

PROJECT MANUAL

SULLIVAN MIDDLE SCHOOL ATHLETIC RESTROOM/CONCESSION BUILDING

ROCK HILL SCHOOLS
BID PACKAGE 1:
BID # 19-2024 SITE PREPARATION & UTILITY CONNECTIONS

ROCK HILL SCHOOLS, YORK DISTRICT THREE
ROCK HILL, SOUTH CAROLINA

MOSELEYARCHITECTS

ARCHITECTURAL

COLUMBIA, SOUTH CAROLINA

February 7, 2020	VOLUME 1 OF 1	APN # 593120
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SULLIVAN MIDDLE SCHOOL ATHLETIC RESTROOM/CONCESSION BUILDING
ROCK HILL SCHOOLS; ROCK HILL, SC
Architect's Project No: 593120
Rock Hill Schools Bid No.: 19-2024 Site Preparation and Utility Connections
Rock Hill Schools Bid No.: 19-2025 Pre-Manufactured Modular Precast Building

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ROCK HILL SCHOOLS; ROCK HILL, SC
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INVITATION TO BID

Sealed bids for construction of the **Sullivan Middle School Athletic Restroom/Concession Building, Rock Hill, SC**, will be received in person or via special courier service at the **Rock Hill School District Facilities Building, 2171 West Main Street, Rock Hill, SC 29732**, until but no later than **2:00 p.m.**, local prevailing time, March 5, 2020, and then publicly opened and read immediately thereafter.

Bids received after the announced time and date for submittal, whether by mail or otherwise, will be rejected. Bidders are responsible for ensuring their Bid is received before the deadline indicated. Bids submitted by telephone, telegraph, email, text message, or facsimile shall not be accepted. No bids may be withdrawn for a period of 60 days following opening of bids. The Owner reserves the right to reject any and all bids and to waive minor informalities and irregularities.

The Work of this Bid Package is as follows:

Bid Package No. 1: Preparing the site including grading, underground utilities, retaining walls, concrete walks, handrails and making final utility connections to the building once building is set in place.

Note: Furnishing and Setting the Pre-Manufactured Modular Precast Building with associated finishes and fixtures is under a separate bid package by others.

There will be a non-mandatory pre-bid meeting for this project, Thursday, February 13, 10:00 am at the Rock Hill School District Facilities Services Building, 2171 West Main Street, Rock Hill, SC 29732. Bidders are encouraged to attend and visit the site.

The deadline for substitutions, questions, and clarifications shall be February 20th, 4:00 pm. Submit questions in writing. Responses will be in the form of addenda if required.

Bidders may obtain, and/or examine electronic Bidding Documents via Vendor Registry or by visiting moseleyarchitects.com, "Bidding." Any printing of the drawings needed by the contractor will be at Contractor expense.

*All formal solicitations and quotes for Rock Hill Schools are posted through Vendor Registry. Vendors are encouraged to register with Vendor Registry. Registration for Rock Hill Schools is FREE. Link to Vendor Registry: <https://vrapp.vendorregistry.com/Vendor/Register/Index/rock-hill-school-district-three-sc-vendor-registration>

In order for Moseley Architects to maintain an accurate list of plan holders, each Bidder is encouraged to complete the following steps:

1. Submit the following information to Moseley Architects:

ATTN: Kerry Petrie kpetrie@moseleyarchitects.com

Company Name:

Address:

Phone/Fax Number:

Email Address:

Contact Person:

SULLIVAN MIDDLE SCHOOL ATHLETIC RESTROOM/CONCESSION BUILDING
ROCK HILL SCHOOLS; ROCK HILL, SC

Architect's Project No: 593120

Rock Hill Schools Bid No.: 19-2024 Site Preparation and Utility Connections

2. Visit moseleyarchitects.com, select "Bidding" (**Sullivan MS Athletic Restroom/Concession Building**), click on "Bid Documents", and follow the instructions located at the top of the page to "Request a key". Once complete, access to the electronic Bidding Document files can be obtained, saved, and or examined as needed.

A Bid Guarantee in the form of a certified check or bank draft, payable to the order of Rock Hill Schools, or a **satisfactory bid bond**, executed by the bidder and accept-able surety, in an amount equal to five per-cent (5%) of the total bid shall be submitted on AIA Document A310, with each bid. It is called to the attention of the bidder that all bid bonds must be co-signed by a resident agent of the State of South Carolina.

The Bidder's attention is called to the requirements relative to the bidder's license. No contract will be awarded hereunder to any bidder who has not been properly licensed by the South Carolina Licensing Board of Contractors as required for the work they are bidding on.

The Owner reserves the right to reject any or all proposals and to waive any informalities in the bidding. Bids may be held by the Owner for a period not to exceed sixty (60) days from the date of the opening of bids for the purpose of reviewing the bids and investigating the qualifications of the bidders, prior to awarding of the contract.

Any questions relating to the Bidding Documents shall be directed to the architect, Moseley Architects at www.moseleyarchitects.com/bidding/, click on "Submit Question".

END OF INVITATION TO BID



AIA® Document A701™ – 2018

Instructions to Bidders

for the following Project:
(Name, location, and detailed description)

Sullivan Middle School Athletic Restroom Concession Building
Rock Hill Schools
Rock Hill South Carolina

THE OWNER:

(Name, legal status, address, and other information)

Rock Hill Schools/York District Three, South Carolina
Post Office Drawer 10072
386 E. Black Street
Rock Hill, South Carolina 29730

THE ARCHITECT:

(Name, legal status, address, and other information)

Moseley Architects P.C.
6210 Ardrey Kell Road
The Hub at Waverly, Suite 425
Charlotte, North Carolina 28277

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This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

FEDERAL, STATE, AND LOCAL LAWS MAY IMPOSE REQUIREMENTS ON PUBLIC PROCUREMENT CONTRACTS. CONSULT LOCAL AUTHORITIES OR AN ATTORNEY TO VERIFY REQUIREMENTS APPLICABLE TO THIS PROCUREMENT BEFORE COMPLETING THIS FORM.

It is intended that AIA Document G612™–2017, Owner's Instructions to the Architect, Parts A and B will be completed prior to using this document.

ARTICLE 1 DEFINITIONS

§ 1.1 Bidding Documents include the Bidding Requirements and the Proposed Contract Documents. The Bidding Requirements consist of the advertisement or invitation to bid, Instructions to Bidders, supplementary instructions to bidders, the bid form, and any other bidding forms. The Proposed Contract Documents consist of the unexecuted form of Agreement between the Owner and Contractor and that Agreement's Exhibits, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, all Addenda, and all other documents enumerated in Article 8 of these Instructions.

§ 1.2 Definitions set forth in the General Conditions of the Contract for Construction, or in other Proposed Contract Documents apply to the Bidding Documents, but are subject to and governed by definitions under applicable laws and regulations.

§ 1.3 Addenda are written or graphic instruments issued by the Architect, which, by additions, deletions, clarifications, or corrections, modify or interpret the Bidding Documents.

§ 1.4 A Bid is a complete and properly executed proposal to do the Work for the sums stipulated therein, submitted in accordance with the Bidding Documents.

§ 1.5 The Base Bid is the sum stated in the Bid for which the Bidder offers to perform the Work described in the Bidding Documents, to which Work may be added or deleted by sums stated in Alternate Bids.

§ 1.6 An Alternate Bid (or Alternate) is an amount stated in the Bid to be added to or deducted from, or that does not change, the Base Bid if the corresponding change in the Work, as described in the Bidding Documents, is accepted.

§ 1.7 A Unit Price is an amount stated in the Bid as a price per unit of measurement for materials, equipment, or services, or a portion of the Work, as described in the Bidding Documents.

§ 1.8 A Bidder is a person or entity who submits a Bid ~~and who meets the requirements set forth in the~~ in conformance with Bidding Documents.

§ 1.9 A Sub-bidder is a person or entity who submits a bid to a Bidder for materials, equipment, or labor for a portion of the Work.

§ 1.10 A Responsible Bidder means a person or entity that has the capability, in all respects, to perform fully the Contract requirements and the moral and business integrity and reliability that will assure good faith performance.

§ 1.11 A Responsive Bidder means a person or entity that has submitted a Bid which conforms in all material respects to the Invitation to Bid and requirements of the Bidding Documents.

§ 1.12 An informality means a minor defect or variation of a Bid from the exact requirements of the Invitation to Bid and of the Bidding Documents which does not affect the price, quality, quantity or delivery schedule for the goods, services or construction being procured.

ARTICLE 2 BIDDER'S REPRESENTATIONS

§ 2.1 By submitting a Bid, the Bidder represents that:

- .1 the Bidder has read and understands the Bidding Documents;
- .2 the Bidder understands how the Bidding Documents relate to other portions of the Project, if any, being bid concurrently or presently under construction;
- .3 the Bid complies with the Bidding Documents;
- .4 the Bidder has visited the site, become familiar with local conditions under which the Work is to be performed, and has correlated the Bidder's observations with the requirements of the Proposed Contract Documents;
- .5 the Bid is based upon the materials, equipment, and systems required by the Bidding Documents without exception; and
- .6 the Bidder has read and understands the provisions for liquidated damages, if any, set forth in the form of Agreement between the Owner and Contractor.

- .7 The Bidder has carefully reviewed the Bidding Documents and has verified that all of the Bidding Documents received are complete. The Bidder shall notify the Architect immediately if received Bidding Documents are not complete.
- .8 The Bidder has familiarized itself with all applicable federal, state and local laws, ordinances, rules and regulations that in any manner may affect cost, progress or performance of the Work; the Bidder has obtained the necessary licenses for bidding, if applicable, and is licensed or certified to perform the Work..9
The Bidder shall pay all county, city, state and federal taxes required by laws in effect at the time the Bids are received and resulting from the Work or traceable thereto. Said taxes shall not be in addition to the Contract price between the Owner and the Bidder, as the taxes shall be an obligation of the Bidder and not of the Owner, and the Owner shall be held harmless and indemnified for the same by the Bidder.
- .10 The failure or omission of any Bidder to receive or examine any form, instrument, addendum or other documents, or to acquaint itself with conditions existing at the site(s), shall in no way relieve any Bidder from any obligations with respect to its Bid or to the Contract.
- .11 The Bidder agrees that its Bid shall be based on products and work indicated in the Bidding Documents.

ARTICLE 3 BIDDING DOCUMENTS

§ 3.1 Distribution

§ 3.1.1 Bidders shall obtain complete Bidding Documents, as indicated below, from the issuing office designated in the advertisement or invitation to bid, for the deposit sum, if any, stated therein.

(Indicate how, such as by email, website, host site/platform, paper copy, or other method Bidders shall obtain Bidding Documents.)

In accordance with Invitation to Bid

§ 3.1.2 Any required deposit shall be refunded to Bidders who submit a bona fide Bid and return the paper Bidding Documents in good condition within ten days after receipt of Bids. The cost to replace missing or damaged paper documents will be deducted from the deposit. A Bidder receiving a Contract award may retain the paper Bidding Documents, and the Bidder's deposit will be refunded.

~~§ 3.1.3 Bidding Documents will not be issued directly to Sub-bidders unless specifically offered in the advertisement or invitation to bid, or in supplementary instructions to bidders.~~

§ 3.1.2.1 When the Bidding Documents are returned by the Bidders to the Architect or Owner, the shipping or postage shall be prepaid by the Bidder. The Bidder's deposit will not be refunded if the deposit sum is non-refundable as indicated in the Advertisement or Invitation to Bid.

§ 3.1.4 Bidders shall use complete Bidding Documents in preparing Bids. Neither the Owner nor Architect assumes responsibility for errors or misinterpretations resulting from the use of incomplete Bidding Documents.

§ 3.1.4.1 Every Bidder is responsible to review all Bidding Documents received to verify that each set contains a complete set of Contract Documents. Any incomplete Bidding Documents shall be immediately returned to the Architect.

§ 3.1.5 The Bidding Documents will be available for the sole purpose of obtaining Bids on the Work. No license or grant of use is conferred by distribution of the Bidding Documents.

§ 3.2 Modification or Interpretation of Bidding Documents

§ 3.2.1 The Bidder shall carefully study the Bidding Documents, shall examine the site and local conditions, and shall notify the Architect of errors, inconsistencies, or ambiguities discovered and request clarification or interpretation pursuant to Section 3.2.2.

§ 3.2.2 Requests for clarification or interpretation of the Bidding Documents shall be submitted by the Bidder in writing and shall be received by the Architect at least seven days prior to the date for receipt of Bids.

(Indicate how, such as by email, website, host site/platform, paper copy, or other method Bidders shall submit requests for clarification and interpretation.)

In accordance with Invitation to Bid

§ 3.2.3 Modifications and interpretations of the Bidding Documents shall be made by Addendum. Modifications and interpretations of the Bidding Documents made in any other manner shall not be binding, and Bidders shall not rely upon them.

§ 3.3 Substitutions

§ 3.3.1 The materials, products, and equipment described in the Bidding Documents establish a standard of required function, dimension, appearance, and quality to be met by any proposed substitution.

§ 3.3.1.1 The Bidder assumes all risks using a price or bid proposal representing a product or Work that is not indicated in the Bidding Documents and, if the Bidder elects to use that product or Work he shall submit it in accordance with the Division 1 requirements, and as stated herein. If that product or Work is rejected, the Bidder shall provide a product or Work indicated in the Bidding Documents at its cost. The Architect and the Owner shall not consider any requests for additional payments to provide the Work as required by the Contract Documents.

§ 3.3.2 Substitution Process

§ 3.3.2.1 Written requests for substitutions shall be received by the Architect at least ten days prior to the date for receipt of Bids. Requests shall be submitted in the same manner as that established for submitting clarifications and interpretations in Section 3.2.2.

§ 3.3.2.2 Bidders shall submit substitution requests on a Substitution Request Form ~~if one is provided~~ in the Bidding Documents.

§ 3.3.2.3 ~~If a Substitution Request Form is not provided, requests shall include (1) the name of the material or equipment specified in the Bidding Documents; (2) the reason for the requested substitution; (3) a complete description of the proposed substitution including the name of the material or equipment proposed as the substitute, performance and test data, and relevant drawings; and (4) any other information necessary for an evaluation. The request shall include a statement setting forth changes in other materials, equipment, or other portions of the Work, including changes in the work of other contracts or the impact on any Project Certifications (such as LEED), that will result from incorporation of the proposed substitution.~~

§ 3.3.3 The burden of proof of the merit of the proposed substitution is upon the proposer. The Architect's decision of approval or disapproval of a proposed substitution shall be final.

§ 3.3.4 If the Architect approves a proposed substitution prior to receipt of Bids, such approval shall be set forth in an Addendum. Approvals made in any other manner shall not be binding, and Bidders shall not rely upon them.

§ 3.3.5 No substitutions will be considered after the Contract award unless specifically provided for in the Contract Documents.

§ 3.4 Addenda

§ 3.4.1 Addenda will be transmitted to Bidders known by the issuing office to have received complete Bidding Documents.

(Indicate how, such as by email, website, host site/platform, paper copy, or other method Addenda will be transmitted.)

Copies of the Addendum will be posted electronically and a notice of posting will be sent via email to each plan holder of record.

§ 3.4.2 Addenda will be available where Bidding Documents are on file.

§ 3.4.3 Addenda will be issued no later than four days prior to the date for receipt of Bids, except an Addendum withdrawing the request for Bids or one which includes postponement of the date for receipt of Bids.

§ 3.4.3.1 Depending on the nature of an Addendum (clarifications, limited scope of revisions, added manufacturers) issued less than four days prior to receipt date, the Architect, in its professional judgment, reserves the right to issue said Addendum without postponement of the bid date. However, if in the professional judgment of the Architect, the information contained in the Addendum would be such that it would be unfair or unreasonable to prepare a bid proposal

based on the revisions in the Addendum, then the bid date will be postponed to allow distribution of the Addendum and time to prepare a bid proposal.

§ 3.4.4 Prior to submitting a Bid, each Bidder shall ascertain that the Bidder has received all Addenda issued, and the Bidder shall acknowledge their receipt in the Bid.

ARTICLE 4 BIDDING PROCEDURES

§ 4.1 Preparation of Bids

§ 4.1.1 Bids shall be submitted on the forms included with or identified in the Bidding Documents.

§ 4.1.2 All blanks on the bid form shall be legibly executed. Paper bid forms shall be executed in a non-erasable medium.

§ 4.1.3 ~~Sums shall be expressed in both words and numbers, unless noted otherwise on the bid form. In case of discrepancy, the amount entered in words shall govern.~~ Where so indicated by the bid form, all amounts shall be expressed in figures only.

§ 4.1.4 ~~Edits to entries made on paper bid forms must be initialed by the signer of the Bid. All changes made by the Bidder to the bid form or outside of the envelope shall be signed or initialed by the Bidder. Bids containing any conditions, omissions, erasures, alterations, or items not called for in the Bid, may be rejected by the Owner as being incomplete or nonresponsive.~~

§ 4.1.5 All requested Alternates shall be bid. If no change in the Base Bid is required, enter "No Change" or as required by the bid form. If the Bidder does not desire to bid on an Alternate, enter the words "No Bid". If the Owner elects to accept an Alternate, all Bidders submitting a "No Bid" for the Alternate selected by the Owner will be ruled nonresponsive and their Bid will not be considered in the award of the Contract. If the Bidder does not enter an Alternate Bid amount, "No Change", or "No Bid" for all requested Alternates, and leaves the Alternate information blank, their Bid will be considered nonresponsive and will not be considered in the award of the Contract.

§ 4.1.6 Where two or more Bids for designated portions of the Work have been requested, the Bidder may, without forfeiture of the bid security, state the Bidder's refusal to accept award of less than the combination of Bids stipulated by the Bidder. The Bidder shall neither make additional stipulations on the bid form nor qualify the Bid in any other manner.

§ 4.1.7 Each copy of the Bid shall state the legal name and legal status of the Bidder. As part of the documentation submitted with the Bid, the Bidder shall provide evidence of its legal authority to perform the Work in the jurisdiction where the Project is located. Each copy of the Bid shall be signed by the person or persons legally authorized to bind the Bidder to a contract. A Bid by a corporation shall further name the state of incorporation and have the corporate seal affixed. A Bid submitted by an agent shall have a current power of attorney attached, certifying the agent's authority to bind the Bidder.

§ 4.1.8 A Bidder shall incur all costs associated with the preparation of its Bid.

§ 4.2 Bid Security

§ 4.2.1 Each Bid shall be accompanied by ~~the following bid security:~~ bid security in the form of either a cashier's or certified check or an acceptable Bid Bond in the amount of five percent (5%) of the Bid amount, and made payable to Orange County Schools, North Carolina. The bid security is a guarantee that if the Contract is awarded by the Owner to the Bidder, the Bidder shall enter into the Contract with the Owner for the Work mentioned in this Bid or forfeit the bid security to the Owner, not as a penalty, but as liquidated damages. No forfeiture under a bid security shall exceed the lesser of (i) the difference between the Bid for which the bid security was written and the next low Bid of another Bidder, or (ii) the face amount of the bid security.

(Insert the form and amount of bid security.)

§ 4.2.2 All bonds shall be executed by a surety company selected by the Bidder which is legally authorized to do business in the State of South Carolina, and the bond shall be the same in both form as well as substance as AIA Document A310, Bid Bond. The Bidder shall require the attorney-in-fact, who executed the required bond on behalf of the surety company, to affix thereto a certified and current copy of the power of attorney. The bond premium shall be paid by the Bidder and the cost shall be included in the Bid.

§ 4.2.2 The Bidder pledges to enter into a Contract with the Owner on the terms stated in the Bid and shall, if required, furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder. Should the Bidder refuse to enter into such Contract or fail to furnish such bonds if required, the amount of the bid security shall be forfeited to the Owner as liquidated damages, not as a penalty. In the event the Owner fails to comply with Section 6.2, the amount of the bid security shall not be forfeited to the Owner.

§ 4.2.3 If a surety bond is required as bid security, it shall be written on AIA Document A310™, Bid Bond, unless otherwise provided in the Bidding Documents. The attorney-in-fact who executes the bond on behalf of the surety shall affix to the bond a certified and current copy of an acceptable power of attorney. The Bidder shall provide surety bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 4.2.4 The Owner will have the right to retain the bid security of Bidders to whom an award is being considered until (a) the Contract has been executed and bonds, if required, have been furnished; (b) the specified time has elapsed so that Bids may be withdrawn; or (c) all Bids have been rejected. However, if no Contract has been awarded or a Bidder has not been notified of the acceptance of its Bid, a Bidder may, beginning sixty (60) days after the opening of Bids, withdraw its Bid and request the return of its bid security.

§ 4.3 Submission of Bids

§ 4.3.1 A Bidder shall submit its Bid as indicated below:

(Indicate how, such as by website, host site/platform, paper copy, or other method Bidders shall submit their Bid.)

In accordance with Invitation to Bid

§ 4.3.2 Paper copies of the Bid, the bid security, and any other documents required to be submitted with the Bid shall be enclosed in a sealed opaque envelope. The envelope shall be addressed to the party receiving the Bids and shall be identified with the Project name, the Bidder's name and address, and, if applicable, the designated portion of the Work for which the Bid is submitted. If the Bid is sent by mail, the sealed envelope shall be enclosed in a separate mailing envelope with the notation "SEALED BID ENCLOSED" on the face thereof.

§ 4.3.2.1 The Bidder shall place on the outside of the envelope containing its Bid the following notation: "Contractor License Number _____."

§ 4.3.3 Bids shall be submitted by the date and time and at the place indicated in the invitation to bid. Bids submitted after the date and time for receipt of Bids, or at an incorrect place, will not be accepted.

§ 4.3.4 The Bidder shall assume full responsibility for timely delivery at the location designated for receipt of Bids.

§ 4.3.5 A Bid submitted by any method other than as provided in this Section 4.3 will not be accepted.

§ 4.3.6 In the solicitation or awarding of Contracts, the Owner shall not discriminate because of the race, religion, color, sex, age, disability or national origin of the Bidder. The Owner welcomes and encourages the participation of small businesses and businesses owned by women and minorities in procurement transactions made by the Owner.

§ 4.3.7 Trade secrets or proprietary information submitted by a Bidder in connection with a procurement transaction, shall not be subject to public disclosure under the Freedom of Information Act; however, the Bidder must invoke the applicable protection, prior to or upon submission of the data or other materials, and must identify the data or other materials to be protected and state the reasons why protection is necessary. The Owner will not accept responses to the Invitation to Bid in cases where the Bidder declares the entire response to the Invitation to Bid to be proprietary information. The Bidder must designate, in the smallest increments possible, that part of the Bid which is deemed to be proprietary.

§ 4.4 Modification or Withdrawal of Bid

§ 4.4.1 Prior to the date and time designated for receipt of Bids, a Bidder may submit a new Bid to replace a Bid previously submitted, or withdraw its Bid entirely, by notice to the party designated to receive the Bids. Such notice shall be received and duly recorded by the receiving party on or before the date and time set for receipt of Bids. The receiving party shall verify that replaced or withdrawn Bids are removed from the other submitted Bids and not considered. Notice of submission of a replacement Bid or withdrawal of a Bid shall be worded so as not to reveal the amount of the original Bid. A Bid may not be modified, withdrawn or canceled by the Bidder after the time and date designated for the receipt of Bids.

and for sixty-one (61) calendar days thereafter except as provided in subparagraph 4.4.3 of these Instructions to Bidders and each Bidder so agrees in submitting a Bid.

§ 4.4.1.1 A Bid may be modified or withdrawn by the Bidder any time prior to the time and date set for the receipt of Bids. The Bidder shall notify the Owner in writing of its intentions. Such notice shall be in writing over the signature of the person who submitted the original Bid and the notice shall be received and date and time stamped by the Owner on or before the date and time set for the receipt of Bids.

§ 4.4.1.2 Bidders may indicate modifications to Bid amounts by writing the modification on the outside of the sealed envelope containing the Bid and initialing the modification. Only the Bid amount may be modified by this means; no other qualifications may be made.

§ 4.4.2 Withdrawn Bids may be resubmitted up to the date and time designated for the receipt of Bids in the same format as that established in Section 4.3, provided they fully conform with these Instructions to Bidders. Bid security shall be in an amount sufficient for the Bid as resubmitted.

§ 4.4.3 After the date and time designated for receipt of Bids, a Bidder who discovers that it made a clerical error in its Bid shall notify the Architect of such error within two days, or pursuant to a timeframe specified by the law of the jurisdiction where the Project is located, requesting withdrawal of its Bid. Upon providing evidence of such error to the reasonable satisfaction of the Architect, the Bid shall be withdrawn and not resubmitted. If a Bid is withdrawn pursuant to this Section 4.4.3, the bid security will be attended to as follows: A Bidder may withdraw its Bid from consideration if the Bid price was substantially lower than other Bids due solely to a mistake therein, provided the Bid was submitted in good faith, and the mistake was a clerical mistake as opposed to a judgment mistake, and was actually due to an unintentional arithmetic error or an unintentional omission of a quantity of Work, labor made directly in the compilation of a Bid which unintentional arithmetic error or unintentional omission can be clearly shown by objective evidence drawn from inspection of original work papers, documents and materials used in the preparation of the Bid sought to be withdrawn. If a Bid contains both clerical and judgment mistakes, a Bidder may withdraw its Bid from consideration if the Bid would have been substantially lower than the other Bids due solely to the clerical mistake, that was an unintentional arithmetic error or an unintentional omission of a quantity of Work, labor or material made directly in the compilation of a Bid which shall be clearly shown by objective evidence drawn from inspection of original work papers, documents and materials used in the preparation of the Bid sought to be withdrawn.

§ 4.4.3.1 The Bidder shall submit to the Owner its original work papers, documents and materials used in the preparation of the Bid within one (1) day after the date fixed for submission of Bids. Such work papers shall be delivered to the Owner by the Bidder in person or by registered mail at or prior to the time fixed by the Owner for the opening of Bids. The Contract shall not be awarded by the Owner until such period has elapsed. Such mistake shall be proved only from the original work papers, documents, and materials delivered to the Owner as required herein.

§ 4.4.3.2 No Bidder who is permitted to withdraw a Bid shall for compensation, supply any material or labor to or perform any subcontract or other work agreement for the person or firm to whom the Contract is awarded or otherwise benefit directly or indirectly from the performance of the Work for which the withdrawn Bid was submitted.

§ 4.4.3.3 If a Bid is withdrawn under authority of this section, the next lowest responsive and responsible Bidder shall be deemed to be the low Bidder.

~~(State the terms and conditions, such as Bid rank, for returning or retaining the bid security.)~~ § 4.4.3.4 When the procedure set forth in the paragraphs above is utilized, original work papers, documents, and materials used in the preparation of the Bid must be submitted in an envelope or package separate and apart from the envelope containing the Bid marked clearly as to the contents.

§ 4.4.3.5 the Owner denies the withdrawal of a Bid under the provisions of this section, it shall notify the Bidder in writing stating the reasons for its decision and award the Contract to such Bidder at the Bid price, provided such Bidder is a responsible and responsive Bidder.

ARTICLE 5 CONSIDERATION OF BIDS

§ 5.1 Opening of Bids

If stipulated in an advertisement or invitation to bid, or when otherwise required by law, Bids properly identified and received within the specified time limits will be publicly opened and read aloud. A summary of the Bids may be made available to Bidders. All Bids received on time in accordance with the Bidding Document requirements shall be opened and publicly read aloud. Any Bidder, upon request, shall be afforded the opportunity to inspect Bid records within a reasonable time after the opening of all Bids but prior to award, except in the event that the public body decides not to accept any of the Bids and to reopen the Contract. Otherwise, Bid records shall be open to public inspection only after award of the Contract. Any inspection of procurement transaction records shall be subject to reasonable restriction to ensure the security and integrity of the records.

§ 5.2 Rejection of Bids

Unless otherwise prohibited by law, the Owner shall have the right to reject any or all Bids. A Bid not accompanied by a required bid security or by other data required by the Bidding Documents, or a Bid which is in any way incomplete or not in conformance with requirements of the Bidding Documents is subject to rejection.

§ 5.3 Acceptance of Bid (Award)

§ 5.3.1 It is the intent of the Owner to award a Contract to the lowest responsive and responsible Bidder, Bidder provided the Bid has been submitted in accordance with the requirements of the Bidding Documents. Unless otherwise prohibited by law, the Documents and does not exceed the funds available. The Owner shall have the right to waive informalities and irregularities in a Bid received and to accept the Bid which, in the Owner's judgment, is in the Owner's own best interests.

§ 5.3.1.1 In determining the lowest responsive Bidder, the Owner may consider, among other things, the Bidder's past performance, conduct on other contracts, and other information provided by the Bidder, including in the Contractor's Pre-Qualification Package, if requested.

§ 5.3.2 Unless otherwise prohibited by law, the Owner shall have the right to accept Alternates in any order or combination, unless otherwise specifically provided in the Bidding Documents, and to determine the lowest responsive and responsible Bidder on the basis of the sum of the Base Bid and Alternates accepted.

§ 5.3.3 In case of a tie Bid, preference may be given to goods, services, and construction produced in York County or the State of South Carolina or provided by persons, firms or corporations having principal places of business in York County or the State of South Carolina, if such a choice is available; otherwise the tie shall be decided by lot. A York County business may be given preference over a State of South Carolina business, if such a choice is available.

§ 5.3.4 If a Contract is to be awarded, the Owner will give the Bidder a Notice of Award within sixty (60) calendar days after the day of the Bid opening.

§ 5.4 NEGOTIATION WITH LOWEST RESPONSIVE AND RESPONSIBLE BIDDER

§ 5.4.1 If award of a Contract to the lowest responsive and responsible Bidder is precluded because of limitations on available funds, the Owner reserves the right to negotiate the Bid amount with the lowest responsive, responsible Bidder to obtain a Contract amount within the available funds. The negotiations may involve changes in either the features or scope of the Work. Such negotiations may include reducing the quantity, quality, or other cost saving mechanisms involving items in the Bid amount, including unit prices (if any) and/or allowances (if any) that affect the Bid amount, and/or Alternates (if any).

§ 5.4.2 The Owner shall notify the lowest responsive and responsible Bidder that such a situation exists and the Owner and Bidder shall then conduct their negotiations in person, by mail, by telephone or by any means they find convenient.

§ 5.4.3 If an acceptable Contract can be negotiated, the changes to the Bid amount and Bidding Documents agreed upon in the negotiations shall be summarized in a "Post Bid Addendum," and included in the Contract.

§ 5.4.4 If the Owner and the lowest responsive and responsible Bidder cannot negotiate a Contract within available funds, the Owner shall terminate negotiations and reject all bids.

ARTICLE 6 POST-BID INFORMATION

§ 6.1 Contractor's Qualification Statement

Bidders to whom award of a Contract is under consideration shall submit to the Architect, upon request and within the timeframe specified by the Architect, a properly executed AIA Document A305™, Contractor's Qualification Statement, unless such a Statement has been previously required and submitted for this Bid.

§ 6.2 Owner's Financial Capability

A Bidder to whom award of a Contract is under consideration may request in writing, fourteen days prior to the expiration of the time for withdrawal of Bids, that the Owner furnish to the Bidder reasonable evidence that financial arrangements have been made to fulfill the Owner's obligations under the Contract. The Owner shall then furnish such reasonable evidence to the Bidder no later than seven days prior to the expiration of the time for withdrawal of Bids. Unless such reasonable evidence is furnished within the allotted time, the Bidder will not be required to execute the Agreement between the Owner and Contractor.

§ 6.3 Submittals

§ 6.3.1 After notification of selection for the award of the Contract, the Bidder shall, as soon as practicable or as stipulated in the Bidding Documents, submit in writing to the Owner through the Architect:

- .1 a designation of the Work to be performed with the Bidder's own forces;
- .2 names of the principal products and systems proposed for the Work and the manufacturers and suppliers of each; and
- .3 names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for the principal portions of the Work.

§ 6.3.2 The Bidder will be required to establish to the satisfaction of the Architect and Owner the reliability and responsibility of the persons or entities proposed to furnish and perform the Work described in the Bidding Documents.

§ 6.3.3 Prior to the execution of the Contract, the Architect will notify the Bidder in writing if either the ~~Owner or Architect~~, Owner, after due investigation, has reasonable objection to a person or entity proposed by the Bidder. If the ~~Owner or Architect~~ has reasonable objection to a proposed person or entity, the Bidder may, at the Bidder's option, (1) withdraw the Bid or (2) submit an acceptable substitute person or entity. The Bidder may also submit any required entity with an adjustment in the Base Bid or Alternate Bid to account for cover the difference in cost occasioned by such substitution, such substitution, provided such adjustment in cost is justifiable and reasonable. The Owner may accept the adjusted bid price or disqualify the Bidder. In the event of either withdrawal or disqualification, bid security will not be forfeited.

§ 6.3.4 Persons and entities proposed by the Bidder and to whom the Owner ~~and Architect have~~ has made no reasonable objection must be used on the Work for which they were proposed and shall not be changed except with the written consent of the ~~Owner and Architect~~, Owner.

ARTICLE 7 PERFORMANCE BOND AND PAYMENT BOND

§ 7.1 Bond Requirements

§ 7.1.1 If stipulated in the Bidding Documents, the Bidder shall furnish bonds. The successful Bidder shall furnish a Performance Bond covering the faithful performance of the Contract and a Payment Bond covering the payment of all obligations arising thereunder. Each bond shall be written for the full value of the Contract, including all adjustments as authorized by Change Order.

§ 7.1.2 If the furnishing of such bonds is stipulated in the Bidding Documents, the cost shall be included in the Bid. If the furnishing of such bonds is required after receipt of bids and before execution of the Contract, the cost of such bonds shall be added to the Bid in determining the Contract Sum. All bonds shall be written by sureties or insurance companies licensed to do business in the State of North Carolina.

§ 7.1.3 The Bidder shall provide surety bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located. bond premiums shall be paid by the successful Bidder and the cost shall be included in the Bid price. Any subsequent bond premium costs shall be as authorized by Change Order.

§ 7.1.4 Unless otherwise indicated below, the Penal Sum of the Payment and Performance Bonds shall be the amount of the Contract Sum.

(If Payment or Performance Bonds are to be in an amount other than 100% of the Contract Sum, indicate the dollar amount or percentage of the Contract Sum.)

§ 7.2 Time of Delivery and Form of Bonds

§ 7.2.1 The successful Bidder shall deliver the required bonds to the Owner not later than three days following the date of execution of the Contract. If the Work is to commence sooner in response to a letter of intent, the Bidder shall, prior to commencement of the Work, submit evidence satisfactory to the Owner that such bonds will be furnished and delivered in accordance with this Section 7.2.1 along with the signed Contract (Agreement) forms and the required Certificate of Insurance to the Owner within fifteen (15) calendar days after the Notice of Award of the Contract.

§ 7.2.2 ~~Unless otherwise provided, the~~ The bonds shall be written on AIA Document A312, Performance Bond and Payment Bond. Each bond shall be written for the full amount of the Contract.

§ 7.2.3 The bonds shall be dated on or after the date of the ~~Contract~~ Contract (Agreement).

§ 7.2.4 The successful Bidder shall require the attorney-in-fact who executes the required bonds on behalf of the surety or insurance company to affix to the ~~bond thereto~~ a certified and current copy of the power of attorney.

ARTICLE 8 ENUMERATION OF THE PROPOSED CONTRACT DOCUMENTS

ARTICLE 8 FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR

§ 8.1 Copies of the proposed Contract Documents have been made available to the Bidder and consist of the following documents:

.1 — AIA Document A101™ 2017, Unless otherwise required in the Bidding Documents, the Contract for the Work will be written on AIA Document A101, Standard Form of Agreement Between Owner and Contractor, unless otherwise stated below.
(Insert the complete AIA Document number, including year, and Document title.)

.2 — AIA Document A101™ 2017, Exhibit A, Insurance and Bonds, unless otherwise stated below.
(Insert the complete AIA Document number, including year, and Document title.)

.3 — AIA Document A201™ 2017, General Conditions of the Contract for Construction, unless otherwise stated below.
(Insert the complete AIA Document number, including year, and Document title.)

.4 — AIA Document E203™ 2013, Building Information Modeling and Digital Data Exhibit, dated as indicated below:
(Insert the date of the E203-2013.)

.5 — ~~Drawings~~ Contractor Where the Basis of Payment Is a Stipulated Sum.

Number

Title

Date

.6 — Specifications

Section

Title

Date

Pages

.7 — Addenda:

Number	Date	Pages
--------	------	-------

~~.8~~ Other Exhibits:
(Check all boxes that apply and include appropriate information identifying the exhibit where required.)

☐ AIA Document E204™ 2017, Sustainable Projects Exhibit, dated as indicated below:
(Insert the date of the E204-2017.)

☐ The Sustainability Plan:

Title	Date	Pages
-------	------	-------

☐ Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages
----------	-------	------	-------

~~.9~~ Other documents listed below:
(List here any additional documents that are intended to form part of the Proposed Contract Documents.)

§ 8.2 The the Contractor recognize that time is of the essence and that the Owner will suffer financial loss if the Work is not completed by the Substantial Completion date required or as may be amended by the Contract Documents. Contractor recognizes the delays, expenses and damages that are involved in proving in a legal proceeding the actual loss that may be suffered by the Owner if the Work is not completed on time. Accordingly, the Owner and the Contractor agree, stipulate and fix as liquidated damages if delayed, but not as a penalty, the sum indicated on the Bid Form that the Contractor together with the Contractor's surety shall pay the Owner for each calendar day or part thereof that expires after the date required or as may be amended by the Contract Documents for the Substantial Completion of the Work.

BID FORM – PACKAGE NO. 1 (19-2024)

SULLIVAN MIDDLE SCHOOL ATHLETIC RESTROOM/CONCESSION BUILDING
ROCK HILL SCHOOLS; ROCK HILL, SC

Architect's Project No: 593120

Rock Hill Schools Bid No.: 19-2024 Site Preparation and Utility Connections

DATE: _____

TO: **Rock Hill School District Facilities Building,
2171 West Main Street, Rock Hill, SC 29732**

FROM: _____

Bidder's Name

Bidder's Address

Bidder's Address

FOR: **SULLIVAN MIDDLE SCHOOL ATHLETIC RESTROOM/CONCESSION BUILDING –
BID PACKAGE NO. 1 (19-2024) SITE PREPARATION AND UTILITY CONNECTIONS**

Having carefully examined the site, and all of the Bidding and Contract Documents, and in compliance with the "Invitation to Bid," "Instructions to Bidders," and "Supplementary Instructions to Bidders," the undersigned proposes to provide all labor, materials, supplies, equipment, services, and perform all Work necessary for the construction of this Bid Package Work in accordance with the Bid Documents, dated **February 7, 2020** prepared by Moseley Architects.

Complete this Bid Form in blue or black ink or by typewriter. Discrepancies in the multiplications of units of work and the unit prices will be resolved in favor of the correct multiplication of the unit prices. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum.

BASE BID PACKAGE NO. 1 (19-2024) PRICE:

The Base Bid Package No. 1 (19-2024) Price includes all Work required by and in strict accordance with the Bid Documents for this Package for the Lump Sum of:

\$ _____ (Figures only).

UNIT PRICE ALLOWANCES: (Reference Division 01 Section "Unit Price Allowances")

1. Unit Price Allowance No. 1: Undercut and Replace Unsuitable Soils with structural fill:

Estimated quantity of 150 c.y. at \$ _____ per c.y. (in-place unit price/measure) =

\$ _____ (Figures only).

RECEIPT OF ADDENDA

We acknowledge the receipt of the following Addenda:

Addendum No. _____, dated _____
Addendum No. _____, dated _____
Addendum No. _____, dated _____
Addendum No. _____, dated _____

SUB-CONTRACTORS LIST

Bidders Submitting a Single prime Contract are required to list the names of sub-contractors used in determining their bid. List the names of sub-contractors below and include license number for each. (If using separate sub-contractors for the combined bid list both subs and identify the project they are to construct.)

- Electrical: _____ License #: _____
- Plumbing: _____ License #: _____

TIME OF COMPLETION – BASE BID PACKAGE NO. 1 (19-2024)

Work shall be substantially complete and ready for occupancy by July 24, 2020.

Work shall be finally complete by August 24, 2020.

LIQUIDATED DAMAGES

Liquidated Damages in the amount of Two Hundred Fifty Dollars (\$250) per calendar day for failure to Substantially Complete the Work on time will be charged by the Owner to the Contractor for not completing his work by the date established for **Substantial Completion**. This amount is agreed upon as the proper measure of liquidated damage that the Owner will sustain per day by the failure of the undersigned to complete the Work by the stipulated dates and is not to be construed in any sense as a penalty.

Liquidated Damages in the amount of Two Hundred Fifty Dollars (\$250) per calendar day for failure to Finally Complete the Work 30 days following Substantial Completion will be charged by the Owner to the Contractor for not completing his work. This amount is agreed upon as the proper measure of liquidated damage that the Owner will sustain per day by the failure of the undersigned to complete the Work by the stipulated dates and is not to be construed in any sense as a penalty.

BID SECURITY

Attached hereto is a Bid Bond for Five Percent (5%) of the Base Bid, made payable Rock Hill School District York County District III.

AGREEMENT TO EXECUTE CONTRACT

Within sixty (60) days after the opening of Bids or any time thereafter before withdrawing this Bid, the Undersigned will, within ten (10) days after receipt of written Notice of Acceptance of this Bid, execute and deliver to the Owner the Contract Agreement Forms, together with Performance and Payment Bonds as required by the Contract Documents and Bids as accepted. The Undersigned designates as his office to which Notice of Acceptance shall be mailed or otherwise delivered:

(Name) _____

(Address) _____

Bidder is: Individual () (check appropriate box)
 Partnership ()
 Corporation ()

Residence of Bidder: _____
(if individual) _____

Name of Partners: _____
(if partnership) _____

State of Incorporation: _____
(if corporation)

Corporate
Seal

SIGNATURE: _____

(Typed Name of Bidder)

By: _____

Title: _____

Submitted this _____ day of _____ 2020

(This form may be reproduced in exact detail.).

END OF BID FORM



AIA[®] Document A310[™] – 2010

Bid Bond

CONTRACTOR:

(Name, legal status and address)

SURETY:

(Name, legal status and principal place of business)

OWNER:

(Name, legal status and address)

Rock Hill Schools/York District Three, South Carolina
Post Office Drawer 10072
386 E. Black Street
Rock Hill, South Carolina 29730

BOND AMOUNT: \$**PROJECT:**

(Name, location or address, and Project number, if any)

Sullivan Middle School Athletic Restroom Concession Building
Rock Hill Schools
Rock Hill South Carolina

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

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

The Contractor and Surety are bound to the Owner in the amount set forth above, for the payment of which the Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, as provided herein. The conditions of this Bond are such that if the Owner accepts the bid of the Contractor within the time specified in the bid documents, or within such time period as may be agreed to by the Owner and Contractor, and the Contractor either (1) enters into a contract with the Owner in accordance with the terms of such bid, and gives such bond or bonds as may be specified in the bidding or Contract Documents, with a surety admitted in the jurisdiction of the Project and otherwise acceptable to the Owner, for the faithful performance of such Contract and for the prompt payment of labor and material furnished in the prosecution thereof; or (2) pays to the Owner the difference, not to exceed the amount of this Bond, between the amount specified in said bid and such larger amount for which the Owner may in good faith contract with another party to perform the work covered by said bid, then this obligation shall be null and void, otherwise to remain in full force and effect. The Surety hereby waives any notice of an agreement between the Owner and Contractor to extend the time in which the Owner may accept the bid. Waiver of notice by the Surety shall not apply to any extension exceeding sixty (60) days in the aggregate beyond the time for acceptance of bids specified in the bid documents, and the Owner and Contractor shall obtain the Surety's consent for an extension beyond sixty (60) days.

If this Bond is issued in connection with a subcontractor's bid to a Contractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

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

Init.

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User Notes:

(1851092601)

Signed and sealed this day of ,

(Witness)

(Witness)

(Contractor as Principal)

(Seal)

(Title)

(Surety)

(Seal)

(Title)

Init.

/

Substitution Request Form – Prior to Receipt of Bids

General Information				
Project Name	Sullivan Middle School Athletic Restroom/Concession Building			
A/E Project Number	593120			
Specified Product/Item Information				
Specification Title				
Section				
Page				
Article / Paragraph				
Description				
Proposed Substitution Information				
Proposed Substitution				
Reason for not providing specified product/item				
Comparative Data	Attach a point-by-point comparative data list. Include all differences between the proposed substitution and the specified product/item. If not provided, this Request will be rejected.			
Manufacturer				
Manufacturer Address				
Manufacturer Phone				
Manufacturer Representative Email address				
Trade / Model Name				
Model Number				
Installer (if known)				
Installer Address				
Installer Phone				
History	<input type="checkbox"/> New product	<input type="checkbox"/> 2-5 years	<input type="checkbox"/> 5-10 yrs	<input type="checkbox"/> 10 yrs or longer
Proposed substitution affects other parts of the Work	<input type="checkbox"/> Yes		<input type="checkbox"/> No	
If yes, explain				
Proposed Substitution Similar Installation				
Have you used this product/item on any other projects	<input type="checkbox"/> Yes		<input type="checkbox"/> No	
Project				
Project Address				
Architect/Engineer				
A/E Phone				

Owner					
Owner Phone					
Date installed					
Attached Supporting Data					
<input type="checkbox"/> Drawings	<input type="checkbox"/> Product Data/Specs	<input type="checkbox"/> Samples	<input type="checkbox"/> Tests	<input type="checkbox"/> Reports	<input type="checkbox"/>
Entity submitting this Substitution Request certifies all of the following:					
<ul style="list-style-type: none"> Proposed substitution has been fully investigated and determined to be equivalent or superior in all respects to the specified product, except as may otherwise be specifically and clearly indicated herein. If applicable, proposed substitution shall not adversely affect LEED requirements nor shall it prevent achieving the relative number of applicable LEED point[s] the specified product would have received. Proposed substitution's function, appearance, and quality are equal or superior in all respects to the specified product, except as may otherwise be specifically and clearly indicated herein. Same or superior warranty and/or guarantees shall be furnished for proposed substitution as is required for the specified product/item. Same maintenance service and source replacement parts, as applicable, are available; including local availability. Proposed substitution shall have no adverse effect on other trades. Proposed substitution shall not affect dimensions and functional clearances. Coordination, installation, and changes to the Work as necessary for the accepted proposed substitution shall be complete in all respects. 					
Entity's Information					
Submitted by					
Signed By					
Date					
Email address of Signee above					
Company Name					
Address					
Phone					
Architect / Engineer Review and Action					
<p>If this Substitution request is acceptable, it shall be included in an Addendum. If the proposed substitution is not included in an Addendum, then the proposed substitution was rejected; was not submitted in accordance with the Bidding/Procurement Documents; and/or this Form was not complete. This Form shall be completely filled in to be considered for acceptance.</p> <p>Acceptance of this Substitution request is an acceptance of the manufacturer and product/item only for general conformance with the design concept reflected in the Bidding/Procurement Documents. The A/E has made no attempt to verify specific performance data, or to check details of the proposed substitution as to special features, capacities, physical dimensions, or code and/or regulatory compliance – all of which remain the responsibility of the submitting entity and the Contractor (if not the submitting entity).</p>					

END OF SUBSTITUTION REQUEST FORM



AIA[®] Document A305[™] – 1986

Contractor's Qualification Statement

The Undersigned certifies under oath that the information provided herein is true and sufficiently complete so as not to be misleading.

SUBMITTED TO:

ADDRESS:

SUBMITTED BY:

NAME:

ADDRESS:

PRINCIPAL OFFICE:

- ☐ Corporation
- ☐ Partnership
- ☐ Individual
- ☐ Joint Venture
- ☐ Other

NAME OF PROJECT: *(if applicable)*

Sullivan Middle School Athletic Restroom Concession Building
Rock Hill Schools
Rock Hill South Carolina

TYPE OF WORK: *(file separate form for each Classification of Work)*

- ☐ General Construction
- ☐ HVAC
- ☐ Electrical
- ☐ Plumbing
- ☐ Other: *(Specify)*

§ 1 ORGANIZATION

§ 1.1 How many years has your organization been in business as a Contractor?

§ 1.2 How many years has your organization been in business under its present business name?

§ 1.2.1 Under what other or former names has your organization operated?

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

This form is approved and recommended by the American Institute of Architects (AIA) and The Associated General Contractors of America (AGC) for use in evaluating the qualifications of contractors. No endorsement of the submitting party or verification of the information is made by AIA or AGC.

§ 1.3 If your organization is a corporation, answer the following:

§ 1.3.1 Date of incorporation:

§ 1.3.2 State of incorporation:

§ 1.3.3 President's name:

§ 1.3.4 Vice-president's name(s)

§ 1.3.5 Secretary's name:

§ 1.3.6 Treasurer's name:

§ 1.4 If your organization is a partnership, answer the following:

§ 1.4.1 Date of organization:

§ 1.4.2 Type of partnership (if applicable):

§ 1.4.3 Name(s) of general partner(s)

§ 1.5 If your organization is individually owned, answer the following:

§ 1.5.1 Date of organization:

§ 1.5.2 Name of owner:

§ 1.6 If the form of your organization is other than those listed above, describe it and name the principals:

§ 2 LICENSING

§ 2.1 List jurisdictions and trade categories in which your organization is legally qualified to do business, and indicate registration or license numbers, if applicable.

§ 2.2 List jurisdictions in which your organization's partnership or trade name is filed.

§ 3 EXPERIENCE

§ 3.1 List the categories of work that your organization normally performs with its own forces.

§ 3.2 Claims and Suits. (If the answer to any of the questions below is yes, please attach details.)

§ 3.2.1 Has your organization ever failed to complete any work awarded to it?

§ 3.2.2 Are there any judgments, claims, arbitration proceedings or suits pending or outstanding against your organization or its officers?

§ 3.2.3 Has your organization filed any law suits or requested arbitration with regard to construction contracts within the last five years?

§ 3.3 Within the last five years, has any officer or principal of your organization ever been an officer or principal of another organization when it failed to complete a construction contract? (If the answer is yes, please attach details.)

§ 3.4 On a separate sheet, list major construction projects your organization has in progress, giving the name of project, owner, architect, contract amount, percent complete and scheduled completion date.

§ 3.4.1 State total worth of work in progress and under contract:

§ 3.5 On a separate sheet, list the major projects your organization has completed in the past five years, giving the name of project, owner, architect, contract amount, date of completion and percentage of the cost of the work performed with your own forces.

§ 3.5.1 State average annual amount of construction work performed during the past five years:

§ 3.6 On a separate sheet, list the construction experience and present commitments of the key individuals of your organization.

§ 4 REFERENCES

§ 4.1 Trade References:

§ 4.2 Bank References:

§ 4.3 Surety:

§ 4.3.1 Name of bonding company:

§ 4.3.2 Name and address of agent:

§ 5 FINANCING

§ 5.1 Financial Statement.

§ 5.1.1 Attach a financial statement, preferably audited, including your organization's latest balance sheet and income statement showing the following items:

Current Assets (e.g., cash, joint venture accounts, accounts receivable, notes receivable, accrued income, deposits, materials inventory and prepaid expenses);

Net Fixed Assets;

Other Assets;

Current Liabilities (e.g., accounts payable, notes payable, accrued expenses, provision for income taxes, advances, accrued salaries and accrued payroll taxes);

Other Liabilities (e.g., capital, capital stock, authorized and outstanding shares par values, earned surplus and retained earnings).

§ 5.1.2 Name and address of firm preparing attached financial statement, and date thereof:

§ 5.1.3 Is the attached financial statement for the identical organization named on page one?

§ 5.1.4 If not, explain the relationship and financial responsibility of the organization whose financial statement is provided (e.g., parent-subsidiary).

§ 5.2 Will the organization whose financial statement is attached act as guarantor of the contract for construction?

§ 6 SIGNATURE

§ 6.1 Dated at this day of

Name of Organization:

By:

Title:

§ 6.2

M being duly sworn deposes and says that the information provided herein is true and sufficiently complete so as not to be misleading.

Subscribed and sworn before me this day of

Notary Public:

My Commission Expires:



AIA® Document A105™ – 2017

Standard Short Form of Agreement Between Owner and Contractor

AGREEMENT made as of the Xth day of Month in the year 2020
(In words, indicate day, month and year.)

BETWEEN the Owner:
(Name, legal status, address and other information)

Rock Hill Schools District 3 of York County
2171 West Main Street
Rock Hill, SC 29732

and the Contractor:
(Name, legal status, address and other information)

CONTRACTOR
CONTRACTOR ADDRESS
CONTRACTOR PHONE NUMBER

for the following Project:
(Name, location and detailed description)

Sullivan Middle School Athletic Restroom/Concession Building Site Preparations and
Utility Connections
RHS Bid #19-2024
Rock Hill, SC

The Architect:
(Name, legal status, address and other information)

Moseley Architects of South Carolina
The Hub at Waverly, 6210 Ardrey Kell Rd Suite 425
Charlotte, NC 28277
Phone: 704-540-3755

The Owner and Contractor agree as follows.

ADDITIONS AND DELETIONS:

The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

TABLE OF ARTICLES

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ARTICLE 1 THE CONTRACT DOCUMENTS

The Contractor shall complete the Work described in the Contract Documents for the Project. The Contract Documents consist of

- .1 this Agreement signed by the Owner and Contractor;
- .2 the drawings and specifications prepared by the Architect, dated February 7, 2020 , and enumerated as follows:

Drawings: see Exhibit A – Drawing Index dated February 7, 2020_

Number	Title
--------	-------

Specifications: see Project Manual dated February 7, 2020

Section	Title	Pages
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- .3 addenda prepared by the Architect as follows:
- | Number | Date | Pages |
|--------|------|-------|
|--------|------|-------|

Init.

- .4 written orders for changes in the Work, pursuant to Article 10, issued after execution of this Agreement; and
- .5 other documents, if any, identified as follows:

ARTICLE 2 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

§ 2.1 The Contract Time is the number of calendar days available to the Contractor to substantially complete the Work.

§ 2.2 Date of Commencement:

Unless otherwise set forth below, the date of commencement shall be the date of this Agreement.
(Insert the date of commencement if other than the date of this Agreement.)

The Date of Commencement shall be set forth in a notice to proceed issued by the Owner.

§ 2.3 Substantial Completion:

Subject to adjustments of the Contract Time as provided in the Contract Documents, the Contractor shall achieve Substantial Completion, as defined in Section 12.5, of the entire Work:
(Check the appropriate box and complete the necessary information.)

☐ Not later than ____ calendar days from the date of commencement.

☒ By the following date: July 24, 2020

ARTICLE 3 CONTRACT SUM

§ 3.1 The Contract Sum shall include all items and services necessary for the proper execution and completion of the Work. Subject to additions and deductions in accordance with Article 10, the Contract Sum is:

xxx (\$XX.XX)

§ 3.2 For purposes of payment, the Contract Sum includes the following values related to portions of the Work:
(Itemize the Contract Sum among the major portions of the Work.)

Portion of the Work

Value

§ 3.3 The Contract Sum is based upon the following alternates, if any, which are described in the Contract Documents and hereby accepted by the Owner: NONE
(Identify the accepted alternates. If the bidding or proposal documents permit the Owner to accept other alternates subsequent to the execution of this Agreement, attach a schedule of such other alternates showing the amount for each and the date when that amount expires.)

§ 3.4 Allowances, if any, included in the Contract Sum are as follows:
(Identify each allowance.)

Allowance 1: Allowance to undercut and replace 150 cubic yards of unsuitable soils at Contractors unit price.

§ 3.5 Unit prices, if any, are as follows: NONE
(Identify the item and state the unit price and quantity limitations, if any, to which the unit price will be applicable.)

Init.

ARTICLE 4 PAYMENTS

§ 4.1 Based on Contractor's Applications for Payment certified by the Architect, the Owner shall pay the Contractor, in accordance with Article 12, as follows:

(Insert below timing for payments and provisions for withholding retainage, if any.)

§ 4.2 Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at the rate below, or in the absence thereof, at the legal rate prevailing at the place of the Project.

(Insert rate of interest agreed upon, if any.)

0%

ARTICLE 5 INSURANCE

§ 5.1 The Contractor shall maintain the following types and limits of insurance until the expiration of the period for correction of Work as set forth in Section 14.2, subject to the terms and conditions set forth in this Section 5.1:

Unless otherwise waived by Rock Hill Schools, at Contractor's sole expense, Contractor shall procure and maintain the following minimum insurances with insurers licensed in South Carolina and rated A-VII or better by A.M. Best.

1. Statutory Workers' compensation and Employer's Liability Insurance in an amount not less than (\$500,000).
2. Commercial General Liability insurance with limits of liability not less than one million dollars (\$1,000,000) per occurrence, Rock Hill School District Three, its officers, employees, and agents shall be named as an additional insured with respects to the General Liability Insurance policy, and such status as additional insured shall be evidenced by a written endorsement to the policy provided to owner.

Commercial Automobile Liability insurance for all owned, non-owned and hired vehicles with limits of liability not less than one million (\$1,000,000) combined single limit

(Table deleted)

(Paragraphs deleted)

§ 5.2 The Owner shall be responsible for purchasing and maintaining the Owner's usual liability insurance and shall provide property insurance to cover the value of the Owner's property. The Contractor is entitled to receive an increase in the Contract Sum equal to the insurance proceeds related to a loss for damage to the Work covered by the Owner's property insurance.

§ 5.3 The Contractor shall obtain an endorsement to its Commercial General Liability insurance policy to provide coverage for the Contractor's obligations under Section 8.12.

§ 5.4 Prior to commencement of the Work, each party shall provide certificates of insurance showing their respective coverages.

§ 5.5 Unless specifically precluded by the Owner's property insurance policy, the Owner and Contractor waive all rights against (1) each other and any of their subcontractors, suppliers, agents, and employees, each of the other; and (2) the Architect, Architect's consultants, and any of their agents and employees, for damages caused by fire or other causes of loss to the extent those losses are covered by property insurance or other insurance applicable to the Project, except such rights as they have to the proceeds of such insurance.

ARTICLE 6 GENERAL PROVISIONS**§ 6.1 The Contract**

The Contract represents the entire and integrated agreement between the parties and supersedes prior negotiations, representations or agreements, either written or oral. The Contract may be amended or modified only by a written modification in accordance with Article 10.

§ 6.2 The Work

The term "Work" means the construction and services required by the Contract Documents, and includes all other labor, materials, equipment, and services provided, or to be provided, by the Contractor to fulfill the Contractor's obligations.

§ 6.3 Intent

The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all.

§ 6.4 Ownership and Use of Architect's Drawings, Specifications and Other Documents

Documents prepared by the Architect are instruments of the Architect's service for use solely with respect to this Project. The Architect shall retain all common law, statutory, and other reserved rights, including the copyright. The Contractor, subcontractors, sub-subcontractors, and suppliers are authorized to use and reproduce the instruments of service solely and exclusively for execution of the Work. The instruments of service may not be used for other Projects or for additions to this Project outside the scope of the Work without the specific written consent of the Architect.

§ 6.5 Electronic Notice

Written notice under this Agreement may be given by one party to the other by email as set forth below.

(Insert requirements for delivering written notice by email such as name, title, and email address of the recipient, and whether and how the system will be required to generate a read receipt for the transmission.)

ARTICLE 7 OWNER

§ 7.1 Information and Services Required of the Owner

§ 7.1.1 If requested by the Contractor, the Owner shall furnish all necessary surveys and a legal description of the site.

§ 7.1.2 Except for permits and fees under Section 8.7.1 that are the responsibility of the Contractor, the Owner shall obtain and pay for other necessary approvals, easements, assessments, and charges.

§ 7.1.3 Prior to commencement of the Work, at the written request of the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. The Contractor shall have no obligation to commence the Work until the Owner provides such evidence.

§ 7.2 Owner's Right to Stop the Work

If the Contractor fails to correct Work which is not in accordance with the Contract Documents, the Owner may direct the Contractor in writing to stop the Work until the correction is made.

§ 7.3 Owner's Right to Carry Out the Work

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a seven day period after receipt of written notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies, correct such deficiencies. In such case, the Architect may withhold or nullify a Certificate for Payment in whole or in part, to the extent reasonably necessary to reimburse the Owner for the cost of correction, provided the actions of the Owner and amounts charged to the Contractor were approved by the Architect.

§ 7.4 Owner's Right to Perform Construction and to Award Separate Contracts

§ 7.4.1 The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and to award separate contracts in connection with other portions of the Project.

§ 7.4.2 The Contractor shall coordinate and cooperate with the Owner's own forces and separate contractors employed by the Owner.

ARTICLE 8 CONTRACTOR

§ 8.1 Review of Contract Documents and Field Conditions by Contractor

§ 8.1.1 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become familiar with local conditions under which the Work is to be performed, and correlated personal observations with requirements of the Contract Documents.

§ 8.1.2 The Contractor shall carefully study and compare the Contract Documents with each other and with information furnished by the Owner. Before commencing activities, the Contractor shall (1) take field measurements and verify field conditions; (2) carefully compare this and other information known to the Contractor with the Contract Documents; and (3) promptly report errors, inconsistencies, or omissions discovered to the Architect.

§ 8.2 Contractor's Construction Schedule

The Contractor, promptly after being awarded the Contract, shall prepare and submit for the Owner's and Architect's information a Contractor's construction schedule for the Work.

§ 8.3 Supervision and Construction Procedures

§ 8.3.1 The Contractor shall supervise and direct the Work using the Contractor's best skill and attention. The Contractor shall be solely responsible for and have control over construction means, methods, techniques, sequences, and procedures, and for coordinating all portions of the Work.

§ 8.3.2 The Contractor, as soon as practicable after award of the Contract, shall furnish in writing to the Owner, through the Architect, the names of subcontractors or suppliers for each portion of the Work. The Contractor shall not contract with any subcontractor or supplier to whom the Owner or Architect have made a timely and reasonable objection.

§ 8.4 Labor and Materials

§ 8.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work.

§ 8.4.2 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Contract Work. The Contractor shall not permit employment of unfit persons or persons not skilled in tasks assigned to them.

§ 8.5 Warranty

The Contractor warrants to the Owner and Architect that: (1) materials and equipment furnished under the Contract will be new and of good quality unless otherwise required or permitted by the Contract Documents; (2) the Work will be free from defects not inherent in the quality required or permitted; and (3) the Work will conform to the requirements of the Contract Documents. Any material or equipment warranties required by the Contract Documents shall be issued in the name of the Owner, or shall be transferable to the Owner, and shall commence in accordance with Section 12.5.

§ 8.6 Taxes

The Contractor shall pay sales, consumer, use, and similar taxes that are legally required when the Contract is executed.

§ 8.7 Permits, Fees and Notices

§ 8.7.1 The Contractor shall obtain and pay for the building permit and other permits and governmental fees, licenses, and inspections necessary for proper execution and completion of the Work.

§ 8.7.2 The Contractor shall comply with and give notices required by agencies having jurisdiction over the Work. If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall assume full responsibility for such Work and shall bear the attributable costs. The Contractor shall promptly notify the Architect in writing of any known inconsistencies in the Contract Documents with such governmental laws, rules, and regulations.

§ 8.8 Submittals

The Contractor shall promptly review, approve in writing, and submit to the Architect shop drawings, product data, samples, and similar submittals required by the Contract Documents. Shop drawings, product data, samples, and similar submittals are not Contract Documents.

§ 8.9 Use of Site

The Contractor shall confine operations at the site to areas permitted by law, ordinances, permits, the Contract Documents, and the Owner.

§ 8.10 Cutting and Patching

The Contractor shall be responsible for cutting, fitting, or patching required to complete the Work or to make its parts fit together properly.

§ 8.11 Cleaning Up

The Contractor shall keep the premises and surrounding area free from accumulation of debris and trash related to the Work. At the completion of the Work, the Contractor shall remove its tools, construction equipment, machinery, and surplus material; and shall properly dispose of waste materials.

§ 8.12 Indemnification

To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Owner's consultants, and agents and employees of any of them, from and against claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Contractor, a subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss or expense is caused in part by a party indemnified hereunder.

ARTICLE 9 ARCHITECT CONTRACT ADMINISTRATOR

§ 9.1 The Architect will provide administration of the Contract as described in the Contract Documents. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

§ 9.2 The Architect will visit the site at intervals appropriate to the stage of construction to become generally familiar with the progress and quality of the Work.

§ 9.3 The Architect will not have control over or charge of, and will not be responsible for, construction means, methods, techniques, sequences, or procedures, or for safety precautions and programs in connection with the Work, since these are solely the Contractor's responsibility. The Owner will not be responsible for the Contractor's failure to carry out the Work in accordance with the Contract Documents.

§ 9.4 Based on the Architect observations and evaluations of the Contractor's Applications for Payment, the Owner will review and certify the amounts due the Contractor.

§ 9.5 The Architect has authority to reject Work that does not conform to the Contract Documents.

§ 9.6 The Architect will promptly review and approve or take appropriate action upon Contractor's submittals, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents.

§ 9.7 On written request from the Contractor, the Architect will promptly interpret and decide matters concerning performance under, and requirements of, the Contract Documents.

§ 9.8 Interpretations and decisions of the Architect will be consistent with the intent of, and reasonably inferable from the Contract Documents, and will be in writing or in the form of drawings. When making such interpretations and decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either and will not be liable for results of interpretations or decisions rendered in good faith.

§ 9.9 The Architect's duties, responsibilities, and limits of authority as described in the Contract Documents shall not be changed without written consent of the Contractor, and Architect. Consent shall not be unreasonably withheld.

ARTICLE 10 CHANGES IN THE WORK

§ 10.1 The Owner, without invalidating the Contract, may order changes in the Work within the general scope of the Contract, consisting of additions, deletions or other revisions, and the Contract Sum and Contract Time shall be adjusted accordingly, in writing. If the Owner and Contractor cannot agree to a change in the Contract Sum, the Owner shall pay the Contractor its actual cost plus reasonable overhead and profit.

§ 10.2 The Architect may authorize or order minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment in the Contract Sum or an extension of the Contract Time. Such authorization or order shall be in writing and shall be binding on the Owner and Contractor. The Contractor shall proceed with such minor changes promptly.

§ 10.3 If concealed or unknown physical conditions are encountered at the site that differ materially from those indicated in the Contract Documents or from those conditions ordinarily found to exist, the Contract Sum and Contract Time shall be subject to equitable adjustment.

ARTICLE 11 TIME

§ 11.1 Time limits stated in the Contract Documents are of the essence of the Contract.

§ 11.2 If the Contractor is delayed at any time in progress of the Work by changes ordered in the Work, or by labor disputes, fire, unusual delay in deliveries, unavoidable casualties, or other causes beyond the Contractor's control, the Contract Time shall be subject to equitable adjustment.

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

ARTICLE 12 PAYMENTS AND COMPLETION

§ 12.1 Contract Sum

The Contract Sum stated in this Agreement, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

§ 12.2 Applications for Payment

§ 12.2.1 At least ten days before the date established for each progress payment, the Contractor shall submit to the Owner an itemized Application for Payment for Work completed in accordance with the values stated in this Agreement. The Application shall be supported by data substantiating the Contractor's right to payment as the Owner may reasonably require, such as evidence of payments made to, and waivers of liens from, subcontractors and suppliers. Payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment stored, and protected from damage, off the site at a location agreed upon in writing.

§ 12.2.2 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment, all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information, and belief, be free and clear of liens, claims, security interests, or other encumbrances adverse to the Owner's interests.

§ 12.3 Certificates for Payment

The Owner will, within seven days after receipt of the Contractor's Application for Payment, either (1) issue to the Owner a Certificate for Payment in the full amount of the Application for Payment, with a copy to the Contractor; (2) issue a Certificate for Payment for such amount as the Owner determines is properly due, and notify the Contractor in writing of the Owner's reasons for withholding certification in part; or (3) withhold certification of the entire Application for Payment, and notify the Contractor of the Owner's reason for withholding certification in whole. If certification or notification is not made within such seven day period, the Contractor may, upon seven additional days' written notice to the Owner, stop the Work until payment of the amount owing has been received. The Contract Time and the Contract Sum shall be equitably adjusted due to the delay.

