- C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.

#### 1.6 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to the following:
  - 1. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

#### 1.7 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with gratings by field measurements before fabrication.

### PART 2 PRODUCTS

#### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Alabama Metal Industries Company; a Gibraltar Industries company.
  - 2. All American Grating.
  - 3. BarnettBates Corporation.
  - 4. Borden Metal Products (Canada) Limited.
  - 5. Fisher & Ludlow; a NUCOR Company.
  - 6. Grating Pacific, Inc.
  - 7. Grupo Metelmex, S.A. de C.V.
  - 8. Harsco Industrial IKG, a division of Harsco Corporation.
  - 9. MLP Steel Company; Laurel Steel Products Division.
  - 10. Neenah Foundry Company.
  - 11. Ohio Gratings, Inc.

12. ROSS TECHNOLOGY CORP.
13. Seidelhuber Metal Products; Brodhead Steel.

## 2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design gratings.
- B. Structural Performance: Gratings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
  1. Uniform distributed load of 150 lbf/sq. ft. or concentrated load of 1,000 lbf, whichever produces the greater stress.
  2. Limit deflection to L/360 or 1/4 inch, whichever is less.
- C. Seismic Performance: Gratings shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
  1. Component Importance Factor: 1.5.

## 2.3 METAL BAR GRATINGS

- A. Metal Bar Grating Standards: Comply with NAAMM MBG 531, "Metal Bar Grating Manual " and NAAMM MBG 532, "Heavy-Duty Metal Bar Grating Manual."
- B. Welded Steel Grating :
  1. Bearing Bar Spacing: 1 3/16 inch o.c.
  2. Bearing Bar Depth: 1 1/2 inches, min.
  3. Bearing Bar Thickness: As required to comply with structural performance requirements.
  4. Crossbar Spacing: 4 inches o.c.
  5. Traffic Surface: Serrated.
  6. Steel Finish: Hot-dip galvanized with a coating weight of not less than 1.8 oz./sq. ft. of coated surface.

## 2.4 FERROUS METALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Steel Bars for Bar Gratings: ASTM A 36/A 36M or steel strip, ASTM A 1011/A 1011M or ASTM A 1018/A 1018M.
- C. Wire Rod for Bar Grating Crossbars: ASTM A 510.

- D. Uncoated Steel Sheet: ASTM A 1011/A 1011M, structural steel, Grade 30.
- E. Galvanized-Steel Sheet: ASTM A 653/A 653M, structural quality, Grade 33, with G90 coating.
- F. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 240/A 240M, Type 304.
- G. Stainless-Steel Bars and Shapes: ASTM A 276, Type 304.

## 2.5 FASTENERS

- A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
  - 1. Provide stainless-steel fasteners for fastening aluminum.
  - 2. Provide stainless-steel fasteners for fastening stainless steel.
- B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563 and, where indicated, flat washers.
- C. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, nuts, and, where indicated, flat washers; ASTM F 593 for bolts and ASTM F 594 for nuts, Alloy Group 1.
- D. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563 and, where indicated, flat washers.
  - 1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.
- E. Post-Installed Anchors: Torque-controlled expansion or chemical anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.
  - 1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.
  - 2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F 593, and nuts, ASTM F 594.

## 2.6 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

## 2.7 FABRICATION

- A. Shop Assembly: Fabricate grating sections 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.
- B. Cut, drill, and punch material cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form from materials of size, thickness, and shapes indicated, but not less than that needed to support indicated loads.
- D. Fit exposed connections accurately together to form hairline joints.
- E. Welding: Comply with AWS recommendations and the following:
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove welding flux immediately.
- F. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space the anchoring devices to secure gratings, frames, and supports rigidly in place and to support indicated loads.
  - 1. Fabricate toeplates to fit grating units and weld to units in shop unless otherwise indicated.
  - 2. Fabricate toeplates for attaching in the field.
  - 3. Toeplate Height: 4 inches unless otherwise indicated.
- G. Removable Grating Sections: Fabricate with banding bars attached by welding to entire perimeter of each section. Include anchors and fasteners of type indicated or, if not indicated, as recommended by manufacturer for attaching to supports.
  - 1. Provide no fewer than four weld lugs for each heavy-duty grating section, with each lug shop welded to two bearing bars.
  - 2. Furnish threaded bolts with nuts and washers for securing grating to supports.
  - 3. Furnish self-drilling fasteners with washers for securing grating to supports.

4. Furnish galvanized malleable-iron flange clamp with galvanized bolt for securing grating to supports. Furnish as a system designed to be installed from above grating by one person.
- H. Fabricate cutouts in grating sections for penetrations indicated. Arrange cutouts to permit grating removal without disturbing items penetrating gratings.
  1. Edge-band openings in grating that interrupt four or more bearing bars with bars of same size and material as bearing bars.
- I. Do not notch bearing bars at supports to maintain elevation.

## 2.8 STEEL FINISHES

- A. Finish gratings, frames, and supports after assembly.
- B. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.
- C. Preparation for Shop Priming: Prepare surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
- D. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

## PART 3 EXECUTION

### 3.1 INSTALLATION, GENERAL

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing gratings to in-place construction. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.
- B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing gratings. Set units accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
- C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete or masonry.
- D. Fit exposed connections accurately together to form hairline joints.
  1. 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 for bolted or screwed field connections.

- E. Attach toeplates to gratings by welding at locations indicated.
- F. Field Welding: Comply with AWS recommendations and the following:
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove welding flux immediately.

### 3.2 INSTALLING METAL BAR GRATINGS

- A. General: Install gratings to comply with recommendations of referenced metal bar grating standards that apply to grating types and bar sizes indicated, including installation clearances and standard anchoring details.
- B. Attach removable units to supporting members with type and size of clips and fasteners indicated or, if not indicated, as recommended by grating manufacturer for type of installation conditions shown.
- C. Attach nonremovable units to supporting members by welding where both materials are same; otherwise, fasten by bolting as indicated above.

### 3.3 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 minimum 2.0-mil dry film thickness.
- B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."
- C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.

END OF SECTION

SECTION 07 72 34  
HATCHES

PART 1 GENERAL

1.1. SUMMARY

- A. The work to be performed in accordance with this Specification consists of furnishing all materials, equipment, supplies, and accessories and of performing all operations required in connection with the fabrication and installation of hatches shown on the Drawings and specified herein.

1.2. SUBMITTALS

- A. Product Data: Submit catalog information, indicating materials of construction and compliance with indicated standards.
- B. Source Quality-Control Submittals: Indicate results of shop or factory tests and inspections.

1.3. DELIVERY, STORAGE, HANDLING, AND PROTECTION

- A. Deliver products in manufacturer's original containers, dry, undamaged, with seals and labels intact.
- B. Store products in weather protected environment, clear of ground and moisture.
- C. Restore to original condition or replace damaged work or materials.

PART 2 PRODUCTS

2.1. ALUMINUM HATCHES

- A. Type 1: Type 1 hatches shall be non-gasketed hatches with all components of the hatches, grating, and anchors manufactured of stainless steel unless noted differently below.
1. Hatches shall have the following features:
    - a. Stainless steel compression spring assist.
    - b. 316 stainless steel automatic hold-open arms with release handle.
    - c. 316 stainless steel hinges and attaching hardware.
    - d. 316 stainless steel slam lock with removable key.
    - e. Single or double leaf construction as shown on the Drawings.
    - f. Safety Grating
      - 1) Provide a protective grating panel located below the door.
      - 2) Grating shall be 1-inch aluminum "I" bar grating.
      - 3) Grating shall be hinged with tamper-proof stainless-steel bolts and shall be supplied with a positive latch to maintain unit in an upright position.
      - 4) Grating shall have a 6-inch-wide viewing area on each lateral unhinged side for visual observation and limited maintenance.
  2. The access frames and covers shall have a 1/4-inch-thick one-piece extruded aluminum frame, incorporating concrete anchor plates 18 inches on-center.
  3. Door panel(s) shall be 1/4-inch aluminum diamond plate, reinforced to withstand a live load of 300 pounds per square foot with a maximum allowable deflection of 1/150 of the span. Door(s)

shall close flush with the frame.

4. Door(s) shall open to 90° and automatically lock with 316 stainless steel hold-open arm(s) with anodized aluminum release handle(s). For ease of operation, the hold-open arm shall incorporate enclosed stainless steel compression spring assists.
5. Hinges and all fastening hardware shall be 316 stainless steel.
6. Unit shall lock with a 316 stainless steel slam lock with removable key and have a recessed stainless steel lifting handle.
7. Manufacturer
  - a. Halliday Products: S1K or S2K,
  - b. Bilco J-AL, or
  - c. Engineer approved equal

B. General Requirements

1. Metal surfaces shall be clean and free from mill scale, flake rust and rust pitting; well-formed and finished to shape and size, with sharp lines and angles and smooth surfaces.
2. Shearing and punching shall leave clean true lines and surfaces.
3. Welds shall be finished flush and smooth on surfaces that will be exposed after installation.

## PART 3 EXECUTION

### 3.1. INSTALLATION

- A. All hatches shall be installed in accordance with approved shop drawings, as indicated on the Drawings, and in strict accordance with the manufacturer.
- B. Anchors: Hatches shall be anchored as shown on the Drawings using stainless steel anchors. The number and size of the anchors shall be as recommended by the hatch manufacturer but shall not be spaced at greater than 18-inches center to center.

END OF SECTION

SECTION 09 90 00  
PAINTING AND COATING

PART 1 GENERAL

1.1. SUMMARY

- A. The work to be performed in accordance with the requirements of this Specification consists of furnishing all materials, equipment, supplies, and accessories required and of performing all operations needed in connection with the painting of the various parts of the work.
- B. No paint shall be applied to permanently finished equipment which is considered to be acceptable by the Engineer such as factory finished motor control centers, control consoles, and factory finished equipment. Equipment and their appurtenant parts such as guards and bases which arrive on the job site only primed, shall be painted in accordance with the appropriate painting system described following. All shop prime coats by equipment manufacturers shall be applied to surfaces as specified herein with paint that is approved and compatible with accepted top coat paint.
- C. A "Summary of the Items to be Painted or Stained" under the scope of this Section is provided in Part 4 herein.

1.2. REFERENCES

- A. National Association of Corrosion Engineers (NACE);
- B. Steel Structures Painting Council (SSPC).

1.3. SUBMITTALS

- A. Product Data
  - 1. name of the manufacturer of the paint;
  - 2. generic name of paint (chemical composition type such as alkyd, epoxy, vinyl, etc.);
  - 3. trade name and number of each specific paint;
  - 4. number of coats to be applied for each paint;
  - 5. dry film thickness to be achieved for each coat;
  - 6. spreading rate at which each coat will be applied;
  - 7. color name and number accompanied by color chart;
  - 8. results of accepted tests (ASTM, Fed. Std.) for hardness, abrasion, impact, humidity, etc.

1.4. DELIVERY, STORAGE, HANDLING, AND PROTECTION

- A. The materials shall be delivered to the site in the manufacturer's original, unopened containers and packaging and with labels clearly identifying:
  - 1. Coating or material name,
  - 2. Manufacturer,
  - 3. Color name and number
  - 4. Batch or lot number,
  - 5. Date of manufacture, and
  - 6. Mixing and thinning instructions.

- B. Paints shall be supplied to the jobsite in unbroken containers on which will be labeled the designated name, formula, or specification number, batch number, color, date of manufacture, manufacturer's directions, and name of manufacturer, all of which shall be plainly legible at the time of use.
- C. Store materials in a clean dry area and within temperature range in accordance with manufacturer's instructions. Keep the containers sealed until they are ready for use. Do not use materials beyond manufacturer's shelf-life limits. Protect materials during handling and application to prevent damage or contamination.

#### 1.5. QUALITY ASSURANCE

- A. The paints to be used on the various substrate materials shall be of the best quality commercial and industrial grades and shall be manufactured by nationally known and approved paint manufacturers with local representation.
- B. Qualification
  - 1. The manufacturer shall have 10 years of successful experience and shall be able to demonstrate successful performance on comparable projects.
  - 2. The applicator shall be able to demonstrate a minimum of 5 years application experience on projects of similar size and complexity to this project. All applying personnel must be trained and experienced in the application of each product.
- C. Manufacturer's Recommendations
  - 1. All paint shall be mixed and applied with strict conformance to the paint manufacturer's directions, which will take precedence over this Specification. Selection of paints to be applied to each specific substrate material shall be verified with the paint manufacturer and his approval obtained.

#### 1.6. COLORS

- A. The exact colors to be used on the various substrate materials will be confirmed by the Engineer from color charts submitted by the Contractor as a portion of the Painting Schedule. General colors to be submitted for use on the various materials are listed with the "Summary of the Items to be Painted and Stained" in Part 4 herein.

### PART 2 PRODUCTS

#### 2.1. GENERAL

- A. Surfaces to receive paint protective coating materials as specified in this Section shall be coated in conformance with the applicable coating systems specified. So far as possible, all paint and coating materials shall be provided by a single source supplier.
- B. Products shall be standard for recognized manufacturer engaged in production of such materials for essentially identical or similar applications in the water and wastewater treatment industry.
- C. Only compatible materials shall be used in the work. Particular attention shall be directed to compatibility of primers and finish coats. If necessary, subject to approval of the Owner, a compatible barrier coat shall be applied between all existing prime coat and subsequent field coats to ensure

compatibility.

- D. With the approval of the Engineer, the field applied primer coat may be omitted when the equipment or material installed has a satisfactory primer coat that is compatible with top coats. Some paint systems require no primer coat, only one or more coats of the paint used as the topcoat. In these cases, primers will not be required, but only when omitting the primer is in accordance with the paint manufacturer's directions.

## PART 3 EXECUTION

### 3.1. SURFACE PREPARATION

- A. Surface preparation of each substrate material shall be as described in the painting system breakdown and completed prior to beginning the painting operation.
- B. All structural steel, metalwork, piping, and other metal surfaces to be painted shall be thoroughly cleaned of grease, oil, and contaminants by the use of solvents recommended by the manufacturer of the paint which will be applied. When blasting is required in the surface preparation of a painting system, the blasting shall be performed within conformance of the "Standard for Surfaces of New Steel Airblast Cleaned with Sand Abrasive" as written by the NACE. Blasting shall be accomplished in a manner and with the appropriate grit to limit the depth of finished surface profile to the appropriate limit for the specified dry mil thickness of the coating system. Any dust permits required for field blasting shall be obtained by the Contractor.
- C. Acceptance of the final blasted steel surfaces will be made by a certified NACE inspector provided by the paint supplier utilizing the visual standards test method NACE TM 01 70 or an illuminated magnifier comparator (Keane Tator) to visually compare the specified NACE surface with the steel actually being blasted. NACE standards of quality are called out for each painting system where blasting is required as a portion of the surface preparation. NACE standards referred to are:
  - 1. NACE № 1: White Metal Blast (SSPC SP5)
  - 2. NACE № 2: Near White Blast (SSPC SP10)
  - 3. NACE № 3: Commercial Blast (SSPC SP6)
  - 4. NACE № 4: Brush Off Blast (SSPC SP7)
- D. The Contractor shall continue to blast the surface of the steel until such time as the NACE inspector is satisfied that the steel being blasted is of a quality equal to the specified NACE grade.
- E. All dust created by the blasting operation must be removed immediately after the blasting operation by vacuuming. The first coat of paint should be applied to the steel as soon as possible and always the same day that the blasting is done.

### 3.2. APPLICATION METHODS

- A. Exterior painting shall not be done during damp weather when ambient temperature is below 50°F. Paint manufacturer's directions for cold weather applications shall be followed explicitly. All fresh work shall be protected from damage. For interior work, the temperature shall not be allowed to fall below 50°F while paint is being applied or while it is drying.
- B. All paint shall be evenly applied in a uniform coat. The finished painting shall show no drops, runs, or

sagging of materials.

- C. In addition to preparatory sanding, each coat, except the last, shall be fine sanded. Avoid cross scratches and swirls.
- D. Each coat of paint shall be given at least 48 hours to dry before the next coat is applied, unless otherwise directed by the manufacturer's instructions. Any walls that are to have damp-proofing applied thereto, will be marked with chalk lines to the approval of the Engineer to establish a clean cut line at which the damp-proofing stops.
- E. All metalwork which has been shop painted with rust inhibitive prime coat shall be handled with care to preserve such coating. Before painting, the Contractor shall repaint all defective or damaged areas with an approved prime coat after cleaning and removing dust.
- F. On metal surfaces, each coat of paint shall be applied at the rate specified to achieve the minimum dry mil thickness required. On concrete and/or masonry, application rates will vary according to surface texture. However, in no case shall the stated spreading rate be exceeded. On porous surfaces, a protective and decorative finish shall be achieved. Deficiencies in the film thickness shall be corrected by the application of an additional coat(s) of paint. Where conditions are other than normal because of the weather or because painting must be done in confined spaces, longer drying times will be necessary. Additional coats of paint shall not be applied, nor shall be returned to service until existing paints are thoroughly dry.
- G. Special care shall be taken when painting surfaces in contact with potable water or water in the treatment process so that adequate curing is accomplished. No paint or curing agents shall be used that could impart a taste, odor or discoloration to the water in the process. Manufacturer's instructions shall be strictly followed.
- H. Where thinning is necessary, only the products of the manufacturer furnishing the paint or for the particular purpose, shall be allowed; all such thinning shall be done strictly in accordance with the manufacturer's instructions, as well as with the full knowledge and approval of the Engineer. Where two or more coats are specified, the first coat shall be tinted a shade lighter than the following coat, and progressively to the color specified for the final coat, and subject to approval.
- I. Paint both faces and all edges of doors which require painting. Doors between rooms having different finishes shall have edges finished to match the room the door opens into.
- J. Knife putty nail holes upon the priming coat with putty tinted to color of finished work. Putty full and flush with surrounding surfaces; thumb puttying will not be permitted. Permit to dry and harden before applying next coat.

### 3.3. CLEAN-UP/TOUCH-UP WORK

- A. Upon completion, carefully remove all splatterings of paint material from adjoining work, glass, plumbing fixtures, trim and concrete surfaces. A detailed inspection of paint work shall be made and disfigured portions thereof shall be satisfactorily touched up or refinished to produce an acceptable job. All disused implements of service, rubbish and debris, resulting from the work shall be removed from the premises and the entire project left in a neat, clean, and acceptable condition.

### 3.4. WRITTEN APPROVAL OF COATINGS MANUFACTURER

- A. For all coatings to be applied to new and existing concrete, concrete block, plaster and asbestos cement paneling, written approval shall be obtained from the coatings manufacturer for the items listed below. Three copies of this written approval shall be submitted to the Engineer after the coatings manufacturer has personally inspected each of the following conditions:
1. Final surface preparation of all surfaces prior to coating application.
  2. Sequencing of application of coatings as to when each surface of each wall and ceiling shall be coated.
- B. This procedure is intended to keep the coatings manufacturer informed of the status of the job at all times so that he can govern the application process to be assured that all coatings are applied within his recommendations.

## PART 4 PAINTING SCHEDULE

### 4.1. SUMMARY OF ITEMS TO BE PAINTED AND STAINED

- A. A summary of the items to be painted and stained under this Section is listed below. A description of acceptable painting systems follows this summary. Where colors are listed as "TBD" they shall be selected by the Owner/Engineer during the submittal procedure.
1. Canopy support structure, including beams, columns, joists, and plates
    - a. Color: Dark Bronze
    - b. Paint System: B2
  2. Canopy support structure – visible underside of galvanized metal deck
    - a. Color: Dark Bronze
    - b. Paint System: C1
  3. Exterior exposed ductile iron piping, i.e. aboveground
    - a. Color: Tan
    - b. Paint System: D1
  4. Interior exposed ductile iron piping, i.e. inside valve vault
    - a. Color: Tan
    - b. Paint System: D2
  5. Exterior exposed aboveground PVC piping and conduit
    - a. Color: Match adjacent surface
    - b. Paint System: E1
  6. Misc ferrous items not listed elsewhere, shipped uncoated or prime coated
    - a. Color: Match adjacent surface or as directed by Engineer
    - b. Paint System: B2
  7. Factory-finished valves and operators where installed on exterior exposed aboveground piping (ie, bypass pump quick connect lines), finish coat in field for color uniformity and aesthetics.
    - a. Color: Tan
    - b. Paint System: B2 or D1, as applicable. Finish coat shall be compatible with factory coat.
  8. Electrical panels, boxes, and conduit. Finish coat in the field for color uniformity and aesthetics.
    - a. Color: Grey
    - b. Paint System: B2 or C1 as applicable. Finish coat shall be compatible with factory coat.

### 4.2. PAINTING SYSTEM BREAKDOWN



- A. Paint the items listed in the summary table above according to the following paint systems. Painting schedule is to be submitted for each of the systems which will be utilized.
- B. Concrete and Masonry Surfaces. Paint shall be similar and equal to that manufactured by the Tnemec Co. unless noted otherwise.
  1. Exterior Concrete Exposed – NOT USED
  2. Exterior Concrete Block – NOT USED
  3. Exterior Concrete Block – Split-Face Concrete Masonry Units – NOT USED
  4. Interior Concrete Block (Semi-Gloss Polyamide Epoxy) – NOT USED
- C. Miscellaneous Metal Surfaces. Paint shall be similar and equal to that manufactured by Tnemec Co.
  1. Interior/Exterior – Submerged or adjacent to water (polyamide epoxy) – NOT USED
  2. Interior/Exterior Miscellaneous Metalwork (Not submerged but exposed to moist atmosphere and/or sunlight and weather). (Aliphatic Polyurethane Semi Gloss Enamel over Polyamide Epoxy)
    - a. Surface Preparation. Remove all grease, oils and contaminants. Remove all weld splatters and grind rough and sharp welds to smooth, rounded contour and blast clean to near white blast finish (NACE № 2). Surface to be dry.
    - b. Coat № 1 High Build Epoxoline N69, Dry Mil. Thickness  $5.0 \pm 1.0$ , Application Rate 175 sq. ft./gal.
    - c. Coat № 2 Endura Shield 73, Dry Mil. Thickness 5 2.5 min. + 1.0, Application Rate 372 sq. ft./gal.
  3. Interior/Exterior - Submerged in Sewage (Coal Tar Epoxy) – NOT USED
- D. Galvanized Steel and Nonferrous Metal Pipes and Surfaces. Paint shall be similar and equal to that manufactured by Tnemec Co.
  1. Exterior Exposed
    - a. Surface Preparation: Remove all grease, oils and contaminants. Remove all rust from galvanized steel. Remove white rust from galvanized steel by hand or power brushing. Remove rust from old galvanized steel in accordance with SSPC-SP 2 or SP3. Do not damage or remove galvanizing. Lightly sand galvanizing to provide surface roughness as recommended by the manufacturer to achieve suitable bond.
    - b. Coat № 1 Hi-Build Epoxoline N69, Dry Mil. Thickness 4.0, Application Rate 225 sq.ft./gal.
    - c. Coat № 2 Endura Shield 73, Dry Mil. Thickness 3.0 mils
  2. Interior Exposed – NOT USED
  3. Immersion – NOT USED
- E. Ductile or Cast Iron – Pipe, Equipment, and Valves. Paint shall be similar and equal to that manufactured by Tnemec Co.
  1. Exterior Exposed
    - a. Surface Preparation: Ensure surfaces are clean, dry and free of oil, grease, dirt, dust, mill scale, rust, paint, oxides, corrosion products and other foreign matter in accordance with SSPC-SP 6/NACE 3.
    - b. Coat № 1 Series N69 Hi-Build Epoxoline, Dry Mil. Thickness 5.0, Application Rate 225 sq.ft./gal.
    - c. Coat № 2 Series N69 Hi-Build Epoxoline, Dry Mil. Thickness 6.0, Application Rate 225 sq.ft./gal.
    - d. Coat № 3 Series 73 Endura-Shield 3.0 mils, Application Rate 225 sq.ft./gal.

2. Interior Exposed:
    - a. Surface Preparation. Ensure surfaces are clean, dry and free of oil, grease, dirt, dust, mill scale, rust, paint, oxides, corrosion products and other foreign matter in accordance with SSPC-SP 6/NACE 3.
    - b. Coat № 1 Series N69 High Build Epoxoline, Dry Mil. Thickness 5.0, Application Rate 225 sq.ft./gal.
    - c. Coat № 2 Series N69 High-Build Epoxoline, Dry Mil. Thickness 6.0, Application Rate 225 sq.ft./gal.
  3. Immersion – NOT USED
- F. PVC Pipe and Fittings. Paint shall be similar and equal to that manufactured by the Tnemec Co.
1. Exterior Exposed
    - a. Surface Preparation: Ensure surfaces are clean, dry and free of oil, grease, dirt, dust, and other contaminants. Scarify the surfaces.
    - b. Coat № 1 Series N69 Hi-Build Epoxoline, Dry Mil. Thickness 3.0
    - c. Coat № 2 Series 73 Endura-Shield, Dry Mil. Thickness 3.0
  2. Interior Exposed: - NOT USED
- G. Wood, drywall, masonite: Paint shall be similar and equal to that manufactured by Tnemec Co. or as specified herein.
1. Interior/Exterior – NOT USED
  2. Interior/Exterior Semi Transparent Stain (An Alkyd Resin Stain) – NOT USED
- 4.3. ITEMS NOT PAINTED OR STAINED UNDER THE SCOPE OF THIS SECTION
- A. Items listed below shall be painted in accordance with other sections of these specifications:
1. Concrete and ductile iron piping in wet well interior.
  2. Site fencing and gates.
- B. Items listed below that are shipped with a factory-finish enamel or epoxy coating do not require field painting, except for touch-up of blemishes. If any items below are shipped with a factory prime coat, then they shall be finish coated in the field in accordance with Paragraph 4.1 above using a system compatible with the prime coat. Refer to the specification Sections associated with the items below for factory finish coating and touch-up requirements. Note that some factory-finished items may still require a field coat for color uniformity or for visual aesthetics where in the public view; those items are identified in Paragraph 4.1 above.
1. Valve bodies and operators inside the valve vault.
  2. Magnetic flow meter tubes.
  3. Submersible sewage pumps.
- C. Items listed below will remain unpainted in their finished state:
1. Aluminum handrails and access hatches (except that a bituminous coating shall be applied wherever aluminum will be in contact with concrete, masonry, grout, or dissimilar metals).
  2. Stainless steel items and fasteners.
  3. Tubing, fittings, and valve bodies that are made of copper, bronze, or brass.
  4. Galvanized steel structures as identified on the structural plans, including generator platform extension, stairways, and elevated walkway structure, unless a painting system is specifically called for above.

5. Exposed PVC piping and conduit inside the valve vault and wet well.

END OF SECTION

SECTION 26 00 10  
ELECTRICAL GENERAL PROVISIONS

**1.00 GENERAL**

1.1 SCOPE

- A. General Conditions of the Contract, Special Conditions, and Instructions to Bidders contained herein are a part of these specifications.
- B. This Contractor shall furnish all labor, materials and equipment and perform all operations necessary for installation of complete electrical work within the intent of, and as indicated on, the Drawings and as specified herein.

1.2 DEFINITIONS

- A. The word "Contractor" as used in this section of the specification refers to the Electrical Contractor unless specifically noted otherwise.
- B. The word "provide" means furnish completely installed, including labor and incidental materials necessary for operation or use of the item referred to or described herein, and/or shown or referred to on the Contract Drawings.

1.3 CONTRACTOR'S MISCELLANEOUS RESPONSIBILITIES

- A. The Contractor shall provide in his work, without extra cost to the Owner, any labor, materials, service, apparatus, drawings, in order to comply with all applicable laws, ordinances, rules and regulations, whether or not shown on the Drawings and/or specified.
- B. The right to make any responsible change in location of apparatus or equipment or routing of conduit to the time of roughing in, is reserved by the Owner without involving any additional expense to the Owner. The Owner reserves the right to relocate any receptacle, light fixture, equipment, device or telcom outlet  $\pm$  10'-0" to the time of roughing-in at no additional expense.
- C. It shall be the duty of prospective Contractors to visit the job site and familiarize themselves with job conditions. No extras will be allowed because of additional work necessitated by, or changes in plans required because of evident job conditions, that are not indicated on the Drawings.
- D. Contractor's Use of Premises: During the construction period, the Contractor will have use of Owner designated areas and access routes as needed for accomplishing this project. Contractor shall leave the premises in a clean and orderly manner upon completion of the work and shall remove from the premises all debris that has

accumulated during the progress of the work.

- E. Storage of Materials: Designated areas will be made available to store materials. Coordinate specific requirements with Owner prior to bid.
- F. Coordination Issues:
  - 1. The Contractor shall coordinate his schedule of work with the Owner.
  - 2. Contractor shall affect cooperation between his employees and those of Owner and Contractors on work awarded separately by the Owner, to the end that all work is properly anchored, installed and finished without hindrance or delay. Care shall be taken to avoid marring surfaces of the work of other Contractors, and each Contractor shall be held responsible for any damage to the work of others. Repair of new work shall be made by the original Contractor at the expense of the Contractor responsible for the damage.
- G. Protection of Existing Equipment and Facility: The Contractor shall be responsible to protect the Owner's existing equipment, stored materials, fixtures, piping, conduit, and other building components and finishes at all times during the construction and shall replace and/or repair any damage that is a result of his construction activities.
- H. Contractor Supervisor: The Contractor shall assign and maintain a single person as a job superintendent on this project. The superintendent shall not be responsible for other duties or projects other than the duties required to complete the scope of work required on the construction documents.
- I. Safety: The Contractor shall be responsible for initiating, maintaining, and supervising all safety measures and precautions and programs in connection with the work as required to meet all the safety standards of the governing agencies.
- J. Manuals: Contractor shall submit to Owner's Representative within 30 days of shop drawing approval, 4 copies of all installation, operation, and maintenance instructions on equipment and materials furnished under his contract. Each set of copies shall be bound in a 3-ring loose-leaf binder for 8-1/2" x 11" paper, with black vinyl covers.

#### 1.4 CONTRACT DOCUMENTS

- A. The Contract Drawings and Specifications are intended to depict the scope of work required. However, the drawings are schematic and diagrammatic and do not depict every item of material and equipment required to accomplish the work.
- B. Contractor shall maintain on the job site, one complete set of contract documents of all trades, and shall coordinate with other trades so as to avoid conflicts.
- C. Indicated locations of outlets, equipment, boxes, etc. are approximate and shall be verified by the Contractor.

1.5 RECORD DRAWINGS: Contractor shall prepare drawings showing proposed rearrangement of work to meet job conditions, including changes to work specified under other sections. Obtain permission of Owner's representative before proceeding.

1.6 REFERENCES

- A. ANSI/IEEE C2 - National Electrical Safety Code
- B. ANSI/NFPA 70 - National Electrical Code
- C. NECA - Standard of Installation 16, in addition to Division 1 provisions.

1.7 REGULATORY REQUIREMENTS

- A. Conform to ANSI/NFPA 70
- B. Conform to ANSI/IEEE C2
- C. Conform to local Building Codes.
- D. Obtain electrical inspections from local Electrical Inspections. Contact with local inspector shall be made prior to start of work. Schedule of inspections shall be as indicated or required by inspections department.

1.8 SUBMITTALS

- A. Contractor shall submit inspection and permit certificates.
- B. Bid Submittals:
  - 1. The Contractor shall study all Contract Documents to determine any conflicts or discrepancies of items which, in the opinion of the Contractor, are not clear. All errors or omissions shall be reported to the Owner's representative for clarification prior to bid submittal. No additional cost to the Owner shall result by Contractor's failure to request clarification on any item.
  - 2. Submittal of bid shall indicate the Contractor has examined the site, Drawings and Specifications and has included all required allowances in his bid. No allowance shall be made for any error resulting from Contractor's failure to visit job site and to review Drawings and Specifications. Bid shall include costs for all required changes including record drawing changes and all shop drawings.
  - 3. Before bid submittals are made, the Contractor shall determine that specified materials availability shall not delay progress of the work. If undue delays or other major circumstances are foreseen, the Contractor must alert the Owner's representative immediately and before submittal of his bid.
  - 4. Contractor's base bid shall include only those Manufacturers and equipment types called for in the Specifications or on the Drawings.
- C. Equipment Submittals, Shop Drawings, Record Drawings:

1. General:

- a. The Contractor shall submit within fifteen (15) calendar days after the awarding of the Contract, six (6) copies of a complete list of all manufacturers to be used in the Project for approval by the Owner's representative. Submitted list shall include both manufacturer's name and product(s) supplied by listed manufacturer.
- b. Submittals are reviewed by the Owner or Owner's representative in accordance with the intent and scope of the Drawings and Specifications. Review of submittal will not waive the requirements of the Specifications or Drawings unless a waiver is specifically requested.
- c. Equipment design basis is indicated in the Specifications and/or on the Drawings. Any change caused by selection of alternate manufacturers shall be the responsibility of the Contractor. Any change resulting in interferences by alternate equipment submitted and accepted shall be paid for by the Contractor.
- d. Submittals and shop drawings on equipment involving several manufacturers and equipment types shall be submitted as a single package clearly indicating noninterference between components. Contractor shall be responsible for proper coordination and interfacing of components on all equipment. Submittals and shop drawings on equipment not handled in this manner shall be labeled "Rejected, Correct and Resubmit".
- e. Samples, shop drawings, specifications and catalogs submitted for approval shall be properly labeled indicating specific service for which material or equipment is to be used, Section and Article number of Specifications governing, equipment item number, Contractor's Name and Name of Job.
- f. Catalogs, pamphlets, shop drawings or other documents submitted to describe items on which approval is being requested, shall be specific and identification in catalog, pamphlet, shop drawing, etc. of item submitted and applicable options shall be clearly marked. Data of general nature will not be accepted and shall be labeled "Rejected, Correct and Resubmit". No portion of work shall be commenced and no payment for any equipment or labor will be allowed until all major items of equipment specified have been submitted to the Owner's representative for review.
- g. Where materials, equipment and installation instructions are specified to comply with current standards of nationally recognized agencies, the Contractor shall submit proof of such compliance.





material he intends to furnish and install and by detailing the fabrication and installation methods he intends to use. The Contractor shall further agree that if deviations, discrepancies or conflicts between shop drawing submittals and the Design Drawings and Specifications are discovered, either prior to or after shop drawing submittals are processed by the Owner's representative, the Design Drawings and Specifications shall control and shall be followed.

- c. Review of shop drawings shall not be considered as a guarantee of quantities, measurements, or building conditions. Where drawings are reviewed, said review will not mean that drawings have been checked in detail; said review will not in any way relieve the Contractor of his responsibilities or necessity of furnishing material or performing work as specified by the Design Drawings and Specifications.
- d. Failure of the Contractor to submit shop drawings in ample time for checking will not entitle him to an extension of Contract time and no claim for extension by reason of default will be allowed.

4. Record Drawings:

- a. The Contractor shall furnish record drawings same scale as Design Drawings, showing all changes in location of conduit, fixtures, etc. from that shown on the Design Drawings and shall include changes in all schedules to indicate equipment actually installed. Record drawings shall consist of clean, legible prints of the Design Drawings, available from the Owner's representative, on which the Contractor shall mark all notes, dimensions, sizes and information required. The prints shall be kept for this purpose only. Prior to final inspection the Contractor shall submit prints to the Owner's representative for incorporation of changes in record drawings.
- b. These records are a specific contract requirement, and final payment will not be made until these Drawings and Specifications have been submitted in acceptable form.

- D. Contractor shall include certificate of final inspection and acceptance from authority having jurisdiction.

1.9 COORDINATION OVERLAY DRAWINGS:

- A. All areas of this project will require extensive coordination between trades that is beyond the requirements for typical construction. It is essential that each contractor review space requirements and coordinate with all other trades to ensure work can be installed in available spaces. No work shall begin, nor shall any payment be provided until the coordination drawings have been reviewed and approved by the Engineer.

- B. All trades shall be responsible for providing coordination information to the Mechanical Contractor. Trade work shall include general construction, mechanical, plumbing, fire protection, electrical, telecommunications, and controls. The coordination drawings shall have each contractor's approval stamp and signature indicating complete coordination between all trades.
- C. Contractor shall coordinate specific requirements for noise and vibration with all other trades.
- D. Coordination Overlay Drawings Required: The Mechanical Contractor shall prepare complete computer-generated coordination overlay drawings at a suitable scale not less than 1/4" = 1'-0". These drawings shall be submitted in the latest AUTOCADD format. Drawings shall include all trades' work relative to the structural and architectural features of this facility. Each trade shall be included on the coordination drawings in a separate drawing layer to allow viewing of each trade independently. At the Contractor's request, the Engineer will provide electronic files of design drawings to the Contractor for use in preparing coordination drawings
- E. Any work installed with interferences due to lack of coordination between trades shall be corrected by the Contractor at no additional cost to the Owner.
- F. One complete set of approved coordination drawings shall be kept at the work site at all times and shall be updated and maintained in the same manner as that required for Record Drawings. When specified herein, original tracings and/or CAD (computer-aided-drafting) drawings shall also be updated and maintained for submittal as part of Project Closeout.

#### 1.10 UTILITIES INTERRUPTION

- A. Any required interruption of utilities serving project site or adjacent buildings, or areas shall be arranged with the Owner in advance. If such interruption is required to be made during "off" hours, this shall be done at no additional cost or inconvenience to the Owner. It is critical that the Building(s) have uninterrupted power unless otherwise scheduled through Owner.
- B. The responsibility of locating, uncovering, disposing of or maintaining all existing utilities shall rest solely on the Contractor. Any minor adjustments in the location or alignment of new work in order to avoid or connect to existing utilities shall be performed without additional cost to the Owner.

- 1.11 ASBESTOS CONTAINING MATERIALS (ACM): Every effort has been made by the Owner to remove ACM prior to start of Contractor work. The Contractor, however, is responsible for notifying the designated Owner's representative upon discovery of any material which the Contractor suspects may contain asbestos. This is particularly true for hidden areas which may become exposed as a result of specified work (e.g., within walls). The designated Owner's representative will arrange for the testing and removal of any ACM. The Contractor shall schedule his or her work in such a manner that minor interruptions for ACM removal will not constitute work stoppages.

## 2.00 PRODUCTS

### 2.1 MATERIALS AND EQUIPMENT

- A. All materials and equipment shall be new, undamaged and top quality. They shall be so-selected and arranged as to fit properly and fulfill their intended purpose.
- B. Materials and equipment shall bear the manufacturers label, marking or name tag, whichever is applicable, giving pertinent information.
- C. Materials and equipment shall be inspected upon arrival at the site, to insure they are correct. Adequate facilities shall be provided on-site for orderly and protective storage of all materials and equipment.
- D. Materials and equipment shall be as given in these Specifications or on the Drawings.
- E. Where these Specifications or the Construction Drawings identify materials or equipment by a catalog number, it shall be understood that all parts of that material or equipment which are necessary for the complete working installation shall be included. For example, motor starters shall be furnished with overload heaters.

## 3.00 EXECUTION

### 3.1 WORKMANSHIP

- A. Contractor shall install work using procedures defined in NECA Standard of Installation.
- B. The Contractor shall furnish the services of an experienced superintendent, who shall be constantly in charge of the construction. All work shall be done by experienced workmen, properly supervised.

3.2 SCAFFOLDING, RIGGING, HOISTING: Contractor shall provide for all scaffolding, rigging, hoisting, and services necessary for handling and installation of materials and equipment.

### 3.3 CONCEALED CONDUIT

- A. All conduit in finished spaces shall be run concealed below floors, in walls, and above ceilings unless noted otherwise on documents.
- B. Concealment of conduit and covering of same shall not be done until authorized by the Owner's representative and Electrical Inspector, after proper tests have been made. This applies to all interior work and exterior work.

### 3.4 CUTTING AND PATCHING

- A. This Contractor shall be responsible for all cutting and patching necessary to install the work specified in this section. Patch all cut areas to match adjacent areas and surfaces.
- B. No structural members shall be cut without the approval of the Owner's representative and all such cutting shall be done in a manner directed by him.
- C. This Contractor shall arrange with the Owner for proper openings to admit and/or install his equipment. If it becomes necessary to cut any portion of building, portions cut must be restored to their former condition by this Contractor through agreeable arrangement with the Owner.

### 3.5 PROTECTION

- A. The Contractor shall protect all work and material from damage and shall be liable for all damage during construction.
- B. The Contractor shall be responsible for work and equipment until all construction is finally inspected, tested, and accepted. He shall protect work against theft, injury or damage; and shall carefully store material and equipment received on site which are not immediately installed. He shall close open ends of work including conduit, or equipment with temporary covers or plugs during storage and construction to prevent entry of obstructing materials or dust and debris.
- C. Contractor shall keep premises free of debris resulting from this work.
- D. Contractor shall provide a protective covering of not less than 0.004" thick vinyl sheeting (or a similar approved material) to be used in covering all items of equipment, immediately after the equipment has been set in place, (or if in a place of storage within the building under construction) to prevent the accumulation of dirt, sand, cement, plaster, paint or other foreign materials from collecting on the equipment and/or fouling working parts.

### 3.6 FIRE STOP SEALS

- A. The Electrical Contractor shall provide all fire stopping for pipe and conduit thru penetrations thru existing and new fire rated floors, partitions, and walls.
- B. Fire stop seals shall be installed in strict accordance with the UL Fire Resistance Directory and the manufacturer's recommendations and data sheets for each type of opening or void.
- C. Fire stop seals shall be an intumescent material capable of expanding up to 10 times when exposed to temperatures beginning at 250°F. All fire stop systems shall be UL Classified and have IBC approved ratings to 4 hours for floor penetrations and 2 hours for wall and

partition penetrations per ASTM E-814 (UL 1479). Manufacturer shall be 3M, Hilti or Dow Corning.

- D. All surfaces that will be in contact with the penetration seal materials shall be cleaned of dirt, grease, oil, loose materials, rust, or other substances that may affect the proper fitting and adhesion of the installed sealant materials. Surfaces shall be smooth and without gouges or other irregularities.
- E. Protect materials installed to seal fire rated penetrations from damage where installed on surfaces subject to traffic.
- F. Verify through penetration seals by inspection of installed materials. Provide for accessibility to penetration seals for inspection by applicable code authorities.

3.7 OBSERVATION: The project will be observed periodically as construction progresses. The Contractor will be responsible for notifying the Owner's representative at least 24 hours in advance when any work to be covered up is ready for inspection. No work will be covered up until after observation has been completed.

### 3.8 PAINTING, FINISHING

- A. Suitable finishes shall be provided on all items of electrical equipment, conduit, etc. which are exposed. This shall consist of either an acceptable finish as manufactured and supplied to the job or application of suitable finishes after installation.
- B. Equipment furnished in finishes such as stainless steel, brushed aluminum, etc. shall not be painted.
- C. All finishing shall be as directed by and satisfactory to the Owner.

### 3.9 EQUIPMENT LABELS, ETC.

- A. Suitable nameplates shall be provided for the identification of major items of electrical equipment including switchboards, panelboards, motor starters, safety switches, enclosed circuit breakers, etc.
- B. Nameplates shall be of engraved phenolic laminate, not less than 1/16" thick. Color coding shall comply with Section 26 05 53 - Identification of Electrical Systems.
- C. Engraving shall be of professional quality, with block style letters, minimum 1/2" high.
- D. Nameplates shall be attached with stainless steel screws or rivets.

### 3.10 FOUNDATIONS, SUPPORTS, PIERS, ATTACHMENTS

- A. This Contractor shall furnish and install all necessary foundations, supports, pads and piers required for all equipment furnished under this contract.

- B. All equipment, unless otherwise shown, shall be securely attached to the building structure in an approved manner. Attachments shall be of a strong and durable nature and any attachments that are, in the opinion of the Owner, not strong enough, shall be replaced as directed by the Owner.

### 3.11 ACCEPTANCE, TESTS, AND GUARANTEE

- A. Upon completion of work, Contractor shall demonstrate and make such tests as may be required to satisfy Owner that construction is in accordance with Drawings, Specifications and instructions.
- B. In the event that the Owner considers it impractical, because of unsuitable test conditions, or some other factors, to execute simultaneous final acceptance of all equipment, portions of the installation may be certified by the Owner for final acceptance when that portion of the system is complete and ready for operation.
- C. Contractor shall guarantee the work done in accordance with Drawings and Specifications, and to be free of defective materials and workmanship. Anything unsatisfactory shall be corrected immediately and at Contractor's expense.
- D. For a period of one year after acceptance, Contractor shall replace, without any expense to the Owner, any defective materials or workmanship, including any cutting or patching which may be required.

**END OF SECTION 26 00 10**

SECTION 26 05 05  
CONDUIT

**1.00 GENERAL**

**1.1 WORK INCLUDED**

- A. Electrical metallic tubing and fittings.
- B. Liquid tight flexible metal conduit and fittings.
- C. Rigid metal conduit and fittings.
- D. Schedule 40 rigid PVC conduit and fittings.

**1.2 REFERENCES**

- A. ANSI C80.1 - Rigid Steel Conduit, Zinc-Coated.
- B. ANSI C80.3 - Electrical Metallic Tubing, Zinc-Coated.
- C. ANSI/NEMA FB 1 - Fittings and Supports for Conduit and Cable Assemblies.
- D. FS WW-C-563 - Electrical Metallic Tubing.
- E. FS WW-C-566 - Specification for Flexible Metal Conduit.
- F. FS WW-C-581 - Specification for Galvanized Rigid Conduit.
- G. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing.

**2.00 PRODUCTS**

**2.1 ELECTRICAL METALLIC TUBING (EMT) AND FITTINGS**

- A. EMT: ANSI C80.3., FS WW-C-563., galvanized tubing.
- B. Fittings and Conduit Bodies: ANSI/NEMA FB1; steel, compression type, insulated throat.
- C. Conduits for Fire Alarm shall be red in color.

**2.2 LIQUIDTIGHT FLEXIBLE CONDUIT AND FITTINGS**

- A. Conduit: Flexible metal conduit with PVC jacket.
- B. Fittings and Conduit Bodies: ANSI/NEMA FB 1.

**2.3 RIGID METAL CONDUIT AND FITTINGS**

- A. Rigid Steel Conduit: ANSI C80.1., FS WW-C-581.
- B. Fittings and Conduit Bodies: ANSI/NEMA FB 1; threaded type, material to match conduit.

**2.4 PLASTIC CONDUIT AND FITTINGS**

- A. Conduit: NEMA TC 2; Schedule 40 PVC and Schedule 80 PVC.

- B. Fittings and Conduit Bodies: NEMA TC 3.

## 2.5 CONDUIT SUPPORTS

- A. Conduit Clamps, Straps, and Supports: Steel or malleable iron; PVC underground or in areas with concrete encasement.
- B. Galvanized for moist locations. Hot dip galvanized for exposure to weather.

## 2.6 ACCEPTABLE MANUFACTURERS

- A. Allied
- B. Triangle
- C. Wheatland
- D. Carlon

## 3.00 EXECUTION

### 3.1 CONDUIT SIZING, ARRANGEMENT, AND SUPPORT

- A. Size conduit for conductor type installed or for Type THHN/THWN conductors, whichever is larger; 3/4-inch minimum size. Minimum size liquid tight conduit is 3/4".
- B. Arrange conduit to maintain headroom and present a neat appearance.
- C. Route exposed conduit and conduit above accessible ceilings parallel and perpendicular to walls and adjacent piping.
- D. Maintain minimum 6-inch clearance between conduit and piping. Maintain 12-inch clearance between conduit and heat sources such as flues, steam pipes, and heating appliances.
- E. Arrange conduit supports to prevent distortion of alignment by wire pulling operations. Fasten conduit using steel channel, lay-in adjustable hangers, clevis hangers, or bolted split stamped galvanized hangers. Use non-metal supports below grade or in areas of concrete cover.
- F. Group conduit in parallel runs where practical and use conduit rack constructed of steel channel with conduit or clamps. Provide space for 25 percent additional conduit.
- G. Do not fasten conduit with wire or perforated pipe straps. Remove all wire used for temporary conduit support during construction, before conductors are pulled.
- H. Support conduit per NEC and at a maximum of 7 feet on center.
- I. All exposed conduits shall be installed using "conduit standoffs" providing minimum 1" space between conduit and finished wall surface.



### 3.2 CONDUIT INSTALLATION:

- A. Cut conduit square using a saw or pipe cutter; de burr cut ends.
- B. Bring conduit to the shoulder of fittings and couplings and fasten securely.
- C. Use conduit hubs (Myers) or sealing locknuts for fastening conduit to cast boxes, and for fastening conduit to sheet metal boxes in damp or wet locations.
- D. Install no more than the equivalent of three 90-degree bends between boxes.
- E. Use conduit bodies to make sharp changes in direction, as around beams.
- F. Use hydraulic one-shot conduit bender or factory elbows for bends in conduit larger than 2-inch size.
- G. Avoid moisture traps where possible; where unavoidable, provide junction box with drain fitting at conduit low point.
- H. Use suitable conduit caps to protect installed conduit against entrance of dirt and moisture.
- I. Provide No. 10 AWG insulated conductor or suitable pull string in empty conduit, except sleeves and nipples.
- J. Install expansion joints where conduit crosses building expansion joints.
- K. Pipe sleeves shall be provided where conduit pass through walls, floors or partitions. Sleeves through floors shall be Schedule 40 steel pipe set flush with bottom of slab and shall extend approximately 2" above the finished floor. Sleeves through partitions shall be Schedule 40 steel pipe flush with both sides of walls or partitions and coated with rust inhibitive paint. Sleeves passing through concrete or masonry walls shall be Schedule 40 steel pipe set flush with the wall on both sides. Seal piping penetrations thru outside walls and floor for weatherproofing and to be leak tight. Provide drainable fittings similar to Crouse Hinds EYD for all conduit penetrating exterior walls and terminating in the top of panels or switchgear. Where conduit penetrates fire- rated walls and floors, provide pipe sleeve two sizes larger than conduit; see Section 26 00 10 for Fire Stopping requirements.
- L. All conduit bodies to be malleable iron, with weatherproof coating, neoprene gasket and malleable iron cover.
- M. Route conduit through roof openings for piping and ductwork where possible; otherwise, route through roof jack with pitch pocket.
- N. Use PVC coated rigid steel factory elbows for bends in plastic conduit runs longer than 100 feet, or in plastic conduit runs which have more than two bends regardless of length.
- O. Wipe plastic conduit clean and dry before joining. Apply full even coat of cement to entire area that will be inserted into fitting. Let joint cure for 20 minutes minimum.

P. Use hexagonal compression-type steel fittings with EMT.

Q. Pulling elbows larger than 2" shall be mogul type.

### 3.3 TERMINATIONS

A. IMC and GRC shall terminate with either a double locknut/bushing set, or in a threaded hub.

B. Where concentric, eccentric or over-sized knockouts are encountered, a grounding-type insulated bushing shall be provided.

C. EMT terminations shall be made utilizing steel-plated hexagonal compression connectors. No pot metal set screw or Indented type fittings shall be utilized.

D. EMT terminations shall be "concrete tight" where buried in masonry or concrete. EMT fittings, where installed in damp locations, shall be of the "raintight" type.

### 3.4 CONDUIT COUPLING

A. Where conduits of any type pass over a building expansion joint, a standard "expansion joint fitting", compatible with the type raceway being used, shall be provided.

B. Conduit couplings for IMC, GRC and PVC shall be in accordance with the NEC.

C. EMT couplings shall be of the plated-steel hexagonal compression type. No pot metal set screw or Indented type fittings shall be utilized.

D. EMT couplings shall be "concrete tight" where buried in masonry or concrete. EMT fittings, where installed in damp locations, shall be of the "raintight" type.

### 3.5 CONDUIT INSTALLATION SCHEDULE

A. Concealed Dry Interior Locations: Electrical metallic tubing.

B. Main Electrical Room: Electrical Metallic tubing.

C. Underground Installations More than Five Feet from Foundation:

1. Raceways run external to building foundation walls, shall be installed as follows.

a. Raceways must have a minimum cover of eighteen (18) inches. (Twenty-four (24) inches where subject to vehicle traffic.)

b. Raceways shall be Schedule 40 PVC listed as "suitable for concrete encasement."

2. Branch circuit raceways run underground external to building foundation walls shall be Schedule 40 PVC and shall be listed as "suitable for direct burial".

Minimum raceway size shall be 3/4 inch.

3. All underground raceways shall be identified by UNDERGROUND LINE MARKING TAPE located directly above the raceway at 6 to 8 inches below finished grade. Tape shall be permanent, bright-colored, continuous printed, plastic tape compounded for direct burial not less than 6 inches wide and 4 mils thick. Printed legend shall be indicative of general type of underground line below.
- D. Installations Under Concrete Slab, or Underground Within Five Feet of Foundation Wall:
1. Raceways shall be Schedule 40 PVC. Provide PVC coated rigid elbows as previously indicated.
  2. Where underground raceways are required to turn up into cabinets, equipment, etc., the elbow required and the stub-up at the slab shall be rigid steel. The elbow shall be PVC coated rigid steel.
  3. All underground raceways shall be identified by UNDERGROUND LINE MARKING TAPE located directly above the raceway at 6 to 8 inches below finished grade. Tape shall be permanent, bright-colored, continuous printed, plastic tape compounded for direct burial not less than 6 inches wide and 4 mils thick. Printed legend shall be indicative of general type of underground line below.
- E. Exposed Outdoor Locations: Rigid steel conduit, galvanized.
- F. Motor Connections: Liquidtight flexible conduit, minimum 1/2" size.
- G. Connections to Movable or Vibrating Equipment: Provide a minimum of 2 ft. of liquidtight flexible conduit in each connection to transformers, motors, and other equipment which may be moved for maintenance.
- H. Where passing through a "below grade" wall from a conditioned interior building space, raceways shall be sealed utilizing fittings similar and equal to OZ/GEDNEY type "FSK" thru-wall fitting with "FSKA" membrane clamp adapter if required.

### 3.6 OPENINGS, SLEEVES & FLASHINGS

- A. The Contractor shall provide all slab cuts and structural beam cores in all existing and new construction. The Electrical Contractor shall advise exact dimensions, shape, and locations of openings required in sufficient time for the Contractor to make the necessary provisions. The Electrical Contractor shall be responsible for the correct size and location of each opening for his equipment even though these openings are provided by the Contractor.
- B. The Electrical Contractor shall arrange for necessary openings in building to admit his equipment. If it becomes necessary to cut any portion of building to admit his equipment, Engineer's approval shall be obtained before cutting, and portions cut shall be restored to their former condition by this Contractor.

- C. The Electrical Contractor shall provide pipe sleeves for installation where pipes pass through walls, floors or partitions. Sleeves through floors shall be Schedule 40 steel pipe set flush with bottom of slab and shall extend approximately 2" above the finished floor. Sleeves through partitions and walls shall be Schedule 40 steel pipe flush with both sides of walls or partitions and coated with rust inhibitive paint. Seal piping penetrations thru outside walls and floor for weatherproofing and to be leak tight.
- D. Sleeves shall be large enough to permit expansion movement. Sleeves shall generally be 1" larger in dimension than the outside diameter of the pipe. Coordinate exact clearance requirements for fire stopping as required by data sheets for UL Fire Penetration System numbers.
- E. Where smooth, uniform penetrations can be made in existing concrete wall construction by means of core drilling, sleeves shall not be required. However, penetrations made in this manner shall meet all the above requirements for sleeves, such as sizes, clearances, sealing requirements, UL fire stopping, and the like.

**END OF SECTION 26 05 05**

SECTION 26 05 10  
WIRE AND CABLE

**1.00 GENERAL**

## 1.1 WORK INCLUDED

- A. Building wire and single conductor cable.
- B. Wiring connections and terminations.

## 1.2 REFERENCES: NEMA WC 5 - Thermoplastic-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.

**2.00 PRODUCTS**

## 2.1 BUILDING WIRE

- A. Thermoplastic-insulated Building Wire: NEMA WC 5.
- B. Service feeders and emergency service feeders exterior to building: Stranded copper conductor, 600 volt insulation, XHHW.
- C. Feeders and branch circuits larger than 10 AWG: Stranded copper conductor, 600-volt insulation, THHN/THWN or as noted on the Drawings.
- D. Feeders and branch circuits 10 AWG and smaller: Solid copper conductor, 600-volt insulation, THHN/THWN.
- E. Control Circuits: Copper, stranded conductor 600-volt insulation, Type THHN/THWN.

## 2.2 ACCEPTABLE MANUFACTURERS

- A. Anaconda
- B. Okonite
- C. Southwire
- D. Triangle
- E. Accepted Equal

**3.00 EXECUTION**

## 3.1 GENERAL WIRING METHODS

- A. Use no wire smaller than 12 AWG for power and lighting circuits, and no smaller than 14

AWG for control wiring.

- B. Use 10 AWG conductor for 20 amperes, 120-volt branch circuit home runs longer than 100 feet. See plans for additional branch circuit sizing requirements.
- C. Place an equal number of conductors for each phase of a circuit in same raceway or cable.
- D. Splice only in junction or outlet boxes.
- E. Neatly train and lace wiring inside boxes, equipment, and panelboards.
- F. Make Conductor lengths for parallel circuits equal.
- G. All individual 120-volt branch circuits shall be provided with a separate "neutral" conductor. Sharing of neutral conductor shall not be permitted. De-rating factors shall be applied for multiple runs of conductors in a common raceway system.

### 3.2 WIRING INSTALLATION IN RACEWAYS

- A. Pull all conductors into a raceway at the same time. Use UL listed wire pulling lubricant for pulling all sizes of conductors, including those #3 AWG and smaller.
- B. Install wire in raceway after all mechanical work likely to damage conductors has been completed.
- C. Completely and thoroughly swab raceway system before installing conductors.

### 3.3 CABLE INSTALLATION

- A. Provide protection for exposed cables where subject to damage.
- B. Support cables above accessible ceilings or in attic space in cable trays as noted or specified on Drawings; do not rest on ceiling tiles.

### 3.4 WIRING CONNECTIONS AND TERMINATIONS

- A. Splice only in accessible junction boxes.
- B. Splicing (circuits of 600 volts or less): Solid conductors, namely those sized #10 AWG copper and smaller, shall be spliced by twisting securely and by means of hot-dipped solder plus gum rubber tape, plus friction tape, or plastic tape approved as a substitute for friction tape. The Contractor shall use "wire-nuts" for recessed lighting fixture lead splices to branch circuit conductors.
- C. As an option, instead of solder and tape, the Contractor may use Ideal "wing-nuts" or 3M Co.'s "Scotchlok" connectors for branch circuit splices (#10 and #12) in junction boxes and light fixtures, except recessed fixtures as noted above. "Sta-Kon" or other permanent type crimp connectors shall not be used.

- D. Stranded conductors, namely #8 AWG and larger, shall be spliced by approved mechanical connectors plus gum tape, plus friction or plastic tape. Solderless mechanical connectors for splices and taps provided with UL approved insulating covers may be used instead of mechanical connectors plus tape.
- E. Thoroughly clean wires before installing lugs and connectors.
- F. Make splices, taps and terminations to carry full ampacity of conductors without perceptible temperature rise.
- G. Terminate spare conductors with wire nuts and electrical tape.

### 3.5 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed under provisions of Section 26 00 10.
- B. Inspect wire and cable for physical damage and proper connection.
- C. Torque test conductor connections and terminations to manufacturer's recommended values.
- D. Perform continuity test on all power and equipment branch circuit conductors. Verify proper phasing connections.

### 3.6 WIRE AND CABLE INSTALLATION SCHEDULE

- A. Concealed Interior Locations: Building wire in raceways.
- B. Exposed Interior Locations: Building wire in raceways.
- C. Fire Alarm Cable: Fire alarm cable shall be extended in raceway throughout.

### 3.7 COLOR CODING

- A. All wiring shall be color coded, no exceptions.
- B. On 120/208V, 3 phase, 4 wire power systems, conductors shall be color coded black (Phase A), red (Phase B), blue (Phase C), and white (Neutral).
- C. On 277/480V, 3 phase, 4 wire power systems, conductors shall be color coded brown (Phase A), orange (Phase B), yellow (Phase C), and gray (Neutral).
- D. Ground conductors on all systems shall be green. Isolated ground conductors shall be green with a yellow stripe.
- E. Unless noted otherwise, busses in panels and switch gear shall be considered "A", "B", and "C" from left to right, top to bottom or front to back when facing equipment.

- F. Control and signal wiring shall not use the above-named colors except green for grounding. Any other colors or striping may be used but the coding shall provide same color or striping between any two terminals being jointed.
- G. "Travelers" in switching circuits shall be of the same color as phase conductors serving the circuit.

**END OF SECTION 26 05 10**



SECTION 26 05 11  
WIRING DEVICES

**1.00 GENERAL**

1.1 WORK INCLUDED

- A. Wall switches.
- B. Receptacles.
- C. Device plates and box covers.
- D. Automatic wall switch.
- E. Automatic ceiling switch.

1.2 REFERENCES

- A. FS W-C-596 - Electrical Power Connector, Plug, Receptacle, and Cable Outlet.
- B. FS W-S-896 - Switch, Toggle.
- C. NEMA WD 1 - General-Purpose Wiring Devices.
- D. NEMA WD 5 - Specific-Purpose Wiring Devices.

1.3 SUBMITTALS

- A. Submit product data under provisions of Section 26 00 10.
- B. Provide product data showing configurations, finishes, dimensions, and manufacturer's instructions.

**2.0 PRODUCTS**

2.1 ACCEPTABLE MANUFACTURERS - WALL SWITCHES

- A. Hubbell
- B. Pass & Seymour
- C. Arrow-Hart
- D. Wattstopper (Automatic Wall Switch)
- E. Substitutions: Under provisions of Section 260010.

2.2 WALL SWITCHES

- A. Wall Switches for Lighting Circuits and Motor Loads Under 1/2 HP: NEMA WD; 1 FS W-S-896; AC general use snap switch with toggle handle, rated 20 amperes and 120-277 volts AC. Switches shall be of the grounding type, with hex head grounding screw. Switches shall have quiet operation, without the use of mercury switches. All switches

shall be third party listed approved for voltage and amperage indicated. Handle: Color by Owner.

- B. Switches used for emergency service shall be red in color.
- C. Automatic wall switch shall be dual technology passive infrared and ultrasonic type, adjustable time delay, adjustable sensitivity, manual override function. Manual bi-level control capability shall be provided at noted locations.

### 2.3 ACCEPTABLE MANUFACTURERS – AUTOMATIC CEILING SWITCHES

- A. Hubbell
- B. Pass & Seymour
- C. Arrow-Hart
- D. Wattstopper
- E. Sensor Switch

### 2.4 AUTOMATIC CEILING SWITCHES

- A. Automatic ceiling switch shall be dual technology passive infrared and ultrasonic type, 360° detection, adjustable time delay, adjustable sensitivity.

### 2.5 ACCEPTABLE MANUFACTURERS - RECEPTACLES

- A. Hubbell
- B. Pass & Seymour
- C. Arrow-Hart

### 2.6 RECEPTACLES

- A. Convenience and Straight-blade Receptacles: NEMA WD 1, FS W-C-596, 20A, 120V.
- B. Convenience Receptacle Configuration: NEMA WD 1; Type 5-20 R, color by Owner, or as noted, 20A, 120V.
- C. Specific-use Receptacle Configuration: NEMA WD 1 or WD 5; type as indicated on Drawings, color by Owner, or as noted.
- D. GFCI Receptacles: Duplex convenience receptacle with integral ground fault current interrupter, 20A, 120V, NEMA 5-20R weather resistant.
- E. Duplex receptacles shall be of the grounding type, arranged for back and side wiring, with separate single or double grounding terminals. Receptacles shall be straight blade, rated 20A, 125 volts and the face configuration shall conform to the NEMA Standard No. WD-1, NEMA WD-6, DSCC W-C-596G & UL-498 and shall be "approved" third-party listed. Self-

grounding or automatic type grounding receptacles are not acceptable in lieu of receptacles with separate grounding screw lugs and a direct, green insulated conductor connection to the equipment grounding system.

- F. Receptacles shall be Federal Specification Grade, mounted vertically. Receptacles mounted over counters, back-splashes, etc., shall be mounted horizontally.
- G. Receptacles shall not be mounted back to back.
- H. Receptacles used for emergency service shall be red in color.

#### 2.7 ACCEPTABLE MANUFACTURERS - WALL PLATES

- A. Hubbell
- B. Pass & Seymour
- C. Arrow-Hart
- D. Substitutions: Under provisions of Section 26 00 10.

#### 2.8 WALL PLATES

- A. Decorative Cover Plate: As directed by Owner. Coordinate prior to bid. Provide 2% spare quantity to Owner.
- B. Weatherproof Cover Plate: Gasketed cast metal with hinged cast metal in-use cover.

### 3.00 EXECUTION

Not Used.

**END OF SECTION 26 05 11**

SECTION 26 05 12  
DISCONNECT SWITCHES AND FUSING

**1.00 GENERAL**

1.1 WORK INCLUDED

- A. Furnish and install disconnect switches as shown or indicated on the Drawings.
- B. Furnish and install fuses in all fusible disconnect switches in accordance with the Drawings and these Specifications.

1.2 REFERENCES

- A. ANSI/UL 198C - High-Intensity Capacity Fuses; Current Limiting Types.
- B. ANSI/UL 198E - Class R Fuses.
- C. FS W-F-870 - Fuse holders (For Plug and Enclosed Cartridge Fuses).
- D. FS W-S-865 - Switch, Box, (Enclosed), Surface-Mounted.
- E. NEMA KS 1 - Enclosed Switches.

1.3 SUBMITTALS

- A. Submit product data under provisions of Section 26 00 10.
- B. Include outline drawings with dimensions, and equipment ratings for voltage, capacity, horsepower, and short circuit.

**2.00 PRODUCTS**

2.1 ACCEPTABLE MANUFACTURERS - DISCONNECT SWITCHES

- A. Square D Company, Cutler Hammer.
- B. Substitutions: Under provisions of Section 26 00 10.

2.2 DISCONNECT SWITCHES

- A. Fusible Switch Assemblies: NEMA KS 1; FS W-S-865; heavy duty, quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position. Fuse Clips: FS W-F- 870. Designed to accommodate Class R fuses. Switches serving equipment with VFD's and elevator equipment shall be provided with auxiliary contact in handle operator.
- B. Non-fusible Switch Assemblies: NEMA KS 1; Type HD; FS W-S-865; quick-make,

quick-break, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position. Switches serving equipment with VFD's and elevator equipment shall be provided with auxiliary contact in handle operator.

- C. Enclosures: NEMA Type 1 Indoors. NEMA Type 3R where exposed to weather. Type as indicated on Drawings.

### 2.3 ACCEPTABLE MANUFACTURERS - FUSES

- A. Buss Fuse Company, Gould Shawmut.
- B. Substitutions: Under provisions of Section 26 00 10.

### 2.4 FUSES

- A. Fuses rated 600 Amperes or less shall be UL Class RK5.
- B. Fuses rated higher than 800 Amperes shall be UL Class L.
- C. All fuses shall have a 60-cycle interrupting rating of 200,000 RMS Amperes at their rated voltage and shall be current limiting.

## 3.00 EXECUTION

### 3.1 INSTALLATION

- A. Install disconnect switches where indicated on Drawings.
- B. Install fuses in fusible disconnect switches.

- 3.2 SPARE FUSES: Provide Owner with ten percent (10%) spare, minimum of three (3), fuses of each type and rating, unless noted otherwise on Drawings.

**END OF SECTION 26 05 12**

SECTION 26 05 26  
GROUNDING AND BONDING

**1.00 GENERAL**

1.1 WORK INCLUDED: Grounding and bonding of the electrical systems.

1.2 SYSTEM DESCRIPTION:

- A. The power distribution system shall be grounded at each voltage level. The conduit of the wiring systems and all electrical equipment shall be grounded.
- B. Each conductive, non-current carrying, part of the electrical system shall be bonded to an equipment grounding conductor sized in accordance with NEC, unless otherwise shown on the Drawings.
- C. The raceway system shall not be relied on for ground continuity. A green grounding conductor, properly sized per NEC Table 250.122, shall be run in all raceways except as follows:
  - 1. Raceways for telecommunications.
  - 2. Raceways for data.
  - 3. Raceways for CCTV.
- D. The Fire Alarm/Security System and the Telephone/Data System shall be grounded and bonded, as shown or indicated on the Drawings.

**2.00 PRODUCTS**

2.1 MATERIALS:

- A. Connectors building steel, exothermic. All other connectors: Copper alloy, clamp type or bolt-on type, as approved for that service.
- B. Grounding and bonding conductors; building wire, color green.
- C. All products shall be new, and UL listed for the use intended.

2.2 ACCEPTABLE MANUFACTURERS OF GROUNDING CONNECTORS:

- A. Exothermic Connectors:
  - 1. Erico/Cadweld.
- B. Bolted, Clamp Type or Compression Type:

1. Burndy.
2. OZ.
3. Anderson.

### **3.00 EXECUTION**

#### **3.1 GENERAL INSTALLATION:**

- A. Provide a separate, green insulated copper equipment grounding conductor in feeder and branch circuits. Terminate each end on a grounding lug, bus, bushing, etc. to each motor, control, switch, receptacle, junction box, panelboard, lighting fixture, etc.
- B. Ground all raceway systems and equipment in accordance with Section 250 of the latest edition of NEC, and in accordance with the Drawings and these Specifications.
- C. Boxes with concentric, eccentric or oversized knockouts shall be provided with bonding bushings and jumpers. The jumper shall be sized per NEC Article 250 and lugged to the box.

**END OF SECTION 26 05 26**

SECTION 26 05 29  
HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

**1.00 GENERAL**

1.1 WORK INCLUDED

- A. Conduit and equipment supports
- B. Fastening hardware

1.2 COORDINATION: Coordinate size, shape and location of concrete pads with Section 03 30 00 - Cast-in-Place Concrete, Concrete Topping.

1.3 QUALITY ASSURANCE: Support systems shall be adequate for weight of equipment and conduit, including wiring, which they carry.

**2.00 PRODUCTS**

2.1 MATERIALS

- A. Support Channel: Galvanized outdoors and electrical room.
- B. Hardware: Corrosion resistant stainless steel.

**3.00 EXECUTION**

3.1 INSTALLATION

- A. Fasten hanger rods, conduit clamps, and outlet and junction boxes to building structure using precast insert system; expansion anchors; preset inserts; beam clamps; spring steel clips.
- B. Use toggle bolts or hollow wall fasteners in hollow masonry, plaster, or gypsum board partitions and walls; expansion anchors or preset inserts in solid masonry walls; self-drilling anchors or expansion anchor on concrete surfaces; sheet metal screws in sheet metal studs; and wood screws in wood construction.
- C. Do not fasten supports to piping, ductwork, mechanical equipment, or conduit.
- D. Do not use powder-actuated anchors.
- E. Do not drill structural steel members.



- F. Fabricate supports from structural steel or steel channel, rigidly welded or bolted to present a neat appearance. Use hexagon head bolts with spring lock washers under all nuts.
- G. Install surface-mounted cabinets and panelboards with minimum of four anchors. Provide steel channel supports to stand cabinet one inch off wall.
- H. Bridge studs top and bottom with channels to support flush-mounted cabinets and panelboards in stud walls.

**END OF SECTION 26 05 29**

SECTION 26 05 33  
RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

**1.00 GENERAL**

1.1 WORK INCLUDED

- A. Wall and ceiling outlet boxes.
- B. Pull and junction boxes.

1.2 REFERENCES

- A. ANSI/NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers and Box Supports.
- B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

**2.00 PRODUCTS**

2.1 OUTLET BOXES

- A. Sheet Metal Outlet Boxes: ANSI/NEMA OS 1; galvanized steel, with 1/2-inch male fixture studs where required.
- B. Cast Boxes: Cast ferrous alloy, deep type, gasketed cover, threaded hubs.
- C. Acceptable Manufacturers: Appleton, Crouse-Hinds, Steel-City.

2.2 PULL AND JUNCTION BOXES

- A. Sheet Metal Boxes: ANSI/NEMA OS 1; galvanized steel.
- B. Sheet Metal Boxes Larger Than 12 Inches in Any Dimension, galvanized steel, bolted cover.
- C. Cast Metal Boxes for Outdoor and Wet Location Installations: NEMA 250; Type 4 and Type 6, flat-flanged, surface-mounted junction box, UL listed as raintight. Cast aluminum box and cover with ground flange, neoprene gasket, and stainless-steel cover screws.
- D. Acceptable Manufacturers: Appleton, Crouse-Hinds, Steel-City.

**3.00 EXECUTION**

3.1 COORDINATION OF BOX LOCATIONS

- A. Provide electrical boxes as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections, and code compliance.

- B. Electrical box locations shown on Contract Drawings are approximate unless dimensioned.
- C. Locate and install boxes to allow access. Where installation is inaccessible, coordinate locations and sizes of required access doors with Contractor and Architect.
- D. Locate and install to maintain headroom and to present a neat appearance.

### 3.2 OUTLET BOX INSTALLATION

- A. Do not install boxes back-to-back in walls or in opposite facing walls within same stud cavity. Provide minimum 6-inch separation.
- B. Locate boxes in masonry walls to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat openings for boxes.
- C. Provide knockout closures for unused openings.
- D. Support boxes independently of conduit except for cast boxes that is connected to two rigid metal conduits, both supported within 12 inches of box.
- E. Use multiple-gang boxes where more than one device is mounted together; do not use sectional boxes. Provide barriers to separate wiring of different voltage systems.
- F. Install boxes in walls without damaging wall insulation.
- G. Coordinate mounting heights and locations of outlets mounted above counters, benches, and backsplashes.
- H. Position outlets to locate luminaires as shown on reflected ceiling plans.
- I. In inaccessible ceiling areas, position outlets and junction boxes within 6 inches of recessed luminaire, to be accessible through luminaire ceiling opening.
- J. Provide recessed outlet boxes in finished areas unless otherwise noted. Secure boxes to interior wall and partition studs, accurately positioning to allow for surface finish thickness. Use stamped steel stud bridges for flush outlets in hollow stud wall, and adjustable steel channel fasteners for flush ceiling outlet boxes.
- K. Align wall-mounted outlet boxes for switches, thermostats, and similar devices.
- L. Provide cast outlet boxes in exterior locations exposed to the weather and wet locations.
- M. Junction and device boxes shall be minimum 4" x 4" x 2-1/8". Provide plaster ring for installation in plaster wall where used for single device installation.
- N. Conduit entry to junction box for branch circuit wiring shall be limited to 4-3/4" conduits,

maximum.

- O. Extension ring use shall be limited to one extension. Conduit shall not enter into extension.

### 3.3 PULL AND JUNCTION BOX INSTALLATION

- A. Provide and install all boxes in accordance with the requirements of Articles 370 and 373 of the National Electric Code. Provide insulated bushings at all feeder conduit entrances to pull and junction boxes.
- B. Install pull and junction boxes where indicated on Drawings. In addition, install pull boxes per the following for above grade conduit runs:
  - 1. Install pull boxes in each conduit run such that the total of all bends including offsets does not exceed 360°.
  - 2. Install pull boxes in conduit runs containing wire sizes #1 AWG or smaller at intervals not exceeding 100 ft.
  - 3. Install pull boxes in conduit runs containing wire sizes #1/0 AWG and larger at intervals not exceeding 200 ft.
- C. Provide pull and junction box sizes as indicated on Drawings. Where sizes are not indicated on Drawings, size boxes for 600V or less wiring in accordance with Article 314 of the NEC.
- D. Rigidly support all boxes directly from ceiling or walls or via hangers.

**END OF SECTION 26 05 33**

SECTION 26 05 53  
IDENTIFICATION OF ELECTRICAL SYSTEMS

**1.00 GENERAL**

1.1 WORK INCLUDED

- A. Nameplates
- B. Wire and cable markers
- C. Conduit color coding

1.2 SUBMITTALS

- A. Submit shop drawings under provisions of Section 26 00 10.
- B. Include schedule for nameplates.

**2.00 PRODUCTS**

2.1 MATERIALS

- A. Nameplates: Engraved three-layer laminated phenolic.
- B. Wire and Cable Markers: Cloth markers, split sleeve or tubing type.

**3.00 EXECUTION**

3.1 INSTALLATION

- A. Degrease and clean surfaces to receive nameplates.
- B. Install nameplates parallel to equipment lines.
- C. Secure nameplates to equipment fronts using self-tapping stainless-steel screws with screw sharp end protected. Otherwise, rivets shall be used. Secure nameplate to inside face of recessed panelboard doors in finished locations.

3.2 WIRE IDENTIFICATION: Provide wire markers on each conductor in panelboard gutters, pull boxes, outlet and junction boxes, and at load connection. Identify with branch circuit or feeder number for power and lighting circuits, and with control wire number as indicated on schematic and interconnection diagrams and equipment manufacturer's shop drawings for control wiring.

3.3 NAMEPLATE ENGRAVING SCHEDULE

- A. Provide nameplates to identify all electrical distribution and control equipment, and loads served.
- B. Provide nameplates of minimum letter height as scheduled below.
  - 1. Panelboards and Switchboards: 1/2 inch; identify equipment designation. Identify voltage rating and source.
  - 2. Individual Circuit Breakers, Switches, and Motor Starters In Panelboards and Switchboards: 1/2 inch; identify circuit and load served, including location.
  - 3. Individual Circuit Breakers, Enclosed Switches, and Motor Starters: 1/2 inch; identify load served.
  - 4. Transformers: 1/2 inch; identify equipment designation. 1/2 inch; identify primary and secondary voltages, primary source, and secondary load and location.

### 3.4 COLOR CODE

- A. The surface of engraved nameplates shall conform to the Color Code Schedule.
- B. All outlet boxes, junction boxes, and pull boxes shall have their covers and exterior visible surfaces painted with colors to conform to the Owner's Color Code Schedule. This includes covers on boxes above lift-out and other type accessible ceilings. Coordinate color codes with the Owner prior to bid.
- C. Color Code Schedule (To be coordinated with Owner):
  - 1. Blue surface with white core for 120/208-volt equipment.
  - 2. Bright red surface with white core for all equipment related to fire alarm system.
  - 3. Dark red (burgundy) surface with white core for all equipment related to security.
  - 4. Red surface with white core for all equipment related to "emergency" systems.
  - 5. Orange surface with white core for all equipment related to telephone systems.
  - 6. Brown surface with white core for all equipment related to data systems.
  - 7. White surface with black core for all equipment related to paging systems.
  - 8. Purple surface with white core for all equipment related to TV systems.

### 3.5 MISCELLANEOUS

- A. All empty conduit runs and conduit with conductors for future use shall be identified for use and shall indicate where they terminate. Identification shall be by tags with string or wire attached to conduit or outlet.
- B. All outlet boxes, junction boxes and pull boxes shall have their covers and exterior visible

surfaces painted with colors to match the surface color scheme outlined above. This includes covers on boxes above lift-out and other type accessible ceilings.

**END OF SECTION 26 05 53**

SECTION 26 05 93  
ELECTRICAL TESTING

**1.00 - GENERAL**

## 1.1 SCOPE:

- A. Provide testing of electrical wiring and systems as specified here.
- B. Provide the following tests:
  - 1. Insulation resistance testing

## 1.2 DOCUMENTATION:

- A. All tests specified shall be completely documented indicating time of day, date, temperature, and all pertinent test information.
- B. All required documentation of readings indicated above shall be submitted to the Engineer prior to, and as one of the prerequisites for final acceptance of the project.
- C. Meet requirements of Section 01 40 00.

**2.00 - PRODUCTS**

Not Used.

**3.00 - EXECUTION**

## 3.1 FEEDER INSULATION RESISTANCE TESTING:

- A. All current carrying phase conductors and neutrals shall be tested as installed, and before connections are made, for insulation resistance and accidental grounds. This shall be done with a 600-volt megger for 250V and below, and a 1,000-volt megger for 600V. The procedures are listed below.
  - 1. Minimum readings shall be one million (1,000,000) or more ohms for #6 wire and smaller, 250,000 ohms or more for #4 wire or larger, between conductors and between conductor and the grounding conductor.
  - 2. After all fixtures, devices, and equipment are installed and all connections completed to each panel, the Contractor shall disconnect the neutral feeder conductor from the neutral bar and take a megger reading between the neutral bar and the grounded enclosure. If this reading is less than 250,000 ohms, the



Contractor shall disconnect the branch circuit neutral wires from this neutral bar. He shall then test each one separately to the panel and until the low readings are found. The Contractor shall correct troubles, reconnect and retest until at least 250,000 ohms from the neutral bar to the grounded panel can be achieved with only the neutral feeder disconnected.

3. The Contractor shall send a letter to the Engineer and City Inspections certifying that the above has been done and tabulating the megger readings for each panel. This shall be done at least four (4) days prior to final inspection.
4. At final inspection, the Contractor shall furnish a megger and show the Engineers that the panels comply with the above requirements. He shall also furnish a hook-on type ammeter and a voltmeter and take current and voltage readings as directed by the representative.

**END OF SECTION 26 05 93**

SECTION 31 10 00  
SITE CLEARING

PART 1 GENERAL

1.1. SUMMARY

- A. The work to be performed in accordance with this Specification consists of furnishing all materials, equipment, supplies, and accessories and of performing all operations required in connection with site clearing as shown on the Drawings and specified herein.
- B. Site clearing Includes
  - 1. Protecting existing vegetation to remain.
  - 2. Removing existing vegetation.
  - 3. Clearing and grubbing.
  - 4. Stripping and stockpiling topsoil.
  - 5. Temporary erosion and sedimentation control.

1.2. REFERENCES

- A. Definitions
  - 1. Surface Soil: Soil that is present at the top layer of the existing soil profile. In undisturbed areas, surface soil is typically called "topsoil," but in disturbed areas such as urban environments, the surface soil can be subsoil.
  - 2. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil; the zone where plant roots grow. Its appearance is generally friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects larger than 2 inches in diameter; and free of weeds, roots, toxic materials, or other non-soil materials.
  - 3. Subsoil: Soil beneath the level of subgrade; soil beneath the topsoil layers of a naturally occurring soil profile, typified by less than 1 percent organic matter and few soil organisms.
  - 4. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction and indicated on Drawings.
  - 5. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction and indicated on Drawings.
  - 6. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.3. SUBMITTALS

- A. Existing Conditions
  - 1. Documentation of existing trees and plantings, adjoining construction, and site improvements that establishes preconstruction conditions that might be misconstrued as damage caused by site clearing.
  - 2. Use sufficiently detailed photographs or video recordings.
  - 3. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plant designated to remain.
- B. Topsoil stripping and stockpiling program.

- C. Record Drawings: Identifying and accurately showing locations of capped utilities and other subsurface structural, electrical, and mechanical conditions.
- D. Burning
  - 1. Documentation of compliance with burning requirements and permitting of authorities having jurisdiction.
  - 2. Identify location(s) and conditions under which burning will be performed.

#### 1.4. FIELD CONDITIONS

- A. Traffic
  - 1. Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
  - 2. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
  - 3. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.
- B. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing.
- C. Do not commence site clearing operations until temporary erosion- and sedimentation- control and plant-protection measures are in place.
- D. Soil Stripping, Handling, and Stockpiling: Perform only when the soil is dry or slightly moist.

#### 1.5. MATERIAL OWNERSHIP

- A. Except for materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

### PART 2 PRODUCTS (NOT USED)

### PART 3 EXECUTION

#### 3.1. PREPARATION

- A. Protect and maintain benchmarks and survey control points from disturbance during construction.
- B. Verify that trees, shrubs, and other vegetation to remain or to be relocated have been flagged and that protection zones have been identified and enclosed according to requirements.
- C. Protect existing site improvements to remain from damage during construction.
- D. Restore damaged improvements to their original or better condition, as acceptable to Owner.

#### 3.2. TEMPORARY EROSION AND SEDIMENTATION CONTROL

- A. Provide temporary erosion- and sedimentation-control measures to prevent soil erosion and discharge

of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings and requirements of authorities having jurisdiction.

- B. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.
- C. Inspect, maintain, and repair erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
- D. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

### 3.3. TREE AND PLANT PROTECTION

- A. Protect trees and plants remaining on-site according to requirements.

### 3.4. EXISTING UTILITIES

- A. Locate, identify, disconnect, and seal or cap utilities indicated to be removed or abandoned in place.
  - 1. Arrange with utility companies to shut off indicated utilities.
  - 2. Owner will arrange to shut off indicated utilities when requested by Contractor.
- B. Protect existing utilities not indicated to be removed or abandoned in place
- C. Relocation of Utilities: If Contractor encounters existing utilities that conflict with the planned work, Contractor shall notify Engineer and Owner within 24 hours, and will coordinate directly with utility to protect and/or temporarily relocate utilities during construction.
- D. Interrupting Existing Utilities
  - 1. Do not interrupt utilities, unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
    - a. Prior coordination and approval in writing by Engineer, Owner, and utility.
    - b. Notify Engineer not less than two days in advance of proposed utility interruptions.
- E. Excavate for and remove underground utilities indicated to be removed.

### 3.5. CLEARING AND GRUBBING

- A. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.
  - 1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
  - 2. Grind down stumps to grade.
  - 3. Use only hand methods or air spade for grubbing within protection zones.
  - 4. Chip removed tree branches and dispose of off-site.
  - 5. Existing trees, stumps and brush piles to be removed inside the temporary and permeant easement area and disposed off-site. Exceptions may apply to the trees located in Catawba Meadows Park. See Drawings.

### 3.6. TOPSOIL STRIPPING

- A. Remove sod and grass before stripping topsoil.

- B. Strip topsoil to depth in a manner to prevent intermingling with underlying subsoil or other waste materials.
- C. Stockpiling
  - 1. Stockpile topsoil away from edge of excavations without intermixing with subsoil or other materials.
  - 2. Grade and shape stockpiles to drain surface water.
  - 3. Cover to prevent windblown dust and erosion by water.
  - 4. Do not stockpile topsoil within protection zones.
  - 5. Dispose of surplus topsoil.

### 3.7. DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.
- B. Burning
  - 1. Burning tree, shrub, and other vegetation waste is permitted according to burning requirements and permitting of authorities having jurisdiction.
  - 2. Control such burning to produce the least smoke or air pollutants and minimum annoyance to surrounding properties.
  - 3. Burning of other waste and debris is prohibited.

END OF SECTION

SECTION 31 22 13  
ROUGH GRADING

PART 1 GENERAL

1.1. SUMMARY

- A. The work to be performed in accordance with this Specification consists of furnishing all materials, equipment, supplies, and accessories and of performing all operations required in connection with rough grading as shown on the Drawings and specified herein.
- B. Rough grading includes:
  - 1. Removal of topsoil and subsoil, and
  - 2. Cutting, grading, filling and rough contouring the site.

1.2. REFERENCES

- A. Standards
  - 1. The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.
  - 2. ASTM International (ASTM)
    - a. ASTM D698 (2021) - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 Ft-Lb<sub>f</sub>/Ft<sup>3</sup> (600 KN-M/M<sup>3</sup>))
    - b. ASTM D1557 (2021) - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 Ft-Lb<sub>f</sub>/Ft<sup>3</sup> (2,700 KN-M/M<sup>3</sup>))

1.3. PROJECT RECORD DOCUMENTS

- A. Accurately record actual locations of utilities remaining, by horizontal dimensions, elevations or inverts, and slope gradients, referenced from permanent improvements.

1.4. EXISTING CONDITIONS

- A. Information concerning a sub-surface soil investigation by an independent testing laboratory is available and will be furnished by the Owner upon request. The data included therein may be used by the contractor for his general information only. The Engineer will not be responsible for the accuracy or applicability of the data therein.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify that survey benchmark and intended elevations for the work are as indicated.

3.2. PREPARATION

- A. Identify required lines, levels, contours, and datum.

- B. Identify known underground, above ground, and aerial utilities. Stake and flag locations.
- C. Coordinate work with utility companies to remove and relocate utilities, as necessary.
- D. Protect above and below grade utilities that remain.
- E. Protect soil from erosion.
- F. Protect benchmarks, existing structures, fences, and sidewalks from excavating equipment and vehicular traffic. Replace in kind if damaged.

### 3.3. TOPSOIL EXCAVATION

- A. Excavate topsoil from areas excavated.
- B. Stockpile or dispose of topsoil as directed by the Owner.

### 3.4. SUBSOIL EXCAVATION

- A. Excavate subsoil from areas to be further excavated.
- B. Dispose of excess excavated material at a location selected by the Owner.

### 3.5. FILLING

- A. Fill areas to contours and elevations with approved materials.
- B. Structural Fill / Granular Backfill Material Type M1:
  - 1. Structural fill material shall be placed below the foundations to extend to the underlying sands and gravels and provide support for conventional footings.
  - 2. Backfill materials shall be placed in loose lifts not to exceed 9 inches thick.
  - 3. The structural fill materials should be adjusted to a workable moisture content and compacted to at least 97% of the material's standard Proctor maximum dry density as determined in accordance with ASTM D698.
- C. Subsoil / Backfill Material Type S1
  - 1. Backfill placed adjacent to below grade structures should consist of approved, low-volume change fill materials which are free from organic matter and debris.
  - 2. The native silty/clayey sands could be used for backfill provided proper moisture contents are obtained prior to placement.
  - 3. Drying of those soils should be expected if they are to be placed for fill or backfill.
  - 4. Imported Type M1 granular materials could also be used to limit long-term settlement of the backfill zone.
  - 5. Fill materials should be placed in loose lifts not to exceed 9 inches thick, adjusted in moisture content, and compacted to at least 97% of the material's maximum dry density as determined in accordance with ASTM D698.
  - 6. The moisture content of the backfill soils should be adjusted to be within the range of the +/-2% of standard Proctor optimum moisture at the time of compaction.

- D. Make grade and alignment changes gradual. Blend slope into level areas.
- E. Remove surplus fill materials from site.
- F. Abate dust during construction using water from an approved source.

3.6. FIELD QUALITY CONTROL

- A. Field review and testing will be performed under provisions of Section 01 40 00 QUALITY REQUIREMENTS.
- B. Compaction testing will be performed in accordance with ASTM D1557.

END OF SECTION



SECTION 31 23 00  
EXCAVATION AND FILL

PART 1 GENERAL

1.1. SUMMARY

- A. The work to be performed in accordance with this Specification consists of furnishing all materials, equipment, supplies, and accessories and of performing all operations required in connection with excavation and fill as shown on the Drawings and specified herein.

1.2. PRICE AND PAYMENT PROCEDURES

- A. All work related to work in this specification is considered subsidiary to other bid items. There is no separate pay item.

1.3. REFERENCES

A. Definitions

1. Capillary Water Barrier
  - a. A layer of clean, poorly graded crushed rock, stone, or natural sand or gravel having a high porosity which is placed beneath a building slab with or without a vapor barrier to cut off the capillary flow of pore water to the area immediately below a slab.
2. Degree of Compaction
  - a. Degree of compaction is expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D698 and ASTM D1557, for general soil types, abbreviated as percent laboratory maximum density.
3. Hard Materials
  - a. Weathered rock, dense consolidated deposits, or conglomerate materials which are not included in the definition of "rock", but which usually require the use of heavy excavation equipment, ripper teeth, or jack hammers for removal.
4. Rock
  - a. Solid homogeneous interlocking crystalline material with firmly cemented, laminated, or foliated masses or conglomerate deposits, neither of which can be removed without systematic drilling, drilling and the use of expansion jacks or feather wedges, or the use of backhoe-mounted pneumatic hole punchers or rock breakers.
  - b. Removal of hard material will not be considered rock excavation because of intermittent drilling that is performed merely to increase production.
5. Pile Supported Structure
  - a. As used herein, a structure where both the foundation and floor slab are pile supported.
6. Unsuitable materials include the materials
  - a. Soils which, when classified under ASTM D 2487 - Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System), fall in the classifications of Pt, OH, CH, MH, or OL.
  - b. Soils which cannot be compacted sufficiently to achieve the density specified for the intended use.
  - c. Materials that contain hazardous or designated waste materials including petroleum

hydrocarbons, pesticides, heavy metals, and any material which may be classified as hazardous or toxic according to applicable regulations.

- d. Topsoil, except as allowed below.

B. Standards

1. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.
2. ASTM International (ASTM)
  - a. ASTM C33 (2018) - Standard Specification for Concrete Aggregates
  - b. ASTM C136 (2019) - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
  - c. ASTM D698 (2021) – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>))
  - d. ASTM D1140 (2017) - Standard Test Methods for Determining the Amount of Material Finer than 75- $\mu$ m (No. 200) Sieve in Soils by Washing
  - e. ASTM D1556 (2015e1) - Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method
  - f. ASTM D1557 (2021) - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000ft-lbf/ft<sup>3</sup> (2700 kN-m/m<sup>3</sup>))
  - g. ASTM D2216 (2019) – Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
  - h. ASTM D2487 (2017e1) Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)
  - i. ASTM D4318 (2017e1) - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
  - j. ASTM D6938 (2017a) - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

1.4. SUBMITTALS

A. Action Submittals

1. Preconstruction Submittals
  - a. Shoring and Sheeting Plan

B. Informational Submittals

1. Test Reports
  - a. Fill and backfill test
  - b. Select material test
  - c. Porous fill test for capillary water barrier
  - d. Density tests
  - e. Moisture Content Tests
  - f. Copies of all laboratory and field test reports within 24 hours of the completion of the test.

1.5. DELIVERY, STORAGE, AND HANDLING

- A. Perform in a manner to prevent contamination or segregation of materials.

1.6. QUALITY ASSURANCE

- A. Utilities
  - 1. Movement of construction machinery and equipment over pipes and utilities during construction shall be at the Contractor's risk.
  - 2. For work immediately adjacent to or for excavations exposing a utility or other buried obstruction, excavate by hand.
  - 3. Start hand excavation on each side of the indicated obstruction and continue until the obstruction is uncovered or until clearance for the new grade is assured.
  - 4. Support uncovered lines or other existing work affected by the contract excavation until approval for backfill is granted by the Owner.
  - 5. Report damage to utility lines or subsurface construction immediately to the Owner.

#### 1.7. SAFETY

- A. The Contractor must conform to the amended Rules and Regulations of Construction Standards for Excavations, CFR 29, Part 1926, Subpart P of Title 29 including appendices of the Occupational Safety and Health Administration, Labor, including revisions thereto.
- B. The Contractor is solely responsible for excavation safety.

### PART 2 PRODUCTS

#### 2.1. SOIL MATERIALS

- A. Backfill Material
  - 1. As indicated on Drawings.
- B. Topsoil
  - 1. Natural, friable soil representative of productive, well-drained soils in the area, free of subsoil, stumps, rocks larger than one inch diameter, brush, weeds, toxic substances, and other material detrimental to plant growth.
  - 2. Amend topsoil pH range to obtain a pH of 5.5 to 7.

### PART 3 EXECUTION

#### 3.1. PROTECTION

- A. Contractor is responsible for site safety including complying with requirements of the Occupational Safety and Health Administration (OSHA) requirements for excavation, confined space, and other requirements.
- B. Shoring and Sheeting
  - 1. Provide shoring where indicated in Drawings and where required for adequate safety.
  - 2. In addition to OSHA and other requirements set forth in this contract, include provisions in the shoring and sheeting plan that will accomplish the following:
    - a. Prevent undermining of pavements, foundations, and slabs.
    - b. Prevent slippage or movement in banks or slopes adjacent to the excavation.
- C. Underground Utilities
  - 1. Location of the existing utilities indicated is approximate.

2. The Contractor shall physically verify the location and elevation of the existing utilities indicated prior to starting construction.

D. Machinery and Equipment

1. Movement of construction machinery and equipment over pipes during construction shall be at the Contractor's risk.
2. Repair, or remove and provide new pipe for existing or newly installed pipe that has been displaced or damaged.

3.2. SURFACE PREPARATION

A. Clearing and Grubbing

1. Prior to commencement of this work, all required erosion control and tree protection measures indicated on the Drawings shall be in place.
2. The existing utilities shall be located and protected as specified in the Contract Documents, and/or indicated on the Drawings.
3. A permit shall be required when utility adjustments are to be made in preparation for construction in the right-of-way.
4. Areas within the construction limits indicated on the Drawings shall be cleared of all trees, stumps, brush, etc.; except trees or shrubs scheduled for preservation which shall be carefully trimmed as directed, and shall be protected from scarring, barking or other injuries during construction operations. All exposed cuts over 2 inches in diameter, exposed ends of pruned limbs or scarred bark shall be treated with an approved asphalt material within 24 hours of the pruning or injury.
5. Construction equipment shall not be operated, nor construction materials stockpiled under the canopies of trees, unless otherwise indicated on the Drawings and/or specified in the Contract Documents.
6. Excavation or embankment materials shall not be placed within the drip line of trees until tree wells are constructed.
7. Within the construction limits or areas indicated, all obstructions, stumps, roots, vegetation, abandoned structures, rubbish, and objectionable material shall be removed to the following depths:
  - a. In areas to receive 6 inches or more embankment, a minimum of 12 inches below natural ground.
  - b. In areas to receive embankment less than 6 inches a minimum of 18 inches below the lower elevation of embankment, structure, or excavation.
  - c. In areas to be excavated a minimum of 18 inches below the lower elevation of the embankment, structure, or excavation.
  - d. In all other areas a minimum of 12 inches below natural ground.
  - e. Holes remaining after removal of all obstructions, objectionable material, trees, stumps, etc. shall be backfilled with select embankment material and compacted by approved methods.
8. All cleared and grubbed material shall be disposed of in a manner satisfactory to the Owner.
9. Unless otherwise provided, all materials as described above shall become the property of the Contractor and removed from the site and disposed of at a permitted disposal site.
10. Burning materials at the site shall conform to requirements of authorities having jurisdiction.

B. Stripping

1. Strip suitable soil from the site where excavation or grading is indicated and stockpile separately

from other excavated material.

2. Material unsuitable for use as topsoil shall be stockpiled and used for backfilling.
3. Locate topsoil so that the material can be used readily for the finished grading.
4. Where sufficient existing topsoil conforming to the material requirements is not available on site, provide borrow materials suitable for use as topsoil.
5. Protect topsoil and keep in segregated piles until needed.

C. Unsuitable Material

1. Remove vegetation, debris, decayed vegetable matter, sod, mulch, and rubbish underneath paved areas or concrete slabs.

### 3.3. EXCAVATION

A. General

1. Excavate to contours, elevation, and dimensions indicated.
2. Reuse excavated materials that meet the specified requirements for the material type required at the intended location.
3. Keep excavations free from water.
4. Excavate soil disturbed or weakened by Contractor's operations, soils softened or made unsuitable for subsequent construction due to exposure to weather.
5. Excavations below indicated depths will not be permitted except to remove unsatisfactory material.
6. Unsatisfactory material encountered below the grades shown shall be removed as directed.
7. Satisfactory material removed below the depths indicated, without specific direction of the Owner, shall be replaced with satisfactory materials to the indicated excavation grade; except as specified for spread footings.
8. Determination of elevations and measurements of approved over depth excavation of unsatisfactory material below grades indicated shall be done under the direction of the Owner.

B. Structures With Spread Footings

1. Ensure that footing subgrades have been inspected and approved by the Owner prior to concrete placement. Fill over excavations with concrete during foundation placement.

C. Pipe Trenches

1. Excavate to the dimension indicated.
2. Grade bottom of trenches to provide uniform support for each section of pipe after pipe bedding placement.
3. Tamp if necessary to provide a firm pipe bed.
4. Recesses shall be excavated to accommodate bells and joints so that pipe will be uniformly supported for the entire length.
5. Rock, where encountered, shall be excavated to a depth of at least 4 inches below the bottom of the pipe.

D. Hard Material Excavation

1. Remove hard material to elevations indicated in a manner that will leave foundation material in an unshattered and solid condition.
2. Roughen level surfaces and cut sloped surfaces into benches for bond with concrete.
3. Protect shale from conditions causing decomposition along joints or cleavage planes and other

types of erosion.

4. Removal of hard material beyond lines and grades indicated will not be grounds for a claim for additional payment unless previously authorized by the Owner.
5. Excavation of the material claimed as rock shall not be performed until the material has been cross sectioned by the Contractor and approved by the Owner.
6. Common excavation shall consist of all excavation not classified as rock excavation.

E. Excavated Materials

1. Satisfactory excavated material required for fill or backfill shall be placed in the proper section of the permanent work required or shall be separately stockpiled if it cannot be readily placed.
2. Satisfactory material more than that required for the permanent work and all unsatisfactory material shall be disposed in compliance with applicable regulations.

F. Final Grade of Surfaces to Support Concrete

1. Excavation to final grade shall not be made until just before concrete is to be placed.
2. Only excavation methods that will leave the foundation rock in a solid and unshattered condition shall be used.
3. Approximately level surfaces shall be roughened, and sloped surfaces shall be cut as indicated into rough steps or benches to provide a satisfactory bond.
4. Shales shall be protected from slaking and all surfaces shall be protected from erosion resulting from ponding or flow of water.

### 3.4. SUBGRADE PREPARATION

A. General

1. Unsatisfactory material in surfaces to receive fill or in excavated areas shall be removed and replaced with satisfactory materials as directed by the Owner.
2. The surface shall be scarified to a depth of 6 inches before the fill is started.
3. Sloped surfaces steeper than 1 vertical to 4 horizontal shall be plowed, stepped, benched, or broken up so that the fill material will bond with the existing material.
4. When subgrades are less than the specified density, the ground surface shall be broken up to a minimum depth of 6 inches, pulverized, and compacted to the specified density.
5. When the subgrade is part fill and part excavation or natural ground, the excavated or natural ground portion shall be scarified to a depth of 12 inches and compacted as specified for the adjacent fill.
6. Material shall not be placed on surfaces that are muddy, frozen, or contain frost.
7. Compaction shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, or other approved equipment well suited to the soil being compacted.
8. Material shall be moistened or aerated as necessary to provide the moisture content that will readily facilitate obtaining the specified compaction with the equipment used.
9. Minimum subgrade density shall be as specified herein.

### 3.5. SUBGRADE FILTER FABRIC

A. General

1. Place synthetic fiber filter fabric as indicated in Drawings directly on prepared subgrade free of vegetation, stumps, rocks larger than 2 inches diameter and other debris which may puncture or otherwise damage the fabric.

2. Repair damaged fabric by placing an additional layer of fabric to cover the damaged area a minimum of 3 feet overlaps in all directions.
3. Overlap fabric at joints a minimum of 3 feet.
4. Obtain approval of filter fabric installation before placing fill or backfill.
5. Place fill or backfill on fabric in the direction of overlaps and compact as specified herein.
6. Follow manufacturer's recommended installation procedures.

### 3.6. FILLING AND BACKFILLING

#### A. General

1. Fill and backfill to contours, elevations, and dimensions indicated.
2. Compact each lift before placing overlaying lift.

#### B. Common Fill Placement

1. Provide for general site and under porous fill of pile-supported structures.
2. Use satisfactory materials.
3. Compact areas not accessible to rollers or compactors with mechanical hand tampers.
4. Aerate material excessively moistened by rain to a satisfactory moisture content. Finish to a smooth surface by blading, rolling with a smooth roller, or both.

#### C. Backfill and Fill Material Placement

1. Provide for paved areas and under concrete slabs, except where select material is provided.
2. Do not place over wet or frozen areas.
3. Place backfill material adjacent to structures as the structural elements are completed and accepted.
4. Backfill against concrete only when approved.
5. Place and compact material to avoid loading upon or against the structure.

#### D. Select Material Placement

1. Do not place over wet or frozen areas.
2. Backfill adjacent to structures shall be placed as structural elements are completed and accepted.
3. Backfill against concrete only when approved.
4. Place and compact material to avoid loading upon or against structure.

#### E. Backfill and Fill Material Placement Over Pipes and at Walls

1. Backfilling shall not begin until construction below finish grade has been approved, underground utilities systems have been inspected, tested, and approved, forms removed, and the excavation cleaned of trash and debris.
2. Backfill shall be brought to indicated finish grade and shall include backfill for outside grease interceptors, underground fuel tanks, vaults, and other underground structures.
3. Heavy equipment for spreading and compacting backfill shall not be operated closer to foundation or retaining walls than a distance equal to the height of backfill above the top of footing; the area remaining shall be compacted in layers not more than 4 inches in compacted thickness with power-driven hand tampers suitable for the material being compacted.
4. Backfill shall be placed carefully around pipes or tanks to avoid damage to coatings, wrappings, or tanks.
5. Backfill shall not be placed against foundation walls prior to 7 days after completion of the walls. As far as practicable, backfill shall be brought up evenly on each side of the wall and sloped to

drain away from the wall.

F. Porous Fill Placement

1. Provide under floor and area-way slabs on a compacted subgrade.
2. Place in 4-inch lifts with a minimum of two passes of a hand-operated plate-type vibratory compactor.

G. Trench Backfilling

1. Backfill as rapidly as construction, testing, and acceptance of work permits.
2. Place and compact backfill under structures and paved areas in 6-inch lifts to top of trench and in 6-inch lifts to 1 foot over pipe outside structures and paved areas.

3.7. FINISH OPERATIONS

A. Grading

1. Finish grades as indicated within one-tenth of one foot.
2. Grade areas to drain water away from structures.
3. Maintain areas free of trash and debris.
4. For existing grades that will remain, but which were disturbed by Contractor's operations, grade as directed.

B. Protection of Surfaces

1. Protect newly backfilled, graded, and topsoiled areas from traffic, erosion, and settlements that may occur.
2. Repair or reestablish damaged grades, elevations, or slopes.

3.8. FIELD QUALITY CONTROL

A. Sampling

1. Take the number and size of samples required to perform the following tests.

B. Testing

1. Perform one of each of the following tests for each material used.
2. Provide additional tests for each source change.

C. Fill and Backfill Material Testing

1. Test fill and backfill material in accordance with
  - a. ASTM C136 for conformance to ASTM D2487 gradation limits;
  - b. ASTM D1140 for material finer than the No. 200 sieve;
  - c. ASTM D4318 for liquid limit and for plastic limit; and
  - d. ASTM D698 or ASTM D1557 for moisture density relations, as applicable.
2. Select Material Testing
  - a. Test select material in accordance with
  - b. ASTM C136 for conformance to ASTM D2487 gradation limits;
  - c. ASTM D1140 for material finer than the No. 200 sieve; and
  - d. ASTM D698 or ASTM D1557 for moisture density relations, as applicable.
3. Porous Fill Testing
  - a. Test porous fill in accordance with ASTM C136 for conformance to gradation specified in ASTM C33.



4. Density Tests
  - a. Test density in accordance with ASTM D1556, or ASTM D6938.
  - b. When ASTM D6938 density tests are used, verify density test results by performing an ASTM D1556 density test at a location already ASTM D6938 tested as specified herein.
  - c. Perform an ASTM D1556 density test at the start of the job, and for every 10 ASTM D6938 density tests thereafter.
  - d. Test each lift at randomly selected locations every 2,000 square feet of existing grade in fills for structures and concrete slabs, and every 2,500 square feet for other fill areas and every 2,000 square feet of subgrade in cut.
  - e. Include density test results in daily report.
  - f. Bedding and backfill in trenches: One test per 50 linear feet in each lift.
5. Moisture Content Tests
  - a. In the stockpile, excavation or borrow areas, a minimum of two tests per day per type of material or source of materials being placed is required during stable weather conditions.
  - b. During unstable weather, tests shall be made as dictated by local conditions and approved moisture content shall be tested in accordance with ASTM D2216. Include moisture content test results in daily report.

END OF SECTION

SECTION 31 23 19  
DEWATERING

PART 1 GENERAL

1.1. SUMMARY

- A. The work to be performed in accordance with this Specification consists of furnishing all materials, equipment, supplies, and accessories and of performing all operations required in connection with dewatering activities as shown on the Drawings and specified herein.
- B. Dewatering activities include:
  - 1. Dewatering plan submittal requirements,
  - 2. Permits for dewatering activities,
  - 3. Performance requirements for trench and structure dewatering,
  - 4. Verification of dewatering performance,
  - 5. Dewatering discharge and monitoring requirements,
  - 6. Termination of dewatering, and

1.2. PRICE AND PAYMENT PROCEDURES

- A. Separate measurement and payment for the performance of dewatering as described in the Contract Documents will not be made.
- B. Performance of this work is considered incidental to the work and pay items must be included therein.
- C. Work required to comply with water quality and permit requirements are considered incidental and additional payment will not be made for this work.
- D. Surface rehabilitation performed because of dewatering activities is considered incidental and no additional payment will be made.

1.3. SUBMITTALS

- A. Prior to start of any earthwork activities the Contractor shall submit their dewatering plan to the Engineer and Owner to communicate the Contractor's intent regarding dewatering to achieve the required performance contained in these specifications.
- B. Submittal of a dewatering plan shall not be interpreted as an acceptance or approval by the Owner or Engineer of the Contractor's dewatering plan.
- C. The dewatering plan shall include at a minimum:
  - 1. Major components of the dewatering system including size, location, spacing and details of wells, well points, vacuum piping, sumps, interception trenches, pumps, and other major dewatering features the Contractor anticipates utilizing.
  - 2. Details of scheduling of dewatering activities relative to trench excavation and pipe installation along the planned alignment and excavation and structure installation including backfilling and ceasing dewatering activities.
  - 3. Contingency plans for equipment or power failure.

4. Procedures for verification that water levels have been lowered to the specified levels prior to trench excavation and pipe installation.
  5. Location of dewatering disposal or discharge locations and the capacity to accept dewatering discharge. Provide a contingency plan for higher than anticipated flows when capacity of planned discharge and disposal locations may conceivably be exceeded.
  6. Location and details of Best Management Practices (BMP's)
  7. Agreements with entities accepting discharges
  8. All permits obtained by the Contractor including any permit conditions and approvals for the discharge of water generated during the execution of the work.
  9. Other permits required for construction or operation of the dewatering system including the drilling of wells, temporary power drops, etc.
- D. The dewatering plan shall be designed and sealed by a qualified professional engineer registered in the jurisdiction of the project. The Contractor will be responsible for selection and payment of the engineer to perform the dewatering system design.

#### 1.4. PERMITS

- A. Contact North Carolina department of Environmental Quality, Stormwater Program for details.
- B. Dewatering discharge to or across adjacent canals, drains, right-of-way, and private property outside of the designated limits of construction shall not be allowed unless the Contractor has obtained written approval from agency or property owner having jurisdiction. Provide Agreements with dewatering plan submittal.

#### 1.5. EXISTING CONDITIONS

- A. Information concerning a sub-surface soil investigation by an independent testing laboratory is available and will be furnished by the Owner upon request. The data included therein may be used by the contractor for his general information only. The Engineer will not be responsible for the accuracy or applicability of the data therein.

### PART 2 PRODUCTS (NOT USED)

### PART 3 EXECUTION

#### 3.1. PREPARATION

- A. Furnish, install, and prepare for operation, all necessary machinery, appliances, and equipment to maintain all trench and structure excavations free from water during construction.
- B. Contractor shall provide temporary power sources for all dewatering equipment that requires a power source.

#### 3.2. TRENCH AND STRUCTURE DEWATERING

- A. Dewater and dispose of water in such a manner that it does not cause injury to public or private property or cause a nuisance or a menace to the public.

- B. The Contractor will be responsible for devising a system to achieve the required level of dewatering. It is anticipated that this system may incorporate wells, well points, interception trenches, sumps, etc. In addition, design and provide dewatering conveyance system to an approved disposal location. The Contractor shall submit details as part of the dewatering plan.
- C. Draw and maintain static water level to at least one foot (1') below the bottom of the excavation prior to excavating below the water table to maintain the undisturbed state of the foundation soils and allow placement of bedding material and backfill to the required density.
- D. Remove all groundwater, seepage, stormwater, and other water that accumulates in the excavation during construction. All trench and structure excavations shall be kept free of water during construction or until otherwise requested by the Contractor and approved by the Engineer.
- E. Prevent softening of the bottom of excavations and the formation of "quick" conditions or "boils" during excavation. The occurrence of such conditions will require over-excavation and subsequent backfilling at no additional cost to the Owner.
- F. Additional cost for trench bottom stabilization resulting from inadequate dewatering and non-compliance with the performance specifications included herein, as determined by the Engineer, will be incidental to the work.
- G. Compact native soil at the bottom of the excavation prior to placing bedding.
- H. Maintain static water level at least one foot (1') below the bottom of the trench until the pipe is placed and the bedding is placed and compacted.
- I. Maintain static water level at least one foot (1') below the bottom of the excavation until the specified foundation and structure is placed in accordance with these specifications.
- J. Maintain water levels at least one foot (1') below the level of backfill during backfilling operations.
- K. Control surface runoff to prevent entry or collection of water in excavations.
- L. Install and operate a dewatering system so that adjacent structures or property are not endangered by the reduction in the groundwater level.
- M. Monitor discharge from dewatering operations for changes in visual or odor components indicating the presence of contaminants including, but not limited to: gasoline, pesticides and other hazardous materials and toxins.
- N. Cease dewatering operations and notify Engineer and regulatory agencies immediately upon observation of conditions that may indicate the presence of hazardous contaminants in the dewatering discharge or excavation.
- O. Pumps used for dewatering operations placed with secondary containment if positioned within 100 feet of a wetland or water body.
- P. Water pumped out of the trench shall not be discharged into waterways. Water shall be discharged into a filter bag or dewatering structure located in a well vegetated area at least 50 feet away from a

stream or wetland.

- Q. Tightly seal the sleeve around the pump discharge hose with a strap or similar device.
- R. Control pumping rate to prevent excessive pressure within the filter bag in accordance with the manufacturer recommendations. As the bag fills with sediment, reduce the pumping rate accordingly.
- S. The pump suction hose must not be allowed to come into contact with the bottom of the trench. Use a floating intake or provision must be made to elevate the suction hose off the bottom of the trench.
- T. Dewatering operations shall not occur in the periods of heavy rainfall except as required to prevent flooding of construction equipment located in the trench.
- U. Remove and properly dispose of the silt bag upon completion of the dewatering operation, or after the silt bag has reached capacity.
- V. Spread the dewatered sediment from the filter bag in an approved upland area and stabilize with seed and mulch by the end of the workday.
- W. Replace the filter bag if the bag develops clogs, or has tears, rips, or punctures. During operation of the dewatering operation keep the connection between the pumping hose and the filter bag tight.
- X. To only install one dewatering hose per filter bag.

### 3.3. VERIFICATION

- A. Contractor's superintendent shall daily observe conditions in excavations where dewatering is being performed to verify performance requirements are being met and that conditions in the excavation are in accordance with the Contract Documents.
- B. Notify Engineer of any observations that may jeopardize the work or are not in accordance with the Contract Documents.
- C. Based on the verification performed by the Contractor and observations made by the Engineer, the Engineer will determine if the performance requirements of the specifications as they relate to dewatering and construction of the improvements are generally being met.
- D. If the Engineer determines that the dewatering related Work is not being performed in accordance with the Contract Documents, the Contractor will be notified and required to cease construction of the affected work. Contractor shall subsequently revise and resubmit the dewatering plan with appropriate adjustments to meet the requirements of the Contract Documents and implement any necessary changes to Contractor's dewatering approach and activities at no additional cost to the Owner.