§ 12.4 Progress Payments

§ 12.4.1 After the Owner has issued a Certificate for Payment, the Owner shall make payment in the manner provided in the Contract Documents.

§ 12.4.2 The Contractor shall promptly pay each subcontractor and supplier, upon receipt of payment from the Owner, an amount determined in accordance with the terms of the applicable subcontracts and purchase orders.

§ 12.4.3 The Owner shall not have responsibility for payments to a subcontractor or supplier.

§ 12.4.4 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the requirements of the Contract Documents.

§ 12.5 Substantial Completion

§ 12.5.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so the Owner can occupy or utilize the Work for its intended use.

§ 12.5.2 When the Contractor believes that the Work or designated portion thereof is substantially complete, it will notify the Owner and the Owner will make an inspection to determine whether the Work is substantially complete. When the Owner determines that the Work is substantially complete, the Owner shall prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion, establish the responsibilities of the Owner and Contractor, and fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

§ 12.6 Final Completion and Final Payment

§ 12.6.1 Upon receipt of a final Application for Payment, the Owner will inspect the Work. When the Owner finds the Work acceptable and the Contract fully performed, the Owner will promptly issue a final Certificate for Payment.

§ 12.6.2 Final payment shall not become due until the Contractor submits to the Owner releases and waivers of liens, and data establishing payment or satisfaction of obligations, such as receipts, claims, security interests, or encumbrances arising out of the Contract.

§ 12.6.3 Acceptance of final payment by the Contractor, a subcontractor or supplier shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment.

ARTICLE 13 PROTECTION OF PERSONS AND PROPERTY

The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs, including all those required by law in connection with performance of the Contract. The Contractor shall take reasonable precautions to prevent damage, injury, or loss to employees on the Work and other persons who may be affected thereby, the Work and materials and equipment to be incorporated therein, and other property at the site or adjacent thereto. The Contractor shall promptly remedy damage and loss to property caused in whole or in part by the Contractor, or by anyone for whose acts the Contractor may be liable.

ARTICLE 14 CORRECTION OF WORK

§ 14.1 The Contractor shall promptly correct Work rejected by the Owner as failing to conform to the requirements of the Contract Documents. The Contractor shall bear the cost of correcting such rejected Work, including the costs of uncovering, replacement, and additional testing.

§ 14.2 In addition to the Contractor's other obligations including warranties under the Contract, the Contractor shall, for a period of one year after Substantial Completion, correct work not conforming to the requirements of the Contract Documents.

§ 14.3 If the Contractor fails to correct nonconforming Work within a reasonable time, the Owner may correct it in accordance with Section 7.3.

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ARTICLE 15 MISCELLANEOUS PROVISIONS

§ 15.1 Assignment of Contract

Neither party to the Contract shall assign the Contract as a whole without written consent of the other.

§ 15.2 Tests and Inspections

§ 15.2.1 At the appropriate times, the Contractor shall arrange tests, inspections, and approvals of portions of the Work required by the Contract Documents or by laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities.

§ 15.2.2 If the Owner requires additional testing, the Contractor shall coordinate those tests.

§ 15.2.3 The Owner shall bear cost of tests, inspections, and/or approvals. The Owner shall directly arrange and pay for tests, inspections, or approvals where building codes or applicable laws or regulations so require.

§ 15.3 Governing Law

The Contract shall be governed by the law of the place where the Project is located, excluding that jurisdiction's choice of law rules.

ARTICLE 16 TERMINATION OF THE CONTRACT

§ 16.1 Termination by the Contractor

If the Work is stopped under Section 12.3 for a period of 14 days through no fault of the Contractor, the Contractor may, upon seven additional days' written notice to the Owner, terminate the Contract and recover from the Owner payment for Work executed including reasonable overhead and profit, and costs incurred by reason of such termination.

§ 16.2 Termination by the Owner for Cause

§ 16.2.1 The Owner may terminate the Contract if the Contractor

- .1 repeatedly refuses or fails to supply enough properly skilled workers or proper materials;
- .2 fails to make payment to subcontractors for materials or labor in accordance with the respective agreements between the Contractor and the subcontractors;
- .3 repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or
- .4 is otherwise guilty of substantial breach of a provision of the Contract Documents.

§ 16.2.2 When any of the above reasons exist, the Owner may without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' written notice, terminate employment of the Contractor and may

- .1 take possession of the site and of all materials thereon owned by the Contractor, and
- .2 finish the Work by whatever reasonable method the Owner may deem expedient.

§ 16.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 16.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

§ 16.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, such excess shall be paid to the Contractor. If such costs exceed the unpaid balance, the Contractor shall pay the difference to the Owner. This obligation for payment shall survive termination of the Contract.

§ 16.3 Termination by the Owner for Convenience

The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause. The Contractor shall be entitled to receive payment for Work executed, and costs incurred by reason of such termination, along with reasonable overhead and profit on the Work not executed.

ARTICLE 17 OTHER TERMS AND CONDITIONS

(Insert any other terms or conditions below.)

This Agreement entered into as of the day and year first written above.

(If required by law, insert cancellation period, disclosures or other warning statements above the signatures.)

Contractor agrees to comply with the requirements of state and federal drug free workplace requirements, District Three's tobacco-free policy, and the provision of Chapter 13, Title 8 (State Ethics Act), South Carolina Code of Laws, 1976.

OWNER *(Signature)*

(Printed name and title)

CONTRACTOR *(Signature)*

(Printed name and title)

LICENSE NO.:

JURISDICTION:

Init.

/

Additions and Deletions Report for AIA® Document A105™ – 2017

This Additions and Deletions Report, as defined on page 1 of the associated document, reproduces below all text the author has added to the standard form AIA document in order to complete it, as well as any text the author may have added to or deleted from the original AIA text. Added text is shown underlined. Deleted text is indicated with a horizontal line through the original AIA text.

Note: This Additions and Deletions Report is provided for information purposes only and is not incorporated into or constitute any part of the associated AIA document. This Additions and Deletions Report and its associated document were generated simultaneously by AIA software at 09:09:54 ET on 02/07/2020.

PAGE 1

AGREEMENT made as of the Xth day of Month in the year 2020

...

Rock Hill Schools District 3 of York County
2171 West Main Street
Rock Hill, SC 29732

...

CONTRACTOR
CONTRACTOR ADDRESS
CONTRACTOR PHONE NUMBER

...

Sullivan Middle School Athletic Restroom/Concession Building Site Preparations and Utility Connections
RHS Bid #19-2024
Rock Hill, SC

...

Moseley Architects of South Carolina
The Hub at Waverly, 6210 Ardrey Kell Rd Suite 425
Charlotte, NC 28277
Phone: 704-540-3755

PAGE 2

- .2 the drawings and specifications prepared by the Architect, dated February 7, 2020, and enumerated as follows:

Drawings: see Exhibit A – Drawing Index dated February 7, 2020

...

Specifications: see Project Manual dated February 7, 2020

...

The Date of Commencement shall be set forth in a notice to proceed issued by the Owner.

...

☐ Not later than ~~(—)~~ _____ calendar days from the date of commencement.

☒ By the following date: July 24, 2020

...

~~(\$—)xxx (\$XX.XX)~~

...

§ 3.3 The Contract Sum is based upon the following alternates, if any, which are described in the Contract Documents and hereby accepted by the Owner: NONE

...

Allowance 1: Allowance to undercut and replace 150 cubic yards of unsuitable soils at Contractors unit price.

Item

Price

§ 3.5 Unit prices, if any, are as follows: NONE

PAGE 4

~~%—0%~~

...

Unless otherwise waived by Rock Hill Schools, at Contractor's sole expense, Contractor shall procure and maintain the following minimum insurances with insurers licensed in South Carolina and rated A-VII or better by A.M. Best.

1. Statutory Workers' compensation and Employer's Liability Insurance in an amount not less than (\$500,000).
2. Commercial General Liability insurance with limits of liability not less than one million dollars (\$1,000,000) per occurrence, Rock Hill School District Three, its officers, employees, and agents shall be named as an additional insured with respects to the General Liability Insurance policy, and such status as additional insured shall be evidenced by a written endorsement to the policy provided to owner.

Commercial Automobile Liability insurance for all owned, non-owned and hired vehicles with limits of liability not less than one million (\$1,000,000) combined single limit

§ 5.1.1 Commercial General Liability insurance for the Project, written on an occurrence form, with policy limits of not less than ~~(\$—)~~ each occurrence, ~~(\$—)~~ general aggregate, and ~~(\$—)~~ aggregate for products-completed operations hazard.

§ 5.1.2 Automobile Liability covering vehicles owned, and non-owned vehicles used, by the Contractor, with policy limits of not less than ~~(\$—)~~ per accident, for bodily injury, death of any person, and property damage arising out of the ownership, maintenance, and use of those motor vehicles along with any other statutorily required automobile coverage.

§ 5.1.3 The Contractor may achieve the required limits and coverage for Commercial General Liability and Automobile Liability through a combination of primary and excess or umbrella liability insurance, provided that such primary and excess or umbrella insurance policies result in the same or greater coverage as those required under Section 5.1.1 and 5.1.2, and in no event shall any excess or umbrella liability insurance provide narrower coverage

than the primary policy. The excess policy shall not require exhaustion of the underlying limits only through the actual payment by the underlying insurers.

§ 5.1.4 Workers' Compensation at statutory limits.

§ 5.1.5 Employers' Liability with policy limits not less than ~~(\$) each accident, (\$) each employee, and (\$) policy limit.~~

§ 5.1.6 ~~The Contractor shall provide builder's risk insurance to cover the total value of the entire Project on a replacement cost basis.~~

§ 5.1.7 Other Insurance Provided by the Contractor

~~(List below any other insurance coverage to be provided by the Contractor and any applicable limits.)~~

Coverage

Limits

PAGE 7

To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, ~~Architect,~~ ~~Architect's Owner's~~ consultants, and agents and employees of any of them, from and against claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Contractor, a subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss or expense is caused in part by a party indemnified hereunder.

ARTICLE 9 ARCHITECT CONTRACT ADMINISTRATOR

...

§ 9.3 The Architect will not have control over or charge of, and will not be responsible for, construction means, methods, techniques, sequences, or procedures, or for safety precautions and programs in connection with the Work, since these are solely the Contractor's responsibility. The ~~Architect Owner~~ will not be responsible for the Contractor's failure to carry out the Work in accordance with the Contract Documents.

§ 9.4 Based on the ~~Architect's Architect~~ observations and evaluations of the Contractor's Applications for Payment, the ~~Architect Owner~~ will review and certify the amounts due the Contractor.

...

§ 9.7 On written request from ~~either the Owner or Contractor~~, the Architect will promptly interpret and decide matters concerning performance under, and requirements of, the Contract Documents.

PAGE 8

§ 9.9 The Architect's duties, responsibilities, and limits of authority as described in the Contract Documents shall not be changed without written consent of the ~~Owner~~, Contractor, and Architect. Consent shall not be unreasonably withheld.

...

§ 12.2.1 At least ten days before the date established for each progress payment, the Contractor shall submit to the ~~Architect Owner~~ an itemized Application for Payment for Work completed in accordance with the values stated in this Agreement. The Application shall be supported by data substantiating the Contractor's right to payment as the Owner or ~~Architect~~ may reasonably require, such as evidence of payments made to, and waivers of liens from, subcontractors and suppliers. Payments shall be made on account of materials and equipment delivered and suitably stored at the site for

subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment stored, and protected from damage, off the site at a location agreed upon in writing.

...

The ~~Architect-Owner~~ will, within seven days after receipt of the Contractor's Application for Payment, either (1) issue to the Owner a Certificate for Payment in the full amount of the Application for Payment, with a copy to the Contractor; (2) issue ~~to the Owner~~ a Certificate for Payment for such amount as the ~~Architect-Owner~~ determines is properly due, and notify the Contractor ~~and Owner~~ in writing of the ~~Architect's-Owner's~~ reasons for withholding certification in part; or (3) withhold certification of the entire Application for Payment, and notify the Contractor ~~and Owner~~ of the ~~Architect's-Owner's~~ reason for withholding certification in whole. If certification or notification is not made within such seven day period, the Contractor may, upon seven additional days' written notice to the ~~Owner and Architect-Owner~~, stop the Work until payment of the amount owing has been received. The Contract Time and the Contract Sum shall be equitably adjusted due to the delay.

PAGE 9

§ 12.4.1 After the ~~Architect-Owner~~ has issued a Certificate for Payment, the Owner shall make payment in the manner provided in the Contract Documents.

...

§ 12.4.3 ~~Neither the Owner nor the Architect shall~~ The Owner shall not have responsibility for payments to a subcontractor or supplier.

...

§ 12.5.2 When the Contractor believes that the Work or designated portion thereof is substantially complete, it will notify the ~~Architect-Owner~~ and the ~~Architect-Owner~~ will make an inspection to determine whether the Work is substantially complete. When the ~~Architect-Owner~~ determines that the Work is substantially complete, the ~~Architect-Owner~~ shall prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion, establish the responsibilities of the Owner and Contractor, and fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

...

§ 12.6.1 Upon receipt of a final Application for Payment, the ~~Architect-Owner~~ will inspect the Work. When the ~~Architect-Owner~~ finds the Work acceptable and the Contract fully performed, the ~~Architect-Owner~~ will promptly issue a final Certificate for Payment.

§ 12.6.2 Final payment shall not become due until the Contractor submits to the ~~Architect-Owner~~ releases and waivers of liens, and data establishing payment or satisfaction of obligations, such as receipts, claims, security interests, or encumbrances arising out of the Contract.

...

§ 14.1 The Contractor shall promptly correct Work rejected by the ~~Architect-Owner~~ as failing to conform to the requirements of the Contract Documents. The Contractor shall bear the cost of correcting such rejected Work, including the costs of uncovering, replacement, and additional testing.

PAGE 10

§ 15.2.1 At the appropriate times, the Contractor shall arrange ~~and bear cost of~~ tests, inspections, and approvals of portions of the Work required by the Contract Documents or by laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities.

§ 15.2.2 If the ~~Architect-Owner~~ requires additional testing, the Contractor shall ~~perform~~ coordinate those tests.

§ 15.2.3 The Owner shall bear cost of tests, inspections, ~~or approvals that do not become requirements until after the Contract is executed.~~ and/or approvals. The Owner shall directly arrange and pay for tests, inspections, or approvals where building codes or applicable laws or regulations so require.

...

If the Work is stopped under Section 12.3 for a period of 14 days through no fault of the Contractor, the Contractor may, upon seven additional days' written notice to the ~~Owner and Architect,~~ Owner, terminate the Contract and recover from the Owner payment for Work executed including reasonable overhead and profit, and costs incurred by reason of such termination.

...

§ 16.2.2 When any of the above reasons exist, the ~~Owner, after consultation with the Architect,~~ Owner may without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' written notice, terminate employment of the Contractor and may

PAGE 11

Contractor agrees to comply with the requirements of state and federal drug free workplace requirements, District Three's tobacco-free policy, and the provision of Chapter 13, Title 8 (State Ethics Act), South Carolina Code of Laws, 1976.

Certification of Document's Authenticity

AIA® Document D401™ – 2003

I, Bill Klein, hereby certify, to the best of my knowledge, information and belief, that I created the attached final document simultaneously with its associated Additions and Deletions Report and this certification at 09:09:54 ET on 02/07/2020 under Order No. 1945904389 from AIA Contract Documents software and that in preparing the attached final document I made no changes to the original text of AIA® Document A105™ – 2017, Standard Short Form of Agreement Between Owner and Contractor , as published by the AIA in its software, other than those additions and deletions shown in the associated Additions and Deletions Report.

(Signed)

(Title)

(Dated)



AIA® Document A312™ – 2010

Performance Bond

CONTRACTOR:

(Name, legal status and address)

SURETY:

(Name, legal status and principal place of business)

OWNER:

(Name, legal status and address)

Rock Hill Schools/York District Three, South Carolina
Post Office Drawer 10072
386 E. Black Street
Rock Hill, South Carolina 29730

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

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

CONSTRUCTION CONTRACT

Date:

Amount: \$ 0.00

Description:

(Name and location)

Sullivan Middle School Athletic Restroom Concession Building
Rock Hill Schools
Rock Hill South Carolina

BOND

Date:

(Not earlier than Construction Contract Date)

Amount: \$

Modifications to this Bond: ☐ None ☐ See Section 16

CONTRACTOR AS PRINCIPAL

Company: (Corporate Seal)

Signature: _____

Name and

Title:

(Any additional signatures appear on the last page of this Performance Bond.)

SURETY

Company: (Corporate Seal)

Signature: _____

Name and

Title:

(FOR INFORMATION ONLY — Name, address and telephone)

AGENT or BROKER:

OWNER'S REPRESENTATIVE:

(Architect, Engineer or other party:)

§ 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 Section 3.

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

- .1 the Owner first provides notice to the Contractor and the Surety that the Owner is considering declaring a Contractor Default. Such notice shall indicate whether the Owner is requesting a conference among the Owner, Contractor and Surety to discuss the Contractor's performance. If the Owner does not request a conference, the Surety may, within five (5) business days after receipt of the Owner's notice, request such a conference. If the Surety timely requests a conference, the Owner shall attend. Unless the Owner agrees otherwise, any conference requested under this Section 3.1 shall be held within ten (10) business days of the Surety's receipt of the Owner's notice. If the Owner, the Contractor and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement shall not waive the Owner's right, if any, subsequently to declare a Contractor Default;
- .2 the Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety; and
- .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 Section 3.1 shall not constitute a failure to comply with a condition precedent to the Surety's obligations, or release the Surety from its obligations, except to the extent the Surety demonstrates actual prejudice.

§ 5 When the Owner has satisfied the conditions of Section 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 Owner's 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 Section 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:

- .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
- .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 Section 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 Section 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 Section 5.1, 5.2 or 5.3, then the responsibilities of the Surety to the Owner shall not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the

Surety shall not be greater than those of the Owner under the Construction Contract. Subject to the commitment by the Owner to pay the Balance of the Contract Price, the Surety is obligated, without duplication, for

- .1 the responsibilities of the Contractor for correction of defective work and completion of the Construction Contract;
- .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 Section 5; and
- .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 Section 5.1, 5.3 or 5.4, the Surety's liability is limited to the amount of this Bond.

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

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

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

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

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

§ 14 Definitions

§ 14.1 Balance of the Contract Price. The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made, including allowance to the Contractor of any amounts received or to be received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.

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

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

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

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

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

§ 16 Modifications to this bond are as follows:

(Space is provided below for additional signatures of added parties, other than those appearing on the cover page.)

CONTRACTOR AS PRINCIPAL

Company: _____
(Corporate Seal)

Signature: _____
Name and Title: _____
Address: _____

SURETY

Company: _____
(Corporate Seal)

Signature: _____
Name and Title: _____
Address: _____

Init.

/



AIA® Document A312™ – 2010

Payment Bond

CONTRACTOR:

(Name, legal status and address)

SURETY:

(Name, legal status and principal place of business)

OWNER:

(Name, legal status and address)

Rock Hill Schools/York District Three, South Carolina
Post Office Drawer 10072
386 E. Black Street
Rock Hill, South Carolina 29730

CONSTRUCTION CONTRACT

Date:

Amount: \$ 0.00

Description:

(Name and location)

Sullivan Middle School Athletic Restroom Concession Building
Rock Hill Schools
Rock Hill South Carolina

BOND

Date:

(Not earlier than Construction Contract Date)

Amount: \$

Modifications to this Bond: ☐ None ☐ See Section 18

CONTRACTOR AS PRINCIPAL

Company: *(Corporate Seal)*

SURETY

Company: *(Corporate Seal)*

Signature: _____

Name and

Title:

(Any additional signatures appear on the last page of this Payment Bond.)

Signature: _____

Name and

Title:

(FOR INFORMATION ONLY — Name, address and telephone)

AGENT or BROKER:

OWNER'S REPRESENTATIVE:

(Architect, Engineer or other party:)

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

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

§ 1 The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner to pay for labor, materials and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference, subject to the following terms.

§ 2 If the Contractor promptly makes payment of all sums due to Claimants, and defends, indemnifies and holds harmless the Owner from claims, demands, liens or suits by any person or entity seeking payment for labor, materials or equipment furnished for use in the performance of the Construction Contract, then the Surety and the Contractor shall have no obligation under this Bond.

§ 3 If there is no Owner Default under the Construction Contract, the Surety's obligation to the Owner under this Bond shall arise after the Owner has promptly notified the Contractor and the Surety (at the address described in Section 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 Section 3, the Surety shall promptly and at the Surety's expense defend, indemnify and hold harmless the Owner against a duly tendered claim, demand, lien or suit.

§ 5 The Surety's obligations to a Claimant under this Bond shall arise after the following:

§ 5.1 Claimants, who do not have a direct contract with the Contractor,

- .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
- .2 have sent a Claim to the Surety (at the address described in Section 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 Section 13).

§ 6 If a notice of non-payment required by Section 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 Section 5.1.1.

§ 7 When a Claimant has satisfied the conditions of Sections 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 Section 7.1 or Section 7.2 shall not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under Section 7.1 or Section 7.2, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.

§ 8 The Surety's total obligation shall not exceed the amount of this Bond, plus the amount of reasonable attorney's fees provided under Section 7.3, and the amount of this Bond shall be credited for any payments made in good faith by the Surety.

§ 9 Amounts owed by the Owner to the Contractor under the Construction Contract shall be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfy obligations of the Contractor and Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.

§ 10 The Surety shall not be liable to the Owner, Claimants or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for the payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligation to make payments to, or give notice on behalf of, Claimants or otherwise have any obligations to Claimants under this Bond.

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

§ 12 No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the state in which the project that is the subject of the Construction Contract is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Section 5.1.2 or 5.2, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

§ 13 Notice and Claims to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, shall be sufficient compliance as of the date received.

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

§ 15 Upon request by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor and Owner shall promptly furnish a copy of this Bond or shall permit a copy to be made.

§ 16 Definitions

§ 16.1 Claim. A written statement by the Claimant including at a minimum:

- .1 the name of the Claimant;
- .2 the name of the person for whom the labor was done, or materials or equipment furnished;
- .3 a copy of the agreement or purchase order pursuant to which labor, materials or equipment was furnished for use in the performance of the Construction Contract;
- .4 a brief description of the labor, materials or equipment furnished;
- .5 the date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;
- .6 the total amount earned by the Claimant for labor, materials or equipment furnished as of the date of the Claim;
- .7 the total amount of previous payments received by the Claimant; and
- .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 shall be to include without limitation in the terms "labor, materials or equipment" that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor's subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials or equipment were furnished.

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

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

§ 16.5 Contract Documents. All the documents that comprise the agreement between the Owner and Contractor.

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

§ 18 Modifications to this bond are as follows:

(Space is provided below for additional signatures of added parties, other than those appearing on the cover page.)

CONTRACTOR AS PRINCIPAL

Company: _____ (Corporate Seal)

Signature: _____
Name and Title: _____
Address: _____

SURETY

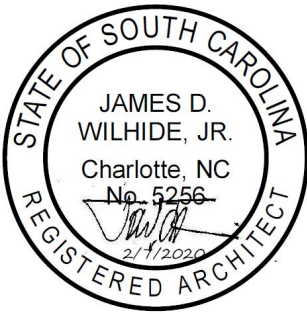
Company: _____ (Corporate Seal)

Signature: _____
Name and Title: _____
Address: _____

SPECIFICATIONS

SULLIVAN MIDDLE SCHOOL ATHLETIC RESTROOM/ CONCESSION BUILDING

ROCK HILL SCHOOLS, YORK DISTRICT THREE
ROCK HILL, SOUTH CAROLINA



SULLIVAN MIDDLE SCHOOL ATHLETIC RESTROOM/CONCESSION BUILDING
ROCK HILL SCHOOLS; ROCK HILL, SC
Architect's Project No: 593120
Rock Hill Schools Bid No.: 19-2024 Site Preparation and Utility Connections
Rock Hill Schools Bid No.: 19-2025 Pre-Manufactured Modular Precast Building

SECTION 011000 - SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 PROJECT INFORMATION

- A. Project Identification: Sullivan Middle School Athletic Restroom/Concession Building.
1. Project Location: 1825 Eden Terrace, Rock Hill, SC 29730.
- B. Owner: Rock Hill Schools District Three of York County, SC.
1. Owner's Representative: Garret Brink, gbrink@jmcope.com.
- C. Architect: Moseley Architects of Columbia, South Carolina.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Work of Project is defined by the Contract Documents and consists of the following:
1. Providing a new freestanding restroom/concession building adjacent to the Sullivan Middle School track. The Work is divided into 2 separate bid packages. Bid Package No. 1 is for preparing the site for Bid Package No. 2. Bid Package No. 1 includes all sitework, site utilities, concrete, railings, retaining walls, grading and making final utilities connections to the building. Bid Package No. 2. consists of furnishing a prefabricated precast restroom/concession building to be set on a pad ready site prepared by the Contractor of Bid Package No. 1.
- B. Type of Contract:
1. Project will be constructed under a single prime contract.
 2. Additional work undertaken at the direction of parties not representing the Owner, will be considered as unauthorized work and will not be paid for by the Owner. Additional work must be authorized in writing by the Owner or the Owner's authorized representative.
- C. Use of Professional Seals on Bidding, Procurement, and Contract Documents: or the purposes of this paragraph, the term "Regulant" refers to the individual who signs and seals parts of the Contract Documents (e.g. the Drawings and Specifications). Certain information has been excerpted verbatim from a source or sources (e.g., UL Assemblies, SMACNA details, IBC code text) which was considered or used by Regulant in preparing parts of the Contract Documents, as follows:
1. The excerpted information was neither prepared under the direct control nor personal supervision nor created by the Regulant, as it was prepared by the source and owner of the excerpted information.
 2. For purposes of bidding, procuring, and performance of the Work, and in any event of conflicts or ambiguities between the excerpted information in the Contract Documents and the requirements of applicable codes and standards, provide the better quality or greater quantity of Work which, at a minimum, complies with the requirements of the applicable codes and standards.

SULLIVAN MIDDLE SCHOOL ATHLETIC RESTROOM/CONCESSION BUILDING
ROCK HILL SCHOOLS; ROCK HILL, SC
Architect's Project No: 593120
Rock Hill Schools Bid No.: 19-2024 Site Preparation and Utility Connections
Rock Hill Schools Bid No.: 19-2025 Pre-Manufactured Modular Precast Building

3. Advise Architect immediately upon becoming aware of requirements of the Work which are not consistent with the requirements of the excerpted information.
4. Attribution is acknowledged for information obtained and included herein verbatim from other source or sources.
5. Regulant has taken into consideration and used certain excerpted information from other sources which are applicable to the Contract Documents, and the Regulant indicates by its seal that it is assuming responsibility for its services in use and application of the excerpted information to the requirements of Work, but not for the excerpted information itself which was prepared by others. Regulant does not indicate by its seal that it is responsible for use or application of other information in such source or sources which was not included herein.

1.4 ACCESS TO SITE

- A. General: Contractor shall have full use of Project site for construction operations during construction period. Contractor's use of Project site is limited only by Owner's right to perform work or to retain other contractors on portions of Project.
- B. General: Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.
- C. Use of Site: Limit use of Project site to work in areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
 1. Driveways, Walkways and Entrances: Keep driveways, loading areas, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
 - a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
 - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

1.5 COORDINATION WITH OCCUPANTS

- A. Partial Owner Occupancy: Owner will utilize the track premises during entire construction period. The site "Work Area" shown on plans is to be fenced with temporary fence to separate the Work under this contract from the Owner's use of the track.
- B. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's operations. Maintain existing exits unless otherwise indicated.
 1. Maintain access to existing walkways. Do not close or obstruct walkways without written permission from Owner.
 2. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.
 3. Protect occupants from materials producing dust (e.g., silica) and other by-products as regulated by OSHA, federal, state, and local regulations.

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1.6 WORK RESTRICTIONS

- A. Work Restrictions, General: Comply with restrictions on construction operations.
 - 1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.
- B. On-Site Work Hours:
 - 1. Weekdays: 7 a.m. to 5 p.m.
 - 2. Weekend and Holiday Hours: Coordinate with Owner.
 - 3. Hours for Utility Shutdowns: Changes of utility services that effect existing school operations shall take place after-hours, on weekends, and holidays.
- C. Existing Utility Interruptions: Do not interrupt utilities directly serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:
 - 1. Notify Architect and Owner not less than seven (7) days in advance of proposed utility interruptions.
 - 2. Obtain Architect's and Owner's written permission before proceeding with utility interruptions.
- D. Excessive Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to Owner occupancy with Owner.
 - 1. Notify Architect Owner not less than two (2) days in advance of proposed disruptive operations.
 - 2. Obtain Architect's and Owner's written permission before proceeding with disruptive operations.

1.7 SPECIAL REQUIREMENTS

- A. Criminal Background Investigations of individuals working on school property (sites occupied with students and sites not occupied with students).
- B. At a minimum, the contractor shall obtain a complete South Carolina statewide criminal background investigation for all employees and subcontractors who will work on this project, covering a period for the last seven (7) years. In the event that the contractor or subcontractor is from out of state, the criminal background investigation shall be broadened to include their home state, as well as the state of South Carolina as outlined above. The company providing such information must be recognized by local law enforcement agency as qualified to do so. All costs associated with these criminal background checks is the responsibility of the contractor.
 - 1. Prime contractor will be responsible and liable for the conduct and actions of their employees and all of their subcontractors working under them
 - 2. A daily sign-in sheet will be presented by prime contractor to the Owner's Representative who will be designated by the Owner at the Pre-Construction Meeting. This list will contain the name of each person on site and the company they work for.
 - 3. The daily sign in log will be made available to the successful prime contractors at the Pre-Construction Meeting.

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- C. Any individual with the following criminal convictions or pending charges will **NOT** be permitted on any school project or property.
 - 1. Child molestation or abuse.
 - 2. Rape.
 - 3. Any sexually oriented crime.
 - 4. Drugs: Felony use, possession or distribution.
- D. Any individual with a prior conviction or pending charges contained in the aforementioned list, shall be banned (not allowed) from any school project or property.
- E. Rock Hill School District, may, at any time, request verification of criminal background investigation for any employee or subcontractor on school property.
- F. Photo ID Badges for personnel working on site for the duration of the project.
 - 1. Photo ID badges shall be issued to the General Contractor, Site Superintendent, and Subcontractor Superintendents who will be on site for the duration of the project.
 - 2. The General Contractor shall provide background checks for personnel working on site for the duration of the project.
 - 3. The General Contractor shall contact the CMO Project Manager to schedule an appointment to be photographed and issued a badge at RHSD3 Facilities Services located at 2171 W. Main Street, Rock Hill, SC.
 - 4. The CMO Project Manager shall maintain a Photo ID Log which lists name, company name, expected duration of work, and actual date of completion for each person who receives a photo ID badge.
 - 5. Photo ID badges must be returned at the completion of the project. A \$25 fee will be incurred for any photo ID badges that are lost or not returned at the complete to the project.
- G. Numbered Badges for subcontractor personnel who will be on site for a short duration.
 - 1. The Site Superintendent for each project will receive a series of numbered badges for subcontractor personnel who will be on site for a short duration.
 - 2. The Site Superintendent will be responsible for collecting background checks for each person who receives a badge.
 - 3. The Site Superintendent shall maintain a daily numbered badge assignment log.
 - 4. The background checks and daily badge assignment log should be kept on file and be readily available to the CMO Project manager upon request.
 - 5. Numbered badges must be returned at the completion of the project. A \$25 fee will be incurred for any numbered badges that are lost or not returned at the completion of the project.
- H. The use of any type of tobacco product on school premises is prohibited. Workers will be asked to leave the site for the balance of the day on their first and second offenses. Workers will be asked to permanently leave the site after the third offense.
- I. If, in the opinion of the Architect, the General Contractor does not properly water tight the building from the elements – the Owner maintains the right to call in a 3rd party Industrial Hygienist for the purpose of evaluating the infiltration of moisture, employ moisture meters. This Industrial Hygienist will prepare a report of corrective action necessary to prevent future mold and mildew issues and the General Contractor is solely responsible for the corrective action necessary, as well as all costs associated with the services of the Industrial Hygienist and any

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additional surface or air quality testing fees that may be required to insure a safe building. No finishes, including drywall work are to commence until the building is permanently enclosed.

- J. All contractors understand and agree that the primary use of an occupied school facility is for the instructional programming to benefit the achievement of the students enrolled in said facility. During periods of standardized and other major testing such as EOC's, etc. the contractors agree to pursue quiet operations that do not disturb the testing operations. No claims for delay will be considered for these days of quiet operation during periods of testing.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

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SECTION 012100 – ALLOWANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements governing allowances.
 - 1. Certain items are specified in the Contract Documents by allowances. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when direction will be provided to the Contractor. If necessary, additional requirements will be issued by Change Order.
- B. Types of allowances include the following:
 - 1. Lump-sum allowances.
- C. Related Sections:
 - 1. Division 01 Section "Quality Requirements" for procedures governing the use of allowances for testing and inspecting.

1.3 SUBMITTALS

- A. Submit time sheets and other documentation to show labor time and cost for installation of allowance items that include installation as part of the allowance.
- B. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.4 COORDINATION

- A. Coordinate allowance items with other portions of the Work. Furnish templates as required to coordinate installation.

1.5 ADJUSTMENT OF ALLOWANCES

- A. Allowance Adjustment: To adjust allowance amounts, prepare a Change Order proposal based on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place where applicable. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.
 - 1. Include installation costs in purchase amount only where indicated as part of the allowance.
 - 2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other margins claimed.
 - 3. Submit substantiation of a change in scope of work, if any, claimed in Change Orders related to unit-cost allowances.
 - 4. Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.

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- B. Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the purchase order amount or Contractor's handling, labor, installation, overhead, and profit.
 - 1. Do not include Contractor's or subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of work has changed from what could have been foreseen from information in the Contract Documents.
 - 2. No change to Contractor's indirect expense is permitted for selection of higher- or lower-priced materials or systems of the same scope and nature as originally indicated.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION

- A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.3 SCHEDULE OF ALLOWANCES

- A. Allowance No. 1: Undercut and Replace Unsuitable Soils with structural fill – only applicable to Bid Package No. 1: Include 150 cu. yds. Of unsuitable soil removal and replacement of suitable soil at a unit price of \$_____/cu. yd. x 150 = _____ total allowance.

END OF SECTION 012100

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SECTION 012300 – ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 DEFINITIONS

- A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the Bidding Requirements that may be added to or deducted from the base bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
 - 1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
 - 2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.3 PROCEDURES

- A. Coordination: Modify or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
 - 1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.
- B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated modifications to alternates.
- C. Execute accepted alternates under the same conditions as other work of the Contract.
- D. Schedule: A schedule of alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

- A. Alternate No. 1 – Epoxy floor finish – only applicable to Bid Package No. 2.
 - 1. Alternate: Add epoxy floor finish to both restrooms and concession area at new precast building in lieu of sealed concrete floor finish.

END OF SECTION 012300

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SECTION 012500 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Provisions of the Contract and Contract Documents apply to this Section.

1.2 DEFINITIONS

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

1.3 SUBMITTALS

- A. Substitution Requests: Contractor shall request and submit a "Substitution Request Form – After Receipt of Bids" for all substitutions to be considered after receipt of bids.
1. Substitution Request Form: Use the Architect's form, which can be obtained from the Architect at the time of the request.
 - a. The form is an electronic Word document requiring the Contractor to fill in "data fields."
 - b. A copy of the form is attached to the end of this Section for informational purposes only. Use the electronic Word document only.
 2. No substitutions will be considered unless submitted using the referenced "Substitution Request Form – After Receipt of Bids."
 - a. Substitution Request Form: Use the Architect's form, which can be obtained from the Architect at the time of the request.
 - 1) The form is an electronic Word document requiring the Contractor to fill in "data fields."
 3. All substitutions must be submitted by the Contractor, and shall include the Contractor's certification and signature.
 - a. Substitution requests submitted directly from subcontractors, sub-subcontractors, manufacturers, vendors, installer, and suppliers will be rejected.
 4. Failure to submit the form, or a fully completed form, shall result in the rejection of the proposed substitution; and shall also include:
 - a. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, which will be necessary to accommodate proposed substitution.
 - b. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable specification section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific

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features and requirements indicated. Indicate deviations, if any, from the Work specified.

- c. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 - d. Samples, where applicable or requested.
 - e. Certificates and qualification data, where applicable or requested.
 - f. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
 - g. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
 - h. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.
 - i. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
 - j. Cost information, including a proposal of change, if any, in the Contract Sum.
 - k. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
 - l. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
5. If the proposed substitution is found to be acceptable to the Architect, the request will be forwarded to the Owner for their approval.
 6. If the Owner approves the substitution, it will then be included in a Change Order or Construction Change Directive.
 7. Only substitutions included in Change Orders or Construction Change Directives shall be allowed to be included in the Work
 8. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven (7) days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed.
 - a. Forms of Acceptance: Change Order or Construction Change Directive only.

1.4 QUALITY ASSURANCE

- A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage qualified testing agency to perform compatibility tests recommended by manufacturers.

1.5 PROCEDURES

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

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PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

- A. Substitutions for Cause: Submit requests for substitution immediately upon discovery of need for change, but not later than twenty-one (21) days prior to time required for preparation and review of related submittals.
1. Conditions: Architect will consider Contractor's request for substitution when all of the following conditions are satisfied. If all of the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
 - a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - b. Substitution request is fully documented and properly submitted.
 - c. Requested substitution will not adversely affect Contractor's construction schedule.
 - d. Requested substitution has received necessary approvals of authorities having jurisdiction.
 - e. Requested substitution is compatible with other portions of the Work.
 - f. Requested substitution has been coordinated with other portions of the Work.
 - g. Requested substitution provides specified warranty.
 - h. If requested substitution involves more than one (1) contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
- B. Substitutions for Convenience: Architect will consider requests for substitution if received within thirty (30) days after Award of Construction Contract. Requests received after that time may be considered or rejected at discretion of Architect.
1. Conditions: Architect will consider Contractor's request for substitution when all of the following conditions are satisfied. If all of the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
 - a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume.
 - 1) Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
 - b. Requested substitution does not require extensive revisions to the Contract Documents.
 - c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - d. Substitution request is fully documented and properly submitted.
 - e. Requested substitution will not adversely affect Contractor's construction schedule.
 - f. Requested substitution has received necessary approvals of authorities having jurisdiction.
 - g. Requested substitution is compatible with other portions of the Work.
 - h. Requested substitution has been coordinated with other portions of the Work.

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- i. Requested substitution provides specified warranty.
- j. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 3 - EXECUTION (Not Used)

END OF SECTION 012500

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SECTION 012900 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The provisions of the Contract and of the Contract Documents apply to this Section.

1.2 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.
1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including the following:
 - a. Construction Progress Schedule, in CPM or bar chart format.
 - b. Application for Payment forms with Continuation Sheets.
 - c. List of Subcontractors.
 - d. Schedule of alternates.
 - e. List of products.
 - f. Quantities lists.
 - g. List of principal suppliers and fabricators.
 - h. Submittals Schedule.
 - i. Items required to be indicated as separate activities in Contractor's construction schedule.
 2. Submit the Schedule of Values to Architect at earliest possible date but no later than seven (7) days before the date scheduled for submittal of initial Applications for Payment.
 3. Subschedules: Where the Work is separated into phases requiring separately phased payments, provide subschedules indicating values correlated with each phase of payment.
- B. Format and Content: Use the Project Manual table of contents format (specification section numbers and names) to establish line items for the Schedule of Values. Provide at least one (1) line item for each Specification Section.
1. The Schedule of Values shall be subject to approval by the Architect and Owner including designated line items and their associated dollar value.
 2. Identification: Include the following Project identification on the Schedule of Values:
 - a. Project name and location.
 - b. Name of Architect.
 - c. Architect's project number.
 - d. Contractor's name and address.
 - e. Date of submittal.
 3. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:
 - a. Related Specification Section or Division.
 - b. Description of the Work.

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- c. Name of subcontractor.
- d. Name of manufacturer or fabricator.
- e. Name of supplier.
- f. Change Orders (numbers) that affect value.
- g. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.
 - 1) Labor.
 - 2) Materials.
 - 3) Equipment.
- 4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide multiple line items for principal subcontract amounts in excess of five percent of Contract Sum or as appropriate.
- 5. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
- 6. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
 - a. Differentiate between items stored on-site and items stored off-site. Include evidence of insurance or bonded warehousing if required.
- 7. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
- 8. Allowances: Provide a separate line item in the Schedule of Values for each allowance amount indicated. Indicate line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
- 9. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
 - a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be indicated either as separate line items in the Schedule of Values or distributed as general overhead expense, at Contractor's option.
- 10. Schedule Updating: Update and resubmit the Schedule of Values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.3 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.
 - 1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
- B. Payment Application Times: Contractor shall submit application for payment at regularly scheduled pay meetings as established at the Pre-Construction Conference. The period covered by each Application for Payment shall be clarified at the Pre-Construction Conference.

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- C. Payment Application Forms: Use AIA Document G702 and AIA Document G703 Continuation Sheets as form for Applications for Payment.
- D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
 - 1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.
 - 2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
 - 3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
 - 4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.
- E. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.
 - 1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment, for stored materials.
 - 2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
 - 3. Provide summary documentation for stored materials indicating the following:
 - a. Materials previously stored and included in previous Applications for Payment.
 - b. Work completed for this Application utilizing previously stored materials.
 - c. Additional materials stored with this Application.
 - d. Total materials remaining stored, including materials with this Application.
- F. Transmittal: Submit four (4) (or number determined at Preconstruction Conference) signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within twenty-four (24) hours. One (1) copy shall include waivers of lien and similar attachments if required.
 - 1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- G. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
 - 1. List of subcontractors.
 - 2. Schedule of Values.
 - 3. Contractor's Construction Schedule (preliminary if not final). Payment to the contractor will not be issued until the Contractor's Construction Schedule is submitted to the Architect and Owner.
 - 4. Products list (preliminary if not final).
 - 5. Submittals Schedule (preliminary if not final).

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6. List of Contractor's staff assignments. Include resumes of the Project Manager and Project Superintendent.
 7. Copies of building permits.
 8. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
 9. Initial progress report.
 10. Certificates of insurance and insurance policies.
 11. Performance and payment bonds.
 12. Data needed to acquire Owner's insurance.
- H. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment indicating 100 percent completion for portion of the Work claimed as substantially complete.
1. Include documentation supporting claim that the Work is substantially complete and a statement indicating an accounting of changes to the Contract Sum.
 2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- I. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. Evidence of completion of Project closeout requirements.
 2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
 3. Updated final statement, accounting for final changes to the Contract Sum.
 4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
 5. AIA Document G707, "Consent of Surety to Final Payment."
 6. Evidence that claims have been settled.
 7. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
 8. Final, liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

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SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
 - 1. Coordination Drawings.
 - 2. Administrative and supervisory personnel.
 - 3. Project meetings.
 - 4. Requests for Interpretation (RFIs).

1.3 DEFINITIONS

- A. RFI: Request from Contractor seeking interpretation or clarification of the Contract Documents.

1.4 COORDINATION

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections that depend on each other for proper installation, connection, and operation.
 - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
 - 2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
 - 3. Make adequate provisions to accommodate items scheduled for later installation.
 - 4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical.
- B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
 - 1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
 - 1. Preparation of Contractor's Construction Schedule.

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2. Preparation of the Schedule of Values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Preinstallation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.
9. Project closeout activities.

1.5 SUBMITTALS

- A. Key Personnel Names: Within fifteen (15) days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.
1. Post copies of list in temporary field office, if used. Keep list current at all times.

1.6 PROJECT MEETINGS

- A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.
1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
 2. Agenda: The Architect will prepare the meeting agenda and distribute it to all invited attendees.
 3. Minutes: The Architect will record significant discussions and agreements achieved. Within seven (7) days of the meeting the Architect will distribute the meeting minutes to the Owner, the Architect's consultants, and to the Contractor for distribution to his personnel and attending major subcontractors, manufacturers, suppliers and other concerned parties.
- B. Preconstruction Conference: Schedule a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than fifteen (15) days after execution of the Agreement. Hold the conference at Project site or another convenient location. The Architect shall conduct the meeting to review responsibilities and personnel assignments.
1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 2. Agenda: Discuss items of significance that could affect progress, including the following:
 - a. Tentative construction schedule.
 - b. Critical work sequencing and long-lead items.

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- c. Designation of key personnel and their duties.
 - d. Procedures for processing field decisions and Change Orders.
 - e. Procedures for RFIs.
 - f. Procedures for testing and inspecting.
 - g. Procedures for processing Applications for Payment.
 - h. Distribution of the Contract Documents.
 - i. Submittal procedures.
 - j. Coordination and submittal of color & finish related selections.
 - k. Preparation of Record Documents.
 - l. Use of the premises.
 - m. Work restrictions.
 - n. Owner's occupancy requirements.
 - o. Responsibility for temporary facilities and controls.
 - p. Construction waste management and recycling.
 - q. Parking availability.
 - r. Office, work, and storage areas.
 - s. Equipment deliveries and priorities.
 - t. First aid.
 - u. Security.
 - v. Progress cleaning.
 - w. Working hours.
3. Minutes: Architect will record and Contractor will distribute meeting minutes, as noted.
- C. Progress Meetings: The Architect shall conduct progress meetings at monthly intervals. Coordinate dates of meetings with preparation of payment requests.
- 1. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 - 2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - 1) Review schedule for next period.
 - b. Review present and future needs of each entity present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Status of submittals.
 - 4) Deliveries.
 - 5) Off-site fabrication.

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- 6) Access.
 - 7) Site utilization.
 - 8) Temporary facilities and controls.
 - 9) Work hours.
 - 10) Hazards and risks.
 - 11) Progress cleaning.
 - 12) Indoor Air Quality.
 - 13) Quality and work standards.
 - 14) Status of correction of deficient items.
 - 15) Field observations.
 - 16) RFIs.
 - 17) Field Clarification. (FC)
 - 18) Status of proposal requests.
 - 19) Pending changes. (Potential Change Order – PCO)
 - 20) Status of Change Orders. (CO)
 - 21) Pending claims and disputes.
 - 22) Documentation of information for payment requests.
3. Minutes: Architect will record and Contractor will distribute meeting minutes, as noted.
 4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.
 - a. Schedule Updating: Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

1.7 REQUESTS FOR INTERPRETATION (RFIs)

- A. Procedure: Immediately on discovery of the need for interpretation of the Contract Documents, and if not possible to request interpretation at Project meeting, prepare and submit an RFI in the form specified.
 1. RFIs shall originate with Contractor. RFIs submitted by entities other than Contractor will be returned with no response.
 2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
- B. Content of the RFI: Include a detailed, legible description of item needing interpretation and the following:
 1. Project name.
 2. Date.
 3. Name of Contractor.
 4. Name of Architect.
 5. RFI number, numbered sequentially.
 6. Specification Section number and title and related paragraphs, as appropriate.
 7. Drawing number and detail references, as appropriate.
 8. Field dimensions and conditions, as appropriate.
 9. Contractor's suggested solution(s). If Contractor's solution(s) impact the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.

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10. Contractor's signature.
11. Attachments: Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, and other information necessary to fully describe items needing interpretation.
 - a. Supplementary drawings prepared by Contractor shall include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments.
- C. Architect's Action: Architect will review each RFI, determine action required, and return it. Allow seven (7) working days for Architect's response for each RFI. RFIs received after 1:00 p.m. will be considered as received the following working day.
 1. The following RFIs will be returned without action:
 - a. Requests for approval of submittals.
 - b. Requests for approval of substitutions.
 - c. Requests for coordination information already indicated in Contract Documents.
 - d. Requests for adjustments in the Contract Time or the Contract Sum.
 - e. Requests for interpretation of Architect's actions on submittals.
 - f. Incomplete RFIs or RFIs with numerous errors.
 2. Architect's action may include a request for additional information, in which case Architect's time for response will start again.
 3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to conditions of the Contract.
 - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within ten (10) days of receipt of the RFI response.
- D. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven (7) days if Contractor disagrees with response.
- E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log at intervals as established. Software log with not less than the following:
 1. Project name.
 2. Name and address of Contractor.
 3. Name and address of Architect.
 4. RFI number including RFIs that were dropped and not submitted.
 5. RFI description.
 6. Date the RFI was submitted.
 7. Date Architect's response was received.
 8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.

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PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

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SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Provisions of the Contract and Contract Documents apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
 - 1. Preliminary Construction Schedule.
 - 2. Contractor's Construction Schedule.
 - 3. Submittals Schedule.
 - 4. Daily construction reports.
 - 5. Field condition reports.
 - 6. Special reports.

1.3 ACTION SUBMITTALS

- A. Submittals Schedule: Submit three (3) copies of schedule. Arrange the following information in a tabular format:
 - 1. Scheduled date for first submittal.
 - 2. Specification Section number and title.
 - 3. Submittal category (action or informational).
 - 4. Name of subcontractor.
 - 5. Description of the Work covered.
 - 6. Scheduled date for Architect's final release or approval.
- B. Preliminary Construction Schedule: Submit two (2) opaque copies.
- C. Contractor's Construction Schedule: Submit two (2) opaque copies of initial schedule, large enough to show entire schedule for entire construction period.
 - 1. Submit an electronic copy of schedule, using software indicated, on CD-R, and labeled to comply with requirements for submittals. Include type of schedule (Initial or Updated) and date on label.
- D. Daily Construction Reports: Submit two (2) copies at monthly intervals.
- E. Field Condition Reports: Submit two (2) copies at time of discovery of differing conditions.
- F. Special Reports: Submit two (2) copies at time of unusual event.

PART 2 - PRODUCTS

2.1 SUBMITTALS SCHEDULE

- A. Preparation: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, resubmittal, ordering, manufacturing, fabrication, and delivery when establishing dates.

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1. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, and Contractor's Construction Schedule.
2. Initial Submittal: Submit concurrently with preliminary network diagram. Include submittals required during the first sixty (60) days of construction. List those required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
 - a. At Contractor's option, show submittals on the Preliminary Construction Schedule, instead of tabulating them separately.
3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's Construction Schedule.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Procedures: Comply with procedures contained in AGC's "Construction Planning and Scheduling."
- B. Time Frame: Extend schedule from date established for commencement of the Work to date of Final Completion.
 1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

2.3 CONSTRUCTION SCHEDULE

- A. Bar-Chart Schedule: Submit preliminary horizontal bar-chart-type construction schedule within three days prior to Preconstruction Conference.
- B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first sixty (60) days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.
- C. Submittal of the Final Construction Schedule and the Schedule of Values by the Contractor certifies that he will prosecute the Work in accordance with this Schedule, subject to any change therein which is implemented in accordance with the Contract Documents.

2.4 RECOVERY SCHEDULE

- A. Should the updated Construction Schedule show at any time during Contractor's performance, in the sole opinion of the Owner, that the Contractor is fourteen (14) or more days behind schedule for any Specific Date, or should Contractor be required to undertake actions under the General Conditions hereof, the Contractor shall prepare a Recovery Schedule at no additional cost to the Owner (unless the Owner is solely responsible for the event or occurrence which has caused the schedule slippage) explaining and displaying how Contractor intends to reschedule his Work in order to regain compliance with the Construction Schedule during the immediate subsequent pay period.
- B. If the Contractor believes that all of the time can be recovered during the subsequent pay period the Contractor will be permitted to prepare a Recovery Schedule as set forth below. However, if the Contractor believes it will take more than thirty (30) days to recover all of the lost time, he

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shall prepare and submit a request for revision to the Construction Schedule and comply with all of the requirements for a Schedule Revision.

1. The Contractor shall prepare and submit to the Owner a one (1)-month maximum duration Recovery Schedule, incorporating best available information from Subcontractors and others, which will permit return to Construction Schedule at the earliest possible time. The Contractor shall prepare a Recovery Schedule to same level of detail as the Construction Schedule for a maximum duration of one (1) month. This Recovery Schedule shall be prepared in coordination with other separate contractors on the Project.
2. Within two (2) days after submission of Recovery Schedule to the Owner, the Contractor shall participate in a conference with the Owner to review and evaluate the Recovery Schedule. Within two (2) days of conference, the Contractor shall submit the revisions necessitated by the review for the Owner's review and approval. The Contractor shall use the approved Recovery Schedule as his plan for returning to the Construction Schedule.
3. Contractor shall confer continuously with the Owner to assess the effectiveness of the Recovery Schedule. As a result of this conference, the Owner will direct the Contractor as follows:
 - a. If the Owner determines the Contractor is still behind schedule, the Owner will direct the Contractor to prepare a Schedule Revision and comply with all of the requirements of a Schedule Revision as stated herein and the other requirements of the Contract Documents; provided, however, that nothing herein shall limit in any way the rights and remedies of the Owner as provided elsewhere in the Contract Documents.
 - b. If the Owner determines the Contractor has successfully complied with provisions of the Recovery Schedule, the Owner will direct the Contractor to return to the use of the approved Construction Schedule.

2.5 SCHEDULE REVISIONS

- A. Should Contractor desire to or be required under the Contract Documents to make modifications or changes in his method of operation, his sequence of Work or the durations of the activities in his Construction Schedule, he shall do so in accordance with the requirements of the Contract Documents. All revisions to the approved Construction Schedule must be identified by the Contractor in writing and approved in writing by the Owner prior to incorporation into the approved schedule.
- B. Submit requests for revisions to the Construction Schedule to the Owner, together with written rationale for revisions and description of logic for rescheduling work and maintaining the Specific Dates listed in the Contract Documents. Incorporate proposed revisions acceptable to the Owner into the next update of Construction Schedule. Pay the Owner for unreasonable costs incurred by the Owner for the revisions.
- C. Revise schedule to include the effect of Changes, acts of God or other conditions or events which have affected the network. If the requested changes are acceptable to the Owner, incorporate them into the Detailed Construction Network in the next reporting period.

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- D. Change Order logic will affect only those activities and performances dates directly concerned. Adjustments in Scheduled intermediate Completion Dates or for the Contract as a whole, will be considered only to the extent that there is insufficient remaining float to absorb these changes.
- E. Neither the updating or revision of Contractor's Detailed Construction Schedule nor the submission, updating changes or revisions of any report or schedule submitted to Owner by Contractor under this Section nor the Owner's review or non-objection of any such report or schedule shall have the effect of amending or modifying, in any way, the Contract Time, any Contract Completion Date, or Contract Milestone Dates or of modifying or limiting in any way Contractor's obligations under this Contract.
- F. If there are separate contractors on the Project, prior to the submission by the Contractor of his proposed schedule revisions, he shall meet with and gain written approval of the separate contractors to make the revisions which shall be evidenced by the signatures of said separate contractors on the proposed schedule revisions. If accepted by the Owner the revisions shall be binding upon Contractor and all separate contractors on the Project.
- G. Submittal of any proposed schedule revisions by the Contractor certifies that he will prosecute the Work in accordance with this schedule revision, subject to any change therein which is implemented in accordance with the Contract Documents.

2.6 SPECIAL REPORTS

- A. General: Submit special reports directly to Owner within one (1) day of an occurrence. Distribute copies of report to parties affected by the occurrence.
- B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one (1) week before each regularly scheduled progress meeting.
 - 1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
 - 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
 - 3. As the Work progresses, indicate Actual Completion percentage for each activity.
- B. Distribution: Distribute copies of approved schedule to Architect, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.

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1. Post copies in Project meeting rooms and temporary field offices.
2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION 013200

SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The provisions of the Contract and of the Contract Documents apply to this Section.

1.2 DEFINITIONS

- A. Action Submittals: Written and graphic information that requires Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as action submittals.
- B. Informational Submittals: Written information that does not require Architect's approval. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as informational submittals.
- C. File Transfer Protocol (FTP): Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.
- D. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

1.3 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

- A. Electronic Files: The Contractor may request electronic files (including CADD Files, BIM model, and Scans) utilizing the Architect's "Request Form for Electronic Files".
- B. Completeness: Submittals shall be complete in every respect and bound in sets. Each Submittal shall be clearly marked to show each item, component and optional feature proposed to be incorporated into the Project.
 - 1. Incomplete submittals may be returned without action. Incomplete submittal packages returned without action or for additional information are not subject to delay claims.
- C. Submittals Schedule: Comply with requirements in Division 01 Section "Construction Progress Documentation" for list of submittals and time requirements for scheduled performance of related construction activities.
- E. Processing Time: Allow enough time for submittal review, including time for resubmittals, in accordance with General Conditions and as follows. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
 - 1. Initial Review: Allow 5 work days processing time for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
 - 2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.

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3. Resubmittal Review: Allow sufficient time for review of each resubmittal.
 4. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing or to allow for a resubmittal, if necessary.
- F. Identification: Place a permanent label or title block on each submittal for identification.
1. Indicate name of firm or entity that prepared each submittal on label or title block.
 2. Provide a space approximately 4 inches by 5 inches (100 mm by 125 mm) on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
 3. Include the following information on label for processing and recording action taken:
 - a. Project name.
 - b. Date.
 - c. Name and address of Architect.
 - d. Name and address of Contractor.
 - e. Name and address of subcontractor.
 - f. Name and address of supplier.
 - g. Name of manufacturer.
 - h. Submittal number or other unique identifier, including revision identifier.
 - i. Number and title of appropriate Specification Section.
 - j. Drawing number and detail references, as appropriate.
 - k. Location(s) where product is to be installed, as appropriate.
 - l. Other necessary identification.
- G. Deviations: Highlight, encircle, or otherwise identify deviations from Contract Documents on submittals. **Submittals without deviations identified will be considered to be in compliance with all requirements.**
- H. Additional Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions of the Contract Documents, initial submittal may serve as final submittal.
1. Submit one (1) copy of submittal to concurrent reviewer in addition to specified number of copies to Architect.
 2. Additional copies submitted for maintenance manuals will not be marked with action taken and will be returned.
- I. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will return submittals, without review, received from sources other than Contractor.
1. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements of the Contract Documents, including minor variations and limitations. Include the same label information as the related submittal.
 2. Include Contractor's certification stating that information submitted complies with requirements of the Contract Documents.
 3. Transmittal Form: Use AIA Document G810 or other approved form.
- J. Re-submittals: Make re-submittals in same form and number of copies as initial submittal.
1. Note date and content of previous submittal.

2. Note date and content of revision in label or title block and indicate extent of revision.
 3. Resubmit submittals until Architect's action indicates Work may proceed.
- K. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- L. Use for Construction: Use only final submittals with mark indicating action taken by the Architect in connection with construction.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

- A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
1. Provide PDF Electronic submittals on this project. Prior to construction, the Contractor and Architect shall discuss the method for exchanging files. Use of the Architect's Newforma InfoExchange website and procedures can be used at no charge. If the Contractor chooses to use a different platform and methodology:
 - a. The Architect may reject the methodology or platform proposed and,
 - 1) use the Architect's Newforma InfoExchange website, or
 - 2) the project team will revert to traditional hard-copy exchange,
 - b. or the Contractor shall bear the cost of software, licensing, training, etc for the project team to participate.
- B. If a specified product is provided, submit only Action Submittals and where designated, Closeout Submittals, unless directed otherwise by the Architect. The Contractor shall certify compliance with all requirements.

2.2 ACTION SUBMITTALS

- A. General: Prepare and submit Action Submittals required by individual Specification Sections. **Action Submittals, for each specification section, shall be submitted as a complete package.**
1. Number of Copies: Submit six (6) copies of each submittal (other than shop drawings and samples), unless otherwise indicated. Architect will return two (2) copies. Mark up and retain one (1) returned copy as a Project Record Document.
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
 2. Mark each copy of each submittal to show which products and options are applicable.
 3. Include the following information, as applicable:
 - a. Manufacturer's catalog cuts.
 - b. Manufacturer's product specifications.
 - c. Manufacturer's printed and published installation instructions.
 - d. Standard color charts.

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- e. Notation of coordination requirements.
 - f. Availability and delivery time information.
 - g. Number and title of applicable Specification Section.
 - 4. Submit Product Data as PDF electronic file.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
- 1. Preparation: Include the following information, as applicable:
 - a. Dimensions.
 - b. Identification of products.
 - c. Schedules.
 - d. Compliance with specified standards.
 - e. Notation of coordination requirements.
 - f. Notation of dimensions established by field measurement.
 - g. Relationship and attachment to adjoining construction clearly indicated.
 - h. Seal and signature of professional engineer if specified.
 - 2. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.
 - 3. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 inches by 11 inches (215 mm by 280 mm) but no larger than 30 inches by 42 inches (standard E-size) (750 mm by 1000 mm).
 - 4. Number of Copies: Submit copies of each submittal, as follows:
 - a. Initial Submittal: Submit one (1) correctable, reproducible print and three (3) black-line prints. Architect will return the reproducible print.
 - b. Final Submittal: Submit three (3) black-line prints, unless prints are required for operation and maintenance manuals. Submit five (5) prints where prints are required for operation and maintenance manuals. Architect will retain two (2) prints; remainder will be returned.
 - 5. Submit Shop Drawings as PDF electronic file.
- D. Samples: Prepare physical units of materials or products, including the following:
- 1. Samples (for verification): Submit full-size units or Samples of size indicated, prepared from the same material to be used for the Work, cured and finished in manner specified, and physically identical with the product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
 - 2. Preparation: Mount, display, or package Samples in manner specified to facilitate review of qualities indicated. Prepare Samples to match Architect's sample where so indicated. Attach label on unexposed side that includes the following:
 - a. Generic description of Sample.
 - b. Product name or name of manufacturer.
 - c. Sample source.
 - d. Number and title of applicable Specification Section.

3. Submit Samples for review of kind, color, pattern, and texture for a final check of these characteristics with other elements and for a comparison of these characteristics between final submittal and actual component as delivered and installed.
 - a. If variation in color, pattern, texture, or other characteristic is inherent in the product represented by a Sample, submit at least three (3) sets of paired units that show approximate limits of the variations.
 - b. Refer to individual Specification Sections for requirements for Samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation, and similar construction characteristics.
4. Number of Samples: Submit three (3) sets of Samples. Architect will retain one (1) Sample set; remainder will be returned to be retained at project site.
 - a. Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
5. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
 - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
 - b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.

E. Delegated-Design Services:

1. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
 - a. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.
2. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally-signed PDF electronic file and three (3) paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
 - a. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

- F. Application for Payment: Comply with requirements in Division 01 Section "Payment Procedures."

2.3 INFORMATIONAL SUBMITTALS

- A. General: Prepare and submit Informational Submittals required by other Specification Sections.

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1. Number of Copies: Submit two (2) copies of each submittal, unless otherwise indicated. Architect will not return copies.
 2. Certificates and Certifications: Provide a notarized statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
- B. Schedule of Values: Comply with requirements in Division 01 Section "Payment Procedures".
- C. Contractor's Construction Schedule: Comply with requirements in Division 01 Section "Progress Schedule".
- D. Submittals Schedule: Comply with requirements in Division 01 Section "Construction Progress Documentation".
- E. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
1. Name, address, and telephone number of entity performing subcontract or supplying products.
 2. Number and title of related Specification Section(s) covered by subcontract.
 3. Drawing number and detail references, as appropriate, covered by subcontract.
- F. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- G. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer. Include the following, as applicable:
1. Preparation of substrates.
 2. Required substrate tolerances.
 3. Sequence of installation or erection.
 4. Required installation tolerances.
 5. Required adjustments.
 6. Recommendations for cleaning and protection.
- H. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements.
- I. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.
- J. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements and, where required, is authorized for this specific Project.
- K. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements. Include evidence of manufacturing experience where required.

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- L. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements.
- M. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements.
- N. Preconstruction Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements.
- O. Compatibility Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- P. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements.
- Q. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- R. Research/Evaluation Reports: Prepare written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
 - 1. Name of evaluation organization.
 - 2. Date of evaluation.
 - 3. Time period when report is in effect.
 - 4. Product and manufacturers' names.
 - 5. Description of product.
 - 6. Test procedures and results.
 - 7. Limitations of use.
- S. Design Data: Prepare written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.
- T. Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representative's tests and inspections. Include the following, as applicable:
 - 1. Name, address, and telephone number of factory-authorized service representative making report.
 - 2. Statement on condition of substrates and their acceptability for installation of product.
 - 3. Statement that products at Project site comply with requirements.
 - 4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.

5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 6. Statement whether conditions, products, and installation will affect warranty.
 7. Other required items indicated in individual Specification Sections.
- U. Warranties: Provide sample of special warranties required for the project.
- V. Insurance Certificates and Bonds: Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles, if any, and term of the coverage.
- 2.4 CLOSEOUT SUBMITTALS (and Maintenance Material Submittals)
- A. Comply with requirements specified in Division 01 Section "Closeout Procedures".
- B. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

- A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.
- B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S ACTION

- A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.
- B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. The Architect will attach a comment sheet that will indicate what "action" the Contractor shall take. "Actions" and review procedure will be clarified at the Preconstruction Conference.
- C. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
- D. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.
- E. Incomplete submittals are not acceptable, will be considered nonresponsive, and will be returned without review.
- F. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

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END OF SECTION 013300

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SECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The provisions of the Contract and of the Contract Documents apply to this Section.

1.2 DEFINITIONS

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect.
- C. Mockups: Full-size, physical assemblies that are constructed on-site. Mockups are used to verify selections made under sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples. Approved mockups establish the standard by which the Work will be judged.
- D. Preconstruction Testing: Tests and inspections that are performed specifically for the Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.
- E. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with industry standards.
- F. Source Quality-Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.
- G. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- I. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
 - 1. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.
- J. Experienced: When used with an entity, "experienced" means having successfully completed a minimum of five previous projects similar in size and scope to this Project; being familiar with

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special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.3 QUALITY ASSURANCE

- A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.
- F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
 - 1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.
- G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 329; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.
 - 1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
 - 2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.
- H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- I. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

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1.4 QUALITY CONTROL

- A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
 - 1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
 - 2. Payment for these services will be made by the Owner.
 - 3. Costs for retesting and re-inspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.
- B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.
 - 1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
 - 2. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
 - a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
 - 3. Notify testing agencies at least twenty-four (24) hours in advance of time when Work that requires testing or inspecting will be performed.
 - 4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
 - 5. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
 - 6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Division 01 Section "Submittal Procedures."
- D. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.
- E. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

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- F. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
 3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
 4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
 5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
 6. Do not perform any duties of Contractor.
- G. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
 4. Facilities for storage and field curing of test samples.
 5. Delivery of samples to testing agencies.
 6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
 7. Security and protection for samples and for testing and inspecting equipment at Project site.
- H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
1. Schedule times for tests, inspections, obtaining samples, and similar activities.

1.5 SPECIAL TESTS AND INSPECTIONS

- A. Special Tests and Inspections: Owner will engage a qualified special inspector to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner and as follows:
1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.
 2. Notifying Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
 3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect with copy to Contractor and to authorities having jurisdiction.
 4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.

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5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
6. Retesting and reinspecting corrected work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 014000

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SECTION 014200 - REFERENCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The provisions of the Contract and of the Contract Documents apply to this Section.

1.2 DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. "Approved": The term "approved," when used in conjunction with Architect's action on Contractor's submittals, applications, and requests, is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
- C. "Directed": Terms such as "directed," "requested," "authorized," "selected," "approved," "required," and "permitted" mean directed by Architect, requested by Architect, and similar phrases.
- D. "Indicated": The term "indicated" refers to graphic representations, notes, or schedules on Drawings; or to other paragraphs or schedules in Specifications and similar requirements in the Contract Documents. Terms such as "shown," "noted," "scheduled," and "specified" are used to help the user locate the reference.
- E. "Regulations": The term "regulations" includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. "Furnish": The term "furnish" means to supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. "Install": The term "install" or "installation" describes operations at Project site including unloading, temporary storage, examining substrate, unpacking, preparing substrate, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
- H. "Provide": The term "provide" means to furnish and install, complete and ready for the intended use.
- I. "Installer": An installer is Contractor or another entity engaged by Contractor, as an employee, subcontractor, or contractor of lower tier, to perform a particular construction operation, including installation, erection, application, and similar operations.
1. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.
- J. The term "experienced," when used with the term "installer," means having successfully completed a minimum of five (5) previous projects similar in size and scope to this Project; being familiar with the special requirements indicated; and having complied with requirements of authorities having jurisdiction.
- K. "Replace": The term "replace" means to provide an acceptable like product or material in the place of a missing or unacceptable (rejected) product or material. To "replace" an unacceptable product or material includes its removal and disposal. (The term "reinstall" shall be used to indicate reuse of the original.)