### 3.4. DEWATERING DISCHARGE

- A. Comply with all State & Federal requirements, including (at a minimum):
  - 1. Dewatering discharge water quality and quantity.
  - 2. Dewatering discharge monitoring and sampling at the frequency stipulated in the permits, at any

locations required therein.

3. Submit monitoring and sampling report to the appropriate agencies.
- B. The Contractor shall be fully responsible for complying with State and Federal water quality requirements.
- C. Contractor shall design a dewatering discharge system to achieve State and Federal requirements.
- D. It is anticipated that stilling basins, geotextile dams, straw bails, silt fences, or siltation channels will be required to meet performance stipulations of the reference permits.
- E. Such temporary facilities may be constructed on-site and will be required to be removed after completion of the work.
- F. Captured sediment must be retained and disposed of at a site furnished by the Contractor. Discharging directly into adjacent surface waters without treatment shall not be permitted.
- G. Contractor will not be allowed to utilize the constructed pipelines at or near the structure excavation to convey dewatering flows. Dewatering down the pipe is prohibited. Contractor shall provide temporary, dedicated dewatering pipe when necessary, as part of the Contractor's dewatering plan.

### 3.5. TERMINATION

- A. Allow groundwater to return to static level after excavations are backfilled as necessary to prevent floatation of constructed improvements.
- B. Prevent disturbance of the compacted backfill and prevent flotation or movement of installed pipelines or structure.
- C. Remove or abandon all temporary improvements associated with the dewatering system in accordance with these specifications and any applicable State and Federal rules and regulations.
- D. Provide surface restoration as required to repair/replace any surface impacted by dewatering activities to a condition as good or better than preconstruction conditions at no additional cost to the Owner.
- E. Comply with any dewatering termination requirements of any State and Federal permits.

END OF SECTION

SECTION 31 23 23  
FLOWABLE FILL

PART 1 GENERAL

1.1. SUMMARY

- A. The work to be performed in accordance with this Specification consists of furnishing all materials, equipment, supplies, and accessories and of performing all operations required in connection with the procurement and installation of controlled low strength material (CLSM) as shown on the Drawings and specified herein.
- B. The work covered by this section includes installation of CLSM as backfill above pipe bedding and below final surface paving, as noted on the Drawings or as directed by an Engineer.

1.2. PRICE AND PAYMENT PROCEDURES

- A. All work related to work in this specification is considered subsidiary to other bid items. There is no separate pay item.

1.3. REFERENCES

- A. Standards
  - 1. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.
  - 2. ASTM International (ASTM)
    - a. ASTM C33 (2018) - Standard Specification for Concrete Aggregates
    - b. ASTM C94 (2021a) - Standard Specification for Ready-Mixed Concrete
    - c. ASTM C150 (2021) - Standard Specification for Portland Cement
    - d. ASTM C494 (2019) - Standard Specification for Chemical Admixtures for Concrete
    - e. ASTM C618 (2019) - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
    - f. ASTM D4832 (2016e1) - Standard Test Method for Preparation and Testing of Controlled Low Strength (CLSM) Test Cylinders
    - g. ASTM D6103 (2017) - Standard Test Method for Flow Consistency of Controlled Low-Strength Material (CLSM)

1.4. SUBMITTALS

- A. A minimum of two (2) days prior to starting CLSM work. Provide product data on the following.
  - 1. CLSM mix design
  - 2. Fly Ash
  - 3. Admixtures

PART 2 PRODUCTS

2.1. MATERIALS

- A. General

1. The CLSM shall consist of a mixture of sand, coarse aggregate, cement, and water.
  2. Fly ash and approved admixtures may be used to obtain the required properties of the mix.
  3. The mix shall have good workability and flowability with self-compacting and self-leveling characteristics.
  4. No changes shall be made in the amounts or sources of the approved mix ingredients without the approval of Engineer.
  5. Product inspection and field-testing of the approved mix may be made by, or on behalf of, Owner.
- B. Cement
1. All cement used shall be Type II Portland cement which shall conform to the requirements of ASTM C150.
- C. Fly Ash
1. Fly ash may be either Class C or Class F. The fly ash shall conform to ASTM C618.
- D. Aggregates
1. Fine Aggregate: All fine aggregate shall conform to the grading and quality requirements of ASTM C33.
  2. Coarse Aggregate: Coarse aggregate shall conform to the grading and quality requirements of ASTM C33 for size No. 476, No. 57, or No. 67.
- E. Water
1. The batch mixing water and mixer washout water shall conform to the requirements of ASTM C94.
- F. Admixtures
1. Chemical admixtures that do not contain calcium chloride and conform to ASTM C494 for concrete may be used in the CLSM mix.
  2. All chemical admixtures shall be compatible with the cement and all other admixtures in the batch.
- G. CLSM Proportions
1. Strength: CLSM shall have a minimum twenty-eight (28) day compressive strength of one hundred (100) psi when molded and cured as in conformance with ASTM D4832.
  2. The CLSM shall have a minimum cement content of fifty (50) pounds per cubic yard. The water-cementitious materials ratio of the mix shall not exceed three and one-half to one (3.5:1).
  3. Air-Entrainment: All CLSM shall be air entrained to a total air content of approximately five percent (5%).
  4. Slump: The minimum slump shall be six (6) inches and the maximum slump shall be eight (8) inches when tested in accordance with ASTM D6103.
  5. Aggregate: Fine aggregate shall be between fifty percent (50%) and sixty percent (60%) by volume of the total aggregates in the CLSM mix.
  6. Consistency:
    - a. The consistency of the CLSM slurry shall be such that the material flows easily.
    - b. When trenches are on a steep slope, a stiffer mix of slurry may be required to prevent CLSM from flowing down the trench.
    - c. When a stiffer mix is used, vibration shall be performed to ensure that the CLSM slurry completely fills all spaces between the pipe and the lower portion of the trench.



PART 3 EXECUTION

3.1. GENERAL

- A. CLSM shall not be placed, if, in the judgment of Engineer, weather conditions are unsuitable.
- B. CLSM shall not be placed when the air temperature is below forty degrees Fahrenheit (40°F) unless the air temperature is thirty-five degrees Fahrenheit (35°F) or more and the temperature is rising.

END OF SECTION

SECTION 31 23 23  
BACKFILLING AND COMPACTING FOR STRUCTURES

PART 1 GENERAL

1.1. SUMMARY

- A. The work to be performed in accordance with this Specification consists of furnishing all materials, equipment, supplies, and accessories and of performing all operations required in connection with the procurement and installation of backfilling, consolidation, compaction, and fill for over-excavation for structures as shown on the Drawings and specified herein.

1.2. REFERENCES

A. Standards

1. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.
2. ASTM International (ASTM)
  - a. ASTM C136 (2019) - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
  - b. ASTM D1556 (2015e1) - Standard Test Method for Density and Unit Weight Of Soil In Place By Sand-Cone Method
  - c. ASTM D1557 (2021) - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000ft-lbf/ft<sup>3</sup> (2700 kN-m/m<sup>3</sup>))
  - d. ASTM D698 (2021) – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>))
  - e. ASTM D6938 (2017a) - Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

1.3. SUBMITTALS

A. Test Results

1. Submit all sample and compaction test results.

1.4. EXISTING CONDITIONS

- A. Information concerning a sub-surface soil investigation by an independent testing laboratory is available and will be furnished by the Owner upon request. The data included therein may be used by the contractor for their general information only. The Engineer will not be responsible for the accuracy or applicability of the data therein.

PART 2 PRODUCTS

2.1. STRUCTURAL FILL / GRANULAR BACKFILL MATERIALS

- A. Type M1 Aggregate – use for structural fill / granular backfill at all locations below foundations.

2.2. SUBSOIL / BACKFILL MATERIAL

- A. Type S1 Aggregate– use for backfill placed adjacent to below grade structures.

### 2.3. QUALITY

- A. Samples: Submit 45 lb. sample of each type of aggregate and soil materials to testing laboratory, in air-tight containers.

## PART 3 EXECUTION

### 3.1. EXAMINATION

- A. Verify fill materials to be used are acceptable.

### 3.2. PREPARATION

- A. Cut out soft areas of subgrade not capable of in situ compaction.
- B. Backfill with Type M1 fill as necessary and compact to density equal to or greater than requirements for subsequent backfill material.
- C. Prior to placement of any fill material, compact subgrade to ninety-seven percent (97%) of its maximum dry density in accordance with ASTM D698 or to density requirements for subsequent backfill materials. Scarify, wet and recompact, if necessary, to achieve densities.
- D. Any over-excavation required should extend to the underlying medium dense sand and gravel and should extend laterally 8 inches for every 12 inches of over-excavation depth below foundation bearing.

### 3.3. BACKFILLING

- A. Backfill areas to contours and elevations with the material(s) specified.
- B. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces. If wet, frozen, porous, spongy, or other unsuitable materials are encountered, backfill with import backfill at no additional cost to Owner.
- C. Aggregate Type M1 Structural Fill / Granular Backfill (Beneath Structures):
  1. The structural fill material should extend to and possibly into the native coarse granular subsoils.
  2. Backfill materials should be placed in loose lifts not to exceed 9 inches thick, adjusted to a workable moisture content, and compacted to at least 97% of the material's standard Proctor maximum dry density as determined in accordance with ASTM D698.
- D. Aggregate Type S1 Subsoil / Backfill Material (Adjacent to Below Grade Structures)
  1. Backfill placed adjacent to below grade structures should consist of approved, low-volume change fill materials which are free from organic matter and debris.
  2. The native silty/clayey sands could be used for backfill provided proper moisture contents are obtained prior to placement.
  3. Drying of those soils should be expected if they are to be placed for fill or backfill.
  4. Imported Type M1 granular materials could also be used to limit long-term settlement of the

backfill zone.

5. Fill materials should be placed in loose lifts not to exceed 9 inches thick, adjusted in moisture content, and compacted to at least 97% of the material's maximum dry density as determined in accordance with ASTM D698.
6. The moisture content of the backfill soils should be adjusted to be within the range of the +/-2% of standard Proctor optimum moisture at the time of compaction.

E. Employ a placement method that does not disturb or damage existing structures or utilities.

F. Remove surplus and unusable backfill materials from site.

G. Make gradual grade and alignment changes. Blend slope into level areas.

#### 3.4. TOLERANCES

A. As specified in the Drawings.

#### 3.5. FIELD QUALITY CONTROL

A. Field testing will be performed under provisions of Section 01 40 00 QUALITY REQUIREMENTS.

B. Tests and analysis of fill material will be performed in accordance with ASTM C136 and ASTM-D1557.

C. Compaction testing will be performed in accordance with ASTM-D6398 (nuclear method) or ASTM-D1556 (sand cone method).

D. If tests indicate work does not meet specified requirements, remove work, replace, and retest at no cost to Owner.

#### 3.6. PROTECTION OF FINISHED WORK

A. Recompact fills subjected to vehicular traffic before placement of subsequent layers.

END OF SECTION

SECTION 31 23 33  
TRENCHING AND BACKFILLING FOR BURIED PIPELINES

PART 1 GENERAL

1.1. SUMMARY

- A. The work to be performed in accordance with this Specification consists of furnishing all materials, equipment, supplies, and accessories and of performing all operations required in connection with excavation and backfilling of pipeline trenches and utility structures as shown on the Drawings and specified herein.
- B. The work shall include the excavation of whatever substances are encountered to the depths shown on the Drawings or modified in the field by the Engineer and installation of compacted bedding, backfill and surface restoration as described herein.

1.2. PRICE AND PAYMENT PROCEDURES

- A. All work related to work in this specification is considered subsidiary to other bid items. There is no separate pay item.

1.3. REFERENCES

- A. Definitions
  - 1. Unclassified Excavation
    - a. Unclassified excavation shall include the removal and subsequent handling of any and all materials and substances encountered (including rock) in performance of the work, regardless of the type, character, composition, or condition thereof.
    - b. All excavation on this project is considered Unclassified.
- B. Standards
  - 1. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.
  - 2. ASTM International (ASTM)
    - a. ASTM C76 (2020) - Standard Specification for Reinforced Concrete Culvert, Storm Drain, And Sewer Pipe
    - b. ASTM C361 (2019a) - Standard Specification for Reinforced Concrete Low-Head Pressure Pipe
    - c. ASTM D448 (2017) – Standard Classification for Sizes Of Aggregate For Road And Bridge Construction
    - d. ASTM D1556 (2015e1) - Standard Test Method for Density and Unit Weight of Soil In Place By Sand-Cone Method
    - e. ASTM D1557 (2021) - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 Ft-Lbf/Ft<sup>3</sup> (2,700 KN-M/M<sup>3</sup>))
    - f. ASTM D4253 (2016e1) - Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table
    - g. ASTM D4254 (2016) - Standard Test Methods for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density

- h. ASTM D6938 (2017a) - Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
- 3. United States Government Federal Regulations
  - a. 29 CFR 1926, Subpart P - Excavations

#### 1.4. CONTRACTOR SUBMITTALS

- A. Submit the following:
  - 1. Certified laboratory test results demonstrating that imported materials meet the requirements of this Section, including gradation, optimum moisture content, and maximum density. Test results shall be dated within 12 months of the date of the submittal.
  - 2. Mix design for Controlled Low Strength Material (CLSM).

#### 1.5. QUALITY ASSURANCE

- A. All soils testing will be done by a testing laboratory of the Contractor's choice, to be submitted for approval by the Owner before testing. Testing must meet the following conditions:
  - 1. In the instance that tests of fill or backfill show non-compliance with the required density, gradation, or other physical properties, the Contractor shall complete the requirements to accomplish compliance. Subsequent testing to demonstrate compliance shall be by a testing laboratory selected by the Owner and shall be at the Contractor's expense.
  - 2. Where soil material is required to be compacted to a percentage of maximum dry density, the maximum density at optimum moisture content will be determined in accordance with ASTM D1557, Modified Proctor.
  - 3. Where granular, cohesionless material is required to be compacted to a percentage of relative density, the calculation of relative density will be determined in accordance with ASTM D4253 and D4254.
  - 4. Field density tests will be performed in accordance with ASTM D1556, ASTM D6938, or by other means acceptable to the Engineer.

#### 1.6. EXISTING CONDITIONS

- A. Except as may be shown on the Drawings, no additional subsurface exploration has been made along the pipeline alignment as a part of this project.
- B. Protection of Existing Utilities
  - 1. Existing power lines, telephone lines, 6-inch and greater diameter trees, six feet or more from the pipe centerline, shrubbery, fences, water mains, gas mains, sewers, cables, conduits, ditches, embankments, and other structures in the vicinity of the work not authorized to be removed, shall be supported and protected from injury by the Contractor during the construction and until completion of the work affecting them.
  - 2. The Contractor shall be liable for all damages done to such existing facilities and structures, as herein provided and shall save the Owner from any liability or expense for injuries, damages, or repairs to such facilities.
- C. Underground Facilities
  - 1. The type, size, location, and number of known underground facilities have been shown on the Drawings based on information available to the Engineer at the time of design; however, no guarantee is made as to the true type, size, location, or number of such facilities, or that all

facilities are shown.

2. It shall be the sole responsibility of the Contractor to verify the existence and location of all underground utilities along the route of the work.
3. The omission from, or the inclusion of, utility locations on the Drawings is not to be considered as the nonexistence of, or a definite location of, existing underground utilities.

D. Existing Utilities

1. The Contractor shall notify the owner or owners of the existing utilities, whether aboveground or underground, 48 hours prior to proceeding with trench excavation whenever such trenching operations are within ten feet of the possible location of any existing utility.
2. The notification shall also include a request for field staking any such underground facility that may be in the area of influence by the construction.
3. Should any such utility be damaged in the trenching operations, the Contractor shall immediately notify the owner of such utility and, unless authorized in writing by the owner of utility, the Contractor shall not attempt to make repairs except to prevent further damage to property.
4. Duplicate copies of any written authorization given to the Contractor to make repairs shall be filed with the Engineer and shall be so worded as to save the Owner from any responsibility whatsoever relative to the sufficiency of the repairs.
5. If a conflict that is not shown on the Drawings develops between an existing utility and the work required by this Contract, the Contractor shall notify the affected utility and the Engineer immediately in writing.
6. Such conflict may be considered, by the Engineer, to be a change in the work. The Contractor may request a change in the Contract amount for such change in the work, subject to the General Conditions.
7. If during construction any underground utility conduit, including sewers, water mains, gas mains and drainage structures, or any aboveground utility facilities are required to be relocated, the Contractor shall notify the utility owner well in advance of approaching the utility so that arrangements can be made with the owner or owners for its relocation without delay to the work.
8. The cost of relocating both underground and aboveground utilities, exclusive of water and sewer service connections, will be borne by the Owner.

1.7. SAFETY

- A. The Contractor must conform to the amended Rules and Regulations of Construction Standards for Excavations, CFR 29, Part 1926, Subpart P of Title 29 including appendices of the Occupational Safety and Health Administration, Labor, including revisions thereto.
- B. The Contractor is solely responsible for excavation safety.

PART 2 PRODUCTS

2.1. GENERAL

- A. Backfill
  1. All backfill material shall be approved before use.
  2. Material from project excavations (i.e. native material) may be used for backfill.
  3. The backfill material shall be free from rubbish, large stones, clods, roots, brush, debris, frozen lumps of earth, or other objectionable material, and shall be moisture conditioned (dried or

- moistened) prior to placement and compaction as specified.
4. Native material used for shall not contain any rocks larger than 2 inches and shall be free of vegetation and debris.
- B. Stability
1. The Contractor is solely responsible for the stability of slopes during construction.
  2. Excavation and fill operations shall be coordinated with water control and stabilization measures to prevent unstable conditions.
- C. Water
1. Water shall be clean and free from harmful substances.
  2. The amount of water used in compaction shall be sufficient to obtain the percent of compaction required.
- D. Topsoil
1. Topsoil is defined as the existing material nominally within a 6-inch depth beneath the existing ground surface.
  2. The Engineer shall verify the suitability of this material as topsoil for use in restoration of the site following construction prior to stockpiling.

## 2.2. PIPELINE BEDDING AND BACKFILL

- A. Trench Zones:
1. For the purposes of this Specification, the terms “Foundation” “Bedding Zone,” “Pipe Zone”, and “Final Backfill Zone” shall refer to the trench zones as identified following:
    - a. Foundation: Foundation consists of all material placed from 4 inches below the pipe invert to 16 inches or more below the pipe invert (12-inch minimum thickness). Foundation material is required where unstable soil or rock conditions are encountered during excavation.
    - b. Bedding Zone: The Bedding Zone shall consist of all material placed below the pipe invert and above the Foundation material, graded and prepared for direct placement of the pipe.
    - c. Pipe Zone: The Pipe Zone shall consist of all material placed above the pipe invert to an elevation of at least 6 inches above the top of the pipe.
    - d. Final Backfill Zone: The Backfill Zone shall consist of all material above the Pipe Zone.
- B. Materials
1. All bedding and backfill material shall have the approval of the Engineer.
  2. All bedding and backfill material shall be free of frozen material, organic material, and debris.
  3. All imported materials shall be, and native materials may be, subject to gradation tests and compaction tests prior to approval of the use of that material. Test results shall be certified by a qualified testing laboratory and submitted to the Engineer for approval and verified as to their accuracy. The cost of these tests shall be borne by the Contractor.
  4. Granular Bedding or Granular Backfill Material. This material shall be imported crushed rock or angular surfaced gravel and meet the following gradation (ASTM D448, No. 67):
    - a. Sieve Size: Total Percent Passing by Weight
    - b. 3/4 inch: 100
    - c. 3/8 inch: 20 – 55



- d. No. 4: 0 - 10
  - e. No. 8: 0 - 5
  5. Trench Stabilization Material: This material shall be Class A Aggregate. When approved by the Engineer, crushed recycled concrete rubble meeting the same gradation may be used.
  6. Backfill Material
    - a. Backfill Material shall consist of suitable material from the native excavated earth when indicated in the Drawings, after clearing, grubbing, and stripping activities have been completed.
    - b. Material shall be processed or screened to remove organic matter, deleterious material, and all rock larger than 2 inches in any dimension.
    - c. Where native excavated material is not indicated as acceptable in the Drawings, such as under streets, flowable fill (controlled low strength material)
  7. Controlled Low Strength Material (CLSM) Backfill
    - a. This material, also known as flowfill, flash fill, or equivalent, shall be placed in the trench where designated on the Drawings or as directed by the Engineer.
    - b. The Contractor may elect to utilize CLSM in lieu of Backfill Material in the Backfill Zone to reduce duration of open trenching in roadways, subject to the approval of the Engineer, or when dictated by the agency having jurisdiction over the roadway or right-of-way.
    - c. Mix design shall be submitted to the Engineer for approval.
    - d. CLSM shall have a 28-day strength of 60-100 psi, and a maximum slump of 7-10 inches.
- C. Special Cutoff Zones
1. Where designated to prevent flow of water along pipeline trenches use all clay soil (CL per unified classification system) throughout the Bedding Zone and Pipe Zone for a thickness of a least 12 inches.
  2. Prepare material to allow good bedding conditions and backfill for pipe.

## PART 3 EXECUTION

### 3.1. GENERAL REQUIREMENTS

- A. Except as shown otherwise on the Drawings, all excavation shall be made by open cut.
- B. Permission may be granted to tunnel under driveways, crosswalks, curbing, walkways, and utility installations, but such tunnels shall not exceed 10 feet in length.
- C. The length of trench permitted to be open at any one time may be limited when, in the opinion of the Engineer, such limitation is necessary for protection of the work or the convenience of the public.
- D. Excavation through grass cover
  1. When excavations are through turf lawns, cultivated fields, pastureland, or areas having natural grass cover, the Contractor shall stockpile separately all stripped topsoil, which shall be replaced to at least the same depth on top of the trench backfill.
  2. All surfaces that have natural grass cover shall be reseeded by the Contractor and in accordance with the erosion control best management practices.
  3. All lawns and other grass-covered areas, not excavated, on which excavated material is placed, shall be protected from damage by placing burlap over the grass.

4. Where indicated on the Drawings or required herein, removed turf lawns shall be replaced with sod of the same species.
- E. It is the general intent and requirement that the Contractor leaves the work area in a similar and equal condition as it was preceding the Contract work.

### 3.2. PREPARATION

- A. Ground Surface Preparation
  1. Prior to excavating, complete all clearing and grubbing and demolition operations as specified in applicable Sections and herein.
- B. Topsoil
  1. In natural areas where excavation will occur, strip all topsoil, or in the absence of topsoil, strip the top surface material and store separately from other excavated materials as specified in applicable Sections and herein.
  2. Concrete Walks, Paved Roadways, Parking Areas, and Road Crossings: Saw cut existing pavement full depth to a true line before excavation. Cutting of concrete shall occur along the lines of existing joints, unless noted otherwise.
- C. The Contractor is to field-verify by excavation the location of all utility crossings, service connections, and connections to existing lines before proceeding with trenching operations.

### 3.3. TRENCH EXCAVATION

- A. Trench Width
  1. The minimum clear trench width measured at the top of the pipe barrel shall be not less than the outside pipe diameter, plus 12 inches, or as specified in the Drawings.
  2. For all pipe, the maximum clear trench width measured at a point 12-inches above the top of the pipe barrel shall be not greater than the outside pipe diameter plus 24 inches, or as specified in the Drawings.
  3. If the maximum trench width is exceeded, either through accident or otherwise, and if the Engineer determines that the combined dead and live loads will exceed the design loadings on the pipe, the Contractor shall either cradle the pipe in concrete, or use a pipe of a stronger class, as required by the Engineer. The cost of such remedial measures shall be entirely at the Contractor's expense.
- B. Trench Walls
  1. The Contractor may slope or bench the trench side walls.
  2. Such sloping or benching shall terminate at a depth not lower than one foot above the top of the pipe barrel, and from that point down, the trench wall shall be vertical and conforming to the specified maximum trench width.
  3. The trenching operation, including the spoil bank and sloping of the trench sidewalls shall be confined to the width of the permanent and temporary rights-of-way or easements, if any.
  4. A clear area shall be maintained a sufficient distance back from the top edge of the excavation to avoid overloading which may cause slides or caving of the trench walls.
  5. The excavated material shall be kept trimmed in such a manner as to be of as little inconvenience as possible to the public and adjoining property owners.
  6. Unless otherwise authorized by the agency having jurisdiction, all public thoroughfares and

crossroads shall be kept open to traffic.

7. Bridging (trench plating) shall be used when required by the agency having jurisdiction at street crossings, sidewalks and other points where necessary, to prevent serious interruption of travel and to provide access to fire hydrants and public and private premises.

C. Trench Depth

1. The trenches shall be excavated to such depths that the pipeline can be laid at the elevation of the grade lines shown on the Drawings, or at depths or covers specified on the Drawings.
2. The pipe trench shall be excavated to a depth as shown on the drawings below the bottom of the pipe and backfilled with the specified Bedding Zone material, and where applicable Foundation material as well.

D. Trench Preparation

1. The trench shall be excavated only so far in advance of pipe laying as permitted by the Engineer, as dictated by public safety, or by the agency having jurisdiction over the public right-of-way or easement.
2. The trench wall shall be so braced that the work may be executed safely and efficiently.
3. All trenches shall be drained so that pipe laying may take place in un-watered conditions.
4. Trench preparation shall also conform to the details shown on the Drawings.
5. Trenches above a point 12-inches above the top of the pipe shall be of such extra width, when required, as will permit the convenient placing of timber supports, sheeting and bracing, and the handling of special units as necessary.
6. Bell holes in the trench bottom shall be provided at each joint to permit the jointing to be made properly and to prevent the pipe from bearing on the bells.
7. After excavation, the trench bottom shall be uniformly graded and hand-shaped so that the pipe barrel (exclusive of the joint) will have uniform and continuous bearing on firm, undisturbed trench bottom (when permitted), or thoroughly compacted Granular Bedding or sand material, throughout the length of the pipe.
8. The trench grade shall permit the pipe spigot to be accurately centered in the preceding laid pipe joint, without lifting the pipe above the grade and without exceeding the permissible joint deflection.
9. If it is necessary to raise the pipe subgrade, approved, compacted Granular Bedding material shall be used at the Contractor's cost.

### 3.4. SHORING

- A. As needed, all trench sidewalls shall be properly sheeted and braced to meet Federal, State, and local laws regarding safe working conditions.
- B. The Contractor shall be solely responsible for providing adequate excavation safety.
- C. The shoring shall be arranged so as not to place any stress on portions of the completed work until the general construction thereof has proceeded far enough to provide ample strength.
- D. Any damage to pipes or structures resulting from settlements, heaving, water or earth pressures, slides, caving, or other causes, due to lack of shoring, sheeting, or bracing, or due to failure of shoring, or due to improper shoring, or due to any other negligence on the part of the Contractor, shall be repaired by the Contractor at their own expense.

- E. Shoring shall be removed as the work progresses, unless left in place by written order of the Engineer. The Contractor will be paid for shoring so ordered left in place based on invoiced material cost only.
- F. If the Engineer is of the opinion that at any point the trench walls are not properly supported to protect the work, the Engineer may order the placement of additional supports by, and at the expense of, the Contractor. Compliance with such order shall not relieve or release the Contractor from their sole responsibility for safety and the protection of the work.

### 3.5. OVEREXCAVATION OF UNSUITABLE MATERIAL

- A. In areas where unsuitable or unstable material is encountered, the Contractor shall over-excavate with 12 inches depth of uniformly-graded, specified Trench Stabilization Material or other material approved by the Engineer. If larger material is needed, it must be approved by the Engineer prior to placement.
- B. Over-excavation and replacement of unsuitable material will be done only upon authorization by the Owner.

### 3.6. WATER CONTROL AND DEWATERING

- A. For all excavations, the Contractor shall provide suitable equipment to divert and/or remove surface, rain, and groundwater regardless of quantity or rate of flow.
- B. The excavation shall be continuously maintained in an un-watered condition so that pipeline construction and backfill operations can be executed at all times under dewatered conditions.
- C. Water shall be disposed of in a suitable manner without damage to adjacent property and without being a menace to public health and convenience.
- D. No water shall be drained into the previously constructed work or work in progress without prior consent of the Engineer.
- E. Dewatering shall be accomplished by well points, sumping, or any other suitable method that ensures a dewatered trench to a minimum of two feet below the excavation bottom, so that the Contractor's operations will not disturb the trench bottom foundation.
- F. Any dewatering method shall be subject to the approval of the Engineer.
- G. Dewatering by over-excavation and installation of crushed rock shall not be paid as rock used for trench stabilization.

### 3.7. STORAGE OF EXCAVATED MATERIALS

- A. Generally excavated material will be stockpiled near the immediate construction area so as not to interfere with other work.
- B. In natural areas, place excavated materials close to the excavation and in as confined a configuration as possible.

- C. Where adjacent slopes are too steep to stockpile, transport materials to special stockpile locations in nearby areas.
- D. All transportation to and from stockpiles (including loading and unloading) shall be included in the work.

### 3.8. TRENCH BACKFILL

#### A. General

- 1. Use mechanical compaction equipment appropriate for the use and material to achieve the specified level of compaction.
- 2. Compaction by means of flooding or jetting with water shall not be acceptable.
- 3. When required by the Engineer, the Contractor shall excavate backfilled trenches for purposes to perform compaction tests at locations and depths required by the Engineer.
- 4. The Contractor shall be responsible to reinstall and compact the test excavations at no additional cost to the Owner.

#### B. Compaction Standard

- 1. Unless accurate results cannot be obtained, the compaction requirements shall conform to maximum dry density according to ASTM D1557, Moisture-Density Relations of Soils (Modified Proctor).
- 2. When the ASTM D1557 test is not applicable for a given material, the percentage compaction requirements shall conform to ASTM D4253.

#### C. Moisture Conditioning

- 1. All imported and native earthwork materials shall be properly moisture conditioned (wetted or dried as necessary) to obtain a moisture content within three percent (3%) of optimum prior to placement and compaction.
- 2. Employ such means as may be necessary to secure a uniform moisture content throughout the material of each lift being compacted.

#### D. Bedding Zone

- 1. Bedding material shall be placed to the required elevation of the bottom of the pipe barrel.
- 2. Bedding Zone installation shall comply with the following:
  - a. Material: Granular Bedding.
  - b. Compaction: Tamping equipment shall be used to thoroughly tamp the bedding material to a minimum of 95 percent of maximum dry density.

#### E. Pipe Zone

- 1. After the Bedding Zone has been placed and has been approved and, after the pipe has been installed and approved, the Pipe Zone material shall be installed to an elevation of 6 inches above the top of the pipe.
- 2. Pipe Zone installation shall comply with the following:
  - a. Material: Granular Backfill Material.
  - b. Compaction: Minimum of 95 percent of maximum dry density utilizing T-bars or mechanical tamping equipment.
  - c. Installation Requirements: Place and compact in distinct, separate lifts not to exceed 6 inches of loose depth; except that the first loose lift shall not be higher than the pipe centerline (springline).

**F. Final Backfill Zone**

1. All backfill above the Pipe Zone shall be carefully placed and compacted.
2. The Backfill Zone installation shall comply with the following:
  - a. Material: Acceptable Native Backfill Material or Imported Backfill Material when authorized by the Engineer.
  - b. Compaction:
    - 1) Outside of roadway limits: Minimum of 90 percent of maximum dry density.
    - 2) Within roadway limits: Minimum of 95 percent of maximum dry density.
3. Installation Requirements
  - a. Compaction shall be by mechanical tamping in 18-inch maximum loose lifts using mechanical or hand tampers, weighing not less than 20 pounds, or vibratory rollers.
  - b. The Contractor may request approval of alternate means of compaction. Such request must be submitted to the Engineer in writing. Approval of the compaction method will be made by the Engineer only in writing.
  - c. Use of specified or approved compaction methods does not relieve the Contractor from providing a complete project meeting the intent and requirements of these Specifications.
  - d. Selectively screen and place Backfill Material such that rock larger than 2 inches in any dimension is omitted from the Backfill Zone.
  - e. In turf or natural grass areas, the top 6 inches of the Backfill Zone shall consist of stockpiled Topsoil or organically amended soil, compacted to no greater than 85% of maximum dry density. Roughen the surface of the underlying compacted trench backfill material to afford good adhesion between the two soil types.

**G. Buried Utility Warning Tape**

1. Install as specified in Section 33 05 98 and in coordination with the trench backfilling operation consistent with the Specifications.

**3.9. SURFACE RESTORATION**

A. General: Unless indicated otherwise, the cost of surface restoration shall be included in the cost of the pipeline installation.

**B. Improved Roadways:**

1. Unless noted otherwise or required by the agency having jurisdiction, all paving, curb and gutter, sidewalks and other street improvements removed or damaged during construction shall be replaced with the same type and dimensions of items removed or damaged to the same line and grade, and shall be equal to, and consistent with, the undisturbed portions of the improvements existing prior to the trench excavation.
2. Concrete curb, gutter, and sidewalk
  - a. All concrete used in the restoration work shall conform to the requirements of the Street or Highway Department having jurisdiction.
  - b. Comply with the details shown on the Drawings for such items, or if not shown, with the applicable local standards in effect.
  - c. Pedestrian sidewalk ramps shall comply with the latest ADA standards.
  - d. Subgrade shall be thoroughly compacted as specified.
  - e. Provide compacted Aggregate Base Course material beneath concrete work to the thicknesses shown on the Drawings or to match existing thicknesses, whichever is

- greater.
3. Asphalt Pavement
    - a. After the Backfill Zone has been approved by the Engineer, and the Highway or Street Department having jurisdiction has approved the pavement subgrade, place and compact a layer of Aggregate Base Course material.
    - b. The thickness of the material shall be as shown on the Drawings, or match existing, whichever is greater.
    - c. Compact the material to a minimum of 95% maximum dry density, or greater if required by the authority having jurisdiction.
    - d. Asphalt shall be hot mix in accordance with the standards of the Street or Highway Department having jurisdiction, or as specified elsewhere in these Contract Documents if more stringent.
    - e. The thickness of the asphalt shall be as shown on the Drawings, or match the existing paving thickness, whichever is greater. In no case shall the asphalt be less than 3 inches in thickness.
  4. Preparation and Placement
    - a. Preparation for paving shall include sawcutting the pavement with a vertical face 12 inches beyond the trench wall or limit of damaged pavement, cleaning, prime and tack coats.
    - b. The depth of the saw cut shall be equal to the full depth of existing pavement
    - c. After placing the material, the pavement shall be compacted with a smooth roller.
    - d. All methods shall meet the requirements of the authority having jurisdiction.
    - e. The final paved surface shall be uniform so that if tested with a 10-foot straight edge, the variation shall not exceed one-quarter inch. Areas not complying with these tolerances shall be reworked to obtain conformity at no additional cost to the Owner.
  5. Limits of Pavement
    - a. Regardless of the amount of pavement damaged by construction equipment or activities or removed during installation of the pipelines, the maximum width of pavement replacement that will be paid for will be up to 36 inches on either side of the pipe centerline and a maximum total width of 72 inches if pavement is excavated on both sides of the pipe centerline and shall include all base course, cleaning, prime coat, tack coats, and asphalt pavement.
    - b. The cost of pavement removal and replacement outside these limits shall be included in the bid cost of the pipe.
- C. Road Gravel Surfacing
1. Gravel surfacing that is removed, disturbed, and/or contaminated during trench excavation or construction activities shall be replaced.
  2. After the backfill has been approved by the Engineer, the gravel shall be placed to a 6-inch minimum thickness.
  3. The gravel shall be compacted by a vibratory roller to the elevation of the undisturbed surface.
  4. The gravel shall conform to the requirements of the authority having jurisdiction. If no requirements apply, the material shall be Aggregate Base Course material.
- D. Turf
1. The top 6 inches of the Backfill Zone shall consist of stockpiled Topsoil or organically amended soil, compacted to no greater than 85% of maximum dry density.
  2. Sod, defined as densely grassed landscaping turf, which is removed shall be replaced with new

sod of the same species and quality, or the sod removed may be put back if it has been properly stored and remains in a healthy condition.

E. Natural Areas

1. The top 6 inches of the Backfill Zone shall consist of stockpiled Topsoil or organically amended soil, compacted to no greater than 85% of maximum dry density.
2. Seed and provide prescribed revegetation and erosion and sedimentation control measures as specified elsewhere or on the Drawings, and in accordance with the referenced erosion and sediment control best management practices.

F. Other Items

1. The Engineer will clarify restoration of other minor items as construction proceeds.
2. Such items must be restored to equal or exceed existing conditions.

3.10. CLEANUP

- A. Prior to final inspection and acceptance, remove all rubbish and excess materials and leave area in a neat, satisfactory condition.

3.11. MAINTENANCE OF BACKFILL

- A. All backfill shall be maintained in a satisfactory condition and all places showing signs of settlement shall be filled and maintained during the life of the Contract and for a period of one year following the date of final acceptance of all work performed under the Contract.
- B. When the Contractor discovers or is notified by the Engineer or the Owner that any backfill is not in compliance with the provision of this Contract, the Contractor shall correct such conditions at once at no additional cost to the Owner.
- C. Any utilities and road surfacing damaged by such settlement shall be repaired by the Contractor to the satisfaction of the Owner and Engineer or agency having jurisdiction.
- D. In addition, the Contractor shall be responsible for the cost to the Owner of all claims for damages filed with the Court, actions brought against the said Owner for, and on account of, such damage.

END OF SECTION



SECTION 32 11 23  
AGGREGATE BASE COURSE

PART 1 GENERAL

1.1. SUMMARY

- A. The work to be performed in accordance with this Specification consists of furnishing all materials, equipment, supplies, and accessories and of performing all operations required in connection with the procurement and installation of aggregate base courses as shown on the Drawings and specified herein.

1.2. PRICE AND PAYMENT PROCEDURES

- A. All work related to work in this specification is considered subsidiary to other bid items. There is no separate pay item.

1.3. REFERENCES

- A. Standards
1. The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.
  2. ASTM International (ASTM)
    - a. ASTM C136 (2019) – Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
    - b. ASTM D1557 (2021) – Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup> (2,700 kN-m/m<sup>3</sup>))
  3. North Carolina Department of Transportation (NCDOT)
    - a. Standard Specifications for Roads and Structures

PART 2 PRODUCTS

2.1. MATERIALS

- A. Aggregate Base Course (ABC) – Material conforming with requirements of Sections 1006, 1010, and Table 1005-1 of NCDOT Standard Specifications for Roads and Structures.

PART 3 EXECUTION

3.1. EXAMINATION

- A. Verify subgrade or subbase has been reviewed, gradients and elevations are correct, and surfaces are dry.

3.2. AGGREGATE PLACEMENT

- A. Placement of ABC shall conform to requirements of Section 530 of NCDOT Standard Specifications for Roads and Structures.

- B. Spread aggregate over prepared substrate to a total compacted thickness as indicated in the Drawings.
- C. Level and contour surfaces to elevations and gradients indicated.
- D. Add small quantities of aggregate as appropriate to assist compaction.
- E. Compact placed aggregate materials to achieve compaction to 95 percent of its maximum dry density in accordance with ANSI/ASTM D1557.
- F. Add water to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.
- G. Maintain finished surface of each lift until next lift is placed.
- H. No ballast or base material shall be placed on a surface which has become potholed, rutted, or developed other surface irregularities.
- I. Use mechanical vibrating tamping in areas inaccessible to compaction equipment.

### 3.3. TOLERANCES

- A. Flatness: Maximum variation of 1/4 inch measured with 10-foot straight edge.
- B. Scheduled Compacted Thickness: Within 1/4 inch.
- C. Variation from True Elevation: Base within 1/2 inch. Subbase within 1/2 inch not cumulative.

### 3.4. FIELD QUALITY CONTROL

- A. Gradation of Aggregate: In accordance with ASTM C136.
- B. Compaction testing will be performed in accordance with ANSI/ASTM D1557.
- C. If tests indicate work does not meet specified requirements, remove work, replace, and retest at no cost to the Owner.
- D. Frequency of Tests: A minimum of one test per 250 square yards of surface area per lift or as required to meet performance criteria as specified.

### 3.5. PROTECTION OF FINISHED WORK

- A. Maintain and protect finish work until project is complete.
- B. Blade and recompact base course subjected to vehicular traffic prior to placement of next lift or surface.
- C. Remove and replace base and ballast material that has become contaminated during construction.

END OF SECTION

SECTION 32 12 16  
ASPHALT PAVING

PART 1 GENERAL

1.1. SUMMARY

- A. The work to be performed in accordance with this Specification consists of furnishing all materials, equipment, supplies, and accessories and of performing all operations required in connection with the fabrication and installation of asphalt paving as shown on the Drawings and specified herein.

1.2. PRICE AND PAYMENT PROCEDURES

- A. All work related to work in this specification is considered subsidiary to other bid items. There is no separate pay item.

1.3. REFERENCES

- A. Standards
1. The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.
  2. American Association of State Highway and Transportation Officials (AASHTO)
  3. ASTM International (ASTM)
    - a. ASTM C136 (2019) - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
    - b. ASTM C566 (2019) - Standard Test Method for Total Evaporable Moisture Content of Aggregate by Drying
    - c. ASTM D1461 (2017) - Standard Test Method for Moisture or Volatile Distillates in Asphalt Mixtures
    - d. ASTM D2172 (2017e1) - Standard Test Methods for Quantitative Extraction of Asphalt Binder from Asphalt Mixtures
    - e. ASTM D2489 (2016) - Standard Test Method for Estimating Degree of Particle Coating of Asphalt Mixtures
    - f. ASTM D2950 (2014) – Standard Test Method for Density of Bituminous Concrete in Place by Nuclear Methods
    - g. ASTM D3665 (2017) - Standard Practice for Random Sampling of Construction Materials
    - h. ASTM D4125 (2021) – Standard Test Method for Asphalt Content of Asphalt Mixtures by the Nuclear Method
    - i. ASTM D5444 (2015) - Standard Test Method for Mechanical Size Analysis of Extracted Aggregate
    - j. ASTM D6307 (2019) - Standard Test Method for Asphalt Content of Asphalt Mixture by Ignition Method
    - k. ASTM D6926 (2020) - Standard Practice for Preparation of Asphalt Mixture Specimens Using Marshall Apparatus
    - l. ASTM D6927 (2015) - Standard Test Method for Marshall Stability and Flow of Asphalt Mixtures
  4. North Carolina Department of Transportation (NCDOT)

- a. Standard Specifications for Roads and Structures

#### 1.4. SUBMITTALS

1. Product Data
  - a. Mix Design
  - b. Quality Control
  - c. Material Acceptance
2. Test Reports
  - a. Aggregates
  - b. QC Monitoring
3. Certificates
  - a. Testing Laboratory

### PART 2 PRODUCTS

#### 2.1. SYSTEM DESCRIPTION

- A. General
  1. Perform the work consisting of pavement courses composed of mineral aggregate and asphalt material heated and mixed in a central mixing plant and placed on a prepared course.
  2. Asphalt mix designed and constructed in accordance with this section shall conform to the lines, grades, thicknesses, and typical cross sections indicated in the Drawings.
  3. Construct each course to the depth, section, or elevation required by the Drawings and roll, finish, and approve it before the placement of the next course.
- B. Hauling Equipment
  1. Provide trucks for hauling hot-mix asphalt having tight, clean, and smooth metal beds.
  2. To prevent the mixture from adhering to them, the truck beds shall be lightly coated with a minimum amount of paraffin oil, lime solution, or other approved material. Petroleum based products shall not be used as a release agent.
  3. Each truck shall have a suitable cover to protect the mixture from adverse weather.
  4. When necessary to ensure that the mixture will be delivered to the site at the specified temperature, truck beds shall be insulated or heated and covers (tarps) shall be securely fastened.
- C. Asphalt Pavers
  1. Provide asphalt pavers which are self-propelled, with an activated screed, heated as necessary, and capable of spreading and finishing courses of hot-mix asphalt which will meet the specified thickness, smoothness, and grade.
  2. The paver shall have sufficient power to propel itself and the hauling equipment without adversely affecting the finished surface.
  3. Provide paver with a receiving hopper of sufficient capacity to permit a uniform spreading operation and equipped with a distribution system to place the mixture uniformly in front of the screed without segregation.
  4. The screed shall effectively produce a finished surface of the required evenness and texture without tearing, shoving, or gouging the mixture.

#### 5. Automatic Grade Controls

- a. Equip the paver with a control system capable of automatically maintaining the specified screed elevation.
- b. The control system shall be automatically actuated from either a reference line and/or through a system of mechanical sensors or sensor-directed mechanisms or devices which will maintain the paver screed at a predetermined transverse slope and at the proper elevation to obtain the required surface.
- c. The transverse slope controller shall be capable of maintaining the screed at the desired slope within plus or minus 0.1 percent. A transverse slope controller shall not be used to control grade.
- d. Provide controls capable of working in conjunction with any of the following attachments:
  - i. Ski-type device of not less than 30 feet in length.
  - ii. Taut stringline set to grade.
  - iii. Short ski or shoe for joint matching.
  - iv. Laser control.

#### D. Rollers

1. Rollers shall be in good condition and shall be operated at slow speeds to avoid displacement of the asphalt mixture.
2. The number, type, and weight of rollers shall be sufficient to compact the mixture to the required density while it is still in a workable condition.
3. Do not use equipment which causes excessive crushing of the aggregate.

### 2.2. AGGREGATES

#### A. General

1. Provide aggregates consisting of crushed stone, crushed gravel, crushed slag, screenings, natural sand, and mineral filler, as required.
2. Submit all aggregate test results to the Owner at least 14 days prior to start of construction.

### 2.3. MIX DESIGN

- A. Use a mix conforming to NCDOT Sections 609 and 610.

## PART 3 EXECUTION

### 3.1. ENVIRONMENTAL REQUIREMENTS

- A. Do not place the hot-mix asphalt upon a wet surface or when the surface temperature of the underlying course is less than specified below. The temperature requirements may be waived by the Owner, if requested; however, meet all other requirements, including compaction.
  1. Mat Thickness, 3 inches or greater: Minimum surface temperature – 40 degrees F
  2. Mat Thickness, less than 3 inches: Minimum surface temperature – 45 degrees F

### 3.2. PREPARATION OF ASPHALT BINDER MATERIAL

- A. Heat the asphalt cement material avoiding local overheating and providing a continuous supply of the asphalt material to the mixer at a uniform temperature.
- B. The temperature of unmodified asphalts shall be no more than 325 degrees F when added to the aggregates.

### 3.3. PREPARATION OF MINERAL AGGREGATE

- A. Heat and dry the aggregate for the mixture prior to mixing.
- B. No damage shall occur to the aggregates due to the maximum temperature and rate of heating used.
- C. The temperature of the aggregate and mineral filler shall not exceed 350 degrees F when the asphalt cement is added.
- D. The temperature shall not be lower than is required to obtain complete coating and uniform distribution on the aggregate particles and to provide a mixture of satisfactory workability.

### 3.4. PREPARATION OF HOT-MIX ASPHALT MIXTURE

- A. The aggregates and the asphalt cement shall be weighed or metered and introduced into the mixer in the amount specified by the job mix formula.
- B. Mix the combined materials until the aggregate obtains a uniform coating of asphalt binder and is thoroughly distributed throughout the mixture.
- C. Wet mixing time shall be the shortest time that will produce a satisfactory mixture, but no less than 25 seconds for batch plants.
- D. Establish the wet mixing time for all plants based on the procedure for determining the percentage of coated particles described in ASTM D2489, for each individual plant and for each type of aggregate used.
- E. The wet mixing time will be set to at least achieve 95 percent of coated particles.
- F. The moisture content of all hot-mix asphalt upon discharge from the plant shall not exceed 0.5 percent by total weight of mixture as measured by ASTM D1461.

### 3.5. PREPARATION OF THE UNDERLYING SURFACE

- A. Immediately before placing the hot mix asphalt, clean the underlying course of dust and debris. Apply a prime coat in accordance with the contract specifications.

### 3.6. TESTING LABORATORY

- A. Submit certification of compliance. Use a laboratory to develop the job mix formula consistent with NCDOT Sections 609 and 610. The statement shall contain as a minimum:
  - 1. Qualifications of personnel; laboratory manager, supervising technician, and testing technicians.
  - 2. A listing of equipment to be used in developing the job mix.

3. A copy of the laboratory's quality control system.
4. Evidence of participation in the AASHTO Materials Reference Laboratory (AMRL) program.

### 3.7. TRANSPORTING AND PLACING

#### A. Transporting

1. Transport the hot-mix asphalt from the mixing plant to the site in clean, tight vehicles.
2. Schedule deliveries so that placing and compacting of mixture is uniform with minimum stopping and starting of the paver.
3. Provide adequate artificial lighting for night placements.
4. Hauling over freshly placed material will not be permitted until the material has been compacted as specified, and allowed to cool to 140 degrees F.
5. To deliver mix to the paver, use a material transfer vehicle operated to produce continuous forward motion of the paver.

#### B. Placing

1. Place and compact the mix at a temperature suitable for obtaining density, surface smoothness, and other specified requirements.
2. Upon arrival, place the mixture to the full width by an asphalt paver; it shall be struck off in a uniform layer of such depth that, when the work is completed, it will have the required thickness and conform to the grade and contour indicated.
3. Regulate the speed of the paver to eliminate pulling and tearing of the asphalt mat.
4. Unless otherwise permitted, placement of the mixture shall begin along the centerline of a crowned section or on the high side of areas with a one-way slope.
5. Place the mixture in consecutive adjacent strips having a minimum width of 10 feet.
6. The longitudinal joint in one course shall offset the longitudinal joint in the course immediately below by at least 1 foot; however, the joint in the surface course shall be at the centerline of the pavement.
7. Transverse joints in one course shall be offset by at least 10 feet from transverse joints in the previous course.
8. Transverse joints in adjacent lanes shall be offset a minimum of 10 feet.
9. On isolated areas where irregularities or unavoidable obstacles make the use of mechanical spreading and finishing equipment impractical, the mixture may be spread and luted by hand tools.

### 3.8. COMPACTION OF MIXTURE

- A. After placing, the mixture shall be thoroughly and uniformly compacted by rolling.
- B. Compact the surface as soon as possible without causing displacement, cracking, or shoving.
- C. The sequence of rolling operations and the type of rollers used shall be at the discretion of the Contractor.

- D. The speed of the roller shall, always be sufficiently slow to avoid displacement of the hot mixture and be effective in compaction.
- E. Any displacement occurring because of reversing the direction of the roller, or from any other cause, shall be corrected at once.
- F. Furnish sufficient rollers to handle the output of the plant.
- G. Continue rolling until the surface is of uniform texture, true to grade and cross section, and the required field density is obtained.
- H. To prevent adhesion of the mixture to the roller, keep the wheels properly moistened but excessive water will not be permitted.
- I. In areas not accessible to the roller, the mixture shall be thoroughly compacted with hand tampers
- J. Any mixture that becomes loose and broken, mixed with dirt, contains check-cracking, or is in any way defective shall be removed full depth, replaced with fresh hot mixture and immediately compacted to conform to the surrounding area.
- K. Skin patching will not be allowed.

### 3.9. JOINTS

- A. The formation of joints shall be performed ensuring a continuous bond between the courses and to obtain the required density.
- B. All joints shall have the same texture as other sections of the course and meet the requirements for smoothness and grade.
- C. Transverse Joints
  1. Do not pass the roller over the unprotected end of the freshly laid mixture, except when necessary to form a transverse joint.
  2. When necessary to form a transverse joint, it shall be made by means of placing a bulkhead or by tapering the course.
  3. The tapered edge shall be cut back to its full depth and width on a straight line to expose a vertical face prior to placing material at the joint.
  4. Remove the cutback material from the project.
  5. In both methods, all contact surfaces shall be given a light tack coat of asphalt material before placing any fresh mixture against the joint.
- D. Longitudinal Joints
  1. Longitudinal joints which are irregular, damaged, uncompacted, cold (less than 175 degrees F at the time of placing adjacent lanes), or otherwise defective, shall be cut back a maximum of 3 inches from the top of the course with a cutting wheel to expose a clean, sound vertical surface for the full depth of the course.
  2. Remove the cutback material from the project.



3. All contact surfaces shall be given a light tack coat of asphalt material prior to placing any fresh mixture against the joint.
4. The Contractor will be allowed to use an alternate method if it can be demonstrated that density, smoothness, and texture can be met.

### 3.10. QUALITY CONTROL

#### A. General

1. Develop and submit an approved quality control plan
2. Submit aggregate and quality control test results.
3. Do not produce hot-mix asphalt for payment until the quality control plan has been approved addressing all elements which affect the quality of the pavement including, but not limited to:
  - a. Mix Design.
  - b. Aggregate Grading.
  - c. Quality of Materials.
  - d. Stockpile Management.
  - e. Proportioning.
  - f. Mixing and Transportation.
  - g. Mixture Volumetrics.
  - h. Moisture Content of Mixtures.
  - i. Placing and Finishing.
  - j. Joints.
  - k. Compaction.
  - l. Surface Smoothness.

#### B. Quality Control Testing

1. Perform all quality control tests applicable to these specifications.
2. Develop a quality control testing plan as part of the quality control program.
3. The testing program shall include, but shall not be limited to
  - a. tests for the control of asphalt content,
  - b. aggregate gradation,
  - c. temperatures,
  - d. aggregate moisture,
  - e. moisture in the asphalt mixture,
  - f. laboratory air voids,
  - g. stability,
  - h. flow,
  - i. in-place density,
  - j. grade, and
  - k. smoothness.
4. Asphalt Content
  - a. A minimum of two tests to determine asphalt content will be performed per lot (a lot is defined in paragraph Material Acceptance) by one of the following methods:
    - 1) the extraction method in accordance with ASTM D2172, Method A or B,
    - 2) the ignition method in accordance with ASTM D6307, or

- 3) the nuclear method in accordance with ASTM D4125.
  - b. Calibrate the ignition oven or the nuclear gauge for the specific mix being used. For the extraction method, determine the weight of ash, as described in ASTM D2172, as part of the first extraction test performed at the beginning of plant production; and as part of every tenth extraction test performed thereafter, for the duration of plant production. The last weight of ash value obtained shall be used in the calculation of the asphalt content for the mixture.
5. Gradation
  - a. Determine aggregate gradations a minimum of twice per lot from mechanical analysis of recovered aggregate in accordance with ASTM D5444.
  - b. When asphalt content is determined by the ignition oven or nuclear method, aggregate gradation shall be determined from hot bin samples on batch plants, or from the cold feed on drum mix plants.
  - c. For batch plants, test aggregates in accordance with ASTM C136 using actual batch weights to determine the combined aggregate gradation of the mixture.
6. Temperatures
  - a. Check temperatures at least four times per lot, at necessary locations, to determine the temperature at the dryer, the asphalt cement in the storage tank, the asphalt mixture at the plant, and the asphalt mixture at the job site.
7. Aggregate Moisture
  - a. Determine the moisture content of aggregate used for production a minimum of once per lot in accordance with ASTM C566.
8. Moisture Content of Mixture
  - a. Determine the moisture content of the mixture at least once per lot in accordance with ASTM D1461 or an approved alternate procedure.
9. Laboratory Air Voids, Marshall Stability and Flow
  - a. Take mixture samples at least four times per lot compacted into specimens, using 50 blows per side with the hand-held Marshall hammer as described in ASTM D6926.
  - b. After compaction, determine the laboratory air voids of each specimen.
  - c. Stability and flow shall be determined for the Marshall-compacted specimens, in accordance with ASTM D6927.
10. In-Place Density
  - a. Conduct any necessary testing to ensure the specified density is achieved.
  - b. A nuclear gauge may be used to monitor pavement density in accordance with ASTM D2950.
11. Grade and Smoothness
  - a. Conduct the necessary checks to ensure the grade and smoothness requirements are met in accordance with paragraph Material Acceptance.
12. Additional Testing
  - a. Any additional testing, which the Contractor deems necessary to control the process, may be performed at the Contractor's option.
13. Quality Control Monitoring
  - a. Submit all quality control test results to the Owner daily as the tests are performed.
  - b. The Owner reserves the right to monitor any of the Contractor's quality control testing

and to perform duplicate testing as a check to the Contractor's quality control testing.

C. Sampling

1. When directed by the Owner, sample and test any material which appears inconsistent with similar material being produced, unless such material is voluntarily removed and replaced or deficiencies corrected by the Contractor.
2. All sampling shall be in accordance with standard procedures specified.

D. Control Charts

1. For process control, establish and maintain linear control charts on both individual samples and the running average of last four samples for the parameters listed in table below, as a minimum.
2. These control charts shall be posted as directed by the Owner and always kept current.
3. The control charts shall identify the project number, the test parameter being plotted, the individual sample numbers, the Action and Suspension Limits listed in the table applicable to the test parameter being plotted, and the Contractor's test results.
4. Target values from the JMF shall also be shown on the control charts as indicators of central tendency for the cumulative percent passing, asphalt content, and laboratory air voids parameters.
5. When the test results exceed either applicable Action Limit, take immediate steps to bring the process back in control.
6. When the test results exceed either applicable Suspension Limit, halt production until the problem is solved.
7. Use the control charts as part of the process control system for identifying trends so that potential problems can be corrected before they occur.
8. Make decisions concerning mix modifications based on analysis of the results provided in the control charts.
9. The Quality Control Plan shall indicate the appropriate action to be taken to bring the process into control when certain parameters exceed their Action Limits.
10. Table: Action and Suspension Limits for the Parameters to be Plotted on Individual and Running Average Control Charts

No. 4 sieve, Cumulative percent passing, deviation for JMF target; plus or minus values	6	8	4	5
No. 30 sieve, Cumulative percent passing, deviation for JMF target; plus or minus values	4	6	3	4
No. 200 sieve, Cumulative percent passing, deviation for JMF target; plus or minus values	1.4	2.0	1.1	1.5
Stability, pounds (minimum)				

75 Blow JMF	1800	1700	1900	1800
50 Blow JMF	1000	900	1100	1000
Flow, 0.01 inch				
75 Blow JMF	8 min.	7 min.	9 min.	8 min.
	16 max.	17 max.	15 max.	16 max.
50 Blow JMF	8 min.	7 min.	9 min.	8 min.
	18 max.	19 max.	17 max.	18 max.
Asphalt content, percent deviation from JMF target; plus or minus value	0.4	0.5	0.2	0.3
Laboratory Air Voids, percent deviation from JMF target value	No specific action and suspension limits set since this parameter is used to determine percent payment			
In-place Mat Density, percent of TMD	No specific action and suspension limits set since this parameter is used to determine percent payment			
In-place Joint Density, percent of TMD	No specific action and suspension limits set since this parameter is used to determine percent payment			

### 3.11. MATERIAL ACCEPTANCE

- A. Testing for acceptability of work will be performed by an independent laboratory hired by the Contractor, and open to Owner approval.
- B. Forward test results daily to the Owner.
- C. Sampling
  1. One random mixture sample for determining laboratory air voids, theoretical maximum density, and for any additional testing the Owner desires, will be taken from a loaded truck delivering mixture to each subplot, or other appropriate location for each subplot.
  2. All samples will be selected randomly, using commonly recognized methods of assuring randomness conforming to ASTM D3665 and employing tables of random numbers or computer programs.
  3. Laboratory air voids will be determined from three laboratory compacted specimens of each subplot sample in accordance with ASTM D6926.
  4. The specimens will be compacted within 2 hours of the time the mixture was loaded into trucks at the asphalt plant.
  5. Samples will not be reheated prior to compaction and insulated containers will be used as necessary to maintain the temperature.
- D. Additional Sampling and Testing
  1. The Owner reserves the right to direct additional samples and tests for any area which appears to deviate from the specification requirements.
  2. The cost of any additional testing will be paid for by the Owner.
  3. Testing in these areas will be in addition to the lot testing, and the requirements for these areas

will be the same as those for a lot.

E. Grade

1. The final wearing surface of pavement shall conform to the elevations and cross sections shown and shall vary not more than 0.05 foot from the plan grade established and approved at site of work.
2. Finished surfaces at juncture with other pavements shall coincide with finished surfaces of abutting pavements.
3. Deviation from the plan elevation will not be permitted in areas of pavements where closer conformance with planned elevation is required for the proper functioning of drainage and other appurtenant structures involved.
4. The grade will be determined by running lines of levels at intervals of 25 feet, or less, longitudinally and transversely, to determine the elevation of the completed pavement surface.
5. Within 5 working days, after the completion of a particular lot incorporating the final wearing surface, test the final wearing surface of the pavement for conformance with the specified plan grade.
6. Diamond grinding may be used to remove high spots to meet grade requirements.
7. Skin patching for correcting low areas or planning or milling for correcting high areas will not be permitted.

END OF SECTION

SECTION 32 31 00  
FENCES AND GATES

PART 1 GENERAL

1.1. SUMMARY

- A. The work to be performed in accordance with this Specification consists of furnishing all materials, equipment, supplies, and accessories and of performing all operations required in connection with the fabrication and installation of fences and gates as shown on the Drawings and specified herein.
- B. Fences and gates include:
  - 1. Chain link fences, including posts, rails, fittings, and fabric.
  - 2. Chain link aluminum cantilever slide gates, including frames, panels, fittings, fabric, and hardware.
  - 3. Chain link swing gates, including frames, fittings, fabric, and hardware.

1.2. REFERENCES

- A. Standards
  - 1. The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.
  - 2. ASTM International (ASTM)
    - a. ASTM A123 (2017) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
    - b. ASTM A307 (2021) - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60,000 PSI Tensile Strength.
    - c. ASTM A392 (2017) - Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric
    - d. ASTM A615 (2020) - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
    - e. ASTM C150 (2021) - Standard Specification for Portland Cement
    - f. ASTM C1107 (2020) Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
    - g. ASTM F567 (2019) Standard Practice for Installation of Chain Link Fence
    - h. ASTM F626 (2019) - Standard Specification for Fence Fittings
    - i. ASTM F900 (2017) Standard Specification for Industrial and Commercial Swing Gates
    - j. ASTM F1043 (2018) - Standard Specification for Strength and Protective Coatings on Steel Industrial Fence Framework
    - k. ASTM F1083 (2018) - Standard Specification for Pipe, Steel, Hot-Dipped Zinc Coated (Galvanized) Welded, for Fence Structures
  - 3. Chain Link Manufacturers Institute (CLFMI)
    - a. CLF-PM0610 (2017) – CLFMI Product Manual
  - 4. International Code Council (ICC)
    - a. ICC IBC (2021) – International Building Code

1.3. ADMINISTRATIVE REQUIREMENTS

- A. Coordination

1. Contractor to coordinate with Owner to determine gate locations, types, sizes, and quantities for the fence layout.

#### 1.4. SUBMITTALS

##### A. Action Submittals

1. Product Data
  - a. Installation Procedures
2. Shop Drawings
  - a. Location, plan, elevation, and details of fence, posts, rails, panels, foundations, anchorages, fittings, slats, reinforcements, and all other components and accessories, including attachments to other components.
  - b. Description of gate operation, and operational clearances.
  - c. Material descriptions, dimensions, and finishes of individual components and fittings, slats, panels, fabric, reinforcements, attachments, gates, and hardware.
3. Design Data
  - a. Design calculations, including all design parameters used, including material types, strength values, allowable stresses, assumed loads, and load combinations. Calculations ring the range of heights and loading conditions on the project and shall bear the seal of a registered professional engineer licensed in the project jurisdiction.

##### B. Informational Submittals

1. Certificates
  - a. Manufacturer certifications that products furnished comply with the requirements.

#### 1.5. QUALITY ASSURANCE

- A. Qualifications: Installer shall have completed fences similar in material, design, and extent to those indicated for this project and have a record of successful in-service performance.
- B. Field Measurements: Verify layout information for fences and gates indicated in the Drawings in relation to property survey and existing structures. Verify dimensions by field measurements.
- C. Obtain each color, grade, finish, type, and variety of component for fences from one source with resources to provide fences and gates of consistent quality in appearance and physical properties.

#### 1.6. DELIVERY, STORAGE, AND HANDLING

- A. Materials shall be stored in such a manner to ensure proper ventilation and drainage, and to protect against damage, weather, vandalism, and theft.

### PART 2 PRODUCTS

#### 2.1. CHAIN-LINK FENCE FABRIC

##### A. General

1. Provide fabric in one-piece heights measured between top and bottom of outer edge of selvage knuckle or twist according to "CLFMI Product Manual" and requirements indicated below:
2. Fabric Height

- a. 96 inches (8 feet) nominal fence height
3. Steel Wire for Fabric
  - a. Wire diameter as indicated on Drawings
  - b. Mesh Size: As indicated on Drawings
  - c. Zinc-Coated Fabric: ASTM A392, Type II, Class 1
4. Selvage
  - a. Twisted top and knuckled bottom
5. Finish
  - a. Black vinyl coated

## 2.2. CHAIN LINK FENCE FRAMEWORK

### A. Posts and Rails

1. ASTM F1043 for framework, including rails, braces, and line; terminal; and corner posts. Provide members with minimum dimensions and wall thickness according to ASTM F1043 based on the following:
  - a. Fence Height
    - 1) 96 inches (8 feet) nominal fence height
  - b. Posts
    - 1) As indicated on Drawings
  - c. Horizontal Framework Members Top rails as indicated on Drawings
2. Brace Rails ASTM F1043
3. Metallic Coating for Steel Framework
  - a. Type A: Not less than minimum 2.0-oz./sq. ft. average zinc coating according to ASTM A123
4. Finish
  - a. Black vinyl coated

## 2.3. CHAIN LINK SWING GATES

### A. General

1. ASTM F900 for gate posts and double swing gate types.
  - a. Framework Member Sizes and Strength Based on gate fabric height of 96 inches.
2. Finish
  - a. Black vinyl coated

### B. Pipe and Tubing

1. Zinc-Coated Steel
  - a. ASTM F1043 and ASTM F1083; protective coating and finish to match fence framework.

### C. Hardware

1. Hinges
  - a. 180-degree outward swing
2. Latch
  - a. Permitting operation from both sides of gate

## 2.4. CHAIN LINK FITTINGS

- A. Provide fittings according to ASTM F626.



- B. Rail and Brace Bands: For each gate, corner, pull, and end post.
- C. Tension and Brace Bands: Pressed steel.
- D. Tension Bars
  - 1. Steel, length not less than 2 inches shorter than full height of chain-link fabric.
  - 2. Provide one bar for each gate and end post, and two for each corner and pull post, unless fabric is integrally woven into post.
- E. Truss Rod Assemblies
  - 1. Steel, hot-dip galvanized after threading rod and turnbuckle or other means of adjustment.
- F. Tie Wires, Clips, and Fasteners
  - 1. Standard Round Wire Ties
    - a. For attaching chain-link fabric to posts, rails, and frames.
    - b. Hot-Dip Galvanized Steel: 0.106-inch diameter wire galvanized coating thickness matching coating thickness of chain-link fence fabric.
- G. Finish
  - 1. Metallic Coating for Pressed Steel or Cast Iron Not less than 1.2 oz./sq. ft. of zinc.
  - 2. Black Vinyl Coated

## 2.5. GROUT AND ANCHORING CEMENT

- A. Nonshrink, Nonmetallic Grout
  - 1. Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107.
  - 2. Provide grout, recommended in writing by manufacturer, for exterior applications.
- B. Anchoring Cement
  - 1. Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.
  - 2. Provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating, and that is recommended in writing by manufacturer for exterior applications.
- C. Concrete: Ready mixed concrete in accordance with Section 03 33 00 CAST IN PLACE CONCRETE; site delivered and placed in accordance with requirements of this section.

## PART 3 EXECUTION

### 3.1. EXAMINATION

- A. Do not begin installation before final grading is completed unless otherwise permitted by the Engineer.
- B. Examine areas and conditions, with Installer present, for compliance with requirements for site clearing, earth work, pavement work and other conditions affecting performance.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2. PREPARATION

- A. Stake location of fence lines and terminal posts. Do not exceed intervals of 500 feet or line of sight between stakes.
- B. Indicate location of utilities, irrigation system, underground structures, benchmarks, and property monuments.
- C. Prepare all work areas and components. Clean all debris from work area prior to installation.

### 3.3. CHAIN LINK FENCE INSTALLATION

- A. Install chain-link fencing according to ASTM F567 and more stringent requirements specified.
  - 1. Install fencing on established boundary lines inside property line.
- B. Post Excavation: Drill or hand-excavate holes for posts to diameters and spacings indicated, in firm, undisturbed soil.
- C. Post Setting
  - 1. Set posts in concrete at indicated spacing into firm, undisturbed soil.
  - 2. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete or mechanical devices.
  - 3. Concrete Fill: Place concrete around posts to dimensions indicated and vibrate or tamp for consolidation. Protect above ground portion of posts from concrete splatter.
  - 4. Exposed Concrete: Extend 2 inches above grade; shape and smooth to shed water.
- D. Terminal Posts
  - 1. Install terminal end, corner, and gate posts according to ASTM F567 and terminal pull posts at changes in horizontal or vertical alignment of 15 degrees or more.
  - 2. For runs exceeding 500 feet space pull posts an equal distance between corner or end posts.
  - 3. Locate horizontal braces at mid-height of fabric 72 inches or higher, on fences with top rail, and at two-third fabric height on fences without top rail.
  - 4. Install so posts are plumb when diagonal rod is under proper tension.
- E. Top Rail
  - 1. Install according to ASTM F567, maintaining plumb position and alignment of fence posts.
  - 2. Run rail continuously through line post caps, bending to radius for curved runs and terminating into rail end attached to posts or post caps fabricated to receive rail at terminal posts.
  - 3. Provide expansion couplings as recommended in writing by fencing manufacturer.
- F. Chain Link Fabric
  - 1. Apply fabric to outside of enclosing framework. Leave 2-inch bottom clearance between finish grade or surface and bottom selvage unless otherwise indicated.
  - 2. Pull fabric taut and tie to posts, rails, and tension wires.
  - 3. Anchor to framework so fabric remains under tension after pulling force is released.
- G. Tension or Stretcher Bars: Thread through fabric and secure to end, corner, pull, and gate posts, with tension bands spaced not more than 15 inches o.c.

- H. Tie Wires
  - 1. Use wire of proper length to firmly secure fabric to line posts and rails.
  - 2. Attach wire at one end to chain-link fabric, wrap wire around post a minimum of 180 degrees, and attach other end to chain-link fabric according to ASTM F626.
  - 3. Bend ends of wire to minimize hazard to individuals and clothing.
  - 4. Maximum Spacing: Tie fabric to line posts at 12 inches o.c. and to braces at 24 inches o.c.
- I. Fasteners: Install nuts for tension bands and carriage bolts on the side of fence opposite the fabric side.

#### 3.4. CHAIN LINK SWING GATE INSTALLATION

- A. Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference.
- B. Attach fabric as for fencing.
- C. Attach hardware using tamper-resistant or concealed means.
- D. Install ground-set items in concrete for anchorage.

#### 3.5. ADJUSTING

- A. Adjust hardware to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range.
- B. Confirm that latches and locks engage accurately and securely without forcing or binding.

END OF SECTION

SECTION 32 92 00  
TURF AND GRASSES

PART 1 GENERAL

1.1. SUMMARY

- A. The work to be performed in accordance with this Specification consists of furnishing all materials, equipment, supplies, and accessories and of performing all operations required in connection with the selection and installation of grasses for revegetation as shown on the Drawings and specified herein.
- B. Grasses for revegetation includes:
  - 1. Hydroseeding, and
  - 2. Sodding
- C. All work shall be completed in accordance with these specifications, the Drawings and Contract Documents, and in a manner consistent with accepted horticultural practices.
- D. All permits, licenses, and fees associated with any work under this Contract are the responsibility of the Contractor, unless otherwise noted.

1.2. PRICE AND PAYMENT PROCEDURES

- A. All work related to work in this specification is considered subsidiary to other bid items. There is no separate pay item.

1.3. REFERENCES

- A. Standards
  - 1. The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.
  - 2. Association of Official Seed Analysis (AOSA)
    - a. Rules for Testing Seeds
  - 3. North Carolina Department of Environmental Quality Sedimentation Control Commission (NCDEQ-SCC)
    - a. Erosion and Sediment Control Planning and Design Manual
  - 4. North Carolina Department of Transportation (NCDOT)
    - a. Erosion and Sediment Control Design and Construction Manual
  - 5. Turfgrass Producers International (TPI)
    - a. Guidelines Specifications to Turfgrass Sodding

1.4. SUBMITTALS

- A. Action Submittals
  - 1. Product Data
    - a. Grass Seed: For each grass seed monostand or mixture, stating the botanical and common name, percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging

- b. Turfgrass Sod: From each vendor, stating the botanical and common name, identification of source and name and telephone number of supplier
  - c. Fertilizer: Manufacturers guaranteed chemical analysis, name, trade name, trademark, and conformance to state law
  - d. Mulch
  - e. Tackifiers
  - f. Other Materials
- B. Informational Submittals
- 1. Preconstruction Submittals
    - a. Work Plan: Submit description of planned seed mix, preparation procedures, seeding rate, method, depth, and schedule of work.
    - b. Guarantees: Provide supplier guarantees for all products submitted
  - 2. Certificates
    - a. Certification of Grass Seed: From vendor for each grass-seed monostand or mixture, certifying submitted product data.
    - b. Certification of Turfgrass Sod: From vendor for each grass-seed monostand or mixture, certifying submitted product data

#### 1.5. DELIVERY, STORAGE, AND HANDLING

- A. All materials shall be stored in a manner that will prevent them from contacting precipitation, surface water, or any other contaminating substance.
- B. Seed and Other Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with state and federal laws, as applicable.
- C. Sod
- 1. Harvest, deliver, store, and handle sod according to manufacturer and requirements in "Specifications for Turfgrass Sod Materials" and "Specifications for Turfgrass Sod Transplanting and Installation" section in TPI's "Guidelines Specifications to Turfgrass Sodding."
  - 2. Deliver sod within 24 hours of harvesting and in time for planting promptly. Protect sod from breakage and drying.
- D. Bulk Materials:
- 1. Do not dump or store bulk materials near structures, utilities, walkways, and pavements, or on existing turf areas or plants.
  - 2. Provide erosion-control measures to prevent erosion or displacement of bulk materials; discharge of soil-bearing water runoff; and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
  - 3. Accompany each delivery of bulk materials with appropriate certificates.

#### 1.6. ADMINISTRATIVE REQUIREMENTS

- A. Coordination
- 1. The Contractor shall coordinate the actual start of the seeding operation with the Owner.
- B. Scheduling

1. Seeding shall be completed as soon as practical after the completion of final grading.
2. Planting Restrictions: Plant seeds approved for use during period of planting as indicated in the NCDEQ Erosion and Sediment Control Planning and Design Manual.
3. Weather Limitations
  - a. Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained.
  - b. Apply products during favorable weather conditions according to manufacturer's written instructions.

## PART 2 PRODUCTS

### 2.1. GENERAL

- A. All materials furnished shall be free of noxious weeds.

### 2.2. SEED

- A. Install grass seed in all areas where existing vegetation is damaged by construction activities, unless prior vegetation was an existing turfgrass, and as indicated in the Drawings.
- B. Grass Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Rules for Testing Seeds" for purity and germination tolerances.
- C. Hydroseed: The Contractor shall consult with professional hydroseed applicators to select and provide the appropriate native grass seed(s) of species consistent with the vegetation currently present at the site. The seed mix must be specified or otherwise approved by restoration ecologists; no substitutions are allowed.
- D. Seed Species: Plant seeds approved for use during period of planting as indicated in the NCDEQ-SCC Erosion and Sediment Control Planning and Design Manual.
- E. Local Requirements
  1. Consult NCDEQ-SCC "Erosion and Sediment Control Planning and Design Manual"
  2. Consult the NCDOT "Erosion and Sediment Control Design and Construction Manual"

### 2.3. SOD

- A. Install turfgrass sod wherever existing turfgrass is damaged by construction activities and as indicated in the Drawings. Damage caused outside of the limits of construction will be installed at the Contractor's expense.
- B. Sod complying with "Specification for Turfgrass Sod Materials" in TPI's "Guidelines Specifications to Turfgrass Sodding."
- C. Furnish viable sod of uniform density, color, and texture that is strongly rooted and capable of vigorous growth and development when planted.
- D. Turfgrass species for sod shall match the existing turfgrass species

#### 2.4. FERTILIZERS

- A. Utilize fertilizers as required by NCDEQ-SCC Erosion and Sediment Control Planning and Design Manual.
- B. All fertilizer shall be a standard commercial product of uniform composition, free flowing, dry, and conforming to applicable state and federal laws.
- C. It shall be delivered in original, unopened containers showing composition and quantity, unless provisions are made and approved by the Owner for bulk deliveries to the site of the work.
- D. No cyanamide compounds will be permitted in fertilizers.

#### 2.5. MULCHES

- A. Utilize mulch as required by NCDEQ-SCC Erosion and Sediment Control Planning and Design Manual.

#### 2.6. HYDRAULIC MULCH

- A. Hydraulic mulch material shall consist of at least ninety (90%) percent virgin wood cellulose fiber and be free of any substance or factor that might inhibit germination or growth of grass seed. The wood cellulose fibers shall have the property of becoming evenly dispersed and suspended when agitated in water.
- B. Hydraulic mulch shall be clean and shall not contain the seeds of noxious weeds or unspecified grasses.
- C. Hydraulic mulch shall be dyed a color to allow visual metering of its application.
- D. When sprayed uniformly on the surface of the soil, the fibers shall form a blotter-like ground cover that readily absorbs water and allows infiltration to the underlying soil
- E. Weight specifications for hydraulic mulch from suppliers and for all applications shall refer only to air-dry weight of the fiber, a standard equivalent to ten (10%) percent moisture.
- F. The hydraulic mulch material shall be supplied in packages having a gross weight not in excess of one hundred (100) pounds and shall be marked by the manufacturer to show the air-dry weight content.

#### 2.7. WATER

- A. All water used on projects under this Contract shall be free of any substances harmful to plant germination and growth or to the environment in general.
- B. The Contractor shall be responsible for furnishing and applying water that meets these requirements.
- C. The Owner may submit samples of water used on any project for laboratory analysis (of a reasonable number and kind) to ensure the acceptable quality of water.

#### 2.8. EROSION BLANKETS

- A. Where indicated on the Drawings, or where slopes to be seeded are steeper than 3:1, erosion blankets

will be required after seeding and hydraulic mulching.

- B. Blankets shall be biodegradable with single-sided netting.

## PART 3 EXECUTION

### 3.1. GENERAL

- A. Notice to Proceed
  1. The Contractor shall inform the Owner when they are ready to commence permanent revegetation.
  2. Upon agreement with the Contractor's preparation for this work the Owner shall provide the Contractor with a Notice to Proceed.
  3. The Contractor shall begin and complete the work as specified in this section.

### 3.2. INSTALLERS

- A. All work is to be performed by personnel thoroughly familiar with proper and accepted methods for soil preparation, herbicide applications, fertilizing, sodding, etc.
- B. All work is to be performed under the direct supervision of the Contractor's superintendent, who shall be thoroughly familiar with the provisions of this Contract.

### 3.3. EXAMINATION

- A. Examine areas to be planted for compliance with requirements and other conditions affecting installation and performance of the Work.
  1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
  2. Suspend planting operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
  3. Uniformly moisten excessively dry soil that is not workable or which is dusty.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Engineer and replace with new planting soil.

### 3.4. PREPARATION

- A. Protect structures; utilities; sidewalks; pavements; and other facilities, trees, shrubs, and plantings from damage caused by planting operations.
- B. Protect adjacent and adjoining areas from hydroseeding and hydro mulching overspray.
- C. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.



D. Seeded Areas Preparation

1. Prepare planting area for soil placement and mix planting soil.
2. Limit subgrade preparation to areas that will be planted in the immediate future.
3. All surfaces to be seeded shall be mechanically roughened immediately prior to seeding in a manner consistent with the referenced erosion control best management practices and described below.
  - a. Roughened surfaces will better retain water for adsorption and resist erosion until the grass becomes established.
  - b. All ripping and tilling operations shall be done in a direction that follows the natural contour of the land on slopes 3:1 or flatter.
  - c. Soils on slopes steeper than 3:1 will be roughened by tracked vehicles with indentations following the natural contours, or in a manner otherwise submitted by the Contractor and approved by the Engineer.
  - d. Any gross irregularities in the ground surface resulting from soil preparation operations shall be corrected to comply with finished grade requirements and sloped to drain.
4. Thoroughly till or rip all areas which are to be seeded that previously supported vehicular traffic to a depth of 12 inches. Till all remaining areas to a depth of 6 inches.
5. The soils shall be worked until no clods greater than 2 inches in diameter remain, unless directed otherwise by the Owner. Remove rocks and other objects 2 inches or greater in any dimension.
6. Moisten prepared areas to be seeded prior to planting when soils are dry. Water thoroughly and allow surface to adsorb free standing water before seeding. Do not create muddy conditions.
7. Before planting, obtain Engineer's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.
8. Restore prepared areas if eroded or disturbed after fine grading and before planting.

E. Sodding Areas Preparation

1. Preparation
  - a. Prepare planting area for soil placement and mix planting soil.
  - b. Reduce elevation of planting soil to allow for soil thickness of sod.
  - c. Moisten prepared area before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.
2. Before laying sod, obtain Engineer's acceptance of finish grading; restore planting areas if eroded or otherwise disrobed after finish grading. Eroded areas outside of limits of construction are to be paid for by Contractor.

3.5. SEEDING

- A. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph.
  1. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.
  2. Do not use wet seed or seed that is moldy or otherwise damaged.
  3. Do not seed against existing trees.
- B. Apply seed as directed in NCDEQ-SCC Erosion and Sediment Control Planning and Design Manual.

3.6. SODDING

1. Lay sod within 24 hours of harvesting.
2. Do not lay sod if dormant or if ground is frozen or muddy.

3. Lay sod to form a solid mass with tightly fitted joints.
4. Butt ends and sides of sod; do not stretch or overlap.
5. Stagger sod strips or pads to offset joints in adjacent courses.
6. Avoid damage to soil or sod during installation.
7. Tamp and roll lightly to ensure contact with soil, eliminate air pockets, and form a smooth surface.
8. Work sifted soil or fine sand into minor cracks between pieces of sod; remove excess to avoid smothering sod and adjacent grass.

### 3.7. FERTILIZATION

- A. Any fertilizers specified by the seed provider shall be applied and mixed with the soil as specified.
- B. In some instances, as directed by the Owner, fertilizers will be spread evenly on the surface of the soil rather than tilled into the top four (4) inches.
- C. All fertilizers shall be applied using standard application equipment at rates indicated by soils tests, or in some cases as specified by the Owner.

### 3.8. HERBICIDE/CHEMICAL APPLICATIONS

- A. Herbicides or other chemicals, if required, shall be applied using well-maintained spraying equipment by individuals working for the Contractor who are appropriately licensed by any state and/or federal agency having jurisdiction over such applications. It shall be the responsibility of the Contractor to be knowledgeable of any and all current laws and regulations pertaining to herbicide and other chemical applications, and to advise the Owner immediately if any requests for these applications made by the Owner are inappropriate as they pertain to these laws and regulations.
- B. Herbicides and other chemicals shall not be applied during periods when wind or other physical conditions cause the herbicides or chemical to be transported more than five (5) feet from the immediate area where they are being placed. It shall be the responsibility of the Contractor to stop work immediately and to notify the Owner if any weather or other physical condition exists that would make the application of herbicides or other chemical inappropriate.
- C. All herbicides or other chemicals used (except solid fertilizers) shall be applied at a rate and strength, and by the method recommended by the manufacturer of the product being used.

### 3.9. EROSION BLANKETS

- A. When required on slopes, deploy and stake erosion control blankets on top of the completed seeded and mulched surface in accordance with the Drawings or referenced best management practices.
- B. Slopes over three to 1 (3:1), concave areas on slopes, drainage swales, areas along the edges of hard surfaces (trails and roads), and any other areas which may rill shall be mulched with jute netting or other erosion control fabric as specified in Drawings.
- C. Installation
  1. Erosion control fabrics shall be installed only after the installation area is graded smooth.
  2. All clods or rocks shall be removed from the area, so that the fabric will lie flat on the surface of the soil and not bridge over it.

3. The edges of the fabric shall be secured by two- (2-) foot wooden stakes installed two (2) feet on center along all edges and seams.
4. Seams shall overlap one (1) foot and the body of the fabric shall be further secured to the soil surface on three- (3-) foot centers.
5. The fabric shall not be stretched tight.

### 3.10. REPAIR

- A. Any damage (e.g. damaged fencing, damaged road surfaces, excessive tire furrows, mud tracked onto pavement, etc.) resulting from the Contractor's or their subcontractors activities shall be repaired or corrected by the Contractor to the Owner's satisfaction at no expense to the Owner.

### 3.11. CLEANING

- A. The work site shall be kept clean and free from all debris.
- B. Promptly remove soil and debris created by turf work from paved areas.
- C. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.
- D. Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of them.
- E. At the conclusion of work, the Contractor shall remove and haul from the site all excess materials, debris, and equipment.

### 3.12. PROTECTION

- A. It shall be the responsibility of the Contractor to locate and protect all utilities, structures, roadways, parking areas, fences, survey markers, existing vegetation (e.g. trees), etc. on all work sites.

### 3.13. TURF MAINTENANCE

- A. General
  1. Maintain and establish turf by watering as required to establish healthy, viable turf.
  2. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth turf.
  3. Provide materials and installation the same as those used in the original installation.
- B. Watering
  1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch.
  2. Water turf with fine spray at a minimum rate of 1 inch per week unless rainfall precipitation is adequate. Continue watering until grass is established

### 3.14. FINAL ACCEPTANCE

- A. When work has been completed for the project, the Contractor and the Owner shall inspect the site together and determine the total area of the work, and whether the work is complete and has been performed in accordance with the Contract Documents and Specifications.

- B. If mutual agreement cannot be reached on these issues, the determinations made by the Owner shall be final.
- C. Deficiencies in the work, if any, shall be noted and a checklist of these deficiencies given to the Contractor by the Owner.
- D. The Contractor shall immediately correct any deficiencies listed on the checklist at no cost to the Owner.
- E. When all checklist items are completed to the satisfaction of the Owner, the Contractor shall then submit these items for payment to the Owner.

### 3.15. GUARANTEE AND REPLACEMENT

- A. The purpose of this guarantee is to ensure that the Owner receives seed of prime quality, installed and maintained in a thorough and careful manner throughout the warranty period.
- B. Warranty Period
  - 1. For a period of two years after the date of "Substantial Completion of the Contract," the Contractor shall maintain and guarantee all seeded areas to be in a vigorous, healthy growing condition.
  - 2. The Contractor shall re-seed any areas that are dead, diseased, sparse, or in the opinion of the Owner in an unhealthy condition at no additional cost to the Owner.
  - 3. Reseeding operations shall be performed by the Contractor within ten days of notification from the Owner.
- C. Seed Establishment Period:
  - 1. Seed establishment period shall begin upon notice of "Substantial Completion of the Contract" given by the Owner in writing.
  - 2. Areas seeded shall be inspected for required coverage approximately five (5) months after "Substantial Completion of the Contract".
    - a. In those cases, inspections shall be completed before or after the dormant season as determined by the Owner.
  - 3. Required performance for seeded areas shall be a healthy, well-rooted, even-colored, viable grass stand that is established, free of weeds, open joints, bare areas and surface irregularities.
  - 4. After the inspections, it is the Contractor's responsibility to perform any required maintenance within one week to insure a healthy established seeded condition.
- D. Maintenance: Maintain all seeded areas to one year from the date of "Final Completion of the Contract."
  - 1. Weed Control
    - a. Apply appropriate herbicide(s) in accordance with manufacturer's suggested rate(s) to control weeds.
    - b. Herbicide application must comply with all requirements of herbicide/pesticide applicator license, including suitable warning/signing following application.
  - 2. Disease and Insect Control: Apply fungicides and insecticides as required to control diseases and insects by a licensed applicator in accordance with state law requirements.
  - 3. Watering
    - a. The Contractor shall be responsible for watering of seeded areas if it deems necessary

- to insure performance under this section.
- b. Apply only the amount of water necessary to maintain seeded areas in a healthy condition until the end of the warranty period.
  - c. Reduce amount of water after seed is established.
  - d. Avoid standing water, surface wash, or erosion from over-watering.
4. Protection:
- a. Provide sufficient barriers and signage notifying the public to keep off newly seeded area.
  - b. Repair reseeded areas that have washed out or are eroded with new soil, seed, and appropriate erosion and sedimentation control measures.
5. Inspection:
- a. The Contractor shall notify the Owner prior to watering, fertilizing, and spraying operations.
  - b. At the time of the first inspection, the Owner shall evaluate the seeded area with the Contractor to determine that maintenance is sufficient to insure a healthy condition of the seeding work.
  - c. At this time, a second inspection will be agreed upon between the Owner and the Contractor, if deemed necessary.

END OF SECTION

SECTION 33 05 05.01  
BURIED PIPING (PRESSURE SERVICE)

PART 1 GENERAL

1.1. SUMMARY

- A. The work to be performed in accordance with this Specification consists of furnishing all materials, equipment, supplies, and accessories and of performing all operations required in connection with the fabrication and installation of a buried piping for pressure service as shown on the Drawings and specified herein.
- B. Buried piping for pressure service includes:
  - 1. Polyvinyl Chloride pipe (PVC)
  - 2. Ductile iron pipe (DIP)
  - 3. HDPE pipe
  - 4. Associated fittings
  - 5. Related appurtenances
- C. All materials shall be new and the best available. All material used shall be manufactured and supplied according to the latest revised standards of the American Water Works Association, the American National Standards Institute, and the American Society for Testing and Materials, or as mentioned hereinafter.
- D. Related Sections:
  - 1. Exposed piping systems and appurtenances, located indoors, aboveground, and in vaults, are specified in Section 40 05 05.
  - 2. Valves associated with buried pipeline systems are specified in Section 40 05 50.
  - 3. Identification requirements for buried pipelines, including warning tape and tracer wire, are specified in Section 33 05 98.
  - 4. Trenchless methods for installation of buried piping are specified in Section 33 05 07.23 for Utility Boring and Jacking and Section 33 05 23.13 for Utility Horizontal Directional Drilling.

1.2. PRICE AND PAYMENT PROCEDURES

- A. Measurement and Payment
  - 1. Pump Station Piping
    - a. Payment shall be subsidiary to the pump station item and is not a separate pay item.
  - 2. Force Main Piping
    - a. Payment shall be based on linear feet of installed buried pressure pipe of size as indicated in the Drawings.
    - b. Distance shall be measured from the transition to force main outside the pump station valve vault to the center of the terminal manhole.
    - c. Unit price for buried pressure pipe shall include excavation, pipe, bedding, backfill, compaction, surface restoration, and all other materials, labor, equipment, tools, and supplies necessary to complete the installation of buried pressure pipe.

1.3. REFERENCES

**A. Standards**

1. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.
2. American Society for Testing and Materials (ASTM)
  - a. A307 (2021) - Standard Specification for Carbon Steel Bolts, Studs, And Threaded Rod 60,000 PSI Tensile Strength
  - b. A536 (2019) - Standard Specification for Ductile Iron Castings
  - c. D1784 (2020) – Standard Classification System and Basis for Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
  - d. D2239 (2021) - Standard Specification for Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter
  - e. D2241 (2020) - Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)
  - f. D2657 (2015) - Standard Practice for Heat Fusion Joining of Polyolefin Pipe and Fittings
  - g. D2774 (2021) - Standard Practice for Underground Installation of Thermoplastic Pressure Piping
  - h. D3139 (2019) – Standard Specification for Joints for Plastic Pressure Pipes using Flexible Elastomeric Seals
  - i. D3261 (2016) - Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing
  - j. D3350 (2021) - Standard Specification for Polyethylene Plastics Pipe and Fittings Materials
  - k. F477 (2021) – Standard Specification for Elastometric Seals (Gaskets) for Joining Plastic Pipe
  - l. F1688 (2022) – Standard Guide for Construction Procedures for Buried Plastic Pipe
3. American National Standards Institute (ANSI)
  - a. B31.1 (2020) – Power Piping
4. American Water Works Association (AWWA)
  - a. C104 (2016) - Cement-Mortar Lining for Ductile-Iron Pipe and Fittings
  - b. C110 (2021) - Ductile-Iron and Gray-Iron Fittings
  - c. C111 (2017) - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
  - d. C115 (2020) - Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges
  - e. C151 (2017) - Ductile-Iron Pipe, Centrifugally Cast
  - f. C153 (2019) - Ductile-Iron Compact Fittings
  - g. C900 (2016) - Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 60 In. (100 mm Through 1,500 mm)
  - h. C901 (2020) - Polyethylene (PE) Pressure Pipe and Tubing 3/4 In. (19 mm) Through 3 In. (76 mm) for Water Service
  - i. C906 (2021) - Polyethylene (PE) Pressure Pipe and Fittings, 4 In. Through 65 In. (100 mm Through 1,650 mm) for Waterworks
5. City of Morganton
  - a. Construction Specifications for Water Lines

**1.4. ADMINISTRATIVE REQUIREMENTS****A. Coordination**

1. The existing system must at all times remain under the control of the Owner. The Contractor shall

- operate no valves or hydrants on the system without permission of the Owner.
2. Service Interruptions, Shut Downs, and Continuity of Service
    - a. Take precautions as necessary to minimize interruption of all utility services and will be responsible for restoration of service.
    - b. Service shall not be disrupted for more than a four-hour period. If a longer shutdown period will be necessary, provide a temporary service to the customer, subject to the review and approval of the Engineer.
    - c. Coordinate service interruptions with the Owner and affected parties.
    - d. No interruption of service shall be permitted without prior approval.
    - e. Provide at least two (2) days' notice and make appropriate arrangements with the Owner and affected parties prior to shut down. Notice shall include when supply will be discontinued, when it will be resumed, and contact information.
    - f. Schedule shutdowns for periods of minimum use and at the Owner's and affected parties' convenience.
    - g. Have all material, equipment, and personnel on hand prior to beginning any work involving a potential shutdown.
    - h. Perform work in a manner that reduces the shutdown time to the minimum.
    - i. In some cases, an increased number of personnel or night or weekend work may be necessary.
  3. Submit a proposed plan for review and coordination.

B. Sequencing

1. Cut Ins and Connecting to Existing System
  - a. All points at which the existing piping systems are to be disconnected and connected to the new pipelines are shown on the Drawings.
  - b. Connections to the existing system shall be completed after new pipeline, valves, thrust blocks and other appurtenances are installed and tested.
  - c. Connections shall be done in accordance with the details given for each point of disconnection or reconnections.
  - d. At each point of connecting new pipes to existing pipes, expose the existing pipe and locate a good sound point at which to cut the existing pipe off square. Then provide and install the approved transition coupling or sleeve suitable for connecting the two types of pipe. If both pipes are DIPS compatible, a mechanical joint solid sleeve with mechanical restraints is preferred in lieu of a coupling, unless indicated otherwise.
  - e. Submit a proposed plan for review and coordination.

1.5. SUBMITTALS

- A. Submit the following in accordance with Section 01 33 00:
1. Affidavit of compliance with AWWA and other referenced standards.
  2. Manufacturer's installation instructions and recommendations.
  3. Manufacturer's literature and product data sufficient to demonstrate compliance with the specified requirements. Highlight proposed products and features, cross out extraneous information.
  4. Pressure, Leakage, Disinfection, and other test results.
  5. Contractor's plan for connecting to service interruptions and connections to the existing system.

1.6. PRODUCT HANDLING



- A. Pipe, fittings, and all other accessories shall be loaded and unloaded by lifting with hoists or skidding to avoid shock or damage to them. Under no circumstances shall any materials be dropped. Pipe handled on skidways shall not be skidded or rolled against pipe already on the ground. Skidding which damages protective coatings will not be permitted.
- B. In distributing the material at the site of the work, each piece shall be unloaded opposite or near the place where it is to be laid in the trench to prevent moving more than once.
- C. All pipe and fittings shall be so handled that the coating and lining will not be damaged. If, however, any part of the coating or lining is damaged, the repair shall be by the Contractor at their expense in a manner satisfactory to the Engineer. Any area damage beyond repair must be cut off and discarded.
- D. Do not store materials directly on the ground. Use opaque covers to protect PVC materials from direct sunlight (UV light).
- E. All pipe will be field inspected at the job site and checked for conformance to these specifications. Pipe and fittings will be checked for out-of-round or damaged joints, interior and exterior surface damage, gasket damage and the other requirements listed herein. Any pipeline or appurtenant material found defective will be rejected. Any material rejected at the job site shall be marked "Rejected," and the Contractor shall remove it immediately from the job site.

#### 1.7. SITE CONDITIONS

- A. Other Utilities and Potholing
  - 1. The type, size, location, and number of known underground facilities have been shown on the Drawings based on information available to the Engineer at the time of design; however, no guarantee is made as to the true type, size, location, or number of such facilities, or that all facilities are shown. It shall be the sole responsibility of the Contractor to verify the existence and location of all underground utilities along the route of the work. The omission from, or the inclusion of, utility locations on the Drawings is not to be considered as the nonexistence of, or a definite location of, existing underground utilities.
  - 2. If existing utilities were potholed during design, that information is shown or identified as such on the Drawings. If a certain utility is not identified as potholed, then its depth on the profile might be based on a reasonable assumption or on other available information such as nearby surveyed manhole invert elevations, valve nut measure-downs, record drawings, or other information as may or may not be indicated. If horizontal or vertical locations of existing utilities are found to be in conflict through the Contractor's own supplemental potholing efforts or during construction, then coordinate with the Engineer to adjust the elevation or location of the new pipeline to achieve adequate clearance from the existing utility or other agreed upon measure to resolve the conflict.
  - 3. The Engineer may not have independently verified any pothole information shown on the Drawings and is not responsible for the accuracy and completeness of utility locating and potholing work. Utility locates and potholing results are provided for the Contractor's convenience only. Reliance upon utility data depicted on the Drawings for risk management purposes during bidding does not relieve the Contractor from following all applicable utility damage prevention statutes, required use of 811, and/or other required or best practices during construction. It is important that the Contractor investigates and understands the scope of work between the Owner and Engineer regarding the scope and limits of the utility investigation leading

to the utility depictions shown on the Drawings. It may be necessary for the Contractor to provide for their own supplemental utility locating and/or potholing prior to excavating or ordering material to the extent they feel is necessary to complete the work safely and successfully.

B. Existing System, Continuity Of Service, Cut-Ins, And Shut-Downs

1. The existing system must at all times remain under the control of the Owner. The Contractor shall operate no valves or hydrants on the system without permission of the Owner.
2. The Contractor shall coordinate service interruptions with the Owner and affected parties. No interruption of service shall be permitted without prior approval. Give at least two (2) days' notice and make appropriate arrangements with the Owner and affected parties prior to shutdown. Schedule shutdowns for periods of minimum use and at the Owner's and affected parties convenience. Have all material, equipment, and personnel on hand prior to beginning any work involving a potential shutdown. Perform work in a manner that reduces the shutdown time to the minimum. In some cases, an increased number of personnel or night or weekend work may be necessary. The Contractor shall take precautions as necessary to minimize interruption of all utility services and will be responsible for restoration of service.
3. At any time that a customer on the existing system will be deprived of service, the Contractor shall advise such customer at least 2 days in advance when the service will be discontinued and when the service will again be available. Service shall not be disrupted for more than a four-hour period. If a longer shutdown period will be necessary, the Contractor shall provide a temporary service to the customer, subject to the review and approval of the Engineer.
4. All points at which the existing piping systems are to be disconnected and connected to the new pipelines are shown on the Drawings. Connections to the existing system shall be completed after new pipeline, manholes and other appurtenances are installed and tested. Connections shall be done in accordance with the details given for each point of disconnection or reconnections. At each point of connecting new pipes to existing pipes, the Contractor shall expose the existing pipe and locate a good sound point at which to cut the existing pipe off square. He shall then provide and install the approved transition coupling or sleeve suitable for connecting the two types of pipe.

## PART 2 PRODUCTS

### 2.1. GENERAL

- A. All pipe, fittings, couplings, and appurtenant items shall be new, free from defects or contamination, and wherever possible shall be the standard product of the manufacturer. They shall be furnished in pressure or thickness classes as specified or shown. All pipe shall have joints as called for in the specifications or indicated on the Drawings.
- B. All bell and spigot pipe and fittings shall allow a minimum of one degree of deflection and still meet all other specification requirements including pressure rating, leak prevention, and thrust restraint.

### 2.2. HARDWARE MATERIALS

- A. Hardware used for the assembly of piping systems, flanges, joints, and appurtenances (including coupling bolts, tie rods, mechanical restraint systems, and the like) shall comply with the following:
  1. Interior dry locations, or exterior above grade: Hot dip galvanized steel.

2. Moist locations (any interior or exterior space wholly or partially below grade level including vaults or pits, or having a wall or ceiling forming head space of part of a clean water channel or basin): Type 304 Stainless Steel with "Never Gall" (or equivalent) factory applied coating system.
3. Submerged locations and in corrosive areas (corrosive meaning spaces with NEC electrical classifications of Class 1 Divisions 1 and 2, in chemical storage and pumping areas, and in head space of channels or basins containing process liquids): Type 316 stainless steel with "Never Gall" (or equivalent) factory applied coating system.
4. Buried in earth: Type 304 stainless steel with "Never Gall" (or equivalent) factory applied coating system. Tie rods shall be Type 304 stainless steel in all cases.

### 2.3. DUCTILE IRON PIPE, FITTINGS, AND APPURTENANCES

- A. Pipe: Ductile-iron pipe, conforming to AWWA C151/ A21.51. Provide pressure class 350 for all pipe 12-inch and smaller.
- B. Joints: Ductile iron pipe shall be flanged, push-on, or mechanical joint as shown on the Drawings. In general, flanged pipe shall be used above ground or where exposed in vaults etc., while push-on or mechanical joint will be used where buried in earth.
  1. Mechanical and Push-On: In accordance with AWWA C111/ A21.11.
  2. Flanged joints: In accordance with Section 40 05 05.
  3. Gasket compound: EPDM compound shall be provided for sewage, sludge, and reclaimed water.
- C. Fittings:
  1. Ductile-iron conforming to the requirements set forth in AWWA C110/ A21.10 or AWWA C153/ 21.53. Provide Class 250 minimum. Joint type shall be as specified above, and as shown on the Drawings or appropriate for the installation location.
  2. All mechanical joint solid sleeves shall be long pattern.
- D. Spools and Wall Pipe:
  1. Spools may be cast as fittings in accordance with AWWA C110 or fabricated from Special Thickness Class 53 ductile iron pipe in accordance with AWWA C115. Wall pipe shall have collars integrally cast. Collars shall be located so as to be in the center of the concrete wall or floor into which they are to be placed.
- E. Interior Lining:
  1. Pipe, spools and fittings shall be cement mortar lined and seal coated in accordance with AWWA C104/ A21.4. Lining shall be recommended by manufacturer for sewer service. Linings in contact with potable water shall be NSF 61 approved.
- F. Exterior Coating:
  1. Pipe, spools, and fittings to be buried in earth or installed within below-grade vaults shall be furnished with standard thickness asphalt coating per AWWA C151.
  2. Pipe, spools, and fittings to be installed above ground shall be in accordance with Section 40 05 05.
  3. Pipe, spools, and fittings to be installed in submerged locations shall be supplied by the factory bare, for shop blasting and application of the specified submerged protective coating system. Asphalt coated or prime coated pipe shall not be used in exposed or submerged locations.

- G. Thrust Restraint:
1. All pressurized ductile iron piping systems shall be fully restrained against thrust. Thrust restraint shall be achieved by the use of both concrete thrust blocks and mechanical restraints.
  2. Thrust blocks shall be installed in accordance with the detail shown on the Drawings. Concrete shall be Class A, Type II, and have a minimum 28-day compressive strength of 3,000 psi. Concrete shall be placed against polywrapped fittings – never against bare fittings.
  3. Mechanical restraints shall be installed to the minimum restrained lengths shown on the detail on the Drawings, for horizontal and vertical bends, other fittings, valves, and dead-ends. Restraints shall conform to the following:
    - a. Push-On Joint Restraints:
      - 1) Restraint ring with serrated wedges on the spigot end of the pipe, with a split bell ring that engages behind the bell without serrations on the other. Ductile iron construction per ASTM A536 with epoxy protective coating, hardware material as specified elsewhere herein. EBBA Iron Megalug Series 1700, equivalent by Star with premium epoxy coating option, or approved equal.
      - 2) As an alternative, proprietary restrained pipe joints may be provided as approved for both pipe and fittings; TR FLEX as manufactured by U.S. Pipe, or equal, and meeting the requirements for ductile iron pipe and fittings specified elsewhere herein. Restrained push-on joint pipe and fittings shall be capable of being deflected after assembly. Any special assembly tools recommended by the manufacturer shall be supplied to the Owner.
    - b. Mechanical Joint Restraints: Restraint ring with serrated wedges and incorporating a follower gland, designed to bolt to a mechanical joint drilling pattern. Ductile iron construction per ASTM A536 with epoxy protective coating, hardware material as specified elsewhere herein. EBBA Iron Megalug Series 1100, equivalent by Star with premium epoxy coating option, or approved equal.

#### 2.4. POLYVINYL CHLORIDE (PVC) PIPE (4 THROUGH 12 INCHES IN DIAMETER)

- A. Pipe:
1. The pipe shall conform to AWWA C900 “Polyvinyl Chloride (PVC) Water Transmission Pipe, Nominal Diameters 4 inch through 12 inch.” The pipe material shall be of new source, conform to ASTM D1784 Cell Classification 12454.
  2. Pipe shall be integrally colored in accordance with the service. Green-colored pipe shall be provided for pressure sanitary force main or sludge service. If a particular color pipe is not available or is a significant cost premium, the Engineer may approve installation of color-coded polywrapping around pipe of an available color which shall be provided at no additional cost. Seek clarification from the Engineer.
  3. Provide Pressure Class 235, DR18, unless specified otherwise on the Drawings.
  4. Joints will provide for contraction and expansion at each joint with a rubber ring, and integral thickened bell as part of each joint. Integral joints shall conform to ASTM D3139. Gaskets shall conform to ASTM F477. Pipe shall be supplied in nominal laying lengths of 20 feet. All pipe and fittings shall be assembled with a non-toxic lubricant. Each length of pipe shall have marked on the exterior the following:
    - a. Manufacturer’s Name or Trademark
    - b. Nominal Pipe Size/Dimension Ratio

- c. PVC Cell Classification (e.g. 12454-B)
    - d. Legend – Type AWWA C900 Pressure Pipe
  - B. Fittings: Ductile iron with mechanical joints as specified elsewhere herein.
  - C. Thrust Restraint: All pressurized PVC piping systems shall be fully restrained against thrust. Thrust restraint shall be achieved by the use of mechanical restraints.
    - 1. Mechanical restraints shall be installed to the minimum restrained lengths shown on the details on the Drawings, for horizontal and vertical bends, other fittings, valves and dead-ends. Restraints shall conform to the following:
      - a. Straight Pipe: Split ring, with continuous serrations around the full circumference on the spigot end of the joint, and a non-serrated ring that rests against the back of the bell on the opposite end of the joint. Ductile iron construction per ASTM A536 with protective epoxy coating, hardware material as specified elsewhere herein. EBBA Iron Series 1600 for C900 pipe, equivalent by Star with premium epoxy coating option, or approved equal.
      - b. Mechanical Joint Fittings: Restraint ring with serrated wedges and incorporating a follower gland, designed to bolt to a mechanical joint drilling pattern. Ductile iron construction per ASTM A536 with protective epoxy coating, hardware material as specified elsewhere herein. EBBA Iron Series 2000PV for C900 pipe, equivalent by Star with premium epoxy coating option, or approved equal.
- 2.5. HIGH DENSITY POLYETHYLENE (HDPE) PIPE (4 THROUGH 63 INCHES IN DIAMETER)
- A. The pipe shall be solid wall high density polyethylene AWWA C906 PE3408 pipe and fittings for pressure service.
  - B. The pipe shall be supplied with a color-coded stripe in accordance with the service: a green stripe for sanitary or sludge service. If there is a question as to which color should be provided, seek clarification from the Engineer.
  - C. Materials used to manufacture high density polyethylene pipe and fittings shall comply with all ASTM D3350 requirements and have a PPI recommended designation of PE3408. The molecular weight category shall be extra high (250,000 to 1,500,000) as per the Gel Permeation Chromatography determination procedure with a typical value of 330,000.
  - D. HDPE pipe manufactured from materials meeting the specification of this section shall have an Environmental Stress Crack Resistance of zero failures when tested to greater than 10,000 hours (ESCR: $F_0 > 10,000$ ) when tested in accordance with ASTM F1248.
    - 1. Pipe supplied under this specification shall have a nominal DIPS (ductile iron pipe size) outside diameter. The dimension ratio (DR) shall be 11 (200 psi), unless specified on the Drawings.
    - 2. All pipe and fittings shall meet the testing requirements of the most current version of AWWA C906. Manufacturer's test data shall be furnished upon request by the Engineer.
    - 3. The pipe shall have product traceability. This shall be accomplished by the inclusion of a product code into the print line of all pipe products. This shall notate the manufacturer, the date of manufacture, the lot and supplier of raw material, the location of the manufacture, and the production shift on which the product was produced. The print line shall also include such other markings as are required by the current version of AWWA C901 or C906. Print line shall be made

permanent by using heat indentation. The use of industrial ink as the only method will be cause for rejection at the job site.

4. All fittings shall be pressure rated to match the system piping to which they are joined. At the point of fusion, the outside diameter and minimum wall thickness specifications of AWWA C906 for the same size of pipe. All fabricated fittings shall be properly rated according to manufacturer's written recommendations, and clearly labeled on the fitting as such. Manufacturer shall have a written specification for all standard fabricated fittings with established Quality Control criteria and tolerances. The manufacturer of the pipe shall be manufacturer of the fabricated fittings. Molded fittings shall be made from PE 3408 HDPE and have fusion compatibility with the pipe. Pipe manufacturer must certify that they produced the pipe, fabricated the fitting, and provide the warranty.
5. Pipe and fittings may be joined by thermal fusion, electrofusion, flange assemblies or mechanical methods as described in AWWA C906. All joints shall be fully restrained against thrust.
  - a. Fused HDPE joints and fittings are considered fully restrained.
  - b. Provide concrete thrust wall anchors on HDPE pipelines where HDPE connects to mechanical joint fittings, valves, or dissimilar pipeline materials where a mechanical (not fused) method of joining is required.
  - c. Connections to mechanical joints shall be restrained by use of a positively locking MJ adaptor fitting, such as that fabricated by Specified Fittings LLC of Bellingham WA, or equal. The plain end of the device is fused to the HDPE pipeline, and the opposite DIPS end inserts into the mechanical joint, with a fused or milled thrust collar that is "sandwiched" between the mechanical joint flange and follower gland. Provide a Type 304 stainless steel internal stiffener ring of sufficient length to encompass the full bearing length of the joint connection.
    - 1) Note: connections at MJ butterfly valves may obstruct full disc movement; Contractor to confirm, and if so provide short ductile iron spool pieces or flanged end connections in lieu of mechanical joint to reconcile the conflict, subject to approval of the Engineer.
  - d. HDPE flanged connections shall be provided with a Type 304 stainless steel backing ring behind the HDPE flange opposite the metallic flange to provide structural rigidity and strength. Drill to match the adjacent flange to which it is connecting. Flange joint assemblies and gaskets shall have a pressure rating of at least 1.5 times the specified test pressure of the pipeline.

#### 2.6. COPPER TUBE AND ACCESSORIES (2-INCHES AND SMALLER):

- A. All components shall be new, suitable for potable water use, and manufactured in accordance with AWWA C800 using lead-free copper alloy UNS No. C89520 or copper alloy UNS No. C89833, in accordance with ASTM B584, as applicable. Components shall be certified to comply with NSF 61, NSF 61 Annex G, NSF 372.
- B. Tube: Type K Copper. Seamless copper water tube. ASTM B88, UNS No. 12200. Furnished in coils and annealed.
- C. Tapping Saddles:
  1. For use with Ductile or Cast Iron Pipe: Double bronze straps. AWWA standard taper threads. Mueller BR2B series, Ford 202B-NL series, or equal.
  2. For use with PVC Pipe: Bronze saddles shall provide full support around the circumference of the

pipe, and have a bearing area of sufficient width along the axis of the pipe so that the pipe will not be distorted when the saddle is tightened. Saddles shall be double strap, bronze. Mueller H-13000 or H-134000 series, Ford S90-NL series, or equal.

D. Corporation Stops:

1. AWWA Standard taper thread by copper flare, unless other end connections are specified on the Drawings. Mueller B25000N, Ford FB-600-NL series, or equal.

E. Insulators:

1. Provide electrical insulators at all corporation stops for services on ductile or cast iron mains. Mueller, Ford or equal.

F. Curb Stops:

1. Flare by flare end connections, unless other end connections are specified on the Drawings. Mueller B25204N, Ford B22-NL series, or equal. Provide a cast iron box for each curb stop. Star Pipe Products SB90ES series, or RWB 145RHD series where located in roadways; or equal.

G. Couplings and fittings:

1. Flare by flare end connections, unless other end connections are specified on the Drawings or required for connection to equipment and devices. Ford C28-NL series, or equal.

## 2.7. FLEXIBLE COUPLINGS

A. Flexible couplings shall be the types below as shown on the Drawings or as otherwise permitted by the Engineer. Couplings shall provide the requisite pipe flexibility without jeopardizing pipe joint integrity due to hydraulic thrust, and shall have the same pressure-rating as the pipe. Couplings shall comply with AWWA C219. Hardware materials shall comply with the materials specified elsewhere herein. All materials in contact with potable water shall be NSF 61 approved.