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- L. "Punch List" (AIA A201): A "punch list" is a listing of work items required by the Contract Documents which are incomplete or non-conforming. The list of observed deficiencies is compiled in the course of review to determine if the Contractor has attained Substantial Completion. It does not constitute a definitive list of remaining work items, and does not limit, amend or supersede requirements of the Contract Documents. Completion of punchlist items is a requirement to achieve Substantial Completion, in accordance with paragraph 9.8.3 of the General Conditions of the Contract for Construction.
 - M. "Project site" is the space available for performing construction activities, either exclusively or in conjunction with others performing other work as part of Project. The extent of Project site is shown on the Drawings and may or may not be identical with the description of the land on which Project is to be built.
 - N. "To Be" or "Shall Be": Where the term "To Be" or "Shall Be" is utilized in a statement to describe Work that is to be performed, the Work shall be provided as part of this Contract.
 - O. "Written," when used in conjunction with manufacturer's product handling and installation requirements means to adhere to the manufacturer's current printed and published information.
- 1.3 INDUSTRY STANDARDS
- A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
 - B. Publication Dates: Comply with standards in effect as of the date of the Contract Documents, unless otherwise indicated.
 - C. Conflicting Requirements: Where compliance with two (2) or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Architect for a decision before proceeding.
 - 1. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of the requirements. Refer uncertainties to Architect for a decision before proceeding.
 - D. Copies of Standards: Each entity engaged in construction on Project must be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
 - 1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from the publication source and make them available on request.
 - E. Abbreviations and Names: Abbreviations and acronyms are frequently used in the Specifications and other Contract Documents to represent the name of a trade association, standards-developing organization, authorities having jurisdiction, or other entity in the context of referencing a standard or publication. Where abbreviations and acronyms are used in the Specifications or other Contract Documents, they mean the recognized name of these entities. Refer to Gale Research's "Encyclopedia of Associations" or Columbia Books' "National Trade and Professional Associations of the U.S.," which are available in most libraries.

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PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 014200

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SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 SUMMARY

- A. This Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

1.3 DEFINITIONS

- A. Permanent Enclosure: As determined by Architect, permanent or temporary roofing is complete, insulated, and weathertight; exterior walls are insulated and weathertight; and all openings are closed with permanent construction or substantial temporary closures.

1.4 USE CHARGES

- A. General: Cost or use charges for temporary facilities shall be included in the Contract Sum. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Owner's construction forces, Architect, occupants of Project, testing agencies, and authorities having jurisdiction.
- B. Water Service: Water from Owner's existing water system is available for use without metering and without payment of use charges. Contractor responsible for costs to provide connections and extensions of services as required for construction operations.
- C. Electric Power Service:
 - 1. Electric power from Owner's existing system is available without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.
- D. Heat and Ventilation
 - 1. Provide temporary heat and ventilation where HVAC systems are off-line due to construction operations.
 - 2. Provide adequate forced ventilation of enclosed areas for curing of installed materials, to disperse humidity, and to prevent hazardous accumulations of dust, fumes, vapors or gases. Provide adequate ventilation during use of volatile or noxious substance.
 - 3. Portable heaters shall be standard units complete with controls.
 - 4. Pay costs of installation, maintenance, operation and removal, and for fuel consumed.
 - 5. Open flame heating equipment is not permissible under any circumstances.
- E. Internet Service: Pay ISP use charges for Internet service, for use by all parties engaged in construction, at Project site.

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1.5 PROJECT CONDITIONS

- A. Temporary Use of Permanent Facilities: Installer of each permanent service shall assume responsibility for operation, maintenance, any warranty extension and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Portable Chain-Link Fencing: Locate as indicated on drawings. Minimum 2-inch, 9-gage, galvanized steel, chain-link fabric fencing; minimum 6 feet high with galvanized steel pipe posts; minimum 2-3/8-inch-OD line posts and 2-7/8-inch-OD corner and pull posts, with 1-5/8-inch-OD top and bottom rails. Provide galvanized steel bases for supporting posts. Fencing fabric gauge and post sizes provided by fencing rental companies are acceptable to Owner.

2.2 TEMPORARY FACILITIES

- A. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.
 - 1. Store combustible materials apart from building.

2.3 EQUIPMENT

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

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

3.2 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service.
 - 1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.
 - 1. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.
- C. Water Service: Use of Owner's existing water service facilities will be permitted, as long as facilities are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.

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1. Where installations below an outlet might be damaged by spillage or leakage, provide a drip pan of suitable size to minimize water damage. Drain accumulated water promptly from pans.
- D. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
 1. Toilets: Use of Owner's existing toilet facilities will **not** be permitted.
- E. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.
 1. Connect temporary service to Owner's existing power source only for work in existing building, as directed by Owner.

3.3 SUPPORT FACILITIES INSTALLATION

- A. General: Comply with the following:
 1. Provide incombustible construction for offices, shops, and sheds located within construction area or within 30 feet (9 m) of building lines. Comply with NFPA 241.
 2. Maintain support facilities until near Substantial Completion. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.
- B. Traffic Controls: Comply with requirements of authorities having jurisdiction.
 1. Protect existing site improvements to remain including curbs, pavement, and utilities.
 2. Maintain access for fire-fighting equipment and access to fire hydrants.
- C. Parking: Use parking areas for construction personnel at areas designated by Owner at Pre-construction Conference.
- D. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with Division 1 Section "Execution Requirements" for progress cleaning requirements.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
 1. Comply with work restrictions specified in Division 1 Section "Summary."
- B. Temporary Erosion and Sedimentation Control: Comply with requirements specified in Divisions 2, 31, and 32 Sections and on Civil Drawings.
- C. Stormwater Control: Comply with authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.

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- D. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.
- E. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.
 - 1. Extent of Fence: As indicated on Drawings.
 - 2. Maintain security by limiting number of keys and restricting distribution to authorized personnel.
- F. Security Enclosure and Lockup: Install substantial temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security.
- G. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

3.5 OPERATION, TERMINATION, AND REMOVAL

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

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END OF SECTION 015000

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SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and equivalent products.

1.3 DEFINITIONS

- A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material", "equipment", "system", and terms of similar intent.
 - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
 - 2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
 - 3. Equivalent Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product" or "basis-of-design standard", including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating equivalent products of additional manufacturers named in the specification.

1.4 ACTION SUBMITTALS

- A. Equivalent Product Requests: Submit request for consideration of each equivalent product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Include data to indicate compliance with the requirements specified in "Equivalent Products" Article.
 - 2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a equivalent product request. Architect will notify Contractor of approval or rejection of proposed equivalent product request..

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- a. Form of Approval: As specified in Division 01 Section "Submittal Procedures".
 - b. Use product specified if Architect does not issue a decision on use of a equivalent product request within time allocated.
 - B. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 01 Section "Submittal Procedures". Show compliance with requirements.
- 1.5 QUALITY ASSURANCE
- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.
- 1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING
- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.
 - B. Delivery and Handling:
 - 1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
 - 2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
 - 3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
 - 4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.
 - C. Storage:
 - 1. Store products to allow for inspection and measurement of quantity or counting of units.
 - 2. Store materials in a manner that will not endanger Project structure.
 - 3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
 - 4. Store foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
 - 5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
 - 6. Protect stored products from damage and liquids from freezing.
 - 7. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces, if any. Coordinate location with Owner.

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1.7 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
 - 1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
 - 2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.
 - 1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
 - 2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
 - 3. Refer to Divisions 02 through 33. Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Division 01 Section "Closeout Procedures".

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
 - 1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
 - 2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
 - 3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
 - 4. Where products are accompanied by the term "as selected", Architect will make selection.
 - 5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
 - 6. Or Equal: For products specified by name and accompanied by the term "or equal", or "or approved equal" or "or approved" comply with requirements in "Equivalent Products" Article to obtain approval for use of an unnamed product.
- B. Product Selection Procedures:
 - 1. Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Equivalent products or substitutions for

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Contractor's convenience will only be considered in accordance with Division 01 Section "Substitution Procedures".

2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Equivalent products or substitutions for Contractor's convenience will only be considered in accordance with Division 01 Section "Substitution Procedures".
 3. Products:
 - a. Restricted List: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Equivalent products or substitutions for Contractor's convenience will only be considered in accordance with Division 01 Section "Substitution Procedures".
 - b. Non-restricted List: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with requirements in "Equivalent Products" Article for consideration of an unnamed product.
 4. Manufacturers:
 - a. Restricted List: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Equivalent products or substitutions for Contractor's convenience will only be considered in accordance with Division 01 Section "Substitution Procedures".
 - b. Non-restricted List: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, that complies with requirements. Comply with requirements in "Equivalent Products" Article for consideration of an unnamed manufacturer's product.
 5. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a equivalent product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Equivalent Products" Article for consideration of an unnamed product by one of the other named manufacturers.
- C. Visual Matching Specification: Where Specifications require "match Architect's sample", provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Division 01 Section "Substitution Procedures" for proposal of product.
- D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with

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requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 EQUIVALENT PRODUCTS

A. Conditions for Consideration: Architect will consider Contractor's request for an equivalent product when all of the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:

1. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is equivalent with other portions of the Work.
2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
3. Evidence that proposed product provides specified warranty.
4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
5. Samples, if requested.

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000

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SECTION 017300 – EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 SUMMARY

- A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:
 - 1. Construction layout.
 - 2. Field engineering and surveying.
 - 3. Installation of the Work.
 - 4. Cutting and patching.
 - 5. Progress cleaning.
 - 6. Starting and adjusting.
 - 7. Protection of installed construction.
 - 8. Correction of the Work.

1.3 DEFINITIONS

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of other work.
- B. Patching: Fitting and repair work required to restore construction to original conditions after installation of other work.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For land surveyor.
- B. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.

1.5 QUALITY ASSURANCE

- A. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
 - 1. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from the Architect before proceeding. Shore, brace, and support structural element during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection
 - 2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operational elements include, but are not limited to, the following:
 - a. Primary operational systems and equipment.

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- b. Fire separation assemblies.
 - c. Air or smoke barriers.
 - d. Fire-suppression systems.
 - e. Mechanical systems piping and ducts.
 - f. Control systems.
 - g. Communication systems.
 - h. Conveying systems.
 - i. Electrical wiring systems.
 - j. Operating systems of special construction.
- 3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Other construction elements include, but are not limited to, the following:
 - a. Water, moisture, or vapor barriers.
 - b. Membranes and flashings.
 - c. Exterior curtain-wall construction.
 - d. Equipment supports.
 - e. Piping, ductwork, vessels, and equipment.
 - f. Noise- and vibration-control elements and systems.
- 4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
 - a. Restrict cutting and patching of existing brick masonry indicated to remain to areas and methods approved by Architect.
- B. Manufacturer's Installation Instructions: Comply with manufacturer's current printed and published (written) instructions and recommendations for storing and installing products and equipment in applications indicated. Maintain copies on-site.

1.6 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections.
 - 1. For all battery-operated devices, provide batteries rated for operation for at least one year.
- B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

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1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to the Architect for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
 1. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
 2. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
 3. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
 4. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Existing Utility Information: Furnish information to local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Field Measurements: **Take field measurements as required to fit the Work properly. Recheck measurements before installing each product.** Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of the Contractor, submit a request for information to Architect according to requirements in Division 01 Section "Project Management and Coordination."
- E. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages in the construction.
- F. Coordinate delivery of items to Project site.

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3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.
- B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.
 - 1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
 - 2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
 - 3. Inform installers of lines and levels to which they must comply.
 - 4. Check the location, level and plumb, of every major element as the Work progresses.
 - 5. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
 - 6. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.
- D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
- E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

3.4 FIELD ENGINEERING

- A. Identification: Owner will identify existing benchmarks, control points, and property corners.
- B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
 - 1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.
 - 2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.
- C. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
 - 1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.

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2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

3.5 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
 1. Make vertical work plumb and make horizontal work level.
 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
 4. Maintain minimum headroom clearance of 96 inches in occupied spaces and 90 inches in unoccupied spaces.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
 1. Where batteries are not provided with battery-operated devices, install batteries.
- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- F. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- G. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
 2. Allow for building movement, including thermal expansion and contraction.
 3. Coordinate installation of anchorages. 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.
- H. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

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3.6 CUTTING AND PATCHING

- A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
 - 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Temporary Support: Provide temporary support of work to be cut.
- C. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- D. Adjacent Occupied Areas: Where interference with use of adjacent occupied areas or interruption of free passage to adjacent occupied areas is unavoidable, coordinate cutting and patching in accordance with requirements of Division 01 Section "Summary."
- E. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.
- F. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
 - 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 - 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 - 3. Concrete: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 - 4. Masonry: Remove existing brick in whole units using hand tools. Minimize disturbance of existing masonry indicated to remain.
 - 5. Excavating and Backfilling: Comply with requirements in applicable Division 31 Sections where required by cutting and patching operations.
 - 6. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
 - 7. Proceed with patching after construction operations requiring cutting are complete.
 - 8. New Masonry Openings: Cut back existing masonry for new openings; remove whole masonry units to suit opening size indicated. Cut masonry unit jambs are not acceptable. Do not remove excessive amounts of existing masonry.
 - 9. Pattern Finishes: Carefully cut the existing finish material to a joint, pattern line, or similar feature to help hide patching work.
- G. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.

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1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.
 - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
 - b. Restore damaged pipe covering to its original condition.
 3. Remove miscellaneous hangers, exposed nails not serving as fasteners, and similar protrusions; remove adhesive residue and tape; fill anchorage holes; and otherwise patch and restore surface to be a uniform substrate suitable for applied finishes.
 4. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
 - a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
 5. New Masonry Openings: Tooth in new matching masonry to build opening size required. Incorporate new lintel where required.
 6. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
 7. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.
 8. Concrete Floor to Receive Terrazzo Flooring: Concrete shall be cured for a minimum of 28 days. Do not use curing agents. Locate construction and control joints in concrete to align with joint and divider locations indicated on terrazzo floor pattern drawing.
 - a. Substrate Tolerance: Concrete sub-floor shall be level with a maximum variation from level of 1/8-inch in 10 feet.
 9. Terrazzo and Other Multi-Component Finishes: Match components, including, but not limited to, metal strips, cement, stone chips, flecks, and matrix. Grind, polish, seal, coat, and otherwise finish to match the texture and surface of adjacent finish and blend as approved by the Architect.
 10. Tile: Match tile, grout, and accessories and blend to adjacent work as approved by the Architect.
 11. Roof Penetrations: Patch roof in a manner that restores enclosure to a weathertight condition. Patch existing roof openings removed from service. Provide water-tight penetrations and flashing at new roof openings. Cut and patch roofing by methods and with materials so as not to void existing warranties.
- H. Existing Concrete Floor Surface: Provide trowelable leveling and patching compounds. Compounds shall be latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated. Coordinate with

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Division 09 flooring specifications. Prepare concrete substrate in accordance with manufacturer's printed and published instructions, including shot-blasting the substrate, to ensure proper adhesion of the leveling and patching compounds.

- I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.7 OWNER-INSTALLED PRODUCTS

- A. Site Access: Provide access to Project site for Owner's construction personnel.
- B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel.
 1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
 2. Preinstallation Conferences: Include Owner's construction personnel at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.

3.8 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.
 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
 - a. Utilize containers intended for holding waste materials of type to be stored.
 4. Coordinate progress cleaning for joint-use areas where more than one installer has worked.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
 1. Remove liquid spills promptly.
 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

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- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Division 01 Section "Construction Waste Management and Disposal."
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure, including silica, during the construction period.

3.9 STARTING AND ADJUSTING

- A. Coordinate startup and adjusting of equipment and operating components with requirements in Division 01 Section "General Commissioning Requirements."
- B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment. Replace failing batteries.
- E. Manufacturer's Field Service: Comply with qualification requirements in Division 01 Section "Quality Requirements."

3.10 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.11 CORRECTION OF THE WORK

- A. Repair or remove and replace defective construction. Restore damaged substrates and finishes.
 - 1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
- B. Restore permanent facilities used during construction to their specified condition.
- C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

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- D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.
- E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 017300

SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Provisions of the Contract and of the Contract Documents apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
 - 1. Substantial Completion procedures.
 - 2. Final completion procedures.
 - 3. Project Record Documents.
 - 4. Operation and maintenance manuals.
 - 5. Warranties.
 - 6. Instruction of Owner's personnel.
 - 7. Final cleaning.

1.3 ACTION SUBMITTALS

- A. Product Data: For cleaning agents.
- B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.
- C. Certified List of Incomplete Items: Final submittal at Final Completion.

1.4 CLOSEOUT SUBMITTALS

- A. Certificates of Release: From authorities having jurisdiction.
- B. Certificate of Insurance: For continuing coverage.
- C. Field Report: For pest control inspection.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

1.6 ABOVE-CEILING WORK:

- A. Complete above-ceiling work prior to installation of finish ceilings. Coordinate with Owner's third-party contractors, such as data network and security systems, if any.
- B. Complete or correct deficiencies, if any, noted by Architect, Owner and local authorities having jurisdiction or confirm with Architect that any such deficiencies may be completed or corrected at a later date without obstructing installation of ceilings.
- C. Coordinate with local authorities having jurisdiction to obtain required above-ceiling reviews. Complete or correct above-ceiling work to comply with directives issued by the reviewing au-

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thorities. Upon completion/correction, certify in writing that all the items cited by reviewing authority have been completed/corrected and submit copies to the local authority, Owner, and Architect.

- D. Following completion of Items A, B and C above, the ceiling may be "enclosed". Coordinate installation of acoustical ceiling hold-down clips, if any, with late stage activities such as HVAC testing and balancing and data network testing.

1.7 SUBSTANTIAL COMPLETION PROCEDURES

- A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete. Substantial Completion shall be for entire scope of Work (for example, both building and sitework) unless Owner has previously agreed to an alternative arrangement.
- B. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.
1. Submit written confirmation that all LEED submittals have been completed in accordance with Division 1 sections "Submittal Procedures" and "Sustainable Design Requirements."
- C. Submittals Prior to Substantial Completion: Complete the following a minimum of ten (10) days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
 3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Architect. Label with manufacturer's name and model number where applicable.
 - a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain signature of Owner's agent for receipt of submittals.
 5. Submit test/adjust/balance records.
 6. Submit sustainable design submittals required in Division 01 Section "Sustainable Design Requirements" and in individual Sections.
 7. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

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- D. Procedures Prior to Substantial Completion: Complete the following a minimum of ten (10) days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
1. Advise Owner of pending insurance changeover requirements.
 2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
 3. Complete startup and testing of systems and equipment. Demonstrate that air and water systems are balanced and that automatic temperature control system is in control of all equipment as indicated. This may require separate demonstrations if controls cannot be tested for applicable seasons of the year.
 4. Submit written certification that all special inspections have been completed.
 5. Submit written certification that all Building Commissioning has been completed, and as required by the appropriate Sections.
 6. Submit written certification that testing/adjusting/balancing operations have been completed, and that systems are operational and under control in conformance with requirements of Division 01.
 7. Submit written certification that all Sustainable Design submittals have been completed in accordance with Division 1 sections "Submittal Procedures" and "Sustainable Design Requirements."
 8. Perform preventive maintenance on equipment used prior to Substantial Completion.
 9. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings.
 10. Advise Owner of changeover in heat and other utilities.
 11. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
 12. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 13. Complete final cleaning requirements, including touchup painting.
 14. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- E. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of ten (10) days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.
1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
 2. Results of completed inspection will form the basis of requirements for final completion.

1.8 FINAL COMPLETION

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- A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:
 - 1. Submit a final Application for Payment according to Division 01 Section "Payment Procedures."
 - 2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
 - 3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 - 4. Submit pest-control final inspection report.
- B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of ten (10) days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
 - 1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.9 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Preparation: Submit three copies of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction. Use CSI Form 14.1A.
 - 1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding interior in numbered order of Architect's finish schedule.
 - 2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
 - 3. Include the following information at the top of each page:
 - a. Project name.
 - b. Date.
 - c. Name of Architect .
 - d. Name of Contractor.
 - e. Page number.

1.10 FINAL INSPECTION AND PUNCH LIST:

- A. The contract has an established contract completion date. In order to avoid the assessment of liquidated damages, the contractor shall request in writing to the Architect/Engineer a final inspection on or prior to the established completion date. The contractor shall certify that all construction/installation is complete and has been checked out and is operating as designed. The Architect/Engineer shall notify the Owner in writing that the job is ready for inspection.

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- B. The Architect/Engineer, Construction Manager, contractor, and all sub-contractors associated with the construction/installation of the building equipment shall be present during the final inspection to demonstrate the proper operations of the equipment. Removal/replacement of necessary covers for inspection shall be conducted by the contractor.
- C. At the time of inspection, should the architect/engineer and Owner's Representatives determine that the construction/installation is less than 100 percent complete to the extent that a re-inspection will be required, the inspection will cease and a charge will be assessed by the Owner against the Contractor, for costs associated with re-inspection requirements and for delays incurred as a result of failure to complete the punch list.

1.11 FINAL PUNCH LIST ITEMS:

- A. The contractor and sub-contractors shall have fourteen (14) calendar days from the date of final inspection to complete the repair of any and all items listed on the final punch list.
- B. If the contractor or his sub-contractor fails to complete all items on the final inspection punch list within the allocated fourteen (14) calendar days, liquidated damages in the amount specified by the contract will be assessed retroactive to the contract completion date and will continue until all items on the punch list are completed. (Only exception shall be by recommendation of the Architect/Engineer and/or Construction Manager, and approval by the Owner, that lack of completion was due to circumstances beyond the control of the Contractor.)

1.12 PROJECT RECORD DOCUMENTS

- A. General: Do not use Project Record Documents for construction purposes. Protect Project Record Documents from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.
- B. Record Drawings: Maintain and submit one (1) set of red-line white prints of Contract Drawings and Shop Drawings. In addition, submit one (1) PDF of the Record Drawings.
 - 1. Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.
 - a. Give particular attention to information on concealed elements that cannot be readily identified and recorded later.
 - b. Accurately record information in an understandable drawing technique.
 - c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
 - d. Mark Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. Where the Shop Drawings are marked, show cross-reference on Contract Drawings.
 - e. Specifically indicate and dimension all exterior underground conduits (or direct burial wiring), pullboxes, under slab panelboard, motor control center feeders,

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manholes, and future connection points. Dimension from a readily identifiable and accessible wall or corner of the building, or column.

- f. Specifically indicate and dimension all underground utilities, including water, sewer, and gas (except branch piping to individual fixtures), including tanks, separators, cleanouts, valves, future connection points, and manholes (including actual manhole inverts and depths below grade of other items). Dimension from a readily identifiable and accessible wall or corner of the building, or column.
 2. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at the same location.
 3. Mark important additional information that was either shown schematically or omitted from original Drawings.
 4. Note Field Clarifications, RFI's, PCO's, Construction Change Directive numbers, Change Order numbers, alternate numbers, and similar identification where applicable.
 5. Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location. Organize into manageable sets; bind each set with durable paper cover sheets. Include identification on cover sheets.
- C. Record Specifications: Not required for project.
- D. Record Product Data: Not required for project.
- E. Miscellaneous Record Submittals: Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

1.13 OPERATION AND MAINTENANCE MANUALS

- A. Assemble a complete set of operation and maintenance data indicating the operation and maintenance of each system, subsystem, and piece of equipment not part of a system. Include operation and maintenance data required in individual Specification Sections and as follows:
1. Operation Data:
 - a. Emergency instructions and procedures.
 - b. System, subsystem, and equipment descriptions, including operating standards.
 - c. Operating procedures, including startup, shutdown, seasonal, and weekend operations.
 - d. Description of controls and sequence of operations.
 - e. Piping diagrams.
 2. Maintenance Data:
 - a. Manufacturer's information, including list of spare parts.
 - b. Name, address, and telephone number of Installer or supplier.
 - c. Maintenance procedures.
 - d. Maintenance and service schedules for preventive and routine maintenance.
 - e. Maintenance record forms.
 - f. Sources of spare parts and maintenance materials.
 - g. Copies of maintenance service agreements.

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- h. Copies of warranties and bonds.
 - 3. Maintenance Schedule: For all Divisions 21, 22, 23, and Division 26 items of equipment, provide an Excel Spreadsheet (inserted in Manual and separately on disk) with the following information for each item of equipment as applicable:
 - a. Designation (from Documents)
 - b. Equipment tag ID
 - c. Location
 - d. Area served
 - e. Manufacturer and model number
 - f. Index location within O&M
 - g. Type of maintenance recommended by manufacturer, including frequency
 - h. Sheave and belt information, including manufacturer's replacement numbers
 - i. Name, address and telephone number of nearest authorized factory representative.
 - 4. Approved Submittal: For each Division 22, 23 and Division 26 item of equipment information, provide legible copy of the final approved submittal.
 - B. Organize operation and maintenance manuals into suitable sets of manageable size. Bind and index data in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, with pocket inside the covers to receive folded oversized sheets. Identify each binder on front and spine with the printed title "OPERATION AND MAINTENANCE MANUAL," Project name, and subject matter of contents.
 - C. Recommended Procedure: Prepare maintenance manuals immediately following final submittal acceptance and submit to the Architect/Engineer for review, unless otherwise indicated. Incorporate comments, if any, and resubmit to Architect/Engineer. Provide triplicate sets (once approvals have been obtained) to the Owner.
 - D. All Operation and Maintenance Manuals shall be submitted at 50 percent construction completion for A/E review, comments, and corrections. Corrections shall be made and resubmitted no later than 60 days prior to Substantial Completion.
- 1.14 WARRANTIES
- A. Submittal Time: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.
 - B. Partial Occupancy (Phased Completion and Occupancy): Submit properly executed warranties within 15 days of completion of all designated portions of the Work that are completed in its entirety and occupied or used by Owner during construction period by separate agreement with Contractor, unless otherwise indicated. Warranty coverage period shall commence when all Work , including all Phased construction, is complete. Interim warranties is not acceptable.
 - C. Organize warranty documents into an orderly sequence based on the Project Manual table of contents.
 - 1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-inch by-11-inch paper.

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2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
 3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
- D. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.
 1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

PART 3 - EXECUTION

3.1 FINAL CLEANING

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

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weathering of exterior surfaces. Restore reflective surfaces to their original condition.

- g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 - h. Sweep concrete floors broom clean in unoccupied spaces.
 - i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
 - j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
 - k. Remove labels that are not permanent.
 - l. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - m. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
 - n. Replace disposable air filters and clean permanent air filters. Filtration media installed at the end of construction shall have a Minimum Efficiency Reporting Value (MERV) of 13. Coordinate filter replacement with the Division 1 Section "Indoor Air Quality Requirements". Clean exposed surfaces of diffusers, registers, and grilles.
 - o. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.
 - 1) Clean HVAC system in compliance with NADCA Standard 1992-01. Provide written report on completion of cleaning.
 - 2) No HVAC operation shall take place without filters, use temporary filters. All temporary filters shall be provided by the General Contractor. Dispose of and replace any temporary and permanent filters during construction. The use of "cleaned filters" is not acceptable.
 - p. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
 - q. Leave Project clean and ready for occupancy.
- C. Pest Control: Comply with pest control requirements in Division 1 Section "Temporary Facilities and Controls." Prepare written report.
- D. Construction Waste Disposal: Comply with waste disposal requirements in Division 1 Section "Construction Waste Management and Disposal."

3.2 REPAIR OF THE WORK

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

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

1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that already show evidence of repair or restoration.
 - a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.
3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

END OF SECTION 017700

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SECTION 024113 – SELECTIVE SITE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Demolition and removal of structures.
 - 2. Demolition and removal of site improvements.
 - 3. Disconnecting, capping or sealing, and abandoning site utilities in place.
 - 4. Disconnecting, capping or sealing, and removing site utilities.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 01, Section "Cutting and Patching" for cutting and patching procedures for demolition operations.
 - 2. Division 01, Section "Construction Progress Documentation" for demolition schedule requirements.
 - 3. Division 01, Section "Temporary Facilities and Controls" for temporary utilities, temporary construction and support facilities, temporary security and protection facilities, and environmental protection measures for demolition operations.
 - 4. Division 01, Section "Closeout Procedures" for record document requirements.
 - 5. Division 31, Section "Site Clearing" for site clearing and removing above- and below-grade improvements.
 - 6. Division 31, Section "Earthwork" for soil materials, excavating, backfilling, and site grading.

1.2 DEFINITIONS

- A. Remove: Remove and legally dispose of items except those indicated to be reinstalled, salvaged, or to remain the Owner's property.
- B. Remove and Salvage: Items indicated to be removed and salvaged remain the Owner's property. Remove, clean, and pack or crate items to protect against damage. Identify contents of containers and deliver to Owner's designated storage area.
- C. Remove and Reinstall: Remove items indicated; clean, service, and otherwise prepare them for reuse; store and protect against damage. Reinstall items in locations indicated.
- D. Existing to Remain: Protect construction indicated to remain against damage and soiling during demolition. When permitted by the Architect, items may be removed to a suitable, protected storage location during demolition and then cleaned and reinstalled in their original locations.

1.3 MATERIALS OWNERSHIP

- A. Except for items or materials indicated to be reused, salvaged, or otherwise indicated to remain the Owner's property, demolished materials shall become the Contractor's property and shall be removed from the site with further disposition at the Contractor's option.

1.4 SUBMITTALS

- A. Proposed dust-control measures.
- B. Schedule of demolition activities indicating the following:
 - 1. Detailed sequence of demolition and removal work, with starting and ending dates for each activity.

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- 2. Dates for shutoff, capping, and continuation of utility services.
- C. Inventory of items to be removed and salvaged.
- D. Record drawings at Project closeout according to Division 01, Section "Closeout Procedures."
 - 1. Identify and accurately locate capped utilities and other subsurface structural, electrical, or mechanical conditions.

1.5 QUALITY ASSURANCE

- A. Demolition Firm Qualifications: Engage an experienced firm that has successfully completed demolition Work similar to that indicated for this Project.
- B. Regulatory Requirements: Comply with governing EPA notification regulations before starting demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

1.6 PROJECT CONDITIONS

- A. Asbestos: It is not expected that asbestos will be encountered in the course of this Contract. If any materials suspected of containing asbestos are encountered, do not disturb the materials. Immediately notify the Architect and the Owner.
 - 1. Asbestos will be removed by Owner before start of Work.
- B. Storage or sale of removed items or materials on-site will not be permitted.

1.7 SCHEDULING

- A. Arrange demolition schedule so as not to interfere with Owner's on-site operations.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped.
- B. Survey existing conditions and correlate with requirements indicated to determine extent of demolition required.
- C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.
- D. Perform surveys as the Work progresses to detect hazards resulting from demolition activities.

3.2 UTILITY SERVICES

- A. Maintain existing utilities indicated to remain in service and protect them against damage during demolition operations.
 - 1. Do not interrupt existing utilities serving occupied or operating facilities, except when authorized in writing by Owner and authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and to governing authorities.
 - a. Provide not less than 72 hours' notice to Owner if shutdown of service is required during changeover.
- B. Owner will arrange for disconnecting and sealing indicated utilities serving structures to be demolished before start of demolition work, when requested by Contractor.
- C. Utility Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services serving structures to be demolished.

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1. Owner will arrange to shut off indicated utilities when requested by Contractor.
 2. Arrange to shut off indicated utilities with utility companies.
- D. Utility Requirements: Refer to Division 22 and 26 Sections for shutting off, disconnecting, removing, and sealing or capping utility services. Do not start demolition work until utility disconnecting and sealing have been completed and verified in writing.

3.3 PREPARATION

- A. Drain, purge, or otherwise remove, collect, and dispose of chemicals, gases, explosives, acids, flammables, or other dangerous materials before proceeding with demolition operations.
- B. Conduct demolition operations and remove debris to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.
 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.
- C. Conduct demolition operations to prevent injury to people and damage to adjacent buildings and facilities to remain. Ensure safe passage of people around demolition area.
 1. Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction.
 2. Protect existing site improvements, appurtenances, and landscaping to remain.
 3. Erect a plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain.

3.4 EXPLOSIVES

- A. Explosives: Use of explosives will not be permitted.

3.5 POLLUTION CONTROLS

- A. Use water mist, temporary enclosures, and other suitable methods to limit the spread of dust and dirt. Comply with governing environmental protection regulations.
 1. Do not create hazardous or objectionable conditions, such as ice, flooding, and pollution, when using water.
- B. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- C. Clean adjacent buildings and improvements of dust, dirt, and debris caused by demolition operations. Return adjacent areas to condition existing before start of demolition.

3.6 DEMOLITION

- A. NOT USED
- B. Damages: Promptly repair damages to adjacent facilities caused by demolition operations.

3.7 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.
- B. Burning: Do not burn demolished materials.
- C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

END OF SECTION 024113

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SECTION 310000 - EARTHWORK

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Stripping and stockpiling of topsoil.
2. Preparing subgrades for slabs-on-grade, walks, pavements, lawns, and plantings.
3. Excavating and backfilling for buildings and structures.
4. Drainage course for slabs-on-grade.
5. Subbase course for concrete walks and pavements.
6. Base course for asphalt paving.
7. Subsurface drainage backfill for walls and trenches.
8. Excavating and backfilling trenches within building lines.
9. Excavating and backfilling trenches for buried mechanical and electrical utilities and pits for buried utility structures.
10. Topsoil respreading.

B. Related Sections include the following:

1. Division 01, Section "Temporary Facilities and Controls" for requirements related to dewatering.
2. Division 31, Section "Temporary Erosion and Sedimentation Control" for erosion control requirements during earthwork operations.
3. Division 31, Section "Site Clearing" for site stripping, grubbing, and protecting trees to remain.

1.2 UNIT PRICES

A. Rock and Unsatisfactory Soil Measurement: Volume of material actually removed, measured in original position, but not to exceed the following:

1. 24 inches outside of concrete forms other than at footings.
2. 12 inches outside of concrete forms at footings.
3. 6 inches outside of minimum required dimensions of concrete cast against grade.
4. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
5. 6 inches beneath bottom of concrete slabs on grade.
6. 6 inches beneath pipe in trenches, and the greater of 24 inches wider than pipe or 42 inches wide.
7. Other limits of measurement as approved in advance by the Engineer.

B. Unit prices for rock excavation and unsatisfactory soils excavation include excavation and removal of the material from the site and replacement with approved materials.

1.3 DEFINITIONS

A. Backfill: Soil materials used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Layer placed between the subbase course and asphalt paving.

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- C. Bedding Course: Layer placed over the excavated subgrade in a trench before laying pipe.
- D. Borrow: Satisfactory soil imported from off-site for use as fill or backfill.
- E. Drainage Course: Layer supporting slab-on-grade used to minimize capillary flow of pore water.
- F. Excavation: Removal of material encountered above subgrade elevations.
 - 1. Additional Excavation: Excavation below subgrade elevations as directed by Engineer. Additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
 - 2. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated dimensions without direction by Engineer. Unauthorized excavation, as well as remedial work directed by Engineer, shall be without additional compensation.
- G. Fill: Soil materials used to raise existing grades.
- H. Rock: Rock material in beds, ledges, unstratified masses, and conglomerate deposits and boulders of rock material exceeding 1 cu. yd. for bulk excavation or 3/4 cu. yd. for footing, trench, and pit excavation that cannot be removed by rock excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted:
 - 1. Rock Excavation, Trench: Late-model, track-mounted hydraulic excavator; equivalent to Caterpillar Model N, 235D LC; measured according to SAE J-1179.
 - 2. Rock Excavation, Mass: Late-model, track-mounted loader with a hydraulically operated power ripper; equivalent to Caterpillar Model No. D-8N, Heavy Duty; measured according to SAE J-732.
 - 3. This classification does not include materials such as loose rock, concrete, or other materials that can be removed by means other than drilling and blasting, but which for any reason, such as economic reasons, the Contractor chooses to remove by drilling and blasting.
- I. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
- J. Subbase Course: Layer placed between the subgrade and base course for asphalt paving, or layer placed between the subgrade and a concrete pavement or walk.
- K. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.
- L. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; 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 more than 2 inches in diameter; and free of weeds, roots, and other deleterious materials.
- M. Unsatisfactory Soils: Soils located below the design subgrade elevation and in excess of the topsoil striping, which are determined unsatisfactory by the geotechnical engineer.
- N. Utilities include on-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.4 MATERIALS OWNERSHIP

- A. Materials indicated to be stockpiled are the Owner's property and shall remain on site.
- B. Unsatisfactory soil, excess topsoil and rock shall be wasted on-site in a location designated by Owner and/or Engineer.

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1.5 SUBMITTALS

- A. Product Data: For the following:
 - 1. Drainage fabric
 - 2. Geosynthetics
- B. Test Reports: Submit test reports indicating suitability of all materials proposed to be supplied from offsite.

1.6 QUALITY ASSURANCE

- A. Pre-Excavation Conference: Conduct conference at Project site to comply with requirements in Division 01, Section "Project Management and Coordination."

1.7 PROJECT CONDITIONS

- A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Engineer and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1. Notify Engineer not less than three days in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without Engineer's written permission.
 - 3. Contact utility locator service for area where Project is located before excavating.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
- B. Satisfactory Soils: Soil Classification [Groups GW, GP, GM, SW, SP, and SM according to ASTM D 2487] [Groups A-1, A-2-4, A-2-5, and A-3 according to AASHTO M 145], or a combination of these groups; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
 - 1. Liquid Limit: Less than 50.
 - 2. Plasticity Index: Less than 30.
- C. Unsatisfactory Soils: Soil Classification [Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487] [Groups A-2-6, A-2-7, A-4, A-5, A-6, and A-7 according to AASHTO M 145], or a combination of these groups.
 - 1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.
- D. Backfill and Fill: Satisfactory soil materials.
- E. Subbase: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2- inch sieve and not more than 12 percent passing a No. 200 sieve and meeting SCDOT standard specifications.
- F. Base: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 95 percent passing a 1-1/2-inch sieve and not more than 8 percent passing a No. 200 sieve and meeting SCDOT standard specifications for "Aggregate Base Course."
- G. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.

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- H. Bedding: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.
- I. Structural Fill and Backfill: Inorganic soil with a maximum particle size of no more than 3 inches, plasticity index of 20 or less, and maximum dry density of at least 90 pounds per cubic foot when tested by the Standard Proctor Method (ASTM D 698).

2.2 ACCESSORIES

- A. Detectable Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, minimum 6 inches wide and 4 mils thick, continuously inscribed with a description of utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored as follows:
 - 1. Red: Electric.
 - 2. Yellow: Gas, oil, steam, and dangerous materials.
 - 3. Orange: Telephone and other communications.
 - 4. Blue: Water systems.
 - 5. Green: Sewer systems.
 - 6. Use warning tape type and color as directed by Utility Agencies having jurisdiction where applicable.
- B. Drainage Fabric: Nonwoven geotextile, specifically manufactured as a drainage geotextile; made from polyolefins, polyesters, or polyamides; and with the following minimum properties determined according to ASTM D 4759 and referenced standard test methods:
 - 1. Grab Tensile Strength: 110 lbf; ASTM D 4632.
 - 2. Tear Strength: 40 lbf; ASTM D 4533.
 - 3. Puncture Resistance: 50 lbf; ASTM D 4833.
 - 4. Water Flow Rate: 150 gpm per sq. ft.; ASTM D 4491.
 - 5. Apparent Opening Size: No. 50; ASTM D 4751.

2.3 SOURCE QUALITY CONTROL

- A. Test all off-site materials used for suitability under requirements of this section.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
- B. Protect subgrades and foundation soils against freezing temperatures or frost. Provide protective insulating materials as necessary.
- C. Provide 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.

3.2 DEWATERING

- A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

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- B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
 - 1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.
 - 2. Install a dewatering system to keep subgrades dry and convey ground water away from excavations. Maintain until dewatering is no longer required.

3.3 EXPLOSIVES

- A. Explosives: Do not use explosives.

3.4 TOPSOIL STRIPPING

- A. Remove sod and grass before stripping topsoil.
- B. Strip topsoil to whatever depths are encountered in a manner to prevent intermingling with underlying subsoil or other waste materials.
 - 1. Strip surface soil of unsuitable topsoil, including trash, debris, weeds, roots, and other waste materials.
 - 2. Stockpile surplus topsoil and allow for re-spreading deeper topsoil.

3.5 EXCAVATION, GENERAL

- A. Classified Excavation: Excavation to subgrade elevations regardless of the character of surface and subsurface conditions encountered, including rock, soil materials, and obstructions.
 - 1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

3.6 EXCAVATION FOR STRUCTURES

- A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. Extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
 - 1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
 - 2. Excavation for Underground Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch. Do not disturb bottom of excavations intended for bearing surface.

3.7 EXCAVATION FOR WALKS AND PAVEMENTS

- A. Excavate surfaces under walks and pavements to indicated cross sections, elevations, and grades.

3.8 EXCAVATION FOR UTILITY TRENCHES

- A. Excavate trenches to indicated gradients, lines, depths, and elevations.
- B. Excavate trenches to uniform widths to provide a working clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit, unless otherwise indicated.
 - 1. Clearance: 12 inches on each side of pipe or conduit, unless otherwise indicated.
- C. Trench Bottoms: Excavate trenches 4 inches deeper than bottom of pipe elevation to allow for bedding course. Hand excavate for bell of pipe.

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1. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

3.9 APPROVAL OF SUBGRADE

- A. Notify Engineer and Testing Agency when excavations have reached required subgrade.
- B. If Engineer or Testing Agency determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.
- C. Proof roll subgrade with heavy pneumatic-tired equipment with a minimum loaded weight of 25 tons to identify soft pockets and areas of excess yielding. Do not proof roll wet or saturated subgrades.
- D. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities and retest, as directed by Engineer.

3.10 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill may be used when approved by Engineer.
 1. Fill unauthorized excavations under other construction or utility pipe as directed by Engineer.

3.11 STORAGE OF SOIL MATERIALS

- A. Stockpile borrow materials and satisfactory excavated soil materials. Stockpile soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.12 BACKFILL

- A. Place and compact backfill in excavations promptly, but not before completing the following:
 1. Construction below finish grade including, where applicable, dampproofing, waterproofing, and perimeter insulation.
 2. Surveying locations of underground utilities for record documents.
 3. Inspecting and testing underground utilities.
 4. Removing concrete formwork.
 5. Removing trash and debris.
 6. Removing temporary shoring and bracing, and sheeting.
 7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

3.13 UTILITY TRENCH BACKFILL

- A. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
- B. Backfill trenches excavated under footings and within 18 inches of bottom of footings; fill with concrete to elevation of bottom of footings.
- C. Provide 4-inch-thick, concrete-base slab support for piping or conduit less than 30 inches below surface of roadways. After installing and testing, completely encase piping or conduit in a minimum of 4 inches of concrete before backfilling or placing roadway subbase.

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- D. Place and compact initial backfill of subbase material, free of particles larger than 1 inch, to a height of 12 inches over the utility pipe or conduit.
 - 1. Carefully compact material under pipe haunches and bring backfill evenly up on both sides and along the full length of utility piping or conduit to avoid damage or displacement of utility system.
- E. Coordinate backfilling with utilities testing.
- F. Fill voids with approved backfill materials while shoring and bracing, and as sheeting is removed.
- G. Place and compact final backfill of satisfactory soil material to final subgrade.
- H. Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.14 FILL

- A. Preparation: Remove vegetation, topsoil, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface before placing fills.
- B. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
- C. Place and compact fill material in layers to required elevations as follows:
 - 1. Use satisfactory soil material except where otherwise indicated.

3.15 MOISTURE CONTROL

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill layer before compaction to within 2 percent of optimum moisture content or as approved by Geotechnical Engineer.
 - 1. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
 - 2. Remove and replace, or scarify and air-dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.16 COMPACTION OF BACKFILLS AND FILLS

- A. Place backfill and fill materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
- B. Place backfill and fill materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.
- C. Compact soil to not less than the following percentages of maximum dry density according to ASTM D 698:
 - 1. Under structures, building slabs, steps, and pavements, scarify and re-compact top 12 inches of existing subgrade and each layer of backfill or fill material at 95 percent. All other fill compacted to 95 percent unless otherwise indicated.
 - 2. Under walkways, scarify and re-compact top 6 inches below subgrade and compact each layer of backfill or fill material at 95 percent.
 - 3. Under lawn or unpaved areas, scarify and re-compact top 12 inches below subgrade and compact each layer of backfill or fill material at 90 percent.
 - 4. Utility trenches shall be compacted to 95 percent.

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3.17 GRADING

- A. General: Uniformly grade areas to a smooth surface, free from irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
 - 1. Provide a smooth transition between adjacent existing grades and new grades.
 - 2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.
- B. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:
 - 1. Lawn or Unpaved Areas: Plus or minus 1 inch when tested with a 10-foot straightedge.
 - 2. Walks: Plus 1/2 inch or minus 1 inch when tested with a 10-foot straightedge.
 - 3. Pavements: Plus 1/4 inch or minus 1/2 inch when tested with a 10-foot straightedge.
- C. Grading inside Building Lines: Finish subgrade to a tolerance of plus 1/4 inch or minus 1/2 inch when tested with a 10-foot straightedge.

3.18 SUBSURFACE DRAINAGE

- A. Drainage Piping: Drainage pipe is specified in Division 33, Section "Subdrainage."

3.19 SUBBASE AND BASE COURSES

- A. Under pavements and walks, place subbase course on prepared subgrade and as follows:
 - 1. Place base course material over subbase.
 - 2. Compact subbase and base courses at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 98 percent of maximum dry density according to ASTM D 698.
 - 3. Shape subbase and base to required crown elevations and cross-slope grades.
 - 4. When thickness of compacted subbase or base course is 6 inches or less, place materials in a single layer.
 - 5. When thickness of compacted subbase or base course exceeds 6 inches, place materials in equal layers, with no layer more than 6 inches thick or less than 3 inches thick when compacted.
- B. Pavement Shoulders: Place shoulders along edges of subbase and base course to prevent lateral movement. Construct shoulders, at least 12 inches wide, of satisfactory soil materials and compact simultaneously with each subbase and base layer to not less than 95 percent of maximum dry density according to ASTM D 1557.

3.20 DRAINAGE COURSE

- A. Under slabs-on-grade, place drainage course on prepared subgrade and as follows:
 - 1. Compact drainage course to required cross sections and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 698.
 - 2. When compacted thickness of drainage course is 6 inches or less, place materials in a single layer.
 - 3. When compacted thickness of drainage course exceeds 6 inches, place materials in equal layers, with no layer more than 6 inches thick or less than 3 inches thick when compacted.

3.21 RESREADING TOPSOIL

- A. Re-spread stockpiled topsoil in all planted areas. Distribute all stockpiled material in a uniform thickness as follows.

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1. Lawn Areas: 4 inches minimum.
 2. Athletic Fields: 12 inches minimum.
 3. Planting Areas: 12 inches minimum.
- B. Adjust topsoil as required by Engineer following topsoil depth testing by Owner's testing representative.

3.22 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will employ a qualified independent geotechnical engineering testing agency to perform field quality-control testing.
- B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.
- C. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design-bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Engineer.
- D. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:
1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft. or less of paved area or building slab, but in no case fewer than three tests.
 2. Foundation Wall Backfill: At each compacted backfill layer, at least one test for each 100 feet or less of wall length, but no fewer than two tests.
 3. Trench Backfill: At each compacted initial and final backfill layer, at least one test for each 150 feet or less of trench length, but no fewer than two tests.
- E. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; re-compact and retest until specified compaction is obtained.

3.23 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
1. Scarify or remove and replace soil material to depth as directed by Engineer; reshape and re-compact.
- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.

3.24 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Disposal: Remove waste material, including trash and debris, and legally dispose of it off Owner's property.

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- B. Disposal: Waste surplus satisfactory soil, unsatisfactory soil, excess topsoil, and rock on-site in a location designated by Owner and/or Engineer.

END OF SECTION 310000

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SECTION 311000 - SITE CLEARING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Protecting existing trees and vegetation to remain.
 - 2. Removing trees and other vegetation.
 - 3. Clearing and grubbing.
 - 4. Removing above-grade site improvements.
 - 5. Disconnecting, capping or sealing, and abandoning site utilities in place.
 - 6. Disconnecting, capping or sealing, and removing site utilities.
- B. Related Sections include the following:
 - 1. Division 01, Section "Execution Requirements" for verifying utility locations and for recording field measurements.
 - 2. Division 01, Section "Temporary Facilities and Controls" for temporary utilities, temporary construction and support facilities, temporary security and protection facilities, and environmental protection measures during site operations.
 - 3. Division 02, Section "Selective Site Demolition" for demolition of buildings, structures, and site improvements.
 - 4. Division 31, Section "Earthwork" for soil materials, excavating, backfilling, site grading, and stripping and redistribution of topsoil.
 - 5. Division 31, Section "Tree Protection and Trimming" for protection of trees to remain.
 - 6. Division 31, Section "Temporary Erosion and Sediment Control" for erosion control requirements prior to and during site clearing.
 - 7. Division 32, Section "Lawns and Grasses" for preparing topsoil for lawns and planting.

1.2 MATERIALS OWNERSHIP

- A. Except for materials indicated to be stockpiled or to remain Owner's property, cleared materials shall become Contractor's property and shall be removed from the site.

1.3 SUBMITTALS

- A. Record drawings according to Division 01, Section "Closeout Procedures."
 - 1. Identify and accurately locate capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.4 PROJECT CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
 - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
 - 2. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
- B. Salvable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated.

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- C. Notify utility locator service for area where Project is located before site clearing.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. Satisfactory Soil Materials: Requirements for satisfactory soil materials are specified in Division 31, Section "Earthwork."
1. Obtain approved borrow soil materials off-site when satisfactory soil materials are not available on-site.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect and maintain benchmarks and survey control points from disturbance during construction.
- B. Provide erosion-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
- C. Locate and clearly flag trees and vegetation to remain or to be relocated.
- D. Protect existing site improvements to remain from damage during construction.
1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TREE PROTECTION

- A. Erect and maintain a temporary fence around drip line of individual trees or around perimeter drip line of groups of trees to remain. Remove fence when construction is complete.
1. Do not store construction materials, debris, or excavated material within drip line of remaining trees.
 2. Do not permit vehicles, equipment, or foot traffic within drip line of remaining trees.
- B. Do not excavate within drip line of trees, unless otherwise indicated.
- C. Where excavation for new construction is required within drip line of trees, hand clear and excavate to minimize damage to root systems. Use narrow-tine spading forks, comb soil to expose roots, and cleanly cut roots as close to excavation as possible.
1. Cover exposed roots with burlap and water regularly.
 2. Temporarily support and protect roots from damage until they are permanently relocated and covered with soil.
 3. Coat cut faces of roots more than 1-1/2 inches in diameter with an emulsified asphalt or other approved coating formulated for use on damaged plant tissues.
 4. Cover exposed roots with wet burlap to prevent roots from drying out. Backfill with soil as soon as possible.
- D. Repair or replace trees and vegetation indicated to remain that are damaged by construction operations, in a manner approved by Architect.
1. Employ a qualified arborist, licensed in jurisdiction where Project is located, to submit details of proposed repairs and to repair damage to trees and shrubs.
 2. Replace trees that cannot be repaired and restored to full-growth status, as determined by the qualified arborist.

3.3 UTILITIES

- A. Locate, identify, disconnect, and seal or cap off utilities indicated to be removed.

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1. Arrange to shut off indicated utilities with utility companies.
- B. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
 1. Notify Architect not less than two days in advance of proposed utility interruptions.
 2. Do not proceed with utility interruptions without Architect's written permission.
- C. Excavate for and remove underground utilities indicated to be removed.

3.4 CLEARING AND GRUBBING

- A. Remove obstructions, trees, shrubs, grass, and other vegetation to permit installation of new construction. Removal includes digging out stumps and obstructions and grubbing roots.
 1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
 2. Cut minor roots and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct installation of new construction.
 3. Completely remove stumps, roots, obstructions, and debris extending to a depth of 18 inches below exposed subgrade.
 4. Use only hand methods for grubbing within drip line of remaining trees.
- B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material, unless further excavation or earthwork is indicated.
 1. Place fill material in horizontal layers not exceeding 8-inch loose depth, and compact each layer to a density equal to adjacent original ground.

3.5 SITE IMPROVEMENTS

- A. Remove existing above- and below-grade improvements as indicated and as necessary to facilitate new construction.
- B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.
 1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut length of existing pavement to remain before removing existing pavement. Saw-cut faces vertically.

3.6 DISPOSAL

- A. Disposal: 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.

END OF SECTION 311000

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SECTION 312500 – TEMPORARY EROSION & SEDIMENT CONTROL

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Temporary erosion and sedimentation control measures during construction.
 - 2. Cleaning, repair, and restoration of adjoining properties and roads necessitated by erosion and sedimentation from the project site during the course of the project.
- B. The following Sections contain requirements that relate to this Section:
 - 1. Division 01, Section “Summary” for restrictions on use of site and related protection of existing site features.
 - 2. Division 01, Section “Submittal Procedures” for construction scheduling requirements related to this work.
 - 3. Division 32, Section “Turf and Grasses” for seeding and maintenance requirements for temporary vegetative cover.

1.2 DEFINITIONS

- A. Soil stabilization refers to measures which protect soil from the erosive forces of raindrop impact and flowing water.
- B. Erosion control structures refers to silt fences, sediment traps, outlet traps, diversion berms, stabilized construction entrances, and similar devices constructed for the purpose of retaining and controlling sediment.

1.3 SYSTEM DESCRIPTION

- A. Performance Requirements: Meet the following requirements:
 - 1. Control erosion on the construction site.
 - 2. Protect existing undisturbed areas from effects of erosion.
 - 3. Retain sediment within the boundaries of the site.
 - 4. Prevent damage to properties outside the construction limits from silting due to construction of the project.

1.4 SUBMITTALS

- A. Submittals for Quality Assurance
 - 1. Regulatory officials' field reports.

1.5 QUALITY ASSURANCE

- A. Regulatory Requirements
 - 1. Comply with requirements of South Carolina Stormwater Management and Sediment Control Handbook for Land Disturbance Activities.
 - 2. Comply with performance standards of Chapter 14, Title 48 of the 1976 Code Laws, South Carolina.
 - 3. Comply with requirements of South Carolina Department of Health and Environmental Control (DHEC).
 - 4. Owner will obtain all necessary permits for work of this Section.

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5. Owner will pay all fees, fines, and assessments related to Work of this Section charged or levied by authorities having jurisdiction.

1.6 SEQUENCING AND SCHEDULING

A. Scheduling of work

1. Schedule and perform clearing and grubbing operations such that subsequent grading operations and erosion control applications can be installed immediately.
2. Conduct excavation, borrow, and embankment operations such that cuts and fills will be completed to final grades in a continuous operation.
3. Plant all construction areas not otherwise protected with permanent vegetative cover within fourteen (14) working days after completion of active construction. Apply permanent or temporary soil stabilization to denuded areas within fourteen (14) days after final grade is reached on any portion of the site.
4. Apply soil stabilization within fourteen (14) days of disturbance to denuded areas which may not be at final grade but will remain dormant (undisturbed) for longer than fourteen (14) days.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Stone materials

1. Washed filter stone, ASTM D448-86(93), size as indicated.
2. Rip rap stone, size as indicated.

B. Geotextiles

1. Sediment Fence Fabric: Polypropylene, woven monofilament geotextile, UV and soil chemical resistant:
 - a. Puncture strength, ASTM D4833, 60 lb (265 N).
 - b. Apparent Opening Size, ASTM D4751, 40 US std. Sieve (0.425 mm).
 - c. Water Flow Rate, ASTM D4491, 75 gpm/ft² (3055 l/min/m²).
 - d. Mirafi 700XG, TC Mirafi (706) 693-2226.
 - e. Geotex 914SC, Synthetic Industries (800) 621-0444.
2. Synthetic Filter Fabric and Sediment Trap Fabric: Polypropylene, staple fiber, needlepunched nonwoven geotextile, UV and soil chemical resistant:
 - a. Puncture strength, ASTM D4833, 55 lb (240 N).
 - b. Apparent Opening Size, ASTM D4751, 70 US std. Sieve, (0.212 mm).
 - c. Water Flow Rate, ASTM D4491, 110 gpm/ft² (4480 l/min/m²).
 - d. Mirafi 140N, TC Mirafi.
 - e. Geotex 351, Synthetic Industries.

C. Erosion Control Blanket: As noted in the plans.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that condition of project site corresponds with information given in the construction drawings.
- B. Inspect project site, areas of property outside of project site, and surrounding properties.

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1. Note and bring to the immediate attention of the Architect any existing disturbed soil conditions, erosion, or sedimentation requiring abatement or documentation.
- C. Stabilize soil stockpiles with temporary vegetative cover or provide sediment trapping measures to prevent soil loss. Refer to Division 32, Section “Turf and Grasses.”
- D. Establish the angle for graded slopes of soil stockpiles and fills no greater than the angle which can be retained by vegetative cover or other adequate erosion control devices.
- E. Establish a permanent vegetative cover on denuded areas not otherwise stabilized.
- F. Permanent vegetation shall not be considered established until a ground cover is achieved which, in the opinion of the Architect and the Erosion Control Inspector or his designated agent, is mature enough to control soil erosion satisfactorily and to survive severe weather conditions.

3.2 SEDIMENT CONTROL DEVICES

- A. Construct all sediment control devices prior to beginning clearing and grubbing of the site. Construct as indicated and as additionally required to provide sediment control specified and required by authorities having jurisdiction.
 1. Silt fences: Construct as indicated utilizing metal posts of length adequate to remain firmly secured. Secure filter fabric to posts. Lap fabric ends minimum 12 inches and secure lap with post. Bury bottom edge of filter fabric in subgrade as indicated.
 2. Sediment traps: Construct as indicated utilizing metal posts of length adequate to remain firmly secured. Use nonwoven fabric specified. Secure filter fabric to posts. Lap fabric ends minimum 24 inches and secure lap with posts. Bury bottom edge of filter fabric in subgrade as indicated.
 3. Outlet traps: Construct as indicated.
 4. Diversion berms: Construct as indicated and as additionally required to control runoff from construction operations.
 5. Stabilized construction entrances: Construct as indicated.

3.3 PROTECTION AND CLEANING

- A. Maintain all devices for sediment control in proper working order for the duration of the project. When control devices become filled halfway to capacity, remove sediment and deposit onsite in such a manner as to preclude further erosion of deposited sediment. Clean and reset device in proper working order.
- B. Restore protection to protected stockpiles and slopes immediately following disturbance.

3.4 REMOVAL OF TEMPORARY DEVICES

- A. Request approval of Architect and authorities having jurisdiction prior to dismantling of erosion control devices.
- B. Dismantle and remove silt fences; clean out and fill silt basins, and remove all other temporary erosion and sediment control devices.
- C. Provide fine grading and seeding of remaining unfinished areas as indicated in accordance with requirements of Division 32, Section “Turf and Grasses”.

END OF SECTION 312500

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SECTION 321216 – ASPHALT PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Hot-mix asphalt paving.
2. Hot-mix asphalt patching.
3. Pavement-marking paint.

B. Related Sections include the following:

1. Division 31, Section "Earthwork" for aggregate subbase and base courses and aggregate pavement shoulders.

1.2 SYSTEM DESCRIPTION

A. Provide hot-mix asphalt pavement according to the materials, workmanship, and other applicable requirements of the standard specifications of the state or of authorities having jurisdiction.

1. Comply with requirements of South Carolina Department of Transportation (SCDOT).

1.3 SUBMITTALS

A. Product Data: For each product specified. Include technical data and tested physical and performance properties.

B. Job-Mix Designs: Certification, by SCDOT, of approval of each job mix proposed for the Work.

C. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience.

D. Material Test Reports: Indicate and interpret test results for compliance of materials with requirements indicated.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer who has completed hot-mix asphalt paving similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

B. Manufacturer Qualifications: Engage a firm experienced in manufacturing hot-mix asphalt similar to that indicated for this Project and with a record of successful in-service performance.

C. Regulatory Requirements: Conform to applicable standards of SCDOT for asphalt paving work on public property.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver pavement-marking materials to Project site in original packages with seals unbroken and bearing manufacturer's labels containing brand name and type of material, date of manufacture, and directions for storage.

B. Store pavement-marking materials in a clean, dry, protected location and within temperature range required by manufacturer. Protect stored materials from direct sunlight.

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1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not apply asphalt materials if substrate is wet or excessively damp or if the following conditions are not met:
 - 1. Tack Coats: Minimum surface temperature of 60 deg F.
 - 2. Asphalt Base Course: Minimum surface temperature of 40 deg F and rising at time of placement.
 - 3. Asphalt Surface Course: Minimum surface temperature of 60 deg F at time of placement.
- B. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 deg F for oil-based materials, 50 deg F for water-based materials, and not exceeding 95 deg F.

PART 2 - PRODUCTS

2.1 AGGREGATES

- A. General: Use materials and gradations that have performed satisfactorily in previous installations.
- B. Coarse Aggregate: Sound; angular crushed stone; crushed gravel; or properly cured, crushed blast-furnace slag; complying with SCDOT Specifications.
- C. Fine Aggregate: Sharp-edged natural sand or sand prepared from stone or gravel, complying with SCDOT specifications.
- D. Mineral Filler: Rock or other inert material complying with SCDOT specifications.

2.2 ASPHALT MATERIALS

- A. Asphalt Cement: Comply with SCDOT Specifications.
- B. Tack Coat: Comply with SCDOT Specifications.
- C. Water: Potable.

2.3 AUXILIARY MATERIALS

- A. Sand: Comply with SCDOT Specifications.
- B. NOT USED

2.4 MIXES

- A. Hot-Mix Asphalt: Provide dense, hot-laid, hot-mix asphalt plant mixes approved by SCDOT.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that subgrade is dry and in suitable condition to support paving and imposed loads.
- B. Proof-roll subbase using heavy, pneumatic-tired rollers to locate areas that are unstable or that require further compaction.
- C. Notify Architect in writing of any unsatisfactory conditions. Do not begin paving installation until these conditions have been satisfactorily corrected and approved by the Architect.

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3.2 NOT USED

3.3 PATCHING AND REPAIRS

- A. Patching: Saw cut perimeter of patch and excavate existing pavement section to sound base. Recompact new subgrade. Excavate rectangular or trapezoidal patches, extending 12 inches into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically.
 - 1. Tack coat faces of excavation and allow to cure before paving.
 - 2. Fill excavation with dense-graded, hot-mix asphalt base mix and, while still hot, compact flush with adjacent surface.
 - 3. Partially fill excavation with dense-graded, hot-mix asphalt base mix and compact while still hot. Cover asphalt base course with compacted, hot-mix surface layer finished flush with adjacent surfaces.
- B. NOT USED
- C. Leveling Course: Install and compact leveling course consisting of dense-graded, hot-mix asphalt surface course to level sags and fill depressions deeper than 1 inch in existing pavements.
 - 1. Install leveling wedges in compacted lifts not exceeding 3 inches thick.
- D. Crack and Joint Filling: Remove existing filler material from cracks or joints to a depth of 1/4 inch. Refill with asphalt joint-filling material to restore watertight condition. Remove excess filler that has accumulated near cracks or joints.
- E. Tack Coat: Apply uniformly to existing surfaces of previously constructed asphalt or portland cement concrete paving and to surfaces abutting or projecting into new, hot-mix asphalt pavement. Apply at a uniform rate of 0.05 to 0.15 gal./sq. yd. of surface.
 - 1. Allow tack coat to cure undisturbed before paving.
 - 2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

3.4 SURFACE PREPARATION

- A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.
 - 1. Sweep loose granular particles from surface of unbound-aggregate base course. Do not dislodge or disturb aggregate embedded in compacted surface of base course.

3.5 HOT-MIX ASPHALT PLACING

- A. Machine place hot-mix asphalt mix on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness, when compacted.
 - 1. Spread mix at minimum temperature required by SCDOT Specifications.
 - 2. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes, unless otherwise indicated.
 - 3. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.
- B. Place paving in consecutive strips not less than 10 feet wide, except where infill edge strips of a lesser width are required.
 - 1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete asphalt base course for a section before placing asphalt surface course.

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- C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.6 JOINTS

- A. Construct joints to ensure continuous bond between adjoining paving sections. Construct joints free of depressions with same texture and smoothness as other sections of hot-mix asphalt course.
 - 1. Clean contact surfaces and apply tack coat.
 - 2. Offset longitudinal joints in successive courses a minimum of 6 inches.
 - 3. Offset transverse joints in successive courses a minimum of 24 inches.
 - 4. Construct transverse joints by bulkhead method or sawed vertical face method.
 - 5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
 - 6. Compact asphalt at joints to a density within 2 percent of specified course density.

3.7 COMPACTION

- A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or vibratory-plate compactors in areas inaccessible to rollers.
 - 1. Complete compaction before mix temperature cools to 185 deg F.
- B. Breakdown Rolling: Accomplish breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Repair surfaces by loosening displaced material, filling with hot-mix asphalt, and rerolling to required elevations.
- C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling, while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to density meeting SCDOT requirements.
- D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.
- E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while still hot, with back of rake or smooth iron. Compact thoroughly using tamper or other satisfactory method.
- F. Repairs: Remove paved areas that are defective or contaminated with foreign materials. Remove paving course over area affected and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.
- G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.
- H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.8 INSTALLATION TOLERANCES

- A. Thickness: Compact each course to produce, as a minimum, the thickness indicated within the following tolerances:
 - 1. Base Course: Plus 1/2 inch, no minus.
 - 2. Surface Course: Plus 1/4 inch, no minus.

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- B. Surface Smoothness: Compact each course to produce a surface smoothness within the following tolerances as determined by using a 10-foot straightedge applied transversely or longitudinally to paved areas:
1. Base Course: 1/4 inch.
 2. Surface Course: 1/8 inch.
 3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch.

3.9 NOT USED

3.10 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will employ a qualified independent testing agency to perform field inspections and tests and to prepare test reports.
1. Testing agency will conduct and interpret tests and state in each report whether tested Work complies with or deviates from specified requirements.
- B. Additional testing, at Contractor's expense, will be performed to determine compliance of corrected Work with specified requirements.
- C. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined according to SCDOT Specifications.
- D. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.
- E. In-Place Density: Samples of uncompacted paving mixtures and compacted pavement will be secured by testing agency according to SCDOT requirements.
1. In-place density of compacted pavement will be determined by testing core samples.
 - a. One core sample will be taken for every 1000 sq. yd. or less of installed pavement, but in no case will fewer than 3 cores be taken.
 - b. Field density of in-place compacted pavement may also be determined by nuclear method according to SCDOT Specifications.
- F. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

END OF SECTION 321216

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SECTION 321313 - CONCRETE PAVEMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes exterior cement concrete pavement for the following:
 - 1. Curbs and gutters.
 - 2. Walkways.
 - 3. Stairs.
- B. Related Sections include the following:
 - 1. Division 31, Section "Earthwork" for subgrade preparation, grading, and subbase course.
 - 2. Division 03, Section "Cast-in-Place Concrete" for general building applications for concrete.

1.2 SUBMITTALS

- A. Design Mixes: For each concrete pavement mix. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.
- B. Material Certificates: Signed by manufacturers certifying that each of the following materials complies with requirements:
 - 1. Cementitious materials and aggregates.
 - 2. Admixtures.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed pavement work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.
- C. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.
- D. ACI Publications: Comply with ACI 301, "Specification for Structural Concrete," unless modified by the requirements of the Contract Documents.

1.4 PROJECT CONDITIONS

- A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

PART 2 - PRODUCTS

2.1 FORMS

- A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces.
 - 1. Use flexible or curved forms for curves of a radius 100 feet or less.