1. Sleeve Type Couplings shall be properly gasketed and shall be of the diameter and type recommended by the manufacturer to fit the outer diameter and type of pipe to which it is connecting. Each coupling shall consist of a ductile iron or steel middle ring, 2 ductile iron or steel followers, 2 gaskets, and the necessary bolts and nuts to compress the gaskets. The couplings shall be Smith Blair 411, 413, or 441 (as appropriate for the pipe type and pressure rating), or approved equal. Couplings to be fusion epoxy lined and coated. Polyethylene encase in accordance with AWWA C105 when buried in earth.
2. Flanged Coupling Adapters shall have a ductile iron body and flange, gaskets, and bolts and nuts required to compress the gaskets. Flange shall be compatible with the flange to which it will mate. Fusion epoxy line and coat. Flanged coupling adapters shall be Smith Blair Model 912 or approved equal. Polyethylene encase in accordance with AWWA C105 when buried in earth.
3. Gasket compound: EPDM compound shall be provided for sewage, sludge, and reclaimed water. EPDM compound shall be provided for blower air service. EPDM, NBR or SBR compound may be provided for raw or potable water service.
4. Restraint: Flexible couplings shall be fully restrained against thrust unless the Engineer has given written approval to omit this feature for specific cases. Anchor studs or set screws shall not be used for restraint.
  - a. Exposed locations: Restraints shall be as specified in Section 40 05 05.

## 2.8. BURIED UTILITY WARNING TAPE

- A. As specified in Section 33 05 98.

## 2.9. TRACER WIRE:

- A. As specified in Section 33 05 98.

## PART 3 EXECUTION

### 3.1. GENERAL INSTALLATION REQUIREMENTS

- A. Do not lay pipe when trenches or weather conditions are unsuitable for such work.
- B. Each pipe length and fitting interior, interior surface of bells, and exterior surface of spigots shall be cleaned of all foreign material before placing it in the trench and shall be kept clean all times thereafter. Each item shall also be examined for cracks and other defects before installation.
- C. Field cutting of pipe for inserting valves, fittings, or closure pieces shall be done in a neat and workmanlike manner without damage to the pipe, and to leave a smooth end at right angles to the axis of the pipe.
- D. Each pipe length shall be laid true to line and grade, without intermediate high or low points not shown on the Drawings. If field conditions are encountered that preclude installation per the Drawings, immediately notify the Engineer for resolution.
- E. Pipe shall be laid in a dry (dewatered) trench and shall not be used for draining water from the trench.
- F. Whenever the pipe is left unattended or pipe laying is not in progress, temporary plugs shall be installed at all openings. Temporary plugs shall be watertight and of such design as to prevent debris and animals from entering the pipe. All temporary plugs shall be subject to review by the Engineer.
- G. In some special circumstances it may be necessary to install the pipeline shallower than the minimum required depth of cover, such as to avoid other utilities or to achieve a specific slope or grade. All special circumstances are subject to the approval of the Engineer.
- H. The Contractor shall install the materials in accordance with the manufacturer's recommendations. If there is a conflict between the Contract Documents and the manufacturer's instructions, the Contractor shall obtain resolution from the Engineer before proceeding with the work.
- I. Where the Drawings call for deflection of pipe joints, Contractor shall deflect one or more joints, depending on constructed pipe configuration, to meet overall pipe alignment as indicated in the plans. Amount of deflection and manner of deflection shall comply with Manufacturer recommendations and requirements.

### 3.2. INSTALLATION OF DUCTILE-IRON PIPELINES

- A. Except as specified herein or unless specifically authorized by the Engineer, all installation of pipe shall conform to the recommendations contained in "A Guide for Installation of Ductile-Iron Pipe,"



published by the Ductile Iron Pipe Research Association. A copy shall be available at the job site.

- B. Pipe Laying: Pipe shall be laid with bell ends facing in the direction of laying, unless directed otherwise by the Engineer. Pipe shall be laid on the bedding with support over the full length of the pipe barrel.
- C. The cutting of pipe for inserting valves, fittings, or closure pieces shall be done in a neat and workmanlike manner without damage to the pipe or cement lining to leave a smooth end at right angles to the axis of the pipe. Flame cutting of pipe by means of an oxyacetylene torch will not be allowed. The pipe end shall be beveled and free of sharp edges that could damage the gasket during installation.
- D. Jointing of Mechanical Joints:
  - 1. The last 8 inches of the pipe spigot and the inside of the bell of the mechanical joint shall be thoroughly cleaned to remove oil, grit, tar (other than standard coating), and other foreign matter from the joint, and then painted with a manufacturer supplied lubricant or soap solution made by dissolving one-half cup of granulated soap in one gallon of water. The ductile-iron gland shall then be slipped on the spigot end of the pipe with the lip extension of the gland toward the spigot end. The gasket shall be painted with the lubricant or soap solution and placed on the spigot end of the pipe to be laid, with the thick edge toward the gland.
  - 2. The entire section of the pipe being laid shall be pushed forward to seat in the spigot end of the bell of the pipe in place. The gasket shall then be pressed into place within the bell, being careful to have the gasket evenly located around the entire joint. The cast-iron gland shall be moved along the pipe into position for bolting, all the bolts inserted, and the nuts screwed up tightly with fingers. All nuts shall then be tightened with a suitable (preferably torque-limiting) wrench. The torque for various sizes of bolts shall be as follows:

<u>Size (Inches)</u>	<u>Range of Torque</u> <u>ft. - lb.</u>
5/8	45 - 60
3/4	75 - 90
1	100 - 120
1-1/4	120 - 150

- 3. Nuts spaced 180 degrees apart shall be tightened alternately to produce an equal pressure on all parts of the gland.
- E. Jointing of Push-On Joints:
  - 1. In jointing the pipe, the exterior 4 inches of the pipe at the spigot end and the inside of the adjoining bell and particularly the groove for the gasket shall be thoroughly cleaned to remove oil, grit, tar (other than standard coating), and other foreign matter. The proper gasket supplied with the pipe shall be placed in the bell as described by the pipe manufacturer so it will spring into its proper place inside the pipe bell. A thin film of the pipe manufacturer's joint lubricant shall be applied to the gasket over its entire exposed surface. The spigot end of the pipe shall then be wiped clean and inserted into the bell to contact the gasket. Then the pipe shall be forced all the way into the bell by crowbar, or by jack and choker slings. The location of the gasket shall be checked with a gauge or tool designed for that purpose to assure that the gasket is in the proper position.

F. Installation of Proprietary Restrained Joints:

1. Restrained-joint pipe and fittings shall be installed according to manufacturer's recommendations. Torque wrenches and any recommended special tools shall be used during installation. Any special tools shall be supplied to the Owner.

3.3. INSTALLATION OF PVC PLASTIC PIPE

A. Pipe Laying:

1. Pipe shall be laid with bell end facing in the direction of laying, unless directed otherwise by the Engineer.

B. The cutting of pipe for inserting valves, fittings, or closure pieces shall be done in a neat and workmanlike manner without damage to the pipe, and so as to leave a smooth end at right angles to the axis of the pipe. Bevel the end of the pipe with a beveling tool after the pipe is field cut. Place a clearly visible position mark at the correct distance from the end of the field cut pipe.

C. Jointing the Pipe:

1. The outside of the spigot and the inside of the bell shall be thoroughly wiped clean. Set the rubber ring in the bell with the marked edge facing toward the end of the bell. Lubricate the spigot end using a thin film of the manufacturer-supplied lubricant. Push the pipe spigot into the bell manually, with blocking and bar or with special jacks. Position the completed joint so that the mark on the pipe end is in line with the end of the bell. Pipe joint shall not be assembled using power or trenching equipment. DO NOT INSERT THE SPIGOT END OF THE PIPE BEYOND THE "HOME" MARK. THE MARK SHALL BE VISIBLE AND IN LINE WITH THE BELL END IN EVERY CASE. THE INSPECTOR MAY REQUIRE REMOVAL AND REINSERTION OF THE JOINT TO THE CORRECT POSITION AT ANY TIME THE MARK IS NOT VISIBLE AFTER INSERTION. no exceptions to this requirement are allowed under any circumstances.

3.4. INSTALLATION OF HIGH-DENSITY POLYETHYLENE (HDPE) PIPE

A. Except as specified herein or unless specifically authorized by the Engineer, all installation of pipe shall conform to ASTM D2774, Underground Installation of Thermoplastic Pressure Pipe.

B. Joining:

1. Heat Fusion Joining: Joints between plain end pipes and fittings shall be made by butt fusion. Joints between the main and saddle branch fittings shall be made using saddle fusion. The butt fusion and saddle fusion procedures used shall be procedures that are recommended by the pipe and fitting Manufacturer. The Contractor shall ensure that persons making heat fusion joints have received training in the Manufacturer's recommended procedure. The Contractor shall maintain records of trained personnel, and shall certify that training was received not more than 12 months before commencing construction. External and internal beads shall not be removed.
2. Joining by Other means: Polyethylene pipe and fittings may be joined together or to other materials by means of (a) flanged connections (flange adapters and back-up rings), (b) mechanical couplings designed for joining polyethylene pipe or for joining polyethylene pipe to another material, (c) MJ Adapters or (d) electrofusion. When joining by other means, the installation instructions of the joining device manufacturer shall be observed.
3. Branch Connections: Branch connections to the main shall be made with saddle fittings or tees. Polyethylene saddle fittings shall be saddle fused to the main.

## C. Installation:

1. General: When delivered, a receiving inspection shall be performed and any shipping damage shall be reported to the manufacturer with 7 days. Installation shall be in accordance with ASTM D 2774, Manufacturer's recommendation and this specification. All necessary precautions shall be taken to ensure a safe working environment in accordance with all applicable safety codes and standards.
2. Mechanical Joint & Flange installation: Mechanical joint and flange connections shall be installed in accordance with the Manufacturer's recommended procedure. MJ Adapters and flanges shall be centered and aligned to the mating component before assembling and tightening bolts. In no case shall MJ gland or flange bolts be used to draw the connection into alignment. Bolt threads shall be lubricated, and flat washers should be used under the nuts. Bolts shall be evenly tightened according to the tightening pattern and torque step recommendations of the Manufacturer. At least 1 hour after initial assembly, flange connections shall be re-tightened following the tightening pattern and torque step recommendations of the Manufacturer. The final tightening torque shall be as recommended by the Manufacturer. The final tightening torque shall be as recommended by the Manufacturer.
3. Foundation and Bedding: Pipe shall be laid on grade on a stable foundation. Unstable trench bottom soils shall be removed, and a 6" foundation or bedding of compacted Class I material shall be installed to pipe bottom grade. Excess groundwater shall be removed from the trench before laying the foundation or bedding for the pipe. A trench cut in rock or stony soil shall be excavated to 6" below pipe bottom grade, and Brought back to grade with compacted Class I bedding. All ledge rock, boulders and large stones shall be removed.
4. Pipe Handling: When lifting with slings, only wide fabric choker slings capable of safely carrying the load shall be used to lift, move, or lower pipe and fittings. Wire rope and chain are prohibited. Slings shall be of sufficient capacity for the load, and shall be inspected before use. Worn or damaged equipment shall not be used.
5. Backing: Embedment material soil type and particle size shall be in accordance with ASTM D 2774. Embedment shall be placed and compacted to at least 90% Standard Proctor Density in 6" lifts to at least 6" above the pipe crown. During embedment placement and compaction, care shall be taken to ensure that the haunch areas below the pipe springline are completely filled and free of voids.
6. Protection against shear and bending loads: In accordance with ASTM D 2774, connections shall be protected where an underground polyethylene branch or service pipe is joined to a branch fitting such as a service saddle, branch saddle or tapping tee on a main pipe, and where pipes enter or exit casings or walls. The area surrounding the connection shall be embedded in properly placed, compacted backfill, preferably in combination with a protective sleeve or other mechanical structural support to protect the polyethylene pipe against shear and bending loads.
7. Final Backfilling: Final backfill shall be placed and compacted to finished grade. Native soils may be used provided the soil is free of debris, stones, boulders, clumps frozen clods or the like larger than 8" in their largest dimension.
8. Polyethylene Fittings & Custom Fabrications: Polyethylene fittings and custom fabrications shall be molded or fabricated by the Approved Pipe Manufacturer. All fittings and custom fabrications shall be pressure rated for the same internal pressure rating as the mating pipe. Reduced pressure-rated (de-rated) fabricated fittings are prohibited.
9. Molded Fittings: Molded fittings shall be manufactured in accordance with ASTM D 3261 and

shall be so marked.

10. Fabricated Fittings: Fabricated fittings shall be made by heat fusion joining specially machined shapes cut from pipe, polyethylene sheet stock, or molded fittings. Fabricated fittings shall be rated for internal pressure service at least equal to the full service pressure rating of the mating pipe.
11. Polyethylene Flange Adapters: Flange adapters shall be made with sufficient throughbore length to be clamped in a butt fusion-joining machine without the use of a stub-end holder. The sealing surface of the flange adapter shall be machined with a series of small v-shaped grooves (serrations) to promote gasketless sealing, or restrain the gasket against blowout.
12. Back-up Rings: Flange adapters shall be fitted with Type 304 stainless steel back-up rings pressure rated equal to or greater than the mating pipe. The back-up ring bore shall be chamfered or radiused to provide clearance to the flange adapter radius.

D. Fusion Quality Control:

1. The Contractor shall ensure the field set-up and operation of the fusion equipment, and the fusion procedure used by the Contractor's fusion operator while on site. Upon request by the Owner, the Contractor shall verify field fusion quality by making and testing a trial fusion. The trial fusion shall be allowed to cool completely; then test straps shall be cut out and bent strap tested in accordance with ASTM D 2657. If the bent strap test of the trial fusion fails at the joint, the field fusions represented by the trial fusion shall be rejected. The Contractor at his expense shall make all necessary corrections to equipment, set-up, operation and fusion procedure, and shall re-make the rejected fusions.

3.5. INSTALLATION OF THRUST RESTRAINT

- A. The movement of fittings shall be restrained by use of mechanical restraints as specified above.
- B. Mechanical restraints shall be provided on all joints located within or exceeding the lengths adjacent to fittings and valves specified on the detail on the Drawings. Install in strict conformance with the manufacturer's written instructions and recommendations. Measure and mark said limits of restraints adjacent to the trench with spray paint while the laying operation is underway.

3.6. BURIED UTILITY WARNING TAPE

- A. Install in accordance with Section 33 05 98.

3.7. TRACER WIRE:

- A. As specified in Section 33 05 98.

3.8. EXTRA DEPTH EXCAVATION

- A. To facilitate crossing under existing pipelines and other utilities, or as shown on the Drawings, the Contractor may be required by the Engineer to increase the depth of burial of new pipelines beyond design depth. No separate payment for extra depth will be made.

3.9. FLUSHING

- A. The Contractor shall flush the pipelines as the work progresses in accordance with good practice to ensure that sand, rocks, or other foreign material are not left in any of the pipelines. If possible, the flushing shall be made through an open pipe end; otherwise, use of a fire hydrant may be acceptable, but only on approval of the Engineer.

### 3.10. TESTING

- A. Testing shall occur after the pipeline has been flushed clean of sediment and debris. In any case where a pressure test will be made against an existing closed valve of an existing potable water system, the pipeline shall be disinfected as specified prior to pressure testing.
- B. A pressure test shall be completed first for all pipelines. If a pipeline with rubber gasket joints does not pass the pressure test, then a leak test may be performed.
- C. Pressure Test: A Hydrostatic test shall be performed consistent with the requirements of the City of Morganton Construction Specifications for Water Lines.
- D. Leakage Test:
1. If the pipeline does not pass the pressure test, meaning there was a measured drop in pressure during the pressure test period, then a leakage test shall be conducted. Leakage tests shall be witnessed by the Engineer or their designated Inspector. The Contractor shall furnish the pump, pipe, gauges, connections, flow meters, and all other necessary apparatus, and shall furnish all necessary assistance to conduct the test. The duration of each leakage test shall be two hours, and, during the test, the main shall be subjected to a hydrostatic pressure of 150 psi.
  2. No pipeline installation will be acceptable until the leakage is less than the amount computed by the following formula:
    - a. DIP, PVC 
$$L = \frac{SD(P)^{0.5}}{133,200}$$

L = Allowable leakage in gallons (per hour)  
S = Tested length of pipe (feet)  
D = Nominal diameter of pipe (inches)  
P = Average test pressure during the test (psi)
  3. Should any test of pipe laid disclose leakage greater than that specified above, the Contractor shall, at their own expense, locate and repair the points of leakage until the leakage is within the specified allowance.
  4. The pipe may be subjected to hydrostatic pressure, inspected, and tested for leakage at any convenient time after the trench has been partially backfilled, except at the joints, or backfilled as permitted by the Engineer. Where any section is provided with concrete thrust blocks, the pressure test shall not be made until at least two days have elapsed after the concrete was installed.
  5. The Engineer shall be notified at least 48 hours before the pipe is to be tested so that they or their designated Inspector may be present during the entire duration of the test.

END OF SECTION

SECTION 33 05 05.03  
BURIED PIPING (GRAVITY SERVICE)

PART 1 GENERAL

1.1. SUMMARY

- A. The work to be performed in accordance with this Specification consists of furnishing all materials, equipment, supplies, and accessories and of performing all operations required in connection with the fabrication and installation of a buried piping for gravity service as shown on the Drawings and specified herein.
- B. Buried piping for gravity service includes:
  - 1. Polyvinyl Chloride pipe (PVC)
  - 2. Ductile iron pipe (DIP)
  - 3. Associated fittings
  - 4. Related appurtenances
- C. All materials shall be new and the best available. All material used shall be manufactured and supplied according to the latest revised standards of the American Water Works Association, the American National Standards Institute, and the American Society for Testing and Materials, or as mentioned hereinafter.
- D. Related Sections:
  - 1. Identification requirements for buried pipelines, including warning tape and tracer wire, are specified in Section 33 05 98.
  - 2. Trenchless methods for installation of buried piping is specified in Section 33 05 07.23 for Utility Boring and Jacking and Section 33 05 23.13 for Utility Horizontal Directional Drilling, if applicable to this project.

1.2. PRICE AND PAYMENT PROCEDURES

- A. Measurement and Payment
  - 1. Gravity Main
    - a. Payment shall be based on linear feet of installed buried gravity pipe for each pipe size, regardless of pipe material.
    - b. Distance shall be measured by linear foot from center of manhole to center of manhole or interior wall of wet well, as applicable.
    - c. Unit price for buried gravity pipe shall include bypass pumping, plugging, cleaning, interim televising not included in pre-and post-televising item, excavation, pipe, bedding, backfill, compaction, surface restoration, and all other materials, labor, equipment, tools, and supplies necessary to complete the installation of buried gravity pipe.

1.3. REFERENCES

- A. Standards
  - 1. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

2. American Society for Testing and Materials (ASTM)
  - a. D1784 (2020) – Standard Classification System and Basis for Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
  - b. D2321 (2020) – Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
  - c. D3034 (2016) – Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
  - d. D3139 (2019) – Standard Specification for Joints for Plastic Pressure Pipes using Flexible Elastomeric Seals
  - e. D3212 (2021) – Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
  - f. F477 (2021) – Standard Specification for Elastometric Seals (Gaskets) for Joining Plastic Pipe
  - g. F1417 (2019) – Standard Practice for Installation Acceptance of Plastic Non-pressure Sewer Lines Using Low-Pressure Air
  - h. F1688 (2022) – Standard Guide for Construction Procedures for Buried Plastic Pipe
3. City of Morganton
  - a. Construction Specifications for Sewer Lines
4. Uni-bell PVC Pipe Association
  - a. Design and Installation Guide for PVC Fittings and Laterals for Solid Wall PVC Sewer Pipe
  - b. Handbook of PVC Pipe Design and Construction (Fifth Edition)

#### 1.4. ADMINISTRATIVE REQUIREMENTS

- A. Coordination
  1. The existing system must at all times remain under the control of the Owner. The Contractor shall operate no valves or hydrants on the system without permission of the Owner.
  2. Service Interruptions, Shutdowns, and Continuity of Service
    - a. Take precautions as necessary to minimize interruption of all utility services and will be responsible for restoration of service.
    - b. Service shall not be disrupted for more than a four-hour period. If a longer shutdown period will be necessary, provide a temporary service to the customer, subject to the review and approval of the Engineer.
    - c. Coordinate service interruptions with the Owner and affected parties.
    - d. No interruption of service shall be permitted without prior approval.
    - e. Provide at least two (2) days' notice and make appropriate arrangements with the Owner and affected parties prior to shut down. Notice shall include when supply will be discontinued, when it will be resumed, and contact information.
    - f. Schedule shutdowns for periods of minimum use and at the Owner's and affected parties' convenience.
    - g. Have all material, equipment, and personnel on hand prior to beginning any work involving a potential shutdown.
    - h. Perform work in a manner that reduces the shutdown time to the minimum.
    - i. In some cases, an increased number of personnel or night or weekend work may be necessary.
  3. Submit a proposed plan for review and coordination.

**B. Sequencing****1. Cut Ins and Connecting to Existing System**

- a. All points at which the existing piping systems are to be disconnected and connected to the new pipelines are shown on the Drawings.
- b. Connections to the existing system shall be completed after new pipeline, valves, thrust blocks and other appurtenances are installed and tested.
- c. Connections shall be done in accordance with the details given for each point of disconnection or reconnections.
- d. At each point of connecting new pipes to existing pipes, expose the existing pipe and locate a good sound point at which to cut the existing pipe off square. Then provide and install the approved transition coupling or sleeve suitable for connecting the two types of pipe. If both pipes are DIPS compatible, a mechanical joint solid sleeve with mechanical restraints is preferred in lieu of a coupling, unless indicated otherwise.
- e. Submit a proposed plan for review and coordination.

**1.5. SUBMITTALS****A. Submit the following:**

1. Affidavit of compliance with ASTM and other referenced standards.
2. Manufacturer's installation instructions and recommendations.
3. Manufacturer's literature and product data sufficient to demonstrate compliance with the specified requirements. Highlight proposed products and features, cross out extraneous information.
4. Pressure, Leakage, Disinfection, and other test results.
5. Contractor's plan for connecting to service interruptions and connections to the existing system.

**1.6. PRODUCT HANDLING**

- A. Pipe, fittings, and all other accessories shall be loaded and unloaded by lifting with hoists or skidding to avoid shock or damage to them. Under no circumstances shall any materials be dropped. Pipe handled on skidways shall not be skidded or rolled against pipe already on the ground. Skidding which damages protective coatings will not be permitted.
- B. In distributing the material at the site of the work, each piece shall be unloaded opposite or near the place where it is to be laid in the trench to prevent moving more than once.
- C. All pipe and fittings shall be so handled that the coating and lining will not be damaged. If, however, any part of the coating or lining is damaged, the repair shall be by the Contractor at their expense in a manner satisfactory to the Engineer. Any area damage beyond repair must be cut off and discarded.
- D. Do not store materials directly on the ground. Use opaque covers to protect PVC materials from direct sunlight (UV light).
- E. All pipe will be field inspected at the job site and checked for conformance to these specifications. Pipe and fittings will be checked for out-of-round or damaged joints, interior and exterior surface damage, gasket damage and the other requirements listed herein. Any pipeline or appurtenant material found defective will be rejected. Any material rejected at the job site shall be marked "Rejected," and the Contractor shall remove it immediately from the job site.



## 1.7. SITE CONDITIONS

### A. Other Utilities and Potholing

1. The type, size, location, and number of known underground facilities have been shown on the Drawings based on information available to the Engineer at the time of design; however, no guarantee is made as to the true type, size, location, or number of such facilities, or that all facilities are shown. It shall be the sole responsibility of the Contractor to verify the existence and location of all underground utilities along the route of the work. The omission from, or the inclusion of, utility locations on the Drawings is not to be considered as the nonexistence of, or a definite location of, existing underground utilities.
2. If existing utilities were potholed during design, that information is shown or identified as such on the Drawings. If a certain utility is not identified as potholed, then its depth on the profile might be based on a reasonable assumption or on other available information such as nearby surveyed manhole invert elevations, valve nut measure-downs, record drawings, or other information as may or may not be indicated. If horizontal or vertical locations of existing utilities are found to be in conflict through the Contractor's own supplemental potholing efforts or during construction, then coordinate with the Engineer to adjust the elevation or location of the new pipeline to achieve adequate clearance from the existing utility or other agreed upon measure to resolve the conflict.
3. The Engineer may not have independently verified any pothole information shown on the Drawings and is not responsible for the accuracy and completeness of utility locating and potholing work. Utility locates and potholing results are provided for the Contractor's convenience only. Reliance upon utility data depicted on the Drawings for risk management purposes during bidding does not relieve the Contractor from following all applicable utility damage prevention statues, required use of 811, and/or other required or best practices during construction. It is important that the Contractor investigates and understands the scope of work between the Owner and Engineer regarding the scope and limits of the utility investigation leading to the utility depictions shown on the Drawings. It may be necessary for the Contractor to provide for their own supplemental utility locating and/or potholing prior to excavating or ordering material to the extent they feel is necessary to complete the work safely and successfully.

### B. Existing System, Continuity Of Service, Cut-Ins, And Shut-Downs

1. The existing system must at all times remain under the control of the Owner. The Contractor shall operate no valves or hydrants on the system without permission of the Owner.
2. The Contractor shall coordinate service interruptions with the Owner and affected parties. No interruption of service shall be permitted without prior approval. Give at least two (2) days' notice and make appropriate arrangements with the Owner and affected parties prior to shutdown. Schedule shutdowns for periods of minimum use and at the Owner's and affected parties convenience. Have all material, equipment, and personnel on hand prior to beginning any work involving a potential shutdown. Perform work in a manner that reduces the shutdown time to the minimum. In some cases, an increased number of personnel or night or weekend work may be necessary. The Contractor shall take precautions as necessary to minimize interruption of all utility services and will be responsible for restoration of service.
3. At any time that a customer on the existing system will be deprived of service, the Contractor shall advise such customer at least 2 days in advance when the service will be discontinued and when the service will again be available. Service shall not be disrupted for more than a four-hour

period. If a longer shutdown period will be necessary, the Contractor shall provide a temporary service to the customer, subject to the review and approval of the Engineer.

4. All points at which the existing piping systems are to be disconnected and connected to the new pipelines are shown on the Drawings. Connections to the existing system shall be completed after new pipeline, manholes and other appurtenances are installed and tested. Connections shall be done in accordance with the details given for each point of disconnection or reconnections. At each point of connecting new pipes to existing pipes, the Contractor shall expose the existing pipe and locate a good sound point at which to cut the existing pipe off square. They shall then provide and install the approved transition coupling or sleeve suitable for connecting the two types of pipe.

## PART 2 PRODUCTS

### 2.1. GENERAL

- A. All pipe, fittings, couplings, and appurtenant items shall be new, free from defects or contamination, and wherever possible shall be the standard product of the manufacturer. They shall be furnished in pressure or thickness classes as specified or shown. All pipe shall have joints as called for in the specifications or indicated on the Drawings.

### 2.2. POLYVINYL CHLORIDE (PVC) GRAVITY SEWER PIPE

- A. Pipe
  1. Each length of pipe shall be marked with the manufacturer's, name or trademark, nominal size, weight, thickness class or diameter ratio (DR), cell classification, type of pipe (e.g. ASTM D3034), and the date of manufacture.
  2. PVC gravity sewer of pipe 16-inches nominal diameter and smaller shall conform to ASTM D3034 with a dimension ratio (DR) of 35 or as indicated in the Drawings.
  3. The pipe material shall be of new source, conform to ASTM D1784 Cell Classification 12364. The pipe shall be furnished in nominal lengths of 20 feet and shall be green in color.
  4. The pipe shall be joined with gasketed, integral bell and spigot-type joints. Joints will provide for contraction and expansion at each joint with a rubber ring, and integral thickened bell as part of each joint.
    - a. Integral joints shall conform to ASTM D3212.
    - b. The minimum wall thickness of the bell at any point shall conform to the DR and stiffness requirements of the pipe.
    - c. Gaskets shall conform to ASTM F477 and shall be marked with the name of the manufacturer, size, and proper insertion directions.
- B. Fittings and accessories for PVC gravity sewer pipe shall have push-on joints and shall meet the requirements of ASTM D3139, with wall thickness or stiffness equal to or greater than the pipe.

### 2.3. DUCTILE IRON PIPE, FITTINGS, AND APPURTENANCES

- A. Pipe: Ductile-iron pipe, conforming to AWWA C151/ A21.51. Provide pressure class as indicated on the Drawings.
- B. Joints: Ductile iron pipe shall be flanged, push-on, or mechanical joint as shown on the Drawings. In

general, flanged pipe shall be used above ground or where exposed in vaults etc., while push-on or mechanical joint will be used where buried in earth.

1. Mechanical and Push-On: In accordance with AWWA C111/ A21.11.
2. Flanged joints: In accordance with Section 40 05 05.
3. Gasket compound: EPDM compound shall be provided for sewage, sludge, and reclaimed water.

C. Fittings:

1. Ductile-iron conforming to the requirements set forth in AWWA C110/ A21.10 or AWWA C153/ 21.53. Provide Class 250 minimum. Joint type shall be as specified above, and as shown on the Drawings or appropriate for the installation location.
2. All mechanical joint solid sleeves shall be long pattern.

D. Spools and Wall Pipe:

1. Spools may be cast as fittings in accordance with AWWA C110 or fabricated from Special Thickness Class 53 ductile iron pipe in accordance with AWWA C115. Wall pipe shall have collars integrally cast. Collars shall be located so as to be in the center of the concrete wall or floor into which they are to be placed.

E. Interior Lining:

1. Pipe, spools and fittings shall be cement mortar lined and seal coated in accordance with AWWA C104/ A21.4. Lining shall be recommended by manufacturer for sewer service.

F. Exterior Coating:

1. Pipe, spools, and fittings to be buried in earth or installed within below-grade vaults shall be furnished with standard thickness asphalt coating per AWWA C151.
2. Pipe, spools, and fittings to be installed above ground shall be in accordance with Section 40 05 05.
3. Pipe, spools, and fittings to be installed in submerged locations shall be supplied by the factory bare, for shop blasting and application of the specified submerged protective coating system. Asphalt coated or prime coated pipe shall not be used in exposed or submerged locations.

2.4. BURIED UTILITY WARNING TAPE

- A. As specified in Section 33 05 98.

2.5. TRACER WIRE:

- A. As specified in Section 33 05 98.

2.6. SOURCE QUALITY CONTROL

A. Factory Test:

1. The supplier shall be responsible for the provisions of all test requirements specified in ASTM or other applicable standards.

PART 3 EXECUTION

3.1. GENERAL

- A. Do not lay pipe when trenches or weather conditions are unsuitable for such work.
- B. Each pipe length and fitting interior, interior surface of bells, and exterior surface of spigots shall be cleaned of all foreign material before placing it in the trench and shall be kept clean all times thereafter. Each item shall also be examined for cracks and other defects before installation.
- C. Field cutting of pipe for inserting valves, fittings, or closure pieces shall be done in a neat and professional manner without damage to the pipe, and to leave a smooth end at right angles to the axis of the pipe.
- D. Each pipe length shall be laid true to line and grade, without intermediate high or low points not shown on the Drawings. If field conditions are encountered that preclude installation per the Drawings, immediately notify the Engineer for resolution.
- E. Pipe shall be laid in a dry (dewatered) trench and shall not be used for draining water from the trench.
- F. Whenever the pipe is left unattended or pipe laying is not in progress, temporary plugs shall be installed at all openings. Temporary plugs shall be watertight and of such design as to prevent debris and animals from entering the pipe. All temporary plugs shall be subject to review by the Engineer.
- G. In some special circumstances it may be necessary to install the pipeline at a slope differing from the design plans, such as to avoid other utilities. All special circumstances are subject to the approval of the Engineer.
- H. The Contractor shall install the materials in accordance with the manufacturer's recommendations. If there is a conflict between the Contract Documents and the manufacturer's instructions, the Contractor shall obtain resolution from the Engineer before proceeding with the work.

### 3.2. INSTALLATION OF DUCTILE-IRON PIPELINES

- A. Except as specified herein or unless specifically authorized by the Engineer, all installation of pipe shall conform to the recommendations contained in "A Guide for Installation of Ductile-Iron Pipe," published by the Ductile Iron Pipe Research Association. A copy shall be available at the job site.
- B. Pipe Laying: Pipe shall be laid with bell ends facing in the direction of laying, unless directed otherwise by the Engineer. Pipe shall be laid on the bedding with support over the full length of the pipe barrel.
- C. The cutting of pipe for inserting valves, fittings, or closure pieces shall be done in a neat and professional manner without damage to the pipe or cement lining to leave a smooth end at right angles to the axis of the pipe. Flame cutting of pipe by means of an oxyacetylene torch will not be allowed. The pipe end shall be beveled and free of sharp edges that could damage the gasket during installation.
- D. Jointing of Mechanical Joints:
  - 1. The last 8 inches of the pipe spigot and the inside of the bell of the mechanical joint shall be thoroughly cleaned to remove oil, grit, tar (other than standard coating), and other foreign matter from the joint, and then painted with a manufacturer supplied lubricant or soap solution made by dissolving one-half cup of granulated soap in one gallon of water. The ductile-iron gland shall then be slipped on the spigot end of the pipe with the lip extension of the gland toward the spigot end. The gasket shall be painted with the lubricant or soap solution and placed on the spigot end of

the pipe to be laid, with the thick edge toward the gland.

2. The entire section of the pipe being laid shall be pushed forward to seat in the spigot end of the bell of the pipe in place. The gasket shall then be pressed into place within the bell, being careful to have the gasket evenly located around the entire joint. The cast-iron gland shall be moved along the pipe into position for bolting, all the bolts inserted, and the nuts screwed up tightly with fingers. All nuts shall then be tightened with a suitable (preferably torque-limiting) wrench. The torque for various sizes of bolts shall be as follows:

<u>Size (Inches)</u>	<u>Range of Torque ft. - lb.</u>
5/8	45 - 60
3/4	75 - 90
1	100 - 120
1-1/4	120 - 150

3. Nuts spaced 180 degrees apart shall be tightened alternately to produce an equal pressure on all parts of the gland.

E. Jointing of Push-On Joints:

1. In jointing the pipe, the exterior 4 inches of the pipe at the spigot end and the inside of the adjoining bell and particularly the groove for the gasket shall be thoroughly cleaned to remove oil, grit, tar (other than standard coating), and other foreign matter. The proper gasket supplied with the pipe shall be placed in the bell as described by the pipe manufacturer so it will spring into its proper place inside the pipe bell. A thin film of the pipe manufacturer's joint lubricant shall be applied to the gasket over its entire exposed surface. The spigot end of the pipe shall then be wiped clean and inserted into the bell to contact the gasket. Then the pipe shall be forced all the way into the bell by crowbar, or by jack and choker slings. The location of the gasket shall be checked with a gauge or tool designed for that purpose to assure that the gasket is in the proper position.

F. Installation of Proprietary Restrained Joints:

1. Restrained-joint pipe and fittings shall be installed according to manufacturer's recommendations. Torque wrenches and any recommended special tools shall be used during installation. Any special tools shall be supplied to the Owner.

### 3.3. INSTALLATION OF PVC PLASTIC PIPE

- A. General: Pipe shall be installed in accordance with Uni-Bell Handbooks and ASTM D2321.

B. Pipe Laying

1. Pipe shall be laid with bell end facing in the direction of laying, unless directed otherwise by the Engineer.
2. Pipe shall be laid starting with the lowest elevation end of each main.

C. Cutting:

1. The cutting of pipe for pieces shall be done in a neat and professional manner without damage to the pipe.
2. Use abrasive wheel cutters or saws.

3. Make cuts square to the pipe.
4. Bevel and free cut ends of sharp edges after cutting to leave a smooth end.
5. Place a clearly visible position mark at the correct distance from the end of the field cut pipe.

D. Jointing the Pipe

1. The outside of the spigot, inside of the bell, and gasket shall be thoroughly wiped clean.
2. Set the rubber ring in the socket in the bell with the marked edge facing toward the end of the bell.
3. Any bulges in the gasket, which might interfere with the entry of the plain end of the pipe shall be removed.
4. A thin film of lubricant shall be applied to the gasket surface, which will contact the spigot end of the pipe. The lubricant shall be furnished by the pipe manufacturer. Lubricant shall also be applied to the outside of the plain spigot end of the pipe where it will contact the gasket.
5. Push the pipe spigot into the bell manually, with blocking and bar or with special jacks. Pipe joint shall not be assembled using power or trenching equipment.
6. Position the completed joint so that the mark on the pipe end is in line with the end of the bell.
7. Do not insert the spigot end of the pipe beyond the "home" mark. The mark shall be visible and in line with the bell end in every case. The inspector may require removal and reinsertion of the joint to the correct position at any time the mark is not visible after insertion. No exceptions to this requirement are allowed under any circumstances.
8. If assembly is not accomplished by reasonable force, the plain end shall be removed and the condition corrected.

3.4. BURIED UTILITY WARNING TAPE

- A. Install in accordance with Section 33 05 98.

3.5. TRACER WIRE

- A. Install in accordance with Section 33 05 98.

3.6. FLUSHING

- A. The Contractor shall flush the pipelines as the work progresses in accordance with good practice to ensure that sand, rocks, or other foreign material are not left in any of the pipelines. If possible, the flushing shall be made through an open pipe end; otherwise, use of a fire hydrant may be acceptable, but only on approval of the Engineer.

3.7. SITE QUALITY CONTROL

A. Site Tests

1. Tests shall be performed after services are installed and all backfill has been placed.
2. Tests shall occur after the pipeline has been flushed clean of sediment and debris.
3. Mandrel Test
  - a. A mandrel (95% of base ID) shall be pulled through all PVC gravity mains to test for unacceptable ring deflection.
  - b. Ring deflection, tested 30 days after backfill, shall not exceed 5%.
  - c. An alternative to waiting 30 days is to submit a certification from a soil sampling firm indicating that backfill was compacted to 95% maximum density.

4. Pressure Test: All sewer pipe shall be tests as required in City of Morganton Construction Specifications for Sewer Lines
5. Television Inspection
  - a. All gravity sewer mains TV inspected in the presence of Town personnel after all other utilities have been installed, and at the end of the warranty period.
- B. Deficiencies shall be corrected prior to acceptance and operation.
- C. Copies of all testing results and inspection videos shall be submitted to the Owner prior to acceptance.

END OF SECTION

SECTION 33 05 07.23  
UTILITY BORING AND JACKING

**PART 1 GENERAL****1.1. SUMMARY**

- A. The work of this section includes providing and installing casing pipe, carrier pipe, carrier pipe supports, and casing seals and related activity including excavation, boring, jacking, grouting, and other materials and activities necessary to provide a complete and functional installation.

**1.2. REFERENCES**

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.
1. American Association of State Highway and Transportation Officials (AASHTO)
  2. American Welding Society (AWS)
    - a. D1.1 (2016) - Structural Welding Code - Steel
    - b. D1.5 (2015) - Bridge Welding Code
  3. ASTM International (ASTM)
    - a. B117 (2016) - Standard Practice for Operating Salt Spray (Fog) Apparatus
    - b. D149 (2013) - Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials at Commercial Power Frequencies
    - c. D2240 (2017) - Standard Test Method for Rubber Property - Durometer Hardness
    - d. D638 (2014) - Standard Test Method for Tensile Properties of Plastics
    - e. D695 (2010) - Standard Test Method for Compressive Properties of Rigid Plastics
    - f. D785 (2015) - Standard Test Method for Rockwell Hardness of Plastics and Electrical Insulating Materials
    - g. D790 (2017) - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
  4. NACE International, Association of Materials Protection and Performance (NACE)
    - a. SP0286 (2007)- Electrical Isolation of Cathodically Protected Pipelines

**1.3. SUBMITTALS**

- A. Review Submittals
1. Product Data
    - a. Pipe casing; G
    - b. Casing Spacers; G
    - c. End seals; G
  2. Work Plan
- B. Informational Submittals
1. Preconstruction Submittals
    - a. Statement of Contractor Qualifications
  2. Product Data
    - a. Affidavit of compliance with AWWA and other referenced standards
  3. Test Results

**1.4. QUALITY CONTROL**



## A. Statement Of Contractor Qualifications

1. Contractors are required to have proven and successful experience in boring and jacking. Applicable experience is the successful completion of similar projects to the tolerances indicated for the size of pipe and quantities shown on the plans, in the anticipated soil conditions.
2. Submit a description of at least three such projects which include, at a minimum, a listing of the location(s), date of projects, owner with contact information, pipe type, size installed, length of installation, type and manufacturer of equipment used, and other information relevant to the successful completion of the project.

## 1.5. DELIVERY, STORAGE, AND HANDLING

- A. Inspect materials delivered to site for damage. Unload and store with minimum handling. Store plastic and rubber components under cover out of direct sunlight. Do not store materials directly on the ground. Keep inside of pipes free of dirt and debris.
- B. Handle pipe in a manner to ensure delivery to the excavation site in sound undamaged condition. Carry, do not drag pipe to the excavation site.

## 1.6. MEASUREMENT

- A. Jacking and Boring: Jacking and Boring shall be measured by the linear foot of bore as measured from face to face of jacking pits.
- B. Casings: Casings of the size and material required shall be measured by the linear foot actually installed in accordance with the plans.
- C. Carrier Pipe: Carrier pipe installed within casings shall be measured by the linear foot of pipe installed from end to end of casing.

## 1.7. PAYMENT

- A. The work performed and materials furnished as specified herein, measured as provided above, shall be paid for at the contract unit price bid, which price shall be full compensation for furnishing all materials, labor, tools, equipment and incidentals necessary to complete the work, including excavation, backfilling, restoration to original ground conditions, and disposal of surplus materials.
- B. Casings shall be paid for at the contract unit price bid for "Casing Pipe" per linear foot of casing or liner installed and measured as prescribed above. Casing unit price shall include boring, jacking, casing pipe, welding, grouting of exterior annular space (between casing and soil), end seals, and other materials as required to install a casing pipe as indicated in the Drawings that is ready to have a carrier pipe installed.
- C. Carrier pipe shall be paid for at the contract unit price bid for "Carrier Pipe for Jacking and Boring " per linear foot of pipe installed and measured as prescribed above. Carrier pipe unit price shall include pipe, joint restraints, spacers, grouting of annular space between carrier pipe and casing if called for, and other materials required to install a carrier pipe within the casing as indicated in the Drawings that is ready for connection to connecting non-carrier pipe.

## PART 2 PRODUCTS

2.1. GENERAL

- A. The work includes providing labor, materials, and specialized equipment for the installation of utility pipelines utilizing the boring and jacking methods of installation.
- B. All pipe, fittings, couplings, and appurtenant items shall be new, free from defects or contamination, and wherever possible shall be the standard product of the manufacturer. They shall be furnished in pressure or thickness classes as specified or shown. All pipe shall have joints as called for in the specifications or indicated on the Drawings.
- C. Excavation Design Requirements
  - 1. Design excavations, including access pit walls, considering loadings from reaction blocks, traffic loads and any surcharge loads.
  - 2. Roadway Crossing Criteria: For loadings under roadways HS20 vehicle loading distribution in accordance with AASHTO.

2.2. STEEL CASING PIPE

- A. The minimum casing pipe diameter is shown on the Drawings. If approved, the Contractor may install a larger casing, at no additional cost, to suit anticipated soil and other site conditions. Contractor shall maintain adequate clearances from existing utilities if a larger casing pipe is selected.
- B. Steel casing pipes for trenchless installation methods shall be smooth-welded steel pipe, conforming to ASTM A252 Grade 1, with watertight butt-welded seams and field joints. The pipe shall be provided with beveled by square joints. Field joints shall be a continuous weld and watertight.
- C. Diameter of the casing pipe shall be sufficient to allow free passage of the carrier pipe, accommodate mechanical restraints on the carrier pipe, permit passage of a sand installation tremie pipe when required, accommodate carrier pipe skids, and accommodate manned entry for removal of obstructions during boring or for outside pressure grouting operations, as applicable.
- D. The minimum wall thickness of the casing pipe shall comply with the following table. The wall thickness shall be increased if necessary, to be determined by the Contractor, to withstand installation loads, and service load of earth cover with superimposed live traffic or railroad loads with a deflection of less than 3%.

<u>Casing Diameter</u>	<u>Minimum Wall Thickness</u>
12"	0.25"
16"-18"	0.3125"
20"-24"	0.375"
28"-32"	0.475"
36"	0.50"
42"-54"	0.625"

- E. The Contractor may submit a proposal to adjust the elevations of the bore based on anticipated soil and site conditions. Such proposals are subject to approval of the Engineer. Should adjustment of the elevation result in a new high and/or low point along the pipeline that is not currently in the design, the Contractor shall provide additional air release valves at new high points or blow-offs at new low points at no additional cost to the Owner.
- F. Interior Annular Grouting Ports: When interior annular grouting is called for in the Drawings, install

multiple rows of 2-inch threaded and plugged grouting ports on 5 to 10-foot centers along the casing pipe for external grouting where determined necessary. Coordinate the grout pipe locations with carrier pipe skids to allow free passage of the carrier pipe.

### 2.3. CARRIER PIPE

- A. Carrier pipe shall be of the types and sizes shown in the Drawings and relevant Specifications.
- B. All joints of carrier pipe within the casing shall be mechanically restrained.

### 2.4. CASING SPACERS

- A. Casing spacers are used to facilitate installing a pipe inside a casing pipe. Spacers shall allow carrier pipe to be approximately centered within the casing pipe.
- B. Casing spacers shall consist of two or more segments that bolt together forming a shell around the carrier pipe(s).
- C. Casing spacers should protect the carrier pipe and any protective coating or wrapping from damage during the installation, and properly support and electrically isolate the carrier pipe(s) within the casing. If indicated in the Drawings, multiple carrier pipes may be installed in one casing, and spacers must be capable of supporting all indicated pipes.
- D. The Owner reserves the right to limit the purchase of casing spacers from the manufacturers and to the models specified, providing such casing spacers conform to the provisions of this specification.
- E. Casing spacers shall be eight inches long for carrier pipes up to 6- inch diameter and twelve inches long for larger carrier pipes. Manufacturer's approval in writing shall be required for installations exceeding 300 ft. in length, carrier pipes greater than 48- inch diameter or multiple carrier pipes in one casing.
- F. Casing spacers shall have a minimum 14-gauge steel band and 10-gauge steel riser when required. The band, risers, and connecting studs shall be welded and cleaned at the factory before the application of a fluidized bed fusion bonded PVC coating. Stainless steel (type 304) casing spacer is an acceptable alternative to PVC coated steel.
  - 1. The fluidized bed fusion bonded PVC coating shall be between 10-16 mils thickness. The PVC coating shall provide good resistance to acids and alkalis and excellent resistance under ASTM B117 salt spray tests. The coating shall have a minimum 1380 volts/mil per ASTM D149-61 short time 0.010" test and a Durometer-shore A@ (10 sec) of 80 per ASTM D2240. Epoxy coatings are not an acceptable alternative.
  - 2. The steel spacers shall have a flexible PVC liner of 0.09-inch thickness with Durometer "A" 85-90 hardness and a minimum 58,000- volt dielectric strength (60,000-volt minimum Surge Test.) Moisture absorption shall not exceed 1%.
- G. Casing spacers shall have runners of high pressure molded glass reinforced polyester with a minimum compressive strength of 18,000 psi per ASTM D695, flexural strength of 25,300 psi per ASTM D790, tensile strength of 17,600 psi per ASTM D638 and Rockwell hardness (M) of 90 per ASTM D785.
  - 1. The riser shall be designed and fabricated to place the runner (skid) in full contact with the inside surface of the casing pipe to evenly distribute the load force to all support members.
  - 2. The ends of all runners shall be shaped to resist hanging or sticking inside casing during installation of the carrier pipe. Polyethylene runners are not acceptable.

3. Runners shall be a minimum of 1.0 inch in width and a minimum of 7 inches long for carrier pipes up to 16-inch diameter, and a minimum of 2.0 inches in width and 11 inches long for larger carrier pipes.
  4. Bolts on runners are not acceptable. The runners shall be attached to the band or riser by 3/8 the wearing surface on the runner. The recess shall be filled with a corrosion inhibiting filler.
  5. There shall be four runners per casing spacer for carrier pipes up to 12-inch diameter, six runners for 14-inch through 36-inch diameter carrier pipes, and eight or more runners for carrier pipes larger than 36-inch diameter.
  6. The band section shall be bolted together with 5/16 inch 304 SS studs, nuts and washers. There shall be six sets per 8-inch-long casing spacer and eight sets per 12-inch-long spacer.
  7. Casing spacers shall have ample riser height to limit vertical movement of the carrier pipe in the casing. A minimum of 1.5-inch clearance shall be provided between the top runner and the ID of the casing or tunnel.
  8. Continuous operating temperatures for the PVC Coated Casing Spacers should not exceed 150 degrees F. Stainless steel casing shall be used in applications where continuous operating temperatures exceed 150 degrees F.
  9. Unless noted otherwise, casing spacers shall be required on all carrier pipes installed in casing or tunnel applications.
- H. All casing spacers are to be manufactured in accordance with NACE International Recommend Practice SP 0286 (Isolation Spacers).
- I. Manufacturers
1. The manufacturers and models listed below are provided for reference and are generally consistent with the intent of the specification. The Contractor is responsible to select and submit for approval selected products that meet the requirements of the Contract Documents, and the Owner may reject any submittal that does not meet those requirements regardless of whether or not the Manufacturer is listed in this section.
    - a. Pipeline Seal & Insulator, Inc., Houston, TX: C8G-2 or SI8G-2
    - b. Pipeline Seal & Insulator, Inc., Houston, TX: C12G-2 or SIIG-2
    - c. Advance Products & Systems, Inc., Lafayette, LA: APS S18-2
    - d. Advance Products & Systems, Inc., Lafayette, LA: APS SS18-2
    - e. Advance Products & Systems, Inc., Lafayette, LA: APS S112-2
    - f. Advance Products & Systems, Inc., Lafayette, LA: APS SS112-2
    - g. Advance Products & Systems, Inc., Lafayette, LA: SI8M-2
    - h. Advance Products & Systems, Inc., Lafayette, LA: SI12M-2 (Carbon Steel)
    - i. Power Seal Pipeline Products, Inc., Wichita Falls, TX: 4810 SS (Stainless steel)
    - j. Power Seal Pipeline Products, Inc., Wichita Falls, TX: 4810 CS (Carbon steel)
    - k. J-Four Pipeline Products Inc, Broken Arrow, OK: M59 CS/SS
    - l. J-Four Pipeline Products Inc, Broken Arrow, OK: M63 CS/SS
    - m. CCI Pipeline Systems, Breaux Bridge, LA: CSC 8" & 12" Wide
    - n. CCI Pipeline Systems, Breaux Bridge, LA: CSS 8" & 12" Wide
    - o. CCI Pipeline Systems, Breaux Bridge, LA: End Seals

## 2.5. CASING SEALS

- A. Seals shall be standard wrap around ends seals, made of synthetic rubber, with watertight seams and seals, and provided with stainless steel bands and clamps.

- B. Manufacturers:
  - 1. PSI Industries Model W;
  - 2. equivalent product by T.D. Williamson;
  - 3. or equal.

## 2.6. GROUT

- A. Grout for annular spaces shall be sand cement slurry containing a minimum of 7 sacks of Portland Cement per cubic yard of slurry. All slurry shall be plant batched and transit mixed.

## PART 3 EXECUTION

### 3.1. PREPARATION

- A. Work Plan: Contractor shall submit a work plan showing and describing the method for installing the casing as shown on the Plans. The work plan must be provided fourteen (14) days prior to beginning any trenchless crossing-related work for administrative and informational review purposes. At a minimum, include the following in the work plan:
  - 1. Description of the general construction and installation sequence.
  - 2. Details and descriptions of the equipment proposed for use to install the casing and carrier pipelines, including dimensions and line-and-grade control system. Proposed equipment shall be suitable for the soil and/or rock properties that are anticipated to be encountered.
  - 3. Plans and details for pits and pit layout. Contractor shall be solely responsible for design of bracing and excavation safety. Contractor shall be responsible for continuous dewatering as specified elsewhere.
  - 4. Details and plans describing all related work.
- B. Safety:
  - 1. The sides of pits shall be supported in accordance with OSHA requirements for excavation safety.
  - 2. Bracing shall be placed in such a manner as to prevent any movement or slippage of the earth during the excavation and jacking or boring operations.
  - 3. The Contractor shall work in close cooperation with all potentially affected utility owners to ensure the protection of all facilities within the work area.
- C. Access Pit Construction Plan
  - 1. Provide a dry jacking work area having a stable concrete floor that drains to a recessed sump pump to handle nuisance inflow.
  - 2. Construct pits of a size commensurate with safe working practices. The Contractor may propose to relocate or resize pits to better suit the capabilities of the equipment/methods proposed, but may not alter either the indicated pipeline alignment or structures associated with the installed pipeline, nor result in additional claims for compensation.
  - 3. To the extent possible, keep pit locations clear of pavements to minimize disruption to the flow of traffic. Locate support equipment, spoil piles, and materials to minimize disruption to traffic.
  - 4. Support all excavations and prevent movement of the soil, pavement, utilities, or structures outside of the excavation. Furnish, place, and maintain sheeting, bracing, and lining required to support the sides of all pits and to provide adequate protection of the work, personnel, and the public.
  - 5. Provide a concrete floor in the jacking access pit.
  - 6. Design loads on the sides of the jacking and receiving pit walls are dependent on the construction

method and flexibility of the wall systems.

7. Consider loading from boring or pipe jacking when preparing the design of the jacking and receiving pit supports as well as special provisions and reinforcement around the breakout location.
8. Design the base of the pits to withstand uplift forces from the full design head of water, unless dewatering or other ground modification methods are employed.
9. Construct a thrust block to transfer jacking loads into the soil. Ensure that the backstop and the proposed pipe alignment are square to each other and are designed to withstand the maximum jacking pressure to be used with a factor of safety of at least 2.5. Design the thrust block to minimize excessive deflections in such a manner as to avoid disturbance of adjacent structures or utilities or excessive ground movement.
10. Provide surface protection during the period of construction to ensure that surface runoff does not enter pits.
11. Provide security fence around all access pit areas and provide pit cover(s) when the pit area is not in use

### 3.2. EQUIPMENT

#### A. Boring and Jacking System

1. Utilize a continuously monitored boring and jacking system matched to the expected subsurface conditions, a hydraulic jacking system to jack the pipeline, an auger to remove boring spoils, a guidance system to provide installation accuracy within the indicated tolerances, excavation equipment, material handling equipment, a dewatering system when necessary, and sheeting/shoring required to provide the work indicated.
2. Pipe Jacking Equipment
  - a. Provide main jacking equipment with a capacity greater than the anticipated jacking load.
  - b. Provide intermediate jacking stations when the total anticipated jacking force needed to complete the installation may exceed the capacity of the main jacks or the designed maximum jacking force for the pipe.
  - c. The jacking system is to supply a uniform distribution of jacking forces on the end of the pipe by use of thruster rings and cushioning material.

### 3.3. INSTALLATION

#### A. Advancing the Casing Pipe

1. Jack each pipe casing section forward as the excavation progresses in such a way to provide complete and adequate ground support at all times.
2. Provide a jacking frame for developing a uniform distribution of jacking forces around the periphery of the pipe. A frame shall be constructed of guide rails, backstop, and pushing or jacking head, or as otherwise appropriate for the approved trenchless installation method proposed by the Contractor.
  - a. Guide rails shall be constructed to the exact line and grade of the pipeline and shall be anchored in such a manner as to be capable of maintaining the alignment and gradient throughout the operation.
  - b. Place a plywood spacer on the outer shoulder of the pipe casing joint.
3. Design and construct the thrust reaction backstop to withstand the jacking forces. Continuously maintain a square alignment between the backstop and pipe casing.
4. Continuously monitor the jacking pressure and rate of cutter head advancement.

5. Exercise special care when setting the pipe guard rails in the jacking pit to ensure correctness of the alignment, grade and stability.
  6. Installation Requirements
    - a. Utilize boring equipment capable of fully supporting the face of the tunnel.
    - b. Dewatering for groundwater control is allowed at the jacking and receiving pits only.
    - c. Jack the pipe into place without causing damage to the coatings, joints, or completed pipe section.
    - d. Replace pipe casings damaged during installation.
    - e. Ensure that the welds of steel pipe attain the full strength of the pipe and are watertight before jacking of the pipe section. Ensure that the inner face of the internal weld seam is flush with the pipe to facilitate the installation of the carrier pipe in the pipe casing.
    - f. Perform all welding in accordance with requirements for shielded metal arc welding of AWS D1.5 for bridges and AWS D1.1 for buildings and other structures.
    - g. Provide a pipeline that has a consistent diameter across assembled joints.
    - h. Once the tunneling process has begun, continue with that process uninterrupted until the pipe reaches the receiving pit. Continue to push any damaged pipe until that damaged pipe section is pushed into the receiving pit and is removed. Notify the Owner immediately if any pipe is known to be or believed to be damaged.
    - i. The excavation for the underside of the pipe, for at least 1/3 of the circumference of the pipe, shall conform to the contour and grade of the pipe. A clearance of not more than 2 inches may be provided for the upper half of the pipe.
    - j. The distance that the excavation shall extend beyond the end of the pipe shall depend on the character of the material, but it shall not exceed 2 feet in any case.
    - k. Generally, the pipe shall be jacked from the downstream end. Permissible lateral or vertical variation in the final position of the pipe from line and grade will be as shown in the contract documents or as determined by the Engineer.
    - l. Tolerance
      - 1) The Contractor shall use an approved line and grade guidance system to ensure that the bore is installed within a slope tolerance of +/-0.25% of the design line and grade.
      - 2) If the casing tolerance is not met, then the Contractor shall adjust the height of the spacer skids to install the carrier pipe within the casing pipe at the specified tolerance.
    - m. Boring operations may include a pilot hole which shall be bored the entire length of crossing and shall be used as a guide for the larger hole to be bored. Water or drilling fluid may be used to lubricate cuttings.
    - n. Pressure grout the outer annular space between casing pipe and limits of excavation (borehole) to fill any void space between the casing and the native soil.
- B. Carrier Pipe Installation
1. Cleaning: Clean the inside of the casing of all foreign matter by using a pipe cleaning plug.
  2. Casing Insulators/Spacers: Install casing insulators/spacers in accordance with approved submittals and the Drawings.
  3. Carrier pipe shall be jointed or fused outside the casing and moved into place by placing a brace across the end furthest from the casing and moving the pipe with a jack behind the brace and/or winch and cable from the opposite end of the casing pipe. Pulling the pipe through the casing pipe from the leading end shall not be permitted.
  4. All carrier pipe joints within the casing shall be mechanically restrained.