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- B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

2.2 STEEL REINFORCEMENT

- A. Plain-Steel Welded Wire Fabric: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.
- B. Reinforcement Bars: ASTM A 615/A 615M, Grade 60, deformed.
- C. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcement bars, welded wire fabric, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete or fiber-reinforced concrete of greater compressive strength than concrete.

2.3 CONCRETE MATERIALS

- A. General: Use the same brand and type of cementitious material from the same manufacturer throughout the Project.
- B. Portland Cement: ASTM C 150, Type I or II.
 - 1. Fly Ash: ASTM C 618, Class F or C.
 - 2. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
- C. Aggregate: ASTM C 33, uniformly graded, from a single source, with coarse aggregate as follows:
 - 1. Class: 4M.
 - 2. Maximum Aggregate Size: 3/4-inch nominal.
 - 3. Do not use fine or coarse aggregates containing substances that cause spalling.
- D. Water: ASTM C 94.

2.4 ADMIXTURES

- A. General: Admixtures certified by manufacturer to contain not more than 0.1 percent water-soluble chloride ions by mass of cement and to be compatible with other admixtures.
- B. Air-Entraining Admixture: ASTM C 260.
- C. Water-Reducing Admixture: ASTM C 494, Type A.

2.5 CURING MATERIALS

- A. Water: Potable.
- B. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
- C. White Waterborne Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

2.6 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.
- B. NOT USED
- C. NOT USED
- D. NOT USED
- E. NOT USED

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2.7 CONCRETE MIXES

- A. Prepare design mixes, proportioned according to ACI 211.1 and ACI 301, for each type and strength of normal-weight concrete determined by either laboratory trial mixes or field experience.
- B. Use a qualified independent testing agency for preparing and reporting proposed mix designs for the trial batch method.
 - 1. Do not use Owner's field quality-control testing agency as the independent testing agency.
- C. Proportion mixes to provide concrete with the following properties:
 - 1. Compressive Strength (28 Days): 3000 psi or as noted in plans.
 - 2. Maximum Water-Cementitious Materials Ratio: 0.45.
 - 3. Slump Limit: 3 inches.
- D. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
 - 1. Combined Fly Ash or Pozzolan, and Ground Granulated Blast-Furnace Slag: 50 percent portland cement minimum, with fly ash or pozzolan not exceeding 25 percent.
- E. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content of 3 to 6 percent.

2.8 CONCRETE MIXING

- A. Ready-Mixed Concrete: Comply with requirements and with ASTM C 94.
 - 1. When air temperature is between 85°F and 90°F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90°F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Proof-roll prepared subbase surface to check for unstable areas and verify need for additional compaction. Proceed with pavement only after nonconforming conditions have been corrected and subgrade is ready to receive pavement.
- B. Remove loose material from compacted subbase surface immediately before placing concrete.

3.2 EDGE FORMS AND SCREED CONSTRUCTION

- A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.
- B. Clean forms after each use and coat with form release agent to ensure separation from concrete without damage.

3.3 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating reinforcement and with recommendations in CRSI's "Placing Reinforcing Bars" for placing and supporting reinforcement.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.
- C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.

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- D. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

3.4 JOINTS

- A. General: Construct construction, isolation, and contraction joints and tool edgings true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.
1. When joining existing pavement, place transverse joints to align with previously placed joints, unless otherwise indicated.
- B. Construction Joints: Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour, unless pavement terminates at isolation joints.
1. Provide preformed galvanized steel or plastic keyway-section forms or bulkhead forms with keys, unless otherwise indicated. Embed keys at least 1-1/2 inches into concrete.
 2. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of pavement strips, unless otherwise indicated.
 3. Provide tie bars at sides of pavement strips where indicated.
 4. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
 5. Use epoxy bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.
1. Locate expansion joints at intervals of 30 feet, unless otherwise indicated.
 2. Extend joint fillers full width and depth of joint.
 3. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
 4. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
 5. Protect top edge of joint filler during concrete placement with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.
- D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows:
1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with groover tool to the following radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover marks on concrete surfaces.
 - a. Radius: ¼ inch.
- E. Edging: Tool edges of pavement, gutters, curbs, and joints in concrete after initial floating with an edging tool to the following radius. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces.
1. Radius: ¼ inch.

3.5 CONCRETE PLACEMENT

- A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcement steel, and items to be embedded or cast in. Notify other trades to permit installation of their work.

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- B. Remove snow, ice, or frost from subbase surface and reinforcement before placing concrete. Do not place concrete on frozen surfaces.
- C. Moisten subbase to provide a uniform dampened condition at the time concrete is placed. Do not place concrete around manholes or other structures until they are at the required finish elevation and alignment.
- D. Comply with requirements and with recommendations in ACI 304R for measuring, mixing, transporting, and placing concrete.
- E. Do not add water to concrete during delivery, at Project site, or during placement.
- F. Consolidate concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures to consolidate concrete according to recommendations in ACI 309R.
 - 1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand-spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels, and joint devices.
- G. Screed pavement surfaces with a straightedge and strike off. Commence initial floating using bull floats or darbies to form an open textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading dry-shake surface treatments.
- H. Curbs and Gutters: When automatic machine placement is used for curb and gutter placement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing as specified for formed concrete. If results are not approved, remove and replace with formed concrete.
- I. Slip-Form Pavers: When automatic machine placement is used for pavement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce pavement to required thickness, lines, grades, finish, and jointing as required for formed pavement.
 - 1. Compact subbase and prepare subgrade of sufficient width to prevent displacement of paver machine during operations.
- J. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
 - 1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
 - 2. Do not use frozen materials or materials containing ice or snow.
 - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators, unless otherwise specified and approved in mix designs.
- K. Hot-Weather Placement: Place concrete according to recommendations in ACI 305R and as follows when hot-weather conditions exist:
 - 1. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 deg F. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 - 2. Cover reinforcement steel with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
 - 3. Fog-spray forms, reinforcement steel, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

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3.6 CONCRETE FINISHING

- A. General: Wetting of concrete surfaces during screeding, initial floating, or finishing operations is prohibited.
- B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and the concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots, and fill low spots. Refloat surface immediately to uniform granular texture.
 - 1. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch deep with a stiff-bristled broom, perpendicular to line of traffic.
 - 2. Medium-to-Coarse-Textured Wood Float Finish: Where indicated: Provide a coarse, random swirl-patterned finish by texture-finishing float-finished concrete surface with a wood float. Tool joints with picture-framed smooth tooled edges.

3.7 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and follow recommendations in ACI 305R for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Begin curing after finishing concrete, but not before free water has disappeared from concrete surface.
- D. Curing Methods: Cure concrete by curing compound as follows:
 - 1. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.8 PAVEMENT TOLERANCES

- A. Comply with tolerances of ACI 117 and as follows:
 - 1. Elevation: 1/4 inch.
 - 2. Thickness: Plus 3/8 inch, minus 1/4 inch.
 - 3. Surface: Gap below 10-foot- long, unleveled straightedge not to exceed 1/4 inch.
 - 4. Joint Spacing: 3 inches.
 - 5. Contraction Joint Depth: Plus 1/4 inch, no minus.
 - 6. Joint Width: Plus 1/8 inch, no minus.
 - 7. Slope Tolerances: Comply with tolerances indicated without exceeding a maximum of 5 percent slope on any pedestrian walkway, unless otherwise specifically indicated as greater than 5 percent slope.
 - 8. Cross slope on pedestrian walks shall not exceed 2 percent unless otherwise specifically indicated.

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3.9 NOT USED

3.10 NOT USED

3.11 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing and inspection agency to sample materials, perform tests, and submit test reports during concrete placement. Sampling and testing for quality control may include those specified in this Article.
- B. Testing Services: Testing shall be performed according to the following requirements:
 - 1. Sampling Fresh Concrete: Representative samples of fresh concrete shall be obtained according to ASTM C 172, except modified for slump to comply with ASTM C 94.
 - 2. Slump: ASTM C 143; one test at point of placement for each compressive-strength test, but not less than one test for each day's pour of each type of concrete. Additional tests will be required when concrete consistency changes.
 - 3. Air Content: ASTM C 231, pressure method; one test for each compressive-strength test, but not less than one test for each day's pour of each type of air-entrained concrete.
 - 4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each set of compressive-strength specimens.
 - 5. Compression Test Specimens: ASTM C 31/C 31M; one set of four standard cylinders per class of concrete per 100 yards maximum per day for each compressive-strength test, unless otherwise indicated. Cylinders shall be molded and stored for laboratory-cured test specimens unless field-cured test specimens are required. Break two cylinders at seven days and two cylinders at twenty-eight days.
 - 6. When frequency of testing will provide fewer than five compressive-strength tests for a given class of concrete, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 - 7. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, current operations shall be evaluated and corrective procedures shall be provided for protecting and curing in-place concrete.
 - 8. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive compressive-strength test results equal or exceed specified compressive strength and no individual compressive-strength test result falls below specified compressive strength by more than 500 psi.
- C. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 24 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing agency, concrete type and class, location of concrete batch in pavement, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
- D. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as the sole basis for approval or rejection.
- E. Additional Tests: Testing agency shall make additional tests of the concrete when test results indicate slump, air entrainment, concrete strengths, or other requirements have not been met, as directed by Architect. Testing agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed.

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3.12 REPAIRS AND PROTECTION

- A. Remove and replace concrete pavement that is broken, damaged, or defective, or does not meet requirements in this Section.
- B. Drill test cores where directed by Architect when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to pavement with epoxy adhesive.
- C. Protect concrete from damage. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.
- D. Maintain concrete pavement free of stains, discoloration, dirt, and other foreign material. Sweep concrete pavement not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 321313

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SECTION 321373 – PAVEMENT JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes cold and hot applied pavement joint sealants in the following locations.
 - 1. Portland cement concrete pavement expansion and contraction joints.
 - 2. Joints between portland cement concrete and asphalt pavement.

1.2 SUBMITTALS

- A. Product Data: For each product indicated.
- B. Product certificates/test reports.

1.3 QUALITY ASSURANCE

- A. Sealant Compatibility and Adhesion Testing: Use sealant manufacturer's standard test methods to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the products specified.
 - 2. Products: Subject to compliance with requirements, provide one of the products specified.

2.2 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
 - 1. Primers: Product recommended in writing by joint sealant manufacturer for adhesion of sealant to joint substrates indicated, as determined from sealant compatibility and adhesion tests and prior experience.
- B. Colors of Exposed Joint Sealants: As selected.
- C. Joint-Sealant Backer Materials: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by joint sealant manufacturer based on field experience and laboratory testing.
 - 1. Round Backer Rod for Cold- and Hot-Applied Sealants: ASTM D 5249, Type 1, of diameter and density required to control sealant depths and prevent bottom-side adhesion of sealant.
 - 2. Backer Strips for Cold- and Hot-Applied Sealants: ASTM D 5249; Type 2; of thickness and width required to control sealant depths, prevent bottom-side adhesion of sealant, and fill remainder of joint opening under sealant.
 - 3. Round Backer Rods for Cold-Applied Sealants: ASTM D 5249, Type 3, of diameter and density required to control sealant depths and prevent bottom-side adhesion of sealant.

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2.3 COLD-APPLIED JOINT SEALANTS

- A. Multicomponent Sealant for Concrete: ASTM C 920, pourable, chemically curing elastomeric formulation.
 - 1. Urethane Formulation: Type M; Grade P; Class 12-1/2; Uses T, M, and, as applicable to joint substrates indicated, O.
 - a. Products:
 - 1) Pecora Corporation; Urexpam NR-300, or approved equal.
 - 2. Coal-Tar-Modified Polymer Formulation: Type M; Grade P; Class 25; Uses T and, as applicable to joint substrates indicated, O.
 - a. Products:
 - 1) Meadows, W.R., Inc.; SEALTIGHT GARDOX, or approved equal.
 - 3. Bitumen-Modified Urethane Formulation: Type M; Grade P; Class 25; Uses T, M, and, as applicable to joint substrates indicated, O.
 - a. Products:
 - 1) Mameco International; Vulkem 202.
 - 2) Sonneborn Building Products Div., ChemRex, Inc.; Soneneric 2.
 - 3) Or approved equal.
- B. Single-Component, Urethane Sealant for Concrete: ASTM C 920 for Type S; Grade P; Class 25; Uses T, M, and, as applicable to joint substrates indicated, O, single-component, pourable, coal-tar-modified, urethane formulation.
 - 1. Products:
 - a. Mameco International; Vulkem 200.
 - b. Sonneborn Building Products Div., ChemRex, Inc.; Soneneric 1.
 - c. Or approved equal.
- C. Nonsag Silicone Sealant for Concrete: ASTM D 5893, Type NS, single-component, low-modulus, neutral-curing, nonsag silicone sealant.
 - 1. Products:
 - a. Crafcro Inc.; Roadsaver Silicone-SL.
 - b. Dow Corning; 888.
 - c. Or approved equal.
- D. Self-Leveling Silicone Sealant for Concrete and Asphalt: ASTM D 5893, Type SL, single-component, low-modulus, neutral-curing, self-leveling silicone sealant.
 - 1. Products:
 - a. Dow Corning; 890-SL, or approved equal.
- E. Multicomponent Low-Modulus Sealant for Concrete and Asphalt: Proprietary, pourable, self-leveling formulation of reactive petropolymer and activator.
 - 1. Products:
 - a. Meadows, W. R., Inc.; SOF-SEAL, or approved equal.

2.4 HOT-APPLIED JOINT SEALANTS

- A. NOT USED
- B. NOT USED
- C. Elastomeric Sealant for Concrete: ASTM D 3406.
 - 1. Products:
 - a. Crafcro, Inc.; Superseal 444/777.
 - b. Meadows, W. R., Inc.; POLY-JET 3406.

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- c. Or approved equal.
- D. Sealant for Concrete and Asphalt: ASTM D 3405.
 - 1. Products:
 - a. Crafcro Inc.; ROADSAVER 221.
 - b. Koch Materials Company; Product #9005.
 - c. Meadows, W. R., Inc.; SEALTIGHT HI-SPEC.
 - d. Or approved equal.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Clean out joints immediately before installing joint sealants.
- B. Joint Priming: Prime joint substrates where indicated or recommended in writing by joint sealant manufacturer, based on sealant compatibility and adhesion tests and prior experience. Confine primers to areas of joint-sealant bond; do not spill primers or allow them to migrate onto adjoining surfaces.
- C. Sealant Installation: Comply with applicable recommendations in ASTM C 1193.
- D. Install backer materials to support sealants during application and at position required to produce optimum sealant movement capability.
 - 1. Do not leave gaps between ends of backer materials.
 - 2. Do not stretch, twist, puncture, or tear backer materials.
 - 3. Remove absorbent backer materials that have become wet before sealant application and replace them with dry materials.
- E. Install sealants at same time backer materials are installed.
 - 1. Place sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses provided for each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths optimize sealant movement capability.
- F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
 - 1. Remove excess sealants from surfaces adjacent to joint.
 - 2. Use tooling agents that are approved in writing by joint sealant manufacturer and that do not discolor sealants or adjacent surfaces.
- G. Clean excess sealants or sealant smears adjacent to joints as installation progresses by methods and with cleaning materials approved by manufacturers of joint sealants and of products in which joints occur.

END OF SECTION 321373

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SECTION 323113 – CHAIN-LINK FENCES AND GATES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. PVC coated steel chain-link fabric and framework.
- B. Related Sections include the following:
 - 1. Division 31, Section "Earthwork" for filling and for grading work.
 - 2. Division 03, Section "Cast-in-Place Concrete" for concrete post footings.

1.2 DEFINITIONS

- A. CLFMI: Chain Link Fence Manufacturers Institute.

1.3 SUBMITTALS

- A. Product Data: Material descriptions, construction details, dimensions of individual components and profiles, and finishes for the following:
 - 1. Fence and gate posts, rails, and fittings.
 - 2. Chain-link fabric, reinforcements, and attachments.
 - 3. Gates and hardware.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed chain-link fences and gates similar in material, design, and extent to those indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Source Limitations for Chain-Link Fences and Gates: Obtain each color, grade, finish, type, and variety of component for chain-link fences and gates from one source with resources to provide chain-link fences and gates of consistent quality in appearance and physical properties.

1.5 PROJECT CONDITIONS

- 1. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others.
- B. Field Measurements: Verify layout information for chain-link fences and gates shown on Drawings in relation to property survey and existing structures. Verify dimensions by field measurements.

PART 2 - PRODUCTS

2.1 CHAIN-LINK FENCE FABRIC

- A. Steel Chain-Link Fence Fabric: Height indicated on Drawings. Provide fabric fabricated in one-piece widths for fencing in height of 12 feet and less. Comply with CLFMI's "Product Manual" and with requirements indicated below:
 - 1. Mesh and Wire Size: Match existing.
 - 2. PVC-Coated Fabric: ASTM F 668, Class 2B over metallic-coated steel wire.
 - a. Metallic Coating: Zinc.
 - b. Color: Black

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3. Coat selvage ends of fabric that is metallic coated during the weaving process with manufacturer's standard clear protective coating.

2.2 INDUSTRIAL FENCE FRAMING

- A. Round Steel Pipe: Standard weight, Schedule 40, galvanized steel pipe complying with ASTM F 1083. Comply with ASTM F 1043, Material Design Group IA, external and internal coating Type A, consisting of not less than 1.8-oz./sq. ft. zinc; and the following strength and stiffness requirements:
 1. Line, End, Corner, and Pull Posts and Top Rail: Per requirements for Heavy Industrial Fence.
 2. Coat with PVC, per ASTM F 668, Class 2D.
- B. Top Rails: Fabricate top rail from lengths 21 feet or longer, with swaged-end or fabricated for expansion-type coupling, forming a continuous rail along top of chain-link fabric.

2.3 TENSION WIRE

- A. General: Provide horizontal tension wire at the following locations:
 1. Location: Extended along bottom of fence fabric.
- B. Metallic-Coated Steel Wire: 0.177-inch- diameter, marcelled tension wire complying with ASTM A 824 and the following:
 1. Coating: Type II, zinc coated (galvanized) by the hot-dip process, with the following minimum coating weight:
 - a. Matching chain-link fabric coating weight.
 - b. Provide with PVC coating.

2.4 NOT USED

2.5 FITTINGS

- A. General: Provide fittings for a complete fence installation, including special fittings for corners. Comply with ASTM F 626.
- B. Post and Line Caps: Hot-dip galvanized pressed steel or hot-dip galvanized cast iron. Provide weathertight closure cap for each post.
 1. Provide line post caps with loop to receive tension wire or top rail.
- C. Rail and Brace Ends: Hot-dip galvanized pressed steel or hot-dip galvanized cast iron. Provide rail ends or other means for attaching rails securely to each gate, corner, pull, and end post.
- D. Rail Fittings: Provide the following:
 1. Top Rail Sleeves: Hot-dip galvanized pressed steel or round steel tubing. Not less than 6 inches long.
 2. Rail Clamps: Hot-dip galvanized pressed steel. Provide line and corner boulevard clamps for connecting rails in the fence line to line posts.
- E. Tension and Brace Bands: Hot-dip galvanized pressed steel.
- F. Tension Bars: Hot-dip galvanized steel, length not less than 2 inches shorter than full height of chain-link fabric. Provide one bar for each gate and end post, and two for each corner and pull post, unless fabric is integrally woven into post.
- G. Truss Rod Assemblies: Hot-dip galvanized steel rod and turnbuckle or other means of adjustment.
- H. Tie Wires, Clips, and Fasteners: Provide the following types according to ASTM F 626:

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1. Standard Round Wire Ties: For attaching chain-link fabric to posts, rails, and frames, complying with the following:
 - a. Hot-Dip Galvanized Steel: 0.148-inch- diameter wire; galvanized coating thickness matching coating thickness of chain-link fence fabric.
 2. Power-driven fasteners.
 3. Round Wire Hog Rings: Hot-dip galvanized steel or aluminum for attaching chain-link fabric to horizontal tension wires.
- I. Pipe Sleeves: For posts set into concrete, provide preset hot-dip galvanized steel pipe sleeves complying with ASTM A 53, not less than 6 inches long with inside dimensions not less than 1/2 inch more than outside dimension of post, and flat steel plate forming bottom closure.

2.6 CAST-IN-PLACE CONCRETE

- A. General: Comply with ACI 301 for cast-in-place concrete.
- B. Materials: Portland cement complying with ASTM C 150 Type I, aggregates complying with ASTM C 33, and potable water for ready-mixed concrete complying with ASTM C 94.
1. Concrete Mixes: Normal-weight concrete with not less than 3000-psi compressive strength (28 days), 3-inch slump, and 1-inch maximum size aggregate.
- C. Materials: Dry-packaged concrete mix complying with ASTM C 387 for normal-weight concrete mixed with potable water according to manufacturer's written instructions.

2.7 GROUT AND ANCHORING CEMENT

- A. Nonshrink, Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout, recommended in writing by manufacturer, for exterior applications.
- B. Erosion-Resistant Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with potable water at Project site to create pourable anchoring, patching, and grouting compound. 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.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements. Review survey of property lines and legal boundaries, site clearing, earthwork, pavement work, and other conditions affecting performance.
1. Do not begin installation before final grading is completed, unless otherwise permitted by Architect.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 500 feet or line of sight between stakes. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.

3.3 INSTALLATION, GENERAL

- A. General: Install chain-link fencing to comply with ASTM F 567 and more stringent requirements specified.

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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 or compacted soil.
- C. Post Setting: Hand-excavate holes for post foundations in firm, undisturbed or compacted soil. Set posts in concrete footing. Protect portion of posts aboveground from concrete splatter. Place concrete around posts and vibrate or tamp for consolidation. Using mechanical devices to set line posts per ASTM F 567 is not permitted. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during placement and finishing operations until concrete is sufficiently cured.
 1. Dimensions and Profile: As indicated on Drawings.
 2. Concealed Concrete Footings: Stop footings 2 inches below grade to allow covering with surface material.
 3. Posts Set into Concrete in Sleeves: Use steel pipe sleeves preset and anchored into concrete for installing posts. After posts have been 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, and finished sloped to drain water away from post.

3.4 CHAIN-LINK FENCE INSTALLATION

- A. Terminal Posts: Locate terminal end, corner, and gate posts per ASTM F 567 and terminal pull posts at changes in horizontal or vertical alignment of 15 degrees or more.
- B. Line Posts: Space line posts uniformly at 8 feet o.c.
- C. Post Bracing Assemblies: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Install braces at end and gate posts and at both sides of corner and pull posts. Locate horizontal braces at midheight of fabric on fences with top rail and at two-thirds fabric height on fences without top rail. Install so posts are plumb when diagonal rod is under proper tension.
- D. Tension Wire: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Pull wire taut, without sags. Fasten fabric to tension wire with 0.120-inch- diameter hog rings of same material and finish as fabric wire, spaced a maximum of 24 inches o.c. Install tension wire in locations indicated before stretching fabric.
 1. Bottom Tension Wire: Install tension wire within 6 inches of bottom of fabric and tie to each post with not less than same gage and type of wire.
- E. Top Rail: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. 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. Provide expansion couplings as recommended by fencing manufacturer.
- F. Chain-Link Fabric: Apply fabric to outside of enclosing framework. Leave 2 inches between finish grade or surface and bottom selvage, unless otherwise indicated. Pull fabric taut and tie to posts, rails, and tension wires. 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: Use wire of proper length to firmly secure fabric to line posts and rails. 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 per ASTM F 626. Bend ends of wire to minimize hazard to individuals and clothing.
 1. Maximum Spacing: Tie fabric to line posts 12 inches o.c. and to braces 24 inches o.c.

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- I. Fasteners: Install nuts for tension bands and carriage bolts on the side of the fence opposite the fabric side. Peen ends of bolts or score threads to prevent removal of nuts.

3.5 NOT USED

3.6 NOT USED

END OF SECTION 323113

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SECTION 329200 – LAWNS AND GRASSES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Temporary lawns and grasses for erosion control.
 - 2. Fine grading and preparing lawn areas.
 - 3. Furnishing incidental topsoil.
 - 4. Furnishing and applying soil amendments.
 - 5. Furnishing and applying fertilizers.
 - 6. Seeding new lawns.
 - 7. Replanting unsatisfactory or damaged lawns.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 01, Section "Construction Progress Documentation" for requirements for reporting milestones related to turf and grasses.
 - 2. Division 31, Section "Temporary Erosion and Sediment Control" for requirements including seeding of stockpiled and disturbed earth.
 - 3. Division 31, Section "Site Clearing" for protection of existing trees and planting, topsoil stripping and stockpiling, and site clearing.
 - 4. Division 31, Section "Earthwork" for excavation, filling, rough grading, redistribution of topsoil, and subsurface aggregate drainage and drainage backfill.

1.2 NOT USED

1.3 NOT USED

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Seed: Deliver seed in original sealed, labeled, and undamaged containers.

1.5 COORDINATION AND SCHEDULING

- A. Planting Season: Sow lawn seed during normal planting seasons for type of lawn work required. Correlate planting with specified maintenance periods to provide required maintenance from date of Substantial Completion.
 - 1. Proceed with and complete grassing work as portions of the site become available, working within seasonal limitations for each kind of grassing work required.
- B. Weather Limitations: Proceed with planting only when existing and forecast weather conditions are suitable for work.

1.6 MAINTENANCE

- A. Begin maintenance of lawns immediately after each area is planted and continue until acceptable lawn is established, but for not less than the following periods:
 - 1. Seeded Lawns: 60 days after date of Substantial Completion.

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- a. When full maintenance period has not elapsed before end of planting season, or if lawn is not fully established at that time, continue maintenance during next planting season.
- B. Maintain and establish lawns by watering, fertilizing, weeding, mowing, trimming, replanting, and other operations. Roll, re-grade, and replant bare or eroded areas and re-mulch to produce a uniformly smooth lawn.
 1. Replant bare areas with same materials specified for lawns.
 2. Add new mulch in areas where mulch has been disturbed by wind or maintenance operations sufficiently to nullify its purpose. Anchor as required to prevent displacement.
- C. Watering: Provide and maintain temporary piping, hoses, and lawn-watering equipment to convey water from sources and to keep lawns uniformly moist to a depth of 4 inches.
 1. Water lawn at the minimum rate of 1 inch per week.
- D. Mow lawns as soon as there is enough top growth to cut with mower set at specified height for principal species planted. Repeat mowing as required to maintain specified height without cutting more than 40 percent of the grass height. Remove no more than 40 percent of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Schedule initial and subsequent mowings to maintain following grass height:
 1. Maintain grass at 3 inch high.
 2. Mow grass when grass exceeds 4 inch high.
 3. If grass exceeds 4-1/2 inch high, mow grass removing maximum of 1-1/2 inch. Allow grass to recover for minimum 4 days, and mow again. Repeat as required until grass is maintained at required 3 inch height.
 4. If grass exceeds 8 inch high, till grass under and reseed.
- E. Postfertilization: Apply fertilizer to lawn after first mowing and when grass is dry.
 1. Use fertilizer that will provide actual nitrogen of at least 1 lb per 1000 sq. ft. of lawn area.
- F. Weed Control: Contractor is responsible for control of weed growth.

PART 2 - PRODUCTS

2.1 SEED

- A. Grass Seed: Fresh, clean, dry, Blue-Tag certified seed complying with the Official Crop Certifying Agency of South Carolina.
 1. Seed Mixture: Provide seed of grass species and varieties, proportions by weight, and minimum percentages of purity, germination, and maximum percentage of weed seed as indicated on Schedules at the end of this Section.

2.2 TOPSOIL

- A. ASTM D 5268, pH range of 5.5 to 7, 4 percent organic material minimum, free of stones 1 inch or larger in any dimension, and other extraneous materials harmful to plant growth.
 1. Topsoil Source: Reuse surface soil stockpiled on the site. Verify suitability of surface soil to produce topsoil meeting requirements and amend when necessary. Supplement with imported topsoil when quantities are insufficient. Clean topsoil of roots, plants, sods, stones, clay lumps, and other extraneous materials harmful to plant growth.

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2.3 SOIL AMENDMENTS

- A. Lime: ASTM C 602, Class T, agricultural limestone containing a minimum 80 percent calcium carbonate equivalent, with a minimum 99 percent passing a No. 8 sieve and a minimum 75 percent passing a No. 60 sieve.
 - 1. Provide lime in the form of dolomitic limestone.
 - 2. Composition: 90 lb per 1000 sq. ft. unless soils testing indicates otherwise.
- B. Water: Potable.
- C. Aluminum Sulfate: Commercial grade, unadulterated.
- D. Sand: Clean, washed, natural or manufactured sand, free of toxic materials.
- E. Perlite: Horticultural perlite, soil amendment grade.
- F. Peat Humus: Finely divided or granular texture, with a pH range of 6 to 7.5, composed of partially decomposed moss peat (other than sphagnum), peat humus, or reed-sedge peat.
- G. Manure: Well-rotted, unleached stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, and material harmful to plant growth.
- H. Herbicides: EPA registered and approved, of type recommended by manufacturer.

2.4 FERTILIZER

- A. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea-form, phosphorous, and potassium in the following composition:
 - 1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.
- B. Slow-Release Fertilizer: Granular fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:
 - 1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.

2.5 MULCHES

- A. Straw Mulch: Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.
- B. Fiber Mulch: Biodegradable dyed-wood cellulose-fiber mulch, nontoxic, free of plant growth- or germination-inhibitors, with maximum moisture content of 15 percent and a pH range of 4.5 to 6.5.
- C. Non-asphaltic Tackifier: Colloidal tackifier recommended by fiber-mulch manufacturer for slurry application, nontoxic and free of plant growth- or germination-inhibitors.

PART 3 - EXECUTION

3.1 TEMPORARY VEGETATIVE COVER FOR EROSION CONTROL

- A. Grade areas to be seeded as necessary to establish stability, prevent erosion, and to provide maintenance of temporary vegetative cover during the course of construction.
- B. Seed areas as required by Seed Mixtures Schedule at end of this Section.

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- C. Maintenance: Maintain temporary vegetative cover by fertilizing, mowing, irrigation, repair of planting failures, and other necessary means for the required duration.
 - 1. Maintain temporary vegetative cover at maximum 6 inch height.

3.2 EXAMINATION

- A. Examine areas to receive lawns and grass for compliance with requirements and for conditions affecting performance of work of this Section. Do not proceed with installation until unsatisfactory conditions have been corrected.
 - 1. Verify depth of topsoil at 4 inch minimum throughout area to receive seed.
 - 2. Report deficient conditions in writing to Architect.

3.3 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by planting operations.
 - 1. Protect adjacent and adjoining areas from hydroseed overspraying.
- B. Provide 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.

3.4 PLANTING SOIL PREPARATION

- A. Limit subgrade preparation to areas that will be planted in the immediate future.
- B. Loosen subgrade to a minimum depth of 4 inches. Remove stones larger than 1 inches in any dimension and sticks, roots, rubbish, and other extraneous matter.
- C. Mix soil amendments and fertilizers with topsoil at rates indicated. Delay mixing fertilizer if planting does not follow placing of planting soil within a few days. Either mix soil before spreading or apply soil amendments on surface of spread topsoil and mix thoroughly into top 4 inches of topsoil before planting.
 - 1. A "Planting Soil Amendments Schedule" is included at the end of this Section.
 - 2. Mix one ton of lime per acre with dry soil prior to mixing fertilizer.
- D. Spread planting soil mixture to depth required to meet thickness, grades, and elevations shown, after light rolling and natural settlement. Do not spread if planting soil or subgrade is frozen.
- E. Preparation of Unchanged Grades: Where lawns are to be planted in areas unaltered or undisturbed by excavating, grading, or surface soil stripping operations, prepare soil as follows:
 - 1. Apply weed killer two (2) weeks prior to removing existing cover.
 - 2. Remove and dispose of existing grass, vegetation, and turf. Do not turn over into soil being prepared for lawns.
 - 3. Till surface soil to a depth of at least 6 inches. Apply required soil amendments and initial fertilizers and mix thoroughly into top 4 inches of soil. Trim high areas and fill in depressions. Till soil to a homogenous mixture of fine texture.
 - 4. Clean surface soil of roots, plants, sod, stones, clay lumps, and other extraneous materials harmful to plant growth.
 - 5. Remove waste material, including grass, vegetation, and turf, and legally dispose of it off the Owner's property.
- F. Finish grade lawn and grass areas to a smooth, even surface with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit fine grading to areas that can be planted in the immediate future. Remove trash, debris, stones larger

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than 1 inches in any dimension, and other objects that may interfere with planting or maintenance operations.

- G. Moisten prepared lawn areas before planting when soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.
- H. Restore prepared areas if eroded or otherwise disturbed after fine grading and before planting.

3.5 SEEDING NEW LAWNS

- A. Sow seed with a spreader or a seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph. Evenly distribute seed by sowing equal quantities in 2 directions at right angles to each other.
 - 1. Do not use wet seed or seed that is moldy or otherwise damaged in transit or storage.
 - 2. Sow seed at the indicated in the planting schedules at the end of Part 3.
- B. Rake seed lightly into top 1/8 inch of topsoil, roll lightly, and water with fine spray.
- C. Protect seeded slopes exceeding 1:3 against erosion with erosion-control blankets installed and stapled according to manufacturer's recommendations.
- D. Mulch seeded areas by spreading straw mulch after completion of seeding operations. Spread uniformly at a minimum rate of 2 tons per acre to form a continuous blanket 1-1/2 inches loose depth over seeded areas. Spread by hand, blower, or other suitable equipment.
- E. Protect seeded areas against hot, dry weather or drying winds by applying peat mulch within 24 hours after completion of seeding operations. Soak and scatter uniformly to a depth of 3/16 inch thick and roll to a smooth surface.

3.6 HYDROSEEDING NEW LAWNS

- A. Hydroseeding: Mix specified seed, fertilizer, and fiber mulch in water, using equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into homogenous slurry suitable for hydraulic application.
 - 1. Mix slurry with nonasphaltic tackifier.
 - 2. Apply slurry uniformly to all areas to be seeded in a 1-step process. Apply mulch at the minimum rate of 1500 lb per acre dry weight but not less than the rate required to obtain specified seed-sowing rate.

3.7 SATISFACTORY LAWN

- A. Seeded lawns will be satisfactory provided requirements, including maintenance, have been met and a healthy, uniform, close stand of grass is established, free of weeds, bare spots exceeding 5 by 5 inches, and surface irregularities.
- B. Replant lawns that do not meet requirements and continue maintenance until lawns are satisfactory.

3.8 FIELD QUALITY CONTROL

- A. Owner will employ a qualified independent testing agency to perform soil tests on topsoil and base soil after site has been fine graded and prior to seeding. Soil laboratory will analyze soil and recommend soil amendments needed.
 - 1. Contractor must amend soil with types and quantities of amendments recommended.
 - 2. Following soil amendment application, testing laboratory will again perform soil tests to verify proper application.

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- B. Submit preliminary and final testing reports.
 - 1. Soil test parameters are given in the schedule following Part 3.
- C. Owner's testing agency will test topsoil distribution for minimum depth requirement.
 - 1. Contractor shall supply suitable topsoil to supplement topsoil distributed if minimum depth does not meet requirements.
 - 2. Testing agency will verify soil depth and proper soil amendments meet specifications prior to seeding.

3.9 CLEANUP AND PROTECTION

- A. Promptly remove soil and debris created by lawn work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto surface of roads, walks, or other paved areas.
- B. Erect barricades and warning signs as required to protect newly planted areas from traffic. Maintain barricades throughout maintenance period until lawn is established.

3.10 OWNER MAINTENANCE INSTRUCTION

- A. Provide instruction to Owner's personnel on proper lawn maintenance requirements.
 - 1. Provide written instructions and demonstration of proper watering, mowing, and fertilizing techniques.

3.11 PLANTING SOIL AMENDMENTS SCHEDULE

- A. Lawns: Provide soil amendments required to provide planting medium within the following parameters:
 - 1. Soil pH range: 5.8 – 6.2.
 - 2. Phosphorus index of 50; equivalent to 60 ppm P (137 ppm P₂O₅).
 - 3. Potassium index of 50, equivalent to 100 ppm K (120 ppm K₂O).
 - 4. Calcium equivalent to 40 – 60 percent of Cation Exchange Capacity (CEC) ($\text{Ca}\% = (\text{Ca}/\text{CEC})$).
 - 5. Magnesium equivalent to 8 – 15 percent of CEC ($\text{Mg}\% = (\text{Mg}/\text{CEC})$).
 - 6. Base Sat equivalent to 60 – 80 percent of CEC ($\text{BS}\% = ((\text{Ca} + \text{Mg} + \text{K})/\text{CEC})$).
 - 7. Manganese Index Mn-I 25 equivalent to 4.0 ppm.
 - 8. Zinc Index Zn-I 25 equivalent to 1.0 ppm Zn.
 - 9. Copper Index Cu-I 25 equivalent to 0.5 ppm Cu.

3.12 SEED MIXTURES SCHEDULE

- A. See Plans

END OF SECTION 329200

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SECTION 331001 – WATER DISTRIBUTION

NOTE: CONTRACTOR SHALL COMPLY WITH THE STANDARD WATER SPECIFICATIONS FOR THE CITY OF ROCK HILL AS ATTACHED IN APPENDIX. CONTRACTOR SHALL ONLY USE THIS SECTION OF SPECIFICATIONS TO ADDRESS THOSE ITEMS NOT COVERED IN THE CITY OF ROCK HILL SPECIFICATIONS.

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes piping and specialties for combined potable-water water service outside the building.
- B. This Section does not include tapping of utility company water main.
- C. Related Sections include the following:
 - 1. Division 21 Sections for fire-protection piping inside the building.
 - 2. Division 22 Section "Water Distribution Piping" for potable-water piping inside the building.
 - 3. Division 28 Section "Fire Alarm Systems."

1.2 DEFINITIONS

- A. The following are industry abbreviations for plastic and rubber materials:
 - 1. NP: Nylon.
 - 2. PE: Polyethylene.
 - 3. PP: Polypropylene.
 - 4. PTFE: Polytetrafluoroethylene.
 - 5. PVC: Polyvinyl chloride.

1.3 SYSTEM PERFORMANCE REQUIREMENTS

- A. Minimum Working Pressures: The following are minimum pressure requirements for piping and specialties, unless otherwise indicated:
 - 1. Combined Potable-Water and Fire-Protection Water Service: 160 psig.

1.4 SUBMITTALS

- A. Product Data: For the following:
 - 1. NOT USED
 - 2. NOT USED
 - 3. Pipe and fittings.
 - 4. Valves.
 - 5. NOT USED
 - 6. NOT USED
- B. NOT USED
- C. NOT USED
- D. Record Drawings: At Project closeout of installed water-service piping according to Division 01, Section "Closeout Procedures."
- E. Test Reports: As specified in "Field Quality Control" Article in Part 3.
- F. Purging and Disinfecting Reports: As specified in "Cleaning" Article in Part 3.

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G. Maintenance Data: For specialties to include in the maintenance manuals specified in Division 01. Include data for the following:

1. NOT USED
2. NOT USED
3. Valves.
4. NOT USED

1.5 QUALITY ASSURANCE

- A. Product Options: Drawings indicate size, profiles, and dimensional requirements of water-service piping specialties and are based on specific types and models indicated. Other manufacturers' products with equal performance characteristics may be considered. Refer to Division 01 Section "Substitutions."
- B. Comply with requirements of utility supplying water. Include tapping of water mains and backflow prevention.
- C. Comply with standards of authorities having jurisdiction for potable water-service piping. Include materials, installation, testing, and disinfection.
- D. Comply with NSF 61, "Drinking Water System Components--Health Effects," for materials for potable water.
- E. Comply with standards of authorities having jurisdiction for fire-protection water-service piping. Include materials, hose threads, installation, and testing.
- F. Comply with NFPA 24, "Installation of Private Fire Service Mains and Their Appurtenances," for materials, installations, tests, flushing, and valve and hydrant supervision.
- G. Comply with ASTM F 645, "Guide for Selection, Design, and Installation of Thermoplastic Water Pressure Piping Systems."
- H. Comply with NFPA 70, "National Electrical Code," for electrical connections between wiring and electrically operated devices.
- I. Provide listing/approval stamp, label, or other marking on piping and specialties made to specified standards.
- J. Listing and Labeling: Provide electrically operated specialties and devices specified in this Section that are listed and labeled.
 1. The Terms "Listed" and "Labeled": As defined in NFPA 70, Article 100.
 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" as defined in OSHA Regulation 1910.7.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Preparation for Transport: Prepare valves, including fire hydrants, according to the following:
 1. Ensure that valves are dry and internally protected against rust and corrosion.
 2. Protect valves against damage to threaded ends and flange faces.
 3. Set valves in best position for handling. Set valves closed to prevent rattling.
- B. During Storage: Use precautions for valves, including fire hydrants, according to the following:
 1. Do not remove end protectors, unless necessary for inspection; then reinstall for storage.
 2. Protect from weather. Store indoors and maintain temperature higher than ambient dew-point temperature. Support off the ground or pavement in watertight enclosures when outdoor storage is necessary.

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- C. Handling: Use sling to handle valves and fire hydrants whose size requires handling by crane or lift. Rig valves to avoid damage to exposed valve parts. Do not use handwheels or stems as lifting or rigging points.
- D. Deliver piping with factory-applied end-caps. Maintain end-caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.
- E. Protect stored piping from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor when storing inside.
- F. Protect flanges, fittings, and specialties from moisture and dirt.
- G. Store plastic piping protected from direct sunlight. Support to prevent sagging and bending.

1.7 PROJECT CONDITIONS

- A. Perform site survey, research public utility records, and verify existing utility locations. Contact utility-locating service for area where Project is located.
- B. Verify that water-service piping may be installed to comply with original design and referenced standards.
- C. Site Information: Reports on subsurface condition investigations made during design of Project are available for informational purposes only; data in reports are not intended as representations or warranties of accuracy or continuity of conditions between soil borings. Owner assumes no responsibility for interpretations or conclusions drawn from this information.

1.8 SEQUENCING AND SCHEDULING

- A. Coordinate connection to water main with utility company.
- B. Coordinate piping materials, sizes, entry locations, and pressure requirements with building water distribution piping.
- C. Coordinate piping materials, sizes, entry locations, and pressure requirements with building fire-protection water piping.
- D. Coordinate with other utility work.

PART 2 - PRODUCTS

2.1 PIPES AND TUBES

- A. General: Applications of the following pipe and tube materials are indicated in Part 3 "Piping Applications" Article.
- B. PVC Plastic Pipe: ASTM D 1785, with marking "NSF-pw" according to NSF 14.

2.2 PIPE AND TUBE FITTINGS

- A. General: Applications of the following pipe and tube fitting materials are indicated in Part 3 "Piping Applications" Article.
- B. Ductile-Iron, Push-on-Joint Fittings: AWWA C110, ductile-iron or cast-iron; or AWWA C153, ductile-iron, compact type. Include cement-mortar lining and seal coat according to AWWA C104 and rubber compression gaskets according to AWWA C111.
- C. Ductile-Iron, Mechanical-Joint Fittings: AWWA C110, ductile-iron or cast-iron; or AWWA C153, ductile-iron, compact type. Include cement-mortar lining and seal coat

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according to AWWA C104 and glands, rubber gaskets, and bolts and nuts according to AWWA C111.

- D. Ductile-Iron, Flanged Fittings: AWWA C110, with cement-mortar lining and seal coat according to AWWA C104 or epoxy, interior coating according to AWWA C550. Include gaskets and bolts and nuts.
- E. Ductile-Iron, Deflection Fittings: Compound coupling fitting with sleeve and flexing sections, gaskets, and restrained-joint ends complying with AWWA C110 or AWWA C153. Include 250-psig minimum working-pressure rating; cement-mortar lining or epoxy, interior coating according to AWWA C550; deflection of at least 20 degrees; and glands, rubber gaskets, and bolts and nuts according to AWWA C111.
- F. PVC Plastic Fittings: UL 1285 and AWWA C907, Class 150. Include elastomeric seals according to ASTM F 477.
- G. Ductile-Iron Fittings for PVC Pipe: AWWA C110, ductile-iron or cast-iron; or AWWA C153, ductile-iron, compact type; push-on- or mechanical-joint type. Include dimensions matching PVC pipe, cement-mortar lining and seal coat according to AWWA C104, and rubber compression gaskets according to AWWA C111.

2.3 JOINING MATERIALS

- A. General: Applications of the following piping joining materials are indicated in Part 3 "Piping Applications" Article.
- B. Refer to Division 32 Section "Utility Materials" for commonly used joining materials.
- C. Ductile-Iron Piping: The following materials apply:
 - 1. Push-on Joints: AWWA C111 rubber gaskets and lubricant.
 - 2. Mechanical Joints: AWWA C111 ductile-iron or gray-iron glands, high-strength steel bolts and nuts, and rubber gaskets.
 - 3. Flanged Joints: AWWA C115 ductile-iron or gray-iron pipe flanges, rubber gaskets, and high-strength steel bolts and nuts.
 - a. Gaskets: Rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.
 - b. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- D. Pipe Couplings: Iron-body sleeve assembly, fabricated to match OD of pipes to be joined.
 - 1. Sleeve: ASTM A 126, Class B, gray iron.
 - 2. Followers: ASTM A 47, malleable iron; or ASTM A 536, ductile iron.
 - 3. Gaskets: Rubber.
 - 4. Bolts and Nuts: AWWA C111.
 - 5. Finish: Enamel paint.
- E. Plastic Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

2.4 VALVES

- A. Nonrising-Stem, Resilient-Seated Gate Valves, 3-Inch NPS and Larger: AWWA C509, gray- or ductile-iron body and bonnet; with bronze or gray- or ductile-iron gate, resilient seats, bronze stem, and stem nut. Include 200-psig minimum working-pressure design, interior coating according to AWWA C550, and push-on- or mechanical-joint ends.
- B. Nonrising-Stem Gate Valves, 2-Inch NPS and Smaller: MSS SP-80; body and screw bonnet of ASTM B 62 cast bronze; with Class 125 threaded ends, solid wedge, nonrising copper-

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silicon-alloy stem, brass packing gland, PTFE-impregnated packing, and malleable-iron handwheel.

- C. Valve Boxes: Cast-iron box with top section and cover with lettering "WATER," bottom section with base of size to fit over valve and barrel approximately 5 inches in diameter, and adjustable cast-iron extension of length required for depth of bury of valve.

1. Provide steel tee-handle operating wrench with each valve box. Include tee handle with one pointed end, stem of length to operate valve, and socket-fitting valve-operating nut.

- D. Indicator Posts: UL 789, FM-approved, vertical-type, cast-iron body with operating wrench, extension rod, and adjustable cast-iron barrel of length required for depth of bury of valve.

- E. Check Valves: AWWA C508, with 175-psig working pressure rating. Include interior coating according to AWWA C550.

2.5 NOT USED

2.6 NOT USED

2.7 NOT USED

2.8 NOT USED

2.9 NOT USED

2.10 NOT USED

2.11 NOT USED

2.12 NOT USED

2.13 ANCHORAGES

- A. Clamps, Straps, and Washers: ASTM A 506, steel.

- B. Rods: ASTM A 575, steel.

- C. Rod Couplings: ASTM A 197, malleable iron.

- D. Bolts: ASTM A 307, steel.

- E. Cast-Iron Washers: ASTM A 126, gray iron.

- F. Concrete Reaction Backing: Portland cement concrete mix, 3000 psig.

1. Cement: ASTM C 150, Type I.

2. Fine Aggregate: ASTM C 33, sand.

3. Coarse Aggregate: ASTM C 33, crushed gravel.

4. Water: Potable.

2.14 IDENTIFICATION

- A. Refer to Division 31, Section "Earthwork" for underground warning tape materials.

- B. Arrange for detectable warning tapes made of solid blue film with metallic core and continuously printed black-letter caption "CAUTION--WATER LINE BURIED BELOW."

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PART 3 - EXECUTION

3.1 EARTHWORK

- A. Refer to Division 31, Section "Earthwork" for excavation, trenching, and backfilling.

3.2 PIPING APPLICATIONS

- A. General: Use pipe, fittings, and joining methods for piping systems according to the following applications:
- B. Transition couplings and special fittings with pressure ratings at least equal to piping pressure rating may be used in applications below, unless otherwise indicated.
- C. Combined Potable-Water and Fire-Protection Water-Service Piping: Drawings indicate valve types to be used.

3.3 VALVE APPLICATIONS

- A. Drawings indicate valve types to be used.

3.4 JOINT CONSTRUCTION

- A. Refer to Division 32 Section "Utility Materials" for basic piping joint construction.
- B. Ductile-Iron Piping, Gasketed Joints for Fire-Service Piping: According to UL 194 and AWWA C600.
- C. Flanged Joints: Align flanges and install gaskets. Assemble joints by sequencing bolt tightening. Use lubricant on bolt threads.
- D. PVC Piping, Gasketed Joints: Use joining materials according to AWWA C900. Construct joints with elastomeric seals and lubricant according to ASTM D 2774 or ASTM D 3139 and pipe manufacturer's written instructions.
- E. Dissimilar Materials Piping Joints: Use adapters compatible with both piping materials, OD, and system working pressure. Refer to "Piping Systems - Common Requirements" Article below for joining piping of dissimilar metals.

3.5 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. General Locations and Arrangements: Drawings indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated, unless deviations to layout are approved on Coordination Drawings.
- B. Install piping at indicated slope.
- C. Install components with pressure rating equal to or greater than system operating pressure.
- D. Install piping free of sags and bends.
- E. Locate groups of pipes parallel to each other, spaced to permit valve servicing.
- F. Install fittings for changes in direction and branch connections.
- G. Piping Connections: Unless otherwise indicated, make piping connections as specified below:
 - 1. Install unions, in piping 2-inch NPS and smaller, adjacent to each valve and at final connection to each piece of equipment with 2-inch NPS or smaller threaded pipe connection.
 - 2. Install flanges, in piping 2-1/2-inch NPS and larger, adjacent to flanged valves and at final connection to each piece of equipment with flanged pipe connection.

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3.6 SERVICE ENTRANCE PIPING

- A. Extend water-service piping and connect to water-supply source and building water piping systems at outside face of building wall in locations and pipe sizes indicated.
 - 1. Terminate water-service piping at building wall until building water piping systems are installed. Terminate piping with caps, plugs, or flanges as required for piping material. Make connections to building water piping systems when those systems are installed.
- B. Install underground piping with restrained joints at horizontal and vertical changes in direction. Use restrained-joint piping, thrust blocks, anchors, tie-rods and clamps, and other supports.
- C. Anchor service-entry piping to building wall.

3.7 PIPING INSTALLATION

- A. Comply with NFPA 24 for fire-protection water-service piping materials and installation.
- B. Install ductile-iron piping according to AWWA C600.
- C. Install AWWA PVC plastic pipe according to AWWA M23 and ASTM F 645.
- D. Bury piping with depth of cover over top at least 36 inches.

3.8 ANCHORAGE INSTALLATION

- A. Install anchorages for tees, plugs and caps, bends, crosses, valves, and hydrant branches. Include anchorages for the following piping systems:
 - 1. Gasketed-Joint, Ductile-Iron, Potable-Water Piping: According to AWWA C600.
 - 2. Gasketed-Joint, PVC Potable-Water Piping: According to AWWA M23.
 - 3. Fire-Service Piping: According to NFPA 24.
- B. Apply full coat of asphalt or other acceptable corrosion-retarding material to surfaces of installed ferrous anchorage devices.

3.9 VALVE INSTALLATION

- A. General Application: Use mechanical-joint-end valves for 3-inch NPS and larger underground installation. Use threaded- and flanged-end valves for installation in pits. Use nonrising-stem UL/FM gate valves for installation with indicator posts. Use bronze corporation stops and valves, with ends compatible with piping, for 2-inch NPS and smaller installation.
- B. AWWA-Type Gate Valves: Comply with AWWA C600. Install underground valves with stem pointing up and with cast-iron valve box.
- C. UL/FM-Type Gate Valves: Comply with NFPA 24. Install underground valves and valves in pits with stem pointing up and with vertical cast-iron indicator post.

3.10 NOT USED

3.11 NOT USED

3.12 NOT USED

3.13 NOT USED

3.14 IDENTIFICATION INSTALLATION

- A. Install continuous plastic underground warning tape during back-filling of trench for underground water-service piping. Locate 6 to 8 inches below finished grade, directly over piping.

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3.15 FIELD QUALITY CONTROL

- A. Piping Tests: Conduct piping tests before joints are covered and after thrust blocks have hardened sufficiently. Fill pipeline 24 hours before testing and apply test pressure to stabilize system. Use only potable water.
- B. Hydrostatic Tests: Test at not less than 1-1/2 times working pressure for 2 hours.
 - 1. Increase pressure in 50-psig increments and inspect each joint between increments. Hold at test pressure for one hour; decrease to 0 psig. Slowly increase again to test pressure and hold for one more hour. Maximum allowable leakage is 2 quarts per hour per 100 joints. Remake leaking joints with new materials and repeat test until leakage is within above limits.
- C. Prepare reports for testing activities.

3.16 CLEANING

- A. Clean and disinfect water distribution piping as follows:
 - 1. Purge new water distribution piping systems and parts of existing systems that have been altered, extended, or repaired before use.
 - 2. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by that authority, use procedure described in NFPA 24 for flushing of piping. Flush piping system with clean, potable water until dirty water does not appear at points of outlet.
 - 3. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities, use procedure described in AWWA C651 or as described below:
 - a. Fill system or part of system with water/chlorine solution containing at least 50 ppm of chlorine. Isolate system or part thereof and allow to stand for 24 hours.
 - b. Drain system or part of system of previous solution and refill with water/chlorine solution containing at least 200 ppm of chlorine; isolate and allow to stand for 3 hours.
 - c. Following allowed standing time, flush system with clean, potable water until chlorine does not remain in water coming from system.
 - d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedure if biological examination shows evidence of contamination.
- B. Prepare reports for purging and disinfecting activities.

END OF SECTION 331001

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SECTION 333000 – SANITARY SEWERAGE

NOTE: CONTRACTOR SHALL COMPLY WITH THE STANDARD SEWER SPECIFICATIONS FOR THE CITY OF ROCK HILL AS ATTACHED IN APPENDIX. CONTRACTOR SHALL ONLY USE THIS SECTION OF SPECIFICATIONS TO ADDRESS THOSE ITEMS NOT COVERED IN THE CITY OF ROCK HILL SPECIFICATIONS.

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes sanitary sewerage outside the building.

1.2 DEFINITIONS

- A. PVC: Polyvinyl chloride plastic.

1.3 PERFORMANCE REQUIREMENTS

- A. Gravity-Flow, Nonpressure-Piping Pressure Ratings: At least equal to system test pressure.

1.4 SUBMITTALS

- A. Product Data: For the following:
 - 1. Cleanouts.
 - 2. Manhole cover inserts.
 - 3. Pipe materials and fittings.
- B. Shop Drawings: Include plans, elevations, details, and attachments for the following:
 - 1. Precast concrete manholes, including frames and covers.
- C. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Do not store plastic structures, pipe, and fittings in direct sunlight.
- B. Protect pipe, pipe fittings, and seals from dirt and damage.
- C. Handle precast concrete manholes and other structures according to manufacturer's written rigging instructions.

1.6 PROJECT CONDITIONS

- A. Site Information: Perform site survey, research public utility records, and verify existing utility locations.
- B. Locate existing structures and piping to be closed and abandoned.
 - 1. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Refer to Part 3 "Piping Applications" Article for applications of pipe and fitting materials.

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2.2 PIPES AND FITTINGS

- A. Ductile-Iron Sewer Pipe: ASTM A 746, for push-on joints.
 - 1. Standard-Pattern, Ductile-Iron Fittings: AWWA C110, ductile or gray iron, for push-on joints.
 - 2. Compact-Pattern, Ductile-Iron Fittings: AWWA C153, for push-on joints.
 - 3. Gaskets: AWWA C111, rubber.
- B. PVC Sewer Pipe and Fittings: According to the following:
 - 1. PVC Sewer Pipe and Fittings, NPS 15 and Smaller: ASTM D 3034, SDR 35, for solvent-cemented or gasketed joints.
 - a. Gaskets: ASTM F 477, elastomeric seals.

2.3 SPECIAL PIPE COUPLINGS AND FITTINGS

- A. Sleeve-Type Pipe Couplings: ASTM C 1173, rubber or elastomeric sleeve and band assembly fabricated to mate with OD of pipes to be joined, for nonpressure joints.
 - 1. Sleeve Material for Plastic Pipe: ASTM F 477, elastomeric seal.
 - 2. Sleeve Material for Dissimilar Pipe: Compatible with pipe materials being joined.
 - 3. Bands: Stainless steel, at least one at each pipe insert.

2.4 NOT USED

2.5 CLEANOUTS

- A. Gray-Iron Cleanouts: ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, gray-iron cover. Include gray-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug. Use units with top-loading classifications according to the following applications:
 - 1. Heavy Duty: In vehicle-traffic service areas.
 - 2. Sewer Pipe Fitting and Riser to Cleanout: ASTM A 74, Service class, cast-iron soil pipe and fittings.
- B. PVC Cleanouts: PVC body with PVC threaded plug. Include PVC sewer pipe fitting and riser to cleanout of same material as sewer piping.

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Excavating, trenching, and backfilling are specified in Division 31, Section "Earthwork."

3.2 IDENTIFICATION

- A. Materials and their installation are specified in Division 31, Section "Earthwork." Arrange for installing green warning tapes directly over piping and at outside edges of underground structures.
 - 1. Use detectable warning tape over nonferrous piping and over edges of underground structures.

3.3 PIPING APPLICATIONS

- A. General: Include watertight joints.
- B. Refer to Part 2 of this Section for detailed specifications for pipe and fitting products listed below. Use pipe, fittings, and joining methods according to applications indicated.

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C. Gravity-Flow Piping: Type and size as indicated.

3.4 SPECIAL PIPE COUPLING AND FITTING APPLICATIONS

- A. Special Pipe Couplings: Use where required to join piping and no other appropriate method is specified. Do not use instead of specified joining methods.
 - 1. Use the following pipe couplings for nonpressure applications:
 - a. Sleeve type to join piping, of same size, or with small difference in OD.
 - b. Increaser/reducer-pattern, sleeve type to join piping of different sizes.
 - c. Bushing type to join piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.

3.5 INSTALLATION, GENERAL

- A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground sanitary sewerage piping. Location and arrangement of piping layout take design considerations into account. Install piping as indicated, to extent practical.
- B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for using lubricants, cements, and other installation requirements. Maintain swab or drag in line, and pull past each joint as it is completed.
- C. Use manholes for changes in direction, unless fittings are indicated. Use fittings for branch connections, unless direct tap into existing sewer is indicated.
- D. Use proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.
- E. Install gravity-flow piping and connect to building's sanitary drains, of sizes and in locations indicated. Terminate piping as indicated.
 - 1. Install piping pitched down in direction of flow, at minimum slope of 2 percent, unless otherwise indicated.
 - 2. Install piping with 36-inch minimum cover.
- F. Extend sanitary sewerage piping and connect to building's sanitary drains, of sizes and in locations indicated. Terminate piping as indicated.

3.6 PIPE JOINT CONSTRUCTION AND INSTALLATION

- A. General: Join and install pipe and fittings according to installations indicated.
- B. Ductile-Iron Sewer Pipe with Ductile-Iron Fittings: According to AWWA C600.
- C. PVC Sewer Pipe and Fittings: As follows:
 - 1. Join pipe and gasketed fittings with gaskets according to ASTM D 2321.
 - 2. Install according to ASTM D 2321.
- D. System Piping Joints: Make joints using system manufacturer's couplings, unless otherwise indicated.
- E. Join piping made of different materials or dimensions with couplings made for this application. Use couplings that are compatible with and that fit both systems' materials and dimensions.
- F. Install with top surfaces of components, except piping, flush with finished surface.

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3.7 NOT USED

3.8 CLEANOUT INSTALLATION

- A. Install cleanouts and riser extension from sewer pipe to cleanout at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts and cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.
- B. Set cleanout frames and covers in earth in cast-in-place concrete block, 18 by 18 by 6 inches deep. Set with tops 1 inch above surrounding grade.
- C. Set cleanout frames and covers in concrete pavement with tops flush with pavement surface.

3.9 TAP CONNECTIONS

- A. Make connections to existing piping and underground structures so finished Work complies as nearly as practical with requirements specified for new Work.
- B. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye fitting, plus 6-inch overlap, with not less than 6 inches of concrete with 28-day compressive strength of 3000 psi.
- C. Protect existing piping and structures to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

3.10 FIELD QUALITY CONTROL

- A. Clear interior of piping and structures of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed.
 - 1. Place plug in end of incomplete piping at end of day and when work stops.
- B. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.
 - 1. Submit separate reports for each system inspection.
 - 2. Defects requiring correction include the following:
 - a. Alignment: Less than full diameter of inside of pipe is visible between structures.
 - b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
 - c. Crushed, broken, cracked, or otherwise damaged piping.
 - d. Infiltration: Water leakage into piping.
 - e. Exfiltration: Water leakage from or around piping.
 - 3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
 - 4. Reinspect and repeat procedure until results are satisfactory.
- C. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
 - 1. Do not enclose, cover, or put into service before inspection and approval.
 - 2. Test completed piping systems according to authorities having jurisdiction.
 - 3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
 - 4. Submit separate reports for each test.
 - 5. NOT USED
 - 6. Leaks and loss in test pressure constitute defects that must be repaired.

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7. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

END OF SECTION 333000

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SECTION 334000 – STORM DRAINAGE UTILITIES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes storm drainage outside the building.
- B. Related Sections include the following:
 - 1. Division 31, Section "Earthwork".
 - 2. Division 31, Section "Temporary Erosion & Sediment Control".

1.2 PERFORMANCE REQUIREMENTS

- A. Gravity-Flow, Nonpressure-Piping Pressure Ratings: At least equal to system test pressure.

1.3 SUBMITTALS

- A. Product Data: For the following:
 - 1. NOT USED
 - 2. Cleanouts, and drains.
 - 3. Pipe materials and fittings.
- B. Shop Drawings: Include plans, elevations, details, and attachments for the following:
 - 1. Precast concrete manholes and other structures, including frames, covers, and grates.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Do not store plastic structures, pipe, and fittings in direct sunlight.
- B. Protect pipe, pipe fittings, and seals from dirt and damage.
- C. Handle precast concrete manholes and other structures according to manufacturer's written rigging instructions.

1.5 PROJECT CONDITIONS

- A. Site Information: Perform site survey, research public utility records, and verify existing utility locations.
- B. Locate existing structures and piping to be closed and abandoned.
- C. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1. Notify Architect not less than two days in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without Architect's written permission.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Refer to Part 3 "Piping Applications" Article for applications of pipe and fitting materials.

2.2 PIPES AND FITTINGS

- A. Corrugated PE Pipe and Fittings: AASHTO M 294, Type S, with smooth waterway for coupling joints.

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1. Silttight Couplings: PE sleeve with ASTM D 1056, Type 2, Class A, Grade 2 gasket material that mates with pipe and fittings to form silttight joints.
- B. PVC Sewer Pipe and Fittings: (Roof drain connectors only): According to the following:
 1. PVC Sewer Pipe and Fittings, NPS 15 and Smaller: ASTM D 3034, SDR 35, for solvent-cemented or gasketed joints.
 - a. Gaskets: ASTM F 477, elastomeric seals.
 2. PVC Sewer Pipe and Fittings, NPS 18 and Larger: ASTM F 679, T-1 wall thickness, bell and spigot for gasketed joints.
 - a. Gaskets: ASTM F 477, elastomeric seals.
- C. Reinforced-Concrete Sewer Pipe and Fittings: ASTM C 76, Class III, Wall B, tongue and groove.

2.3 NOT USED

2.4 NOT USED

2.5 CLEANOUTS

- A. PVC Cleanouts: PVC body with PVC threaded plug. Include PVC sewer pipe fitting and riser to cleanout of same material as sewer piping.

2.6 NOT USED

2.7 PIPE OUTLETS

- A. Rip Rap Aprons/Energy Dissipators: NSA No. A-1, sized as indicated.
- B. Beveled End Sections: Of same size and material as pipe.

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Excavating, trenching, and backfilling are specified in Division 31 Section "Earthwork."

3.2 IDENTIFICATION

- A. Materials and their installation are specified in Division 31, Section "Earthwork." Arrange for installing green warning tapes directly over piping and at outside edges of underground structures, when required by Utility Agencies having jurisdiction.

3.3 PIPING APPLICATIONS

- A. General: Include silt-tight joints, unless watertight joints are indicated.
- B. Refer to Part 2 of this Section for detailed specifications for pipe and fitting products. Use pipe, fittings, and joining methods according to applications indicated.
 1. Gravity-Flow Piping: Use size and type indicated.

3.4 INSTALLATION, GENERAL

- A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take design considerations into account. Install piping as indicated, to extent practical.
- B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves,

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and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab or drag in line, and pull past each joint as it is completed.

- C. Use manholes for changes in direction, unless fittings are indicated. Use fittings for branch connections, unless direct tap into existing sewer is indicated.
- D. Use proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.
- E. Install gravity-flow piping and connect to building's storm drains, of sizes and in locations indicated. Terminate piping as indicated.
 - 1. Install piping pitched down in direction of flow, at minimum slope of 1 percent, unless otherwise indicated.
- F. Extend storm drainage piping and connect to building's storm drains, of sizes and in locations indicated. Terminate piping as indicated.
- G. Tunneling: Install pipe under streets or other obstructions that cannot be disturbed by tunneling, jacking, or a combination of both.

3.5 PIPE JOINT CONSTRUCTION AND INSTALLATION

- A. General: Join and install pipe and fittings according to installations indicated.
- B. PE Pipe and Fittings: As follows:
 - 1. Join pipe, tubing, and fittings with couplings for soiltight joints according to manufacturer's written instructions.
 - 2. Install according to ASTM D 2321 and manufacturer's written instructions.
 - 3. Install corrugated piping according to the Corrugated Polyethylene Pipe Association's "Recommended Installation Practices for Corrugated Polyethylene Pipe and Fittings."
- C. PVC Sewer Pipe and Fittings: As follows:
 - 1. Join pipe and gasketed fittings with gaskets according to ASTM D 2321.
 - 2. Install according to ASTM D 2321.
- D. Concrete Pipe and Fittings: Install according to ACPA's "Concrete Pipe Installation Manual." Use the following seals:
 - 1. Round Pipe and Fittings: Tongue and groove.
- E. System Piping Joints: Make joints using system manufacturer's couplings, unless otherwise indicated.
- F. Join piping made of different materials or dimensions with couplings made for this application. Use couplings that are compatible with and that fit both systems' materials and dimensions.

3.6 NOT USED

3.7 NOT USED

3.8 STORM DRAINAGE INLET AND OUTLET INSTALLATION

- A. Construct riprap/energy dissipators of broken stone, as indicated.
- B. Install outlets that spill onto grade, with beveled end sections that match pipe, unless otherwise indicated.

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3.9 CLEANOUT INSTALLATION

- A. Install cleanouts and riser extension from sewer pipe to cleanout at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts and cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.
- B. Set cleanout frames and covers in earth in cast-in-place concrete block, 18 by 18 by 6 inches deep. Set with tops 1 inch above surrounding earth grade.
- C. Set cleanout frames and covers in concrete pavement with tops flush with pavement surface.

3.10 NOT USED

3.11 FIELD QUALITY CONTROL

- A. Clear interior of piping and structures of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed.
 - 1. In large, accessible piping, brushes and brooms may be used for cleaning.
 - 2. Place plug in end of incomplete piping at end of day and when work stops.
 - 3. Flush piping between manholes and other structures to remove collected debris, if required by authorities having jurisdiction.
- B. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.
 - 1. Submit separate reports for each system inspection.
 - 2. Defects requiring correction include the following:
 - a. Alignment: Less than full diameter of inside of pipe is visible between structures.
 - b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
 - c. Crushed, broken, cracked, or otherwise damaged piping.
 - d. Infiltration: Water leakage into piping.
 - e. Exfiltration: Water leakage from or around piping.
 - 3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
 - 4. Reinspect and repeat procedure until results are satisfactory.
- C. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
 - 1. Do not enclose, cover, or put into service before inspection and approval.
 - 2. Test completed piping systems according to authorities having jurisdiction.
 - 3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
 - 4. Submit separate reports for each test.

END OF SECTION 334000

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SECTION 334600 – SUBDRAINAGE

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes subdrainage systems for the following:
 - 1. Foundations.
 - 2. Underslab areas.
 - 3. Retaining walls.
 - 4. Landscaped areas.

1.2 DEFINITIONS

- A. PE: Polyethylene.
- B. PVC: Polyvinyl chloride.

1.3 SUBMITTALS

- A. Product Data: For drainage conduit, drainage panels, and geotextile fabrics.
 - 1. Perforated pipe.
 - 2. Solid pipe.
 - 3. Drainage panels.
 - 4. Geotextile fabrics.

1.4 COORDINATION

- A. Drainage panel materials and installation shall be compatible with waterproofing of walls below grade.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Refer to various application articles in Part 3 for applications of pipe, tube, fitting, and joining materials.

2.2 UNDERSLAB HEADERS

- A. PVC Sewer Pipe and Fittings: ASTM D 3034, SDR 35, bell-and-spigot ends, for gasketed joints.
 - 1. Gaskets: ASTM F 477, elastomeric seal.

2.3 DRAINAGE PIPES AND FITTINGS

- A. Perforated, PVC Sewer Pipe and Fittings: ASTM D 2729, bell-and-spigot ends, for loose joints.
- B. Perforated PE Pipe and Fittings:
 - 1. NPS 6 (DN150) and Smaller: ASTM F405 or AASHTO M252. Type CP; corrugated for coupled joints.
 - 2. NPS 8 (DN200) and Larger: ASTM F 667; AASHTO M252, Type CP; or AASHTO M 294, Type CP.; corrugated for coupled joints.
 - 3. Couplings: Manufacturer's standard, band type.

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2.4 SPECIAL PIPE COUPLINGS

- A. Description: ASTM C 1173. Rubber or elastomeric sleeve and band assembly fabricated to match outside diameters of pipes to be joined.

2.5 CLEANOUTS

- A. PVC Pipe: ASTM D 3034, PVC cleanout threaded plug and threaded pipe hub.

2.6 MOLDED-SHEET DRAINAGE PANELS

- A. Description: Prefabricated, composite panels, 36 to 60 inches wide, and manufactured with geotextile facing laminated to molded-plastic drainage core.
- B. Drainage Core: Three-dimensional, nonbiodegradable, molded PP or PS.
 - 1. Minimum Compressive Strength: 15,000 psig when tested according to ASTM D 1621.
- C. Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage, made from polyolefins or polyesters; with elongation greater than 50 percent.
- D. Geotextile: Woven geotextile fabric, manufactured for subsurface drainage, made from polyolefins or polyesters; with elongation less than 50 percent.
- E. Film Backing: Polymeric film bonded to drainage core surface.

2.7 FABRIC DRAINAGE PANELS

- A. Description: Prefabricated, composite drainage panels, made with drainage core and filter fabric, for use as part of foundation, underslab, and retaining-wall drainage system.
- B. Drainage Core: Open-construction, resilient, 0.8-inch- thick, nylon-filament mesh.
- C. Drainage Core: 3-dimensional, PE strand, 0.25-inch- thick, nonwoven net.
- D. Filter Fabric: Nonwoven geotextile filter fabric of PP or polyester fibers, or combination of both. Flow rates range from 120 to 200 gpm per sq. ft. when tested according to ASTM D 4491.

2.8 SOIL MATERIALS

- A. Impervious Fill: Clay, gravel, and sand mixture.
- B. Drainage Fill: Washed, evenly graded mixture of crushed stone, or crushed or uncrushed gravel, ASTM D 448, coarse aggregate, Size No. 57, with 100 percent passing 1-1/2-inch sieve and not more than 5 percent passing No. 8 sieve.

2.9 ROOFING FELTS

- A. ASTM D 226, Type I, asphalt-saturated roofing felt.

2.10 GEOTEXTILE FILTER FABRICS

- A. Woven or nonwoven geotextile filter fabric of PP or polyester fibers, or combination of both. Flow rates range from 110 to 330 gpm per sq. ft. when tested according to ASTM D 4491. Available styles are flat and sock.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces and areas for suitable conditions where subdrainage systems are to be installed.

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- B. If subdrainage is required for landscaping, locate and mark existing utilities, underground structures, and aboveground obstructions before beginning installation and avoid disruption and damage of services.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 EARTHWORK

- A. Excavating, trenching, and backfilling are specified in Division 31, Section "Earthwork."

3.3 SUBDRAINAGE SYSTEM APPLICATIONS

- A. NPS 4 Piping:
 - 1. Perforated, PVC sewer pipe and fittings for loose, bell-and-spigot joints.
- B. NPS 6 Piping:
 - 1. Perforated, PVC sewer pipe and fittings for loose, bell-and-spigot joints.

3.4 UNDERSLAB DRAINAGE SYSTEM APPLICATIONS

- A. NPS 4 Piping:
 - 1. Perforated, PVC sewer pipe and fittings for loose, bell-and-spigot joints.
- B. NPS 6 Piping:
 - 1. Perforated, PVC sewer pipe and fittings for loose, bell-and-spigot joints.

3.5 UNDERSLAB DRAINAGE SYSTEM HEADER APPLICATIONS

- A. NPS 4 and NPS 6 Piping:
 - 1. PVC sewer pipe and fittings, couplings, and coupled joints.
- B. NPS 8 and NPS 10 Piping:
 - 1. PVC sewer pipe and fittings, couplings, and coupled joints.

3.6 IDENTIFICATION

- A. Materials and their installation are specified in Division 31, Section "Earthwork." Arrange for installation of green warning tapes directly over piping.
 - 1. Install warning tape or detectable warning tape over ferrous piping.
 - 2. Install detectable warning tape over nonferrous piping and over edges of underground structures.

3.7 FOUNDATION DRAINAGE INSTALLATION

- A. Bottom Impervious Fill: Place impervious fill material on subgrade adjacent to bottom of footing after concrete footings have been cured and forms removed. Place and compact impervious fill to dimensions indicated, but not less than 6 inches deep and 12 inches wide.
- B. Drainage Fill: Place supporting layer of drainage fill over compacted subgrade to compacted depth of not less than 4 inches. After installing drainage piping, add drainage fill to width of at least 6 inches on side away from wall and to top of pipe to perform tests. After satisfactory testing, cover piping to width of at least 6 inches on side away from footing and above top of pipe to within 12 inches of finish grade. Place drainage fill in layers not exceeding 3 inches in loose depth; compact each layer placed.
 - 1. Before installing drainage fill, lay flat-style geotextile filter fabric in trench and overlap trench sides. After installing drainage fill, wrap top of drainage fill with flat-style geotextile filter fabric.

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2. Encase pipe with sock-style geotextile filter fabric before installing pipe. Connect sock sections with electrical tape.
 3. After installing drainage fill, place one layer of flat-style geotextile filter fabric over top of drainage fill, overlapping edges at least 4 inches.
- C. Install vertical drainage panel as follows:
1. Coordinate placement with other drainage materials.
 2. Lay perforated, PE or PVC drainage pipe at base of footing as described elsewhere in this Specification. Do not install aggregate.
 3. Mark horizontal chalk line on wall at a point 6 inches less than panel width above footing bottom. Before marking wall, subtract footing width.
 4. Separate 4 inches of fabric at beginning of roll and cut away 4 inches of core. Wrap fabric around end of remaining core.
 5. Wrap bottom of panel around drainage pipe.
 6. Attach panel to wall at horizontal mark and at beginning of pipe. Place core side of panel against wall. Use concrete nails with washers through product cylinders to attach panel to wall. Place nails from 2 to 6 inches below top of panel, approximately 48 inches apart. Some manufacturers use construction adhesives, metal stick pins, or double-sided tape. Do not penetrate waterproofing. Before using adhesives, discuss with waterproofing manufacturer.
 7. If another panel is required on the same row, cut away 4 inches of installed panel core and wrap fabric over new panel.
 8. If additional rows of panel are required, overlap lower panel with 4 inches of fabric.
 9. Cut panel as necessary to keep top 12 inches below finish grade.
 10. For inside corners, bend panel. For outside corners, cut core to provide 3 inches for overlap.
 11. Do not use drainage panels as protection over waterproof membrane, unless otherwise approved by waterproofing membrane manufacturer.
- D. Fill to Grade: Place native fill material over compacted drainage fill. Place material in loose-depth layers not exceeding 6 inches. Thoroughly compact each layer. Fill to finish elevations and slope away from building.

3.8 UNDERSLAB DRAINAGE INSTALLATION

- A. Excavate for underslab drainage system after subgrade material has been compacted, but before drainage fill has been placed. Include horizontal distance of at least 6 inches between drainage pipe and trench walls. Grade bottom of trench excavations to required slope and compact to firm, solid bed for drainage system.
- B. Drainage Fill: Place supporting layer of drainage fill over compacted subgrade to compacted depth of not less than 4 inches. After installing drainage piping, add drainage fill to top of pipe to perform tests. After satisfactory testing, cover piping with drainage fill to elevation of bottom of slab and compact drainage material.
1. Before installing drainage fill, lay flat-style geotextile filter fabric in trench and overlap trench sides. After installing drainage fill, wrap top of drainage fill with flat-style geotextile filter fabric.
 2. Encase pipe with sock-style geotextile filter fabric before installing pipe. Connect sock sections with electrical tape.
- C. Install horizontal drainage panels as follows:
1. Coordinate placement with other drainage materials.

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2. Lay perforated, PE or PVC drainage pipe at inside edge of footings.
3. Place drainage panel over drainage pipe with core side up. Peel back fabric and wrap fabric around pipe. Locate top of core at bottom elevation of floor slab.
4. Butt additional panels against other installed panels. If panels have plastic flanges, overlap installed panel with flange.

3.9 RETAINING-WALL DRAINAGE INSTALLATION

- A. Drainage Fill: Place supporting layer of drainage fill over compacted subgrade to compacted depth of not less than 4 inches. After installing drainage piping, add drainage fill to width of at least 6 inches on side away from wall and to top of pipe to perform tests. After satisfactory testing, cover piping to width of at least 6 inches on side away from footing and above top of pipe to within 12 inches of finish grade. Place drainage fill in layers not exceeding 3 inches in loose depth; compact each layer placed.
 1. Before installing drainage fill, lay flat-style geotextile filter fabric in trench and overlap trench sides. After installing drainage fill, wrap top of drainage fill with flat-style geotextile filter fabric.
 2. Encase pipe with sock-style geotextile filter fabric before installing pipe. Connect sock sections with electrical tape.
 3. After installing drainage fill, place one layer of flat-style geotextile filter fabric over top of drainage fill, overlapping edges at least 4 inches.
- B. Install vertical drainage panels as follows:
 1. Coordinate placement with other drainage materials.
 2. Lay perforated, PE or PVC drainage pipe at base of footing as described elsewhere in this Specification. Do not install aggregate.
 3. If weep holes are used in lieu of drainage pipe, cut 1/2-inch- diameter holes on core side at weep-hole locations. Do not cut fabric.
 4. Mark horizontal chalk line on wall at a point 6 inches less than panel width above footing bottom. Before marking wall, subtract footing width.
 5. Separate 4 inches of fabric at beginning of roll and cut away 4 inches of core. Wrap fabric around end of remaining core.
 6. Wrap bottom of panel around drainage pipe.
 7. Attach panel to wall at horizontal mark and at beginning of wall corner. Place core side of panel against wall. Use concrete nails with washers through product. Use construction adhesives. Do not penetrate waterproofing. Before using adhesives, discuss with waterproofing manufacturer.
 8. If another panel is required on the same row, cut away 4 inches of installed panel core and wrap fabric over new panel.
 9. If additional rows of panel are required, overlap lower panel with 4 inches of fabric.
 10. Cut panel as necessary to keep top 12 inches below finish grade.
 11. For inside corners, bend panel. For outside corners, cut core to provide 3 inches for overlap.
 12. Do not use drainage panels as protection over waterproof membrane, unless otherwise approved by waterproofing membrane manufacturer.
- C. Fill to Grade: Place native fill material over compacted drainage fill. Place material in loose-depth layers not exceeding 6 inches. Thoroughly compact each layer. Fill to finish grade.

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3.10 LANDSCAPING DRAINAGE INSTALLATION

- A. Install drainage pipe with a horizontal distance of at least 6 inches between pipe and trench walls. Grade bottom of trench excavations to required slope and compact to firm, solid bed for drainage system.
- B. Drainage Fill: Place supporting layer of drainage fill over trench bottom to compacted depth of not less than 4 inches. After installing drainage piping, add drainage fill to top of pipe to perform tests. After satisfactory testing, cover piping to within 12 inches of finish grade. Place drainage fill in layers not exceeding 3 inches in loose depth; compact each layer placed.
 - 1. After installing drainage fill, place one layer of flat-style geotextile filter fabric over top of drainage fill, overlapping edges at least 4 inches.
 - 2. Before installing drainage fill, lay flat-style geotextile filter fabric in trench and overlap trench sides. After installing drainage fill, wrap top of drainage fill with flat-style geotextile filter fabric.
 - 3. Encase pipe with sock-style geotextile filter fabric before installing pipe. Connect sock sections with electrical tape.
- C. Fill to Grade: Place native fill material over drainage fill. Place material in loose-depth layers not exceeding 6 inches. Thoroughly compact each layer. Fill to finish grade.

3.11 PIPING INSTALLATION

- A. Install piping beginning at low points of system, true to grades and alignment indicated, with unbroken continuity of invert. Bed piping with full bearing in filtering material. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions and other requirements indicated.
 - 1. Foundation Subdrainage: Install piping pitched down in direction of flow, at a minimum slope of 0.5 percent and with a minimum cover of 36 inches, unless otherwise indicated.
 - 2. Underslab Subdrainage: Install piping pitched down in direction of flow, at a minimum slope of 0.5 percent.
 - 3. Retaining-Wall Subdrainage: When water discharges at end of wall into stormwater piping system, install piping pitched down in direction of flow, at a minimum slope of 0.5 percent and with a minimum cover of 36 inches, unless otherwise indicated. However, when water discharges through wall weep holes, pipe may be installed with a minimum slope of zero percent.
 - 4. Landscaping Subdrainage: Install piping pitched down in direction of flow, at a minimum slope of 0.5 percent and with a minimum cover of 36 inches, unless otherwise indicated.
 - 5. Lay perforated pipe with perforations down.
 - 6. Excavate recesses in trench bottom for bell ends of pipe. Lay pipe with bells facing upslope and with spigot end entered fully into adjacent bell.
- B. Use increasers, reducers, and couplings made for different sizes or materials of pipes and fittings being connected. Reduction of pipe size in direction of flow is prohibited.
- C. Install PVC piping according to ASTM D 2321.

3.12 PIPE JOINT CONSTRUCTION

- A. Join PVC pipe and fittings according to ASTM D 3034 with elastomeric seal gaskets according to ASTM D 2321 and in accordance with manufacturer's instructions.
- B. Join perforated, PVC pipe and fittings according to ASTM D 2729 and in accordance with manufacturer's instructions, with loose, bell-and-spigot joints.

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- C. Special Pipe Couplings: Join piping made of different materials and dimensions with special couplings made for this application. Use couplings that are compatible with and that fit both pipe materials and dimensions.

3.13 FOUNDATION, RETAINING-WALL, AND LANDSCAPING SUBDRAINAGE CLEANOUT INSTALLATION

- A. Install cleanouts from subdrainage piping to grade. Locate cleanouts at beginning of piping run and at changes in direction. Install fittings so cleanouts open in direction of flow in piping.
- B. In vehicular-traffic areas, use NPS 4 cast-iron soil pipe and fittings for subdrainage piping branch fittings and riser extensions to cleanout plug. Set cleanout frames and covers in a cast-in-place concrete anchor, 18 by 18 by 12 inches in depth. Set top of cleanout plug flush with grade. Cast-iron pipe may also be used for cleanouts in nonvehicular-traffic areas.
- C. In nonvehicular-traffic areas, use NPS 4 PVC pipe and fittings for subdrainage piping branch fittings and riser extensions to cleanout plug. Set cleanout frames and covers in a cast-in-place concrete anchor, 12 by 12 by 4 inches in depth. Set top of cleanout plug 1 inch above grade.

3.14 UNDERSLAB SUBDRAINAGE CLEANOUT INSTALLATION

- A. Install cleanouts and riser extensions from subdrainage piping to top of slab. Locate cleanouts at beginning of piping run and at changes in direction. Install fittings so cleanouts open in direction of flow in piping.
- B. Use NPS 4 cast-iron soil pipe and fittings for subdrainage piping branch fittings and riser extensions to cleanout plug flush with top of slab.

3.15 CONNECTIONS

- A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect low elevations of subdrainage system to solid storm drainage system.

3.16 FIELD QUALITY CONTROL

- A. Testing: After installing drainage fill to top of pipe, test drain piping with water to ensure free flow before backfilling. Remove obstructions, replace damaged components, and repeat test until results are satisfactory.

3.17 CLEANING

- A. Clear interior of installed piping and structures of dirt and other superfluous material as work progresses. Maintain swab or drag in piping and pull past each joint as it is completed. Place plugs in ends of uncompleted pipe at end of each day or when work stops.

END OF SECTION 334600



STANDARD WATER SPECIFICATIONS

FOR THE
CITY OF ROCK HILL



June 2018



City of Rock Hill
Water/Sewer Utilities
P.O. Box 11706
Rock Hill, SC 29731-1706
803-329-5500





June 14, 2018

ROCK HILL CITY OF
PO BOX 11706
ROCK HILL SC 29731-1706

RE: Standard Specifications for Water System
ROCK HILL CITY OF
Approval Number SS-002145

This office has reviewed the water system specifications submitted to this office on 03/08/2018, revised on 6/14/2018 for consideration of becoming Standard Specifications. Based on our review this letter may serve as your approval of these Standard Specifications.

For further submittals of projects, please indicate on the application for permit to construct that your specifications have been approved as Standard Specifications and that no additional copies will be necessary.

If you have any questions, please call me at 803-898-1941.

Sincerely,

A handwritten signature in black ink, appearing to read "Maia P Milenkova".

Maia P Milenkova
Construction Permitting Section
Bureau of Water

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I. Purpose and General Information

A. **PURPOSE & APPLICATION:** This document was created and assembled for use in planning, designing, and constructing potable water facilities which will be owned and operated by the City of Rock Hill. In addition to the information contained herein, rules and regulations set forth by the South Carolina Department of Health and Environmental Control (SCDHEC) and the US Environmental Protection Agency (EPA) apply to the permitting and construction of these facilities. This information applies to both existing and new facilities construction.

B. **SCOPE OF WORK:** All materials, labor, and equipment necessary for potable water construction and placing in operation water infrastructure and appurtenances within the City of Rock Hill water service territory or to be served by the City of Rock Hill shall be provided in accordance with the following specifications and City of Rock Hill Standard Details.

1. The work shall include all clearing, grubbing, trenching, shoring [in accordance with Occupational Safety & Health Administration (OSHA) regulations], dewatering, installing water infrastructure (i.e., valves, hydrants, piping and other appurtenances) shown and specified, backfilling and consolidating the backfill material, as well as other work as may be necessary to complete the work.

2. Construction Drawings shall be prepared under the direction of a Professional Engineer licensed to practice in the state of South Carolina.

3. The Contractor shall furnish all materials, equipment and labor required to construct the project as outlined in these specifications and Construction Drawings.

C. **ORDER OF WORK:** The Order of Work shall be determined by the Contractor, subject to approval by the City Engineer.

D. **MATERIAL INSPECTION:** All materials and workmanship shall be subject to inspection by the City Engineer or his or her designee and representatives of SCDHEC or SCDOT or any other entity having permitting authority over the project. Work and/or materials not conforming to these specifications or any applicable permit shall be corrected immediately. The Engineer shall have the right to label materials not meeting the specifications and/or the Contractor shall segregate said materials to distinguish them as such.

E. **ORGANIZATION OF WORK AND NOTIFICATIONS:**

1. The Contractor shall so organize his work that backfilling of open trenches and or excavations and associated cleanup of the construction site shall closely follow pipe laying operations and manhole construction. The City Engineer or his designee shall have the authority to determine if the contractor is negligent in complying with this provision. The City shall have the authority to stop work if needed to bring the site into a respectable level of maintenance.

2. All planned road closures shall be reported to the following entities a minimum of 72 hours prior to closing any street.

- a) The City of Rock Hill's Homeland Security Director's office at 803-326-3810; and

b) The York County Public Safety Communications office at 803-329-1110.

3. The Public Safety Communications office will notify the appropriate emergency services responders (i.e., EMS, Fire Department, etc.) of the planned road closure(s). Lane closures, where a minimum of one lane is left open to traffic, do not require notification to either office – City of Rock Hill’s Homeland Security Director’s office or York County’s Public Safety Communications office.

4. Traffic control, signage and barricades for road and lane closures and work inside the road rights-of-way shall be in accordance with applicable encroachment permits and the Federal Highway Administration’s (FHWA), Manual on Uniform Traffic Control Devices.

5. Failure on the part of the Contractor to comply with the above provisions in a reasonable manner, in the opinion of the Engineer, shall be sufficient cause for the Engineer to order a temporary shut-down of trenching and pipe laying operations until the provisions have been met.

6. Contractor shall notify each property owner affected by a planned interruption of existing services at least 72 hours prior to the loss of service. For emergency interruption of services, the Contractor shall notify the property owner as soon as practical

F. **LEAD-FREE REQUIREMENTS:** Lead-free pipes, plumbing fittings/fixtures, and solder/flux shall meet the Reduction of Lead in Drinking Water Act (P.L. 111-380). Any pipe, solder, or flux which is used in the installation or repair of any public water system, or used in any plumbing which provides water through connection to a public water system for human consumption, shall be lead-free. Lead-free for solder and flux means those containing not more than 0.2 percent lead. Lead-free for pipes and pipe fittings means those containing not more than 8.0 percent lead. Leaded joints necessary for the repair of CIP shall be exempt from the above lead-free requirements.

G. **SPECIFICATIONS:** Unless superseded or modified herein or in the Standard Details, all materials apparatus, supplies, methods of manufacture, or construction shall conform to the specifications contained herein and to AWWA specifications. All materials/products that contact potable water must be third party certified as meeting the specifications of ANSI/NSF Standard 61. National standards (ASTM, ANSI, AWWA, etc.) referenced herein shall be considered to be the latest revisions only.

H. ABBREVIATIONS

1. A list for reference purposes is as follows:

AASHTO	American Association of State Highway and Transportation Officials
AC	Asbestos cement
ACI	American Concrete Institute
AMS	Aerospace Material Specification
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
ANSI	American National Standards Institute
ARV	Air release valve
AWS	American Welding Society
AWWA	American Water Works Association

BPD	Backflow Prevention Device
°C	Degrees Celsius
CIP	Cast iron pipe
DIP	Ductile iron pipe
EPA	US Environmental Protection Agency
°F	Degrees Fahrenheit
FHWA	Federal Highway Administration
FM	Factory Mutual
fps	Feet per second
gph	Gallons per hour
gpm	Gallons per minute
g/m ²	grams per square meter
ISO	International Organization for Standardization
LF	Linear feet
MJ	Mechanical joint
MSS	Manufacturers Standardization Society of the Valve and Fittings Industry
MUTCD	Manual on Uniform Traffic Control Devices
NFPA	National Fire Protection Association
NPT	National Pipe Thread
NSF	National Sanitation Foundation
NST	National Standard Thread
OSHA	Occupational Safety and Health Administration
ppm	Parts per million
psi	Pounds per square inch
psig	Pounds per square inch – gauge
PVC	Polyvinyl Chloride
SC811	South Carolina 811
SCDHEC	South Carolina Department of Health and Environmental Control
SCDOT	South Carolina Department of Transportation
SDR	Standard Dimension Ratio
SDWA	Safe Drinking Water Act
UL	Underwriters Laboratory
UNS	Unified Numbering System
USDOT	United States Department of Transportation

II. Material Specifications

A. GENERAL

1. **STANDARDS:** All material or products which come in contact with drinking water shall be third party certified as meeting the specifications of the NSF/ANSI Standard 61, "Drinking Water System Components – Health Effects". The certifying party shall be accredited by ANSI. Pipe, fittings, packing, jointing materials, valves and fire hydrants shall conform to AWWA Standards, Section C. In the absence of AWWA Standards, materials meeting applicable Product Standards and with prior approval from the Utilities Department may be selected.

2. **USED MATERIALS:** Water mains which have been used previously for conveying potable water may be reused provided they meet the above standards and have been thoroughly cleaned, restored, pressure and bacteriological tested practically to their original condition, unless otherwise stated in these specifications.

3. **GASKETS AND JOINTS:** Gaskets, O-rings, and other products used for material to the water system shall comply with the requirements of SCDHEC, and shall not be made of natural rubber or any other material which will support microbiological growth. Lubricants which will support microbiological growth shall not be used for slip-on joints. The use of vegetable shortening to lubricate joints is prohibited.

a) LINE SIZING:

(1) **Pressure** - The minimum pressure in all public water mains under conditions of maximum instantaneous demand shall be 25 psi at every customer's tap. At any tap when fire flows or flushing flows are provided in excess of maximum peak hourly flow, 20 psi will be acceptable.

(2) **Diameter** - The minimum size of water mains for providing fire protection and serving fire hydrants shall be six (6) inches in diameter. Larger size mains will be required if necessary to allow the withdrawal of the required fire flow while maintaining the minimum residual pressure specified in the State Primary Drinking Water Regulation.

4. **NO LINE EXTENSION** shall be made off an existing line when the existing line does not meet the minimum pressure and flow requirements.

5. DEAD ENDS:

a) Dead ends shall be minimized by looping of all mains whenever practical.

b) The lengths of small dead end lines shall not exceed the following:

2-inch diameter	1500 ft.
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c) Conditions may warrant having less than the above maximum lengths in order to meet the minimum pressure requirements.

B. ASBESTOS CEMENT PIPE: Asbestos cement pipe shall not be used in potable water systems

except in the repair of existing asbestos cement lines.

c. DUCTILE IRON PIPE AND FITTINGS

1. PIPE: Ductile-iron pipe shall be centrifugally cast and shall conform to the requirements of AWWA C150/ANSI A21.50 and AWWA C151/ANSI A21.51. All ductile iron pipe shall be domestically manufactured in the United States. Push-on and restrained joint pipe shall have a minimum rated working pressure of 150 psi in accordance with AWWA. Pipe larger than 16 inches in diameter shall be as recommended by Engineer and approved by City Engineer; pipe 16 inches in diameter and smaller shall be a Pressure Class 350. Pipe shall have mechanical or push-on joints as outlined in ANSI A21.11 with laying lengths of at least 18 feet.

2. QUALITY ASSURANCE: Require submitted evidence that the ductile iron pipe and fitting manufacturer has a minimum of ten years' experience in material production of diameters noted on the Construction Drawings and specifications. All ductile iron pipe shall be manufactured in the United States. All pipe material suppliers shall be ISO registered or provide the services of an independent inspection agency. Prior to the start of manufacturing, any manufacturer not meeting the ISO registration requirements shall submit to the owner and owner's engineer the names of an independent inspection agency for approval. The independent inspection agency shall be responsible for sample monitoring of chemical and mechanical test, sample visual inspection of quality assurance tests performed on in-process pipe and fittings, and a sample visual and dimensional inspection of finished product for this project. A certified inspection report from the independent inspection agency of all witnessed tests shall be supplied to the owner or owner's engineers within ten (10) days of completion of pipe manufacturing. Chemical samples shall be taken from each ladle of iron and the manufacturers' chemical control limits shall be maintained for at least the following elements: carbon, sulfur, phosphorus, silicon, magnesium, chromium, manganese, tin, aluminum, cerium, copper, and lead. When chemical values fall outside the manufacturer's control limits, additional mechanical property tests shall be performed to assure minimum mechanical properties are met.

3. FITTINGS: Fittings shall be cast from ductile iron and shall conform to AWWA C110/ANSI A21.10 for Pressure Class 250 or AWWA C153 for Pressure Class 350 Compact Fittings. All fittings shall have standard mechanical joints or as shown. For sizes greater than 14-inches, fittings shall be full-bodied. All pipe joints and fittings (including glands and bolts) shall have a minimum working pressure rating as follows:

- a) 350 psi for 4-inch through 16-inch diameters
- b) 250 psi for greater than 16-inch diameters

4. JOINTS: Joints for DIP shall meet the following requirements:

- a) FLANGE JOINTS AND ACCESSORIES: Flanges for pipe, fittings, and valves shall be furnished in accordance with AWWA C115/ANSI A21.15 and shall be faced and drilled identical to ANSI B16.1, Class 125 flanges with full-face rubber gaskets 1/8" thickness. Bolts and nuts for flanges shall be in accordance with ANSI/AWWA Standards.
- b) MECHANICAL JOINTS AND ACCESSORIES: Bolts and gaskets for mechanical joint pipe and fittings shall be furnished by the pipe/fitting manufacturer and shall conform to

AWWA C111/ANSI A21.11

c) **PUSH-ON JOINT MATERIAL:** Gaskets for push-on pipe shall be furnished by the pipe manufacturer. Gaskets and gasket lubricant shall meet the requirements of AWWA C111/ANSI A21.11.

d) **RESTRAINED JOINTS:** Flexible restrained joints shall be supplied by the pipe manufacturer. Gaskets with vulcanized internal stainless steel locking segments may be used for 6-inch through 12-inch DIP, if approved by the City Engineer and not in lieu of concrete blocking. The following manufacturers are approved: U.S. Pipe and Field Lock Gasket. Only designs using a welded retainer ring on the spigot will be allowed for 16-inch and larger diameter pipe. Push-on or mechanical joint designs may be used for the pipe and associated fittings. The restrained joint shall be rated for a minimum 250 psi working pressure with a 2:1 safety factor. The following manufacturer's products are approved: American Lok Ring, American Lok Fast, Griffin Snap Lok, Griffin Bolt Lok, and U.S. Pipe TR Flex.

5. **MARKINGS AND WEIGHTS:** Markings and weights of pipe and fittings shall conform to the requirements of AWWA Specifications.

6. **LININGS AND COATING:** Pipe and fittings shall be cement-mortar lined in accordance with AWWA C104/ANSI A21.4. The interior cement lining shall be approved for contact with potable water. The pipe's interior and exterior is to be of bituminous coating with a minimum thickness of one mil.

a) **ZINC COATING:** Zinc-coated ductile iron pipe conforming to ISO 8179 standards may be installed as an alternative in corrosive soils and other special conditions as approved by the City Engineer. The exterior zinc coating shall be factory-installed using a thermal arc spray process. The zinc layer shall have a mass of 200 grams per square meter (g/m^2) of pipe surface area. A finish layer of bituminous coating shall be placed over the zinc in accordance with AWWA C104, and the pipe shall be marked with the word "zinc".

7. **CERTIFICATION:** The manufacturer of iron pipe and fittings shall be prepared to furnish both the City and the Contractor with certified reports stating that inspection and specified tests have been made and that the results thereof comply with the applicable ANSI Specifications.

8. **QUALITY AND INSPECTION:** Latitudes in workmanship and finish allowed by ASTM notwithstanding, all pipe shall have smooth exterior and interior surfaces; be first quality, be free from cracks, blisters and other imperfections, and be true to theoretical shapes and forms throughout each length. Pipe that does not conform will be so marked by the Engineer, and shall not be used in the work. On-the-job repairing of rejected pipe will not be permitted.

D. PLASTIC PIPE AND FITTINGS

1. **PIPE:** All plastic pressure pipes (sizes 4"-12") shall meet all requirements of AWWA C900 and be made from blue-pigmented virgin materials. Polyvinyl Chloride (PVC) water pipe shall be bell and spigot pipe, shall be in lengths not exceeding 20 feet laying lengths, and shall have minimum wall thickness conforming to SDR18 Class 150 dimensions. Pipe shall be NSF approved. Alternative plastic pipe (sizes 4"-12"), other than C900, shall meet all requirements of ASTM

D1785 (Sch. 40) or ASTM D2241 (SDR26 Class 160 and SDR21 Class 200), but its use shall be subject to the approval of the City Engineer. All plastic pipes (sizes 14"-48") shall also meet all requirements of AWWA C905. Use of plastic pipes 12" and larger shall be subject to the approval of the City Engineer. New mains shall be 6" diameter or larger unless otherwise approved by the City Engineer for a service on a cul-de-sac or other dead-end line. Thermoplastic pipe shall not be used above grade.

2. **FITTINGS:** PVC pressure pipe fittings for 6-, 8-, and 12- inch PVC pipe shall utilize Class 350 ductile-iron fittings in accordance with AWWA C110/ANSI A21.10 or AWWA C153 (Compact Fittings) up to 12" diameter pipe. Fittings shall be in accordance with ductile iron pipe requirements. Fittings for 2-inch PVC pipe shall be push-on joint PVC or threaded malleable iron. Malleable iron fittings shall be furnished with threaded PVC adapters to connect the fittings to the push-on joint pipe. Elastomeric joints for PVC adapters and PVC fittings with push-on joints shall conform to ASTM D3139. PVC adapters and fittings shall have a minimum pressure of 200 psi and shall, except for threaded area on adapters, have a SDR of 13.5.

3. **JOINTS:** All pipes shall have elastomeric joints with an integral belled gasket coupler. Rubber gaskets shall comply with the physical requirements specified in ASTM F477. Joints shall meet the requirements specified in ASTM D3139 for 2-inch pipe and to AWWA C900 and C111 for 6-inch, 8-inch and 12-inch pipe. The use of solvent-weld PVC pipe and fittings in water mains 4 inches and larger is prohibited. If the waterline pipe is required to be cased for any reason, the pipe shall be restrained joint ductile iron pipe.

4. **MARKINGS:** PVC pipe shall be marked at intervals of 5 feet or less with information regarding the Manufacturer's Name or Trade Mark, Plant Code, Date of Manufacture, Nominal Pipe Size, PVC Cell Classification and Legend, in accordance with AWWA C900, that will remain legible during normal handling, storage and installation and which have been applied in a manner that will not reduce the strength of or otherwise damage the pipe or coupling.

E. WATER SERVICE PIPE

1. **COPPER WATER TUBE:** Copper water tube shall conform to ASTM B88. Tubing located aboveground, in vaults and structures shall be Type K, drawn temper (hard). Buried tubing shall be Type K, annealed temper (soft), except 3-inch tube shall be Type K, drawn temper (hard). Continuous pipe run to be installed between water main and water meter, i.e. no joints in pipe.

2. **PIPE AND NIPPLES:** Pipe and short threaded nipples shall be brass conforming to ASTM B43 or copper conforming to ASTM B42, regular wall thickness, except that pipe and nipples of sizes 1-inch and smaller shall be extra strong. Threads shall conform to ASME B1.20.1, NPT.

3. SOLDER-JOINT FITTINGS

a) Use solder-joint fittings for working pressures of 300 psi or less.

b) Wrought copper solder-joint seamless fittings shall be designed for use with copper water tube and conform to ASTM B75 and ASME B16.22. Material shall be UNS C10200, C12000, or C12200.

c) Cast copper solder-joint pressure fittings shall be designed for use with copper

water tube and conform to ASME B16.18.

4. **THREADED FITTINGS:** Cast bronze threaded fittings shall be designed for use with brass or copper pipe and nipples and conform to ASME B16.15, Class 125 and 250. Use Class 125 fittings for working pressures of 200 psi or less. Use Class 250 fittings for working pressures greater than 200 psi, but less than 400 psi.

5. **FLANGES AND FLANGED FITTINGS:** Cast bronze pipe flanges and flanged fittings shall conform to ASME B16.24, Class 150 or Class 300. Use Class 150 flanged fittings for working pressures of 225 psi or less. Use Class 300 flanged fittings for working pressures greater than 225 psi, but less than 500 psi. Provide flat-faced flanges. Use solder-joint or threaded end companion flanges. Companion flanges with solder-joint or threaded end shall be limited to the pressure rating of the pipe connection and not the flanged joint.

6. **SOLDER AND FLUX:** Solder shall be 95/5 (95-percent tin and 5-percent antimony) conforming to ASTM B32, Alloy Grade Sb5 or silver solder conforming to AMS 4773C. Do not use lead or cored solder. Soldering flux shall comply with ASTM B813.

F. **HYDRANT ASSEMBLIES**

1. **GENERAL:** Hydrants shall be furnished as indicated on approved Construction Drawings and as specified herein. All fire hydrants shall meet the requirements of AWWA C502 at a minimum. Hydrants shall be compressive type, self-oiling, non-freezing, and provided with a safety flange and coupling (See Standard Detail). Post-type hydrants are not allowed. Where standard 6-inch diameter hydrants are proposed, the design flow shall not be less than 500 gpm over and above peak hourly flow. Hydrants shall be capable of a working pressure of 150 psi with a test pressure of 300 psi. Hydrants shall be painted silver by the manufacturer.

2. **HYDRANT LEADS:** The hydrant leads shall be a minimum of six (6) inches in diameter. Auxiliary gate valves shall be installed in all hydrant leads.

3. **DRAINAGE:** A gravel pocket or dry well shall be provided unless the natural soils will provide adequate drainage. Hydrant drains shall not be connected to or located within ten (10) feet of sanitary sewers.

4. **VALVE OPENING:** Valve opening shall be not less than 4 ½". Hydrants shall open by turning counter-clockwise.

5. **HOSE AND PUMPER CONNECTION:** Hose nozzles shall be two (2) in number and 2-½ inches in size. A 4-½ inch pumper connection with Storz connector shall be provided. Hose connections shall be threaded and locked in place, or breech-locked into the hydrant barrel. The operating nut shall be 1 ¼ inch and pentagon in shape. Any extensions required shall be as recommended and supplied by the manufacturer.

6. **CONNECTION TO SYSTEM:** Standard hydrants shall not be placed on systems using only hydro-pneumatic storage, unless standby power is provided and the pumping capacity from wells or ground storage exceeds the fire flow demand with the largest well or pump out of service. Standard hydrants shall not be connected to lines not designed to carry fire flows.

a) Shoe connection shall be 6 inch furnished with mechanical joint for connection to spigot of mechanical joint hydrant pipe lead.

7. SEAT RINGS: Seat rings shall be shaped and arranged as to be readily removable. Seat rings shall be bronze and shall screw into a bronze bushing in the shoe. An O-ring seal between the shoe and seat ring shall provide a watertight non-wearing, permanent seat between shoe and seat ring. This seal shall always come out with main valve removal.

8. THRUST BLOCKING: Thrust blocking should not block weep holes.

G. WATER METERS AND METER BOXES

1. METER BOXES: Meter boxes for service connections shall be located 5 feet from the center of the lots with 10-foot minimum separation from the sewer service. Meter boxes shall not be located in driveways or sidewalks. Meters shall be placed in landscaped areas on the property-owner side of any sidewalk and as shown in the Standard Details. Meter boxes shall be prominently marked in the field a by blue stake to prevent damage during or after construction operations. Meter boxes shall be installed with the service pipe at a depth of 9 inches below grade.

2. WATER METERS: The City of Rock Hill shall be responsible for purchasing all meters. The City shall install Badger or Hersey meters, unless otherwise contacted and approved by the City Engineer. Mueller System FM3 fire service meters may be used for customer services with fire loops. Load data sheets shall be submitted for review in order that the appropriately-sized commercial/industrial meter may be installed. Dedicated fire lines to buildings shall not be metered.

3. BACK FLOW PREVENTION DEVICES: Backflow Prevention Devices (BPD) shall be in accordance with the City's Cross-Connection Control Policy and in accordance with the SCDHEC Backflow Prevention Manual.

H. VALVES, BLOW-OFFS AND CHAMBERS

1. AIR RELIEF VALVES – Combination air relief valves (ARV) shall be provided in accordance with sound engineering practice at high points in water mains or along extended runs as required. Automatic air relief valves shall not be used in situations where flooding of the manhole or chamber may occur. ARVs shall be furnished and installed as shown on approved Construction Drawings and as specified herein. The combination ARV shall have a cast iron body and stainless steel float. A $\frac{3}{4}$ " valve capable of 200 psi pressure shall be installed on the service line to the air valve in order to facilitate testing. Other internal parts shall be stainless steel or bronze. The combination ARV shall be in accordance with the Standard Details.

a) ARV PIPING - The open end of an air relief pipe from automatic valves or from a manually operated valve shall be extended to the top of the pit and provided with a screened downward facing elbow.

2. BUTTERFLY VALVES

a) **GENERAL:** Butterfly valves shall be furnished with valve operators and accessories as indicated on the approved Construction Drawings or as specified herein. Valves shall be furnished as manufactured by Mueller, or approved equal. All valves shall comply with AWWA C504, for tight-closing, rubber-seated valves. Butterfly valves shall be Class 150 designed for 16 fps maximum velocity unless otherwise shown. Valves shall be bubble-tight at rated pressures and shall be satisfactory for applications involving throttling service and/or frequent operation and for applications involving valve operation after long periods of inactivity. Valve discs shall rotate 90-degrees from full open position to the tight shut position. Wafer type valves are not acceptable. All valves in road shoulder shall have a concrete valve protector ring. (See Standard Detail)

b) **VALVE BODY:** Valve bodies shall be either of cast iron conforming to ASTM A126, Class B, or ASTM A48, Class 40, or ductile iron conforming to ASTM A536, Grade 65-45-12. The valve body shall have mechanical joint ends meeting the requirements of ANSI 21.11 with necessary nuts, bolts, glands and gaskets. Drilled and tapped holes are permitted where required at the body bearing trunnions. The body shall be designed to withstand the internal forces acting directly and forces resulting from the thrust of the operating mechanism. Trunnion boxes shall be located at diametrically opposite points in the valve body which shall be accurately bored to accept permanently self-lubricated shaft bearing bushings. The trunnion box at the operator end shall be furnished with an integral packing box and the other trunnion shall include a factory set two-way bronze thrust bearing and a cast iron thrust bearing cover.

c) **VALVE SHAFTS:** Valve shafts may consist of a one-piece unit or may be the "stub-shaft" type. Valve shafts shall be turned, ground and polished. Valve shafts shall be constructed of 18-8 Type 304 stainless steel conforming to ASTM A276. Shaft diameters shall meet requirements established by AWWA C504 or service required. Valve shafts shall be securely attached to the valve disc by means of taper pins. Taper pins shall be mechanically secured.

d) **VALVE DISC:** Valve discs 20 inches and smaller shall be constructed of alloy cast iron ASTM A436, Type 1 (Ni-Resist); ductile iron ASTM A536, Class 65-45-12; or cast iron ASTM A48. Valve discs 24 inches and larger shall be constructed of ductile iron ASTM A536, Class 65-45-12 or cast iron ASTM A48 with 18-8, Type 304, with stainless steel seating edges. The valve discs shall be designed to withstand bending and bearing loads resulting from the pressure load and operating forces. The faces of the discs shall be the pressure load and operating forces. The faces of the discs shall be smooth and free of external projections. All retaining or pinning hardware in contact with water shall be 316 stainless steel.

e) **VALVE SEATS:** Valve seats shall be natural rubber or Buna "N" rubber designed for tight shutoff in both directions with 150 psi upstream and 0 psi downstream pressure. Rubber seats in the valve body shall be retained by 18-8 Type 304 stainless steel mechanical means, or bonded, without retaining hardware in the flow stream. Rubber seats attached to the disc shall be retained with an 18-8 Type 304 stainless steel clamp ring and stainless steel bolting. Retaining ring cap screws shall pass through the rubber seat and be self-locking. Mating seat surfaces for resilient seats shall be 18-8 Type 304 stainless steel. Seats shall be a full 360-degrees without interruption. Valve seats shall be designed to permit removal and replacement in the field for valves 30 inches in diameter and larger.

f) VALVE BEARINGS: The valve shall be fitted with sleeve-type bearings. Bearings shall be corrosion resistant and self-lubricating. Bearing load shall not exceed 1/5 of the compressive strength of the bearing or shaft material. Bearing material must have coefficient of friction no greater than 0.25, which must be maintained regardless of wear.

g) VALVE OPERATORS: Valve operator shall conform to AWWA C504, and shall be equipped with adjustable mechanical stop-limiting devices to prevent over travel of the disc in the open and closed positions. All valves shall open counter-clockwise. The manual operator shall be the enclosed type, suitable for buried service, fully gasketed, grease packed or oil lubricated and designed to withstand submersion in water to 10 psi. The manual operator for valves size 20 inches and smaller shall be the traveling-nut type with threaded-steel reach-rods and bronze or ductile-iron nut with internal threads. The manual operator for valves size 24 inches and larger shall be the worm-gear type having a self-locking worm gear

h) VALVE TESTING: Performance, leakage and hydrostatic tests shall be conducted in strict accordance with AWWA C504. The manufacturer shall provide the City, upon request, with an "Affidavit of Compliance" as per AWWA C504 upon completion of manufacture.

i) EXTENSION STEMS: Extension stems for the butterfly valves shall be furnished and installed with position indicators.

3. CHECK VALVES: Check valves shall be iron body, bronze mounted, with outside lever and spring, and meet ANSI B16.1, Class 125 flanges and drilling. Iron body valves shall be fusion-bonded, epoxy coated and include 316 top cover bolts. Operating mechanism shall be by internal weight of linkage and spring, and shall be all bronze or stainless steel. Valves shall have rubber faced clapper and bronze seat. Valves shall have two tapped bosses on each side to permit installation of a metered bypass. Valves shall be UL listed/FM approved. Provisions for removing trapped air shall be made.

4. RESILIENT-SEAT GATE VALVES

a) GENERAL: Gate valves shall be furnished as indicated on the approved Construction Drawings and as specified herein.

(1) Gate valves shall be used for 6-, 8- and 12-inch diameter lines. Butterfly valves shall be used for all lines 16-inch diameter and larger.

(2) Metal seated gate valves shall meet all requirements for AWWA C500, but its use shall be subject to the approval of the City Engineer. Resilient-Seat Gate valves shall conform to AWWA C509 or C515, with "O" ring packing. Resilient seated gate valves shall be furnished with durable, opaque end-shields to prevent ultraviolet damage to the rubber discs. Valves shall be furnished as manufactured by Mueller or approved equal.

(3) Working pressure for valves shall be 200 psi.

(4) Gate valves shall embody the best class of workmanship and finish, and shall open and close freely and easily. With discs raised, each valve shall have a clear waterway of the full nominal diameter of the valve. If guides or guide lugs

are used, the design shall be such that corrosion in the guide area does not affect sealing. Resilient seats may be applied to the body or gate and shall seat against a corrosion-resistant surface. The surface may be either metallic or non-metallic. Resilient seats shall be bonded or mechanically attached to either the gate or valve body. The mating surface of the resilient seat shall be machined to a smooth, even finish.

(5) All stems shall be forged bronze stems.

(6) Valve ends shall have mechanical joints.

(7) Valve markers are required for water lines and valves not within road rights-of-way. All valves in road shoulder shall have a concrete valve protector ring.

b) **OPERATION:** All valves shall open counter-clockwise. A 2-inch square operating nut with an extension stem will be required for manual operation. The operating nut shall have an arrow cast, indicating the direction for opening the valve.

c) **JOINTING:** All valves shall be furnished with mechanical joints and necessary bolts, glands and gaskets unless otherwise shown on the approved Construction Drawings or specified herein.

d) **MARKINGS:** Each valve shall be plainly marked with the manufacturer's name or particular mark, the year of manufacture, the size of the valve, and designation indicating working pressure, all cast on the bonnet or body.

e) **PAINTING:** All surfaces of the valve shall be clean, dry and free from grease before painting. The interior and exterior valve surfaces except for disc, seating and finished portions shall receive two coats of asphalt varnish.

5. **VALVE BOXES:** The Contractor shall furnish and install valve boxes for butterfly and gate valves and by-pass valves. Valve boxes shall be heavy roadway type. The valve boxes shall be cast-iron, two-piece, slide-type with drop covers. The valve box cover shall have the word "WATER" cast into the cover. The bottom section of the box may be 6-inch diameter ductile iron pipe. The ductile iron pipe or valve box covers shall not be placed directly on the valve. The box must be placed on concrete blocks. Concrete valve rings shall be used on all valves not located in paved surfaces.

6. **EXTENSION STEMS:** In all locations where the valve operating nut is 4 feet or more beneath the ground surface, an extension stem for the valve to terminate at 1.5 feet beneath the ground surface.

7. **BLOW-OFF ASSEMBLY:** Blow-off assemblies for typical use shall be Kupferle Foundry TF-500, which fits in a standard 5 ¼-inch valve box. (See detail.) The orifice should be provided on the fixed piping, in the valve box. Blow-offs should not be directed toward roads or so that the water will flow into creeks, etc. At stream crossings, direct away from streams over ground.

a) Orifices should be sized as follows:

<u>Pipe Diameter</u>	<u>Minimum Flow Required</u>	<u>Orifice Size</u>
2 inch	25 gpm	0.75 inch
4 inch	100 gpm	1.5 inch
6 inch	220 gpm	2 inch
8 inch	400 gpm	2 inch
12 inch	882 gpm	2 inch
16 inch	1570 gpm	2 inch

8. **CHAMBERS/VAULTS/PITS/MANHOLES** - Chambers, vaults, pits or manholes containing valves, blow-off, meters, air release valves, or other such appurtenances to a water distribution system, shall not be connected directly to any storm drain or sanitary sewer.

a) Chambers, vaults, pits or manholes within rights-of-way shall be designed for AASHTO H-20 traffic loadings and may be adjusted using standard size clay or concrete brick.

I. CONNECTIONS

1. **SERVICE TAPS:** All service taps shall be made in accordance with the Standard Details using epoxy coated cast iron service saddles with double stainless steel straps, and ¾" Mueller #H-15000 series corporation stops or approved equal. The service line shall be Type "K" copper. Copper services shall conform to AWWA C800.

a) **Fire/Domestic Service Piping:** Domestic service piping can branch off dedicated fire line piping to avoid having two service taps to the main and two separate service lines in the public right-of-way or easement. Piping from the main to the vault or right-of-way or easement line is to be maintained by the City and must be constructed of ductile iron pipe. On-site piping may be PVC meeting applicable codes. No 3-inch piping is allowed on domestic line – must be either 2-inch (or smaller) Type K" copper or 4-inch (or larger) ductile iron pipe.

2. **SERVICE SADDLES:** All corporation stops for services or air releases on pipe, as well as ¾-inch and larger corporations installed on ductile iron pipe, shall be installed with service saddles having threads to acceptable AWWA standards. Service saddles shall be as shown on the Standard Details. Doubled banded complete stainless steel straps must be performed by the manufacturer to the specified outside diameters of the pipe.

3. **CORPORATION STOPS:** Corporation stops shall comply with AWWA C800 and shall be high pressure rated at 150 psi. All corporations installed on C900 PVC pipe, as well as ¾-inch and larger corporations installed on ductile iron pipe, shall require a tapping saddle/service clamp.

4. **TAPPING SLEEVES AND VALVES:** Tapping Sleeves and Valves for connection into existing pipelines shall be furnished and installed as indicated on approved Construction Drawings or as specified herein. Unless otherwise indicated, tapping sleeves shall be constructed of stainless steel and include stainless steel bolts, testing plug and stainless steel flange (ductile iron flange may be substituted). Prior approval by the Utility Department is needed before ductile iron mechanical joint sleeves may be used. All tapping sleeves shall be tested for leaks and approved by the City Engineer before the tap is made. The hydraulic pressure test shall be timed for a minimum of 5 minutes at 150 psi.

- a) MATERIALS: Tapping sleeve shall be stainless steel as indicated above or ductile iron, mechanical joint furnished complete with joint accessories, including split glands, split end gaskets, bolts, etc.
- b) BODY: Mechanical joint watermain fittings and accessories, 2-inch through 48-inch shall be produced of ductile iron in accordance with and meet AWWA C110/ANSI A21.10 and AWWA C111/ANSI A21.11. Ductile iron, mechanical joint fittings 3-inch through 24-inch shall be rated for 350 psi working pressure.
- c) OUTLET FLANGE: Carbon Steel per ASTM A36 in accordance with AWWA C207 and ASME B16.1 Class 125. Compatible with approved tapping valve. Recessed for tapping valve per MSS SP-60.
- d) FLANGED ENDS: Flanged ends shall meet the requirements of AWWA C115 or AWWA C207, depending on pipe material.
- e) FINISH: Finish shall be fusion bonded epoxy coating to an average 12 mil thickness. Fusion applied per AWWA C213. Coatings must be NSF-61 approved and conform to AWWA C104.
- f) TEST PLUG: A ¾ inch NPT carbon steel test plug with square head and fusion-bonded epoxy coating shall be used.

J. REPAIR/TIE-IN SLEEVES/CLAMPS

- 1. SLEEVES: Solid cast iron mechanical joint sleeves (long pattern) shall be used where indicated for tie-ins between new mains and existing mains and when replacing defective sections of pipe with new pipe.
- 2. REPAIR CLAMPS: Repair clamps or split sleeves will not be allowed on new construction. These may be used to repair existing mains if specifically directed by the Engineer.

K. CONCRETE WORK

- 1. GENERAL: Concrete of the respective classes for structures, bedding, blocking, headwalls, piers and other miscellaneous structures shall be as called for in the work to which they pertain.
- 2. CEMENT: Cement shall satisfy the requirements of ASTM C150, Type I or Type II.
- 3. AGGREGATE: Aggregate shall satisfy the requirements of ASTM C33.
 - a) COURSE AGGREGATE: Course aggregate shall be uniformly and evenly graded for each application in accordance with ACI Standard 318. Unless otherwise approved, aggregates shall be sound, crushed, angular granitic stone. Smooth or rounded stone (river rock) shall not be acceptable.
 - b) FINE AGGREGATE: Fine aggregate shall consist of natural sand, manufactured sand or a combination thereof, and shall be graded to meet the requirements of SCDOT

size number FA-10 and 67, as appropriate.

4. **WATER:** Water shall be fresh, clean and free from injurious amounts of oil, acid, alkali, and organic materials.

5. **MIXING:** Mixing shall be accomplished at a central mix plant unless prior approval is given by the Engineer for mixing on the job site.

6. **CENTRAL MIX PLANT:** Concrete supplied from a central mix plant shall have 28-day compressive strengths not less than those listed below.

(1)	Class "A"	-	3,000 psi
(2)	Class "B"	-	2,200 psi
(3)	Class "C"	-	1,500 psi

7. **JOB SITE MIX:** Concrete mixed on the job site shall have 28-day compressive strengths as above and shall contain not less than the following quantities of cement per cubic yard.

(1)	Class "A"	-	564 lbs. (6 bags)
(2)	Class "B"	-	470 lbs. (5 bags)
(3)	Class "C"	-	376 lbs. (4 bags)

8. **GROUTS:** All grouts shall be of a non-shrink nature (as may be achieved through additives or proportioning) and depending upon application, range from plastic to flowable cement water paste. Testing as specified above for concrete may be required for acceptance of grouts to include frequent checks for consistency by a time-of-flow measurement.

a) Expansion grouts shall be either Gilco premixed or Supreme non-metallic grout as manufactured by Gifford-Hill and Company, Inc. or Embeco 636 grout as manufactured by Master Builders, or approved equal.

b) Grouts shall be mixed (if applicable) and placed in accordance with the manufacturer's recommendations, for each specific application.

9. **FLOWABLE FILL:** Flowable fill shall be controlled, self-leveling, non-shrink, low-strength material consisting of a fluid mixture of cement, aggregate, water and with admixtures as necessary to provide workable properties. Long-term hardened strength shall be between 75 psi and 150 psi at 56 days as determined based on an average of three tests for the same placement.

a) Fly ash shall not be used in flowable fill adjacent to ductile iron pipe and fittings. Protect pipe and fittings by covering with polyethylene.

10. **THRUST BLOCKING:** All tees, bends, plugs and hydrants on lines 2-1/2 inches in diameter and larger shall be provided with reaction blocking, tie roads, or other approved method of restraint. Reaction blocking dimensions should be as shown on the Construction Drawings.

Dimensions will depend on field conditions.

11. **CONCRETE CYLINDERS:** Concrete cylinders for testing purposes shall be made in accordance with the procedure described in ASTM C31. Compression tests shall be made at the age of 7 days and 28 days by the testing laboratory as per ASTM C39. Testing shall be done by a laboratory approved by the Engineer. Each test shall consist of at least four (4) specimens; two (2) for field control and two (2) for laboratory control. One (1) initial test will be required and then one (1) test for each one hundred (100) yards thereafter.

L. MISCELLANEOUS STEEL

1. **STEEL PIER MATERIAL:** Steel piles, cross braces, cradles, etc., shall consist of structural steel shapes of the section required in the Construction Drawings based on the Engineer's design for the specific needs of the project and approved by the City Engineer. The steel shall conform to specifications for ASTM A36.

a) All bolts and nuts shall conform to ASTM A325 for 7/8-inch and ASTM A490 for 1-inch and larger.

b) The Contractor shall handle and store steel members above ground on platforms, skids or other supports. Members shall be free of dirt, grease, and other foreign material and protected against corrosion.

c) Coal tar epoxy coating Carboline Koppers No. 300M, Amercoat No. 78, Carboline Carbomastic No. 14, or approved equal shall be applied to all specified surfaces of the steel pier.

d) Welding Electrodes shall conform to the following:

- | | | |
|-----|---------------------|------------------------------------|
| (1) | Shielded Metal-arc: | AWS A5.1 or AWS 5.5, E70XX |
| (2) | Submerged-arc: | AWS A5.17, F70X-EXXX |
| (3) | Gas Metal-arc: | AWS A5.18, E70S-X or E70U-1 |
| (4) | Flux Cored-arc: | AWS A5.20, E70T-X (except 2 and 3) |

2. **STEEL ENCASEMENT PIPE:** Steel pipe shall be welded or seamless, smooth wall or spiral weld, consisting of Grade "B" steel as specified in ASTM A139. Encasement pipe must be approved by the appropriate controlling agency (i.e. SCDOT, railway corporation, etc.) and the City Engineer prior to ordering.

a) Minimum yield strength shall be 35,000 psi; and pipe thickness shall be as specified for each individual job.

b) All pipe shall be furnished with beveled ends prepared for field welding of circumferential joints. All burrs at pipe ends shall be removed.

3. **STRUCTURAL STEEL TUNNEL LINER PLATES:** The tunnel liner plates shall be either the four (4) flanged type (as approved for use within SCDOT rights-of-way) or the lap seam type (as

approved for use within railroad rights-of-way) and fabricated to permit assembly of a continuous steel support system as the tunnel is excavated as specified by the design Engineer. Tunnel liner plates shall be fabricated from hot rolled, carbon steel sheets or plates conforming to the specifications of ASTM A569 and must be approved by the appropriate controlling agency (i.e. SCDOT, railway corporation, etc.) and the City Engineer prior to ordering.

4. **STEEL REINFORCING FOR CONCRETE**

a) **BARS:** All reinforcement bars shall conform to ASTM A615. All bars shall be deformed and of structural grade 60. All splices shall be lapped 24 diameters unless otherwise noted.

b) **WIRE:** All reinforcement wire fabric shall conform to ASTM A185.

M. **STONE AND BRICK**

1. **BRICK:** All brick used to construct or adjust manholes, frames, vaults, or boxes shall be made from concrete, shall be solid only, and shall be of standard building size. All brick shall meet or exceed the compressive strength and water absorption properties as specified in ASTM C139.

2. **GRANULAR BEDDING MATERIAL:** All bedding material shall be angular, clean washed crushed stone graded in accordance with Size #67 in ASTM D448 or SCDOT Standard Size #67. Bedding material will be used only as instructed in the specifications and/or as specifically directed by the Engineer.

3. **RIP RAP:** All rip rap shall consist of clean, field stone or rough unhewn quarry stone, resistant to the action of air and water, varying in weight from 25 to 250 pounds with 60% weighing a minimum of 100 pounds each and no more than 5% weighing less than 50 pounds each (SCDOT Class 2 Rip Rap). Rip rap will be placed from a minimum of 4.0 feet below the toe of the bank to top of the bank in areas determined by field conditions. Rip rap thickness shall be 1-1/2 times the diameter of the largest stones used, or as directed by the Construction Drawings.

4. **SILT CHECK DAM MATERIAL:** Material shall be coarse angular, clean washed, crushed stone, gravel or rock, well-graded, and ranging in size from 2-inches to 6-inches, or SCDOT stone for erosion control, Class A.

5. **STONE STABILIZATION MATERIAL:** All stone stabilization material shall be angular, clean washed crushed stone graded in accordance with standard sizes #67 in ASTM D448 or SCDOT Standard Size #67. Stabilization material will be used only as instructed in the specifications and/or as specifically directed by the Engineer.

N. **DEFECTIVE MATERIALS AND WORKMANSHIP:** Any cracked or broken material, such as pipe, fittings, valves or hydrants, shall be removed and replaced with sound pieces, at the expense of the Contractor. Joints that leak shall be carefully remade. Remade joints and replaced material shall be retested under the same conditions of operation. If joints or materials are then found to be defective, they shall be remade and replaced until the line passes the required test.

III. CONSTRUCTION SPECIFICATIONS

A. ABANDONMENT

1. **GENERAL:** The following requirements shall apply for proposed abandonment of existing facilities, unless otherwise shown on the Construction Drawings or approved by the Engineer. All areas disturbed by abandonment will be restored.
2. **PIPE:** Piping to be abandoned-in-place shall be cut and plugged on the ends and completely filled with flowable fill as indicated on the Construction Drawings. If existing pipe to be abandoned is less than 8 inches in diameter and has less than 5-feet of cover, then the pipe shall be removed and the trench backfilled with suitable material, unless otherwise approved by the City Engineer.
3. **APPURTENANCES:** Valves, hydrants, meters, services, and other water main appurtenances to be abandoned shall be removed and the excavations backfilled with suitable material.
4. **FLOWABLE FILL:** Placement of flowable fill may be by grouting techniques in pipelines or other restricted areas, or as mass placement by chutes or tremie methods in unrestricted locations with open access.
5. **BACKGROUTING:** Backgrouting is secondary stage pressure grouting to ensure that voids have been filled within abandoned pipes. Backgrouting will only be required at critical locations indicated on the Construction Drawings or if there is evidence of incomplete flowable fill placements.

B. HANDLING AND STORAGE OF MATERIALS

1. **GENERAL:** The Contractor shall be responsible for the safe storage of materials furnished by or to him, and accepted by him, and intended for the Work, until they have been incorporated into the completed project. The interior of all pipe, valves and other accessories shall be kept free from dirt and foreign materials at all times. The City Inspector has the right to reject any and all material based on its storage and handling.
2. **TRANSPORTATION OF MATERIALS AND EQUIPMENT:** All materials furnished by the Contractor shall be delivered and distributed at the site by the Contractor or his material supplier. The Contractor and his Supplier are directed to contact the SCDOT to verify axle load limits on State-maintained roads (and bridges) which would be used for hauling of equipment and materials for the Project. The Contractor and his Suppliers shall do all that is necessary to satisfy the SCDOT requirements and will be responsible for any damage to said roads which may be attributed to this project.
3. **HANDLING:** Proper and suitable tools and equipment shall be used for the safe and convenient handling and laying of pipe. Pipe, fittings and other materials shall be carefully handled so as to prevent breakage and as to prevent damage to the interior lining and coatings on the pipe and fittings. Pipe shall not be unloaded by rolling or dropping off of trucks or cars, but shall be handled by carefully lifting and lowering into position, using approved slings or clamps

which shall be provided by the Contractor or material manufacturer for the purpose. Pipes and fittings shall be carefully examined for cracks, broken lining and other defects. No pipe or fitting shall be laid which is known to be defective. If any pipe or fitting is discovered to be cracked, broken or defective after being laid, it shall be removed and replaced with sound material at the expense of the Contractor. If any part of the coating or lining is damaged; the repair shall be made by the Contractor at his expense in a manner satisfactory to the Engineer. All pipe and fittings shall be thoroughly cleaned before being laid and shall be kept clean until accepted as completed work.

4. **LOADING AND UNLOADING:** Personnel and equipment for unloading, transporting, distributing and storing materials shall be furnished by the Contractor. The Contractor is responsible for the coordination of material deliveries and for providing appropriate staging and or lay-down areas. Ductile iron pipe and cast iron accessories shall be loaded and unloaded by lifting with hoists or skidding so as to avoid shock or damage. Other pipe and materials shall be loaded and unloaded with hoists and/or as recommended by the respective manufacturers. Under no circumstances shall such materials be dropped. Pipe handled on skidways shall not be skidded or rolled against pipe already on the ground.

5. **DISTRIBUTING:** Materials shall be distributed and placed so as to least interfere with traffic. The Contractor shall furnish and maintain proper warning signs and lights for the protection of traffic along highways, streets and roadways upon which material is distributed. No distributed materials shall be placed in drainage ditches.

a) 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.

b) Contractor will string in advance no more than the amount of pipe and material that can be installed within four (4) weeks or less, as approved by the Engineer. All materials shall be placed in such a manner as not to hinder access, endanger or impede traffic, or create a public nuisance. Materials strung through residential areas (or any area with maintained lawns) shall be placed in such a manner as not to restrict normal maintenance of established lawns, and must either be installed within two (2) weeks or removed to an approved storage yard, as required by the Engineer.

6. **STORAGE:** All pipe, fittings and other materials that cannot be distributed safely along the route of the work shall be stored for subsequent use when needed. The Contractor shall make his own arrangements for the use of storage areas. Unless prior written consent from the owner of the proposed storage area is received by the City Engineer, the Contractor will be required to store all equipment and materials within the limits of the right-of-way, permanent easement, and temporary construction easement provided. The materials and equipment storage shall comply with all local and state ordinances throughout the construction period. Material and equipment may only be stored within road rights-of-way if approved by the controlling agency. PVC pipe shall not be exposed to direct sunlight for inordinate periods of time.

C. **WATER SYSTEM INSTALLATION:** The Contractor shall assemble, joint and lay all ductile iron pipe and fittings in accordance with the following:

1. **GENERAL:** Installation of all water lines and appurtenances shall be conducted in accordance with the requirements of AWWA Section C and/or manufacturer's recommended

installation procedures. All installation practices shall be in accordance with the State Primary Drinking Water Regulations unless as noted.

a) PIPE shall be laid in a workmanlike manner, true to line and grade. Any water pipe with less than 4 feet of cover to finished grade shall be ductile iron with a minimum cover of three feet. Additionally, any water pipe laid with 12 feet to 18 feet of cover shall be ductile iron. No water line shall be installed with more than 18 feet of cover. All pipe laid outside the road right-of-way shall be ductile iron. Pipe laid within the roadway may be PVC.

b) OVERNIGHT COVER: During construction all vault, hydrant or other ground openings shall be covered at the end of each day. For sidewalls, use wing-nut type plugs to secure openings. Trenches shall be covered or backfilled at the end of each working day.

c) CONTAMINATED AREAS: All water mains shall be located outside contaminated areas. Re-route line if possible. If the main must run through a contaminated site, the main material must protect the water system from being contaminated (e.g. Ductile Iron Pipe with chemical resistant gaskets).

d) EASEMENTS/RIGHTS-Of-Way: Pipe shall be installed in dedicated easements or public rights-of-way. The minimum easement width for water main shall be 20 feet; however, this may be increased to accommodate large-diameter pipe or burial greater than standard depth. See City Standard Details for additional information.

e) UTILITY CROSSINGS: All crossings with other utilities shall be made with ductile iron pipe.