5. Inspect carrier pipe prior to installing end closures and prior to backfilling pits.
6. End Closures/Bulkheads and Grouting of Casing Pipe: Seal ends of casing with specified end seals. Grout interior annular space, between carrier pipe and casing pipe, if indicated in Drawings.

C. Ventilation

1. Provide adequate ventilation for all tunnels and pits, following confined space entry procedures.
2. Include such factors as the volume required to furnish fresh air in the pits, and the volume to remove dust that may be caused by the cutting of the face and other operations which may impact the laser guidance system.
3. Routinely test the air in areas accessed by workers in accordance with the most current OSHA methods and standards.:

D. Lighting

1. Provide adequate lighting for the nature of the activity being conducted by workers.
2. Separate and insulate with ground fault interrupters power and lighting circuits.
3. Comply with requirements with regards to shatter resistance and illumination requirements.

E. Spoil Transportation

1. Match the excavation rate with rate of spoil removal.
2. Utilize a system capable of balancing groundwater pressures and adjustment to maintain face stability for the soil conditions of the project.

### 3.4. CLEANUP AND FINAL CLOSEOUT

A. Site Cleanup

1. Immediately clean "blow holes" or "breakouts" of drilling fluid to the surface and fill depressions with satisfactory fill material.
2. Dispose of all drilling fluids, soils, and separated materials in compliance with Federal, State, and local environmental regulations.
3. Pit Backfill and Compaction: Upon completion of the pipe jacking, tests, and inspections remove all equipment, debris, and unacceptable materials from the pits and commence backfilling operation.
4. Immediately upon completion of work of this section, remove all rubbish and debris from the job site. Remove all construction equipment and materials leaving the entire area involved in a neat condition equal to existing conditions prior to construction, unless indicated otherwise.

END OF SECTION



SECTION 33 05 23.13  
UTILITY HORIZONTAL DIRECTIONAL DRILLING

PART 1 GENERAL

1.1. SUMMARY

- A. The work to be performed in accordance with this Specification consists of furnishing all materials, equipment, supplies, and accessories and of performing all operations required in connection with the fabrication and installation of piping by horizontal directional drilling as shown on the Drawings and specified herein.
- B. Horizontal Directional Drilling includes:
  - 1. Excavation for approach trenches and pits
  - 2. Horizontal directional drilling
  - 3. Pipe
  - 4. Drilling fluid system
- C. All materials shall be new and the best available. All material used shall be manufactured and supplied according to the latest revised standards of the American Water Works Association, the American National Standards Institute, and the American Society for Testing and Materials, or as mentioned hereinafter.

1.2. PRICE AND PAYMENT PROCEDURES

- A. Measurement and Payment
  - 1. Horizontal Directional Drill
    - a. Payment shall be based on linear feet of piping installed by horizontal directional drill of the size as indicated in the Drawings.
    - b. Distance shall be measured horizontally for all pipe installed by horizontal directional drill. Any additional length of pipe required for construction or left exposed for purposes of connection to open excavation pipe shall be considered subsidiary to this item or shall be included in open excavation pipeline item.
    - c. Unit price for horizontal directional drill pipe shall include excavation, drilling, pipe, backfill, compaction, surface restoration, testing, drilling fluid and fluid systems, and all other materials, labor, equipment, tools, and supplies necessary to complete the installation of pipe by this method.

1.3. REFERENCES

- A. Standards
  - 1. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.
  - 2. American Society for Testing and Materials (ASTM)
    - a. D2239 (2021) - Standard Specification for Polyethylene (PE) Plastic Pipe (SIDR-PR) Based On Controlled Inside Diameter
    - b. D2657 (2015) - Standard Practice for Heat Fusion Joining of Polyolefin Pipe And Fittings
    - c. D2774 (2021) - Standard Practice for Underground Installation Of Thermoplastic

- Pressure Piping
- d. D3035 - Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter
- e. D3261 (2016) - Standard Specification For Butt Heat Fusion Polyethylene (PE) Plastic Fittings For Polyethylene (PE) Plastic Pipe And Tubing
- f. D3350 (2021) - Standard Specification For Polyethylene Plastics Pipe And Fittings Materials
- g. F714 - Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Outside Diameter
- h. F1056 - Standard Specification for Socket Fusion Tools for Use in Socket Fusion Joining Polyethylene Pipe or Tubing and Fittings
- i. F1688 (2022) – Standard Guide for Construction Procedures for Buried Plastic Pipe
- j. ASTM F1962 - Standard Guide for Use of Maxi-Horizontal Directional Drilling for Placement of Polyethylene Pipe or Conduit Under Obstacles, Including River Crossings
- 3. American Water Works Association (AWWA)
  - a. C906 (2021) - Polyethylene (PE) Pressure Pipe and Fittings, 4 In. Through 65 In. (100 mm Through 1,650 mm) for Waterworks
- 4. City of Morganton
  - a. Construction Specifications for Water Lines
- 5. National Utility Contractors Association:
  - a. HDD Installation Guidelines
- 6. Plastic Pipe Institute
  - a. PPI TR-46 - Guidelines for Use of Mini-Horizontal Directional Drilling for Placement of High Density Polyethylene Pipe

#### 1.4. ADMINISTRATIVE REQUIREMENTS

##### A. Coordination

1. Coordinate the work of this Section with the other construction activities and with the easement and permit requirements.

#### 1.5. SUBMITTALS

##### A. Product Data

1. Identify source of water used for drilling.
2. Copy of approvals and permits for use of water source.
3. Pipe data

##### B. Shop Drawings

1. Pilot bore plan:
  - a. Horizontal scale: 1 inch = 40 feet
  - b. Vertical scale: 1 inch = 4 feet
  - c. Existing utilities and constraints and proposed clearances
  - d. Deflection and radius of pilot bore.
  - e. Bore entry/exit points and angles.
  - f. Confirm the alignment and elevation of critical utilities by potholing, using a vacuum excavator, or using other suitable excavation equipment.
2. Technical data for equipment, method of installation, and proposed sequence of construction.

3. Include information pertaining to pits, dewatering, method of spoils removal, equipment size and capacity, equipment capabilities, including installing pipe on radius, type of drill bit, drilling fluid, method of monitoring line and grade, detection of surface movement, name plate data for drilling equipment, and mobile spoils removal unit.
- C. Quality Control Submittals
1. Safety Data Sheets (SDS) of potentially hazardous substances to be used.
  2. Environmental protection and Inadvertent Release Contingency Plan for spilled materials
- D. Field Quality-Control Submittals
1. Results of Contractor-furnished tests and inspections.
- E. Qualifications Statement:
1. Contractors are required to have proven and successful experience in horizontal directional drilling. Applicable experience is the successful completion of similar projects to the tolerances indicated for the size of pipe and quantities shown on the plans, in the anticipated soil conditions.
  2. Submit a description of at least three such projects which include, at a minimum, a listing of the location(s), date of projects, owner with contact information, pipe type, size installed, length of installation, type and manufacturer of equipment used, and other information relevant to the successful completion of the project.

#### 1.6. PRODUCT HANDLING

- A. Pipe, fittings, and all other accessories shall be loaded and unloaded by lifting with hoists or skidding to avoid shock or damage to them. Under no circumstances shall any materials be dropped. Pipe handled on skidways shall not be skidded or rolled against pipe already on the ground. Skidding which damages protective coatings will not be permitted.
- B. In distributing the material at the site of the work, each piece shall be unloaded opposite or near the place where it is to be laid in the trench to prevent moving more than once.
- C. All pipe and fittings shall be so handled that the coating and lining will not be damaged. If, however, any part of the coating or lining is damaged, the repair shall be by the Contractor at his expense in a manner satisfactory to the Engineer. Any area damage beyond repair must be cut off and discarded.
- D. Do not store materials directly on the ground. Use opaque covers to protect PVC materials from direct sunlight (UV light).
- E. Support pipes with nylon slings during handling.
- F. Inspect all pipe at the job site and check for conformance to these specifications. Pipe and fittings will be checked for out-of-round or damaged joints, interior and exterior surface damage, gasket damage and the other requirements listed herein. Any pipeline or appurtenant material found defective will be rejected. Any material rejected at the job site shall be marked "Rejected," and the Contractor shall remove it immediately from the job site.

#### 1.7. QUALITY ASSURANCE

- A. Perform Work according to following:

1. NUCA HDD Installation Guidelines.
  2. ASTM F1962.
  3. PPI TR-46.
- B. Qualifications: Driller company specializing in performing Work of this Section with minimum five years' documented experience. Guidance system operators shall have experience in its setup, calibration, and use.

#### 1.8. SITE CONDITIONS

- A. Field Measurements: Verify all field measurements and indicate on Shop Drawings.
- B. Other Utilities and Potholing
1. The type, size, location, and number of known underground facilities have been shown on the Drawings based on information available to the Engineer at the time of design; however, no guarantee is made as to the true type, size, location, or number of such facilities, or that all facilities are shown. It shall be the sole responsibility of the Contractor to verify the existence and location of all underground utilities along the route of the work. The omission from, or the inclusion of, utility locations on the Drawings is not to be considered as the nonexistence of, or a definite location of, existing underground utilities.
  2. If existing utilities were potholed during design, that information is shown or identified as such on the Drawings. If a certain utility is not identified as potholed, then its depth on the profile might be based on a reasonable assumption or on other available information such as nearby surveyed manhole invert elevations, valve nut measure-downs, record drawings, or other information as may or may not be indicated. If horizontal or vertical locations of existing utilities are found to be in conflict through the Contractor's own supplemental potholing efforts or during construction, then coordinate with the Engineer to adjust the elevation or location of the new pipeline to achieve adequate clearance from the existing utility or other agreed upon measure to resolve the conflict.
  3. The Engineer may not have independently verified any pothole information shown on the Drawings and is not responsible for the accuracy and completeness of utility locating and potholing work. Utility locates and potholing results are provided for the Contractor's convenience only. Reliance upon utility data depicted on the Drawings for risk management purposes during bidding does not relieve the Contractor from following all applicable utility damage prevention statutes, required use of 811, and/or other required or best practices during construction. It is important that the Contractor investigates and understands the scope of work between the Owner and Engineer regarding the scope and limits of the utility investigation leading to the utility depictions shown on the Drawings. It may be necessary for the Contractor to provide for their own supplemental utility locating and/or potholing prior to excavating or ordering material to the extent they feel is necessary to complete the work safely and successfully.
  4. Potholing during design was not conducted. The Contractor shall provide for potholing and elevation survey of existing utilities present along the proposed pipeline alignment. Do not prepare any shop drawings for, or make final order for, or design any pipe materials for any particular section of pipeline until confirmation of the location of utilities is complete, and until such time as no interferences are identified between the proposed pipeline and said existing utilities. If interferences are found, do not proceed until the pipeline design alignment or profile has been modified or otherwise reconciled by the Engineer to eliminate all such known interferences. Provide a copy of the pothole survey to the Engineer.

## 1.9. CLOSEOUT SUBMITTALS

- A. Project Record Documents:
  - 1. Record actual locations of pipe and invert elevations.
  - 2. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.
  - 3. Record actual depth of pipe at 25-foot intervals.
  - 4. Record actual horizontal location of installed pipe.
  - 5. Show depth and location of abandoned bores.
  - 6. Record depth and location of drill bits and drill stems not removed from bore.

## PART 2 PRODUCTS

### 2.1. GENERAL

- A. All pipe, fittings, couplings, and appurtenant items shall be new, free from defects or contamination, and wherever possible shall be the standard product of the manufacturer. They shall be furnished in pressure or thickness classes as specified or shown. All pipe shall have joints as called for in the specifications or indicated on the Drawings. Drilling Fluid
- B. Liquid bentonite clay slurry, totally inert with no environmental risk

### 2.2. HIGH DENSITY POLYETHYLENE (HDPE) PIPE (4 THROUGH 63 INCHES IN DIAMETER)

- A. The pipe shall be solid wall high density polyethylene AWWA C906 PE3408 pipe and fittings for pressure service.
- B. The pipe shall be supplied with a color-coded stripe in accordance with the service: a green stripe for sanitary or sludge service. If there is a question as to which color should be provided, seek clarification from the Engineer.
- C. Materials used to manufacture high density polyethylene pipe and fittings shall comply with all ASTM D3350 requirements and have a PPI recommended designation of PE3408. The molecular weight category shall be extra high (250,000 to 1,500,000) as per the Gel Permeation Chromatography determination procedure with a typical value of 330,000.
- D. HDPE pipe manufactured from materials meeting the specification of this section shall have an Environmental Stress Crack Resistance of zero failures when tested to greater than 10,000 hours (ESCR: $F_0 > 10,000$ ) when tested in accordance with ASTM F1248.
  - 1. Pipe supplied under this specification shall have a nominal DIPS (ductile iron pipe size) outside diameter. The dimension ratio (DR) shall be a minimum of 7.3 (254 psi), unless specified on the Drawings or required for drilling operations.
  - 2. All pipe and fittings shall meet the testing requirements of the most current version of AWWA C906. Manufacturer's test data shall be furnished upon request by the Engineer.
  - 3. The pipe shall have product traceability. This shall be accomplished by the inclusion of a product code into the print line of all pipe products. This shall notate the manufacturer, the date of manufacture, the lot and supplier of raw material, the location of the manufacture, and the production shift on which the product was produced. The print line shall also include such other markings as are required by the current version of AWWA C901 or C906. Print line shall be made

- permanent by using heat indentation. The use of industrial ink as the only method will be cause for rejection at the job site.
4. All fittings shall be pressure rated to match the system piping to which they are joined. At the point of fusion, the outside diameter and minimum wall thickness specifications of AWWA C906 for the same size of pipe. All fabricated fittings shall be properly rated according to manufacturer's written recommendations, and clearly labeled on the fitting as such. Manufacturer shall have a written specification for all standard fabricated fittings with established Quality Control criteria and tolerances. The manufacturer of the pipe shall be manufacturer of the fabricated fittings. Molded fittings shall be made from PE 3408 HDPE and have fusion compatibility with the pipe. Pipe manufacturer must certify that they produced the pipe, fabricated the fitting, and provide the warranty.
  5. Pipe and fittings may be joined by thermal fusion, electrofusion, flange assemblies or mechanical methods as described in AWWA C906. All joints shall be fully restrained against thrust.
    - a. Fused HDPE joints and fittings are considered fully restrained.
    - b. Provide concrete thrust wall anchors on HDPE pipelines where HDPE connects to mechanical joint fittings, valves, or dissimilar pipeline materials where a mechanical (not fused) method of joining is required.
    - c. Connections to mechanical joints shall be restrained by use of a positively locking MJ adaptor fitting, such as that fabricated by Specified Fittings LLC of Bellingham WA, or equal. The plain end of the device is fused to the HDPE pipeline, and the opposite DIPS end inserts into the mechanical joint, with a fused or milled thrust collar that is "sandwiched" between the mechanical joint flange and follower gland. Provide a Type 304 stainless steel internal stiffener ring of sufficient length to encompass the full bearing length of the joint connection.
      - 1) Note: connections at MJ butterfly valves may obstruct full disc movement; Contractor to confirm, and if so provide short ductile iron spool pieces or flanged end connections in lieu of mechanical joint to reconcile the conflict, subject to approval of the Engineer.
    - d. HDPE flanged connections shall be provided with a Type 304 stainless steel backing ring behind the HDPE flange opposite the metallic flange to provide structural rigidity and strength. Drill to match the adjacent flange to which it is connecting. Flange joint assemblies and gaskets shall have a pressure rating of at least 1.5 times the specified test pressure of the pipeline.

## PART 3 EXECUTION

### 3.1. GENERAL INSTALLATION REQUIREMENTS

- A. Do not lay pipe when trenches or weather conditions are unsuitable for such work.
- B. Each pipe length and fitting interior shall be cleaned of all foreign material before placing it in the trench and shall be kept clean all times thereafter. Each item shall also be examined for cracks and other defects before installation.
- C. Field cutting of pipe for inserting valves, fittings, or closure pieces shall be done in a neat and professional manner without damage to the pipe, and to leave a smooth end at right angles to the axis of the pipe.
- D. Each pipe length shall be laid true to line and grade, without intermediate high or low points not shown

on the Drawings. If field conditions are encountered that preclude installation per the Drawings, immediately notify the Engineer for resolution.

- E. Whenever the pipe is left unattended or pipe laying is not in progress, temporary plugs shall be installed at all openings. Temporary plugs shall be watertight and of such design as to prevent debris and animals from entering the pipe. All temporary plugs shall be subject to review by the Engineer.
- F. The Contractor shall install the materials in accordance with the manufacturer's recommendations. If there is a conflict between the Contract Documents and the manufacturer's instructions, the Contractor shall obtain resolution from the Engineer before proceeding with the work.

### 3.2. PREPARATION

- A. Call local utility line information service at not less than five working days before performing Work.
- B. Request underground utilities to be located and marked within and surrounding construction areas.
- C. Locate and identify utilities indicated to remain and protect from damage.
- D. Coordinate with utility company to remove and relocate utilities.
- E. Identify required lines, levels, contours, and data locations.
- F. Protect benchmarks, existing structures, fences, sidewalks, paving, curbs, and survey control points from excavating equipment and vehicular traffic.

### 3.3. HORIZONTAL DIRECTIONAL DRILLING

- A. Dewatering
  - 1. Intercept and divert surface drainage, precipitation, and groundwater away from excavation using dikes, curb walls, ditches, pipes, sumps, or other approved means.
  - 2. Develop and maintain substantially dry subgrade during drilling and pipe installation.
  - 3. Comply with NCDEQ and permit requirements for discharging water to watercourse, preventing stream degradation, and controlling erosion and sediment.
  - 4. Comply with Section 31 23 19.
- B. Excavation
  - 1. Excavate soils as specified in Sections 31 23 00 and 31 23 33
  - 2. Excavate approach trenches and pits as site conditions require; minimize number of access pits.
  - 3. Provide sump areas to contain drilling fluids.
  - 4. Install excavation supports as specified in Sections 31 23 00 and 31 23 33.
  - 5. Restore areas after completion of drilling and carrier pipe installation.
- C. Drilling
  - 1. Drill pilot bore with vertical and horizontal alignment as indicated on Drawings.
  - 2. Survey entire drill path, and mark entry and exit locations with stakes. If a magnetic guidance system is used, survey drill path for surface geomagnetic variations or anomalies.
  - 3. Guide drill remotely from ground surface to maintain alignment by monitoring signals transmitted from drill bit.

- a. Monitor depth, pitch, and position.
    - b. Adjust drill head orientation to maintain correct alignment.
  4. Inject drilling fluid into bore to stabilize hole, remove cuttings, and lubricate drill bit and pipe.
  5. Continuously monitor drilling fluid pumping rate, pressure, viscosity, and density while drilling pilot bore, back reaming, and installing pipe to ensure adequate removal of soil cuttings and stabilization of bore.
    - a. Provide relief holes when required to relieve excess pressure.
    - b. Minimize heaving during pullback.
  6. After completing pilot bore, remove drill bit.
- D. Drilling Obstructions
  1. If obstructions are encountered during drilling, notify Engineer immediately. Do not proceed around obstruction without Engineer's approval.
  2. For conditions requiring more than 3 feet of deviation in horizontal alignment, submit request to Engineer for approval before resuming Work.
  3. Maintain adjusted bore alignment within easement or right-of-way.
- E. Pipe
  1. Install reamer and pipe pulling head; select reamer with minimum bore diameter required for pipe installation.
  2. Attach pipe to pipe pulling head, and pull reamer and pipe to entry pit along pilot bore.
  3. Inject drilling fluid through reamer to stabilize bore and lubricate pipe.
  4. Install piping with horizontal and vertical alignment as shown on Drawings.
  5. Protect and support pipe being pulled into bore such that pipe moves freely and is not damaged during installation.
  6. Do not exceed pipe manufacturer's recommended pullback forces.
  7. Provide sufficient length of pipe to extend past termination point to allow connection to other pipe sections.
  8. Allow minimum of 24 hours for stabilization after installing pipe before making connections to pipe.
  9. Mark location and depth of bore with spray paint on paved surfaces and on wooden stakes on non-paved surfaces at 25-foot intervals.
- F. Slurry Removal and Disposal
  1. Contain excess drilling fluids at entry and exit points until recycled or removed from Site; provide recovery system to remove drilling spoils from access pits.
  2. Drilling Spoils
    - a. Remove, transport, and legally dispose of drilling spoils.
    - b. Do not discharge drilling spoils in sanitary sewers, storm sewers, or other drainage systems.
    - c. When drilling in suspected contaminated soil, test drilling fluid for contamination before disposal.
  3. If drilling fluid leaks to surface, immediately contain leak and barricade area from vehicular and pedestrian travel before resuming drilling operations.
  4. Complete cleanup of drilling fluid at end of each working day.
- G. Backfilling
  1. Install backfill as specified in Sections 31 23 00 and 31 23 33.



2. Backfill approach trenches and pits with subsoil fill to original contours and elevations.
3. Compact subsoil fill as specified in Sections 31 23 00 and 31 23 33.

### 3.4. INSTALLATION OF HIGH-DENSITY POLYETHYLENE (HDPE) PIPE

- A. Except as specified herein or unless specifically authorized by the Engineer, all installation of pipe shall conform to ASTM D2774, Underground Installation of Thermoplastic Pressure Pipe.
- B. Joining
  1. Heat Fusion Joining: Joints between plain end pipes and fittings shall be made by butt fusion. Joints between the main and saddle branch fittings shall be made using saddle fusion. The butt fusion and saddle fusion procedures used shall be procedures that are recommended by the pipe and fitting Manufacturer. The Contractor shall ensure that persons making heat fusion joints have received training in the Manufacturer's recommended procedure. The Contractor shall maintain records of trained personnel, and shall certify that training was received not more than 12 months before commencing construction. External and internal beads shall not be removed.
- C. Installation
  1. General: When delivered, a receiving inspection shall be performed and any shipping damage shall be reported to the manufacturer with 7 days. Installation shall be in accordance with ASTM D 2774, Manufacturer's recommendation and this specification. All necessary precautions shall be taken to ensure a safe working environment in accordance with all applicable safety codes and standards.
  2. Pipe Handling: When lifting with slings, only wide fabric choker slings capable of safely carrying the load shall be used to lift, move, or lower pipe and fittings. Wire rope and chain are prohibited. Slings shall be of sufficient capacity for the load, and shall be inspected before use. Worn or damaged equipment shall not be used.
- D. Fusion Quality Control
  1. The Contractor shall ensure the field set-up and operation of the fusion equipment, and the fusion procedure used by the Contractor's fusion operator while on site. Upon request by the Owner, the Contractor shall verify field fusion quality by making and testing a trial fusion. The trial fusion shall be allowed to cool completely; then test straps shall be cut out and bent strap tested in accordance with ASTM D 2657. If the bent strap test of the trial fusion fails at the joint, the field fusions represented by the trial fusion shall be rejected. The Contractor at their expense shall make all necessary corrections to equipment, set-up, operation and fusion procedure, and shall re-make the rejected fusions.

### 3.5. FIELD QUALITY CONTROL

- A. Certify that equipment for drilling has been properly set up and is ready for drilling.
- B. Tolerances
  1. Maximum Variation from Horizontal Position: 12 inches
  2. Maximum Variation from Vertical Elevation: 2 inches
  3. Minimum Horizontal and Vertical Clearance from Other Utilities: 12 inches
  4. When pipe installation deviates beyond specified tolerances, abandon bore, remove installed pipe, rebores, and reinstall pipe in correct alignment.
  5. Fill abandoned bores greater than 3 inches in diameter with grout or flowable fill material.

- C. Upon completion of pipe installation, test pipe as specified in Section 33 05 05.01.
- D. Compaction Testing: As specified in Sections 31 23 00 and 31 23 33.
- E. When tests indicate Work does not meet specified requirements, remove Work, replace, and retest.

3.6. CLEANING

- A. Upon completion of drilling and pipe installation, remove drilling spoils, debris, and unacceptable material from approach trenches and pits. Clean up excess slurry from ground.
- B. Restore approach trenches and pits to original condition.
- C. Remove temporary facilities for drilling operations.

END OF SECTION

SECTION 33 05 61  
CONCRETE SANITARY MANHOLES

PART 1 GENERAL

1.1. SCOPE

- A. The work of this section consists of furnishing, installing, and testing pre cast or cast-in-place bases with reinforcement, precast concrete risers, frames, covers, and installation materials, and appurtenances for sanitary manholes.

1.2. REFERENCES

- A. American Society for Testing and Materials (ASTM).
1. A48 (2022) – Standard Specification for Gray Iron Castings
  2. A615 (2022) – Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement
  3. C150 (2020) – Standard Specification for Portland Cement
  4. C443 (2021) – Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber gaskets
  5. C478 (2022) – Standard Specification for Circular Precast Reinforced Concrete Manhole Sections
- B. American Association of State Highway and Transportation Officials (AASHTO)
1. HB-17 (2002) – Standard Specifications for Highway Bridges.

1.3. CONTRACTOR SUBMITTALS

- A. Manufacturer's literature on manholes, joint material, frame and cover, steps, and pipe inserts, connectors, and stubs sufficient to demonstrate compliance with the Specification and Drawing requirements.
- B. Shop drawings showing design criteria, reinforcing steel location and embedment, layout of inserts, attachments and openings, and location and details of joints.
- C. Test results.

PART 2 PRODUCTS

2.1. GENERAL

- A. Manholes shall be constructed of pre-cast concrete riser sections, in accordance with the details shown on the Drawings. The concrete sections shall conform to ASTM C478. The top section required for change of diameter shall be eccentric cone or flat slab if permitted by the Engineer.
- B. To bring the manhole cover to the correct elevation, the grade ring section of each manhole shall be pre-cast concrete placed beneath the cast iron frame and cover. Drop-in steel rim inserts are NOT acceptable. Grade rings shall not be less than 6 inches wide and furnished in heights to allow for 1-inch adjustment. Maximum adjustment height shall not exceed 12 inches.
- C. Manholes and castings shall be rated for AASHTO H-20 loading.

- D. Stubs shall be provided at manholes when shown on the Drawings. Stubs shall be sealed with a removable gasketed watertight plug of the same specification and rating as the pipe.
- E. Waterstop gaskets for connecting PVC pipe to cast-in-place manhole bases shall be specifically manufactured for that purpose. The gasket shall be provided by the pipe manufacturer.

## 2.2. JOINTS

- A. Precast manhole joints shall be made watertight with a o-ring joint sealant consistent with ASTM C443. Diameter of gasket shall be as recommended by the manufacturer.

## 2.3. FRAME AND COVER

- A. Frames and covers shall be nominal 24-inch diameter cast iron. Frame shall have a minimum height of 6-inches. Cast iron shall be per ASTM A48, Class 30B or better. Minimum load rating shall be AASHTO H-20.
- B. Cover shall have the word "SEWER" clearly cast on its surface.
- C. Where bolt-down lids are specifically called for on the Drawings, provide bolt down and gasketed, watertight, with 316 SS bolts.

## 2.4. MANHOLE STEPS

- A. The manhole steps shall be copolymer polypropylene with grade 60 reinforcement as indicated in the Drawings.

## 2.5. GROUT

- A. Grout shall be non-shrink type with aluminum filings; grout with iron filings are not acceptable. Grout shall be "Five Star Grout," "Embeco Grout" or equal.

## 2.6. CONCRETE

- A. Concrete for cast-in-place manhole bases shall have a 28-day compressive strength of not less than 3,000 psi.
- B. The maximum water content shall be 0.5 pounds of water per pound of cement. Entrained and entrapped air shall be between 4 and 9 percent. All reinforcement shall be standard deformed reinforcement conforming to the requirements set forth in ASTM, A615, Grade 60.

# PART 3 EXECUTION

## 3.1. GENERAL

- A. Manholes shall be constructed to conform to the details shown on the Drawings. The invert channels shall be smooth, semi-circular in shape, and tangent to pipe openings at each end, conforming to the inside of the incoming and outgoing pipelines. Changes in direction of flow shall be made with a smooth curve of as large a radius as the size of the manhole will permit. Changes in size and grade of the channels shall be made gradually and evenly. Where differences in invert elevations exist, sloped

flow channels shall be formed so the sewage does not undergo a sharp vertical drop. Where an inlet invert is above the crown of the outlet, provide a smooth ogee profile transition channel, with the channel invert tangent to the pipe invert slope at the inlet and outlet. The invert channels may be formed directly in the concrete of the manhole base. The floor of the manhole outside of the channel shall be smooth and shall slope toward the channels at not less than 1 inch per foot and not more than 2 inches per foot.

- B. In graded areas, manhole frames and covers shall be set with their tops at the ground line, unless shown otherwise on the Drawings. Compacted backfill shall be placed around the exposed section as shown on the Drawings. The site shall be graded so that drainage is away from the manhole.
- C. In paved areas, accurately locate and place the frames no more than 1/4-inch vertical elevation below the finished paved surface at any location along its circumference. Shim and slope the cover so that it is parallel with the plane of the pavement surface. Coordinate the activities of all trades so that this tolerance is achieved.
- D. Outside each manhole where the pipe enters/exits, within 12 inches of the manhole base, the Contractor shall install a bell section of pipe or a certified and accepted coupling as indicated on the Drawings.
- E. Each joint of the precast manhole barrel shall have at least one continuous gasket placed on the lower ledge before the barrel immediately above is lowered into place.

### 3.2. GROUTING

- A. Any opening between manhole walls and pipe made by the Contractor, and lifting holes or as designated elsewhere, shall be closed watertight with non-shrink grout. The opening shall be of sufficient size to accommodate the pipe, "O"-rings, and grout. The grout shall extend no less than the full width of the manhole barrel. Use grout to make a watertight seal in and around existing pipes which are removed from service.
- B. Channels that have been cut into existing concrete bases shall be smoothed to the specified contour with grout.

### 3.3. TESTING MANHOLES

- A. During the construction of the manholes, the Contractor shall, in accordance with good practice, ensure that no earth, sand, rocks or other foreign material exists on the joint surfaces during assembly of the sections. The Engineer shall check each manhole to determine whether the manhole fulfills the requirements of the Drawings and Specifications. The Visual Examination and either the Leakage Test or Vacuum Test are required.
- B. Visual Examination
  - 1. The Engineer shall visually check each manhole, both exterior and interior, for flaws, cracks, holes, or other inadequacies which might affect the operation or watertight integrity of the manhole.
  - 2. Should any inadequacies be found, the Contractor shall make any repairs deemed necessary by the Engineer.
- C. Leakage Test
  - 1. All manholes shall be tested for leakage and all tests shall be witnessed by the Engineer. The

leakage test shall be conducted prior to backfilling around the manhole and shall be carried out in the following manner:

- a. All lines leading into or out of the manhole shall be tightly plugged.
- b. The manhole shall be filled with water to a level at least 2 inches above the uppermost step. The water shall be allowed to stand for two hours to allow for normal water absorption into the manhole material.
- c. At the end of the two-hour stabilization period, if the water level in the manhole has dropped below the top step, additional water will be added to bring the level above the step as before.
- d. Any visible external leakage or drop in water level noted within the one-hour test period shall constitute failure, and the Contractor, at their own expense, shall repair the manhole and re-test until satisfactory watertightness is obtained.

D. Vacuum Testing

- 1. All pipes entering and exiting the manhole shall be temporarily plugged, taking care to securely brace the pipes and plugs to prevent them from being drawn into the manhole.
- 2. The test head shall be placed at the top of the manhole and the seal inflated in accordance with the manufacturer's recommendations.
- 3. A vacuum of 10-inches of mercury shall be drawn on the manhole, the valve on the vacuum line of the test head shall be closed, and the vacuum pump shut-off. The time shall be measured for the vacuum to drop to 9-inches of mercury.
- 4. The manhole will be declared unacceptable if the time to drop from 10-inches of mercury to 9-inches of mercury is less than the time shown in the following table:

DEPTH (FEET) (Vertical Length of Manhole)	TIME (seconds)		
	48" Diameter	60" Diameter	72" Diameter
8	20	26	33
10	25	33	41
12	30	39	49
14	35	46	57
16	40	52	67
18	45	59	73
20	50	65	81
22	55	72	89
24	59	78	97
26	64	85	105
28	69	91	113
30	74	98	121

- 5. The minimum test time shall be one minute. If the manhole fails the initial tests, the manhole shall be repaired and re-tested until a satisfactory test is obtained.

END OF SECTION

SECTION 33 05 63  
PRECAST CONCRETE VAULTS

1.1. SUMMARY

- A. The work required under this Specification consists of furnishing all labor and materials and performing all construction operations in connection with installation and erection of precast concrete vaults, and all related embedded and attached items.

1.2. SUBMITTALS

- A. Product data: Descriptive details of the manufacturer's proposal products, including:
1. Precast sections.
  2. Steps, ladder rungs and other hardware.
  3. Minimum concrete 28-day compressive strength.
  4. Cement certification.
- B. Shop Drawings, including:
1. Design criteria.
  2. Floatation calculations.
  3. Reinforcing steel location and concrete cover.
  4. Layout of all inserts, attachments, and openings.
  5. Location and type of joints.
  6. Instructions for field-casting tongue-and-groove joint in cast-in-place base slab to accept precast vault wall sections.

1.3. DESIGN

- A. Comply with ASTM C857 and C858.
- B. Precast vaults shall be designed to accommodate AASHTO HS-20 vehicle loading, as well as all dead and live loads indicated or illustrated on the Drawings.
- C. Vaults shall be designed to resist floatation with a groundwater level equal to finish grade elevation shown on the Drawings. Calculations shall not consider the weight of items contained within the vault. Provide ballast, extended bottom slab, or other methods needed to prevent floatation of the vault.
- D. Pipe penetration openings shall be provided as shown on the Drawings and shall be smooth core drilled in the field or cast at the factory. Percussion drilling shall not be used. Pipe openings shall be of sufficient diameter to accommodate the pipe and specified modular link seal or other annular sealing method as shown on the Drawings.
- E. Roof slab opening(s) shall have additional reinforcement, set 45 degrees from the edges of the vault and extending 2 feet beyond the opening(s).
- F. Vault design and fabrication shall include installation of ladders, inserts, access hatches, piping supports, and other appurtenances required per the Drawings and specified.
- G. The Contractor shall submit design calculations signed and sealed by an Engineer licensed to practice in the State of North Carolina, and shop drawings showing details of construction.

## PART 2 MATERIALS

### 2.1. CEMENT

- A. ASTM C150.

### 2.2. SEALANT GASKETS

- A. Preformed, continuous rope form plastic material, protected by removable two-piece wrapper. Conform to Federal Specification SS-S-210. Rub-R-Nek or equivalent.

### 2.3. ACCESS HATCH

- A. Minimum clear opening dimensions of each hatch shall be as shown on the Drawings. Bilco J-AL series, Halliday H1r or H2R, or equivalent. All non-aluminum components shall be Type 304 stainless steel.
  - 1. Loading: H-20.
  - 2. Leaves: 1/4-inch thick aluminum, diamond pattern, reinforced to withstand the specified loads.
  - 3. Frame: 1/4-inch thick aluminum channel with anchor flange around perimeter for embedment into concrete. Surfaces in contact with concrete shall be first coated with bituminous coating or mastic, to prevent aluminum/cement contact. Provide channel to collect rain water and provide 1-1/2-inch drainage coupling for connection to drain lines. Drain lines shall be freely draining by gravity.
  - 4. Doors: Doors shall open to 90 degrees and shall include an automatic hold-open arm with a positive automatic latch that will secure the door in the open position until the release handle is activated. Door hinges shall be recessed or flush.
  - 5. Lock: Provide a slam-lock with removable handle and a hinged covered recess with a door to frame padlock hasp.
  - 6. Lift-Assist Mechanism: Provide stainless steel compression spring(s) or pneumatic spring(s) enclosed in sealed telescoping tube(s).
  - 7. Manufacturer
    - a. Halliday Products: H1R or H2R,
    - b. Bilco J-AL, or
    - c. Engineer approved equal

### 2.4. FIXED LADDER

- A. Ladder shall be fabricated from aluminum or steel and encapsulated in copolymer polypropylene for corrosion resistance. Comply with ASTM C497 and OSHA 1910.26 and 1910.27. Provide pull-up handrail extension that raises to 42-inches above the hatch when fully extended. Lane International Corporation, or equal. Securely anchor to the vault wall and floor with Type 304 stainless steel anchors.

## PART 3 EXECUTION

### 3.1. FABRICATION:

- A. Access Hatches
  - 1. Hatch frame drain lines shall be plumbed by the vault manufacturer at the factory with 1.5-inch schedule 40 PVC to daylight to the exterior of vault as shown on the drawings or as coordinated with the Engineer. Show the proposed location of the drain line routing on the shop drawings for Engineer review and approval.



2. Apply bituminous coating to aluminum access hatch frames where in contact with concrete at the factory, prior to casting in the top slab.

3.2. INSTALLATION:

- A. Comply with ASTM C891.
- B. Prior to vault placement, prepare the subgrade and base course aggregate as shown on the Drawings and as specified for structures in the Division 31 specifications.
- C. Apply primer to joint surfaces in accordance with manufacturer's instructions. Make all joints watertight with sealant gaskets.
- D. Provide rigid foam insulation around the vault exterior if shown on the Drawings.
- E. Backfill and compact around the vault as specified for backfill adjacent to structures in the Division 31 specifications.
- F. Install the sump pump, discharge piping, and accessories in accordance with the manufacturer's instructions and test to verify proper operation.

END OF SECTION

SECTION 33 05 98  
IDENTIFICATION OF BURIED PIPING

PART 1 GENERAL

1.1. SUMMARY

- A. The work to be performed in accordance with this Specification consists of furnishing all materials, equipment, supplies, and accessories and of performing all operations required in connection with the fabrication and installation of buried piping identification systems as shown on the Drawings and specified herein.
- B. This Section includes requirements for buried piping systems, including:
  - 1. Buried utility warning tape
  - 2. Tracer Wire

1.2. PRICE AND PAYMENT PROCEDURES

- A. All work related to work in this specification is considered subsidiary to other bid items. There is no separate pay item.

1.3. SUBMITTALS

- A. Action Submittals
  - 1. Product Data: Submit manufacturer's catalog literature for each product of sufficient quantity and content to demonstrate conformance with the specification requirements. Highlight or identify items proposed for use. Cross out extraneous items.

PART 2 PRODUCTS

2.1. BURIED UTILITY WARNING TAPE

- A. Metallic detectable type, three (3) inch wide plastic metallic type consisting of a color-coded polyethylene or melinex film, a solid core aluminum detection layer and other layers recommended by the manufacturer to provide durability and longevity. The tape and ink shall be resistant to acids, alkalis, and other components likely to be encountered in soils.
- B. Tape shall be color-coded to the pipeline service. Provide color blue with repeating text "Caution Water Main Buried Below" or equivalent for potable water service. Green color with repeating text "Caution Sewer Main Below" for sewer force main service, etc. Seek clarification from the Engineer on which color is to be used as necessary.
- C. Manufacturer: Sentry Line Detectable Terra Tape by Reef Industries; Detectable Marking Tape by T. Christy Enterprises; or equal.

2.2. TRACER WIRE:

- A. Direct burial rated, 12-gauge solid (single) copper strand, 600-volt UF tracer wire with 30 mil HDPE insulation.

1. Wire insulation color shall be color-coded to the pipeline service. Blue-colored wire shall be used for potable water service, green for sewer force main service, purple for reclaimed or non-potable water service, etc. Seek clarification from the Engineer on which color is to be used for each pipeline service as necessary.
- B. Splices: Silicone-filled UL Listed product specifically designed for waterproof direct bury splicing of tracer wire. 3M DBR-6 or equivalent.
- C. Test stations: C.P. Mini as manufactured by C.P. Test Services, Inc., or equivalent. Lid shall be marked "test", shall be locking, and shall be of cast iron construction suitable for AASHTO H-20 traffic loading.

## PART 3 EXECUTION

### 3.1. WARNING TAPE

- A. Install buried utility warning tape as shown on the trench detail shown on the Drawings or centered 24-inches above the pipe within the trench backfill if not shown. Tape shall be laid continuously along the length of the pipeline.

### 3.2. TRACER WIRE:

- A. Provide tracer wire for all pipelines in this project except as directed otherwise by the Engineer. Tracer wire shall be a continuous, fully functioning, and tested system to include all appurtenances.
- B. Where the pipe is encased or provided with concrete collars or cut-off walls, lay the wire around the encasement (do not encase the wire).
- C. Splice tracer wire using the specified silicone-filled splice kits in accordance with manufacturer recommendations. Ensure the kit fully encapsulates un-insulated wire ends and are made watertight.
- D. Tracer wire shall be accessible at a spacing that shall not exceed 750 feet along the pipeline.
  1. Provide test station boxes adjacent to fire hydrants, valve boxes, vaults, and at other pipeline appurtenances that are visible at grade as required to meet the spacing criteria.
  2. If there are no at-grade features proposed within the spacing criteria for a particular segment of a pipeline, then provide intermediate test stations per the spacing criteria, and contained within a valve box.
  3. Where the pipeline terminates at structures, tanks, or buildings, provide a test station at grade outside and adjacent to the structure, centered over the pipeline, for access to the tracer wire.
- E. For each wire end, provide an 18-inch long length of extra wire (coiled and tucked into the test station box) for connection to electronic locating equipment, or connect the wire to the terminal board inside the test station box in accordance with Owner preference.
- F. Upon completion and partial backfill of the pipeline, the Contractor shall test and demonstrate electrical continuity of each segment of tracer wire. Submit test results to the Engineer indicating the location of the tested segment. Testing shall be by the conductive method; inductive test methods are not acceptable. Repair all faulty work at no additional cost to the Owner until the system is functional and approved. Demonstrate that all installed test stations are visible, set at final grade, and accessible.

END OF SECTION

SECTION 40 05 05  
EXPOSED PIPING

PART 1 GENERAL

1.1. SUMMARY

- A. The work to be performed in accordance with this Specification consists of furnishing all materials, equipment, supplies, and accessories and of performing all operations required in connection with the fabrication and installation of exposed piping as shown on the Drawings and specified herein.
- B. Exposed piping includes:
  - 1. All interior piping within structures, tanks, and vaults
  - 2. Piping under structures and through walls
  - 3. Piping to the outside of a wall pipe of any structure
- C. This Section does generally not cover buried pipeline systems. Buried piping is covered in Division 33 of the Technical Specifications.
- D. Pipe supports and hangers to be used with piping installed under this specification shall be as specified in Section 40 05 07 – Pipe Hangers and Supports for Exposed Piping.
- E. Due to the diagrammatic nature of the Drawings, not all offsets, fittings, etc. which may be required may be shown. The Contractor shall furnish, install, and test pipe, pipe supports, fittings, specials, and all required appurtenances as shown on the Drawings and as required to make the entire piping system properly assembled and operable. Space requirements and locations of connections of equipment the Contractor proposes to furnish shall be fully investigated and vetted prior to ordering equipment or releasing items for fabrication. The Contractor shall not scale off the drawings to cut pipe or as a basis for making connections to equipment. Piping layouts or appurtenances which will not enter the openings, or which will not adequately fit the assigned space will not be acceptable. All drawings relating to the construction, including architectural, structural, electrical, plumbing, piping, heating, and ventilating, together with these specifications shall be considered collectively.

1.2. REFERENCES

- A. Standards
  - 1. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.
  - 2. American Society of Mechanical Engineers (ASME)
    - a. B16.1 (2020) - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, And 250
    - b. B31.1 (2020) – Power Piping
    - c. B31.3 (2020) - Process Piping
  - 3. American Society for Testing and Materials (ASTM)
    - a. A307 (2021) - Standard Specification for Carbon Steel Bolts, Studs, And Threaded Rod 60,000 PSI Tensile Strength
    - b. D412 (2016) – Standard Test Methods for Vulcanized Rubber And Thermoplastic Elastomers - Tension
    - c. D1784 (2020) – Standard Classification System and Basis for Specification for Rigid

- Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds
- d. D1785 (2021) - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, And 120
  - e. D2564 (2020) - Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems
  - f. D2665 (2020) - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste, And Vent Pipe and Fittings
  - g. D3311 (2021) - Standard Specification for Drain, Waste, And Vent (DWV) Plastic Fittings Patterns
  - h. F656 (2021) - Standard Specification for Primers for Use in Solvent Cement Joints of Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings
4. American Water Works Association (AWWA)
- a. C104 (2016) - Cement-Mortar Lining for Ductile-Iron Pipe and Fittings
  - b. C110 (2021) - Ductile-Iron and Gray-Iron Fittings
  - c. C111 (2017) - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
  - d. C115 (2020) - Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges
  - e. C151 (2017) - Ductile-Iron Pipe, Centrifugally Cast
  - f. C153 (2019) - Ductile-Iron Compact Fittings
  - g. M11 (2018) – Steel Pipe – A Guide for Design and Installation

### 1.3. ADMINISTRATIVE REQUIREMENTS

#### A. Coordination

1. Coordinate Work of this Section with piping and equipment connections specified in other Sections and indicated on Drawings.

### 1.4. SUBMITTALS

#### A. Submit the following:

1. Manufacturer's Certificates of Compliance: Certify that products meet or exceed specified requirements.
2. Submit qualifications for manufacturer, installer, and licensed professional.
3. Submit manufacturer's approval of installer.
4. Shop drawings, complete with dimensions and elevations, material, grade and class on all pipe, fittings, and couplings and on all joints, coatings, and appurtenances.
5. Detailed catalog and engineering data sheets for all items, components, and appurtenances, of sufficient quantity and content to demonstrate conformance with the specification requirements. Highlight or identify items proposed for use. Cross out extraneous items.
6. Proposed schedule for delivering and installing the piping systems.
7. Manufacturer's installation instructions and recommendations.
8. Test results.
9. Record Documents: Accurately record actual location of constructed pipelines in relation to existing permanent benchmarks and/or improvements. Submit scan of field redline markups, AutoCAD survey data, or as otherwise acceptable to the Engineer as agreed to in advance.

### 1.5. QUALITY ASSURANCE

## A. Qualifications

1. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years' documented experience.
2. Installer: Company specializing in performing Work of this Section with minimum three years' documented experience.

## 1.6. PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Pipe, fittings, valves, and all other accessories shall be loaded and unloaded by lifting with hoists or skidding to avoid shock or damage to them. Under no circumstances shall any materials be dropped. Pipe handled on skidways shall not be skidded or rolled against pipe already on the ground. Skidding which damages protective coatings or primers will not be permitted.
- B. All pipe and fittings shall be so handled that the coating and lining will not be damaged. If, however, any part of the coating or lining is damaged, the repair shall be by the Contractor at their expense in a manner satisfactory to the Engineer. Any area damage beyond repair must be cut off and discarded.
- C. Examination: All piping components and accessories shall be field inspected at the job site and checked for conformance to these specifications. Pipe and fittings will be checked for out-of-round or damaged joints, interior and exterior surface damage, gasket damage and the other requirements listed herein. Any pipeline or appurtenant material found defective will be rejected. Any material rejected at the job site shall be marked "Rejected," and the Contractor shall remove it immediately from the job site.
- D. Store piping and appurtenances according to manufacturer's instructions. Do not store materials directly on the ground. Polyvinyl chloride (PVC) pipe shall be stored under opaque cover that does not transmit UV light.

## 1.7. EXISTING CONDITIONS

- A. Field Measurements: Field verify all pertinent dimensions, elevations, and measurements prior to releasing products and piping and related appurtenances (i.e. pipe supports, etc.) for fabrication. Indicate field measurements on Shop Drawings.
- B. Verify that field dimensions are as indicated on Drawings.
- C. Inspect existing flanges for nonstandard bolt hole configurations or design and verify that new pipe and flange mate properly.

## PART 2 PRODUCTS

## 2.1. GENERAL

- A. All pipe, fittings, couplings, and appurtenant items shall be new, free from defects or contamination, and wherever possible shall be the standard product of the manufacturer. They shall be furnished in pressure or thickness classes as specified or shown. All pipe shall have joints as called for in the specifications or indicated on the Drawings.

## 2.2. HARDWARE MATERIALS

- A. Hardware used for the assembly of piping systems, flanges, joints, and appurtenances (including coupling bolts, tie rods, mechanical restraint systems, and the like) shall comply with the following:
  - 1. Interior dry locations, or exterior above grade: Hot dip galvanized steel.
  - 2. Moist locations (any interior or exterior space wholly or partially below grade level including vaults or pits, or having a wall or ceiling forming head space of part of a clean water channel or basin): Type 304 Stainless Steel with "Never Gall" (or equivalent) factory applied coating system.
  - 3. Submerged locations and in corrosive areas (corrosive meaning spaces with NEC electrical classifications of Class 1 Divisions 1 and 2, in chemical storage and pumping areas, and in head space of channels or basins containing process liquids): Type 316 stainless steel with "Never Gall" (or equivalent) factory applied coating system.
  - 4. Buried in earth: Type 304 stainless steel with "Never Gall" (or equivalent) factory applied coating system.

### 2.3. DUCTILE IRON PIPE

- A. Manufacturers: Subject to compliance with project requirements, provide products by one of the following:
  - 1. American Ductile Iron Pipe
  - 2. US Pipe
  - 3. Approved equal
- B. Pipe: Ductile-iron pipe, conforming to AWWA C151. Provide Special Thickness Class 52 minimum for interior piping, except that flanged-joint piping shall be Special Thickness Class 53 minimum, and piping through concrete encasements, below slabs or structures, within sludge or sewage containing vessels, or otherwise inaccessible after construction shall be Special Thickness Class 55.
- C. Joints: Ductile iron pipe shall be flanged, push-on, or mechanical joint as shown on the Drawings. In general, flanged pipe shall be used above ground or where exposed, while push-on or mechanical joint will be used where buried in earth.
  - 1. Flanged joints: In accordance with AWWA C115 and ANSI B16.1 Class 125, except provide Class 250 when specifically shown on the Drawings or required for connection to equipment or valves. Flanges shall be accurately shop faced and drilled true. Where tap or stud bolts are shown or otherwise required, flanges shall be tapped. Flanged pipe joints shall be made with full face gaskets of cloth inserted rubber compound, not less than 1/8-inch in thickness. EPDM compound shall be provided for sewage, sludge, and reclaimed water. Gaskets shall be pressure-rated for at least 1.5 times the specified test pressure of the pipeline, submit the pressure rating for review.
  - 2. Mechanical and Push-On: In accordance with AWWA C111, Gaskets shall be EPDM compound.
- D. Fittings: Ductile iron. Comply with AWWA C110 or C153. Provide Class 250 minimum. Joint type and pressure rating shall match those specified for the adjacent pipe and as shown on the Drawings or appropriate for the installation location.
  - 1. All mechanical joint solid sleeves shall be long pattern.
  - 2. Dielectric Fittings: Provide between dissimilar metals.
- E. Spools and Wall Pipe: Spools may be cast as fittings in accordance with AWWA C110 or fabricated from Special Thickness Class ductile iron pipe in accordance with AWWA C115. Wall pipe shall have weep/thrust collars integrally cast or welded. Collars shall be located to be in the center of the concrete wall or floor into which they are to be cast.



- F. Exterior Coating:
  - 1. Pipe, spools, and fittings to be buried in earth shall be furnished with standard thickness asphalt coating per AWWA C151.
  - 2. Pipe, spools, and fittings to be installed indoors or above ground shall be furnished with a factory prime coat, for finish coating in the field with the appropriate system specified in Specification 09 90 00.
  - 3. Pipe, spools, and fittings to be installed in submerged locations, inside the wet well, or treatment tank head spaces that may constitute a corrosive environment shall be supplied by the factory bare, for shop blasting and application of the specified submerged protective coating system. Asphalt coated or primer coated pipe shall not be used inside submerged or corrosive locations.
- G. Interior Lining:
  - 1. Piping and fittings conveying raw sewage shall be lined with ceramic epoxy; Protecto 401 as manufactured by U.S. Pipe, or approved equal.
- H. Joint Restraint: All pressurized ductile iron piping systems shall be fully restrained against thrust.
  - 1. Exposed piping (aboveground, indoors, or inside vaults): Flanged connections are considered fully restrained. Sleeves, flanged coupling adapters, couplings, and other un-restrained accessories shall be restrained using Tie Rod Harness Restraints specified in another paragraph herein.
  - 2. Buried piping: In accordance with the applicable section in Division 33 of these Technical Specifications.

#### 2.4. GALVANIZED STEEL PIPE

- A. Materials: Galvanized steel pipe shall conform to the requirements of Federal Specification WW-P-406b (Int Amd 2), Class 2, ends threaded, with a coupling on one end, Schedule 40.
- B. Specials and Fittings: Specials and fittings for galvanized steel pipe shall be galvanized malleable iron conforming to the requirements of Federal Specification WW-P-521f, Type II. Unions shall be ground joint hubs with screwed ends, bronze to iron seats, 300-pound WOG.
- C. Minimum allowable wall thickness, unless specified otherwise elsewhere, shall be similar to those specified hereinbefore for black alloy steel pipe.

#### 2.5. POLYVINYL CHLORIDE (PVC) PIPE AND FITTINGS FOR DRAIN WASTE AND VENT (DWV) SERVICE

- A. Plastic pipe and fittings for plumbing, venting, and gravity drainage service shall conform to the following requirements.
  - 1. Pipe: In accordance with ASTM D1784, ASTM D1785, and ASTM D2665, Schedule 40. White in color.
  - 2. Fittings: Same material as the pipe, white in color, Schedule 40. Comply with ASTM D3311.
  - 3. Joints: Solvent welded, except as otherwise indicated on the Drawings or specified herein. Solvent cement and primer shall be as recommended by the pipe manufacturer for the schedule and size to be joined, and meet the requirements of ASTM D2564 and ASTM F656.

#### 2.6. TIE ROD HARNESS (THRUST) RESTRAINTS

- A. Where specified herein or required or shown on the Drawings for thrust restraint of piping accessories in exposed (unburied) locations, provide tie rod harness restraints. Diameter and quantity of tie rods

shall be consistent with AWWA Manual M11, Chapter 13 based on pipe size and test pressure. Hardware and rod materials shall be as specified elsewhere herein based on installation location.

- B. Provide flange lugs (“dog ears”) or eye-bolts attached to the nearest flanges on each side of the item to be restrained for anchorage of the tie rods. Tie rods shall not anchor directly to flange bolt holes. Flange lugs shall be fabricated from 3/4-inch thick structural steel plate and be designed to fit the flange and bolt pattern of the flanges to which they are attached. Provide at least 2 tie rods per restraint, spaced equally around the pipe. Tie rods shall have a minimum yield stress of 46,000 psi. Double nut all tie rods to prevent loosening under vibration.
- C. Megalug style serrated wedge restraint systems shall not be used as a substitute for tie rod harness restraints unless specifically approved by the Engineer in writing. Anchor studs or set screws shall not be used for restraint.

## 2.7. FLEXIBLE COUPLINGS

- A. Flexible couplings shall be the types below as shown on the Drawings or as otherwise permitted by the Engineer. The flexible couplings shown on the Drawings are the minimum required; the Contractor may add additional as required to facilitate the piping installation subject to approval by the Engineer. Couplings shall provide the requisite pipe flexibility without jeopardizing pipe joint integrity due to hydraulic thrust or location of pipe supports, and shall have the same pressure-rating as the pipe. Couplings shall comply with AWWA C219. Hardware shall comply with the materials specified elsewhere herein based on installation location. EPDM or NBR gaskets shall be used for raw sewage, sludge, and reclaimed water service.
  - 1. Sleeve Type Couplings shall be properly gasketed and shall be of the diameter and type recommended by the manufacturer to fit the outer diameter and type of pipe to which it is connecting. Each coupling shall consist of a ductile iron or steel middle ring, 2 ductile iron or steel followers, 2 gaskets, and the necessary bolts and nuts to compress the gaskets. The couplings shall be Smith Blair 411, 413, or 441 (as appropriate for the pipe type and pressure rating), or approved equal. Couplings to be fusion epoxy lined and coated. Polyethylene encase when buried in earth.
  - 2. Flanged Coupling Adapters shall have a ductile iron body and flange, gaskets, and bolts and nuts required to compress the gaskets. Flange shall be compatible with the flange to which it will mate. Fusion epoxy line and coat. Flanged coupling adapters shall be Smith Blair Model 912 or approved equal.
  - 3. Restraint: Flexible couplings shall be fully restrained against thrust unless the Engineer has given written approval to omit this feature for specific cases.
    - a. Exposed locations: Restraints shall consist of Tie Rod Restraint Harnesses as specified elsewhere herein. Megalug style serrated wedge restraint systems shall not be used unless specifically approved by the Engineer in writing. Anchor studs or set screws shall not be used for restraint.
    - b. Buried locations: Couplings shall be restrained using mechanical restraints in accordance with the details shown on the Drawings and the pertinent buried pipeline Section elsewhere in the Technical Specifications.