2. LOCATION AND GRADE: The line and grade of the water main and appurtenances will be given by the Engineer. The location shall be in agreement with approved Construction Drawings. Any substantial deviation shall be subject to approval by the City Engineer.

a) The water main shall be laid and maintained to the required lines and grades with fittings, valves and hydrants at the required locations; spigots centered in bells; and all valves and hydrant stems plumb. Necessary lines, levels and grades will be given by the Engineer but the Contractor shall be responsible for accurately transferring such lines and grades to the work. This work by the Contractor shall be subject to frequent checking by the Engineer and City personnel.

b) All water mains shall be provided with a minimum forty-eight (48) inches of cover. Where this is not possible, pipe shall be ductile iron or other approved material and method approved by the Engineer, and, when necessary, insulated to prevent freezing. The Contractor may be required to vary the depth of pipe to achieve minimum clearance from existing utilities while maintaining the minimum cover specified, whether or not the existing pipelines, conduits, cables, mains, etc. are shown on the Construction Drawings. Water lines in excess of 12 feet of cover shall be ductile iron and shall be subject to approval by the City Engineer.

c) When the water line is constructed in the road right-of-way, it shall be in conformance with the City of Rock Hill Utility Location Plan and applicable encroachment

permits. All pipe laid outside the road right-of-way shall be ductile iron. In some cases depending on soil types and the presence of other utilities with cathodic protection, 16 mil polyethylene pipe wrap, or PVC pipe may be required for use. Metal water lines crossing or within 10 feet of utilities with cathodic protection shall be designed to protect the water line and shall be approved by the City Engineer.

d) Potable water lines shall not be laid less than 25 feet horizontally from any portion of a wastewater tile-field or spray-field, or shall be otherwise protected by an acceptable method approved by SCDHEC.

e) In general, alignment and gradient for pipe shall be straight; however, pipeline may be laid on a curve but must be within the limits of curvature as recommended by the pipe manufacturer, both horizontal and vertical.

f) Blow-offs shall not be directed toward creeks or other water bodies without proper precaution being taken to dechlorinate prior to discharge.

3. **PLACEMENT:** All pipe, fittings, valves and hydrants shall be carefully lowered into the trench piece by piece by means of a backhoe or other suitable means, in such a manner as to prevent damage to protective coatings and linings. Under no circumstance shall water main materials be dropped or dumped into the trench.

4. **REUSING PIPE:** Water mains that have been previously used for conveying potable water may be reused provided they meet applicable criteria from AWWA Section C, ANSI/NSF 61, and ASTM D1785 or D2241. The mains must be thoroughly cleaned and restored practically to their original condition.

5. **DETECTION OF MAINS:** All mains shall be detectable within three (3) feet with electronic locating equipment. Non-metallic pipes shall be installed with solid, UL-approved 14-gage (min) copper tracer wire running along the centerline of the pipe or other means of detection. Wire shall be brought up into the valve boxes and bare wire connected to a valve bolt. Warning tape shall be placed 1-foot over top of water mains.

6. **CREEK CROSSINGS:** Creek crossings and other applications may require a specialized section of pipe (e.g., long-span steel pipe with specialized joint restraint). Each such crossing shall be addressed on a case-by-case basis and approved by the City Engineer.

a) **ABOVE GRADE CROSSINGS:** For pipe crossing above creeks, streams and other bodies of water, pipe shall be adequately supported and anchored, protected from damage and freezing, and accessible for repair or replacement.

b) **BELOW GRADE CROSSINGS:** For pipe crossing under creeks, streams and other bodies of water, a minimum of two feet (2') of cover shall be provided over the pipe. When crossing water courses that are greater than fifteen feet (15') in width, the pipe and material shall be designed appropriately, valves shall be located on both sides of crossing to isolate for testing and repair that are easily accessible and not subject to flooding, a blow-off shall be provided on the side opposite the supply service (directed away from creeks and over ground), and ductile iron pipe with mechanical joints shall be used for any lines being installed in rock.

D. PIPE INSTALLATION

1. DUCTILE IRON PIPE AND IRON FITTINGS

a) GENERAL: The Contractor shall assemble, joint and lay all pipe and fittings in accordance with AWWA C600.

b) CUTTING DUCTILE IRON: Whenever ductile iron pipe or special castings are required to be cut, the cutting shall be done by skilled workmen, using an abrasive wheel cutter. Use of oxyacetylene torch will not be permitted. Pipe that is cut in the field must be ground and beveled before assembly and cut to leave a smooth end at right angles to the axis of the pipe. The plain end shall be beveled; any sharp edges that might damage the gasket shall be removed by means of a file or power grinder.

2. PVC PIPE AND IRON FITTINGS

a) GENERAL: The Contractor shall assemble, joint and lay all pipe and fittings in accordance with AWWA C605.

b) CUTTING PVC PIPE: Whenever pipe or special castings are required to be cut, the cutting shall be done by skilled workmen, using an abrasive wheel cutter. Pipe that is cut in the field must be ground and beveled prior to assembly and cut to leave a smooth end at right angles to the axis of the pipe. The plain end shall be beveled; any sharp edges that might damage the gasket shall be removed by means of a file or power grinder.

3. COPPER PIPE AND FITTINGS

a) GENERAL: For copper pipe Install pipe and tube without springing, forcing or stressing the pipe, tube, or any connecting valves. Provide pipe hangers and supports for pipe and tube where installed aboveground, in vaults, and structures. Use soldered joints and fittings with copper water tube in buried and exposed service. Use threaded joints and fittings with brass or copper piping in buried and exposed service.

b) INSTALLATION

(1) Cut tubing square and remove burrs. Use a sizing ring on the ends of soft copper tubing and bring to true dimension and roundness.

(2) Joints shall be watertight. Remove foreign matter and dirt from inside the tubing and keep clean during and after laying.

(a) Clean surfaces to be soldered with fine emery cloth, cleaning pads, or special wire brushes. Make soldered joints in accordance with ASTM B828. Solder shall penetrate to the full depth of the cup in joints and fittings.

(b) Clean threaded joints by wire brushing or swabbing. Apply Teflon joint compound or Teflon tape to male pipe threads before mating threaded joint.

- (3) Bends in soft copper tubing shall be long sweep. Shape bends with shaping tools, without flattening, buckling, or thinning the tubing wall.

E. JOINT AND FITTING INSTALLATION

1. **GENERAL:** The location of bends, joints, and fittings indicated on the Construction Drawings are a guide. The Contractor will be required to furnish additional bends and fittings as needed to complete all installations.
2. **PERMISSIBLE DEFLECTION OF JOINTS:** Where ever it is necessary to deflect pressure pipe from a straight line, either in the vertical or horizontal plane, to avoid obstruction or plumb valve stems, or where long radius curves are permitted, the amount of deflection allowed shall not exceed that required for satisfactory sealing of the joint as recommended by the manufacturer, and shall be approved by the Engineer.
3. **PUSH-ON JOINT PIPE:** The gasket groove and bell socket shall be cleaned and lubricated, and the gasket inserted as specified by the pipe manufacturer. Sterile lubricant, as furnished or specified by the manufacturer shall be applied to the gasket and beveled spigot end of the pipe. The beveled spigot end of pipe shall be pushed straight into bell using either a bar, jack, lever, puller, or backhoe. A timber header will be placed between the jack or backhoe bucket and the pipe to prevent damage to the pipe. At no time will the joint be made by swinging the pipe. The pipe will be deflected, if required, after the joint is made.
4. **MECHANICAL JOINT PIPE AND FITTINGS:** All spigots shall be centrally located in the bell and adequate anchorage shall be provided where abrupt change in direction of dead ends occur. All pipe surfaces with which the rubber gasket seals come into contact will be brushed with a wire brush just prior to assembly in order to remove all loose rust or foreign material and to provide a clean surface of the installation of the gasket. The pipe surface with which the gasket comes into contact will be brushed with soapy water just prior to the installation of the gasket and the making up of the joint. When tightening bolts, the gland will be brought up toward the pipe flange evenly, maintaining approximately the same distance between the gland and the face of the flange at all points around the socket.

F. CONNECTIONS

1. **CONNECTIONS TO EXISTING PIPELINES:** Connections to existing pipelines shall be made with necessary fittings and valves as indicated on the approved Construction Drawings. The Contractor shall, before opening pipeline trenches, locate the various points of connections to be made into existing pipelines.
 - a) When a tapping sleeve and valve is installed, the coupon from the existing water main shall be submitted to the City. The coupon must be marked indicating the date and time of the tap and the location.
 - b) Only one (1) connection between the existing system and the new extension will be allowed until testing, chlorination, and successful sampling of the new extension is complete.
 - c) Contractor shall verify blocking at existing valves prior to making connections

and will be required to block, rod, or restrain existing and new pipe, fittings and valves as necessary.

d) Coordinate with the City Inspector to be present during exposure and tapping of the existing water main. Contact Inspector and Engineer a minimum of 48 hours prior to exposure.

2. SERVICE CONNECTIONS: Once service connections are approved and all fees paid to the City of Rock Hill, connections for water service can be made.

a) Service lines will be made perpendicular to the water main unless otherwise approved. All taps will be made substantially as shown on the Standard Details. Service connections shall be installed prior to pressure testing and sterilization of the main. Allowance for joints in service connection will be included when computing the allowable leakage. The contractor shall flush each connection after testing and sterilization is complete.

b) Service lines will be installed with a minimum depth of cover of 24 inches and a maximum depth of cover of 30 inches.

c) Multiple service taps shall have a minimum of 24 inches of separation between taps and shall be located on planes at least 12 inches offset.

d) Service connections to the main piping shall be made by using tapping saddles threaded to accept corporation stops.

e) Meter boxes and locations shall be as shown on the Standard Details. In areas with sidewalks or proposed sidewalks, the meter boxes are to be set outside the sidewalk area on the property-owner side of the sidewalk. Meter boxes shall not be set in driveway locations.

f) The location of the services will be identified by the letter "W" imprinted into the curb adjacent to the service. Where a service is moved or removed, the "W" will be removed from the curb or grouted over.

g) For services 3-inches and larger, the Contractor shall consult with the City Inspector to determine the location of meter vaults prior to the installation.

h) The City requires the property owner or developer to perform the tap to the main. There are no tap fees associated with this work. Contractors performing taps to the City's main(s) must contact the City's Planning and Development Services Engineer to schedule an inspection and witness pressure testing of the tapping sleeve and valve.

3. INTERCONNECTIONS AND CROSS CONNECTIONS

a) INTERCONNECTIONS: The approval of SCDHEC shall be obtained for interconnections between potable water supplies.

b) **CROSS CONNECTIONS:** There shall be no connection between the water distribution system and any pipes, pumps, hydrants, or tanks whereby unsafe water or other contamination materials may be discharged or drawn into the system.

c) **DEVICES:** Backflow Prevention Devices (BPD) shall be installed in accordance with the SCDHEC Backflow Prevention Manual. All piping up to the inlet of the BPD must be suitable for potable water. The pipe must be AWWA or NSF approved. Black steel pipe cannot be used on the inlet side of the device.

(1) No by-passes shall be allowed, unless the bypass is equipped with an equal, approved BPD.

(2) High-hazard category cross-connections shall require an air gap separation or an approved reduced pressure principal (RPP) backflow preventer.

(3) RPP backflow prevention assemblies shall not be installed in any area location subject to possible flooding. This includes pits or vaults which are not provided with a gravity drain to the ground's surface that is capable of exceeding the discharge rate of the relief valve. Generally, if installed in a pit, the drain line shall be 2 times the size of the line entering the BPD. The drain cannot empty into any ditch or sewer, which could flood water back into the pit.

(4) Fire line sprinkler systems and dedicated fire lines, except those in the high-hazard category shall be protected by an approved double check valve assembly. Double Check Valve Assembly (DCVA) can be located in the building's mechanical/riser room or in a vault. If installed in a vault, the installation shall be in accordance with the City's Standard Detail.

d) **COOLING WATER:** Neither steam condensate nor cooling water from engine jackets or other heat exchange devices shall be returned to the potable water supply.

e) **WATER LOADING STATIONS:** To prevent contamination of the public supply, the following criteria shall be met:

(1) **Air Gap -** A device shall be installed on the fill line to provide an air break and prevent a submerged discharge line.

(2) **Hose length -** The fill hose and cross connection control device must be constructed so that when hanging freely it will terminate at least two (2) feet above the ground surface.

(3) **Fill line terminus -** The discharge end of the fill line must be unthreaded

4. **INTERRUPTION OF SERVICE:** Connections to existing pipelines shall be made only at such times and in such manner as will meet operating requirements. No cut shall be made in existing lines until the permission of the City Engineer has been obtained as to time and manner of making the cuts and connections. All existing valves shall be operated only by authorized representatives of the City. If connections to existing mains will necessitate an interruption of service, the Contractor will schedule the connection for a time that is most convenient to the affected customers as determined by the Engineer. Adequate notice will be provided to those customers

who will be put out of service by the connection. When such interruption of service is approved, the Contractor will have all required labor, material and equipment at the site before beginning any work and the service interruption will be kept to an absolute minimum.

5. JUMPER CONNECTION: Contractor shall use a jumper connection as shown in the Standard Details for the purpose of filling a newly constructed line with water to prepare it for testing and disinfection.

G. FIRE HYDRANT ASSEMBLIES

1. COVER: Hydrants shall have a 3-foot depth of cover over the leader pipe. However, if the hydrant is located so as to require additional cover, extension sections shall be furnished and installed.

2. GENERAL CONSTRUCTION

a) Hydrant assemblies shall be installed plumb and in accordance with the Standard Details at locations shown on the Construction Drawings and/or as directed by the Engineer.

b) The operating nut shall be totally sealed away from the hydrant barrel and all working parts shall be continuously and automatically lubricated from a large oil reservoir and packing gland. Drain mechanism shall be simple, positive, and automatic in operation.

c) The safety flange on barrel and safety coupling on valve stem shall operate to prevent damage to barrel and stem in case of a traffic accident. The construction of the flange and coupling shall be such as to permit rapid and inexpensive replacement. They shall be located above the ground line. The force of the impact of a traffic accident shall break the flange and spread the coupling. Hydrant shall be constructed as to permit facing nozzles in any direction at any time without digging up the hydrant or cutting off the water. This shall be accomplished by removing safety flange bolts and rotating the head.

d) All working parts, including the seat ring shall be removable and through the top without digging.

e) Hydrants shall be set to grade such that a wrench may turn the hose connection covers in any direction, at any time, without impacting the ground.

f) Each hydrant installation shall include a drainage bed of clean washed stone approximately 1 cubic foot in size at the "weep hole." Piping from the main to the hydrant shall be 6-inch (minimum size) DIP.

H. VALVES AND VALVE BOXES: Sufficient valves shall be provided on water mains so that customer inconvenience and sanitary hazards will be minimized during repairs. No valve is required at the right-of-way or easement line if a valve is provided at the main tap location. Valves located within a street shall be located outside the wheel travel paths. At intersections, valves shall be located on the side of the less traveled street.

1. **AIR RELIEF VALVES (ARV):** Air relief valves shall be installed at the high points shown on approved Construction Drawings on 12-inch and larger mains. The installation shall include the corporation stop, necessary piping, valve vault with manhole frame and cover and appurtenances. All valves shall be tested in accordance with AWWA Standards.
2. **RESILIENT-SEAT GATE VALVES:** Valves shall be for vertical installation only, with square operating nut and non-rising stem.
3. **VALVE BOXES**
 - a) A valve box conforming to the Standard Details shall be installed for every gate valve. The valve box shall not transmit shock or stress to the valve and shall be centered plumb over the operating nut, with the box cover flush with the surface of the pavement or other existing surface.
 - b) Where the box is not set in a paved surface, the top section shall be anchored by a concrete pad, set flush with the existing terrain. The top section will be grouted into the concrete pad. The location of valves will be identified by the letter "V" imprinted into the curb adjacent to the mainline or hydrant valve.

I. **BLOCKING/RESTRAINTS:**

1. **BLOCKING:** All tees, bends, plugs and hydrants on lines 2 ½ inches in diameter and larger shall be provided with reaction blocking, tie rods or other approved restraining methods to prevent movement.
2. **VALVE BLOCKING:** All end of line valves 12-inch and smaller installed on PVC or ductile iron water mains and all 12-inch valves installed along PVC water mains shall be securely wedge blocked with concrete bearing against, and cut into the excavated sides of the trench. Care shall be taken in forming and pouring the "wedge" blocking so the fitting joints will be accessible for repair and/or valve extraction.
3. **BLOCKING/RESTRAINT FITTINGS:** Thrust blocking or mechanical restraints must be specified for all plugs, caps, tees, and bends deflecting 11-1/4 degrees or greater on lines 2 ½ inches in diameter and larger, for all post hydrants on lines 3 inches in diameter and larger, and for all hydrants on lines 6 inches in diameter and larger. Blocking and/or restraints must be placed as shown on the Construction Drawings and/or as directed by the Engineer. Blocking shall consist, of ready mix concrete having a compressive strength of not less than 3,000 psi at 28 days.
 - a) Bagged mix concrete may be used for blocking, anchorage, concrete valve pads, etc. on water mains and valves 12-inch and smaller, when less than ½ yard is required.
 - b) Blocking shall be placed between solid ground and the fittings to be anchored. The area of bearing on the pipe and on the ground in each instance shall be that shown or directed by the Engineer. The blocking shall be placed that the pipe and fittings will be accessible for repair.
 - c) Restrained joints shall be installed where shown on the Construction Drawings, Standard Details, or when approved by the Engineer, and may be installed in lieu of

blocking. Installation shall be per manufacturer's recommendations, as shown on the Construction Drawings, special provisions, and/or as directed by the Engineer. Restrained joints will not be allowed on PVC pipe.

J. CLEANING, FLUSHING AND DISINFECTION

1. CLEANING: All dirt and foreign material must be cleaned from each joint of pipe or fitting while it is suspended, before it is lowered into the trench. The Contractor shall also, before the system is accepted, thoroughly clean all lines.

2. FLUSHING: The design shall provide for a readily accessible means of flushing all water lines at a minimum velocity of 2.5 fps. This does not apply to service lines.

a) Where dead-end lines occur they shall be provided with a fire hydrant if flow and pressure are sufficient, or a readily accessible blow-off valve in a box for flushing purposes, except for the following cases and also must have prior approval from the Engineer:

b) Lines 1-inch diameter and smaller will not require blow-offs. Lines 2 inches in diameter and shorter than 200 feet will not require a blow-off. However, a service connection shall be installed at the end of the line or another acceptable means of bleeding chlorine through the lines must be provided.

c) Blow-offs shall be sized to provide a minimum velocity of 2.5 feet per second in the line and maintain a residual pressure of 25 psi.

d) Design head loss calculations, including elevation changes shall show 25 psi minimum residual when instantaneous demand occurs or 20 psi minimum residual when either fire flow or flushing flow in excess of peak hourly flow occurs, whichever is greater.

e) Lines 10 inches and larger require flows in excess of 500 gpm to achieve a 2.5 fps scouring velocity. This would require a standard fire hydrant or other approved blow-off, for flushing which must be designed to provide at least 500 gpm in excess of peak hourly flow and a minimum residual pressure of 20 psi.

f) No flushing device shall be directly connected to any sewer.

3. DISINFECTION

a) GENERAL: All pipelines and appurtenances, both existing and newly constructed which have been exposed to contamination by reason of construction, shall be sterilized after testing and flushing of the lines has been completed. The Contractor shall notify the City before chlorination to ensure that precautions are taken to not allow the backflow of water into the existing system.

b) Disinfection of all new water mains shall be in accordance with AWWA C651 and ANSI/NSF Standard 60 for the disinfection of water mains.

c) A BPD shall be utilized to supply water from the City's water system to the new

water line extension. Lines shall be filled and flushed to clear the lines of any debris. Lines shall then be filled with fresh water containing 50 parts per million of chlorine and allowed to stand for a period of 24 hours. At the end of this 24 hour period, the treated water in all portions of the main must have a residual of not less than 10 ppm free chlorine, or the procedure must be repeated. Lines shall then be flushed slowly and uniformly at a controlled rate, at which time a sample shall be collected for bacteriological examination. No flushing device shall be directly connected to any sewer.

d) The Contractor shall collect a minimum of two (2) samples from each sampling site for total coliform analysis. The number of sites depends on the amount of new construction but must include all dead-end lines, be representative of the water in the newly constructed mains, and shall be collected a minimum of every 1,200 linear feet. Prior to sampling, the chlorine residual must be reduced to normal system residual levels or be non-detectable in those systems not chlorinating. These samples must be collected at least twenty-four (24) hours apart and must show the water line to be absent of total coliform bacteria. The chlorine residual must also be measured and reported. All samples must be analyzed by a State certified laboratory.

e) No line shall be placed into service without the consent of the City Engineer and SCDHEC.

K. PROXIMITY TO SEWER INFRASTRUCTURE

1. GENERAL: All installation practices shall be in accordance with Section R61-58.4D of the State Primary Drinking Water Regulations when installing water supply infrastructure in the vicinity of sanitary sewer.

2. PARALLEL INSTALLATION: Water mains shall be laid at least ten (10) feet horizontally from any existing or proposed sewer (gravity or force main). The distance shall be measured edge to edge. In cases where it is not practical to maintain a ten foot separation, any deviation shall be authorized by SCDHEC on a case-by-case basis, if supported by data from the design engineer. Such deviation may allow installation of the water main closer to a sewer, provided that the water main is laid in a separate trench or on an undisturbed earth shelf located on one side of the sewer at such an elevation that the bottom of the water main is at least eighteen (18) inches above the top of the sewer. If these condition are not able to be met or an alternative design is not feasible, the sewer pipe shall be replaced and the water line laid such that the distances between joints of water and sewer pipe is maximized and the sewer pipe shall be replaced with ductile iron pipe.

a) There shall be no physical connection(s) between a public or private potable water supply and a sanitary sewer collection system.

b) Sanitary sewer service lateral piping shall be installed no closer than 10 feet as measured horizontally from water service piping.

3. CROSSINGS: Water mains crossing sewers shall be laid to provide a minimum vertical separation of eighteen (18) inches between the outside of the water main and the outside of the sewer. This shall be the case whether the water main is either above or below the sewer line. Whenever possible, the water main shall be located above the sewer line. Where a new water main crosses a new sewer line, a full length of pipe shall be used for both the water main and sewer line and the crossing shall be arranged so that the joints of each line will be as far as possible

from the point of crossing and each other. Where a new water main crosses an existing sewer line, one full length of water pipe shall be located so both joints will be as far from the sewer line as possible. Where a water main crosses under a sewer, adequate structural support shall be provided for the sewer line to prevent damage to the water main.

4. SPECIAL CONDITIONS: When it is impossible to obtain the distances specified in R.61-58.4(D)(12)(a) and (b) SCDHEC may allow an alternative design. Any alternative design shall:

- a) Maximize the distances between the water main and sewer line and the joints of each;
- b) Use materials which meet the requirements R.61-58.4(D)(1) for the sewer line; and,
- c) Allow enough distance to make repairs to one of the lines without damaging the other.

5. FORCE MAINS: There shall be at least a ten (10) foot horizontal separation between water mains and sanitary sewer force mains. There shall be an eighteen (18) inch vertical separation at crossing as required in R.61-58.4(D).

6. SEWER MANHOLES: No water pipe shall pass through or come in contact with any part of a sewer manhole. Water lines may come in contact with storm sewers or catch basins if there is no other practical alternative, provided that ductile iron is used, no joints of the water line are within the storm sewer or catch basin and the joints are located as far as possible from the storm sewer or catch basin.

7. DRAIN-FIELDS AND SPRAY-FIELDS: Potable water lines shall not be laid less than twenty-five (25) feet horizontally from any portion of a waste-water tile-field or spray-field, or shall be otherwise protected by an acceptable method approved by SCDHEC.

L. PROTECTION OF OTHER UTILITIES AND STRUCTURES: Before beginning any excavation for installing water infrastructure, the Contractor shall locate or cause to have located any water, sewer, gas or other utilities as necessary to avoid conflicts. The Contractor shall excavate and expose existing underground utilities in advance of trenching operations to determine the precise location of the utilities or other underground obstructions shown on the Construction Drawings. Such location and excavations shall be at least 500 feet ahead of the construction, unless otherwise noted. Conflicts with existing utilities shall be reported to the Engineer and conflicting utility's owner for resolution. Changes to the alignment and/or grade of the water piping shall be submitted to the City Engineer for review and approval.

1. All utility owners will be notified prior to excavation as required by the 1985 Underground Damage Prevention Act. To aid in the location of existing utilities, Contractor shall contact the South Carolina Utility Protection Service (PUPS) by telephone or posting a utility location requires on the PUPS website. The following information is provided by PUPS.

- a) "South Carolina State Law requires the excavator, when planning any activity that results in the movement or removal of earth, rock, or other materials in or on the ground to contact South Carolina 811 and any non-member company with adequate information regarding the excavation.

b) At least 3 full working day notice at 11:59 pm (not including the day of the call) prior to digging, call SC 811 by dialing 811 or (888) 721-7877. A SC811 representative will record the location of the digging site and notify member companies of your intent to dig. Each member company will then send either one of their employees or a contract locator to your dig site to mark the location of their underground facilities lines.

c) Once the lines have been marked, you may begin carefully to dig, keeping in mind the 2 feet allowance on either side of the markings. [(a) if the diameter of the facility is known, the distance of one-half of the know diameter plus twenty-four inches on either side of the designated center line; (b) if the diameter of the facility is not marked, twenty-four inches on either side of the outside edge of the mark indicating a facility; or (c) for subaqueous facilities, a clearance of fifteen feet on either side of the indicated facility}. Not all utilities are members with SC811. If a utility is not named, please contact them directly.

d) Remember: Call 811, wait the required time, respect the marks, and dig with care!"

2. Prior to final acceptance by the City of the water utility being constructed, the developer/owner shall be responsible for the integrity of the utility and for locating the utility until final acceptance by the City. Final acceptance shall include written documentation, permits to operate, copies of record drawings, and other requirements so listed by the City.

3. Crossings:

a) Whenever a water main crosses under other utility lines (gas, telephone conduit, storm drain, etc.), there shall be 2-feet clearance between the top of the water and the bottom of the affected utility. Stone bedding shall be used from 6-inches below the water to 12-inches above the water from one foot outside the utility trench. If this clearance is not possible, the water line shall be ductile iron pipe 1-foot outside the utility trench, with a minimum length of 10 feet.

b) Whenever a water main crosses over other utility lines (gas, telephone conduit, storm drain, etc.), there shall be one foot clearance from the top of the utility to the bottom of the water for PVC water lines. If this clearance is not possible, the water line shall be ductile iron pipe from 1-foot outside the utility trench, with a minimum length of 10 feet.

4. The Contractor shall be solely responsible for the repair and payment of penalties for any damage made to existing utilities as a result of the work.

M. SYSTEM TESTING

1. GENERAL: All required testing of pipelines and valves shall be done under the direct supervision of the City Inspector and must be conducted in accordance with AWWA C600 and C605. Field testing shall not negate the requirements for material certifications as contained in these specifications unless otherwise directed by the Engineer. All testing and disinfection shall be completed prior to connection to any existing line. Contractor shall be responsible for providing all equipment, personnel, and ventilation necessary to comply with OSHA confined space regulations.

2. **TESTING AND CLEANING:** When a length of pipe is deemed adequate for testing, the line shall be filled and thoroughly exhausted of air and a leakage test made. The Contractor shall furnish all labor, materials and equipment for carrying out these tests. Wherever conditions will permit, pipelines shall be tested before the trench is backfilled. All joints then shall be examined during open trench test and all leaks entirely stopped. The Contractor shall furnish a test pump, a means for accurate measurement, of water introduced into a line during testing, and shall furnish and install corporation stops at all high points in the line and at the test pump location as required for exhausting the air.

3. **TEMPORARY BULKHEADS:** The Contractor shall furnish, install and remove all temporary bulkheads, flanges or plugs, to permit the required pressure tests, and shall furnish all equipment and labor to properly carry out such tests and to replace defective material. City Inspector shall be present during installation of bulkheads and during the removal of the bulkheads.

4. **TEST PRESSURE AND LEAKAGE:** The Contractor shall give the City Inspector a 48-hour notice before starting test. On completion of the line or sections of the lines, connections and appurtenances, the line shall be filled and hydrostatically tested. All air shall be released from the system prior to testing. Test pressure shall be 1.5 times the maximum working pressure in the system (i.e. 150 psig) and 150 psig minimum as measured at the lowest point of elevation of the section of line being tested. Testing time shall be a minimum two (2) hours. Leakage shall not exceed the allowable leakage shown AWWA C600 and C605 or calculated by the formula:

For Ductile Iron Pipe:

$$G = \{S * D * (P^{1.5})\} / 148,000$$

Where: L = allowable leakage, in gallons per hour
 S = length of pipe tested, in feet
 D = nominal diameter of pipe, in inches
 P = average test pressure (psig) = 150 psig

For PVC Pipe:

$$L = \{N * D * (P^{1/2})\} / 7,400$$

Where: L = allowable leakage, in gallons per hour
 N = # of joints of pipeline being tested
 D = nominal diameter of pipe, in inches
 P = average test pressure (psig) = 150 psig

Note: Add 0.0043 gph for each ¾-inch service and 0.0057 gph for each 1-inch service.

All visible leaks shall be repaired regardless of the amount of leakage, and test will be repeated until it passes.

N. GENERAL CONSTRUCTION

1. **CLEARING & GRUBBING:** The Contractor shall perform all clearing necessary for installation of the complete work. Clearing shall consist of removing all trees, stumps, roots, brush and debris in the way of the work. Temporary Construction easements shall be selectively cleared with specimen trees left standing.

2. **DISPOSAL:** All excess and waste material shall be legally disposed in a satisfactory manner. Burning shall be in accordance with City Fire Department regulations and SCDHEC Regulations. When burning is allowed, the Contractor shall obtain a Burning Permit from the office of the City Fire Chief prior to any burning operations.

3. **REMOVAL OF PRIVATE OR PUBLIC FACILITIES:** Any private or public facilities, including fences, mailboxes, etc., removed for construction purposes shall be promptly replaced of the same material in the same or better condition than prior to construction. Trees or shrubbery along highways, roadways and streets shall not be disturbed unless absolutely necessary. Tree removal is subject to the approval of the City Engineer. Planting such trees or shrubs that are to be removed and replaced may be heeled in and replanted. Heeling and replanting shall be done under the direction of an experienced nurseryman and City Forester.

O. CONSTRUCTION ALONG HIGHWAYS, STREETS AND ROADWAYS

1. **GENERAL:** The Contractor shall install pipelines and appurtenances along publicly owned and maintained highways, streets and roadways in accordance with all applicable encroachment permits and City and SCDOT regulations, with reference to construction operations and requirements, safety, traffic control, road maintenance and repair.

2. **PROTECTION OF TRAFFIC:** The Contractor shall provide suitable signs, barricades and lights for protection of traffic, in locations where traffic may be endangered by construction operations. All highway signs removed by reason of construction shall be replaced as soon as the conditions that necessitated such removal have been cleared. No highways, streets or roadways shall be closed without first obtaining permission from the proper authorities. Before any roadway is blocked, the Contractor shall notify the City Engineer's office.

3. **CLOSURES:** In general, not more than one block of a street or roadway shall be closed for construction at any one time. Before proceeding with trenching operations in a succeeding block, the preceding section shall be backfilled, cleaned completely and the street opened to traffic. All planned road closures shall be reported in accordance with these specifications prior to closing any street, or for unplanned roadway closings, as soon as possible after the roadway has been closed.

4. **MAINTAINING HIGHWAYS, STREETS, ROADWAYS, AND DRIVEWAYS:** The Contractor shall furnish adequate personnel and proper construction equipment, which shall be available for use at all times, for maintaining highways, streets and roadways upon which work is being performed. All such highways, streets and roadways shall be maintained in suitable condition for movement of traffic until completion and final acceptance of the work. For temporary drive closures, the contractor is to coordinate the closure(s) with applicable property owner(s). The Contractor shall immediately repair all driveways that are cut or damaged and shall maintain them in a suitable condition for use until completion and final acceptance of the work.

5. **CONSTRUCTION OPERATIONS:** The Contractor shall construct all work along roadways using the sequence of construction operations, as to least interfere with traffic.

6. **REMOVING PAVEMENT:** The Contractor shall remove pavement as necessary for installing the new piping and appurtenances and for making connections to existing pipelines. Care shall be taken by the Contractor to avoid damage to pavement adjoining pavement removal

areas. If damaged, the Contractor shall remove the damaged pavement and shall replace it with new pavement at his own expense.

- a) There may be instances where the City requires additional pavement removal and repair based on the condition of the road. In these areas, the City will contract with and negotiate the price with the Contractor for the damaged pavement removal and associated repair work to be completed. Should a portion of this work be completed by City forces, the Contractor shall work with the City in coordinating the work as the applicable Encroachment Permit allows.

7. **MARKING & CUTTING:** Before removing any pavement, the pavement shall be marked for cuts neatly paralleling pipelines and existing street lines taking into consideration existing pavement conditions. Pavement shall be saw-cut prior to removal to form a clean transition edge. Asphalt pavement shall be broken along the marked cuts by use of a jackhammer or other suitable tool. Concrete pavement and asphalt pavement on concrete base shall be scored to a depth of approximately 2" below the surface of the concrete along the marked cuts. Scoring shall be done by use of a rotary saw, after which the pavement may be broken below the scoring by use of a jackhammer or other suitable tool.

8. **STRIPPING:** Where the pipeline is laid along road shoulders, all sod, topsoil and other materials suitable for shoulder restoration shall be stripped and stockpiled for replacement.

9. **EXCAVATED MATERIAL:** Excavated Material shall not be placed along highways, streets and roadways in such a manner as to obstruct traffic. No scattered excavated material shall be allowed to remain on the pavement. All such material shall be kept swept away.

10. **PAVERS OR CURB:** The Contractor shall remove and replace or tunnel or bore under any paver areas or concrete/stone curb encountered along the project route. In any case, protection of the pavers' and curb and gutter's supporting foundation is the responsibility of the Contractor.

11. **MACHINE PULLING:** No pavement shall be machine pulled until completely broken and separated along the marked cuts.

12. **DRAINAGE STRUCTURES:** All side ditches, culverts, cross drains and other drainage structures shall be kept clear of excavated material and be free to drain at all times.

P. EARTHWORK

1. **GENERAL:** The Contractor shall excavate, install piping and backfill and consolidate the trench backfill as quickly as possible to maintain safety within the construction site. Trenches shall not be opened any further ahead of pipe laying operations than is necessary for proper laying operations, and trenches shall be progressively backfilled and consolidated, and excess material removed immediately behind laying operations. Backfill material and material consolidation shall meet SCDOT specifications, but in no case shall the consolidation be less than 95% maximum dry density for each layer of soil material-in-place as determined by ASTM D698 (Standard Proctor) test procedures. The Contractor shall so organize his work that backfilling and cleanup shall closely follow pipe laying operations and construction.

- a) Excavations within street rights-of-way shall be backfilled when left unattended

for more than 1 hour, unless otherwise approved by the controlling agency.

b) Excavations within water rights-of-way/easement shall be backfilled, fenced, or otherwise protected when left unattended for more than 1 hour.

2. **TRENCH EXCAVATION:** Trench excavation shall include the removal of material necessary for the installation of the piping infrastructure and associated fittings and structures. Excavated materials that are not suitable for backfill material shall be removed from and legally disposed offsite.

a) **DEPTH OF TRENCHES:** The minimum cover over the top of the pipe shall be 3 feet, unless otherwise directed by the City Engineer and/or shown on approved Construction Drawings. If the minimum cover is not achieved, the pipe shall be made of ductile iron and meet the requirements of these specifications. Where obstructions are encountered, minimum depth may be changed to avoid interference. Where necessary to increase the depth of cover to avoid interference with underground utilities, obstructions and utilities services, the Contractor shall furnish all construction equipment and shall perform all labor required for additional trench depth.

b) **LENGTH OF OPEN TRENCH:** A maximum trench of ± 100 LF shall be open in advance of the pipe laying than is necessary to expedite the work, unless prior approval is given by the Engineer. Ground conditions and/or location requirements shall govern the amount of trench open at any one time as determined by the Engineer.

c) **WIDTH OF TRENCHES:** Trenches shall be excavated sufficiently wider than the infrastructure to be installed to allow for personnel and the preparation of the infrastructure foundation, installation of infrastructure and associated bedding, and to properly consolidate the backfill material including the pipe support bedding located under the pipe's haunches. In any case, the width of the trench is not to be narrower than 24 inches plus the outside diameter of the pipe.

3. **GENERAL EXCAVATION**

a) **BELL HOLES:** The trench bottom shall be true and even with bell holes at each joint to provide the barrel of the pipe with soil and/or granular (as applicable) support for its full length. If stone bedding of sufficient depth is not provided, the Contractor shall over-excavate the locations where the pipe bells rest so the entire length of the pipe will be uniformly supported.

b) **EARTH EXCAVATION:** Earth excavation shall include all excavation of whatever substance encountered, except rock excavation, as further provided in these specifications. The area excavated shall be limited to no more than is necessary to allow the proper installation of the structure as determined by the Engineer, and the excavation shall be made to the lines, grades and elevations shown on the Construction Drawings. In locations where pipe is to be bedded in earth excavated trenches and no stone is used for bedding the pipe, the bottoms of such trenches shall be fine graded to allow for a firm and uniform bearing for the bottom of the pipe. Where any part of the trench has been excavated below the engineered grade for the pipe, the part excavated below such grade shall be backfilled with sand and compacted at the Contractor's expense.

c) **BORE PITS:** Bore pit excavations shall be controlled by the limits of the existing rights-of-way and shall not exceed these without prior written approval of the property owner. The excavation shall be made to the proper elevation, line and grade as required to install the casing pipe as shown on the Construction Drawings. The pit bottom shall be true and even with adequate stabilization to maintain proper elevation and grade on the boring rig for the duration of the bore.

d) **ROCK EXCAVATION IN TRENCHES AND PITS** includes removal and disposal of materials and obstructions encountered which cannot be excavated with a 1.0 cubic yard (heaped) capacity, 42 inch wide bucket on track-mounted power excavator equivalent to Caterpillar Model 215, rated as not less than 90 HP flywheel power and 30,000 lb drawbar pull. Rock excavation shall comprise solid rock in the original bed, or in well-defined ledges, the removal of which in the opinion of the City Engineer requires drilling, blasting, or the use of jackhammers or bull-points, and shall also include boulders or detached pieces of rock 8 cubic feet or more in content. Trenches in excess of 10 feet in width and pits in excess of 30 feet in either length or width are classified as open excavations. Rock removal shall extend to be a minimum of 6 inches vertically and 12 inches horizontally from the piping to be installed.

4. **MATERIALS**

a) Satisfactory soil materials are defined as those complying with ASTM D2487 soil classification groups GW, GP, GM, SM, SW, GC, SC, CL, ML and SP.

b) Unsatisfactory soil materials are defined as those complying with ASTM D2487 soil classification groups MH, CH, OL, OH, and PT.

5. **SHORING AND BRACING:** All shoring and bracing shall conform to all OSHA regulations. The specific type of shoring and bracing used shall be determined by the Contractor as to prevent caving of trench banks and to provide safe excavation.

6. **DEWATERING:** The Contractor shall at all times provide and maintain ample means and equipment with which to remove and properly dispose of any and all water entering the excavation or other parts of the work, and keep all excavation dry until such time as pipe laying and grading is completed and structures to be built therein are completed.

a) No water shall be allowed to rise around the pipe in unbackfilled trenches nor shall it be allowed to rise over masonry until the concrete or mortar has set (minimum 24 hours). All water pumped or drained from the Work shall be disposed in such a manner as to prevent siltation and erosion to adjacent property or other construction.

7. **BACKFILL:** All backfill shall be of non-plastic nature free from roots, vegetative matter, waste, construction material, rock larger than $\frac{3}{4}$ cubic foot, or other objectionable material. Backfill material shall be capable of being tamped by mechanical tamps using relatively low velocity and heavy blows. Material deemed by Engineer to be unsuitable for backfill purposes shall be removed from the job site before backfilling operations begin and replaced with satisfactory soil materials as approved by the Engineer or directed by the permitting agency.

a) Continuous and uniform bedding shall be provided in the trench for all buried pipe. Backfill material shall be tamped in layers around the pipe and to a sufficient height

above the pipe to adequately support and protect the pipe. Stones, other than crushed bedding, shall not come in contact with the pipes and shall not be within 6-inches of the pipe.

8. **COMPACTION CONSOLIDATION REQUIREMENTS:** Compaction of the trench backfill is to conform to the more stringent requirements of the permit issuing authority and requirements herein. Contractor shall be responsible for ensuring the material is adequately compacted. Compaction shall be in accordance with the Standard Detail as determined by ASTM D698 (Standard Proctor) test procedures.

9. **CRUSHED STONE STABILIZATION AND BEDDING:** Crushed stone material shall conform to ASTM C33, as amended to date, gradation #67 (ASTM #67), varying in sizes 1/4" through 3/4". Stabilization and bedding material shall be placed in the trench and thoroughly compacted to grade by tamping. Compacted bedding material shall be carried up the sides of the pipe to the heights shown on the Standard Details.

a) Wherever the sub grade is by nature too soft or mucky, in the opinion of the City Engineer, for the proper installation of the pipe, the Contractor may be ordered to undercut the trench and backfill with crushed stone or gravel.

b) Crushed stone bedding material shall conform to ASTM C33, gradation #67 (ASTM #67), varying in sizes 1/4" through 3/4". Bedding material shall be placed in the trench and thoroughly compacted by tamping to the grade required for the particular location. Compacted bedding material shall be carried up the sides of the pipe to the heights necessary for the various classes of bedding.

10. **SHAPING:** The Contractor, immediately after completing backfilling operations shall re-shape any damaged cut and fill, slopes, side ditches and ditch lines, and shall replace topsoil, sod and any other materials removed from shoulders. When installing pipelines and appurtenances, the Contractor will be required to provide sufficient personnel and equipment so as to simultaneously carry out all of the above operations.

Q. CONCRETE CONSTRUCTION

1. **PLACING OF CONCRETE:** Placing of concrete shall be in daylight hours. Concrete mixed at a central plant shall be transported to the job site as per ASTM C94 and placed within 90 minutes of the dispatch time. Concrete shall be deposited in such a manner so as to prevent contamination by foreign material and segregation due to re-handling or flowing. Free fall shall not exceed 3-feet. Concrete when placed shall be compacted with mechanical, internal-vibrating equipment and/or with hand spading with a slicing rod. Temperature shall be above 35 degrees Fahrenheit and rising by 10:00 AM for the placement of concrete. Depositing shall cease when the descending air temperature in the shade falls below 40 degrees Fahrenheit. If the temperature drops below 35 degrees after concrete is placed the Contractor shall enclose, heat and protect the concrete or Contractor shall replace the concrete at his own expense. Earth fill shall not be placed on concrete until concrete has been allowed to set for 24 hours. Exposed concrete shall have 3/4" chamfered corners.

2. **FORMWORK:** Formwork, where required, shall be built to conform to the shape, lines and dimensions of the concrete work as shown. Forms may be made of wood, plywood, metal or any

other material approved by the Engineer. Forms shall be mortar tight, of materials strong enough to resist noticeable deflection or bulging between supports, and the interior dimensions of the forms shall be such that the finished concrete shall be of the form and dimensions shown on the Construction Drawings. The design of the forms shall take into account the effect of the vibration of the concrete as it is places and also the rate of speed at which the forms will be filled.

- a) Mechanical vibrators of an approved type, and continuous spading and/or rodding of concrete shall be used to produce proper contact of concrete with forms and reinforcing steel in piers and with forms and pipe in monolithic inverts insuring a compact, dense, and impervious artificial stone of uniform texture.

3. SETTING FORMS: Forms shall be set to line and grade, and shall be braced, tied, and secured in a manner which will withstand placing of the concrete, and which will maintain shape and position. Forms shall be tight, and be substantially assembled to prevent bulging and the leaking of concrete. Joints shall be arranged vertically or horizontally. Temporary openings shall be arranged, where required, at the bottoms of wall forms and elsewhere, to facilitate cleaning and inspecting. Lumber used once in forms shall have nails removed and surfaces in contact with concrete work thoroughly cleaned before reuse. Wall sleeves, inserts, and openings required in concrete work shall be properly set in formwork. Chamfer strips shall be placed in forms for all exterior corners.

4. CURING: All concrete will be cured after placement according to the following procedures.

- a) Forms will normally be left in place for the entire curing period. Exposed surfaces not covered by forms will be kept moist continuously for the entire seven day period or will be cured through use of an approved curing compound which will be applied after all surface water has disappeared.
- b) All form marks exposed to view shall be rubbed off with a stone.

5. REMOVING FORMS: Under normal conditions, the time elapsing before the forms may be stripped shall not be less than the following:

- (1) Slabs 14 days
- (2) Piers 7 days
- (3) Walls 2 days

6. FINISHING: All exposed concrete work shall be kept wetted with water, and shall be rubbed with a carborundum stone of medium fineness, or other equally as good abrasive, to bring the surface to a smooth texture and to remove all form and other marks. The paste formed by the rubbing may be rubbed down by floating with a canvas, carpet-faced, or cork float, or may be rubbed down with dry burlap.

7. TESTING: The following test may be performed by the City to ensure the concrete quality.

- a) Compressive Strength – Compressive strength testing shall be conducted in accordance with ASTM C31 and ASTM C39. Test cylinders which are formed in the field

will be left in the field until compression testing is completed.

b) Slump – Slump testing shall be in accordance with ASTM C143.

c) Air Content Test – The test for air content in the mixture will be in accordance with either ASTM C173 or ASTM C231.

8. **ACCEPTANCE:** Concrete shall be accepted on the basis of its meeting the requirements listed under the Material Specifications and Detail specification Section of this contract. The Inspector will accept no ready mix concrete without the plant dispatch ticket.

a) The Engineer shall require any test as he deems necessary to insure that the concrete meets specifications. The Engineer may require the test to be performed by an independent testing laboratory at the Contractor's expense.

b) Segregated concrete and/or concrete containing foreign material will not be accepted.

9. **BLOCKING INSTALLATION:** Concrete blocking shall be formed and poured at the backs of fittings, including elbows, tees, fire hydrants and other fittings to the dimensions shown on approved detailed Construction Drawings. Unless otherwise noted, concrete shall be 3,000 psi with a four-inch (4") slump. Blocking shall be poured against undisturbed earth. If existing soil conditions will not support concrete blocking, it is the Engineer's responsibility to recommend proper restraining devices in order to prevent movement of the pipe. Concrete of the respective classes for thrust blocking, bedding, blocking, headwalls, piers and other miscellaneous structures shall be as called for in the work to which they pertain.

R. **BORES, TUNNELS, AND CASINGS:**

1. **BORE PITS (OR TUNNEL PITS):** Bore or tunnel pits shall be safed-up, shore, well-marked, lighted, and not left unattended except as approved by the controlling agency. Requirements of stabilization and dewatering of bore pits shall be as herein before specified. The angle of repose method (sloping pit walls) for creating a safe working area shall not be used.

2. **SIZING:** Carrier pipe shall be Restrained Joint DIP. Casing is to extend beyond the edge of pavement or control structure at least as far out as it is deep and clearance of 25 feet beyond the casing shall be granted for future removal of the carrier pipe. Spiders shall be used on all water lines installed within steel casing. The minimum size and thickness standards for casing pipe and tunnels for various sewer line sizes and types are as follows:

Carrier Pipe (inch diameter)	Casing Pipe (inches)	Thickness (inches)		Recommended * Tunnel (inches min.)
		DOT	RR	
8" DIP	18"	0.250"	0.312"	48"
10" DIP	20"	0.250"	0.344"	48"
12" DIP	24"	.0.250"	0.406"	48"
16" DIP	30"	0.312"	0.469"	48"
18" DIP	30"	0.312"	0.469"	48"
24" DIP	36"	0.375"	0.562"	48"
30" DIP	48"	0.500"	0.750"	60"

- Gauge to be determined by controlling agency and/or by depth of installation

3. **INSTALLATION:** Smooth wall or spiral weld steel pipe may be jacked through dry bores slightly larger than the pipe, bored progressively ahead of the leading edge of the advancing pipe as soil is mucked by the auger back through the pipe. As dry boring operation progresses, each new section of encasement pipe shall be butt welded to the section previously jacked into place. Continuous checks shall be made as to the elevation, grade and alignment of each successive section of encasement, as well as the tracks (rails) upon which the boring rig travels. Continuous checks shall be made as to the elevation, grade and alignment of each successive section of encasement, as well as the tracks (rails) upon which the boring rig travels.

a) Installation shall be such to prevent the formation of a waterway under the road or rail bed. If voids are encountered or occur outside the encasement pipe, grout holes shall be installed in the top section of the encasement pipe at ten (10) foot centers and the voids filled with 1:3 Portland cement grout at sufficient pressure to prevent settlement in the roadway/railway.

b) Boring operations shall be continuous to their completion, and unnecessary or prolonged stoppages shall not be allowed.

c) In the event an obstruction is encountered during the boring and jacking operations, the auger is to be withdrawn and the excess pipe is to be cut off, capped, and filled with 1:3 Portland cement grout at sufficient pressure to fill all voids before reapplying to the controlling agency for permission to open cut, bore at an alternative location, or install a tunnel.

d) Installation shall be to the limits specified by the controlling agency and/or as delineated in their encroachment permit issued. The controlling agency shall have full authority to require remedial measures and/or to stop all work if, in its opinion, said work will cause any damage to the roadway/railway section or endanger traffic. In all instances the controlling agencies reserve the right to sample, test, and approve all materials and methods used.

e) The Contractor shall notify the controlling agency through the Engineer and an acknowledgement shall be received a minimum of five (5) working days prior to beginning any work within the roadway or railway rights-of-way. If required, 24-hour notice will be given prior to completion.

4. **GUARANTEED CASING INSTALLATION:** The casing shall be installed by jacking, with simultaneous removal of spoil. The spoil removal shall not proceed more than 18-inches ahead of the casing. The diameter of the excavated hole shall be no larger than necessary to keep the casing moving freely and lubricant may be used to reduce the jacking forces. Casing sections shall be joined by butt weld.

a) After casing is jacked in place, 2-inch grout holes shall be used to pump a 1:3 Portland cement grout to fill the void outside the casing. Sufficient pressure should be applied to force grout out the adjacent grout hole. Grout holes shall be a maximum of 10 feet apart at the top of the casing.

5. **TUNNELS USING STEEL LINER PLATES:** All structural steel liner plates for tunnels shall

be formed to provide circumferential-flanged joints. Longitudinal joints may be flanged or offset lap seam type. All plates shall be punched for bolting on both the longitudinal and circumferential seams or joints. Bolt spacing in circumferential flanges shall be in accordance with the manufacturer's standard spacing and shall be multiples of the plate length so that plates having the same curvature shall be interchangeable to permit staggering of the longitudinal seam. Bolt spacing at flanged longitudinal seams shall be in accordance with the manufacture's standard spacing. For lapped longitudinal seams, bolt size and spacing shall be in accordance with the manufacturer's standard, but not less than that required to meet the longitudinal seam strength requirements of the design specifications. All liner plates for the full length of a specified tunnel shall be either the flange or the lapped seam type. The two types shall not be mixed in the same tunnel.

a) Liner plates shall be assembled in accordance with the manufacturer's instructions. Galvanized and coated plates shall be handled in such a manner as to prevent bruising, scaling, or breaking of the coating. Any plates that are damaged during the handling or placing shall be replaced, except that small areas with minor damage may be repaired to the satisfaction of the Engineer or his representative.

b) Galvanized surfaces shall be repaired by thoroughly wire brushing the damaged areas and removed all loose, cracked coating, after which the cleaned areas shall be painted with two (2) coats of zinc rich paint as approved and an acceptable bituminous coating restored.

c) When tunneling has proceeded in a distance sufficient for placing one section of the tunnel liner, that section of liner will be placed before excavating further. Excavation shall be controlled so that the space outside the liner plate shall be held to a minimum. All voids between the liner plate and tunnel wall shall be filled with 1:3 Portland cement grout, containing no more water than necessary, placed under sufficient pressure to fill all voids. Grout shall be placed through the grout holes provided in the top of the tunnel liner plates. Grout holes 2" in diameter shall be provided at no more than 4.5-foot center or every third ring of plates to permit grouting as the erection of the tunnel liner progresses. At no time will the grouting operations be further than 10 feet from the front end or head of the tunnel construction.

d) At the end of each day's operations, the voids outside installed liner plates shall be grouted whether 10-feet or less. Grout will be forced into each grout hole. If the grout from one hole should flow along the liner plates so as to plug the next holed, the plug shall be opened by punching through the grout so that each hole may be used for grouting. The grouting operation will be continued at each hole until all spaces outside the liner plates are filled and no grout will flow.

e) The tunnel shall be constructed to the limits, grade and alignment shown on the Construction Drawings. Excavation, without the use of jetting, shall be done in such a manner as to protect public and/or private property from damage. Prior to beginning any construction, the Contractor shall submit pit shoring and tunnel liner details for approval and no tunneling may begin prior to approval of these details by the appropriate controlling agency. After approval of tunnel liner and pit shoring details, a five (5) day notice to the Controlling Agency, through the Engineer shall be provided as previously specified.

f) No blasting will be done without prior written approval of the controlling agency

and then only in strict accordance with all Federal, State, and Local laws, ordinances, rules or regulations governing the storage and use of explosives. Where blasting is required, only small controlled charges or 40% dynamite or plastic explosives shall be used. The depths of the holes for these charges shall not exceed the depth necessary to clear an area sufficient to place one section of tunnel liner.

g) The charges for the initial series of blasts should be placed in the triangle method. The second series should be placed in the radial method a minimum distance from the desired diameter of the tunnel. The triangular charges shall be set to go off first, with the radial charges to go off following a short interval or using the time-lag method.

h) Where rock is encountered before approaching the shoulder or pavement, the first four series of charges will be used in determining the amount of controlled blasting to be used before beginning any blasting beneath the railway or shoulders or pavement of the highway as applicable. If rock is encountered after tunneling progresses beneath the pavement or railway, charges will initially be set at very low levels and increased in small increments until the proper amount of charged is determined. In no case will an overshoot be permitted. If a boulder is encountered and removed by blasting or by other methods, a bulkhead will be formed immediately after removal of the boulder and the area filled with grout before proceeding with the tunneling operations.

i) If there is any indication of a vertical split in the rock formation, or any indication of settlement of the roadway or railway fill, all operations shall be stopped and the controlling agency notified immediately. If the vertical split is not determined to be out too great a magnitude or too close to the rails/pavement, the split shall be filled with grout at a pressure specified by the controlling agency, allowed to set and tunneling operations may be continued.

j) If it is determined that the vertical split is too great of a magnitude or too close to the pavement or railway, the Controlling Agency shall determine the method to be used to correct the split. If settlement of the roadway or railway occurs, the Controlling Agency will advise the Owner and his Contractor of the proper steps to be taken to correct the settlement. If deemed necessary by the Controlling Agency, adequate warning devices (signs, flasher, etc.) accompanied by responsible flagmen shall be placed at a distance allowing any and all traffic time to stop safely before reaching the questionable area. At the option of the Controlling Agency, it may provide the necessary flagmen, warning devices, etc., at the Contractor's expense. Traffic shall be allowed over the questionable area, only as directed by the Controlling Agency.

k) The completed liner shall consist of a series of structural steel liner plates assembled with staggered longitudinal joints. Liner plates shall have been fabricated to fit the cross-section of the tunnel. All plates shall be connected by bolts on both longitudinal and circumferential seams or joints.

l) After tunneling operations have been completed, the Contractor will install the carrier pipe in a manner approved by the Engineer. Concrete fill (1:3 Portland cement grout) will then be placed after completing installation of the water pipe within the tunnel liner as directed by the Engineer and end enclosure walls installed as shown on the Construction Drawings or Standard Details. Ends of the tunnel liner will be sealed with an 8-inch masonry wall on the lower end and a 12-inch masonry wall on the higher end.

Weep holes will be provided on the downstream end for drainage.

6. **FINISH WORK:** Once the Contractor has installed the carrier pipe, complete and in-place, the Contractor shall then remove the vertical shoring for pits (if ground conditions allow), surplus spoils, and material from the site. The site shall then be returned to its original condition, seeded, mulched, or restored as specified and left in a neat and satisfactory condition. Shoring material shall be removed in such a manner so as to avoid collapse and to allow proper backfill. The backfill shall be placed in accordance with these Specifications or the requirements of the Controlling Agency

S. **BLASTING:** The Contractor shall not be allowed to blast within any rights-of-way maintained by any agency (SCDOT, railroad, gas, etc.) other than the City without specific approval of the controlling agency and only in accordance with their respective requirements.

1. Prior to commencing any blasting operations, the Contractor shall notify either the City Fire Department – Fire Prevention Section or the County Fire Administrator as applicable, and obtain blasting permits as required. The Contractor must furnish certification of Insurance specifically covering any and all obligations assumed pursuant to the use of explosives. All blasting supplies shall be stored in a place and manner approved by the City, State Fire Marshal and other entities having jurisdiction over blasting operations. In no case shall blasting caps or other igniters or exploders be kept in the vicinity of dynamite or where other explosives are stored.

2. Blasting operations shall be conducted in strict accordance with any and all decrees, rules, regulations, ordinances, and laws as may be imposed by any regulatory body and/or agency having jurisdiction over the Work relative to handling, transporting, use and storage of explosives. Blasting shall be done only by competent, sober, and experienced personnel whose activities shall be conducted in a workmanlike manner. Satisfactory information must be provided to the Engineer that the blaster meets or exceeds the qualifications enumerated in OSHA Regulations Part 1926, Subpart U, Section 1926.901 – Blaster Qualifications. All blasting supplies shall be stored in a place and manner approved by the City. In no case shall caps or other exploders be kept at the place where dynamite or other explosives are stored.

3. All rock, dirt and debris from blasting shall be contained within the excavation by use of weighted mats or undisturbed overburden. The Contractor's blaster shall be fully responsible for determining the method of containment and the weight, size and placement of material required to contain the charge he is using. Charges shall be sized such that no damage to houses, structures, roadways, etc., outside the limits of excavation will occur. Where there is a possibility of such damage, the charge will initially be set at a very low level and increased in small increments until the proper charge is determined. The Contractor shall be held responsible for any and all injury to persons or damage to public or private property. No blasting will be permitted adjacent to existing buildings and structures. Rock at those locations shall be removed with jackhammers and bull-points. A seismic survey and/or a pre-blast survey may be required.

T. **EROSION AND SEDIMENT CONTROL:**

1. **GENERAL:** Erosion and sediment control shall be conducted in accordance with the applicable Erosion and Sediment Control and or NPDES permit. It is the Contractor's responsibility for controlling soil erosion and sediment runoff. The Contractor is to utilize mulches, matings and or other fabrics, silt fences and other filters, grasses, slope drains, and other erosion control

devices as necessary to control erosion and sediment runoff. Erosion control may include temporary work that must be removed upon achieving construction site surface stabilization.

2. **TEMPORARY EROSION CONTROL:** Temporary erosion control shall consist of planting temporary grass of a quick growing species such as millet, rye grass, or cereal grasses suitable to the area or other approved temporary means. When used, seed, fertilizer, mulch and periodic watering shall be applied in adequate quantities to assure a full, healthy ground cover over the entire disturbed area of construction operations. All materials shall be of first class quality and subject to approval by the governing erosion control authority. All disturbed areas along the pipeline, with exception to a construction access or haul road, shall be grassed as soon as possible after backfilling operations have been completed.

3. **CONSTRUCTION IN STREAMS AND IMPOUNDMENTS:** Unless otherwise approved by the City Engineer, construction operations in streams and impoundments shall be restricted to those areas which must be entered for the construction of temporary or permanent structures. As soon as conditions permit, streams and impoundments shall be promptly cleared of all falsework, piling which are to be removed, debris and other obstructions placed therein or caused by the construction operations. Frequent fording of live streams with construction equipment will not be permitted; therefore, temporary bridges or other structures shall be used wherever an appreciable number of stream crossings area necessary. Unless otherwise approved by the City Engineer, mechanized equipment shall not be operated in live streams except as may be required to construct channel changes and temporary or permanent structures, and to remove temporary structures.

4. **CONSTRUCTION IN EASEMENTS:** Erosion control measures shall be constructed such that they do not discharge onto water or sewer easements, but to the opposite sides of such easements to prevent future erosion of the easement.

5. **LIMIT OF PROGRESS:** The Engineer will limit the area of excavation commensurate with the Contractor's capability and progress in keeping the finish grading, mulching, seeding and other such pollution control measures current in accordance with an accepted schedule. Should seasonal limitations make such coordination unrealistic, special erosion control measures shall be taken immediately to the extent feasible and justified.

6. **SURFACE STABILIZATION: PERMANENT GROUND COVER:** Upon construction completion and upon achieving construction site surface stabilization, the Contractor is to establish a permanent ground cover over any remaining denuded areas, and the Contractor shall remove all temporary erosion and sediment control measures upon achieving a permanent ground cover or satisfactory surface stabilization.

7. **RIGHT TO CORRECT:** In the case of failure on the part of the Contractor to adequately control erosion, pollution, and/or Siltation, the City reserves the right to employ outside assistance or to use his own forces to provide the necessary corrective measures. Such incurred direct costs will be charged to the Contractor.

U. RESTORATION OF DISTURBED AREAS

1. **GENERAL:** All surfaces (both public and private) within and adjacent to the construction operations shall be restored to a condition comparable to that existing prior to construction, or

as specified by the Engineer. All surplus materials shall be disposed in a manner acceptable to the Engineer, and the construction area shall be left in a neat condition, with special attention called to proper drainage, smoothness of surface, and general clean-up. No machinery or equipment shall be left or stored on the job site after the project is complete.

2. **STABILIZATION:** Unless otherwise specified, complete restoration is to include fertilizing, seeding, and mulching any and all areas disturbed during the construction within 30 working days following the initial ground disturbing activity.

3. **APPURTENANCES:** Water meters, valve boxes, drain pipes, and other structures encountered shall be reset or re-laid to match or clear surface grade and/or water main pipe grade as applicable.

4. **REFUSE BURIAL:** Timber, rock and other refuse may not be buried within the temporary or permanent water rights-of-way with the exception of rock smaller than $\frac{3}{4}$ cubic foot.

5. **RIP-RAP:** The Contractor shall place stone rip-rap as specified in those areas subject to severe water action, where directed by the Engineer. Placement of rip-rap as shown on the Construction Drawings shall be considered as a guide only, with final determination made at the time of construction by the Engineer.

a) Stone rip-rap will be placed as indicated on the Standard Details immediately following pipe installation and will be installed no steeper than a 2:1 slope, except when specifically approved by the engineer. Grading will be required as necessary to insure continuous even flow.

b) In locations where a creek bank is eroded near the water line, the Contractor will be required to place compacted fill material along the creek bank in order to maintain 3-feet of cover over the water line in all directions. This is to be done before the rip-rap is placed.

c) The rip-rap installation shall include all earthwork necessary to stabilize the creek bank and to provide cover for the water line.

6. **JUTE NETTING/EROSION BLANKET:** The Contractor shall install jute netting or erosion control blank in areas subject to high runoff velocities, areas subject to concentrated runoff, and on steep slopes as shown on the Construction Drawings or directed by the Engineer.

V. RESTORATION OF EXISTING PAVED SURFACES

1. **GENERAL:** All removal and restoration of pavement and road surfaces will be in accordance with the specifications approved by the City of Rock Hill Public Works Department or the South Carolina Department of Transportation, whichever applies.

a) All resorted bituminous and concrete pavements shall be placed to existing cross-section and ride quality. Restored pavement will in all instances be flush and level with existing pavement at the sawed edges, and at existing gutter lines where applicable, unless approved by the Engineer. When pavement repairs do not meet the above criteria or are not permitted in a workmanship manner as determined by the Engineer, the City

of Rock Hill Public Works or SCDOT, whichever applies, will remove and re-perform the restoration as specified at the Contractor's expense.

b) When cuts are to be made in street rights-of-way under maintenance by the City of Rock Hill Public Works Department, the Contractor shall contact the Public Works Director or his designated representative before each separate pavement cut is made and secure a permit.

2. **REPLACEMENT:** All areas of existing pavement shall be neatly removed with straight edges. The Contractor shall remove and replace pavement, which in the opinion of the Engineer has been cracked or displaced by the operations of the Contractor. Edges shall be sealed upon completion of the repair.

a) In all pavement cuts either the permanent pavement or a temporary pavement consisting of 1 to 1 ½ inches of black asphaltic concrete (later to be replaced permanently) will be placed immediately upon completion of the subgrade unless otherwise approved by the Engineer.

b) Unless otherwise approved or required, concrete pavement shall be removed to the nearest expansion or contraction joint. The Contractor shall contact the Public Works Director and/or SCDOT's District Engineer for determination of the limits of concrete replacement and location of joints. Work procedures shall be such to prevent damage to surrounding pavement.

c) Bituminous pavement shall be cut in a smooth and straight line. Sawing is required on asphaltic concrete. The width of the pavement left between the edge of the ditch and the existing edge of pavement or the front line of the gutter, shall be at least 2 feet. Residual strips of pavement less than 2 feet in width must be removed and replaced. Existing pavement shall be removed on each side of the trench for at least 12-inches beyond the top of trench.

3. **RESTORATION:** Restoration of the paved surface shall be in accordance with the following specifications:

a) **CONCRETE PAVEMENT:** The concrete used to restore pavement shall have a minimum 28-day compressive strength of 3000 psi. The concrete shall conform to the shape, grade, and finish of the existing pavement and will be 1-inch deeper than the original pavement, including base, but in no instance less than 6 inches.

b) **ASPHALT PAVEMENT:** All material above the sub-base level shall be hot-mix bituminous concrete conforming to the SCDOT Standard Specifications for Roads and Structures for both mix design and placement. The asphalt pavement as placed shall be 1-inch deeper than the original pavement, including base, but in no instance less than 6 inches within City-maintained roadways or eight inches in state-maintained roadways. The asphalt shall be placed in lifts not greater than 4 inches and shall not be hot-mix bituminous concrete binder, Type H. The last 2 inches in either instance shall be bituminous plant mix (Type C – surface course) suitable to the appropriate controlling agency. Type C asphalt pavement surfacing will be placed with paving machines and/or rollers of a size and type currently approved by the SCDDOT for use on resurfacing contracts.

(1) If bituminous surfacing overlays a concrete base, the Contractor, at the option of the Engineer, shall replace the concrete to its original thickness or to a level 2-inches below the finished surface. The Engineer may direct the Contractor to omit all concrete and to replace the pavement with bituminous materials.

(2) Tack coats shall be employed with each lift. Tack coats shall be placed on both horizontal and vertical surfaces (pavement cuts or faces of concrete gutters).

(3) Under normal conditions, asphalt binder will be placed in pavement cuts at the end of each workday. Following completion of pipeline construction along a continuous section of pavement, 1 to 2 inches shall be replaced weekly or within five days. During inclement weather, the Engineer may permit the use of temporary asphalt (cold Mix) to seal the trench until permanent asphalt can be placed.

(4) All pavement markings are to be restored.

4. **DAMAGE TO ADJACENT PAVEMENT:** The pavement adjacent to pipeline trenches must not be disturbed or damaged. If the adjacent pavement is disturbed or damaged, irrespective of cause, the Contractor shall remove the damaged pavement and shall replace with new pavement at his own expense

W. RECORD/AS-BUILT DRAWINGS: The Contractor is to keep a set of approved Construction Drawings on site to make notes to facilitate the preparation as-built/record drawing information for the sewer infrastructure being installed. Notes taken during construction shall include but is not limited to field changes to the horizontal alignment or grades of the infrastructure being installed, valves and meter service locations (station along water main), description, size and location (station and elevation(s)) of all underground tees and utility crossings encountered during the construction work, location of bedrock encountered and removed, and other pertinent information.

1. The Contractor shall supply a copy of the field noted drawings to the engineer, along with surveyed as-built/record drawings (signed and sealed by a South Carolina Licensed Surveyor). Surveyed as-built/record drawings shall include the location and elevations of all tees and vaults, locations of valves and meter boxes (station and offset) and calculated pipe grades. Stations and elevations of all utilities encountered during the water installation shall be incorporated in the drawings. If easements or rights-of-way were acquired for the project, a list shall be provided on the record drawings stating the tax identification number and deed book/page number of each recording. Engineer shall provide to City hard set (bond and Mylar) of as-built drawings and digital set (in .pdf and .dwg formats) prior to receiving final approval of the project.