## 2.8. EXPANSION JOINTS

- A. Rubber Spool Type Expansion Joints

1. Rubber expansion joints shall be provided for movement and for vibration isolation but not for misalignment of piping ends.
2. The single piece, leakproof tube, corrugated with one or more corrugations shall be made of compounds of oil resistant synthetic rubber for water, sewage and sludge.
3. The tube shall extend through the bore to the outside edges of the flanges.
4. All fabric plies shall be impregnated with long-lived synthetic rubber compounds and laminated into a unit.
5. Metal reinforcing shall be used in all rubber joints. In sizes 4-inch and smaller metal wire shall be used; in sizes 4-inch and larger, solid metal rings shall be used.
6. Flanges shall be made of fabric reinforced rubber to resist stresses developed when flange bolts are tightened.
7. Flange bolt holes shall be coated with a sealer to prevent absorption and leaking of moisture.
8. Steel retaining rings shall be placed against the back side of the flange of the expansion joint and bolted through it to the metal flange of the pipe.
9. Provide control rods if recommended by the manufacturer for the test pressure of the pipeline.
10. Spool type rubber expansion joints shall be as manufactured by Proco, the United States Rubber Company, Mercer Rubber Company, or equal.

B. Expansion Joints for Cast Iron, Ductile Iron, and Steel Pipe

1. Expansion joints shall be provided where shown on the Drawings and in accordance with the manufacturer's recommendations.
2. The expansion joints shall be Dresser, Style 63, Type 2, double-end expansion joint; the comparable product of Smith-Blair, or equal.
3. The expansion joints shall have a deep packing chamber to provide for full and ample packing space.
4. The followers shall be three-fourths as long as the packing chamber to afford a wide margin for take-up should future retightening of the expansion joint be necessary.
5. The expansion joint packing chamber shall be accessible after assembly with sufficient room available to pull out the followers and repack the joint without disassembly from the pipeline in which it is installed.
6. Standard packing shall consist of alternate split rubber-compound rings for sealing purposes and split jute rings for lubrication and shall be designed to operate at temperatures up to 212°F.
7. Expansion joints shall be of welded steel construction.
8. Fusion epoxy line and coat, except that the slip pipe shall be chrome plated.

2.9. WALL CASTINGS AND WALL PIPE

A. Wall Pipes

1. Ductile iron wall pipes shall have an integrally cast intermediate thrust collar centered in the wall in which it is located, and have mechanical joint, flange or plain end connections as indicated on the Drawings, and shall be similar and equal to Clow figure numbers F-1426, F-1428, or F-1431, as required.
2. Provide the same linings and coatings as those specified for the adjacent pipe. Coatings shall be compatible with embedment in concrete, or shall be omitted or removed by blasting from the portion embedded in the concrete. Coating shall be present on exposed portions of the casting, outside of the concrete.
3. Wall pipe shall be Thickness Class 55 minimum.
4. Provide tapped flange holes where flanges are shown flush with walls on the Drawings. Provide

through flange holes where flanges are shown offset from walls facilitating use of standard flange assembly hardware.

B. Fabricated Wall Piece

1. Ductile iron pipe with an annular ring attached and sealed around the pipe barrel.
2. Flange, mechanical joint, or plain end connections as indicated on the Drawings.
3. Thickness Class shall be 55 minimum.
4. Linings and coatings shall be the same as those specified for the adjacent pipe. Coatings shall be compatible with embedment in concrete, or shall be omitted or removed by blasting from the portion embedded in concrete. Coating shall be present on exposed portions of the casting, outside of the concrete.
5. Wall pieces shall not be used for high pressure pipes and shall not be substituted for wall pipes where the latter are specified or shown on the Drawings.

C. Wall Sleeves

1. Wall and floor sleeves, through which pressurized carrier piping passes uninterrupted, shall be minimum Thickness Class 52 ductile iron or stainless steel pipe, fabricated or integrally cast with an exterior collar centered in the wall or slab in which it is located, and flush with the surface of the concrete on both sides.
2. If approved by the Engineer for use with Modular Link Seals, sleeves may be furnished of non-metallic material provided they include water stop collars and are textured or roughened on the outer surface to enhance concrete bond, are of sufficient strength and stiffness to maintain round during the concrete pour, rated for a minimum of 40 feet of water head pressure without weeping, and are specifically designed for that purpose.

## 2.10. WALL SLEEVE SEALING MATERIALS

A. Wall Sleeve Sealant

1. The sealant shall be one which will bond securely to concrete and steel, be watertight under continuous submergence, and will not contaminate water in any way.
2. The material shall not harden materially when exposed to weather, and shall be suitable for application by caulking, knife, or gun.
3. Certified test reports shall be submitted by the manufacturer on the actual batch of compound material furnished, showing compliance with the specifications before sealant is delivered.
4. The sealant material shall conform to the following:
  - a. Lead caulking will not be permitted.
  - b. Polyurethane Compound
    - 1) The compound shall be a polyurethane polymer that cures at ambient air temperature to a firm flexible, tear-resistant rubber designed for bonding to continuously submerged surfaces.
    - 2) It shall have cured physical properties meeting the requirements of ANSI A116.1 and Federal Specification TT-S-00227E; shall develop a Shore A hardness of between 22 and 40 after 7 days submergence in water; shall have 150 psi minimum tensile strength and 500 percent minimum elongation when tested in accordance with ASTM Designation D412 at 75EF; and shall be provided in gray color for nonsubmerged use and black for submerged use.

- B. Joint Filler: The joint filler shall be glass fiber roving, or formed neoprene, butyl, or polyurethane type as recommended by the sealant manufacturer.

C. Modular Link Seals

1. When shown on the Drawings, provide modular link seals sized as recommended by the manufacturer for the inner diameter of the sleeve or core hole, and the outer diameter and material of the pipeline to be sealed.
2. EPDM rubber compound, 316 stainless steel hardware.
3. PSI Link Seal series S 316 or BS316, or approved equal.

2.11. FLOOR DRAINS AND TRENCH DRAINS

A. Floor Drains

1. Floor drains are to be installed at the locations shown on the Drawings.
2. Floor drains shall be similar and equal to Josam type No. 30004 with 6-inch adjustable bronze strainer, 4-inch threaded outlet and P-trap.
3. Trap shall be cast-iron with NPT clean out plug similar and equal to Josam Type No. 88124.
4. Provide adaptor for connection to PVC DWV piping on outlet, if required on drawings.

B. Trench Drains

1. Trench drains shall be 4-inch internal width, channels of polymer concrete or similar construction with rounded bottom and integral 0.5% downslope, ductile iron or stainless steel edge rails, ductile iron grate with hold down clips or bolts.
2. Provide end cap and transition to sump pit or bottom outlet as necessary to make a continuously flowing system.
3. Continuously slope the surrounding floor to drain toward the trench.
4. ACO PowerDrain S100K, Josam Meadrain EN1000, or approved equal.

2.12. SOURCE QUALITY CONTROL

A. Section 01 40 00 - Quality Requirements: Requirements for testing, inspection, and analysis.

B. Certificate of Compliance: When fabricator is approved, submit certificate of compliance indicating Work performed at fabricator's facility conforms to the Contract Documents.

1. Specified shop tests are not required for Work performed by approved fabricators.

PART 3 EXECUTION

3.1. GENERAL

A. Care and Handling of Materials:

1. All materials shall be carefully handled in all steps of fabrication, storing, loading, transporting, unloading, storing at the site, and installation, using the means and following the procedures approved with the shop drawings.
2. Pipe slings used during handling, and tie-down straps during transit shall be not less than 4-inch wide flat fiber or plastic straps.
3. During storage and in transit, pipe 8-inches and larger shall be rested on saddles or on another support system approved by the Engineer, which will ensure freedom from damage of the barrel, interior lining, and exterior coating. Not less than 3 saddles or other longitudinal pipe supports shall be used during transit.
4. Mortar lined pipe shall be kept sufficiently moist to prevent drying out of the mortar lining before installation.

- B. Verification of Dimensions
  - 1. All dimensions essential to the correct location of the pipe, or fit of piping at equipment and valves, or to the proper location and orientation of pipe sleeves and wall castings, or to the avoidance of obstructions or conflict with other improvements, shall be accurately determined by the Contractor prior to fabrication of the piping involved.
  - 2. Any required change from the nominal locations shown of the Drawings shall be made by the Contractor and shall be included as a part of the work hereunder and be subject to the approval of the Engineer.

### 3.2. PIPE INSTALLATION

- A. The types and sizes of pipes and fittings to be used shall be as specified herein and as shown on the Drawings. Where required fittings are omitted from the Drawings, they shall be the same size as the piping and in all cases shall conform to the code requirements.
- B. The various types of piping shall be installed in accordance with the Drawings, these specifications, and the procedures and methods approved with the shop and erection Drawings. Piping carrying liquids shall be installed without high points which could trap gasses and shall be kept below the static water level of the items which they connect.
- C. The interior of pipe, fittings, and couplings shall be clean and free from contamination when installed and effective means shall be taken to prevent the entrance of foreign matter during progress of the work.
- D. All pipe shall be carefully placed and supported at the proper lines and grades and where practicable shall be sloped to permit complete drainage. Piping runs shown on the Drawings shall be followed as closely as possible, except for minor adjustments to avoid architectural and structural features or to suit the type or make of approved equipment purchased by the Contractor. If field-relocations are required, they shall be subject to the approval of the Engineer.
- E. Provisions for pipeline flexibility are not always shown and the Contractor may add flexible joints where required for equipment and valve installations, and for the ease of installation where submitted and approved by the Engineer. All flexible joints shall be thrust restrained.
- F. Exposed pipe shall be run parallel with or at right angles to the adjacent walls and floors, unless shown otherwise on the Drawings. Vertical piping shall be plumb. Parallel lines shall be grouped on the same horizontal or vertical plane wherever possible.
- G. The entire piping configuration shall allow adequate clearances for the actuation of valves, and for convenient access for painting and preventive maintenance of joints, valves, and other accessories.
- H. Piping shall clear obstructions, preserve headroom, and keep openings and passageways clear. If structural difficulties or other work prevent the running of pipes or the setting of equipment at the point indicated on the Drawings, the necessary minor deviations as determined by the Engineer, will be allowed, and shall be shown on the erection drawings to be furnished.
- I. Except as otherwise shown or specified, piping installation work shall conform to the requirements of ANSI B31.1.0 and the printed or written recommendations of the manufacturer of the product involved for the given conditions.

- J. All piping shall be installed as closely as possible to walls, ceilings, columns, beams, and equipment (consistent with proper space requirements for maintenance and operational appurtenances) to occupy the minimum of space, and all offsets, fittings, etc., required to accomplish this must be furnished by the Contractor at their own expense.

### 3.3. JOINT INSTALLATION

- A. Joints and Couplings: Joints and couplings shall be made in accordance with the specified requirements made part of the erection procedure submitted by the Contractor and approved by the Engineer.
- B. In erecting the pipe, a sufficient number of unions or flanged joints shall be used to allow any sections or run of pipe to be disassembled without impacting operation of adjacent runs.
- C. Screw unions may be employed on pipelines 3 inches in diameter and under. Flanged joints shall be employed on pipe 4 inches in diameter or larger unless otherwise shown on the Drawings.
- D. Pipe Threads
1. Pipe threads shall be in accordance with the requirements of ANSI B2.1 and shall be cut full and free from torn or ragged surfaces.
  2. No more than three threads on the pipe at any joint shall remain exposed after installation. Threaded joints shall be established with joint compound applied to the male ends only.
  3. The use of thread cement or caulking of threaded joints to stop or prevent leakage will not be permitted.
  4. Sharp-toothed pipe wrenches or similar wrenches shall not be used in making up copper or brass pipe.
- E. Flanged Joints
1. Flanged joints shall be made with the gaskets specified for the pipeline service centered in the joint.
  2. Bolts studs, and nuts shall be lubricated with graphite and oil so that the nuts can be turned by hand.
  3. Install anti-galling compound on stainless steel bolt and nut threads to prevent seizing.
  4. Care shall be taken to prevent excessive initial tension to the bolt and studs and so that the tension applied is as nearly uniform as possible.
  5. The rust preventive compound applied to the faces of flanges before shipment shall be removed before installation.
  6. Where slip-on flanges are used, they shall be fillet welded to the pipe on both front and back sides.
  7. Where raised faced and flat faced flanges are joined, the raised face flange shall be ground smooth and full face gaskets shall be used.
- F. Push-on or Mechanical Joints: Pipe shall be installed with spigot end facing downstream.
- G. Flexible Type Joints of the sleeve, split sleeve, and flanged coupling adapter types of flexible couplings shall be made in accordance with the printed instructions of the manufacturer. The pipe ends to receive the couplings shall be finished to the outside diameter and surface finish required by the coupling manufacturer. Prior to assembly, all surfaces which will be inaccessible after installation shall be given protective coating.

- H. Tie Rod Restraint Harnesses shall be provided at flexible type joints where shown on the Drawings and as required. The harnesses shall be tightened just sufficiently to preclude displacement of the downstream piping under hydraulic thrust. Double nut all rods to prevent loosening under vibration.
- I. Electrical/Dielectric Insulation shall be provided at all connections between ferrous and nonferrous pipe except where the nonferrous pipe is an electrical nonconductor. The joint shall be tested after completion to verify nonconductivity. Flange Insulation Kits shall be PSI, APS, or approved equal. Dielectric unions shall be Epcor or approved equal.
- J. PVC Pipe Joints at fittings and couplings to valves and equipment shall be made in accordance with the manufacturer's printed instructions.

#### 3.4. WALL CASTINGS AND WALL PIPE

- A. All piping which will pass through walls, slabs, footings, or beams shall be provided with the specified wall sleeves with annular space sealed or with the specified wall pipes or pieces with collars. The Contractor shall provide the wall sleeves and castings for insertion in the concrete work covered in Division 3 of these Specifications and shall verify the correct setting prior to concrete placement. The sleeve sealant shall be as specified in Part 2 herein. No pipe joint will be allowed to occur in the sleeve. The seal on both ends of the sleeve shall be flush with the concrete surfaces on completion of work and drying of sealant. Caulking and sealing of wall sleeves shall conform to the following requirements:
  - 1. Preparation for Sealing
    - a. The annular space between the pipe and sleeve shall be cleaned of all loose particles and contamination and shall be dry prior to sealing.
    - b. Tape or other recommended protection shall be applied on the structure surfaces to preclude contamination by the sealant, and any contamination which occurs shall be removed immediately, followed by a thorough washing of the surfaces with solvent.
    - c. Prepared compound not used during the application time limits designated by the manufacturer of such compound shall be discarded.
  - 2. Application of Compound Sealant
    - a. The sealing shall be performed after any required primer has been applied and backup material placed.
    - b. The work shall be performed in accordance with the submitted erection drawing detail and procedure, and all grooves shall be solidly filled.
    - c. The application shall be made in clean, straight lines free of wrinkles, be tooled as required and finished with a convex surface just sufficient to provide the required flush surface upon drying.
    - d. Work shall not be performed when the air temperature is below 50°F.
  - 3. Modular Link Seals
    - a. When used where indicated on the Drawings, install in accordance with the manufacturer's written instructions.
    - b. Where sleeves are not provided, concrete shall be cored smooth and true, with the hole size as recommended by the seal manufacturer for the type and size of pipe to be sealed.
    - c. Bolts shall be installed from the accessible, or non-buried, side of the wall.
    - d. Bolts shall remain exposed and accessible after installation, unless shown otherwise on the Drawings or directed by the Engineer.
    - e. On the opposite side of the seal, install a single layer of backer rod against the back of



the bolts.

- f. Fill the remaining annulus with non-shrink grout flush with the face of the concrete.

### 3.5. FIELD COATING

- A. Where exposed pipe is to be field coated, comply with the requirements of Specification 09 90 00. Pipe supplied with a factory prime coat shall be field finish coated. Color selection shall be as directed or approved by the Engineer. Mask all hardware, rods, rubber, nameplates, stainless steel, copper, bronze, and the like; do not coat. Equipment, valves, couplings, and accessory items which are supplied with a factory finish or fusion epoxy coating need not be field coated, unless a finish coat for color consistency with the adjacent pipe is specified.
- B. When exposed pipeline systems are indicated on the Drawings or in Specification Section 09 90 00 or 40 05 98 to be color-coded for the purposes of process stream identification, the colors shall be in accordance with the table in Section 40 05 98 unless specified otherwise. Clarify any ambiguities with the Engineer prior to proceeding with the work. Coating products and procedures used for color coding shall be in accordance with Section 09 90 00.

### 3.6. ADDITIONAL REQUIREMENTS FOR DUCTILE IRON PIPE

- A. Pipe Laying:
  1. Inspection: All pipe shall be carefully inspected by the Engineer for defects before installation. Such inspection shall include light tapping with a hammer while the pipe is suspended in the air. No pipe or fittings which are cracked or which show defects excluded by the Specifications for such pipe or fittings shall be used. Any injuries to the protective coating of the pipe or fittings shall be carefully repaired by the Contractor, subject to the Engineer's approval.
  2. Cleanliness of Material: All pipes, valves, and fittings shall be carefully cleaned before installation. Every open end of a pipe shall be carefully plugged or capped before leaving the work.
  3. Positioning: For bell and spigot pipe, the direction of bells shall normally face upstream of the flow. This direction may be altered with the permission of the Engineer. Bells and spigots must be thoroughly cleaned and free from oil, grease, blisters, and excess coating before spigots are inserted into bells. The spigot end of the pipe shall be brought to true line and grade and be inserted to the full depth of the socket before the joints are made. The inner surface of the pipe shall conform at the joints, and the annular space for the jointing material shall be of uniform width and depth. If any pipe does not allow sufficient space for jointing material, it shall be replaced by one of proper dimensions.
  4. Deflection: The maximum deflection in push-on or mechanical joints shall be no more than half that specified by the manufacturer.
- B. Thrust Restraint: Tie rod harness restraints shall be used above ground where there is a possibility of pulling the joint under pressure. Tie rod restraints are not to be buried in earth, unless specifically allowed by the Engineer in writing. Instead, Megalug style serrated wedge mechanical restraints as specified may be used.
- C. Piping Through Walls: Where pipes pass through walls or floors, care shall be exercised to ensure joints being watertight. The pipe shall be free of all dirt, incompatible coatings, and grease to secure a tight bond with the concrete.
- D. Push-on or Mechanical Joints: Joint assembly shall conform to AWWA C111. Installation shall be in

accordance with the manufacturer's printed recommendations. Gasket seats and rubber gaskets shall be thoroughly cleaned before assembly. The completed joint shall have a uniform contact by the gasket between the outer surface of the spigot and the gasket seat of the bell.

- E. Flanged Joints: Flanged pipe shall be cut true to length. Joints shall be made up square, with even pressure upon the gaskets and shall be perfectly watertight. Gaskets shall fit the inside dimension of the pipe accurately, so that no surplus material projects out into the flow area. The completed joint shall be smooth and properly aligned.
- F. Taps: Make taps to ductile iron piping only with a service saddle, or to the tapping boss of a fitting or valve body.

### 3.7. PRESSURE TESTING

- A. Following the cleaning the pipe shall be pressure tested to confirm the absence of leaks.
  - 1. Test pressure: 150 psi at the lowest elevation point in each section. Each section of pipeline shall be tested separately.
  - 2. Test Duration: At least one continuous hour per test.
  - 3. Allowable leakage: None, as determined visually and/or by the observation of a constant pressure being maintained over the full duration of the test.
- B. Each section of pipeline being tested shall be slowly filled with water and all air removed. All water used in testing the pipelines shall be taken from a clean or potable water supply. The specified test pressure shall be applied by means of a pump connected to the pipe in a manner satisfactory to the Engineer. After bringing the pipeline to test pressure, the pump shall be physically disconnected from the pipeline prior to the test period commencing, and shall not be reconnected for the duration of the test. The Contractor shall furnish all necessary labor, equipment, gauges, connection corporation stops to the pipeline, and other necessary appurtenances to perform the test.
- C. No testing shall be permitted against valves or fittings that are a part of an existing system that is in service unless specifically approved by the Engineer. In such cases, in potable water applications, the Engineer might require the pipeline be disinfected and pass bacteriological testing prior to pressure testing, such that water of questionable safety not be introduced into the existing system.
- D. All joints will be carefully examined during the test. Any cracked or defective pipe, joints, couplings, fittings, valves, or other components discovered during the pressure test shall be removed and replaced by the Contractor with sound material. The test shall be repeated until it is satisfactory to the Engineer.
- E. Pressure tests shall be witnessed by the Engineer or their designated Inspector. Provide a minimum of 48 hours notice before the proposed test time. The Contractor may complete their own preliminary tests prior to the witnessed test to confirm readiness and that all air has been purged from the pipeline which may interfere with the test results.
- F. Reporting: The Contractor shall prepare and submit to the Engineer a written statement or form documenting each pressure test which shall include at a minimum the following:
  - 1. Description and identification of piping tested (location, station-to-station, etc.)
  - 2. Test pressure, beginning and ending values
  - 3. Date and beginning and ending times of the test.

4. Witnessing by Contractor and Engineer – names and signatures.
5. Test evaluation. Note pass or fail.
6. Remarks, to include such items as:
  - a. Leaks (type, location)
  - b. Repairs made on leaks

END OF SECTION

SECTION 40 05 07  
HANGERS AND SUPPORTS FOR EXPOSED PIPING

PART 1 GENERAL

1.1. SUMMARY

- A. The work to be performed in accordance with this Specification consists of furnishing all materials, equipment, supplies, and accessories and of performing all operations required in connection with the fabrication and installation of hangers and supports for exposed piping as shown on the Drawings and specified herein.
- B. Hangers and supports for exposed piping include an adequate number of pipe supports and hangers for exposed piping systems specified in Section 40 05 05 that are installed within structures, tanks, galleries and vaults, and aboveground or above decks.

1.2. REFERENCES

A. Standards

- 1. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.
- 2. American Society of Mechanical Engineers (ASME)
  - a. B16.1 (2020) - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, And 250
- 3. American Society for Testing and Materials (ASTM)
  - a. A27 (2020) - Standard Specification for Steel Castings, Carbon, For General Application
  - b. A36 (2019) - Standard Specification for Carbon Structural Steel
  - c. A47 (2018) - Standard Specification for Ferritic Malleable Iron Castings
  - d. A53 (2022) - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
  - e. A276 (2017) - Standard Specification for Stainless Steel Bars and Shapes
  - f. A283 (2018) - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates
  - g. A307 (2021) - Standard Specification for Carbon Steel Bolts, Studs, And Threaded Rod 60,000 PSI Tensile Strength
  - h. A563 (2015) - Standard Specification for Carbon and Alloy Steel Nuts
  - i. A575 (2020) – Standard Specification for Steel Bars, Carbon, Merchant Quality, M-Grades
  - j. B98 (2019) - Standard Specification for Copper-Silicon Alloy Rod, Bar and Shapes
- 4. Manufacturer’s Standardization Society of Valve and Fittings Industry (MSS)
  - a. MSS SP-58 (2018) – Pipe Hangers and Supports – Materials, Design and Manufacture, Selection, Application, and Installation

1.3. SUBMITTALS

A. Submit the following:

- 1. Proposed pipe support plan for all piping.
- 2. Shop fabrication drawings, complete with dimensions, elevations, material, grade, thickness, attachments, bolting or welding, coatings, and appurtenances.

3. For pre-manufactured products, provide catalog and engineering data sheets of sufficient quantity and content to demonstrate conformance with the specification requirements. Highlight or identify items proposed for use. Cross out extraneous items.
4. Calculations showing adequacy of hangers and supports to meet the specified requirements.
5. Anchor bolts.

#### 1.4. PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Handle materials with care to avoid shock or damage to them. Store and protect items from damage.
- B. Examination
  1. All components and accessories shall be field inspected at the job site and checked for conformance to these specifications.
  2. Components and protective coatings or galvanizing will be checked for damage. If any part of the coating is damaged, the repair shall be by the Contractor at their expense in a manner satisfactory to the Engineer.
  3. Any component found defective or beyond repair will be rejected.
  4. Any material rejected at the job site shall be marked "Rejected," and the Contractor shall remove it immediately from the job site.

#### 1.5. EXISTING CONDITIONS

- A. Field Measurements: Field verify all pertinent dimensions, elevations, and measurements prior to releasing products and related appurtenances for fabrication. Indicate field measurements on Shop Drawings.
- B. Verify that field dimensions are as indicated on Drawings.
- C. Field verify existing flanges and piping for diameter, dimension, bolt hole pattern, etc where new pipe supports will be provided on existing piping and flanges.

### PART 2 PRODUCTS

#### 2.1. GENERAL

- A. All materials and components shall be new, free from defects or contamination. Provide materials of construction as specified or called out on the Drawings depending on installation location.
- B. Pipe hangers, brackets, saddles, clamps and other supports shall be adjustable type conforming to the requirements of MSS SP-58. Supports shall have ample strength and rigidity to resist the hydraulic thrusts at changes in direction and at dead ends as well as the dead weight loads and the contents carried. Supports shall maintain required grade, prevent vibration, and allow expansion and contraction.
- C. Except where otherwise shown, specified, or required, hangers, supports, anchors and concrete inserts shall be the standard types as manufactured by Crane Co., Cooper B-Line, Anvil International, Fee and Mason Manufacturing Co., or equal meeting the requirements specified herein. Unless otherwise approved by the Engineer, all hangers, supports, and concrete inserts shall be listed with the Underwriters' Laboratory. Chain or perforated strap hangers will not be permitted.

- D. Supports for PVC Piping: Rigid plastic piping normally shall be supported by the same type of hangers used with metallic pipe. Support spacing shall be based on the plastic pipe manufacturer's recommendations for the service conditions but not greater than 5 feet on center. Flexible plastic tubing or rigid plastic pipe operating at temperatures high enough to materially lower its strength, shall be supported continuously by cable tray or channels and special hangers.
- E. Saddle Stands: Saddle stands shall be of the adjustable type. Each stand shall consist of a length of wrought pipe fitted at the base with a standard screw threaded cast iron flange and at the top with an adjustable saddle or roll. Alternatively, the top may be provided with a flange bolt attachment plate where attachment to a pipe or valve flange is necessary. The base flange shall be bolted to the floor or foundation. Stanchions shall be of similar construction to the saddle stand, except that they shall be fitted at the top with cast iron pipe saddle supports or with pipe stanchion saddles with yokes and nuts. Where adjustable supporting devices are not required, pipelines 3 inches in diameter and smaller may be supported on approved cast iron, malleable iron, or wrought steel hooks, hook plates, ring or ring plates.
- F. Pipe Anchors: Anchors shall be furnished and installed where specified, shown, or required for holding the pipelines and equipment in position or alignment. Pipe anchors shall be designed for rigid fastening to the structures, either directly or through brackets. The design of all anchors shall be subject to approval by the Engineer. Pipe anchors shall be fabricated of materials as specified below based on installation location.
- G. Concrete Inserts: Inserts for concrete shall be furnished and installed in the concrete structures where required for fastening supporting devices. Coordinate with all trades to ensure inserts are included with the cast-in-place concrete work, or at the casting yard if structures are to be precast. They shall be designed to permit the rods to be adjusted to hang vertically. Nail slots shall be provided in the exposed flanges of the insert. Inserts shall be designed to carry safely the maximum load that can be imposed by the rod which they engage.
- H. Materials of fabrication shall be as specified below based on installation location.
1. Provide support systems, including bolts, hardware and anchorages, of the following materials, specified further below, based on these installation locations:
    - a. Interior dry locations, or exterior above grade: Hot dip galvanized steel.
    - b. Moist locations (at a minimum, any interior or exterior space wholly or partially below grade level including vaults or pits, or having a wall or ceiling forming head space of part of a clean water channel or basin, shall be considered moist): Type 304 stainless steel.
    - c. Submerged locations (in raw sewage or process fluids) and in corrosive areas (at a minimum, spaces with electrical classifications of Class 1 Division 1, and in chemical storage and pumping areas, shall be considered corrosive): Type 316 stainless steel, or FRP structural shapes (fiberglass reinforced plastic) with Type 316 stainless steel bolts and hardware.
  2. Hangers and supports of metallic construction shall conform to the requirements specified herein and to the following standards:
    - a. Structural Steel ASTM A36 and A283
    - b. Steel Bars (Grade 1022) ASTM A575
    - c. Steel Castings (Grade N-1) ASTM A27
    - d. Wrought Steel Pipe (Grade A, Schedule 40) ASTM A53

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|----|---|--------------------|
| e. | Cast Iron Pipe Fittings (Class 125)   | ANSI B16.1         |
| f. | Malleable Iron Castings   | ASTM A47           |
| g. | Bolting Materials, Steel  |                    |
|    | 1) Bolts, Yokes and Stud Bolts  | ASTM A307          |
|    | 2) Nuts   | ASTM A563          |
|    | 3) Physical requirements:   |                    |
|    | a) Tensile strength   | 60,000 psi minimum |
|    | b) Yield strength   | 48,000 psi minimum |
|    | c) Elongation   | 27 percent maximum |
|    | d) Reduction of area  | 35-55 percent      |
| h. | Bolting materials, silicon bronze   |                    |
|    | 1) Bolts, stud bolts yokes and nuts (alloy A)   | ASTM B98           |
|    | 2) Physical requirements:   |                    |
|    | a) Tensile strength   | 70,000 psi minimum |
|    | b) Yield strength   | 38,000 psi minimum |
|    | c) Elongation   | 17 percent maximum |
| i. | Bolting materials, stainless steel  |                    |
|    | 1) Bolts, stud bolts and nuts (Type 304 and 316)  | ASTM A276          |
|    | 2) Physical requirements:   |                    |
|    | a) Tensile strength   | 75,000 psi minimum |
|    | b) Yield strength   | 30,000 psi minimum |
|    | c) Elongation   | 35 percent maximum |
|    | d) Reduction of area  | 45 percent maximum |
| j. | Where specified or shown, bolts, stud bolts, rods, yokes and nuts of hangers and supports shall be of silicon bronze or stainless steel as specified above with dimensions, threads and sizes equivalent to those specified in steel. |                    |
- I. Brackets for Piping: Brackets for support of piping from walls and columns shall be fabricated from materials specified herein based on installation location. When brackets are designed to support 1500 lbs. or more, back plates of adequate size and thickness shall be furnished and installed to distribute the load against the wall. When used on concrete walls the back plates shall be cast in the concrete. Where the use of back plates is not practicable, the brackets shall be fastened to the wall in such a manner that the safe bearing strength of the wall will not be exceeded. Pipe rolls or chairs shall be of the cast iron type. Pipe rolls shall be provided with threaded rods.
- J. Spacing of Hangers: In some cases more stringent requirements are indicated on the Drawings or elsewhere in these Specifications, but in no case shall the spacing of hangers exceed twelve feet.
- K. Where concentrations of valves, fittings and equipment occur, closer spacing of supports will be required. In no case shall any total hanger load (weight of piping, insulation, and contents) exceed the following (based on load carrying capacities of hot rolled steel rod per ASTM A575. Load capacities shall be adjusted accordingly for other materials of construction).

<u>Nominal Rod Diameter-inches</u>	<u>Maximum Safe Load-Pounds</u>	<u>Nominal Rod Diameter-inches</u>	<u>Maximum Safe Load-Pounds</u>
1/4	1,130	1-1/8	6,230
3/8	1,810	1-1/4	8,000
1/2	2,710	1-3/8	9,470
3/8	3,770	1-1/2	11,500
1	4,960	1-3/4	15,400

2.2. DESIGN REQUIREMENTS

- A. The Contractor shall be responsible for the design and layout of supports in accordance with MSS SP-58 and latest industry practices and standards.
- B. Due to the diagrammatic nature of the Drawings, pipe supports may not be shown, or may not be shown to the full extent required. The Contractor shall design, submit, furnish, and install all pipe supports, brackets, and hangers required to adequately support all piping systems and connected valves and other appurtenances. Incorporate all pipe supports that are specifically shown on the Drawings, plus provide any additional pipe supports that may be required per the Contractor’s calculations and design.
- C. Space requirements, potential interferences, and locations and types of supports the Contractor proposes to furnish shall be fully investigated and vetted prior to submittal and ordering of equipment or releasing items for fabrication. All design Drawings relating to the project, including architectural, structural, electrical, plumbing, piping, heating, and ventilating, together with these specifications, shall be considered collectively.
- D. The Drawings might not include typical details for every type of support or hanger that might be necessary for the project as determined with the Contractor’s design. Typical support details that are shown on the Drawings may require modification depending on method of attachment to the pipe or valve or floor/wall/ceiling, location, spatial constraints, etc. Contractor shall make such additions and modifications necessary in the Shop Drawings submitted for approval.
- E. Hangers and supports shall be adequate to maintain the pipelines, apparatus, and equipment in proper position and alignment under all operating conditions. Supports shall be provided so that no weight shall be transmitted to any equipment to which the piping is connected and have springs where necessary. Hangers and supports shall be of standard design where possible, and be best suited for the service required, as approved by the Engineer. Where required, they shall be screw adjustable after installation. Supporting devices shall be designed in accordance with the best practice and shall not be unnecessarily heavy. Sufficient hangers and supports shall be installed to provide a working safety factor of not less than 12 for each hanger, assuming that the hanger is supporting 12 linear feet of pipe filled with water.
- F. Verification of Dimensions: All dimensions essential to the correct location of the pipe, or fit of piping at equipment and valves, or to the proper location and orientation of pipe sleeves and wall castings, or to the avoidance of obstructions or conflict with other improvements, shall be accurately determined by the Contractor prior to fabrication of the piping involved. Any required change from the nominal locations shown of the Drawings shall be made by the Contractor and shall be included as a part of the work hereunder and be subject to the approval of the Engineer.



- G. Wall Penetrations for pipe sizes 4-inches and larger:
  - 1. Where pipelines pass through walls with the use of wall pipes or wall pieces that are integrally and rigidly cast into the concrete wall of a structure or vault, they may be considered a point of support in the Contractor's design.
  - 2. Where pipelines pass through walls with the use of a sleeve or cored hole and elastomeric sealant compound or modular link-seal, these types of penetrations shall not be considered adequate support. A pipe support or hanger shall be included in the Contractor's design adjacent to the wall to carry the load accordingly.
- H. Flexible Couplings: Where flexible couplings are provided on pipelines (i.e. flanged coupling adapters, bolted sleeve couplings, expansion joints, rubber spools, etc.), a pipe support is generally required on each side unless approved otherwise by the Engineer. Ensure there are no interferences between supports and thrust restraint rods or similar restraint systems installed across flexible couplings which may not be specifically shown on the Drawings but are specified.
- I. Equipment Connections: A pipe support shall be provided adjacent to equipment so that the equipment does not bear the load of the piping connected to it, and so that equipment may be disassembled or removed for maintenance or replacement without disturbing the connected piping.

## PART 3 EXECUTION

### 3.1. GENERAL

- A. Care and Handling of Materials: All materials shall be carefully handled in all steps of fabrication, storing, loading, transporting, unloading, storing at the site, and installation, using the means and following the procedures approved with the shop drawings.
- B. Install and adjust hangers and supports in accordance with MSS SP-58. Confirm placement and adjustment of supports with final pipe and equipment locations before anchor bolts are installed.
- C. Pipe supports and hangers shall allow adequate clearances for the actuation of valves, and for convenient access for painting and preventive maintenance of joints, valves and other accessories. They shall clear obstructions, preserve headroom, and keep openings and passageways clear.
- D. Electrical/Dielectric Insulation, such as elastomeric pads or sleeves, shall be provided at all points of contact between ferrous and nonferrous pipe and supports.

### 3.2. TESTING AND CLEANUP

- A. After each of the systems have been installed, the Contractor shall thoroughly clean all parts of the installation. Clean materials of grease, metal cuttings, soil, dust, and other debris. Any discoloration, or other damage to any of the work due to the Contractor's failure to properly install or to properly clean the systems shall be repaired without cost to the Owner.

END OF SECTION

SECTION 40 05 50  
VALVES AND ACCESSORIES

PART 1 GENERAL

1.1. SUMMARY

- A. The work to be performed in accordance with this Specification consists of furnishing all materials, equipment, supplies, and accessories and of performing all operations required in connection with the fabrication and installation of valves and appurtenances as shown on the Drawings and specified herein.
- B. Valves and appurtenances include:
1. All valves, gates, associated actuators, and related accessories as specified, indicated, and required
  2. Miscellaneous small diameter valves 3-inches and smaller in size, hose bibbs, yard hydrants, and related accessories
  3. Fire hydrants

1.2. REFERENCES

- A. Standards
1. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.
  2. American Society for Testing and Materials (ASTM)
    - a. A126 (2019) - Standard Specification for Gray Iron Castings for Valves, Flanges, And Pipe Fittings
    - b. A536 (2019) - Standard Specification for Ductile Iron Castings
    - c. D429 (2014) - Standard Test Methods for Rubber Property - Adhesion To Rigid Substrates
  3. American Water Works Association (AWWA)
    - a. C111 (2017) - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
    - b. C207 (2018) - Steel Pipe Flanges for Waterworks Service--Sizes 4 In. Through 144 In. (100 mm Through 3600 mm)
    - c. C508 (2017) - Swing-Check Valves for Waterworks Service, 2 In. Through 24 In. (50-mm Through 600-mm) NPS
    - d. C512 (2015) - Air-Release, Air/Vacuum, and Combination Air Valves for Water and Wastewater Service
    - e. C517 (2016) - Resilient-Seated Cast-Iron Eccentric Plug Valves
    - f. C550 (2016) - Protective Interior Coatings for Valves and Hydrants
  4. National Sanitation Foundation International (NSF)
    - a. NSF-61 (2022) - Drinking Water System Components - Health Effects

1.3. SUBMITTALS

- A. Submit the following:
1. Clearly indicate where and for what service the submitted valves are proposed for use.
  2. Manufacturer's literature and product data sufficient to demonstrate compliance with the

specification requirements. Highlight proposed products and features, cross out extraneous information.

3. Shop Drawings: Provide assembly drawings indicating parts list, materials, sizes, operators, position indicators, limit switches. Show orientation of operators.
4. Manufacturer's certificates of compliance.
5. Manufacturer's Owners Manuals, if applicable.
6. Instructions, seating and unseating heads, and shop drawings that include dimensions and anchor bolt pattern for sluice gates and fabricated slide gates.

#### 1.4. CLOSEOUT SUBMITTALS

- A. Project Record Documents: Record actual locations of valves and operators.

#### 1.5. QUALITY ASSURANCE

- A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum five years' documented experience.
- B. Manufacturer shall test valves at the factory according to manufacturer's standard testing protocol, including hydrostatic, seal, and performance testing.
- C. Certification of Valves Larger than 12 in: Submit certified copies of hydrostatic factory tests, indicating compliance with applicable standards.

#### 1.6. DELIVERY, STORAGE, AND HANDLING

- A. Accept materials on-Site in original factory packaging, labeled with manufacturer's identification.
- B. Protect from weather and construction traffic, dirt, water, chemicals, and damage by storing in original packaging in protected storage areas. Store materials on pallets off the ground.

#### 1.7. FIELD VERIFICATION

- A. Verify field dimensions and clearances available for valves and operators prior to fabrication or ordering materials. Indicate field measurements and show orientation of operators on Shop Drawings. Contractor responsible for resolving clearance issues or spatial conflicts with valve operators in advance with the coordination of the Engineer.

### PART 2 PRODUCTS

#### 2.1. GENERAL REQUIREMENTS

- A. Valves shall have pressure ratings not less than the adjacent piping unless otherwise indicated. Valves shall be provided with pipe supports on either side of the valve or as otherwise allowed per Section 40 05 07.
- B. Assemblies of valves, operators, and accessories shall be complete and adequate for the intended purpose and shall include all essential components of equipment together with all mountings and other appurtenances normal and necessary for proper installation and full functionality, whether or

not indicated or specified.

- C. Direction of rotation to open each valve shall be to the left (counter-clockwise). Each valve body or operator shall have cast thereon the work "OPEN" and an arrow indicating the direction to open.
- D. Buried valves shall be non-rising stem, nut operated. Provide valve box and cover. Provide nut extensions for valves that will have nut operators deeper than 4 feet below ground surface.
- E. Exposed (non-buried) valves:
  - 1. Handwheel or lever operated, except where indicated or specified to be electric or pneumatic operated. Provide chainwheel operators for valves installed 7-ft or more above the ground, walkway, or floor.
  - 2. Provide position indicator for all valves 6-inches and larger.
  - 3. Operators shall be designed to produce the required actuating torque with a minimum hand pull of 60 pounds; incorporate gearbox assisting devices if necessary. Gearboxes shall be totally enclosed in a sealed housing, permanently lubricated bronze or steel, and adjustable without requiring the removal of the actuator from the valve.
  - 4. Operators shall be manufactured of cast-iron and finish coated with epoxy. Chains for chainwheel operators shall be looped and extend to 4 foot above the floor, or higher as directed by the Engineer. Operator extensions shall be provided where required to avoid interference with adjacent equipment, piping, walls, etc.
  - 5. Gear operators shall be self-locking to prevent unwanted movement or creeping of the valve position. Lever-operators shall have a means of being fixed in position to prevent unwanted movement.
  - 6. Contractor shall be responsible for eliminating all spatial interferences between valve bodies and operators from adjacent walls, structures, equipment, and pipe supports. Sufficient clearance shall be provided for each valve body and operator for maintenance and operation. In some cases, it may be necessary to shift the location of the valve along the piping, re-orient the valve operator, provide operator extensions, or other measure acceptable to the Engineer. Actuator mounting position shall not interfere with access to valves or equipment, or obstruct spaces required for removal or maintenance of equipment.
- F. Valve connections (joints) shall be compatible with the pipe to which they are connected and shall be the type shown or called out on the Drawings, or as listed in the Valve Schedule if included in the Contract Documents.
  - 1. Joints shall generally match the AWWA or ASTM specification of the joints of the pipe to which they are connected as specified in Section 40 05 05.
  - 2. Hardware: Unless specified otherwise, joint assembly hardware materials and gaskets shall be the same as the pipe to which they are connected as specified in Section 33 05 05 or 40 05 05 based on installation location, service, and the Pipe Schedule.
- G. Provide a fine debris strainer upstream of all electric solenoid control valves and regulators.
- H. All valves identified by a number on the Drawings, or in the Valve Schedule if included in the Contract Documents, shall be tagged with a permanent, stamped, non-corroding metal tag of the same number.
- I. Furnish two sets of special tools and other special devices for every valve that requires them for adjustment and maintenance.

- J. Valves used for potable water service shall be NSF-61 compliant.

## 2.2. PLUG VALVES

- A. Plug valves shall be the non-lubricated eccentric plug type, full port, comply with AWWA C517. Valves shall open from fully open to tight closure in one-quarter (90°) turn and shall have an indicator to show plug position. Port area shall be 100% of the cross-sectional area of the connecting pipe. Valve plugs, bearings, and seals shall be easily removable for repair or replacement without removing the valve body from the pipeline in which it is installed. Valve material shall be compatible with sewage and sludge and shall be as follows:
1. Body: Cast iron, fusion epoxy lined and coated per AWWA C550
  2. Plug: Cast iron with neoprene/EPT encapsulation
  3. Bearings: Type 316 stainless steel
  4. Seals: Adjustable "V" type of Buna N
  5. Seating Surface: Nickel or 316 stainless steel
- B. End connections: Exposed (non-buried) valve connections shall be 125 lb. ANSI B16.1 flanges. Buried valve connections shall be mechanical joint in accordance with AWWA C111. Flange and mechanical joint assembly hardware shall be as specified in Division 33 or Section 40 05 05 based on the installation location.
- C. Valves installed in exposed locations: Each plug valve shall be supplied with a lever or handwheel operator (as applicable to comply with the opening force requirements specified elsewhere herein), unless otherwise noted on the Drawings, with indicator to show valve position. Handwheel operators shall be as specified for general requirements herein. When required for larger valves, provide permanently-lubricated worm gear actuator, with all gearing totally enclosed in a sealed cast iron housing. Shaft and fasteners shall be stainless steel. Operator extensions shall be provided where required to avoid interference with adjacent equipment, piping, walls, etc.
- D. Valves installed in buried locations: Provide nut operator intended for buried installations with valve box and cover. When required for larger valves, provide permanently-lubricated worm gear actuator, with all gearing totally enclosed in a sealed cast iron housing. Buried actuators shall be 90% grease filled. Shaft and fasteners shall be stainless steel.
- E. The valves shall be similar and equal to DeZurik PEF or Clow EPV or approved equal.

## 2.3. SWING CHECK VALVES

- A. Comply with AWWA C508. Check valves shall be cast iron body, and suitable for use with raw sewage. Check Valves shall be constructed to permit top entry for complete removal of internal components without removing the valve body from the pipeline.
- B. Provide metal seat with bronze trim for sewage and wastewater process service.
- C. Valve body shall be fusion epoxy lined and coated. Provide outside lever and weight closure control device. End connections shall be 125 lb. flanged. Flange assembly and bonnet assembly hardware shall be as specified in Section 40 05 05 based on the installation location.
- D. Manufacturer:

1. M&H Style 159
2. equivalent by Dezurik
3. or approved equal

#### 2.4. SEWAGE COMBINATION AIR VALVE (SCAV)

##### A. Air Valve

1. Exhausts large volumes of air during pipeline filling, releases accumulated air under pressure, and allows air back in when pipeline pressure drops below atmospheric pressure.
2. Valve shall be designed specifically for use in raw sewage applications.
3. Comply with AWWA C512.
4. Single body.
5. Pipe connection (valve inlet) size: 2-inches.
6. Large orifice size: 1-inch.
7. Small orifice size: Manufacturer's standard for sewage.
8. Pipeline operating pressure is 10 psi.
9. Rubber compound shall be selected accordingly based on the provided pressures.
10. All internal components shall be 316 stainless steel construction.

##### B. Pipe Connection and Vent

1. All SCAV assemblies shall include a 2-inch plug valve and 2-inch Schedule 40 Type 316 stainless steel pipe threaded nipples at the inlet connection, and Schedule 40 PVC air vent line routed to the point of discharge shown on the drawings.
2. The PVC air vent line shall include a PVC union fitting near the SCAV and shall slope continuously downhill towards the point of discharge to drain liquid and condensation.

##### C. Manufacturer:

1. Vent O Mat RGXII
2. or approved equal

#### 2.5. SEWAGE AIR RELEASE VALVE (SARV)

##### A. Air Release Valve

1. Valve shall be designed specifically for use in raw sewage applications.
2. Comply with AWWA C512.
3. Single body.
4. Pipe connection (valve inlet) size: 2-inches.
5. Large orifice size: 1-inch.
6. Small orifice size: Manufacturer's standard for sewage.
7. Pipeline operating pressure is 10 psi.
8. Rubber compound shall be selected accordingly based on the provided pressures.
9. All internal components shall be 316 stainless steel construction.

##### B. Pipe Connection and Vent

1. All SARV assemblies shall include a 2-inch plug valve and 2-inch Schedule 40 Type 316 stainless steel pipe threaded nipples at the inlet connection, and Schedule 40 PVC air vent line routed to the point of discharge shown on the drawings.
2. The PVC air vent line shall include a PVC union fitting near the SARV and shall slope continuously downhill towards the point of discharge to drain liquid and condensation.

- C. Floodplain Locations
  - 1. All air valves installed in locations below flood elevation shall be equipped with features to prevent flood water from entering the valve when submerged.
- D. Manufacturer:
  - 1. Vent O Mat
  - 2. or approved equal

## PART 3 EXECUTION

### 3.1. GENERAL INSTALLATION OF BURIED VALVES

- A. Install valves, actuators, extensions, valve boxes, and accessories according to manufacturer's instructions and the latest good industry practices.
- B. Provide all necessary fittings, pipe, and joints to install valve at the location shown in the Drawings or as otherwise approved by the Engineer.
- C. Valves shall be set in true alignment and grade in accordance with the requirements of this specification. Valves shall be operated and all adjustments and operating settings of valves and appurtenances shall be made prior to installation.

### 3.2. GENERAL INSTALLATION OF EXPOSED VALVES

- A. Verify that piping system is ready for valve installation. Valves shall be operated and adjusted before installation.
- B. Install valves, actuators, extensions, and accessories according to manufacturer's instructions and the latest good industry practices.
- C. Provide all necessary fittings, pipe, and joints to install valve at the location shown in the Drawings or as otherwise approved by the Engineer.
- D. Valves shall be rigidly held in place using supports or hangers on each side of or under the valve in accordance with Section 40 05 07. Saddle supports used beneath valves shall conform to the shape and diameter of the valve body.
- E. The stem orientation of valves in exposed piping shall be coordinated by the Contractor and approved by the Engineer for operator accessibility and adequate clearance.
- F. Valves shall be pressure tested with adjacent piping in accordance with Section 40 05 05. Disinfect potable water service valves in accordance with Section 40 05 05.

### 3.3. PRESSURE TESTING

- A. Valves shall be tested at the same time that the adjacent pipeline is tested. Exposed valve joints shall show no visible leakage under test. Buried valve joints may be considered in the allowable leakage calculation specified for the buried piping system.

#### 3.4. INSTALLATION OF PLUG VALVES

- A. Unless otherwise approved by the Engineer, eccentric plug valves shall be installed with the shaft horizontal with the plug in the upper half of the body, with the seat on the upstream end.

#### 3.5. INSTALLATION OF AIR RELEASE AND COMBINATION AIR VALVES

- A. Install and adjust in accordance with manufacturer recommendations. The inlet shall be connected to the pipeline utilizing the specified threaded nipples and isolation valve. Plumb the valve outlet to discharge vented air to the location shown on the Drawings. Support pipe as specified in Section 40 05 07 and continuously slope downhill away from the valve. Provide a PVC union located near the valve outlet to facilitate disassembly.

END OF SECTION



SECTION 40 61 96  
PROCESS CONTROL DESCRIPTIONS

PART 1 GENERAL

1.1. SUMMARY

- A. This specification serves to document the function and objective of the process control system for this project.
- B. Related Requirements
  - 1. Utilize instrumentation and controls specified in Section 40 70 00 or elsewhere in Division 40, and provide I/O for SCADA connectivity, if applicable to the project, in accordance with Section 40 61 93 or elsewhere in Division 40 or on the Drawings.

PART 2 PRODUCTS

2.1. GENERAL

- A. Provide a complete system that achieves the control descriptions and functionality described in this section.
- B. Provide, program, and configure control systems to achieve the functions below and as shown on the drawings.

2.2. INPUT / OUTPUT LIST

- A. Outputs: Provide a system that transmits the following data remotely to the Owner's existing SCADA system:
  - 1. Pump 1 status (running, off)
  - 2. Pump 2 status (running, off)
  - 3. Pump 1 local HOA switch position
  - 4. Pump 2 local HOA switch position
  - 5. Pump 1 general fault (fail to start, high amp, low amp, high temp, moisture [seal failure], etc. TBD in coordination with pump supplier)
  - 6. Pump 2 general fault (fail to start, high amp, low amp, high temp, moisture [seal failure] etc. TBD in coordination with pump supplier)
  - 7. Wet well level value
  - 8. Level sensor fault from either sensor 1 or 2 (generated from the instrument or PLC, as necessary)
  - 9. PLC Failure/loss of power (generated from pump control panel)
  - 10. Wet well high-water alarm (float switch)
  - 11. Wet well low water alarm (float switch)
  - 12. Pump 1 flow value (mag meter)
  - 13. Pump 2 flow value (mag meter)
  - 14. Power status
  - 15. Intrusion Alarms on all hatches, 5 total
- B. Inputs (Remote Control): Provide a system that receives the following control input signals remotely from the Owner's existing SCADA system:

1. None: No remote control functionality is provided. All control inputs shall be local. SCADA connection is for remote monitoring only.

### 2.3. PERFORMANCE REQUIREMENTS

- A. There are two (2) constant speed sewage pumps. Under normal operation the system is designed to turn on and off one or both pumps depending on wet well liquid level measurement and defined set points.
- B. Operator will monitor the system via remote SCADA per the I/O list above.
- C. The system will have HAND, OFF, and AUTO modes. Each of the pumps shall be provided with a manual physical HOA selector switch located on the local control panel. The position of the local HOA switch shall be displayed in SCADA.
- D. Sewage pumps shall be designated Pump #1 and Pump #2, as identified on the Drawings. Each pump is designed for full flow capacity with one in service and one standby for normal service. The controls for the pumps will operate the pumps in a Lead / Lag configuration, with once pump designated as Lead and the second pump designated as Lag to operate in the event of higher than expected inlet flows. Lead and Lag designation of pumps shall be manually selectable by the Operator. Additionally, the Operator shall have the option to enable automatic cycling through lead/lag assignments with each pumping cycle to provide equal use of all pumps.
- E. The local HMI shall display the following minimum information for each pump and total station, with certain data being transmitted offsite through SCADA per the I/O list:
  1. Pump HOA switch position (HAND, OFF, AUTO)
  2. Pump running status (running or not running)
  3. Elapsed run time hours
  4. Pump speed (Hz)
  5. Flow rate (each pump and total station)
  6. Power status
  7. Alarm status. There shall be an error screen explaining which pump and which errors are occurring
  8. Additional information as indicated in the I/O list

### 2.4. LEVEL INSTRUMENTS

- A. Two independent radar level sensor systems shall be provided. Each system shall be complete with independent sensing element, transmitter, and interface with PLC, labeled as "radar level sensor 1", and "radar level sensor 2". The operator will manually select the primary sensing element in the HMI, and the other sensor will be backup. If a fault is detected with the primary system, the backup system shall be automatically promoted to primary and an alarm issued to SCADA.
- B. Water level float switches shall be provided as an independent, redundant backup to the radar level sensors. Five floats shall be provided in the wet well, listed below in order of lowest elevation to highest:
  1. Low water level (alarm)
  2. Low water level (all pumps off)
  3. Lead pump on
  4. Lag pump on

5. High water level (alarm).

- C. All float elevations shall be adjustable. Initially set the elevations of the floats as shown on the Drawings. Sufficient extra cable length shall be provided such that the operator may adjust float heights up or down. In the event both radar sensors or the PLC faults, the floats shall provide independent control input for operation of the pumps according to the Backup Operating Mode described herein.

#### 2.5. "HAND" POSITION

- A. When the local physical HOA switch is in the "HAND" position for a given pump:
1. The position of the switch shall be indicated on SCADA.
  2. The associated pump shall continuously run, regardless of programming or control signals except for signals related to motor faults.

#### 2.6. "OFF" POSITION

- A. When the local physical HOA switch is in the "OFF" position:
1. The position of the switch shall be indicated on SCADA.
  2. The associated pump shall remain deactivated regardless of programming or other control signals.

#### 2.7. "AUTO" POSITION

- A. When the HOA selector switch is in "AUTO" position, operation of the respective pump will be by the PLC. The PLC logic is programmed to maintain a the wet well liquid level between the Lead Pump On and All Pumps Off levels. The programming will control pump operation (on, off) based on the water level in the wet well from the radar level instruments.
- B. A pump is available to be called to start in AUTO mode if all of the following are met:
1. The "HAND, OFF, AUTO" switch is in AUTO, and programming is still in AUTO mode for that pump.
  2. Pump is not experiencing any faults or alarms (loss of power fault, etc.). Once the pump is cleared from its trouble alarms by an operator the pump shall go back into AUTO mode.
- C. Lead/Lag:
1. At the control panel HMI the operator can manually select which pumps are lead and lag. In addition, the operator can also enable automatic cycling between pump lead/lag designations after each call. This is to facilitate similar run times for all pumps.
    - a. If a pump is not available, it will be skipped in the sequence. If the automatic cycling feature is enabled, then with each START and STOP cycle in AUTO mode, the following shall take place: If PUMP #1 is lead, it will become lag, Lag PUMP #2 will become lead, or the opposite if PUMP #2 is lead.
    - b. If only one pump is available this pump will maintain position as the lead pump.
- D. Normal operating scheme:
1. The pumps shall remain off until the water level in the wet well rises to the LEAD PUMP ON LEVEL setpoint. At this point the Lead Pump turns on. The LEAD PUMP ON LEVEL setpoint is adjustable in the HMI; initially set at an elevation as indicated in the Drawings.
  2. If the water level continues to rise to the LAG PUMP ON LEVEL, the Lag Pump turns on. The LAG PUMP ON LEVEL setpoint is adjustable in the HMI; initially set at an elevation as indicated in the

Drawings.

3. If the water level continues to rise to the HIGH HIGH LEVEL a PLC Alarm is activated and communicated via SCADA. The HIGH HIGH LEVEL setpoint is adjustable in the HMI; initially set at an elevation as indicated in the Drawings.
4. When the water level drops to the LOW LEVEL, all pumps are turned off, regardless of lead or lag status. If selected, the lead/lag designation is switched as described above. The LOW LEVEL setpoint is adjustable in the HMI; initially set at an elevation as indicated in the Drawings.
5. If LOW LOW LEVEL is reached, a PLC Alarm is activated and communicated via SCADA. The LOW LOW LEVEL setpoint is adjustable in the HMI; initially set at an elevation as indicated in the Drawings.

## 2.8. BACKUP CONTROL MODE

- A. This mode shall automatically engage and override the PLC control system, and send an alarm to SCADA, in the event that a major fault with both radar sensors or the PLC control system occurs.
- B. A hard-wired manual selector switch shall also be provided on the control panel to select this mode in lieu of PLC control mode if desired by the operator.
- C. BACKUP CONTROL MODE utilizes water level floats wired directly to the pump starters (bypassing the PLC) to facilitate continued automatic operations.
  1. Pumps will be turned on and off based on float switch positions.
    - a. When the LOW LEVEL float level is reached, then both pumps shall shut off.
    - b. When the LEAD PUMP START float level is reached, then the lead pump shall start and operate continuously until the LOW LEVEL float is triggered.
    - c. If influent flows to the lift station are high, the water level will continue to rise to the LAG PUMP START water level, at which time the second, lag-designated, pump shall start. Both pumps shall run continuously at that speed until the LOW LEVEL float is triggered at which time both pumps shall stop.
  2. In the event of either the lead or lag pump becoming impaired by blockage or other abnormal condition, the pumping rate will decrease and the water level will continue to rise in the wet well. If the HIGH HIGH LEVEL float is activated, then this means at least one of the running pumps is impaired or underperforming and is abnormal. The PLC will trigger an Alarm and communicate this via SCADA

## 2.9. LIMITATIONS

- A. The programming and/or hard wire interlocks shall:
  1. Never allow both pumps to start at one time. Pump starting shall always be staggered. In the event more than one pump is called to start simultaneously, for example after a power outage or by operator action in HAND mode, the programming shall:
    - a. Issue an electrical over-capacity error message to SCADA.
    - b. Start the first pump normally.
    - c. Start the second pump 60 seconds after starting the first pump.

## 2.10. ALARMS

- A. If a pump fails or faults, an alarm shall be generated to SCADA. Alarms may be categorized as "general" to SCADA (thus requiring operator to visit the site to see the specific alarm information on the HMI

screen), or may have a dedicated signal sent to SCADA, in accordance with the I/O list.

- B. Abnormal flow: In the event the flow rate from a pump is below the MINIMUM FLOW setpoint based on signal from the corresponding flow meter, an alarm shall be generated to SCADA, this indicating a blockage or impaired impeller, or other issue with the pump that requires attention.
- C. In the event of a flow meter failure, an alarm shall be generated to SCADA.
- D. An individual pump will shut down and alarm to SCADA on high motor heat or moisture in seals or motor. Automatically resetting thermal switches can allow the pump to automatically return to service when the high heat dissipates. However, an alarm shall be sent to SCADA each and every time a pump shuts down due to high heat. Moisture in motor shall cause a pump to shut down until manually reset in the field.
- E. High Water Alarm. If the water level elevation rises above the high-high water level elevation shown on the Drawings, an alarm signal shall be generated to SCADA. Similarly for low-low water level.

END OF SECTION

SECTION 40 70 00  
INSTRUMENTATION AND CONTROL FOR PROCESS SYSTEMS

PART 1 GENERAL

1.1. SUMMARY

- A. The work to be performed in accordance with this Specification consists of furnishing all materials, equipment, supplies, and accessories and of performing all operations required in connection with the fabrication and installation of instrumentation and control systems as shown on the Drawings and specified herein.
- B. Instrumentation and control systems include:
  - 1. Closed conduit flow meters
  - 2. Liquid level instrumentation and switches
  - 3. Panels
  - 4. Panel-mounted instruments
  - 5. PLC
  - 6. HMI
  - 7. Uninterruptable power supplies (UPS)

1.2. QUALITY ASSURANCE

- A. Contractor shall perform all work and furnish and install all materials and equipment in full accordance with the latest applicable rules, regulations, requirements, and specifications of the following:
  - 1. Local laws and ordinances
  - 2. State and federal Laws
  - 3. Underwriters Laboratories (UL)
  - 4. National Electrical Manufacturer's Associations (NEMA)
  - 5. National Electrical Code (NEC)
  - 6. Occupational Safety and Health Act (OSHA)

1.3. SUPPLIER'S SCOPE

- A. Under the allowance item identified for the city's SCADA provider:
  - 1. City's SCADA provider will design, coordinate, supply, and assist with startup of the instruments under their scope of supply specified herein.
  - 2. City's SCADA provider will provide and commission the magnetic flow meters, radar level sensors, wet well level float switches, and intrusion/door switch instruments specified herein.
  - 3. City's SCADA provider will design, coordinate, supply, integrate, and assist with startup of the RTU for remote transmission and monitoring of instrument and equipment data.
  - 4. City's SCADA provider will act as integrator of instrumentation specified herein under this scope of supply, the PLC and control panel supplied by pump vendor, and RTU supplied by City's SCADA provider.
- B. Contractor's Scope
  - 1. Contractor shall provide and commission the high-water alarm light and audible horn device.
  - 2. Contractor shall furnish and install any equipment or services required for a complete and

operable system that is excluded from City's SCADA provider's scope.

#### 1.4. ADMINISTRATIVE REQUIREMENTS

##### A. Coordination

1. Coordinate and comply with the requirements of the Input/Output List and the Process Control Description in Section 40 61 96.
2. Instrument and control systems shall be designed and coordinated for proper operation with related equipment and materials furnished by other suppliers under other sections of these specifications. All instruments and control devices shall be applied in full conformity with the drawings, specifications, engineering data, instructions, and recommendations of the instrument or device manufacturer and the manufacturer of related equipment to achieve a fully and properly functioning system as intended by the Contract Documents.
3. Installation drawings shall be prepared by the supplier or integrator for interconnecting wiring and piping between the related equipment and the equipment furnished under this section. All interconnecting wiring shall be appropriate for the service and shall result in a properly functioning system.
4. The Contractor shall provide coordination with City's SCADA provider and other contractors and supervision of installation as required during construction.

#### 1.5. SUBMITTALS

A. Clearly indicate where and for what service each submitted instrument and equipment item is proposed for use. Include the instrument tag number or P&ID drawing reference if provided in the Drawings. Submittal data for multifunctional instruments shall include complete descriptions of the intended functions and configurations of the instruments.

##### B. Action Submittals

1. A detailed list of any exceptions, functional differences, or discrepancies between the supplier's proposed system and the contract requirements.
2. Product Data
  - a. Manufacturer's literature and product data sufficient to demonstrate compliance with the specification requirements. Highlight proposed products and features, cross out extraneous information.
  - b. Manufacturer's installation manual and installation recommendations
  - c. Technical Manuals: Complete owner's manuals, operation and maintenance instruction manuals, and troubleshooting guides.
3. Shop Drawings
  - a. Provide assembly drawings indicating parts list, materials, dimensions, wiring diagrams, and schematics. Show orientation of electrical connections and transmitters.
  - b. System wiring and installation drawings for all interconnecting wiring between components of the systems furnished and for all interconnecting wiring between the related equipment and the equipment furnished under this section. Wiring diagrams shall show complete circuits and indicate all connections.
    - 1) If panel terminal designations, interdevice connections, device features and options, or other features are modified because of the fabrication process or factory testing, revised drawings shall be resubmitted.
4. Certificates

- a. Manufacturer's certificates of compliance with applicable referenced standards.
- 5. Test Reports
  - a. Factory test and calibration results.
- 6. Equipment Specific Requirements
  - a. For flow meters: manufacturer recommendations for minimum straight length of pipe upstream and downstream of the meter.
  - b. For level instruments: Show details of all required mounting brackets and supports, and indicate position relative to the process stream and structure or tank or pipe to which the instrument is mounted.
  - c. For panels: Complete panel fabrication drawings and details of panel wiring, piping, and painting. Panel and subpanel drawings shall include overall dimensions, metal thickness, door swing, mounting details, and front of panel arrangement to show general appearance, with spacing and mounting height of instruments and control devices.

#### 1.6. CLOSEOUT SUBMITTALS

- A. Complete system documentation, in the form of operation and maintenance manuals, shall be provided. Manuals shall include complete product instruction books for each item of equipment furnished.
- B. Where instruction booklets cover more than one specific model or range of instrument, product data sheets shall be included which indicate the instrument model number, calibrated range, and all other special features.
- C. A complete set of "as-built" wiring, fabrication, and interconnection drawings.

#### 1.7. QUALITY ASSURANCE

- A. All instruments shall be factory tested and calibrated. Submit factory test results for approval prior to shipment.
- B. Verify and be responsible to eliminate spatial interferences and provide adequate clearances for installation and maintenance of the equipment.
- C. Verify that the installation conditions shown on the Drawings comply with the proposed instrument's installation requirements. For example, regarding straight lengths of pipe upstream and downstream of flow meters. If conflicts exist, coordinate with the Engineer to find resolution. In the same example, it may be necessary to submit an alternative meter (of the same type meeting the minimum specification requirements) that requires shorter upstream and downstream lengths, subject to the approval of the Engineer.
- D. The work shall be executed in accordance with the Drawings and Specifications and all manufacturer recommendations and instructions. Should items be required by the manufacturer which are not specifically indicated on the Drawings or Specifications, they shall be supplied and properly integrated into the Work by the Contractor.
- E. Metering Accuracy. System metering accuracy, as compared to the actual process value, shall be determined from the value read at the principal readout device such as the recorder or totalizer.



System requirements shall not preclude any requirements specified herein for individual devices.

- a. For systems where the primary measuring device, transmitter, and receiver are furnished under this section, the accuracies shall be within the following limits:
  - 1) Level: 1.0 percent of measured span.
  - 2) Flow Rate Magnetic metering: 1.5 percent of full scale between 1.0 and 100 percent of scale.

## PART 2 PRODUCTS

### 2.1. GENERAL REQUIREMENTS

- A. All equipment furnished under this section shall be selected by the system supplier for its superior quality and intended performance. Equipment and materials used shall be submitted and subject to review.
- B. Contractor's Responsibility for Material
  1. Contractor shall carefully examine all materials for defects. Material that is known or thought to be defective shall not be incorporated into the Work.
  2. The Engineer or Owner reserves the right to inspect all material and to reject all defective material. Failure of the Engineer or Owner to detect damaged material shall not relieve the Contractor from Contractor's total responsibility to properly complete the Work and place it into proper working order.
- C. Power and Instrument Signals
  1. Unless specified otherwise, electrical power supply to the instrumentation equipment will be unregulated 120 volts ac at the locations noted on the one-line and functional diagrams.
  2. All transmitted electronic analog instrument signals shall be 4-20 mA dc and shall be linear with the measured variable.
  3. Wiring shall be enclosed in conduit as specified on the Electrical Drawings and Specifications. Provide a length of flexible conduit directly connecting to the device to enable maintenance and removal of the device from the process pipeline or tank.
- D. Appurtenances
  1. Signal converters, signal boosters, amplifiers, special power supplies, special cable, special grounding, and isolation requirements shall be furnished and installed as required for proper performance of the equipment.
- E. Interchangeability
  1. All instruments and equipment of the same type incorporated in the Work shall be of the same brand and model line insofar as possible to facilitate maintenance and stocking of repair parts.
  2. Whenever possible, identical units shall be furnished.
- F. Programming Devices
  1. A programming or system configuring device shall be provided for systems that contain any equipment which required such a device for routine calibration, maintenance, and troubleshooting.
  2. The programming device shall be complete and in like-new condition and shall be turned over to the Owner at completion of the startup.

- G. Special Tools and Accessories.
  - 1. Equipment requiring periodic repair and adjustment shall be furnished complete with all special tools, instruments, and accessories required for proper maintenance. Equipment requiring special devices for lifting or handling shall be furnished complete with those devices.
- H. Unless shown otherwise on the Drawings, all small diameter nipples, piping, tubing, and fittings interconnecting the instrument and process piping or tank shall be bronze, or 316 stainless steel in-corrosive environments.
- I. Mounting:
  - 1. Equipment supplier shall be responsible for providing all brackets, supports, mounts, and other hardware necessary for proper mounting of the instrument and associated equipment in the correct position and orientation to facilitate proper operation of the equipment. Comply with details on the Drawings as applicable and in accordance with the manufacturer's best practices and standards. Materials of fabrication shall be compatible with the installation location. Installations in corrosive areas shall be 316 stainless steel or structural FRP.
- J. Selective Coordination:
  - 1. If required for the project in the Electrical Specifications or Drawings, overcurrent devices in panels shall selectively coordinate with upstream overcurrent, see Electrical Drawings for additional information.
- K. SCADA Coordination:
  - 1. The Contractor shall coordinate with the control and telemetry equipment suppliers to ensure successful communication of all required signals and parameters between the Control Panel and SCADA Panel to provide a properly functioning system as intended.

## 2.2. MAGNETIC FLOW METERS (MAG METERS):

- A. The equipment shall meet or exceed the following specifications:
  - 1. Completely obstructionless, in-line flow meter with no constrictions in the flow of fluid through the meter.
  - 2. Bidirectional flow capabilities.
  - 3. Metallic flow tube lined in hard elastomer or fluoropolymer suitable for the liquid being conveyed through the meter. Fusion epoxy exterior coating in accordance with the manufacturer's standard suitable for installation in moist environments.
  - 4. The meter shall be capable of standing empty for extended periods of time without damage to any components. The meter housing shall be of a splash-proof and drip-proof design.
  - 5. Pressure rating shall be suitable for the maximum range of working pressures of the adjacent piping.
  - 6. End connections shall be Class 125-lb flanged, unless shown otherwise on the Drawings.
  - 7. Electrodes and grounding rings shall be Type 316 stainless steel. Provide a grounding ring circuit for each meter.
  - 8. Power supply shall be 120 volts ac, 60 Hz, single phase.
  - 9. Rated for installation in Class 1, Division 2 locations.
- B. Signal Converters.
  - 1. Microprocessor-based signal converters shall be provided. The signal converters shall include output dampening, self-testing, integral digital indicator, built-in calibration capability, and an

- “empty pipe zero” contact input. The overall accuracy of the magnetic flow meter transmitter and signal converter shall be +/-1.0 percent of actual flow rate for full-scale settings of 0.3 to 30 fps.
2. Mounting shall be integral with the flow tube or remotely mounted as indicated on the Drawings, seek clarification on the mounting location from the Engineer if required.
  3. The signal cable between the converter and the magnetic flow meter shall be furnished by the meter manufacturer. The signal converter shall be housed in a NEMA Type 12 or better housing depending on installation location and shall be suitable for operation over an ambient temperature range of -30 to +140F, and relative humidity of 10 to 100 percent. The converter shall have an analog output of 4-20 mA dc.
  4. The signal converter shall have a seven-digit, non-reset totalizer on the face of the enclosure. Local electronic indicators shall be provided.
  5. Indicators shall be mounted on or near the flow meter signal converters in weatherproof NEMA Type 4 or better housings depending on installation location. Indicators shall be four-digit LCD type and shall read in engineering units.
- C. Wiring shall be enclosed in conduit as specified on the Drawings and in the electrical Specifications. Provide a length of flexible conduit directly connecting to the device to enable maintenance and removal of the device.
- D. Each meter shall be factory calibrated, and a copy of the calibration report shall be submitted as part of the operation and maintenance manual submittal.
- E. Manufacturer
1. Rosemount 8705
  2. Endress Hauser
  3. Or approved equal
- F. Immersion Rated. All flow meter components inside the vault, below the 100-year floodplain elevation, and ALL associated electrical conduit, junction boxes, and the like located within the interior space of the valve vault shall be immersion rated up to at least 25 feet of water head. The valve vault is subject to flooding in the event of a stormwater flood event and the system shall be capable of operating properly even while submerged.

### 2.3. RADAR LEVEL SENSORS

- A. Capable of continuous measurement of liquid level of wastewater in tanks and wet wells.
- B. Each radar level sensor shall be a microprocessor-based electronic unit consisting of a sensor assembly with an integrated signal converter/transmitter. Output shall be 4-20 mA/HART 2-wire. Provide power supply units as required and recommended by the manufacturer.
- C. The sensor shall have a plastic horn antenna and be encapsulated in a chemical- and corrosion-resistant material such as keener or CPVC, and shall be suitable for operation over a temperature range of -40 to +175F and a relative humidity of 10 to 100 percent. The sensing element shall be rated for installation on a Class 1 Division 1 classified space; provide intrinsically safe barriers as required. Sensors will be mounted in areas subject to freezing, and so shall be provided with special transducers or protected against icing by heaters, unless recommended otherwise in writing by the manufacturer. Sensors shall be provided with sunshades to protect display from direct sunlight.

- D. The supplier shall furnish drawings complete with dimensions and elevations for the sensor mounting. To be bracket mounted to wet well ceiling per manufacturer's recommended method.
- E. Manufacturer
  - 1. Vega VegaPuls 64

#### 2.4. WEIGHTED FLOAT LEVEL SWITCHES

- A. Each level switch shall consist of a single-pole, double-throw switch, rated not less than 3 amperes ac, sealed and housed in a chemical-resistant polypropylene casing. The switch assembly shall be weighted and suspended on its own cable. The flexible support cable shall be waterproof, three-conductor, synthetic covered cable with 18AWG conductors, and shall be of sufficient length so that no splice or junction box is required in the wetwell. Switches shall be suitable for operation up to 150 volts within an ambient temperature range of 0 to 60 C. Switches shall be suitable for use in a sanitary or wastewater wetwell environment.
- B. High level floats shall be normally closed (closed when float is down), open when float moves up to high level.
- C. Low level floats shall be normally closed (closed when float is up), open when float moves down to low level.
- D. Manufacturer
  - 1. US Filter "Type 9GEF"
  - 2. Or approved equal

#### 2.5. MISCELLANEOUS INSTRUMENTATION

- A. Limit Switch
  - 1. The limit switch shall be of the lever operated limit switch type and shall be enclosed in a NEMA 4 housing. The switch shall be furnished with one NO and one NC contacts and screw type wiring terminal. The switch shall be heavy duty, oiltight type. Limit switches shall be Square D model "9007C54B2" with adjustable type roller lever arm "9007HA1" or equal.
- B. Hatch Intrusion Switch
  - 1. Intended for use with wet well access hatches (floor doors).
  - 2. Two-position limit switch, explosion-proof rated for use in hazardous Class 1 Division 1 areas.
  - 3. 316 stainless steel housing.
  - 4. Four isolated contacts (two normally open and two normally closed).
  - 5. Minimum 10 amperes rating at 125 V AC and 5 amperes at 125 V DC.
  - 6. Contractor shall coordinate with hatch manufacturer to confirm switch compatibility with hatch mounting recommendations.
  - 7. Honeywell "Micro Switch" for hazardous locations, or equal.

#### 2.6. FABRICATED PANELS

- A. General Fabrication Requirements
  - 1. All panels furnished hereunder shall conform to the requirements of NEMA ICS-6-1988.

**B. Wiring**

1. All internal instrument and component device wiring shall be as normally furnished by the manufacturer. With the exception of electronic circuits, all interconnecting wiring and wiring to terminals for external connection shall be stranded copper, insulated for not less than 600 volts, with a moisture-resistant and flame-retardant covering rated for not less than 90 °C.
2. The power entrance to each panel shall be provided with a surge protection device. Surge protectors shall be nominal 120 volts ac with a nominal clamping voltage of 200 volts. Surge protectors shall be of a nonfaulting and non-interrupting design, with a response time of not more than 5 nanoseconds. Surge protectors shall be Transector "ACP-100 BW" or Phoenix Contact "PT-2".
3. All panels shall have an uninterruptible power supply (UPS) battery backup power to maintain all panel functions for a minimum of 30 minutes in the event of a power outage. UPS units shall be capable of being removed by unplugging the unit and unplugging the panel feed from the UPS without any hard-wiring required.
4. All panels with programmable devices in them shall have a convenience receptacle in the panel.
5. Panels that are over 12 cubic feet in total volume shall have panel lighting above each door of the panel.
6. Power distribution wiring on the line side of the panel's protective devices shall be minimum 12 AWG. Secondary power distribution wiring shall be minimum 16 AWG. Wiring for control circuits shall be minimum 16 AWG. Electronic analog circuits shall be 18 AWG twisted and shielded pairs rated not less than 300 volts. Analog circuits shall be separated from ac power circuits. Wiring for ac power distribution, dc power distribution, and control circuits shall have different colors and shall agree with the color coding legend on the system supplier's panel wiring diagrams.
7. Terminal blocks for external connections shall be suitable for 12 AWG wire and shall be rated 30 amperes at not less than 300 volts. Terminal blocks shall be fabricated complete with a marking strip, covers, and pressure connectors. Terminals shall be labeled to agree with identification shown on the supplier's submittal circuits, plus one ground for each shielded cable. Not less than 8 inches of clearance shall be provided between the terminal strips and the base of vertical panels for conduit and wiring space. Not less than 25 percent spare terminals shall be provided. Each control loop or system shall be individually fused, and all fused or circuit breakers shall be clearly labeled and located for easy maintenance.
8. All wiring shall be grouped or cables and firmly supported inside the panel. Wiring shall be bundled in groups and bound by nylon cable ties or shall be routed in Pundit or similar nonmetallic slotted ducts. Ducts shall be readily accessible within the panel with removable covers and shall have a space of at least 40 percent of the depth of the duct available for future use after installation is complete and all field wiring installed. Sufficient space shall be provided between cable groups or ducts and terminal blocks for easy installation or removal of cables.
9. Where signal or loop wiring must be routed to more than one panel or device, the required circuit routing shall be as indicated on the one-line diagrams.
10. The panel fabricator shall provide such additional circuits as may be indicated on the electrical schematic drawings.
11. All wires in the panel shall be identified at both ends of the wire. These labels shall agree with the labels shown on the wiring diagrams. The wire labels shall be of the heat-shrink tube type of wire marker.

**C. Nameplates and Tags**

1. Nameplates shall be provided on the face of the panel or on the individual device as required. Panel nameplates shall have approximate dimensions and legends, as indicated on the drawings,

- letters approximately 3/16-inch-high extending through the black face into the white layer.
2. Nameplates shall be secured firmly to the panel. Panel face nameplates do not replace the requirement for device identification tags.
  3. All devices shall be provided with permanent identification tags. The tag numbers shall be consistent with the supplier's equipment drawings. All field-mounted transmitters and devices shall have stamped stainless steel identification tags.
  4. Hand lettered labels or tape labels will not be acceptable.

D. Painting

1. Interior and exterior surfaces of all panels shall be thoroughly cleaned and painted with rust-inhibitive primer.
2. The panel interior shall be painted white with the manufacturer's standard coating. All pits and blemishes in the exterior surface shall be filled.
3. Exterior surfaces shall be painted with one or more finish coats of the manufacturer's standard coating. Finish coats shall have a dry film thickness of at least 4 mils.
4. Exterior surfaces of panels located outdoors in public view shall be further coated in the field with a finish color coat that is compatible with the manufacturer's standard finish coating. Contractor shall be responsible for coordinating and selecting an appropriate compatible coating. Lightly sand the surface of the manufacturer's finish to increase adhesion. Color shall match the color of the wall or surface on which it is mounted, or as otherwise directed by the Engineer. A custom-color match may be required. Submit proposed color for review and approval prior to proceeding.

E. Factory test

1. Panels shall be factory tested electrically by the panel fabricator before shipment.

2.7. PANEL FRONT-MOUNTED DEVICES

A. Selector switches

1. Selector switches shall be a minimum 30 mm, heavy-duty, oiltight type with gloved-hand or wing lever operators.
2. Position legends shall be engraved on the switch faceplate. Switches for electric circuits shall have silver butting or sliding contacts, rated 10 amperes continuous at 120 volts ac.
3. Contact configuration shall be as indicated on the drawings or as required for the application.
4. Switches used in electronic signal circuits shall have contacts suitable for that duty.
5. Manufacturers:
  - a. Cutler-Hammer "Series 10250T"
  - b. Square D "Class 9001"
  - c. or approved equal

B. Indicating Lights

1. Indicating lights shall be a minimum 30 mm, heavy-duty, oiltight type, which uses a low voltage lamp.
2. A built-in transformer shall be used for ac service. Legends shall be engraved on the lens or on a legend faceplate.
3. Lamps shall be easily replaceable from the front of the indicating light.
4. Manufacturers:
  - a. Cutler-Hammer "Series 10250T"
  - b. Square D "Class 9001"

- c. or approved equal
- C. Push Buttons
  1. Push buttons shall be a minimum 30 mm, heavy-duty, oiltight type.
  2. Legends shall be engraved on push button faceplate.
  3. Contacts shall be rated 10 amperes continuous at 120 volts ac.
  4. Manufacturers:
    - a. Cutler-Hammer "Series 10250T"
    - b. Square D "Class 9001"
    - c. or approved equal
- D. Totalizers
  1. Totalizers shall have miniature, rectangular, semi-flush counters, designed for use in conjunction with miniature indicators and recorders, and shall be of such a design that only the counter is flush-mounted and the associated integrating mechanism is located in the rear of the panel.
  2. The counter shall contain not less than seven digits, with a multiplier of a power of 10 plainly engrave on the face of the counter, or on a nameplate below the counter, so that a full range of 9,999,999 is reached before repeating.
  3. Totalizers actuated by dc powered coils shall be equipped with a reverse voltage protection device.
  4. Totalizers shall not reset upon power failure.
  5. Manufacturers:
    - a. Red Lion or
    - b. Action Instruments
- E. Run Time Meters
  1. Run time meters shall have miniature, rectangular, semi-flush counters.
  2. The counter shall contain not less than seven digits, with a nameplate plainly engraved on the face of the counter, or below the counter identifying it as a run time meter.
  3. Run time meters shall not reset upon power failure.
  4. Manufacturers:
    - a. Red Lion or
    - b. Action Instruments
- F. Digital Panel Indicators
  1. Digital indicators shall be designed for semi-flush mounting in a panel.
  2. The display shall be a 3-1/2 digit LED or gas-discharged type, with digit height of not less than 0.5 inch. The display shall be easily read at a distance of 10 feet in varying control room lighting environments.
  3. Operating temperature range shall be 0 to 40 C. Accuracy shall be plus or minus 0.1 percent. The display shall be scaled in engineering units, with the units engraved on the display face or on the associated nameplate.
  4. The display shall have s selectable decimal point and shall provide ore-range indication.
  5. Manufacturers:
    - a. Action Instruments or
    - b. Red Lion
- G. Single Loop PID Controllers

1. Each controller shall be of the "Manual-Automatic" control type with balanceless, bumpless transfer between control modes.
2. The controller manual output shall be adjusted by means of "Raise-Lower" push buttons on the controller face. The controller shall have a process variable indicator. The process variable scale shall be as indicated on the drawings or as specified.
3. The controller shall have proportional plus reset control modes or other control modes as indicated on the drawings.
4. Each controller shall include a digital indicator, reading in engineering units, switchable to any analog input.
5. Proportional band shall be adjustable from 5 to 500 percent. Reset shall be adjustable from 0.04 to 50 repeats per minute. Controllers shall be suitable for direct or reverse control action.

## 2.8. PANEL INTERIOR-MOUNTED DEVICES

### A. Power Supplies

1. Regulated dc power supplies for instrument loops shall be provided as needed.
2. Power supplies shall be suitable for input voltage variation of plus or minus 10 percent. The output dc voltage shall be fused.

### B. Relays

1. Relays indicated to be provided in panels, enclosures, or systems furnished under this section shall be of the plug-in socket base type with dustproof plastic enclosures unless noted otherwise.
2. Relays shall be UL listed and shall have at least double-pole, double-throw contacts. Relays shall have a minimum rating of 10 amperes at 120 volts ac.
3. Time-delay relays shall have dials or switch settings engraved in seconds and shall have timing repeatability of +/- 2.0 percent of setting.
4. Latching and special purpose relays shall be as required for the specific application.
5. Manufacturers:
  - a. IDEC "RH Series"
  - b. or equal

### C. Electronic Signal Booster/Isolators

1. Electronic signal boosters and isolators shall have all solid-state circuitry and complete electrical isolation between the power supply and the input and output signals.
2. Accuracy shall be +/-0.15 percent of span.
3. Manufacturers:
  - a. Acromag
  - b. Moore
  - c. or Phoenix Contact

## 2.9. PROGRAMMABLE LOGIC CONTROLLER (PLC)

- A. PLCs and associated equipment shall be in conformance with the Owner's preferences and standards for compatibility with existing equipment, programs, and service contracts. Seek clarification from the Owner as necessary. The requirements below shall be assumed as the basis for bidding.
- B. All PLCs in the project will be programmed using the same programming software package, and shall be the Owner's preferred software.



- C. PLCs shall conform to the following, unless directed otherwise by the Owner:
1. The PLC shall collect data, perform process control functions, communicate with other PLCs, and distribute process information through the local area network.
  2. Utilize Ethernet for communication.
  3. Capable of having its program downloaded from a remote workstation over the local area network, and be locally programmed from a portable laptop computer.
  4. The executive firmware of all intelligent modules shall be stored in Flash memory and shall be able to be updated in the field using standard programming tools. Executive firmware files shall be readily available via a public web site.
  5. The PLC shall be field expandable to allow for the expansion of the system by the simple addition and configuration of hardware.
  6. Each component shall include a clearly visible faceplate with appropriate data such as the manufacturer's model number and a brief description of the component's function.
  7. All cables and connectors shall be as specified by the manufacturer. Cables shall be assembled and installed per the manufacturer's recommendations.
  8. Each discrete point shall have a light emitting diode on the face of the module to indicate point status. Green shall indicate that the point is logic level "1", also referred to as "on" or "high".
- D. Environmental requirements for the equipment:
1. Minimum temperature range:
    - a. Operating: 0-55° C (+32 to +131°F)
    - b. In Storage: -25 to +70° C (-13 to +158°F)
  2. Relative humidity: 30 to 95% non-condensing.
  3. Altitude: At the elevation of the project location without derating.
  4. Degree of protection: NEMA 1 (IP20)
  5. Vibration resistance in accordance with at least one of the following:
    - a. Installed rating:
      - 1) DIN rail mounted PLC: 10-57 Hz, amplitude 0.075 mm, acceleration 25-100 Hz, and
      - 2) Panel or plate mounted PLC: 2-25 Hz, amplitude 1.6mm, acceleration 25-200 Hz.
    - b. In compliance with IEC 60068 and IEC 61131.
  6. Shock resistance: 147m/s<sup>2</sup> for 11ms.
- E. Manufacturer:
1. Schenider Electric
  2. Or approved equal acceptable to the Owner

#### 2.10. HUMAN MACHINE INTERFACE (HMI)

- A. HMIs and associated equipment shall be in conformance with the Owner's preferences and standards. The requirements below shall be assumed as the basis for bidding.
- B. General:
1. Certifications: CE, UL, and CUL
  2. Power Supply: nominal voltage of 24VDC with a range of 10.2-26.4 Volts DC
  3. Include a built-in real-time clock
  4. Utilize Ethernet networks that are available for multiple vendors. Conversion equipment will not be accepted

## C. Environmental Requirements

1. Temperature:
2. Minimum temperature range:
  - a. Operating: 0-50° C (+32 to +122°F)
  - b. In Storage: -20 to +60° C (-4 to +140°F)
3. Relative Humidity: minimum of non-condensation humidity of 5-95%.
4. Altitude: At the elevation of the project location without derating.
5. Degree of Protection: Front panel rating of IP 65 and conform to IEC 60529. This rating shall be a NEMA 4X rating suitable for indoor use only. The back panel rating shall be IP 20 and conform to IEC60529.
6. Shock Resistance: Conform to one of the following:
  - a. IEC 60068-2-27; Semi-sinusoidal Pulse for 11ms, and 15gn on 3 axes
  - b. IEC 61131-3; 15gn 11ms
7. Vibration: Conform to one of the following
  - a. IEC 60068-2-6. The Terminal shall be capable of 5-9Hz at 3.5 mm, and 9-150Hz at 1g.
  - b. IEC 61131-3; 1gn 5Hz to 150Hz (maximum 3.5 mm (0.13 in.))
8. Electrostatic Discharge: Conform to one of the following
  - a. IEC61000-4-2, level 3
  - b. 6 kV direct contact, or 8Kv air contact
9. Electromagnetic Interference: Conform to one of the following
  - a. IEC 61000-4-3, 10 V/m.
  - b. 10 V/m / 80 MHz to 2.7GHz Sinus amplitude modulated 80 % 1 kHz + Internal clock frequency

## D. Minimum requirements for HMI OIT screens, unless directed otherwise by the Owner:

1. Screen size: no less than 15 inches (measured diagonally) for primary screens or primary control access locations, and no less than 6 inches for secondary locations.
2. Screen Type: Color TFT screen with 64k solid colors. The screen shall have minimum 1024x768 pixel (QVGA) resolution, with a backlighting service life of 50,000 hours of continual usage at 50% brightness. There shall be an embedded analog touch sensitive zone with a minimum lifetime of 1 million touches. The screen shall have 16 levels of adjustment via the touch screen.
3. Primary Memory: The screen has 82Mb application flash memory, data backup in FRAM of 64Kb, and Application run DRAM of 32MB. For screen sizes five (5) inches or greater, the units shall have a 16Mb flash EPROM and a Compact Flash expansion memory slot. The Compact Flash slot shall be capable of handling cards up to 1GB.
4. Memory Management Backup: Detected alarms data are saved automatically every hour in the back-up memory, or upon request through the programming software.
5. Battery-less Backup: The terminal shall not require a battery for memory backup.
6. Communication Ports: The Operator Interface Terminals shall support have a RJ-45 serial port, a USB port, and a RJ45 Ethernet port.
7. Protocols: The operator terminal shall support Modbus, Uni-Telway, Modbus TCP, Siemens® PPI-MPI/Profinet, Omron® Sysmacway/Sysmac Ethernet, Rockwell® DF1/DH485/Ethernet IP, and Mitsubishi® Melsec FX/Q/A/TCP-A/TCP-Q

## E. Manufacturer:

1. Schneider Electric
2. Red Lion CR3000 series
3. Or approved equal acceptable to the Owner

### 2.11. UNINTERRUPTABLE POWER SUPPLY (UPS)

- A. Provide uninterruptable power supply (UPS) battery backup to maintain the PLC and HMI in continuous operation during power outages or ATS switch-overs without rebooting. Duration/capacity shall be in accordance with best industry practices and standards.
- B. Manufacturer:
  - 1. Leibert
  - 2. Or approved equal

### 2.12. LOCAL ALARM INDICATION

- A. The pump station shall have a high-high water level alarm in the form of a horn and light beacon mounted where shown in the Drawings. The light shall be red and mounted so as to be visible in a 360 degree radius.
- B. Weather-proof audible and visual alarms shall be provided in accordance with 15A NCAC 2H.0219(h)(5). The horn and light shall be interlocked to activate upon the high-high level float switch in the wet well.
- C. Horn and light shall be connected to the UPS battery backup and be capable of operating during a power outage.

## PART 3 EXECUTION

### 3.1. INSTALLATION REQUIREMENTS

- A. The instrumentation equipment shall be installed in accordance with the manufacturers' instructions. The services of the system supplier's technical representative shall be provided as necessary to calibrate, test, and advise others of procedures for adjustment and operation.
- B. Field-Mounted Instruments
  - 1. Instruments shall be mounted so they may be easily read and serviced, and all appurtenant devices are easily operated.
  - 2. Installation details for some instruments are indicated on the Drawings. Unless otherwise indicated on the Drawings or directed by the Engineer, instruments should generally be mounted approximately 5 feet above the floor.
  - 3. Displays shall be oriented for ease of viewing from walkways.
  - 4. Remote transmitters shall be mounted on corrosion-resistant pipe supports suitable for floor, wall, bracket mounting, or vandal-resistant cabinet mounting.
- C. Field Piping
  - 1. Field piping materials and installation shall conform to the requirements of Section 40 05 05 and herein.
- D. Field Wiring
  - 1. Field wiring materials and installation shall conform to the requirements of the Electrical Specifications and Drawings.

E. Field Calibration

1. A technical representative of the system supplier shall calibrate each instrument and shall provide a written calibration report for each instrument, indicating the results and final tuning adjustment settings. The adjustment of each calibrated instrument shall be sealed or marked, insofar as possible, to discourage tampering. Instruments shall be calibrated before checkout of the operation of the system. A typical instrument calibration report form is included at the end of this section.

F. Systems Check

1. A technical representative of the system supplier or integrator shall participate in the checkout of instruments, control systems, and the integration thereof. If interrelated devices furnished by other suppliers, such as valve actuators, motor controls, chemical feeders, or primary measuring devices, do not perform properly when placed in service, the technical representative shall use suitable test equipment to introduce simulated signals to verify or measure signals from such devices as required to locate the source of trouble or malfunction so that it may be resolved by the Contractor and their integrators and suppliers.

G. Installation Test Equipment

1. Unless specified otherwise, all test equipment for the calibration and checking of system components shall be provided by the Contractor for the duration of the testing work. Unless specified otherwise, test equipment will remain the property of the Contractor or the system supplier.

H. Requirements for flow meters

1. Contractor shall install flow meters on straight runs of full-flow pipe.
  - a. Flow meters shall be installed with minimum straight pipe lengths before and after as indicated by the manufacturer.
  - b. Flow meters shall be installed in either the complete vertical or horizontal position.

3.2. OWNER TRAINING

- A. The coordinating supplier shall provide a qualified representative at the job site to train the Owner's personnel in operating and maintenance of the equipment. The training session shall include a technical explanation of the equipment and an actual hands-on demonstration. The training shall consist of adequate time to cover all equipment included in this section for one session, and the schedule shall be arranged and coordinated with the Owner.

END OF SECTION

SECTION 40 73 13  
ANALOG PRESSURE GAUGES

PART 1 GENERAL

1.1. SUMMARY

- A. The work to be performed in accordance with this Specification consists of furnishing all materials, equipment, supplies, and accessories and of performing all operations required in connection with the fabrication and installation of analog pressure gauges and associated appurtenances as shown on the Drawings and specified herein.

1.2. SUBMITTALS

- A. Clearly indicate where and for what service each submitted instrument is proposed for use. Include the instrument tag number or P&ID drawing reference if provided in the Drawings. Indicate the proposed pressure range for each.
- B. Manufacturer's literature and product data sufficient to demonstrate compliance with the specification requirements. Highlight proposed products and features, cross out extraneous information.
- C. Manufacturer's installation manual and installation recommendations, and operations and maintenance manual.

1.3. QUALITY ASSURANCE

- A. All gauges shall be factory tested and calibrated.
- B. Contractor shall verify and be responsible to eliminate spatial interferences and provide adequate clearances for installation and maintenance of the gauges.
- C. Contractor shall verify that the installation conditions shown on the Drawings comply with the proposed instrument's installation requirements. If conflicts exist, coordinate with the Engineer to find resolution.
- D. Performance Guarantee
  - 1. The work shall be executed in accordance with the Drawings and Specifications and all manufacturer recommendations and instructions. Should items be required by the manufacturer which are not specifically indicated on the Drawings or Specifications, they shall be supplied and properly integrated into the Work by the Contractor.

PART 2 PRODUCTS

2.1. GENERAL

- A. Contractor's Responsibility for Material
  - 1. Contractor shall carefully examine all materials for defects. Material that is known or thought to be defective shall not be installed.

2. The Engineer or Owner reserves the right to inspect all material and to reject all defective material. Failure of the Engineer or Owner to detect damaged material shall not relieve the Contractor from Contractor's total responsibility to properly complete the Work and place it into proper working order.
- B. Unless shown otherwise on the Drawings, all small diameter nipples, piping, tubing, and fittings interconnecting the gauge and process piping or tank shall be copper or bronze, or 316 stainless steel in-corrosive environments.
- C. Interchangeability
1. All gauges of the same type incorporated in the Work shall be of the same brand and model line insofar as possible to facilitate maintenance and stocking of repair parts.
  2. Whenever possible, identical units shall be furnished.

## 2.2. ANALOG PRESSURE GAUGES

- A. Sewage, Sludge, or Sediment-Laden Water:
1. 4-1/2" dial with white face, 1/2" MPT bottom connection, phenolic turret case, liquid filled phosphor bronze bourdon tube.
  2. Accuracy shall be 1 percent of full scale.
  3. Each gauge installation shall include the gauge and a glycol or glycerin-filled bolt-through isolation ring sandwiched between pipe flanges (Ashcroft Type 81, or equal). Ring liner to be EPDM, 316 SS for wetted metal, epoxy-coated carbon steel is acceptable for non-wetted metal except 316 SS shall be provided in corrosive environments.
  4. Gauges shall be mounted vertically, with pilot tubing bend fittings being provided as required.
  5. The ring and pilot tubing to the gauge shall be filled with glycol or glycerin by the gauge manufacturer at the factory if possible, to eliminate air bubbles.
  6. Manufacturer: Ashcroft, U.S Gauge, or approved equal. All gauges and accessories in the project shall be supplied by the same manufacturer.
- B. Pressure ranges shall be as follows:
1. Sewage Pump 1 and 2 discharge: 0 to 50 psig

## PART 3 EXECUTION

### 3.1. INSTALLATION REQUIREMENTS

- A. Gauges shall be installed in accordance with the manufacturers' instructions, and details on the Drawings if provided.
- B. Gauges shall be mounted so they may be easily read and serviced and all appurtenant devices are easily operated. Displays shall be oriented for ease of viewing.
- C. Field piping materials and installation shall conform to the requirements of Section 40 05 05 and herein.

END OF SECTION

SECTION 41 22 13.21  
DAVIT CRANES

PART 1 GENERAL

1.1. SUMMARY

- A. The work to be performed in accordance with this Specification consists of furnishing all materials, equipment, supplies, and accessories and of performing all operations required in connection with the fabrication and installation of davit cranes for removal of pumps as shown on the Drawings and specified herein.

1.2. ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate the selection and installation of davit cranes with
  1. Wet well construction
  2. Hatch selection and installation
  3. Handrail selection and installation
  4. Pump selection

1.3. SUBMITTALS

- A. Submit product information sufficient to demonstrate conformance with the specified criteria.
- B. Submit an Owner's Manual that includes the following information: Important information and warnings, installation and operation instructions, inspection requirements, and lubrication, maintenance, handling and troubleshooting guidelines.

1.4. QUALITY ASSURANCE

- A. Qualifications: Manufacturer shall have a minimum of five (5) years of experience in producing substantially similar equipment.

1.5. DELIVERY, STORAGE, AND HANDLING

- A. Materials shall be stored in such a manner to ensure proper ventilation and drainage, and to protect against damage, weather, vandalism, and theft.

1.6. WARRANTY

- A. The equipment shall be covered by a minimum two (2) year warranty which shall cover 100% of shop labor and parts for the first two years after Final Acceptance.

PART 2 PRODUCTS

2.1. DAVIT CRANES

- A. Davit Crane: Davit crane shall be mounted to top slab of wet well as indicated in the Drawings and be able to lift installed pumps from bottom of wet well and pivot while loaded to unload pumps either on wet well top slab or on vehicle or ground adjacent to the wet well structure.

1. Weight Capacity: A variable lift capacity based on boom position, with a minimum 1,400 lb capacity with the boom horizontal and extended the length required to access either pump.
2. Lift below floor: 25 feet minimum
3. Hook Height: hook height shall be adjustable by moving the boom up or down between horizontal and 45 degrees from vertical, with a minimum of 56 inches hook height at the lowest position.
4. Hook height above floor: 56 inch minimum
5. Hook Reach: Boom shall have a hook reach of at least 100 inches measured from mast center to hook center when the boom is horizontal and fully extended.
6. Boom Angle: boom angle shall be fixed or adjustable with a hand operated screw jack acting to raise or lower the boom between horizontal and 45 degrees from vertical.
7. Rotation: mast and boom shall rotate 360 degrees in the base on roller and tapered roller bearings, with a rotational handle attached to mast to facilitate rotation.
8. Design Factor: designed with an ultimate design factor greater than 2:1 for all components including the lifting winch and base.
9. Boom Sheave: Wire rope shall pass over a sheave at the end of the boom. Sheave shall have a needle bearing.
10. Fastening Pins: Crane components shall be fastened together using solid steel pins.
11. Winch Location: Lifting winch shall be located such that the center point of the drive shaft is no more than 18 inches in front of the centerline of the mast.
12. Nametag: Crane shall be labeled with a non-corrosive metal identification plate labeled or imprinted with the manufacturer's name, model number, serial number, capacity rating, and other essential information.
13. Finish: 3 step epoxy finish consisting of a primer, an epoxy coat, and a topcoat of polyurethane. Finish color shall be grey.

B. Lifting Winch

1. Crane shall be equipped with electric winch from the same manufacturer design for the selected crane.
2. Power: 115V single phase 60 Hz
3. Lifting Winch: Winch shall have machine cut worm gearing operating in an enclosed oil bath, cast aluminum gear case and drum construction, radial ball bearings, pressure plate, and a positive load holding mechanical brake able to stop and hold the load automatically if winch operation is halted.
4. Motor: Motor shall be totally enclosed non-ventilated, or fan cooled, with antifriction bearings and Class B insulation minimum. Motor shall be reversible with torque characteristics suitable for the hoist service and capable of operating at specified loads, with a NEMA 4 pendant control on a minimum 6-foot control cord. Motor at rated frequency shall be capable of operating within 10% of rated motor voltage.
5. Cable Anchor: Lifting winch shall include the quick disconnect feature allowing quick attachment and detachment of wire rope equipped with a swaged end fitting.



6. Emergency Hand Crank: Emergency hand crank shall include handle that can be used in case of power failure.
- C. Wire Rope: 304 stainless steel wire rope minimum ¼-inch diameter.
- D. Hooks: Latch type hooks shall be provided and shall be swivel type to allow 360-degree rotation under all load conditions. Hooks shall be heat treated drop forged type 304/316 stainless steel.
- E. Manufacturer
  1. Thern Model 5FT20X-E2X, or
  2. Engineer approved equal

### PART 3 EXECUTION

#### 3.1. EXAMINATION

- A. Examine slabs for suitable conditions where davit crane will be installed
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2. INSTALLATION

- A. Equipment and accessories shall be installed in strict conformance with the manufacturer's installation instructions.
- B. Test crane for operability after installation including clearances, horizontal reach, vertical reach, and lifting capacity.

END OF SECTION

SECTION 43 25 13  
SUBMERSIBLE/IMMERSIBLE NON-CLOG WASTEWATER PUMPS

PART 1 GENERAL

1.1. SUMMARY

- A. The work to be performed in accordance with this Specification consists of furnishing all materials, equipment, supplies, and accessories and of performing all operations required in connection with the fabrication and installation of submersible non-clog wastewater pumps as shown on the Drawings and specified herein.
- B. Submersible non-clog wastewater pumps include:
  - 1. Solids handling pump and motor,
  - 2. Pre-rotation basin and frame,
  - 3. Fast-out Elbow and Guide Shoe
  - 4. Guide Rail system including brackets, and
  - 5. all other appurtenances as specified or as shown on Drawings or required to make a complete and fully functioning system.

1.2. REFERENCES

- A. Standards
  - 1. The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.
  - 2. American Society for Testing and Materials (ASTM)
    - a. A48 – Standard Specification for Grey Iron Castings
  - 3. Hydraulic Institute Standards

1.3. SUBMITTALS

- A. Submit certificates of compliance with manufacturer's literature.
- B. The curves shall be developed for the individual pump and must include overall efficiencies. The curves shall show a flow capacity range from 0 to 125 percent of the maximum specified flow.
- C. The Contractor shall submit the following on all pump units:
  - 1. Certified characteristic pump curves
  - 2. Seal descriptions
  - 3. NPSH requirements
  - 4. Minimum recommended submergence
  - 5. Operating point
  - 6. Certified pump test
  - 7. Dimensions and minimum submergence
  - 8. Motor horsepower for maximum load condition
  - 9. Shaft sizes
  - 10. Power factor at design load
  - 11. Motor efficiency at design load
  - 12. Wire to water efficiency at design load

13. Shut off head in feet
14. Safety Factor of drive system
15. Start Up Plan
16. Start Up Report for 5 day and 14 day tests
17. Operation and Maintenance Manuals

- D. Submit typical wet well installation drawings indicating dimensions and minimum clearances. Submit guide rail and other accessory data.
- E. Submit certified non-witnessed factory performance testing in accordance with Hydraulics Institute Standards for each pump. Obtain approval from Engineer prior to shipment.

#### 1.4. WARRANTY

- A. All items shall be covered by a minimum two (2) year warranty which shall cover 100% of shop labor and parts for the first two years after Final Acceptance.

### PART 2 PRODUCTS

#### 2.1. GENERAL

- A. Pumps shall be designed such that no damage will occur in the event of backflow through the pump. Pumps shall be rated for constant speed operation, 1,800 RPM maximum. Motor horsepower provided shall be non-overloading throughout the entire pump curve.
- B. Pump assembly, including motor, pump, and cable accessories shall be rated for Class 1, Division 1 hazardous environment, explosion proof, Groups C and D.
- C. All pumps shall be of the same manufacturer and shall be of the make and model shown, or Engineer approved equal.
- D. Acceptable manufacturers and model numbers:
  1. Hidrostal F4K & Size 800 Prerostal basin
  2. Trillium Wemco pump and prerotation basin, equivalent model
  3. Or Engineer approved equal.

#### 2.2. DESIGN REQUIREMENTS

The selected pump shall work with current design conditions and ultimate buildout conditions, using the same pump with a motor replacement only.

- A. Design pumping equipment for the following conditions:
  1. Phase 1 – Current Design Conditions
    - a. Primary Design Point Flow: 340 GPM
    - b. Primary Design Point Head: 37.6 ft TDH
    - c. Static Head (system head, no flow): 34 ft TDH
    - d. Pump operating speed: no greater than 960 RPM synchronous full speed
    - e. Minimum Pump Shut-off Head: 61 ft +/-
    - f. Minimum efficiency at primary design point: 66%

- g. Maximum motor power: 7.4 hp
    - h. Pump discharge size: 6" minimum
    - i. Minimum solid passage size: 3" sphere
    - j. Power supply: 3 phase, 60 Hz, 480 VAC
  2. Phase 2 – Ultimate Buildout Conditions
    - a. Primary Design Point Flow: 831 GPM
    - b. Primary Design Point Head: 111 ft TDH
    - c. Static Head (system head, no flow): 34 ft TDH
    - d. Pump operating speed: no greater than 1,800 RPM synchronous full speed
    - e. Minimum Pump Shut-off Head: 210 ft +/-
    - f. Minimum efficiency at primary design point: 72%
    - g. Maximum motor power: 50 hp
    - h. Pump discharge size: 6" minimum
    - i. Minimum solid passage size: 3" sphere
    - j. Power supply: 3 phase, 60 Hz, 480 VAC
- B. Pump(s) shall be capable of handling raw unscreened sewage and similar solids and rags/flushable wipes-laden fluids without clogging.
- C. Permanently install the discharge base and elbow in the wet well and connect to the discharge piping as shown on plans.
- D. Connecting of the pumping unit to the guide rail base shall be accomplished by a simple linear downward motion of the pump, without need for personnel to enter the wet well.
- E. No portion of the pump shall bear directly on the floor of the sump.
- F. The pump with its appurtenances and cable shall be capable of continuous submergence to a depth of at least 30 feet without damage.
- G. Pump construction shall be as follows:
  1. Impeller – High chrome cast iron (hardened iron), multi-channel/blade centrifugal design, or non-clog screw centrifugal design.
  2. Self Cleaning Front Plate – hardened cast iron.
  3. Volute – ASTM A48 Cast Iron, with centerline discharge.
  4. Shaft – high alloy stainless-steel.
  5. Mechanical Seals – Tandem double mechanical seals. Lower and upper seal faces to be tungsten and/or silicon carbide both rotating and stationary sides, according to the manufacturer's standard.
  6. Bearings – Upper shall be deep grooved ball bearing, the lower shall be two heavy duty, single row, angular contact ball bearings. Bearings shall be permanently grease lubricated. B-10 bearing life shall be 50,000 hours minimum at design operating conditions.
  7. All mating surfaces of pump and motor shall be machined and fitted with Buna N "O" rings where watertight sealing is required. Sealing shall be accomplished by proper fitting of parts and not by compression or special torque requirements.
  8. All external screws and fasteners shall be 316 stainless steel. Type 304 is not acceptable.
- H. Submersible motor construction shall be as follows:
  1. Motor housing – ASTM A48 Cast Iron.

2. Motor shall be capable of sustaining at least 10 evenly spaced starts per hour.
3. Stator windings and leads shall be insulated with moisture resistant Class H or Class F insulation rated for 155°C minimum. Motor temperature rise shall be limited to 80°C.
4. Pump motor cable shall be type SOOW. Cable sizing shall conform to NEC and ICEA specifications. Cable length shall be of sufficient length to extend into the junction box without splicing.
5. Cable entry shall consist of a cylindrical elastomer grommet flanked by stainless steel washers and shall not require specific torque requirements to insure a watertight seal. A cable cap shall be provided which incorporates a strain relief feature.
6. Minimum motor service factor to be 1.15.
7. Motor shall be rated explosion proof by Factory Mutual and comply with NEC requirements for Class 1 Division 1 locations.
8. Pump and motor protection: Provide moisture detection probes located between the mechanical seals or float switch in the stator chamber. Provide automatically resetting thermal sensors embedded in the motor windings. Relays for the protection devices shall be provided by the pump manufacturer or shall be guaranteed by the Contractor to be compatible with each pump in accordance with the pump manufacturer requirements. Install in the pump starter enclosure.

- I. Factory Coating: Pump, motor, and accessories shall be factory applied and finish coated in accordance with the manufacturer's standard.

### 2.3. CLOG-FREE FEATURE

- A. Pumps shall be provided with accessories or design features to specifically eliminate clogging by rags or stringy fibrous material, including flushable wipes. Features may consist of special electronic monitoring and control, or impeller and volute design, as follows:
  1. "Deragger" system, as manufactured by Clearwater Controls, or equal. System shall be integral with the vendor-packaged control panel.
  2. Special impeller design specifically designed to eliminate/minimize clogs associated with flushable wipes and stringy material and accompanied by a special written non-clog guarantee from the pump manufacturer, with capability in the control panel to add the "Deragger" control package retrofit in the future by the Owner if desired.

### 2.4. RAIL MOUNTING SYSTEM

- A. Each pump shall be furnished with quick-disconnect discharge elbow, two Schedule 40 pipe guide rails, upper guide rail bracket, intermediate guide rail bracket(s), rail-guided lifting assembly, and 316 stainless steel chain of sufficient strength to raise and lower pump. Provide intermediate guide rail support brackets spaced as recommended by the pump manufacturer.
- B. All guide rail components and fasteners shall be Type 316 stainless steel.

### 2.5. SPARE PARTS

- A. Each pump unit shall be provided with the following spare equipment with instructions:
  1. One complete mechanical seal assembly kit,
  2. One volute case wearing ring or wear plate,
  3. One set of gaskets and O-rings

### 2.6. CONTROL PANEL

- A. Provide a vendor-packaged control panel for the two pumps. Panel shall meet industry standards set by National Electrical Code requirements, and National Electrical Manufacturer's Association (NEMA) Standards. Enclosure shall be NEMA 3R or better. The panel components shall be coordinated with and suitable for the furnished pumps, shall meet the requirements shown on the Drawings and in the Electrical Specifications, shall provide for pump operation and other functions described in the Process Control Narrative attached as Appendix A hereto, and shall include all components necessary whether specified or not to provide a properly and fully functioning system as intended. Panel components shall include, but not be limited to, the following:
1. Programmable logic controller (PLC).
    - a. Schneider Electric, or Owner- approved equal.
    - b. Provide uninterruptable power supply (UPS) to maintain PLC in constant operation, without rebooting, during events of utility power outage and during switchover to generator power and back again.
  2. SCADA and RTU input/output signal terminals as listed on Electrical Drawings, P&ID, and instrumentation drawings/specification.
  3. Input terminals and logic to receive and process signals from external instrumentation devices as shown or required to meet the functionality of the Process Control Narrative, including flow meter signal, radar level sensor signals, water level float signals, pump temperature and moisture sensor signals, and Deragger system.
    - a. Radar level sensor transmitters will be integral with the instrument mounted on the wet well. Control panel and PLC shall receive and process signal from the transmitters.
    - b. Flow meter transmitters will be remotely mounted. Control panel and PLC shall receive and process signal from the transmitters.
    - c. Water level float switch signals shall be wired to the control panel, bypassing the PLC, such that they provide fully redundant automatic pump control in the event of a radar level sensor or PLC failure.
    - d. Provide relays and control package necessary for the pump temperature and moisture sensors.
  4. Touch screen color HMI display mounted on the panel cover, 8" screen size minimum. Schneider Electric, or Owner-approved equal.
  5. Indicator lights, HOA switches, emergency stop buttons, disconnect switches, and other standard front-of-panel mounted display and switching devices for each pump in accordance with the manufacturer's standard. Provide placard labels for each item.
  6. All required intrinsically safe barriers and devices required to interface with instruments located in the wet well shall be provided in accordance with the electrical drawings and specifications. Provide with the control panel accordingly if so indicated.
- B. Overcurrent devices in panel shall selectively coordinate with upstream overcurrent, see Electrical Drawings for additional information.
- C. The Contractor shall coordinate with the control and telemetry equipment suppliers to ensure successful communication of all required signals and parameters between the Control Panel and SCADA Panel to provide a properly functioning system as intended.

## PART 3 EXECUTION

### 3.1. INSTALLATION

- A. Equipment and accessories shall be installed in strict conformance with the manufacturer's installation instructions.

3.2. MANUFACTURER'S FIELD SERVICES

- A. The manufacturer of the pumps shall supply a certified factory trained field service engineer to thoroughly check and inspect the pumps after installation, place the pumps in operation and make necessary adjustments, and instruct Owner's personnel in proper operating and maintenance procedures. These services will be provided for a minimum of five (5) working days and shall be scheduled at least two weeks in advance through the Owner and Engineer.

END OF SECTION