2. Engineer shall prepare individual AutoCAD drawings of each valve in the project, with location and measurements from valve to two or more permanent monuments.

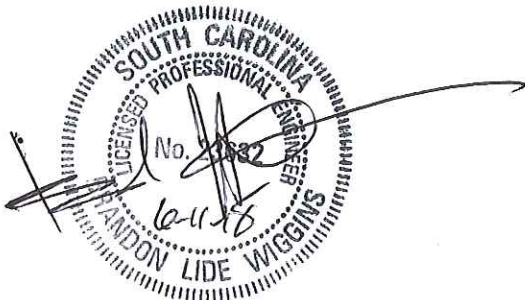
3. Engineer shall flow each hydrant and provide test results to the City. Hydrant flow test results shall include at a minimum, the date of the test, the tester's name, the hydrant location and plan reference number, the static pressure in psi, the residual pressure in psi, and the flow rate in gpm.

X. **WARRANTY:** The Work shall be free of defects in material and workmanship for a full year from the date of acceptance, which is defined as either the date of the signature by the City Engineer on the Final Plat or as referenced in correspondence by the City Engineering Division. If neither date can be identified, the date shall be the issuance date for the SCDHEC Permit to Operate.

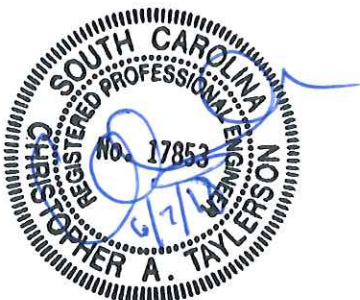


STANDARD SEWER SPECIFICATIONS

FOR THE
CITY OF ROCK HILL



June 2018



City of Rock Hill
Water/Sewer Utilities
P.O. Box 11706
Rock Hill, SC 29731-1706
803-329-5500





June 14, 2018

ROCK HILL CITY OF
PO BOX 11706
ROCK HILL SC 29731-1706

RE: Standard Specifications for Wastewater System
ROCK HILL CITY OF
Approval Number SS-002146

This office has reviewed the wastewater system specifications submitted to this office on 03/08/2018, revised on 6/14/2018 for consideration of becoming Standard Specifications. Based on our review this letter may serve as your approval of these Standard Specifications. The specifications have been approved for the following:

1. Gravity Sewers (PVC, DIP)
2. Force Mains (PVC, DIP)
3. Details (Standard Manhole, Drop Manhole, FM Tie-In)

Please be advised that these Standard Specifications are only approved for those items specifically listed above. Separate "Pump Station Specifications" must be submitted with each wastewater project that includes a pump station design.

For further submittals of projects, please indicate on the application for permit to construct that your specifications have been approved as Standard Specifications and that no additional copies will be necessary.

If you have any questions, please call me at 803-898-1941.

Sincerely,

Maia P Milenkova
Construction Permitting Section
Bureau of Water

STANDARD SPECIFICATIONS FOR SANITARY SEWER FACILITIES CONSTRUCTION

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I. PURPOSE AND GENERAL INFORMATION

A. **PURPOSE & APPLICATION:** This document was created and assembled for use in planning, designing, and constructing sanitary sewer facilities which will be owned and operated by the City of Rock Hill. In addition to the information contained herein, rules and regulations set forth by the South Carolina Department of Health and Environmental Control (SCDHEC) and the US Environmental Protection Agency (EPA) apply to the permitting and construction of these facilities. This information applies to both existing and new facilities construction.

B. **SCOPE OF WORK:** All materials, labor, and equipment necessary for sewer construction and placing in operation sanitary sewer infrastructure and appurtenances within the City of Rock Hill sewer service territory or to be served by the City of Rock Hill shall be provided in accordance with the following specifications and City of Rock Hill Standard Details.

1. The work shall include all clearing, grubbing, trenching, shoring [in accordance with Occupational Safety & Health Administration (OSHA) regulations], dewatering, installing sanitary sewerage (i.e., foundations, manholes, piping and other appurtenances) shown and specified, backfilling and consolidating the backfill material, as well as other work as may be necessary to complete the work.

2. Construction Drawings shall be prepared under the direction of a Professional Engineer licensed to practice in the state of South Carolina.

3. The Contractor shall furnish all materials, equipment and labor required to construct the project as outlined in these specifications and Construction Drawings.

C. **ORDER OF WORK:** The Order of Work shall be determined by the Contractor, subject to approval by the City Engineer.

D. **MATERIAL INSPECTION:** All materials and workmanship shall be subject to inspection by the City Engineer or his or her designee and representatives of SCDHEC or SCDOT or any other entity having permitting authority over the project. Work and/or materials not conforming to these specifications or any applicable permit shall be corrected immediately. The Engineer shall have the right to label materials not meeting the specifications and/or the Contractor shall segregate said materials to distinguish them as such.

E. ORGANIZATION OF WORK AND NOTIFICATIONS

1. The Contractor shall so organize his work that backfilling of open trenches and or excavations and associated cleanup of the construction site shall closely follow pipe laying operations and manhole construction. The City Engineer or his designee shall have the authority to determine if the contractor is negligent in complying with this provision. The City shall have the authority to stop work if needed to bring the site into a respectable level of maintenance.

2. All planned road closures shall be reported to the following entities a minimum of 72 hours prior to closing any street.

- a) The City of Rock Hill's Homeland Security Director's office at 803-326-3810; and

b) The York County Public Safety Communications office at 803-329-1110.

3. The Public Safety Communications office will notify the appropriate emergency services responders (i.e., EMS, Fire Department, etc.) of the planned road closure(s). Lane closures, where a minimum of one lane is left open to traffic, do not require notification to either office – City of Rock Hill’s Homeland Security Director’s office or York County’s Public Safety Communications office.

4. Traffic control, signage and barricades for road and lane closures and work inside the road rights-of-way shall be in accordance with applicable encroachment permits and the Federal Highway Administration’s (FHWA), Manual on Uniform Traffic Control Devices.

5. Failure on the part of the Contractor to comply with the above provisions in a reasonable manner, in the opinion of the Engineer, shall be sufficient cause for the Engineer to order a temporary shut-down of trenching and pipe laying operations until the provisions have been met.

6. Contractor shall notify each property owner affected by a planned interruption of existing services at least 72 hours prior to the loss of service. For emergency interruption of services, the Contractor shall notify the property owner as soon as practical.

F. **LEAD-FREE REQUIREMENTS:** Lead-free pipes, plumbing fittings/fixtures, and solder/flux shall contain less than 0.25 percent lead in accordance with the Reduction of Lead in Drinking Water Act (P.L. 111-380).

G. **SPECIFICATIONS:** Unless superseded or modified herein or in the Standard Details, all materials apparatus, supplies, methods of manufacture, or construction shall conform to the specifications contained herein and AWWA specifications. All materials/products that contact potable water must be third party certified as meeting the specifications of ANSI/NSF Standard 61. National standards (ASTM, ANSI, AWWA, etc.) referenced herein shall be considered to be the latest revisions only.

H. **ABBREVIATIONS**

1. A list for reference purposes is as follows:

AASHTO	American Association of State Highway and Transportation Officials
AC	Asbestos cement
ACI	American Concrete Institute
ASTM	American Society for Testing and Materials
ANSI	American National Standards Institute
ARV	Air release valve
AWS	American Welding Society
AWWA	American Water Works Association
BPD	Backflow Prevention Device
°C	Degrees Celsius
CIP	Cast iron pipe

DIP	Ductile iron pipe
EPA	US Environmental Protection Agency
°F	Degrees Fahrenheit
FHWA	Federal Highway Administration
FSE	Food Service Establishments
fps	Feet per second
gph	Gallons per hour
gpm	Gallons per minute
g/m ²	grams per square meter
GMP	Grease Management Program
ISO	International Organization for Standardization
LF	Linear feet
MJ	Mechanical joint
MSS	Manufacturers Standardization Society of the Valve and Fittings Industry
MUTCD	Manual on Uniform Traffic Control Devices
NFPA	National Fire Protection Association
NSF	National Sanitation Foundation
NST	National Standard Thread
OSHA	Occupational Safety and Health Administration
ppm	Parts per million
psi	Pounds per square inch
psig	Pounds per square inch – gauge
PVC	Polyvinyl Chloride
SC 811	South Carolina 811
SCDHEC	South Carolina Department of Health and Environmental Control
SCDOT	South Carolina Department of Transportation
SDR	Standard Dimension Ratio
SDWA	Safe Drinking Water Act
UL	Underwriters Laboratory
USDOT	United States Department of Transportation

II. MATERIAL SPECIFICATIONS

A. GENERAL

1. **QUALITY AND INSPECTION:** Latitudes in workmanship and finish allowed by ASTM notwithstanding, all pipe shall have smooth exterior and interior surfaces; be first quality, be free from cracks, blisters and other imperfections, and be true to theoretical shapes and forms throughout each length. Pipe that does not conform will be so marked by the Engineer, and shall not be used in the work. On-the-job repairing of rejected pipe will not be permitted.

A. DUCTILE IRON PIPE AND FITTINGS

1. **PIPE:** Ductile-iron pipe (mechanical properties) shall be centrifugally cast and shall be domestically manufactured in the United States. Push-on, and restrained joint pipe shall have a minimum rated working pressure of 150 psi in accordance to bury per AWWA. Pipe 16 inches in diameter or smaller shall be a minimum Pressure Class 350; pipe greater than 16 inches in diameter shall be as approved by the City Engineer. Pipe shall have mechanical or push-on joints as outlined in ANSI A21.11 with laying lengths of at least 18 feet.

a) Ductile iron pipe for gravity sewers shall meet the requirements of AWWA C150/ANSI A21.50 and AWWA C151/ANSI A21.51.

b) Ductile iron pipe for force mains shall meet ASTM A-377.

2. **QUALITY ASSURANCE:** Require submitted evidence that the ductile iron pipe and fitting manufacturer has a minimum of ten-years' experience in material production of diameters noted on the Construction Drawings and specifications. All ductile iron pipe shall be manufactured in the United States. All pipe material suppliers shall be ISO registered or provide the services of an independent inspection agency. Prior to the start of manufacturing, any manufacturer not meeting the ISO registration requirements shall submit to the owner and owner's engineer the names of an independent inspection agency for approval. The independent inspection agency shall be responsible for sample monitoring of chemical and mechanical test, sample visual inspection of quality assurance tests performed on in-process pipe and fittings, and a sample visual and dimensional inspection or finished product for this project. A certified inspection report from the independent inspection agency of all witnessed tests shall be supplied to the owner or owner's engineers within ten (10) days of completion of pipe manufacturing. Chemical samples shall be taken from each ladle of iron and the manufacturers' chemical control limits shall be maintained for at least the following elements: carbon, sulfur, phosphorus, silicon, magnesium, chromium, manganese, tin, aluminum, cerium, copper, and lead. When chemical values fall outside the manufacturer's control limits, additional mechanical property tests shall be performed to assure minimum mechanical properties are met.

3. **FITTINGS:** Fittings shall be cast from ductile iron and shall conform to AWWA C110 (ANSI A21.10) and/or AWWA C153. All fittings shall have standard mechanical joints or as shown. Mechanical joint fittings shall meet AWWA C111 (ANSI A21.11). Bolts and nuts for mechanical joint fittings shall be uncoated, high strength, low alloy steel meeting ASTM A242.

4. **JOINTS:** Flanges for pipe, fittings, and valves shall be furnished in accordance with AWWA C115 (ANSI 21.15) and shall be faced and drilled identical to Class 125 B16.1 flanges with full-face

rubber gaskets 1/8" thickness. Bolts and nuts for flanges shall be in accordance with ANSI/AWWA Standards for uncoated, high strength, low alloy steel meeting ASTM A242.

5. **MARKINGS AND WEIGHTS:** Markings and weights of pipe and fittings shall conform to the requirements of AWWA Specifications. -

6. **LININGS AND COATINGS:** Force main lining applications shall be at high points in the force main where air is expected to accumulate, at discharge points, and as indicated by the Engineer. Ductile iron pipe for use in wastewater applications (both gravity and pressure) shall contain one of the following linings in accordance with the manufacturer's recommended guidelines unless otherwise approved by the City Engineer.

a) **Protecto 401 Ceramic Epoxy lining** by Induron Coatings, Inc. of Birmingham, AL, or approved equal. Thickness:

(1) 40 mils (0.04-inches) nominal dry film thickness for interior of pipe and fittings

(2) 6 mils (0.006-inches) nominal, 10 mils (0.01-inches) maximum using Protecto 401 Joint Compound for the gasket area and spigot end up to 6 inches back from the end of the spigot end on the outside of the pipe.

b) **Coal tar epoxy lined** for gravity applications per AWWA C210.

c) **Series 431 Perma-Shield PL**, by Tnemec Company Inc., or approved equal, at a minimum dry-film thickness of 40 mils.

d) **ZINC COATING:** Zinc-coated ductile iron pipe conforming to ISO 8179 standards may be installed as an alternative in corrosive soils and other special conditions as approved by the City Engineer. The exterior zinc coating shall be factory-installed using a thermal arc spray process. The zinc layer shall have a mass of 200 grams per square meter (g/m²) of pipe surface area. A finish layer of bituminous coating shall be placed over the zinc in accordance with AWWA C104, and the pipe shall be marked with the word "zinc".

7. **CERTIFICATION:** The manufacturer of iron pipe and fittings shall be prepared to furnish both the City and the Contractor with certified reports stating that inspection and specified tests have been made and that the results thereof comply with the applicable ANSI Specifications.

8. **QUALITY AND INSPECTION:** Latitudes in workmanship and finish allowed by ASTM notwithstanding, all pipe shall have smooth exterior and interior surfaces; be first quality, be free from cracks, blisters, and other imperfections, and be true to theoretical shapes and forms throughout each length. Pipe that does not conform will be so marked by the Engineer, and shall not be used in the work. On-the-job repairing of rejected pipe will not be permitted

B. PVC PIPE FOR GRAVITY SEWER APPLICATIONS

1. **PIPE:** Polyvinyl Chloride (PVC) sewer pipe shall be bell and spigot pipe, shall be in lengths not exceeding 20 feet laying lengths, and shall have minimum wall thickness conforming to ASTM D3034 under the classification for SDR26 pipe.

- a) 2-inch to 4-inch: Sch. 40
- b) 8-inch to 15-inch: ASTM D3034
- c) 18-inch to 27-inch: ASTM F679

2. **FITTINGS:** PVC sewer pipe fittings for gravity systems shall be bell and spigot or bell and plain end and shall conform to the same cell classification requirements as defined above. Fittings shall be in accordance with ASTM F794, D3212, and/or D3034, as applicable with stiffness and wall thickness equal to or greater than the pipe. Adapters shall be provided to join different materials.

3. **JOINTS:** Joining shall be by rubber gaskets that conform in all respects to the physical requirements specified by ASTM F477 for low head applications. The lubricant used for assembly shall be as recommended by the manufacturer and shall have no detrimental effect on either the pipe or the rubber gasket.

4. **MARKINGS:** The pipe shall contain markings required by ASTM F794.

C. **PLASTIC PIPE FOR (PRESSURE) FORCE MAIN APPLICATIONS**

1. **PIPE:** All plastic pressure pipes (sizes 4" through 12") shall meet all requirements of AWWA Standard C900 and be made from green-pigmented virgin materials. Polyvinyl Chloride (PVC) sewer pipe shall be bell and spigot pipe, shall be in lengths not exceeding 20 feet laying lengths, and shall have minimum wall thickness conforming to SDR18 Class 150 dimensions. Pipe shall be NSF approved. Alternative plastic pipe (sizes 4"-12"), other than C900, shall meet all requirements of ASTM D1785 (Sch. 40) or ASTM D2241 (SDR26 Class 160 and SDR21 Class 200), but its use shall be subject to the approval of the City Engineer. All plastic pipes (sizes 16"-48") shall also meet all requirements of AWWA Standard C905, but its use shall be subject to the approval of the City Engineer. No new main shall be smaller than 4" diameter, unless designed for a low-pressure sewer system. Thermoplastic pipe shall not be used above grade.

2. **FITTINGS:** Fittings shall be in accordance with ASTM F794, D3212, and/or D3034, as applicable with stiffness and wall thickness equal to or greater than the pipe. Adapters shall be provided to join different materials.

3. **JOINTS:** Joints for PVC pipe shall be elastomeric-gasket type with a pressure rating not less than the pipe pressure rating meeting performance requirements of ASTM D3139. All PVC pipes shall have elastomeric joints with an integral belled, bell and spigot rubber gasketed joint. Each integral bell joint shall consist of a formed bell complete with a single rubber gasket. Gaskets shall conform to ASTM F477. Joints shall meet the requirements specified in ASTM D3212.

4. **MARKINGS:** The pipe shall contain markings required by ASTM D3034. All markings shall remain legible during normal handling, storage and installation, and will be applied in a manner that will not reduce the strength of or otherwise damage the pipe or coupling.

B. **STEEL PIPE FOR AERIAL CROSSINGS**

1. **PIPE:** High Strength steel pipe shall be welded or seamless, manufactured in accordance

with ASTM A53 for Welded Steel and Seamless Steel Pipe (1/8-inch to 26-inch inclusive) and/or ASTM A139 for Welded Straight-Seam Steel Pipe (4-inch to 92 inch inclusive).

a) All steel shall be Grade "B" only, with minimum yield strength of 35,000 psi. Thickness shall be 0.250-inch unless otherwise specified or shown on the Construction Drawings.

b) The pipe shall be produced in a single continuous length. Welding of two or more individual pieces together end to end shall not be permitted. Spiral-seam pipe shall not be permitted.

c) Pipe ends shall have tolerances within the limits required for approved couplings. Pipe shall also be furnished with plain right-angle ends with all burrs removed from the ends. Steel mechanical transition couplings shall be as follows:

(1) Steel Pipe to Steel Pipe:

(a) 30-inch and smaller pipe sizes shall have a center ring length of seven (7) inches.

(b) 36-inch and larger pipe sizes shall have a center ring length of ten (10) inches.

(c) Couplings shall be manufactured by Dresser Industries Style 38 Straight Coupling, or approved equal. Center ring, glands, bolts, and nuts shall receive one shop coat of primer.

(2) Steel Pipe to Ductile Iron Pipe:

(a) 8-inch and smaller pipe sizes shall have a center ring length of five (5) inches.

(b) 10-inch through 20-inch pipe sizes shall have a center ring length of seven (7) inches.

(c) 24-inch and larger pipe sizes shall have a center ring length of ten (10) inches.

(d) Couplings shall be as manufactured by Dresser Industries Style 62 Transition Coupling, or approved equal. Center ring, glands, bolts, and nuts shall receive one shop coat of primer.

(e) Couplings shall receive field applied protective coatings as specified for steel pipe.

2. LININGS: All steel pipe shall receive one (1) of the following shop applied linings on the inside of the pipe barrel:

a) Coal tar lining 3/32-inch minimum dry film thickness in accordance with AWWA 203.

- b) Coal tar epoxy lining 24 mils minimum dry film thickness and shall be Carboline Koppers No. 300M, Amercoat No. 78, Carboline Carbomastic No. 14, or approved equal.

3. COATINGS: The outside of steel pipe and complete couplings shall receive one coat of Carboline Koppers 300M coal tar epoxy, 16 mils minimum dry film thickness or approved equal. The coal tar epoxy coat shall be shop applied to the pipe, and field applied to the couplings. Damage to exterior shop applied coatings shall be repaired with the same coating used by the manufacturer and applied as recommended by the manufacturer.

C. VITRIFIED CLAY PIPE (VCP): Vitrified clay pipe shall not be used in new wastewater system applications.

1. EXISTING VCP: If construction activities are conducted over top an existing VCP, then at a minimum that portion of existing VCP shall be replaced with ductile iron pipe. Replacement length shall be between the two closest adjacent manholes upstream and downstream of the impacted sewer, unless otherwise approve by the City Engineer.

D. SEWER LATERAL

1. PIPE: Sewer service piping shall be constructed of Schedule 40 PVC pipe in accordance with ASTM D2665 and ASTM D1785. Service piping shall be sized to accept flows from the structure being served, but in no case shall the size of the service be less than the following:

- a) Residential service piping: Minimum 4-inch diameter piping
- b) Commercial Service piping: Minimum 6-inch diameter piping

2. FITTINGS: Service branch connection for PVC pipe shall consist of a molded wye branch fitting with gasketed connections and shall be in accordance with ASTM D2466. Joining shall be through solvent cement in accordance with ASTM D2564. Sewer service lateral piping shall be installed perpendicular to the mainline when possible.

E. COUPLINGS AND SADDLES

1. COUPLINGS: Couplings used to join various types of 12-inch and smaller pipe shall be elastomeric PVC sleeve couplings with stainless steel compression bands and stainless steel shear rings as manufactured by Mission Clay Products, Fernco, Logan Clay Products or approved equal.

- a) Couplings for 12-inch and smaller pipe may also be elastomeric PVC with internally molded rigid fiberglass insert and stainless steel bands as manufactured by DFW Plastics, or approved equal. The coupling shall provide a water and/or gas tight connection.
- b) Couplings for 15-inch and larger pipe shall be submitted to the Engineer for approval.
- c) Fernco couplings shall only be used on clay pipe or orangeburg pipe and when attaching to a different type material.

2. **SADDLES:** Saddles for lateral connections shall be ABS Plastic, PVC, elastomeric PVC, or approved equivalent. Saddles shall be connected to VCP using epoxy sealant. Saddles shall be Style "CB" Sewer Saddles by Romac Industries, or approved equal. The lateral shall be connected to the saddle with a compression gasket, solvent weld adapter, and/or stainless steel band, as applicable.

F. PRECAST CONCRETE MANHOLES

1. **GENERAL:** Manholes shall consist of precast reinforced concrete riser sections, top section and a base section manufactured in accordance with ASTM C478 and these specifications. Manholes are to be designed and constructed to withstand HS-20 vehicle live load ratings. Concrete shall have a minimum compressive strength of 4,000 psi when tested in accordance with ASTM C39. Steel reinforcement shall be as specified in ASTM C478, as amended to date. The wall thickness shall be designed for the approved depth of installation, but in no case shall the wall of all sections be less than five (5) inches.

2. **MANHOLE SIZES:** Manholes will be furnished with the following clear inside diameters according to the sewer main diameter, unless amended by the depth of invert, Construction Drawings or other project documents.

<u>Pipe Diameter</u>	<u>Manhole Diameter (min.)</u>
6" to 18" pipe	4'
21" to 24" pipe	5'
30" to 36" pipe	6'
48" to 54" pipe	7'
Larger than 54"	8' or as necessary to accommodate pipe

<u>Manhole Diameter</u>	<u>Invert Depth</u>
4' manhole minimum	Less than or equal to 20'
5' manhole minimum	Greater than 20'

3. **BASE SECTION:** Base sections for precast concrete manholes shall have a bottom poured monolithically with the walls. Base sections shall be furnished with inside diameters as required to accommodate the connecting piping. Base sections shall be furnished with a minimum height of 24 inches for pipes having a diameter of 12 inches or less, and a minimum height of 36 inches for pipes having a diameter greater than 12 inches. Minimum height for 5- or 6-foot diameter base sections shall be 48 inches regardless of pipe size. Base sections with 5- or 6-foot inside diameters shall be reduced to 4-foot inside diameter by means of an adapter ring or transition top. Base sections are to be design to resist buoyant forces to prevent the manhole from floating.

a) The openings in the base section for the accommodation of the pipe shall be cast into the base section and the pipe connection shall be facilitated by the use of a flexible watertight connector, conforming to ASTM C923 such as the Cast-A-Seal products manufactured by the Press-Seal Gasket Corporation and installed in accordance with the manufacturer's recommended installation guidelines.

b) Manholes shall be furnished with flexible water-tight boots for 15-inch and smaller pipe. The boots shall be cast in as integral parts of the base or installed in cored openings with stainless steel compression bands, and shall conform to ASTM C923. Manholes for 18-inch and larger pipe may be furnished with flexible boots, flexible seals, or concrete collars. The flexible seals shall be A-Lok or Contour Seal. Flexible connectors shall conform to ASTM C923. The concrete collars shall be according to the applicable Standard Detail.

4. **RISER SECTIONS:** The riser sections shall be furnished in a minimum of six inch (6") increments and shall match the base diameter. The gasket joint shall be thoroughly cleaned of all loose materials and brushed with an approved Epoxy to give a smooth surface free of any honeycomb.

5. **CONE SECTION:** The cone section for manholes shall be eccentric type with the vertical face installed over the manhole's effluent pipe. Cone sections can be eliminated and replaced with a flat top slab meeting SCDOT traffic ratings where elevations preclude the laying height of the cone section. Eccentric cones with bolt-down frame and cover shall have a minimum vertical height, as measured from the top of the cone to the bottom of the bell, of 32 inches. Eccentric cones without bolt-down frame and cover to be installed flush to finished grade may have a minimum vertical height of 24-inches. Transition cone sections may be provided for eccentric transition from a 60-inch riser to a 48-inch cone section to be placed directly beneath the 48-inch cone. The minimum access diameter of a manhole shall be 22-inches.

6. **SLABS:** Transition slabs may be placed a minimum of five (5) feet above the invert shelf for six (6) feet and larger diameter manholes where the slab will be buried. Flat top slabs may be used in six (6) feet and larger diameter manholes, unless the manhole is located within pavement or maintained lawn.

7. **DOGHOUSE MANHOLE:** Manholes to be placed over existing pipes shall be furnished with "doghouse" openings cast into the bottom section, allowing it to be set over the existing pipe. A concrete base and invert shall be poured around the bottom section, and the pipe according to the applicable Standard Detail.

8. **JOINTS:** Joints between manhole sections shall be manufactured in accordance with ASTM C443. Joints may be sealed with rubber gaskets in accordance with ASTM C443 or with butyl rubber sealants conforming to Federal specification SS-S-210A and AASHTO M198, Type B. An external mastic seal wrap shall be installed per the Standard Details and manufacturer's instructions.

9. **DROP CONNECTIONS:** Drop manholes are required where the invert differential is twenty-four inches (24") or more. Where drop connections are required, drop pipe shall not be smaller than 8-inches. Generally, drop pipe shall be one size smaller than the sewer that they serve. Openings in walls of precast concrete manholes for drop connections shall not be made at joints. Drop connection fittings and riser pipe shall be located on the outside of the manhole and encased in brick and mortar or formed Class "C" concrete. Drop connections for precast concrete manholes shall conform to the City's Standard Details. Slide inverts shall be installed on drop connections with drops less than two (2) feet. Drop connections shall be carefully backfilled to prevent dangerous side pressures. Interior drops shall only be installed where approved by the City Engineer.

10. **INVERTS:** Manhole inverts shall be carefully constructed with cement grout, Class "B" concrete, or cement mortar brickwork. Special care shall be taken to form the channel connecting the influent pipe invert(s) to the effluent pipe invert. Cement mortar shall be made of one (1) part cement

and two (2) parts clean sharp sand. Channels shall be properly formed, rounded, and troweled smooth to prevent turbulent flow through the manhole. Manhole inverts shall match the size of the associated influent and effluent pipes and have a smooth transformation between the two pipes on existing and proposed manholes.

11. **STEPS:** Manhole steps are to be copolymer polypropylene plastic covered 1/2 or 5/8 inch grade 60 reinforcing steel measuring a minimum of 11-3/8 inches in overall width and 9-1/16 inches overall depth and as manufactured by M.A. Industries, Inc. or equal. Steps are to resist a pullout force of over 1,500 pounds, and impact of up to 300 foot-pounds. Steps for precast concrete manholes shall be installed along a vertical centerline (centered over the effluent pipe), on approximately 14" to 16" centers.

12. **FRAMES AND COVERS:** Manhole frames and covers shall be secured to the manhole cone section and grouted in place to provide a waterproof seal. Frame and covers shall be as indicated in the Standard Details. Bolt-down watertight lids are to be used where it is anticipated that storm water runoff depth will exceed the rim elevation or on outfall lines located outside the road right-of-way. Manhole rim elevations shall be installed at an elevation two (s) foot above the anticipated 100-year flood water surface elevation, unless watertight covers are provided with approval of the City Engineer.

13. **BRICK:** Brick for manhole invert construction or grade adjustment shall be solid concrete brick. Brick for height adjustment shall not exceed 18 inches in height. Where manholes are installed in a street or other travel ways (i.e., driveways, parking lots, etc.), there shall be a minimum of two courses of brick used for adjusting the manhole rim elevation.

14. **ALTERATION TO MANHOLES:** In the event that a manhole has to be altered after delivery to job site, the Contractor may, with permission of the City Engineer, connect the pipe to the manhole with a Kor-n-seal slotted band style connector manufactured by Trelleborg Pipe Seals Milford, Inc., Kwik Seal Manhole Connector manufactured by the Press-Seal Gasket Corporation, or equal. Any remaining gaps between the pipe and manhole shall be filled with a non-shrink grout installed from the inside of the manhole.

15. **FIELD ADJUSTMENTS:** All final grade adjustment of manhole covers and frame assemblies shall be completed utilizing brick or concrete adjustment rings. The maximum height for field adjustment is 18"-24".

16. **REPAIRED AND PATCHED SECTIONS:** Repaired and patched sections will not be acceptable unless each individual section to be repaired or patched shall have first been inspected and approved by the Engineer. Repairs to and patching of "O"-ring grooves and shoulders will not be permitted.

17. **TESTING:** Absorption shall not exceed 9 percent when determined in accordance with ASTM C497, as required by the City Engineer.

18. **MARKINGS:** An inspection, by an independent testing laboratory approved by the Engineer, of the manufacturer's plant and product will be required to assure conformity of the precast manholes to these Specifications, and the minimum requirements of ASTM C478, as amended to date. Each section of precast concrete manhole shall clearly indicate the laboratory's configuration that it was accepted in accordance with applicable ASTM Specifications. Job site inspection shall be visual for shape, uniformity, and density.

19. LININGS: Manholes shall be lined in accordance with the following.

a) Conditions: Manholes meeting any of the following conditions, unless otherwise approved by the City Engineer, shall be lined:

- (1) Manholes receiving discharge from force main piping and adjacent manholes as directed by the City Engineer
- (2) Manholes located within FEMA 100-year flood plain
- (3) Manholes located within flood-prone areas as determined by the Rock Hill Stormwater Master Plan
- (4) Areas indicated by the design engineer

b) Installation: Installation of the linings shall be one of the following applications on clean surfaces in accordance to the manufacturer's instructions. For new manholes, lining shall be applied after all repairs have been made and manhole has been successfully vacuum tested. Additional surface preparation, cleaning or other work may be required as directed by the Engineer.

- (1) Manholes shall be lined with Spraywall urethane liner by Sprayroq Inc. or approved equal at a minimum dry-film thickness of 125 mils for the first 9 vertical feet of manhole depth and at 250 mils for manhole depths greater than 9 vertical feet.
- (2) Manholes shall be lined with Ultra-High Build Epoxy Coating System Raven 405 by Raven Lining Systems, or approved equal, at a minimum dry-film thickness of 125 mils.

G. APPURTENANCES

1. AIR RELEASE AND AIR VACUUM RELIEF VALVES – Combination air relief valves (ARV) shall be provided in accordance with sound engineering practice at high points in force mains. Automatic air relief valves shall not be used in situations where flooding of the manhole or chamber may occur. ARVs shall be furnished and installed as shown on approved Construction Drawings and as specified herein. The combination ARV shall have a cast iron body, and internal parts shall be stainless steel. The combination ARV shall be in accordance with the Standard Details.

a) ARV PIPING - The open end of an air relief pipe from an automatic valve or from a manually operated valve shall be extended to the top of the pit and provided with a screened downward facing elbow.

b) FORCE MAIN ALIGNMENT - The route of the force main shall be such that the number of air release and air vacuum valves is minimized.

H. CONCRETE WORK

1. **GENERAL:** Concrete of the respective classes for manhole bottoms, bedding, blocking, headwalls, piers and other miscellaneous structures shall be as called for in the work to which they pertain.
2. **CEMENT:** Cement shall satisfy the requirements of ASTM C150, Type I or Type II.
3. **AGGREGATE:** Aggregate shall satisfy the requirements of ASTM C33.
 - a) **Course Aggregate:** Course aggregate shall be uniformly and evenly graded for each application in accordance with ACI Standard 318. Unless otherwise approved, aggregates shall be sound, crushed, angular granitic stone. Smooth or rounded stone (river rock) shall not be acceptable.
 - c) **Fine Aggregate:** Fine aggregate shall consist of natural sand, manufactured sand or a combination thereof and shall be graded to meet the requirements of SCDOT size number FA-10 and 67, as appropriate.
4. **WATER:** Water shall be fresh, clean and free from injurious amounts of oil, acid, alkali, and organic materials.
5. **MIXING:** Mixing shall be accomplished at a central mix plant unless prior approval is given by the Engineer for mixing on the job site.
6. **CENTRAL MIX PLANT:** Concrete supplied from a central mix plant shall have 28-day compressive strengths not less than those listed below.
 - a) Class "A" 3,000 psi
 - b) Class "B" 2,200 psi
 - c) Class "C" 1,500 psi
7. **JOB SITE MIX:** Concrete mixed on the job site shall have 28-day compressive strengths as above and shall contain not less than the following quantities of cement per cubic yard.
 - a) Class "A" 564 lbs. (6 bags)
 - b) Class "B" 470 lbs. (5 bags)
 - c) Class "C" 376 lbs. (4 bags)
8. **GROUTS:** All grouts shall be of a non-shrink nature (as may be achieved through additives or proportioning) and depending upon application, range from plastic to flowable cement water paste. Testing as specified above for concrete may be required for acceptance of grouts to include frequent checks for consistency by a time-of-flow measurement.
 - a) Expansion grouts shall be either Gilco premixed or Supreme non-metallic grout as manufactured by Gifford-Hill and Company, Inc., Embeco 636 grout as manufactured by Master Builders, or approved equal.

- b) Grouts shall be mixed (if applicable) and placed in accordance with the manufacturer's recommendations, for each specific application.

9. **MORTAR:** Mortar used in sanitary sewer manholes shall be hydraulic cement mortar in accordance with ASTM C398.

10. **FLOWABLE FILL:** Flowable fill shall be controlled, self-leveling, non-shrink, low-strength material consisting of a fluid mixture of cement, aggregate, water and with admixtures as necessary to provide workable properties. Placement of flowable fill may be by grouting techniques in pipelines or other restricted areas, or as mass placement by chutes or tremie methods in unrestricted locations with open access. Long-term hardened strength shall be between 75 psi and 150 psi at 56 days as determined based on an average of three tests for the same placement.

- a) Fly ash shall not be used in flowable fill adjacent to ductile iron pipe and fittings. Protect pipe and fittings by covering with polyethylene.

11. **CONCRETE CYLINDERS:** Concrete cylinders for testing purposes shall be made in accordance with the procedure described in ASTM C31. Compression tests shall be made at the age of 7 days and 28 days by the testing laboratory as per ASTM C39. Testing shall be done by a laboratory approved by the Engineer. Each test shall consist of at least four (4) specimens; two (2) for field control and two (2) for laboratory control. One (1) initial test will be required and then one (1) test for each one hundred (100) yards thereafter.

I. MISCELLANEOUS STEEL

1. **STEEL PIER MATERIAL:** Steel piles, cross braces, cradles, etc., shall consist of structural steel shapes of the section required in the Construction Drawings. The steel shall conform to specifications for ASTM A36 – Carbon Structural Steel.

- a) All bolts and nuts shall conform to ASTM A325 for 7/8-inch and ASTM A490 for 1-inch and larger.
- b) The Contractor shall handle and store steel members above ground on platforms, skids or other supports. Members shall be free of dirt, grease, and other foreign material and protected against corrosion.
- c) Coal tar epoxy coating Carboline Koppers No. 300M, Amercoat No. 78, Carboline Carbomastic No. 14, or approved equal shall be applied to all specified surfaces of the steel pier.
- d) Welding Electrodes shall conform to the following:

- (1) Shielded Metal-arc: AWS A5.1 or AWS 5.5, E70XX
- (2) Submerged-arc: AWS A5.17, F70X-EXXX
- (3) Gas Metal-arc: AWS A5.18, E70S-X or E70U-1

- (4) Flux Cored-arc: AWS A5.20, E70T-X (except 2 and 3)

2. STEEL ENCASEMENT PIPE: Steel pipe shall be welded or seamless, smooth wall or spiral weld, consisting of Grade "B" steel as specified in ASTM A139. Encasement pipe must be approved by the appropriate controlling agency (i.e. SCDOT, railway corporation, etc.) and the City Engineer prior to ordering.

a) Minimum yield strength shall be 35,000 psi; and pipe thickness shall be as specified for each individual job.

b) All pipe shall be furnished with beveled ends prepared for field welding of circumferential joints. All burrs at pipe ends shall be removed.

3. STRUCTURAL STEEL TUNNEL LINER PLATES: The tunnel liner plates shall be either the four (4) flanged type (as approved for use within SCDOT rights-of-way) or the lap seam type (as approved for use within railroad rights-of-way) fabricated to permit assembly of a continuous steel support system as the tunnel is excavated. Tunnel liner plates shall be fabricated from hot rolled, carbon steel sheets or plates conforming to the specifications of ASTM A569 and must be approved by the appropriate controlling agency (i.e. SCDOT, railway corporation, etc.) and the City Engineer prior to ordering.

a) The tunnel liner shall be designed in accordance with the requirements of Division I, Section 15 and constructed to conform to Division II, Section 25 of the AASHTO Standard Specifications for Highways and Bridges.

b) Liner plates shall be galvanized in accordance with AASHTO M167 and fully bituminously coated in accordance with AASHTO M190. All hardware necessary to the tunneling operation shall be hot-dip galvanized in accordance with ASTM A153 prior to the bituminous coating application. Hardware shall conform to ASTM A307, Grade A.

c) The mechanical properties of the flat steel plate before cold forming used for the design of the tunnel liner shall be:

- | | | |
|-----|---------------------------|------------|
| (1) | Minimum tensile strength: | 42,000 psi |
| (2) | Minimum yield strength: | 28,000 psi |
| (3) | Elongation, 2-inches: | 30 percent |

d) The moment of inertia shall be 0.042 inches to the 4th power per inch of width for four flange 12 gauge liner plate.

4. STEEL FOR REINFORCING FOR CONCRETE

d) BARS: All reinforcement bars shall conform to ASTM A615. All bars shall be deformed and of structural grade 60. All splices shall be lapped 24 diameters unless otherwise noted.

e) WIRE: All reinforcement wire fabric shall conform to ASTM A185.

5. **STEEL VENT PIPE:** Unless otherwise specified, steel vent pipes shall be Schedule 40 five (5) inch diameter steel pipe, consisting of Grade "B" steel as specified in ASTM A139, with a minimum yield strength of 35,000 psi.

a) The steel pipe shall have an inside coal tar lining 3/32 inch minimum thickness in accordance with AWWA C203 or a coal tar epoxy lining conforming to that required for steel (aerial creek crossing) pipe.

b) Outside surface of pipe shall be sand or grit blasted to commercial standard and have one (1) coat of zinc chromate primer applied in accordance with Federal Specification TT-86A.

c) Pipe shall be furnished with two (2) evenly applied coats of rust inhibiting enamel paint, either Koppers Glamortex No. 501 Enamel (olive Green), Southern Coatings and Chemical Company Rustaloy No. 0537 Enamel (Garden Green), or approved equal.

6. **STEEL STRAPS AND ANCHORS:** Where stainless steel is identified in the Standard Details, pipes, bolts/anchors and/or straps shall conform to the requirements of ASTM A276. All other steel pipe and/or pier straps shall conform to the requirements of ASTM A36, with minimum yield strength of 36,000 psi.

a) Finished straps and anchors of carbon steel shall be galvanized in accordance with ASTM A153. The entire strap and all exposed surfaces of anchors and/or bolts (and nuts) shall be fully bituminously coated in accordance with AASHTO M190. Anchor bolts (non-head) shall conform to ASTM A36 with tension test to be made (as required on the bolt body or on the bar stock used for making the anchor bolts. Unless otherwise specified all other fasteners shall conform to ASTM A307 for carbon steel externally and internally threaded standard fasteners Grade A or B.

J. **STONE AND BRICK**

1. **BRICK:** All brick used to construct manhole inverts or adjust frames shall be made from concrete, shall be solid only and shall be of standard building size. All brick shall meet or exceed the compressive strength and water absorption properties as specified in ASTM C139. All manholes placed within the limits of roadway pavement and sidewalk shall use the minimum course of adjusting brick as indicated in the Standard Details.

2. **GRANULAR BEDDING MATERIAL:** All bedding material shall be angular, clean washed crushed stone graded in accordance with Size #67 in ASTM D448 for "Standard Sizes of Course Aggregate", or SCDOT Standard Size #67. Bedding material will be used only as instructed in the specifications and/or as specifically directed by the Engineer and be spaded around the pipe on both sides.

3. **RIP RAP:** All rip rap shall consist of clean, field stone or rough unhewn quarry stone, resistant to the action of air and water, varying in weight from 25 to 250 pounds with 60% weighing a minimum of 100 pounds each and no more than 5% weighing less than 50 pounds each (SCDOT Class 2 Rip Rap). Rip rap will be placed from a minimum of 4.0 feet below the toe of the bank to top of the bank in areas determined by field conditions. Rip rap thickness shall be 1-1/2 times the diameter of the largest stones used, or as directed by the Construction Drawings.

4. **SILT CHECK DAM MATERIAL:** Material shall be course angular, clean washed, crushed stone, gravel or rock, well-graded, and ranging in size from 2-inches to 6-inches, or SCDOT stone for erosion control, Class A.

5. **STONE STABILIZATION MATERIAL:** All stone stabilization material shall be angular, clean washed crushed stone graded in accordance with standard sizes #67 in ASTM D448 or SCDOT Standard Size #67. Stabilization material will be used only as instructed in the specifications and/or as specifically directed by the Engineer.

K. FERROUS CASTINGS

1. **SPECIAL CASTINGS:** All cast iron pipe fittings and special castings shall be furnished in weight, classes, and/or special thickness as specified elsewhere. The castings shall conform to ASTM A126 and shall be manufactured in domestic foundries. Coatings and linings, if applicable, shall be the same as specified for Ductile Iron Pipe.

2. **FRAMES, COVERS AND GRATES:** All manhole frames and covers shall conform to ASTM A48, Class 30 and shall conform to the Standard Details. Manufactured by domestic foundries preferred, but not required.

a) Manhole frames and covers shall be furnished with the common contract surfaces between frame and cover machines.

b) Where watertight frames and covers are specified, the water tight seal between frame and cover shall be accomplished by means of rubber gasket.

L. DEFECTIVE MATERIALS AND WORKMANSHIP: Any cracked or broken material, such as pipe, fittings, valves or hydrants, shall be removed and replaced with sound pieces, at the expense of the Contractor. Joints that leak shall be carefully remade. Remade joints and replaced material shall be retested under the same conditions of operation. If joints or materials are then found to be defective, they shall be remade and replaced until the line passes the required test.

III. CONSTRUCTION SPECIFICATIONS

A. ABANDONMENT

1. **GENERAL:** The following requirements shall apply for proposed abandonment of existing facilities, unless otherwise shown on the Construction Drawings or approved by the Engineer. All areas disturbed by abandonment shall be restored by the Contractor.
2. **PIPE:** Piping to be abandoned-in-place shall be cut and plugged on the ends and completely filled with flowable fill as indicated on the Construction Drawings. If existing pipe to be abandoned is less than 8 inches in diameter and has less than 5-feet of cover, then the pipe shall be removed and the trench backfilled with suitable material, unless otherwise approved by the City Engineer.
3. **APPURTENANCES:** Valves, meters, services, and other sewer main appurtenances to be abandoned shall be removed and the excavations backfilled with suitable material.
4. **MANHOLES:** Existing manholes which are to be abandoned will first have both influent and effluent lines plugged inside the manhole with watertight masonry. Weeps holes will be drilled into the base of the manhole, and the manhole will then be filled with non-compressible material (#67 stone or as approved) to a point three feet below the finished grade. The remainder of the manhole shall be broken down and removed. Then the excavation shall be filled to finished grade with suitable soil compacted in place.
5. **MAINS AT MANHOLE WHICH REMAIN IN SERVICE:** Abandoned mains at active manholes shall be completely disconnected from the manhole by cutting the pipe outside the manhole and then plugging the abandoned main and the manhole wall with watertight masonry. The invert shall then be rebuilt to conform to the Standard Details.
6. **EXPOSED PIPE:** Exposed sections of abandoned mains shall be removed to a point not less than 5-feet into the adjacent banks. The remaining ends of the pipe shall be plugged with watertight masonry. Concrete piers or collars in the creek channel shall be removed completely. Concrete piers or collars not located in the creek channel shall be removed to a point 3-feet below the finished grade. Steel piers shall be cut off 3-feet below finished grade.
7. **BACKGROUTING:** Backgrouting is a secondary stage pressure grouting to ensure that voids have been filled within abandoned pipes. Backgrouting will only be required at critical locations indicated on the Construction Drawings or if there is evidence of incomplete flowable fill placements.
8. **PUMP STATIONS:** For abandonment of existing pump stations, pumps, motors, controls, etc., shall be salvaged and transported by the Contractor to an area designated by the City Engineer or representative, unless otherwise directed. All influent and effluent pipes shall be plugged with watertight masonry. The pipe chamber and wetwell (if abandoned) will have holes drilled in the bottom, be filled with non-compressible material (#67 stone or as approved) to a point 3-feet below the finished grade. The remainder of the structure shall be broken down and removed. Then the excavation shall be filled to the finished grade with suitable soil compacted in place. All aboveground structures associated with the pump station, including fencing and the access road shall be removed and the area restored.

B. HANDLING AND STORAGE OF MATERIALS

1. GENERAL: The Contractor shall be responsible for the safe storage of materials furnished by or to him, and accepted by him, and intended for the Work, until they have been incorporated into the completed project. The interior of all pipe, manholes and other accessories shall be kept free from dirt and foreign materials at all times.

2. TRANSPORTATION OF MATERIALS AND EQUIPMENT: All materials furnished by the Contractor shall be delivered and distributed at the site by the Contractor or his material supplier. The Contractor and his Supplier are directed to contact the SCDOT to verify axle load limits on State-maintained roads (and bridges) which would be used for hauling of equipment and materials for the Project. The Contractor and his Suppliers shall do all that is necessary to satisfy the SCDOT requirements and will be responsible for any damage to said roads which may be attributed to this project.

3. HANDLING: Proper and suitable tools and equipment shall be used for the safe and convenient handling and laying of pipe. Pipe, fittings and other materials shall be carefully handled so as to prevent breakage and as to prevent damage to the interior lining and coatings on the pipe and fittings. Pipe shall not be unloaded by rolling or dropping off of trucks or cars, but shall be handled by carefully lifting and lowering into position, using approved slings or clamps which shall be provided by the Contractor or material manufacturer for the purpose. Pipes and fittings shall be carefully examined for cracks, broken lining and other defects. No pipe or fitting shall be laid which is known to be defective. If any pipe or fitting is discovered to be cracked, broken or defective after being laid, it shall be removed and replaced with sound material at the expense of the Contractor. If any part of the coating or lining is damaged; the repair shall be made by the Contractor at his expense in a manner satisfactory to the Engineer. All pipe and fittings shall be thoroughly cleaned before being laid and shall be kept clean until accepted as completed work.

4. LOADING AND UNLOADING: Personnel and equipment for unloading, transporting, distributing and storing materials shall be furnished by the Contractor. The contractor is responsible for the coordination of material deliveries and for providing appropriate staging and or lay-down areas. Ductile iron pipe and cast iron accessories shall be loaded and unloaded by lifting with hoists or skidding so as to avoid shock or damage. Concrete pipe, and precast manholes shall be loaded and unloaded with hoists and/or as recommended by the respective manufacturers. Under no circumstances shall such materials be dropped. Pipe handled on skidways shall not be skidded or rolled against pipe already on the ground.

5. DISTRIBUTING: Materials shall be distributed and placed so as to least interfere with traffic and not impair sight distances. The Contractor shall furnish and maintain proper warning signs and lights for the protection of traffic along highways, streets and roadways upon which material is distributed. No distributed materials shall be placed in drainage ditches.

a) 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.

b) Contractor will string in advance no more than the amount of pipe and material that can be installed within four (4) weeks or less, as approved by the Engineer. All materials shall be placed in such a manner as not to hinder access, endanger or impede traffic or intersection sight distances, or create a public nuisance. Materials strung through residential areas (or

any area with maintained lawns) shall be placed in such a manner as not to restrict normal maintenance of established lawns, and must either be installed within two (2) weeks or removed to an approved storage yard, as required by the Engineer.

6. STORAGE: All pipe, fittings and other materials that cannot be distributed along the route of the work shall be stored for subsequent use when needed. The Contractor shall make his own arrangements for the use of storage areas. Unless prior written consent from the owner of the proposed storage area is received by the City Engineer, the Contractor will be required to store all equipment and materials within the limits of the right-of-way, permanent easement, and temporary construction easement provided. The materials and equipment storage shall comply with all local and state ordinances throughout the construction period. Material and equipment may only be stored within road rights-of-way if approved by the controlling agency. PVC pipe shall not be exposed to direct sunlight for inordinate periods of time.

C. SEWER SYSTEM INSTALLATION: The Contractor shall assemble, joint and lay all ductile iron and plastic pipe and fittings in accordance with the following:

1. GENERAL: Installation of all sewer lines and appurtenances shall be conducted in accordance with the requirements of AWWA Section C and/or manufacturer's recommended installation procedures.

a) PIPE shall be laid in a workmanlike manner, true to line and grade, with bell ends facing up-grade in the direction of laying with a uniform slope between manholes. There shall be no joints in the piping located closer than 10 feet from the exterior wall of the manhole structure. All sewer lines shall be installed in a manner that they intersect at manholes with angles of 90-degrees or greater (measured in plan view) between the in-coming pipe and the discharge pipe. Any sanitary sewer with less than 4 feet of cover to finished grade shall be ductile iron with a minimum cover of three feet. Additionally, any sewer laid with 10 feet to 18 feet of cover shall be ductile iron. No sewer line shall be installed with more than 18 feet of cover. All pipe laid outside the road right-of-way shall be ductile iron. Pipe laid within the roadway may be PVC.

b) TRANSITIONS between DI Pipe and PVC Pipe are allowed in some cases. However, no DI-PVC transitions shall be made within 10-feet of a manhole. DI-PVC transitions must be approved by City Engineer.

c) SANITARY SEWER GRADES shall not exceed 8% and waste velocities in the pipe shall not be designed to exceed 10 feet per second without written approval by the City Engineer. Standard 4-foot diameter manholes with a typical slide invert may be used for differences in grade of 2 feet and less. For elevation differences greater than 2 feet, an outside piping drop must be utilized. Inside piping drops shall only be allowed for tying into existing manholes, and they shall be approved by the City Engineer.

d) OVERNIGHT COVER: During construction all manhole openings shall be covered at the end of each day. For sidewalls, use wing-nut type plugs to secure openings. Trenches shall be covered or backfilled at the end of each working day.

e) CONTAMINATED AREAS: All sewer piping shall be located outside contaminated areas. Re-route line if possible. If the piping must run through a contaminated site, the

pipng material must protect the system from being contaminated (e.g. Ductile Iron Pipe with chemical resistant gaskets).

f) EASEMENTS/RIGHTS-Of-Way: Pipe shall be installed in dedicated easements or public rights-of-way. The minimum easement width for sewer main shall be 30 feet; however, this may be increased to accommodate large-diameter pipe or burial greater than standard depth. See City Standard Details for additional information.

g) UTILITY CROSSINGS: All crossings with other utilities shall be made with ductile iron pipe.

2. LOCATION AND GRADE: The horizontal alignment and grade of the sewer piping and the location of manholes and other structures and or appurtenances shall be determined by the Engineer. The location shall be in agreement with approved Construction Drawings. The grade line shown and specified relates to the invert of the pipe to be installed. Any substantial deviation shall be subject to approval by the City Engineer.

a) Alignment/lines, levels and grades shall be determined by the Engineer/Surveyor, but the Contractor shall be responsible for accurately transferring such alignment/lines and grades to the work. This work by the Contractor shall be subject to frequent checks by the Engineer and City personnel.

b) Each section of sewer pipe shall be laid to the appropriate line and grade, as designed and approved beginning at the downstream end and working in the upstream direction with the bell end laid upgrade. Non-conformance with this provision must be approved by the City Engineer.

c) Any sanitary sewer with less than 4' of cover to finished grade shall be constructed of ductile iron pipe, but shall have a minimum cover of three feet (3'). Additionally, any sewer laid with at least 12 feet of cover shall be ductile iron. No sewer piping shall be installed with less than 3 feet or more than 18 feet of cover unless approved by the City Engineer.

d) When the sewer line is constructed in the road right-of-way, it shall be in conformance with the City of Rock Hill Utility Location Plan and applicable encroachment permits. All pipe laid outside the road right-of-way shall be ductile iron. In some cases depending on soil types and the presence of other utilities with cathodic protection, 16 mil polyethylene pipe wrap, or PVC pipe may be required for use. Sewer lines crossing or within 10 feet of utilities with cathodic protection shall be designed to protect the sewer line and shall be approved by the City Engineer.

3. PLACEMENT: All pipe, fittings, valves, manholes, and appurtenances shall be carefully lowered into the trench piece by piece by means of a backhoe or other suitable means, in such a manner as to prevent damage to protective coatings and linings. Under no circumstance shall materials be dropped or dumped into the trench.

a) DUCTILE IRON PIPE: Ductile iron piping shall be installed in accordance with ANSI/AWWA C600 – Installation of Ductile Iron Water Mains and their Appurtenances.

b) PVC GRAVITY PIPE: PVC gravity sewer shall be installed in accordance with ASTM

D2321 – Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and other Gravity-flow Applications.

c) PVC FORCE MAIN (PRESSURE) INSTALLATION: PVC force mains shall be installed in accordance with ASTM D2774 – Standard Practice for Underground Installation of Thermoplastic Pressure Piping.

d) FORCE MAIN INSTALLATION: Design and construction of force mains shall be such that they satisfy a leakage test in accordance with specifications herein. Thrust blocking or mechanical restraints shall be provided at all changes in alignment greater than or equal to 11 ¼ - degrees. Automatic air relief valves shall be placed at high points in the force main sewer to prevent air locking. Blocking and/or restraints must be placed as shown on the Construction Drawings and/or as directed by the Engineer. Blocking shall consist of ready mix concrete having a compressive strength of not less than 3,000 psi.

4. DETECTION OF MAINS: All force mains shall be detectable within three (3) feet with electronic locating equipment. Non-metallic pipe shall be installed with solid, UL-approved 14-gage (min) copper tracer wire running along the centerline of the pipe or other means of detection. Warning tape shall be placed 1-foot over top of force main piping.

5. CUTTING PIPE: Whenever pipe or special castings are required to be cut, the cutting shall be done by skilled workmen, using an abrasive wheel cutter. Pipe that is cut in the field must be ground and beveled prior to assembly.

a) DUCTILE IRON: Use of oxyacetylene torch will not be permitted. The plain end shall be beveled, any sharp edges that might damage the gasket shall be removed by means of a file or power grinder.

b) PVC PIPE: The plain end shall be beveled, any sharp edges that might damage the gasket shall be removed by means of a file or power grinder.

5. CREEK CROSSINGS: Creek crossings and other applications may require a specialized section of pipe (e.g., long-span steel pipe with specialized joint restraint). Each such crossing shall be addressed on a case-by-case basis and approved by the City Engineer

a) ABOVE GRADE CROSSINGS: For pipe crossing above creeks, streams and other bodies of water, pipe shall be adequately supported and anchored, protected from damage and freezing, and accessible for repair or replacement.

b) BELOW GRADE CROSSINGS: For pipe crossing under creeks, streams and other bodies of water, a minimum of two (2) feet of cover shall be provided over the pipe unless approved by City Engineer. If cover is less than two (2) feet, then carrier pipe shall be placed inside steel casing pipe. When crossing water courses that are greater than fifteen feet (15') in width, the pipe and material shall be designed appropriately, manholes shall be located on both sides of crossing to isolate for testing and repair that are easily accessible and not subject to flooding, and ductile iron pipe with mechanical joints shall be used for any lines being installed in rock.

c) WATER STOP: Install water stop per the Standard Details at the downstream

edge of wetland areas, creek crossings, and other bodies of water crossed by a sanitary sewer.

D. SEWER SERVICE INSTALLATION

1. GENERAL: All laterals except those serving lots adjacent to in-line manholes or upstream from dead-end manholes in cul-de-sacs shall be connected to the sewer main. Service line piping shall be laid with a minimum slope of 1/8-inch per foot for 6-inch diameter service piping and 1/4-inch per foot for 4-inch diameter service piping. No service connections shall be located in the sewer piping closer than 10 feet from the exterior wall of the manhole structure (Refer to paragraph C.1.a. Sewer service piping shall extend to and be stubbed out at the applicable right-of-way, easement, or property line (or as otherwise directed or approved by the City Engineer) using a wye fitted with a plug and cleanout. An "S" shall be cut in the curb at the location where the lateral crosses under the curb.
2. SERVICE LATERAL ELEVATION CHANGES: In locations where the sanitary sewer main is at such a depth that a service lateral riser pipe is required to place the service piping at an appropriate elevation, service line piping shall be installed by benching the service line trench floor and installing riser in a vertical position against undisturbed earth. A cleanout shall be installed at all vertical riser locations, and bends shall be used to connect the riser to the house service lines.

E. CONNECTIONS

1. CONNECTIONS TO SERVICES
 - a) SERVICE LATERALS: The wye fitting connecting the service piping to the main shall be rotated so that the service line branch inclines upward at approximately 45 degrees above a horizontal line normal to main line piping. Service lines shall be laid on a straight line and grade from the service wye fitting to the applicable right-of-way, easement or property line (or as otherwise approved by the City Engineer). The service line piping must be located at a depth to receive wastewater from the lowest floor of the structure to be serviced, but in no event shall the service line piping invert be less than three and one-half feet (3-1/2 feet) below grade at the applicable right-of-way, easement or property line. All service piping is to be equipped with cleanouts.
 - b) CONNECTIONS TO EXISTING MANHOLES: At locations where new sewer piping is to be connected to existing manholes, the Contractor may temporarily block and/or divert wastewater flows to facilitate construction operations. The connection work shall consist of making the opening in the manhole wall, inserting the new pipe to the elevation shown, filling the space in the wall around the pipe with non-shrink grout, and constructing and remodeling manhole inverts. High-early strength cement shall be used for mortar in order that proper channels may be formed in manhole bottoms with a minimum interruption of service to the existing sewer. Any connection made to an existing sewer system shall be plugged until the City Engineer has authorized removal of plug so as to prevent inflow problems.
2. CONNECTIONS TO EXISTING SEWERS: At locations where new sewers are shown to be connected to existing sewers at a new manhole, the Contractor shall first expose the existing sewer and install a supporting timber beam with suitable straps around the pipe so as to bridge the excavation for the new manhole. The manhole shall then be constructed complete with invert and frame and cover. Under special conditions the Contractor may temporarily block and/or divert sewage

flows to facilitate construction operations. Actual physical connection of the sewers will be made at a later date, as directed.

a) If bypass pumping is required, an identical standby pump shall be onsite in the event of failure of the primary pump. If at any time during construction, effluent from the existing sewer is not fully contained by the bypass system, gravity service will be restored by a temporary tie to the new construction and work shall be suspended until the problem is resolved to the satisfaction of the Engineer. Quiet pumps (below 70 dBA at 30 feet) shall be used between the hours of 8 pm and 6 am. The Contractor shall be responsible for any fines levied as a result of failure of bypass pumping system. The Contractor will be required to verify his method of handling sewer flows during construction by pumping at peak flows for 1 hour as approved by the Engineer. Bypass system shall be supervised 24 hours a day, 7 days a week or a float and monitor system installed for the duration of the bypass pumping event.

b) All services 6-inches and greater for hotels and restaurants shall tie directly to a manhole.

F. CLEANOUTS

1. GENERAL: Cleanout piping shall be constructed of Schedule 40 PVC pipe and be equipped with a threaded cap to facilitate access.

a) SPACING AND LOCATION: All sanitary sewer services are to have a cleanout installed at the applicable right-of-way, easement or property, or as otherwise approved by the City Engineer. Cleanouts along the service line piping shall be spaced in accordance with Section 708 of the current edition of the International Plumbing Code, but in no case more than 100 feet apart for the portion of the service piping to be maintained by the City.

b) CONSTRUCTION: A cleanout stack constructed of minimum 4-inch diameter piping shall be extended vertically from the wye and terminate with a threaded plug a minimum of 18" above finished lot grade for undeveloped properties and flush or slightly above the ground for developed properties. The cleanout is to be installed to facilitate cleaning in the direction of flow of the pipe (i.e., toward the direction of the main line piping).

2. STOPPERS, CAPS AND PLUGS: All service connections shall be closed or terminated with factory manufactured pipe stopper, cap or plug secured in such a manner as to not leak under a maximum hydrostatic head of ten feet (10') or five (5) psi air pressure. Pipe stoppers, if used, shall be able to be removed without special tools, excessive force or breakage of the pipe bell.

G. CLEANING: The Contractor shall thoroughly clean all lines prior to placing the piping into operation, without discharging into the existing system.

1. All dirt and foreign material is to be cleaned from each joint of pipe or fitting before being lowered into the trench.

2. Temporary watertight plugs may be installed at any manhole that is incomplete, at the open end of the pipeline prior to leaving the job site daily, and elsewhere as dictated by good engineering and construction practices to prevent infiltration or the introduction of any foreign material into either

the existing or proposed sewer systems.

3. The Contractor will be responsible for the complete removal of all watertight plugs in the necessary sequence to allow testing and subsequent activation, all under the direction of the Engineer.

H. PROXIMITY TO WATER INFRASTRUCTURE

1. GENERAL: All installation practices shall be in accordance with Section R61-58.4D of the State Primary Drinking Water Regulations when installing sanitary sewer piping in the vicinity of a well, potable water main or other public water supply infrastructure.

2. PARALLEL INSTALLATION: Water mains shall be laid at least ten (10) feet horizontally from any existing or proposed sewer (gravity or force main). The distance shall be measured edge to edge. In cases where it is not practical to maintain a ten foot separation, any deviation shall be authorized by SCDHEC on a case-by-case basis, if supported by data from the design engineer. Such deviation may allow installation of the water main closer to a sewer, provided that the water main is laid in a separate trench or on an undisturbed earth shelf located on one side of the sewer at such an elevation that the bottom of the water main is at least eighteen (18) inches above the top of the sewer. If these condition are not able to be met or an alternative design is not feasible, the sewer pipe shall be replaced and the water line laid such that the distances between joints of water and sewer pipe is maximized and the sewer pipe shall be replaced with ductile iron.

a) There shall be no physical connection(s) between a public or private potable water supply system and a sanitary sewer collection system.

b) Sanitary sewer service lateral piping shall be installed no closer than 10 feet as measured horizontally from water service piping.

3. CROSSINGS: Water mains crossing sewers shall be laid to provide a minimum vertical separation of eighteen (18) inches between the outside of the water main and the outside of the sewer. This shall be the case whether the water main is either above or below the sewer line. Whenever possible, the water main shall be located above the sewer line. Where a new water main crosses a new sewer line, a full length of pipe shall be used for both the water main and sewer line and the crossing shall be arranged so that the joints of each line will be as far as possible from the point of crossing and each other. Where a new water main crosses an existing sewer line, one full length of water pipe shall be located so both joints will be as far from the sewer line as possible. Where a water main crosses under a sewer, adequate structural support shall be provided for the sewer line to prevent damage to the water main.

4. SPECIAL CONDITIONS: When it is impossible to obtain the distances specified in R.61-58.4(D)(12)(a) and (b) SCDHEC may allow an alternative design. Any alternative design shall:

a) Maximize the distances between the water main and sewer line and the joints of each;

b) Use materials which meet the requirements R.61-58.4(D)(1) for the sewer line; and,

c) Allow enough distance to make repairs to one of the lines without damaging the other.

5. **FORCE MAINS:** There shall be at least a ten (10) foot horizontal separation between water mains and sanitary sewer force mains. There shall be an eighteen (18) inch vertical separation at crossing as required in R.61-58.4(D).

6. **SEWER MANHOLES:** No water pipe shall pass through or come in contact with any part of a sewer manhole.

I. **PROTECTION OF OTHER UTILITIES AND STRUCTURES:** Before beginning any excavation for installing sanitary sewer infrastructure, the contractor shall locate or cause to have located any water, sewer, gas or other utilities as necessary to avoid conflicts. The Contractor shall excavate and expose existing underground utilities in advance of trenching operations to determine the precise location of the utilities or other underground obstructions shown on the Construction Drawings. Such location and excavation shall be at least 500 feet ahead of the construction, unless otherwise noted. Conflicts with existing utilities shall be reported to the Engineer and conflicting utility's owner for resolution. Changes to the alignment and or grade of the sanitary sewer piping shall be submitted to the City Engineer for review and approval.

1. All utility owners will be notified prior to excavation as required by the 1985 Underground Damage Prevention Act. To aid in the location of existing utilities, Contractor shall contact the South Carolina 811 (SC 811) by telephone or posting a utility location request on the PUPS website. The following information is provided by the SC 811.

a) "South Carolina State Law requires the excavator, when planning any activity that results in the movement or removal of earth, rock or other materials in or on the ground, to contact South Carolina 811 and any non-member company with adequate information regarding the excavation.

b) At least 3 full working day notice at 11:59 pm (not including the day of the call) prior to digging, call SC 811 by dialing 811 or (888) 721-7877. A SC811 representative will record the location of the digging site and notify member companies of your intent to dig. Each member company will then send either one of their employees or a contract locator to your dig site to mark the location of their underground facility lines.

c) Once the lines have been marked, you may begin carefully to dig, keeping in mind the 2 feet allowance on either side of the markings. [(a) if the diameter of the facility is known, the distance of one-half of the known diameter plus twenty-four inches on either side of the designated center line; (b) if the diameter of the facility is not marked, twenty-four inches on either side of the outside-edge of the mark indicating a facility; or (c) for subaqueous facilities, a clearance of fifteen feet on either side of the indicated facility]. Not all utilities are members with SC 811. If a utility is not named, please contact them directly.

d) Remember: call 811, wait the required time, respect the marks and dig with care!"

2. Prior to final acceptance by the City of the sewer utility being constructed, the developer/owner shall be responsible for the integrity of the utility and for locating the utility until final acceptance by the City. Final acceptance shall include written documentation, permits to operate, copies of record drawings, and other requirements so listed by the City.

3. Crossings:

a) Whenever a sewer main crosses under other utility lines (gas, telephone conduit, storm drain, etc.), there shall be 2-feet clearance between the top of the sewer and the bottom of the affected utility. Stone bedding shall be used from 6-inches below the sewer to 12-inches above the sewer from one foot outside the utility trench. If this clearance is not possible, the sewer line shall be ductile iron pipe 1-foot outside the utility trench, with a minimum length of 10 feet.

b) Whenever a sewer main crosses over other utility lines (gas, telephone conduit, storm drain, etc.), there shall be one foot clearance from the top of the utility to the bottom of the sewer for PVC sewer lines. If this clearance is not possible, the sewer line shall be ductile iron pipe from 1-foot outside the utility trench, with a minimum length of 10 feet.

4. The Contractor shall be solely responsible for the repair and payment of penalties for any damage made to existing utilities as a result of the work.

J. **PRE-TREATMENT DEVICES:** Pre-treatment devices, such as grease traps/grease interceptors may be required as determined by the Building Code and/or Pre-treatment Coordinator (See Standard Details). Such devices shall meet the current Building Code as adopted by the City of Rock Hill, be sized accordingly, and must have the written approval of the Building Official and the Pre-treatment Coordinator. Grease traps/interceptors are required at establishments such as food service establishments (FSE) and convenience stores involved in food preparation activities. Grease traps/grease interceptors are not serviced or maintained by the City of Rock Hill. Questions regarding the use of grease traps/interceptors should be directed to the City's Grease Management Program (GMP) official.

K. **SYSTEM TESTING**

1. **GENERAL:** All required testing of pipelines and valves shall be done under the direct supervision of the City Inspector and must be conducted in accordance with AWWA C600 and C605. Field testing shall not negate the requirements for material certifications as contained in these specifications unless otherwise directed by the Engineer. All testing and cleaning shall be completed prior to connection to any existing line. Contractor shall be responsible for providing all equipment, personnel, and ventilation necessary to comply with OSHA confined space regulations.

2. **TESTING AND CLEANING:** Before acceptance of any sewer or systems of sewers, lines shall be cleaned and tested in accordance with these Specifications. Where any obstruction is met, the Contractor will be required to clean the sewers by means of rods, swabs, or other instruments. Lines and manholes shall be clean before final inspection. Pipelines shall be straight and show a uniform grade between manholes. The Contractor shall be required to correct any variations that may be disclosed during the inspection.

3. **TEMPORARY BULKHEADS:** The Contractor shall furnish, install and remove all temporary bulkheads, flanges or plugs, to permit the required pressure tests, and shall furnish all equipment and labor to properly carry out such tests and to replace defective material. City Inspector shall be present during installation of bulkheads and during the removal of the bulkheads.

4. **INFILTRATION TEST:** Infiltration test is required when groundwater is above the top of pipe.

The infiltration shall not exceed 100 gallons per day per inch diameter per mile as measured for a reach of pipe the same diameter, up to one mile long. However, when excessive infiltration can be isolated to a particular section (manhole to manhole), the limit will be applied to that section. There shall be no visible points of infiltration. Any section (manhole to manhole) must be isolated and tested separately if so directed by the Engineer. Procedure for testing shall follow the procedure below.

- a) Step 1: Plug upper section of line.
- b) Step 2: Install suitable measuring device at lower end.
- c) Step 3: Measure the amount of water flowing through the outlet over a specified period of time.

5. **LOW-PRESSURE AIR TEST:** All gravity sewer piping shall be air tested in accordance with applicable portions of ASTM C828, ASTM C924 and ASTM F1417 or it shall be hydrostatic tested in accordance with ASTM E1003. Test pressure will be measured by gauges furnished and installed by the Contractor aboveground at the manhole opposite the air supply. Contractor shall furnish all other test equipment required. Prior to air testing, the section of sewer between manholes shall be thoroughly cleaned and wetted. Immediately after cleaning or while the pipe is water soaked, the sewer shall be tested with low-pressure air. At the Contractor's option sewers may be tested in lengths between manholes or in shorter sections using Air-Lock balls pulled through the line from manhole to manhole. Air shall be slowly supplied to the plugged sewer section until internal air pressure reaches approximately 4.0 psi. After the test pressure is achieved and stabilized (approximately 2 to 5 minutes), the pressure may be reduced to 3.5 psi before starting the tests. If a 1.0-psi drop does not occur within the test time, then the line has passed the test. If the pressure drops more than 1.0 psi during the test time, the line is presumed to have failed the test, and the Contractor will be required to locate the failure, make necessary repairs and retest the line. Minimum test time for various pipe sizes shall be in accordance with ASTM C828.

- a) **EQUIPMENT:** Required test equipment includes Air-Lock bails, braces, air hose, air source, timer, rotometer as applicable, cut-off valves, pressure reducing valve, 0-15 psi pressure gauge, 0-5 psi pressure gauge with gradations in 0.1 psi and accuracy of $\pm 2\%$.
- b) **TEST RECORDS:** The Contractor shall keep records of all tests made. Copy of such records will be given to the City Engineer. The Contractor is cautioned to observe proper safety precautions in performance of the air testing. It is imperative that plugs are properly secured and that care is exercised in their removal. Every precaution shall be taken to avoid the possibility of over pressurizing the sewer line.
- c) **REPAIRS:** All visible leaks shall be repaired regardless of whether air test is within allowable limits. No sewer will be accepted until leakage tests demonstrate compliance.

6. **MANHOLE LEAKAGE TESTS:** Manholes shall be tested by plugging the inlet and outlet pipes with airtight plugs and completing a vacuum air test. Manhole vacuum air testing shall be performed in accordance with ASTM C1244. The Engineer will select 25% of the manholes on the project to be tested. Manholes that fail the test shall be repaired as specified and retested until they pass. Manholes that show leaks and are repaired prior to testing shall be tested as specified.

7. **FORCE MAIN SEWER PIPE LEAKAGE TEST:** Pressure and leakage test must be conducted

in accordance with AWWA C600 for ductile iron material and AWWA C605 for PVC material. On completion of the line or sections of the lines, connection and appurtenances, the line shall be filled and hydrostatically tested. All leaks and any defective material shall be repaired or replaced to the satisfaction of the Engineer and the test repeated until the requirements of this specification are met. Any special equipment, pumps, etc., required to make the test shall be furnished and operated by the Contractor. The Contractor shall use great care to remove all air from each section under test. If openings are not available for the purpose of expelling air, the Contractor shall provide air release of sufficient size (as determined by the Engineer) in accordance with the Standard Details, at his expense.

a) The maximum length of pipe tested in one test shall be 5,000 feet, or as close to 5,000 feet as possible depending on valve spacing.

b) Test pressure shall be 1.5 times the maximum working pressure in the system (i.e. 120 psig) and 120 psig minimum as measured at the lowest point of elevation of the section of line being tested. Testing time shall be a minimum of two (2) hours. Leakage shall not exceed the allowable leakage shown in AWWA C600 and C605 or calculated by the formula:

For Ductile Iron Pipe:

$$G = \{S \cdot D \cdot (P^{1.5})\} / 148,000$$

Where:	L	=	allowable leakage, in gallons per hour
	S	=	length of pipe tested, in feet
	D	=	nominal diameter of pipe, in inches
	P	=	average test pressure (psig) = 150 psig

For PVC Pipe:

$$L = \{N \cdot D \cdot (P^{1/2})\} / 7,400$$

Where:	L	=	allowable leakage, in gallons per hour
	N	=	# of joints of pipeline being tested
	D	=	nominal diameter of pipe, in inches
	P	=	average test pressure (psig) = 150 psig

Note: Add 0.0043 gph for each ¾-inch service and 0.0057 gph for each 1-inch service.

All visible leaks shall be repaired regardless of the amount of leakage, and test will be repeated until it passes.

8. **DEFLECTION TESTS AND INSPECTIONS:** After backfilling trenches, all sewer pipes may be flashed and visually inspected for pipe alignment. Pipelines shall be straight and show uniform grade between manholes. Each run of pipe must present a full circle when viewed from one of the connected manholes. Any run of pipe that does not present a full circle indicates a deficiency in the alignment or failure of the pipe, and it shall be the responsibility of the contractor to correct the installation prior to placing the pipe in operation.

a) The Contractor must perform a Mandrel test on PVC main sewer line piping (excludes laterals) to test deflection a minimum of 30 days after the installation of the line has been completed. The initial diametric deflection shall not exceed five percent (5%) of the

base inside diameter as defined in ASTM D3034. Deflection test will be performed after the trench is no longer subject to construction traffic loading. The mandrel shall be provided by the Contractor and pulled through each section of pipe from manhole to manhole. The mandrel must slide freely through with only a nominal hand force applied. Any pipe that refuses the mandrel shall be removed and replaced. Such section shall be retested for deflection and infiltration after completion of backfill.

L. GENERAL CONSTRUCTION

1. **CLEARING & GRUBBING:** The Contractor shall perform all clearing necessary for installation of the complete work. Clearing shall consist of removing all trees, stumps, roots, brush and debris in the way of the work. Temporary Construction easements shall be selectively cleared with specimen trees left standing.
2. **DISPOSAL:** All excess and waste material shall be legally disposed in a satisfactory manner. Burning shall be in accordance with City Fire Department regulations and SCDHEC Regulations. When burning is allowed, the Contractor shall obtain a Burning Permit from the office of the City Fire Chief prior to any burning operations.
3. **REMOVAL OF PRIVATE OR PUBLIC FACILITIES:** Any private or public facilities, including fences, mailboxes, etc., removed for construction purposes shall be promptly replaced of the same material in the same or better condition than prior to construction. Trees or shrubbery along highways, roadways and streets shall not be disturbed unless absolutely necessary. Tree removal is subject to the approval of the City Engineer. Planting such trees or shrubs that are to be removed and replaced may be heeled in and replanted. Heeling and replanting shall be done under the direction of an experienced nurseryman and City Forester.

M. CONSTRUCTION ALONG HIGHWAYS, STREETS, AND ROADWAYS

1. **GENERAL:** The Contractor shall install pipelines and appurtenances along publicly owned and maintained highways, streets and roadways in accordance with all applicable encroachment permits and City and SCDOT regulations, with reference to construction operations and requirements, safety, traffic control, road maintenance, and repair.
2. **PROTECTION OF TRAFFIC:** The Contractor shall provide suitable signs, barricades and lights for protection of traffic, in locations where traffic may be endangered by construction operations. All highway signs removed by reason of construction shall be replaced as soon as the conditions that necessitated such removal have been cleared. No highways, streets or roadways shall be closed without first obtaining permission from the proper authorities. Before any roadway is blocked, the Contractor shall notify the City Engineer's office.
3. **CLOSURES:** In general, not more than one block of a street or roadway shall be closed for construction at any one time. Before proceeding with trenching operations in a succeeding block, the preceding section shall be backfilled, cleaned completely and the street opened to traffic. All planned road closures shall be reported in accordance with these specifications prior to closing any street, or for unplanned roadway closings, as soon as possible after the roadway has been closed.
4. **MAINTAINING HIGHWAYS, STREETS, ROADWAYS, AND DRIVEWAYS:** The Contractor

shall furnish adequate personnel and proper construction equipment, which shall be available for use at all times, for maintaining highways, streets, and roadways upon which work is being performed. All such highways, streets and roadways shall be maintained in suitable condition for movement of traffic until completion and final acceptance of the work. For temporary drive closures, the contractor is to coordinate the closure(s) with applicable property owner(s). The Contractor shall immediately repair all driveways that are cut or damaged and shall maintain them in a suitable condition for use until completion and final acceptance of the work.

5. **CONSTRUCTION OPERATIONS:** The Contractor shall construct all work along roadways using the sequence of construction operations, as to least interfere with traffic.

6. **REMOVING PAVEMENT:** The Contractor shall remove pavement as necessary for installing the new piping and appurtenances and for making connections to existing pipelines. Care shall be taken by the contractor to avoid damage to pavement adjoining pavement removal areas. If damaged, the Contractor shall remove the damaged pavement and shall replace it with new pavement at his own expense.

a) There may be instances where the City requests additional pavement removal and repair based on the condition of the road. In these areas, the City will contract with and negotiate the price with the Contractor for the damaged pavement removal and associated repair work to be completed. Should a portion of this work be completed by City forces, the contractor shall work with the City in coordinating the work as the applicable Encroachment Permit allows.

7. **MARKING AND CUTTING:** Before removing any pavement, the pavement shall be marked for cuts neatly paralleling pipelines and existing street lines taking into consideration existing pavement conditions. Pavement shall be saw-cut prior to removal to form a clean transition edge. Asphalt pavement shall be broken along the marked cuts by use of a jackhammer or other suitable tool. Concrete pavement and asphalt pavement on concrete base shall be scored to a depth of approximately 2" below the surface of the concrete along the marked cuts. Scoring shall be done by use of a rotary saw, after which the pavement may be broken below the scoring by use of a jackhammer or other suitable tool.

8. **STRIPPING:** Where the pipeline is laid along road shoulders, all sod, topsoil and other materials suitable for shoulder restoration shall be stripped and stockpiled for replacement.

9. **EXCAVATED MATERIAL:** Excavated material shall not be placed along highways, streets and roadways in such a manner as to obstruct traffic. No scattered excavated material shall be allowed to remain on the pavement. All such material shall be kept swept away.

10. **PAVERS OR CURB:** The Contractor shall remove and replace or tunnel or bore under any paver areas or concrete/stone curb encountered along the project route. In any case, protection of the pavers' and curb and gutter's supporting foundation is the responsibility of the Contractor.

11. **MACHINE PULLING:** No pavement shall be machine pulled until completely broken and separated along the marked cuts.

12. **DRAINAGE STRUCTURES:** All side ditches, culverts, cross drains and other drainage structures shall be kept clear of excavated material and be free to drain at all times.

N. EARTHWORK

1. GENERAL: The Contractor shall excavate, install piping and backfill and consolidate the trench backfill as quickly as possible to maintain safety within the construction site. Trenches shall not be opened any further ahead of pipe laying operations than is necessary for proper laying operations, and trenches shall be progressively backfilled and consolidated, and excess material removed immediately behind laying operations. Backfill material and material consolidation shall meet SCDOT specifications, but in no case shall the consolidation be less than 95% maximum dry density for each layer of soil material-in-place as determined by ASTM D698 (Standard Proctor) test procedures. The Contractor shall so organize his work that backfilling and cleanup shall closely follow pipe laying operations and manhole construction.

- a) Excavations within street rights-of-way shall be backfilled when left unattended for more than 1 hour, unless otherwise approved by the controlling agency.
- b) Excavations within sewer rights-of-way/easements shall be backfilled, fenced, or otherwise protected when left unattended for more than 1 hour.
- c) Final grades of sewer rights-of-way/easements shall be smooth and at such grade that they can be navigated by vehicles and maintenance equipment. Horizontal and vertical grades of rights-of-way/easements shall be gentle and not exceed roadway standards.

2. TRENCH EXCAVATION: Trench excavation shall include the removal of material necessary for the installation of the piping infrastructure and associated fittings and structures. Excavated materials that are not suitable for backfill material shall be removed from and legally disposed offsite.

- a) DEPTH OF TRENCHES: The minimum cover over the top of the pipe shall be 3 feet, unless otherwise directed by the City Engineer and/or shown on approved Construction Drawings. Where obstructions are encountered, minimum depth may be changed to avoid interference. Where necessary to increase the depth of cover to avoid interference with underground utilities, obstructions and utilities services, the Contractor shall furnish all construction equipment and shall perform all labor required for additional trench depth.
- b) LENGTH OF OPEN TRENCH: A maximum trench of ± 100 LF shall be open in advance of the pipe laying than is necessary to expedite the work, unless prior approval is given by the Engineer. Ground conditions and/or location requirements shall govern the amount of trench open at any one time as determined by the Engineer.
- c) WIDTH OF TRENCHES: Trenches shall be excavated sufficiently wider than the infrastructure to be installed to allow for personnel and the preparation of the infrastructure foundation, installation of infrastructure and associated bedding, and to properly consolidate the backfill material including the pipe support bedding located under the pipe's haunches. In any case, the width of the trench is not to be narrower than 24 inches plus the outside diameter of the pipe.

3. GENERAL EXCAVATION

a) **BELL HOLES:** The trench bottom shall be true and even with bell holes at each joint to provide the barrel of the pipe with soil and/or granular (as applicable) support for its full length. If stone bedding of sufficient depth is not provided, the Contractor shall over-excavate the locations where the pipe bells rest so the entire length of the pipe will be uniformly supported.

b) **EARTH EXCAVATION:** Earth excavation shall include all excavation of whatever substance encountered, except rock excavation, as further provided in these specifications. The area excavated shall be limited to no more than is necessary to allow the proper installation of the structure as determined by the Engineer, and the excavation shall be made to the lines, grades and elevations shown on the Construction Drawings. In locations where pipe is to be bedded in earth excavated trenches and no stone is used for bedding the pipe, the bottoms of such trenches shall be fine graded to allow for a firm and uniform bearing for the bottom of the pipe. Where any part of the trench has been excavated below the engineered grade for the pipe, the part excavated below such grade shall be backfilled with sand and compacted at the Contractor's expense.

c) **BORE PITS:** Bore pit excavations shall be controlled by the limits of the existing rights-of-way and shall not exceed these without prior written approval of the property owner. The excavation shall be made to the proper elevation, line and grade as required to install the casing pipe as shown on the Construction Drawings. The pit bottom shall be true and even with adequate stabilization to maintain proper elevation and grade on the boring rig for the duration of the bore.

d) **ROCK EXCAVATION IN TRENCHES AND PITS** includes removal and disposal of materials and obstructions encountered which cannot be excavated with a 1.0 cubic yard (heaped) capacity, 42 inch wide bucket on track-mounted power excavator equivalent to Caterpillar Model 215, rates as not less than 90 HP flywheel power and 30,000 lb drawbar pull. Rock excavation shall comprise solid rock in the original bed, or in well-defined ledges, the removal of which in the opinion of the City Engineer requires drilling, blasting, or the use of jackhammers or bull-points, and shall also include boulders or detached pieces of rock 8 cubic feet or more in content. Trenches in excess of 10 feet in width and pits in excess of 30 feet in either length or width are classified as open excavations. Rock removal shall extend to be a minimum of 6 inches vertically and 12 inches horizontally from the piping to be installed.

4. **MATERIALS:**

a) Satisfactory soil materials are defined as those complying with ASTM D2487 soil classification groups GW, GP, GM, SM, SW, GC, SC, CL, ML and SP.

b) Unsatisfactory soil materials are defined as those complying with ASTM D2487 soil classification groups MH, CH, OL, OH, and PT.

5. **SHORING AND BRACING:** All shoring and bracing shall conform to all OSHA regulations. The specific type of shoring and bracing used shall be determined by the Contractor as to prevent caving of trench banks and to provide safe excavation.

6. **DEWATERING:** The Contractor shall at all times provide and maintain ample means and

equipment with which to remove and properly dispose of any and all water entering the excavation or other parts of the work, and keep all excavation dry until such time as pipe laying and grading is completed and structures to be build therein are completed.

- a) No water shall be allowed to rise around the pipe in unbackfilled trenches nor shall it be allowed to rise over masonry until the concrete or mortar has set (minimum 24 hours). All water pumped or drained from the Work shall be disposed in such a manner as to prevent siltation and erosion to adjacent property or other construction.

7. **BACKFILL:** All backfill shall be of non-plastic nature free from roots, vegetative matter, waste, construction material, rock larger than $\frac{3}{4}$ cubic foot, or other objectionable material. Backfill material shall be capable of being tamped by mechanical tamps using relatively low velocity and heavy blows. Material deemed by Engineer to be unsuitable for backfill purposes shall be removed from the job site before backfilling operations begin and replaced with satisfactory soil materials as approved by the Engineer or directed by the permitting agency.

- a) Continuous and uniform bedding shall be provided in the trench for all buried pipe. Backfill material shall be tamped in layers around the pipe and to a sufficient height above the pipe to adequately support and protect he pipe. Stones, other than crushed bedding, shall not come in contact with the pipes and shall not be within 6-inches of the pipe.

8. **COMPACTION CONSOLIDATION REQUIREMENTS:** Compaction of the trench backfill is to conform to the more stringent requirements of the permit issuing authority and requirements herein. Contractor shall be responsible for testing the material for adequate compaction. Compaction shall be in accordance with the Standard Detail as determined by ASTM D698 (Standard Proctor) test procedures.

9. **CRUSHED STONE STABILIZATION AND BEDDING:** Crushed stone bedding material shall conform to ASTM C33, as amended to date, gradation #67 (ASTM #67), varying in sizes $\frac{1}{4}$ " through $\frac{3}{4}$ ". Stabilization and bedding material shall be placed in the trench and thoroughly compacted to grade by tamping. Compacted bedding material shall be carried up the sides of the pipe to the heights shown on the Construction Drawings.

- a) Wherever the sub grade is by nature too soft or mucky, in the opinion of the City Engineer, for the proper installation of the pipe, the Contractor may be ordered to undercut the trench and backfill with crushed stone or gravel.
- b) Crushed stone bedding material shall conform ASTM C33, gradation #67 (ASTM #67), varying in sizes $\frac{1}{4}$ " through $\frac{3}{4}$ ". Bedding material shall be placed in the trench and thoroughly compacted by tamping to the grade required for the particular location. Compacted bedding material shall be carried up the sides of the pipe to the heights necessary for the various classes of bedding.

10. **SHAPING:** Once backfilling operations are complete, the Contractor shall immediately re-shape the roadway shoulder area including any damaged cut and fill slopes and ditches, and he shall replace topsoil, sod and any other materials removed from shoulders. When installing pipelines and appurtenances, the Contractor will be required to provide sufficient personnel and equipment so as to simultaneously carry out all of the above operations in an appropriate timeframe.

O. MANHOLE CONSTRUCTION

1. GENERAL: For sewer manholes being installed in developed areas, the sewer manhole ring and covers (castings) are to be installed at an elevation at or slightly above the surrounding finished grade. Manholes within street rights-of-way or landscaped areas of a development shall have finished rim elevations flush with the pavement or adjacent finished grade. Frame and covers of manholes within streets shall be located outside the wheel travel paths. All manholes outside street rights-of-way in landscaped areas of a development shall be constructed to a height of 2 feet above the finished grade, unless otherwise indicated on the Construction Drawings. In undeveloped areas and cross-country sewer installations, the manhole ring and covers (castings) shall be installed at an elevation a minimum of 3 feet and a maximum of 4 feet above finished grade. In flood plain areas manhole rims shall be 1-foot above the 100-year flood elevation or vented.

a) The Contractor will do that which is necessary to stabilize the soil intended to support the structure. A stable condition shall only be judged only by the Engineer or his authorized representative. Under no circumstances will a precast base section be placed on unstable soil. Any cost incurred by the Contractor in stabilizing the area to support a manhole shall be considered incidental to the manhole construction.

b) Joining of precast sections will be done in accordance with the manufacturer's recommendation, with special attention called to the amount of force needed.

c) All backfill around structures shall be thoroughly tamped in layers a specified for placing backfill.

2. OUTSIDE DROPS: When design considerations dictate a large elevation change across a manhole, an outside drop shall be constructed in accordance with the Standard Details. Depending on the particular fittings used, elevation differences greater than 24 inches are required to accommodate an outside drop. Where there is not sufficient elevation difference to permit construction of an outside drop, the grade of the influent pipe shall be lowered such that the vertical separation of the influent and effluent pipe is 0.2 feet, as measured at the center to the manhole when the grades of both pipes are projected to that point. Outside drops shall not enter the cone section of precast manholes. The influent pipe of an outside drop manhole must be ductile iron pipe, a minimum of 18-feet long.

3. INSIDE DROPS: When connecting a proposed sewer main to an existing manhole at an elevation significantly higher than the existing invert elevation, and where safety consideration or working space limitations preclude building an outside drop, the connection may be made with an inside drop constructed in conformance with the Standard Details. Inside drops will be used only with the approval of the City Engineer and where shown on the Construction Drawings or specifically approved by the Engineer. They may not be used in lieu of outside drops shown on the Construction Drawings. Inside drops shall not enter the manhole in the cone section. Inside drops are not allowed on four-foot diameter manholes.

4. FRAMES AND COVERS: The frame shall be installed on the manhole with anchor bolts on all manholes that are not flush with the ground. The Contractor shall seal the frame to the manhole by installing a length of butyl rubber joint sealant to form a gasket between the frame and the manhole. The butyl rubber joint sealant shall have a one-inch cross-section, shall make two full circles when placed on the cone section, and shall be compressed by the frame with the anchor bolts. Butyl

rubber joint sealant shall be "Rubber Seal as manufactured by Ru Van, Inc. or approved equal. Cement mortar grouting of the frame shall be required. Brick may not be used to adjust rim elevations of above-grade manholes.

- a) Manholes that are installed flush with pavement or grade shall have frames attached to the manhole with a bed of cement mortar grout. Standard-size brick shall be used to adjust the finished rim elevation of such manholes.
- b) When the manhole rim elevations are greater than the finished grade and in flood plain or flood prone areas, bolt-down type, waterproof manhole covers shall be used.

5. **STEEL VENT PIPES:** Steel vent pipes shall be installed at appropriate locations to facilitate drawing and venting of the piping system, but should be located away from planned vertical (building) construction. Steel vent pipe shall be installed in accordance with the Standard Details. Shop drawings of strap on vents, mounting straps, and other anchor bolts will be subject to approval of the Engineer. Material shall be as specified in the Materials Specification section.

P. CONCRETE CONSTRUCTION

1. **PLACING OF CONCRETE:** Placing of concrete shall be in daylight hours. Concrete mixed at a central plant shall be transported to the job site as per ASTM C94 and placed within 90 minutes of the dispatch time. Concrete shall be deposited in such a manner so as to prevent contamination by foreign material and segregation due to re-handling or flowing. Free fall shall not exceed 3-feet. Concrete when placed shall be compacted with mechanical, internal-vibrating equipment and/or with hand spading with a slicing rod. Temperature shall be above 35 degrees Fahrenheit and rising by 10:00 AM for the placement of concrete. Depositing shall cease when the descending air temperature in the shade falls below 40 degrees Fahrenheit. If the temperature drops below 35 degrees after concrete is placed the Contractor shall enclose, heat and protect the concrete or Contractor shall replace the concrete at his own expense. Earth fill shall not be placed on concrete until concrete has been allowed to set for 24 hours. Exposed concrete shall have $\frac{3}{4}$ " chamfered corners.

2. **FORMWORK:** Formwork, where required, shall be built to conform to the shape, lines and dimensions of the concrete work as shown. Forms may be made of wood, plywood, metal or any other material approved by the Engineer. Forms shall be mortar tight, of materials strong enough to resist noticeable deflection or bulging between supports, and the interior dimensions of the forms shall be such that the finished concrete shall be of the form and dimensions shown on the Construction Drawings. The design of the forms shall take into account the effect of the vibration of the concrete as it is placed and also the rate of speed at which the forms will be filled.

- a) Mechanical vibrators of an approved type, and continuous spading and/or rodding of concrete shall be used to produce proper contact of concrete with forms and reinforcing steel in piers and with forms and pipe in monolithic inverts insuring a compact, dense, and impervious artificial stone of uniform texture.

3. **SETTING FORMS:** Forms shall be set to line and grade, and shall be braced, tied, and secured in a manner which will withstand placing of the concrete, and which will maintain shape and position'. Forms shall be tight, and be substantially assembled to prevent bulging and the leaking of concrete. Joints shall be arranged vertically or horizontally. Temporary openings shall be arranged, where required, at the bottoms of wall forms and elsewhere, to facilitate cleaning and inspecting. Lumber

used once in forms shall have nails removed and surfaces in contact with concrete work thoroughly cleaned before reuse. Wall sleeves, inserts, and openings required in concrete work shall be properly set in formwork. Chamfer strips shall be placed in forms for all exterior corners.

4. CURING: All concrete will be cured after placement according to the following procedures.

a) Forms will normally be left in place for the entire curing period. Exposed surfaces not covered by forms will be kept moist continuously for the entire seven day period or will be cured through use of an approved curing compound which will be applied after all surface water has disappeared.

b) All form marks exposed to view shall be rubbed off with a stone.

5. REMOVING FORMS: Under normal conditions, the time elapsing before the forms may be stripped shall not be less than the following:

a) Slabs 14 days

b) Piers 7 days

c) Walls 2 days

6. FINISHING: All exposed concrete work shall be kept wetted with water, and shall be rubbed with a carborundum stone of medium fineness, or other equally as good abrasive, to bring the surface to a smooth texture and to remove all form and other marks. The paste formed by the rubbing may be rubbed down by floating with a canvas, carpet-faced, or cork float, or may be rubbed down with dry burlap.

7. TESTING: The following test may be performed by the City to ensure the concrete quality.

a) Compressive Strength – Compressive strength testing shall be conducted in accordance with ASTM C31 and ASTM C39. Test cylinders which are formed in the field will be left in the field until compression testing is completed.

b) Slump – Slump testing shall be in accordance with ASTM C143.

c) Air Content Test – The test for air content in the mixture will be in accordance with either ASTM C173 or ASTM C231.

8. ACCEPTANCE: Concrete shall be accepted on the basis of its meeting the requirements listed under the Material Specifications and Detail specification Section of this contract. The Inspector will accept no ready mix concrete without the plant dispatch ticket.

a) The Engineer shall require any test as he deems necessary to insure that the concrete meets specifications. The Engineer may require the test to be performed by an independent testing laboratory at the Contractor's expense.

b) Segregated concrete and/or concrete containing foreign material will not be accepted.

9. **BLOCKING INSTALLATION:** Concrete blocking shall be formed and poured at the backs of fittings, including elbows, tees, and other fittings to the dimensions shown on approved detailed Construction Drawings. Unless otherwise noted, concrete shall be 3,000 psi with a four-inch (4") slump. Blocking shall be poured against undisturbed earth. If existing soil conditions will not support concrete blocking, it is the Engineer's responsibility to recommend proper restraining devices in order to prevent movement of the pipe. Concrete of the respective classes for thrust blocking, bedding, blocking, headwalls, piers and other miscellaneous structures shall be as called for in the work to which they pertain.

Q. BORES, TUNNELS, AND CASINGS

1. **BORE PITS (OR TUNNEL PITS):** Bore or tunnel pits shall be safed-up, shore, well-marked, lighted, and not left unattended except as approved by the controlling agency. Requirements of stabilization and dewatering of bore pits shall be as herein before specified. The angle of repose method (sloping pit walls) for creating a safe working area shall not be used.

2. **SIZING:** Carrier pipe shall be DIP. Casing is to extend beyond the edge of pavement or control structure at least as far out as it is deep and a clearance of 25 feet beyond the casing shall be granted for future removal of the carrier pipe. Spiders shall be used on all gravity sewer lines installed within steel casing when the clearance between the bell of the carrier pipe and the top of the steel casing exceeds the allowable deflection of the carrier pipe. The minimum size and thickness standards for casing pipe and tunnels for various sewer line sizes and types are as follows:

Carrier Pipe (inch diameter)	Casing Pipe (inches)	Thickness (inches)		Recommended * Tunnel (inches min.)
		DOT	RR	
8" DIP	18"	0.250"	0.312"	48"
10" DIP	20"	0.250"	0.344"	48"
12" DIP	24"	0.250"	0.406"	48"
16" DIP	30"	0.312"	0.469"	48"
18" DIP	30"	0.312"	0.469"	48"
24" DIP	36"	0.375"	0.562"	48"
30" DIP	48"	0.500"	0.750"	60"

- Gauge to be determined by controlling agency and/or by depth of installation

3. **INSTALLATION:** Smooth wall or spiral weld steel pipe may be jacked through dry bores slightly larger than the pipe, bored progressively ahead of the leading edge of the advancing pipe as soil is mucked by the auger back through the pipe. As dry boring operation progresses, each new section of encasement pipe shall be butt welded to the section previously jacked into place. Continuous checks shall be made as to the elevation, grade and alignment of each successive section of encasement, as well as the tracks (rails) upon which the boring rig travels.

a) Installation shall be such to prevent the formation of a waterway under the road or rail bed. If voids are encountered or occur outside the encasement pipe, grout holes shall be installed in the top section of the encasement pipe at ten (10) foot centers and the voids filled with 1:3 Portland cement grout at sufficient pressure to prevent settlement in the roadway/railway.

b) Boring operations shall be continuous to their completion, and unnecessary or

prolonged stoppages shall not be allowed.

c) In the event an obstruction is encountered during the boring and jacking operations, the auger is to be withdrawn and the excess pipe is to be cut off, capped, and filled with 1:3 Portland cement grout at sufficient pressure to fill all voids before reapplying to the controlling agency for permission to open cut, bore at an alternative location, or install a tunnel.

d) Installation shall be to the limits specified by the controlling agency and/or as delineated in their encroachment permit issued. The controlling agency shall have full authority to require remedial measures and/or to stop all work if, in its opinion, said work will cause any damage to the roadway/railway section or endanger traffic. In all instances the controlling agencies reserve the right to sample, test, and approve all materials and methods used.

e) The Contractor shall notify the controlling agency through the Engineer and an acknowledgement shall be received a minimum of five (5) working days prior to beginning any work within the roadway or railway rights-of-way. If required, 24-hour notice will be given prior to completion.

4. **GUARANTEED CASING INSTALLATION:** The casing shall be installed by jacking, with simultaneous removal of spoil. The spoil removal shall not proceed more than 18-inches ahead of the casing. The diameter of the excavated hole shall be no larger than necessary to keep the casing moving freely and lubricant may be used to reduce the jacking forces. Casing sections shall be joined by butt weld.

a) After casing is jacked in place, 20-inch grout holes shall be used to pump a 1:3 Portland cement grout to fill the void outside the casing. Sufficient pressure should be applied to force grout out the adjacent grout hole. Grout holes shall be a maximum of 10 feet apart at the top of the casing.

5. **TUNNELS USING STEEL LINER PLATES:** All structural steel liner plates for tunnels shall be formed to provide circumferential-flanged joints. Longitudinal joints may be flanged or offset lap seam type. All plates shall be punched for bolting on both the longitudinal and circumferential seams or joints. Bolt spacing in circumferential flanges shall be in accordance with the manufacturer's standard spacing and shall be multiples of the plate length so that plates having the same curvature shall be interchangeable to permit staggering of the longitudinal seam. Bolt spacing at flanged longitudinal seams shall be in accordance with the manufacturer's standard spacing. For lapped longitudinal seams, bolt size and spacing shall be in accordance with the manufacturer's standard, but not less than that required to meet the longitudinal seam strength requirements of the design specifications. All liner plates for the full length of a specified tunnel shall be either the flange or the lapped seam type. The two types shall not be mixed in the same tunnel.

a) Liner plates shall be assembled in accordance with the manufacturer's instructions. Galvanized and coated plates shall be handled in such a manner as to prevent bruising, scaling, or breaking of the coating. Any plates that are damaged during the handling or placing shall be replaced, except that small areas with minor damage may be repaired to the satisfaction of the Engineer or his representative.

b) Galvanized surfaces shall be repaired by thoroughly wire brushing the damaged

areas and removed all loose, cracked coating, after which the cleaned areas shall be painted with two (2) coats of zinc rich paint as approved and an acceptable bituminous coating restored.

c) When tunneling has proceeded in a distance sufficient for placing one section of the tunnel liner, that section of liner will be placed before excavating further. Excavation shall be controlled so that the space outside the liner plate shall be held to a minimum. All voids between the liner plate and tunnel wall shall be filled with 1:3 Portland cement grout, containing no more water than necessary, placed under sufficient pressure to fill all voids. Grout shall be placed through the grout holes provided in the top of the tunnel liner plates. Grout holes 2" in diameter shall be provided at no more than 4.5-foot center or every third ring of plates to permit grouting as the erection of the tunnel liner progresses. At no time will the grouting operations be further than 10 feet from the front end or head of the tunnel construction.

d) At the end of each day's operations, the voids outside installed liner plates shall be grouted whether 10-feet or less. Grout will be forced into each grout hole. If the grout from one hole should flow along the liner plates so as to plug the next hole, the plug shall be opened by punching through the grout so that each hole may be used for grouting. The grouting operation will be continued at each hole until all spaces outside the liner plates are filled and no grout will flow.

e) The tunnel shall be constructed to the limits, grade and alignment shown on the Construction Drawings. Excavation, without the use of jetting, shall be done in such a manner as to protect public and/or private property from damage. Prior to beginning any construction, the Contractor shall submit pit shoring and tunnel liner details for approval and no tunneling may begin prior to approval of these details by the appropriate controlling agency. After approval of tunnel liner and pit shoring details, a five (5) day notice to the Controlling Agency, through the Engineer shall be provided as previously specified.

f) No blasting will be done without prior written approval of the controlling agency and then only in strict accordance with all Federal, State, and Local laws, ordinances, rules or regulations governing the storage and use of explosives. Where blasting is required, only small controlled charges or 40% dynamite or plastic explosives shall be used. The depths of the holes for these charges shall not exceed the depth necessary to clear an area sufficient to place one section of tunnel liner.

g) The charges for the initial series of blasts should be placed in the triangle method. The second series should be placed in the radial method a minimum distance from the desired diameter of the tunnel. The triangular charges shall be set to go off first, with the radial charges to go off following a short interval or using the time-lag method.

h) Where rock is encountered before approaching the shoulder or pavement, the first four series of charges will be used in determining the amount of controlled blasting to be used before beginning any blasting beneath the railway or shoulders or pavement of the highway as applicable. If rock is encountered after tunneling progresses beneath the pavement or railway, charges will initially be set at very low levels and increased in small increments until the proper amount of charged is determined. In no case will an overshoot be permitted. If a boulder is encountered and removed by blasting or by other methods, a bulkhead will be formed immediately after removal of the boulder and the area filled with

grout before proceeding with the tunneling operations.

i) If there is any indication of a vertical split in the rock formation, or any indication of settlement of the roadway or railway fill, all operations shall be stopped and the controlling agency notified immediately. If the vertical split is not determined to be out too great a magnitude or too close to the rails/pavement, the split shall be filled with grout at a pressure specified by the controlling agency, allowed to set and tunneling operations may be continued.

j) If it is determined that the vertical split is too great of a magnitude or too close to the pavement or railway, the Controlling Agency shall determine the method to be used to correct the split. If settlement of the roadway or railway occurs, the Controlling Agency will advise the Owner and his Contractor of the proper steps to be taken to correct the settlement. If deemed necessary by the Controlling Agency, adequate warning devices (signs, flasher, etc.) accompanied by responsible flagmen shall be placed at a distance allowing any and all traffic time to stop safely before reaching the questionable area. At the option of the Controlling Agency, it may provide the necessary flagmen, warning devices, etc., at the Contractor's expense. Traffic shall be allowed over the questionable area, only as directed by the Controlling Agency.

k) The completed liner shall consist of a series of structural steel liner plates assembled with staggered longitudinal joints. Liner plates shall have been fabricated to fit the cross-section of the tunnel. All plates shall be connected by bolts on both longitudinal and circumferential seams or joints.

l) After tunneling operations have been completed, the Contractor will install the carrier pipe in a manner approved by the Engineer. Concrete fill (1:3 Portland Cement grout) will then be placed after completing installation of the sewer pipe within the tunnel liner as directed by the Engineer and end enclosure walls installed as shown on the Construction Drawings or Standard Details. Ends of the tunnel liner will be sealed with an 8-inch masonry wall on the lower end and a 12-inch masonry wall on the higher end. Weep holes will be provided on the downstream end for drainage.

6. **FINISH WORK:** Once the Contractor has installed the carrier pipe, complete and in-place, the Contractor shall then remove the vertical shoring for pits (if ground conditions allow), surplus spoils, and material from the site. The site shall then be returned to its original condition, seeded, mulched, or restored as specified and left in a neat and satisfactory condition. Shoring material shall be removed in such a manner so as to avoid collapse and to allow proper backfill. The backfill shall be placed in accordance with these Specifications or the requirements of the Controlling Agency.

R. **BLASTING:** The Contractor shall not be allowed to blast within any rights-of-way maintained by any agency (SCDOT, railroad, gas, etc.) other than the City without specific approval of the controlling agency and only in accordance with their respective requirements.

1. Prior to commencing any blasting operations, the Contractor shall notify either the City Fire Department – Fire Prevention Section or the County Fire Administrator as applicable, and obtain blasting permits as required. The Contractor must furnish Certification of Insurance specifically covering any and all obligations assumed pursuant to the use of explosives. All blasting supplies shall be stored in a place and manner approved by the City, State Fire Marshal and other entities having jurisdiction over blasting operations. All blasting supplies shall be stored in a place and manner

approved by the City. In no case shall blasting caps or other igniters or exploders be kept in the vicinity of dynamite or where other explosives are stored.

2. Blasting operations shall be conducted in strict accordance with any and all decrees, rules, regulations, ordinances, and laws as may be imposed by any regulatory body and/or agency having jurisdiction over the Work relative to handling, transporting, use and storage of explosives. Blasting shall be done only by competent, sober, and experience personnel whose activities shall be conducted in a workmanlike manner. Satisfactory information must be provided to the Engineer that the blaster meets or exceeds the qualifications enumerated in OSHA Regulations Part 1926, Subpart U, Section 1926.901 – Blaster Qualifications.

3. All rock, dirt and debris from blasting shall be contained within the excavation by use of weighted mats or undisturbed overburden. The Contractor's blaster shall be fully responsible for determining the method of containment and the weight, size and placement of material required to contain the charge he is using. Charges shall be sized such that no damage to houses, structures, roadways, etc., outside the limits of excavation will occur. Where there is a possibility of such damage, the charge will initially be set at a very low level and increased in small increments until the proper charge is determined. The Contractor shall be held responsible for any and all injury to persons or damage to public or private property. No blasting will be permitted adjacent to existing buildings and structures. Rock at those locations shall be removed with jackhammers and bull-points. A seismic survey and/or pre-blast survey may be required.

S. EROSION AND SEDIMENT CONTROL:

1. GENERAL: Erosion and sediment control shall be conducted in accordance with the applicable Erosion and Sediment Control and or NPDES permit. It is the Contractor's responsibility for controlling soil erosion and sediment runoff. The Contractor is to utilize mulches, matings and or other fabrics, silt fences and other filters, grasses, slope drains, and other erosion control devices as necessary to control erosion and sediment runoff. Erosion control may include temporary work that must be removed upon achieving construction site surface stabilization.

2. TEMPORARY EROSION CONTROL: Temporary erosion control shall consist of planting temporary grass of a quick growing species such as millet, rye grass, or cereal grasses suitable to the area or other approved temporary means. When used, seed, fertilizer, mulch and periodic watering shall be applied in adequate quantities to assure a full, healthy ground cover over the entire disturbed area of construction operations. All materials shall be of first class quality and subject to approval by the governing erosion control authority. All disturbed areas along the pipeline, with exception to a construction access or haul road, shall be grassed as soon as possible after backfilling operations have been completed.

3. CONSTRUCTION IN STREAMS AND IMPOUNDMENTS: Unless otherwise approved by the City Engineer, construction operations in streams and impoundments shall be restricted to those areas which must be entered for the construction of temporary or permanent structures. As soon as conditions permit, streams and impoundments shall be promptly cleared of all falsework, piling which are to be removed, debris and other obstructions placed therein or caused by the construction operations. Frequent fording of live streams with construction equipment will not be permitted; therefore, temporary bridges or other structures shall be used wherever an appreciable number of stream crossings are necessary. Unless otherwise approved by the City Engineer, mechanized equipment shall not be operated in live streams except as may be required to construct channel

changes and temporary or permanent structures, and to remove temporary structures.

4. CONSTRUCTION IN EASEMENTS: Erosion control measures shall be constructed such that they do not discharge onto water or sewer easements, but to the opposite sides of such easements to prevent future erosion of the easement.

5. LIMIT OF PROGRESS: The Engineer will limit the area of excavation commensurate with the Contractor's capability and progress in keeping the finish grading, mulching, seeding and other such pollution control measures current in accordance with an accepted schedule. Should seasonal limitations make such coordination unrealistic, special erosion control measures shall be taken immediately to the extent feasible and justified.

6. SURFACE STABILIZATION – PERMANENT GROUND COVER: Upon construction completion and upon achieving construction site surface stabilization, the Contractor is to establish a permanent ground cover over any remaining denuded areas, and the Contractor shall remove all temporary erosion and sediment control measures upon achieving a permanent ground cover or satisfactory surface stabilization.

7. RIGHT TO CORRECT: In the case of failure on the part of the Contractor to adequately control erosion, pollution, and/or Siltation, the City reserves the right to employ outside assistance or to use his own forces to provide the necessary corrective measures. Such incurred direct costs will be charged to the Contractor.

T. RESTORATION OF DISTURBED AREAS

1. GENERAL: All surfaces (both public and private) within and adjacent to the construction operations shall be restored to a condition comparable to that existing prior to construction, or as specified by the Engineer. All surplus materials shall be disposed in a manner acceptable to the Engineer, and the construction area shall be left in a neat condition, with special attention called to proper drainage, smoothness of surface, and general clean-up. No machinery or equipment shall be left or stored on the job site after the project is complete.

2. STABILIZATION: Unless otherwise specified, complete restoration is to include fertilizing, seeding, and mulching any and all areas disturbed during the construction within 30 working days following the initial ground disturbing activity.

3. APPURTENANCES: Manholes, valve boxes, drain pipes, and other structures encountered shall be reset or re-laid to match or clear surface grade and/or sewer pipe grade as applicable.

4. REFUSE BURIAL: Timber, rock and other refuse may not be buried within the permanent sewer rights-of-way with the exception of rock smaller than $\frac{3}{4}$ cubic foot.

5. RIP-RAP: The Contractor shall place stone rip-rap as specified in those areas subject to severe water action, where directed by the Engineer. Placement of rip-rap as shown on the Construction Drawings shall be considered as a guide only, with final determination made at the time of construction by the Engineer.

a) Stone rip-rap will be placed as indicated on the Standard Details immediately

following pipe installation and will be installed no steeper than a 2:1 slope, except when specifically approved by the engineer. Grading will be required as necessary to insure continuous even flow.

b) In locations where a creek bank is eroded near the sewer line, the Contractor will be required to place compacted fill material along the creek bank in order to maintain 3-feet of cover over the sewer line in all directions. This is to be done before the rip-rap is placed.

c) The rip-rap installation shall include all earthwork necessary to stabilize the creek bank and to provide cover for the sewer line.

6. **JUTE NETTING/EROSION BLANKET:** The Contractor shall install jute netting or erosion control blank in areas subject to high runoff velocities, areas subject to concentrated runoff, and on steep slopes as shown on the Construction Drawings or directed by the Engineer.

U. **RESTORATION OF EXISTING PAVED SURFACES:**

1. **GENERAL:** All removal and restoration of pavement and road surfaces will be in accordance with the specifications approved by the City of Rock Hill Public Works Department or the South Carolina Department of Transportation, whichever applies.

a) All restored bituminous and concrete pavements shall be placed to existing cross-section and ride quality. Restored pavement will in all instances be flush and level with existing pavement at the sawed edges, and at existing gutter lines where applicable, unless approved by the Engineer. When pavement repairs do not meet the above criteria or are not permitted in a workmanship manner as determined by the Engineer, the City of Rock Hill Public Works or SCDOT, whichever applies, will remove and re-perform the restoration as specified at the Contractor's expense.

b) When cuts are to be made in street rights-of-way under maintenance by the City of Rock Hill Public Works Department, the Contractor shall contact the Public Works Director or his designated representative before each separate pavement cut is made and secure a permit.

2. **REPLACEMENT:** All areas of existing pavement shall be neatly removed with straight edges. The Contractor shall remove and replace pavement, which in the opinion of the Engineer has been cracked or displaced by the operations of the Contractor. Edges shall be sealed upon completion of the repair.

a) In all pavement cuts either the permanent pavement or a temporary pavement consisting of 1 to 1 ½ inches of black asphaltic concrete (later to be replaced permanently) will be placed immediately upon completion of the subgrade unless otherwise approved by the Engineer.

b) Unless otherwise approved or required, concrete pavement shall be removed to the nearest expansion or contraction joint. The Contractor shall contact the Public Works Director and/or SCDOT's District Engineer for determination of the limits of concrete replacement and location of joints. Work procedures shall be such to prevent damage to surrounding pavement.

c) Bituminous pavement shall be cut in a smooth and straight line. Sawing is required on asphaltic concrete. The width of the pavement left between the edge of the ditch and the existing edge of pavement or the front line of the gutter, shall be at least 2 feet. Residual strips of pavement less than 2 feet in width must be removed and replaced. Existing pavement shall be removed on each side of the trench for at least 12-inches beyond the top of trench.

3. **RESTORATION:** Restoration of the paved surface shall be in accordance with the following specifications:

a) **CONCRETE PAVEMENT:** The concrete used to restore pavement shall have a minimum 28-day compressive strength of 3000 psi. The concrete shall conform to the shape, grad, and finish of the existing pavement and will be 1-inch deeper than the original pavement, including base, but in no instance less than 6 inches.

b) **ASPHALT PAVEMENT:** All material above the sub-base level shall be hot-mix bituminous concrete conforming to the SCDOT Standard Specifications for Roads and Structures for both mix design and placement. The asphalt pavement as placed shall be 1-inch deeper than the original pavement, including base, but in no instance less than 6 inches within City-maintained roadways or eight inches in state-maintained roadways. The asphalt shall be placed in lifts not greater than 4 inches and shall not be hot-mix bituminous concrete binder, Type H. The last 2 inches in either instance shall be bituminous plant mix (Type C – surface course) suitable to the appropriate controlling agency. Type C asphalt pavement surfacing will be placed with paving machines and/or rollers of a size and type currently approved by the SCDDOT for use on resurfacing contracts.

(1) If bituminous surfacing overlays a concrete base, the Contractor, at the option of the Engineer, shall replace the concrete to its original thickness or to a level 2-inches below the finished surface. The Engineer may direct the Contractor to omit all concrete and to replace the pavement with bituminous materials.

(2) Tack coats shall be employed with each lift. Tack coats shall be placed on both horizontal and vertical surfaces (pavement cuts or faces of concrete gutters).

(3) Under normal conditions, asphalt binder will be placed in pavement cuts at the end of each workday. Following completion of pipeline construction along a continuous section of pavement, 1 to 2 inches shall be replaced weekly or within five days. During inclement weather, the Engineer may permit the use of temporary asphalt (cold Mix) to seal the trench until permanent asphalt can be placed.

(4) All pavement markings are to be restored.

4. **DAMAGE TO ADJACENT PAVEMENT:** The pavement adjacent to pipeline trenches must not be disturbed or damaged. If the adjacent pavement is disturbed or damaged, irrespective of cause, the Contractor shall remove the damaged pavement and shall replace with new pavement at his own expense

V. **RECORD/AS-BUILT DRAWINGS:** The Contractor is to keep a set of approved Construction Drawings on site to make notes to facilitate the preparation as-built/record drawing information for the sewer

infrastructure being installed. Notes taken during construction shall include but is not limited to field changes to the horizontal alignment or grades of the infrastructure being installed, sanitary sewer service locations (station along sewer main), description, size and location (station and elevation(s)) of all underground utility crossings encountered during the construction work, location of bedrock encountered and removed, and other pertinent information.

1. The Contractor shall supply a copy of the field noted drawings to the engineer, along with surveyed as-built/record drawings (signed and sealed by a South Carolina Licensed Surveyor). Surveyed as-built/record drawings shall include the location and elevations of all manholes (rim and invert elevations), locations of service lateral cleanouts (station and offset) and calculated pipe grades. Stations of all service lateral wyes and/or connections and station and elevation of all utilities encountered during the sewer installation shall be incorporated in the drawings. Engineer shall provide to City a hard set (bond and Mylar) of as-built drawings and digital set (in .pdf and .dwg formats) prior to receiving final approval of the project.
2. The Contractor is to provide video imagery from closed-circuit television (CCTV) inspection of the newly installed sanitary sewer infrastructure. The video is to be provided to the Engineer of Record for the project, who is to review it for abnormal or defective structures, infiltration, joint offsets, unacceptable slope conditions, and any other instances of unsatisfactory construction. Engineer of Record is to prepare a sealed letter report to the City stating that there are no abnormalities, deficiencies, or unsatisfactory conditions found in the new infrastructure.
3. The Builder shall field verify the sewer service locations relative to the finished floor elevations of the building prior to installing the service.
4. Prior to receiving a Certificate of Occupancy on a building, residence, structure, or portion thereof that contains a connection to the City's sewer system, the Plumber shall provide to the City Utilities Department video imagery of the newly installed sanitary sewer service infrastructure to the sewer main.
5. As-built/record documentation is required for pump stations and low pressure sewer system. Please see those sections for additional requirements.

W. **WARRANTY:** The Work shall be free of defects in material and workmanship for a two-year period from the date of acceptance, which is defined as either the date of signature by the City Engineer on the Final Plat or as referenced in correspondence by the City Engineering Division. If neither date can be identified, the date shall be the issuance date for the SCDHEC Permit to Operate.

IV. SANITARY SEWER PUMP STATIONS

A. PURPOSE:

1. GENERAL: These standards address the City's minimum requirements for operation and control of connecting pump stations and include guidelines for sizing new wet wells to accommodate the service conditions. Standards for hydrogen sulfide control for connecting pump stations are also included herein.
2. OBJECTIVES: The objectives of these supplemental standards are as follows:
 - a) Control connecting pump station operations to prevent simultaneous operation with the pump station upstream of the connection point.
 - b) Minimize number of connecting pumping stations
 - c) Minimize hydrogen sulfide formation in the City's collection system.
 - d) It is the City's intent to minimize the number of new sewage pump stations connecting to the City's wastewater system. Since it is required to coordinate pump station operations to mitigate the sewer system capacity deficit, the addition of numerous small pump station connections will complicate the City's proposed plan.
3. REQUIREMENTS: All materials, equipment, and labor for submersible pump station construction shall be furnished in accordance with these specifications and in accordance with the Construction Drawings prepared by a registered Professional Engineer licensed to practice in the state of South Carolina.

B. DESIGN REQUIREMENTS:

1. APPLICABLE REGULATIONS AND STANDARDS: The design and construction of sewage pump stations shall comply with all applicable City of Rock Hill and SCDHEC standards contained in Regulation 61-67.300. Related buildings and structures shall comply with the Building Officials Conference of America (BOCA) and permitting requirements of the City Planning and Development department. Other standards governing facilities, materials, and construction shall include, but not limited to the following:
 - a) American Society for Testing and Materials (ASTM)
 - b) American National Standards Institute (ANSI)
 - c) America Water Works Association (AWWA)
 - d) Factory Mutual (FM)
 - e) Hydraulic Institute Standards (HIS)
 - f) Institute of Electrical and Electronic Engineers (IEEE)
 - g) Joint Industrial Council (JIC)
 - h) National Electric Code (NEC)
 - i) National Electric Manufacturers Association (NEMA)
 - j) National Fire Protection Association (NFPA)
 - k) National Institute for Occupational Safety and Health (NIOSH)

- l) National Machine and Tool Builders Association (NMTBA)
- m) Occupational Safety and Health Administration (OSHA)
- n) Ten States Standards
- o) Underwriters' Laboratory (UL)

2. **DESIGN ENGINEER:** It is the responsibility of the design engineer to determine the applicability of the design standards and to integrate all applicable criteria and guidelines for sewage pump stations to be connected into the City sewer system.

3. **GENERAL:** Pumping systems shall be designed to serve the upstream basin service area and to achieve a minimum cleansing velocity of 2.5 fps and a maximum design velocity of 6 fps. Wetwells and force mains shall be constructed to serve the entire basin. Pumps may be sized for the development being served, with future developments being required to include the necessary upgrades for additional flows. Arc-flash study to be completed and appropriate labels placed on panels. Contractor to furnish permanent signage for confined space.

4. **PUBLIC WATER:** City water shall be installed at all pump stations. At a minimum, access to City water shall be through an on-site yard hydrant.

C. PRE-APPROVAL OF PUMP STATION:

1. To minimize the number of pump stations connecting to the City's collection system, the design engineer shall prepare an evaluation of wastewater collection options for existing and future developments in the vicinity of the proposed development. The evaluation shall consider:

- a) Adjacent drainage areas that can potentially be served by a new sewage pump station, including estimated flow projections and future pump station upgrades.
- b) Connection to an existing pump station, including additional force main length and necessary improvements to the pump station to accept additional flow.

2. Three (3) originals of the evaluation shall be submitted to the City Engineer for review at the preliminary design phase for the project and is required for pre-approval of new sewage pump stations.

3. Design flow for determining pumping station capacity shall be based on peak hourly flow in accordance with the SCDHEC regulations. Information for existing pump stations and possible future developments can be obtained from the City.

4. Additional design will be required to address provisions for emergency pumping for wet wells that are greater than 20 feet in depth. These additional provisions and any associated protocol shall be approved by the City Engineer prior to approval of the pump station use.

D. PUMP STATION SITE:

1. Site shall be designed such that pad and fenced area can accommodate a boom truck to remove the pumps from the wet well.

2. A minimum 60-foot by 60-foot fenced area with a 12-foot entrance gate shall be provided.
3. Access drive shall be paved.
4. An area around the fence shall be provided to meet screening requirements if adjacent to a residential development.

E. **WET WELL CAPACITY:**

1. **GENERAL:** The pumping station wet well shall be sized to accommodate the influent sewer and pump suction piping or pump submergence as recommended by the HIS. Since pumping shall be restricted when the upstream pump station pumps are running, additional storage capacity shall be provided to contain wastewater generated during the required pump-off time. Guidelines for determining the required working and storage volumes are given below.

2. **WORKING VOLUME:**

- a) Required Working volume and preferred distances between sewer and control elevations shall be determined as follows:

- (1) Working Volume (in gallons) = $TQ/4$; the volume between the elevations of the lead pump on and lead pump off.

- (2) With T = Minimum time between motor starts or 7 minutes, whichever is greater; For pumps greater than 30 horsepower, minimum cycle shall be 12 minutes.

- (3) Q = Ultimate design discharge rate of one pump (lead pump) in operation, gallons per minute (gpm)

- b) Working volume shall allow no more than 3 or 4 pump cycles considering the minimum cycle time recommended by the pump manufacturer.

- c) Filling rate shall not exceed 30 minutes at the design average flow rate, unless the facility is designed for storage as described in the following section.

- d) Minimum inside width or diameter shall be 8 feet. Considerations shall include retention time and pipe/pump configuration and equipment access.

- e) Minimum elevation difference between influent sewer and high water alarm shall be 18 inches.

- f) Minimum elevation difference between control elevations shall be 6 inches.

- g) Minimum elevation difference between Lead Pump On and bottom of wet well shall be as required for submergence of pumps or pump station.

- (1) As a guideline for determining pump suction pipe submergence, provide 1-foot of submergence for each foot per second (fps) of velocity at the suction pipe

inlet. Maximum intake velocity shall not exceed 6 fps.

3. STORAGE VOLUME:

a) Storage volume shall be provided in the wet well for containment of wastewater generated during controlled pump-off periods or for emergency storage. Storage volumes shall be determined as described below.

b) Controlled Pump-Off Storage

(1) For pumping stations connecting to the City's collection system, sufficient storage volume shall be provided in the wet well between the pump-on and high water levels for containment of wastewater generated when the pump station upstream of the pump station's force main connection is operating (controlled pump-off storage). The volume shall be computed from the maximum pump-on time for the upstream pump station and the peak design flow to the pump station.

(2) Cycle times for the City's pump stations are extremely variable. However, it can be assumed that pump station pump-on time will generally be approximately 3 minutes to an estimated maximum of 10 minutes (subject to verification by the City). Therefore, storage shall be provided for 10 minutes (subject to verification by the City) of generated wastewater at the design peak flow rate. If emergency storage is provided, as described below, the emergency storage volume can be considered to meet the controlled pump-off storage requirement.

c) Emergency Storage

(1) In accordance with SCDHEC regulations, auxiliary power using either two separate power substation connections or an on-site standby generator shall be provided for sewage pump stations. For emergency storage, additional volume shall be computed for the projected flow from the community during the longest reported power outage in the last five (5) years, excluding power outage from a catastrophic storm. As a minimum, the City requires storage for a two-hour period.

4. TOP SLAB: The top slab elevation shall be at least 2-feet above the 100-year water surface elevation.

F. PUMP STATION CONTROL AND MONITORING:

1. All new pump stations in the City's sewer collection system shall install computerized supervisory control and data acquisition (SCADA) system equivalent and compatible to the system the City is using at the time of construction.

G. HYDROGEN SULFIDE AND ODOR CONTROL:

1. Control Measures shall be provided at pump stations to minimize the release of odorous gases and the effects of hydrogen sulfide (H₂S) on downstream infrastructure. Such measures are required for the following conditions:

a) Condition 1 - For wet wells with a filling rate in excess of 20 minutes at average flow, including initial flows, it shall be assumed that there is potential for septicity and resulting odors.

b) Condition 2 - For force mains with greater than two-hour detention time, it shall be assumed that H₂S will be produced at a level greater than 5 parts per million (ppm).

c) Condition 3 - For pump stations receiving flow from intermediate pump stations or grinder pump systems, it shall be assumed that sufficient H₂S will be present in the incoming wastewater to cause corrosion and odors at the pump station.

2. It is the responsibility of the design professional to determine the conditions at the proposed pump station. Analyses shall be prepared and submitted for the City's review with the preliminary design submittal, and shall consider conditions ranging from initial operation to build-out.

3. The following control measures shall be provided at pump stations meeting the above conditions.

a) Condition 1

(1) Provide either continuous or intermittent mechanical ventilation of wet well. Air shall be forced into the wet well with a fan. Provide a timer for normal operation. Provide a limit switch to energize the fan whenever the entrance hatch is opened.

(2) The fan shall be sized to provide a minimum of 30 complete air changes per hour with continuous operation for worker safety. Timer operation of the fan shall allow a minimum of 2 complete air changes per hour.

(3) The fan shall be direct drive. If the fan is installed outdoors, the fan assembly and housing shall be of corrosion resistant and weather-proof construction.

(4) Exhaust from the wet well shall be passed through a biofilter before released to the atmosphere. The biofilter shall be composed of suitable organic media with embedded air distribution system and sized in accordance with the Standard Detail.

b) Condition 2

(1) Provide chemical dosing system. Equipment shall include chemical metering units, storage facilities, and related piping and controls to feed chemical solution into pump station wet well. Chemicals for H₂S control shall be approved by City Engineer.

(2) Dosing Rates shall be as specified by the manufacturer

c) Condition 3

(1) Provide mechanical ventilation and exhaust air treatment as described for

Condition 1 and chemical dosing as described for Condition 2.

4. Wet well structures shall be lined with Ultra-High Build Epoxy Coating System Raven 405 by Raven Lining Systems, or approved equal, at a minimum dry-film thickness of 125 mils, installed per the manufacturer's instructions.

H. MATERIAL SPECIFICATIONS:

1. DESCRIPTION: All materials, equipment, and labor for submersible pump station construction shall be furnished in accordance with these specifications and in accordance with the Construction Drawings prepared by a Registered Professional Engineer licensed to practice in the state of South Carolina.

2. SYSTEM DESCRIPTION:

- a) Contractor shall furnish and install one electric submersible non-clog wastewater pump station. The station shall be complete with all equipment and appurtenances specified herein and approved by the City. See Standard Detail for typical layout.

- b) Principle items of equipment shall include two electric submersible pumps (minimum) to be supplied with motor, close-coupled volute, ductile iron discharge elbow, guide bar brackets, power cable and accessories necessary for wet pit installation, on-site generator, monitoring and control equipment, and all other appurtenances as show on the Standard Details. All hardware, including anchors, bolts, etc., shall be 316 stainless steel.

- c) All items associated with the pumps and tier installation and operation shall be provided by the pump manufacturer, unless specified elsewhere. Other items, such as the on-site generator, valves and piing, etc., may be supplied by others.

3. PERFORMANCE CRITERIA:

- a) Pumps must be designed to handle raw, unscreened, domestic sanitary sewage. Each pump shall be selected to perform under operating conditions base on, but not limited to the following:

- (1) Capacity (gpm)
 - (2) Total Dynamic Head (ft)
 - (3) Total Discharge Head (ft)

- b) Site power furnished to pump station shall be three phase, 60 hertz, 460 volts, four wire maintained within industry standards. Voltage tolerance shall be plus or minus 10 percent. Control voltage shall not exceed 132 volts.

4. SUBMITTALS:

- a) Product Data

(1) Prior to fabrication, the project's contractor or developer's representative, shall submit 3 copies of the manufacturer's data for review and approval. Submittal shall include shop drawings, electrical ladder logic drawings, and support data as follows: catalog cut sheets reflecting characteristics for major items of equipment (including control panels), materials of construction, major dimensions, motor data, pump characteristic curves showing the design duty point capacity (gpm), head (ft), net positive suction head required (NPSHr), and hydraulic brake power (HBP). Electrical components used in the motor branch and liquid level control shall be fully described.

(2) Prior to fabrication, the project's contractor or developer's representative, shall submit 3 copies of the on-site generator manufacturer's data for review and approval.

(3) Prior to fabrication, the project's contractor or developer's representative, shall submit 3 copies of the SCADA system manufacturer's data for review and approval. The submittal data shall include, but not be limited to, the RTU Communication's Study.

b) Operation Maintenance Manuals

(1) Installation shall be in accordance with written instructions provided by the pump station equipment manufacturer(s). Comprehensive instructions supplied at time of shipment shall enable personnel to properly operate and maintain all equipment supplied. Content and instructions shall assume operating personnel are familiar with pumps, motors, piping and valves, but lack experience on exact equipment supplied. A minimum of three (3) printed copies and one (1) digital version of the manual shall be provided to the City.

(2) Documentation shall be specific to the pump station and collated in functional sections. Each section shall combine to form a complete system manual covering all aspects of equipment supplied by the station manufacturer. Support data for any equipment supplied by others, even if mounted or include in overall station design, shall be provided by those supplying the equipment. Instructions shall include the following as a minimum.

(a) Functional description of each major component, complete with operating instructions.

(b) Instructions for operating pumps and pump controls in all modes of operation.

(c) Calibration and adjustment of equipment for initial start-up, replacement of level control components or as required for routine maintenance.

(d) Support data for commercially available components not produced by the station manufacturer, but supplied in accordance with the specifications, shall be supported by literature from the prime manufacturer and incorporated as appendices.

(e) Electrical schematic diagram of the pump station circuits shall be in accordance with NMTBA and JIC standards. Schematics shall illustrate, to the extent of authorized repair, pump motor branch, control and alarm system circuits including interconnections. Wire numbers and legend symbols shall be shown. Schematic diagrams for individual components, not normally repairable by the station operator, need not be included. Details for such parts shall not be substituted for an overall system schematic. Partial schematics, block diagrams, and simplified schematics shall not be provided in lieu of an overall system diagram.

(f) Mechanical layout drawing of the pump station and components, prepared in accordance with good commercial practice, shall provide installation dimensions and location of all pumps, motors, valves and piping.

(3) Operation and maintenance instructions, which rely on vendor cut-sheets and literature, which include general configurations, or require operating personnel to selectively read portions of the manual shall not be acceptable. Operation and maintenance instructions must be specific to equipment supplied in accordance with these specifications.

5. QUALITY ASSURANCE:

a) Upon request from the engineer, the pump station equipment manufacturer(s) shall prove financial stability and ability to produce the station within the specified delivery schedules. Evidence of facilities, equipment and expertise shall demonstrate the manufacturer's commitment to long term customer service and product support.

b) The pumps shall be heavy-duty, electric submersible centrifugal non-clog units designed for handling raw, unscreened sewage and wastewater. The pumps shall be capable of pumping a 3.0" spherical solid.

c) The pumps provided shall be capable of operating in an ambient liquid temperature of 104 degrees F as specified by NEMA and FM.

d) The pump and motor unit shall be suitable for continuous operation at full nameplate load while the motor is completely submerged, partially submerged or totally non-submerged. The use of shower systems, secondary pumps or cooling fans to cool the motor is not acceptable.

e) The pump, mechanical seals and motor units provided under this specification shall be from the same manufacturer in order to achieve standardization of operation, maintenance, spare parts, manufacturer's service and warranty.

f) The manufacturer's technical representative shall inspect the completed installation, correct or supervise the correction of any defect or malfunction, and instruct operating personnel in the proper operation and maintenance of the equipment.

6. MANUFACTURER'S WARRANTY:

a) The pump station equipment manufacturer(s) shall warrant all equipment to be of quality construction, free of defects in material and workmanship. A written warranty shall include specific details described below:

(1) All equipment, apparatus, and parts furnished shall be warranted for one year, excepting only those items normally consumed in service, such as light bulbs, oils, grease, packing, gaskets, O-rings, etc. The pump manufacturer shall be solely responsible for warranty of the pumps and all its supplied components.

(2) The pump shaft seal shall be warranted for a minimum of four years from the date of shipment. Should the seal fail within the first year, the manufacturer shall furnish a new seal, without charge to the owner, F.O.B. factory. The warranty replacement cost for seals after the first year will be pro-rated as follows:

<u>Failure Within</u>	<u>Percent New Price</u>
2 years	75%
3 years	50%
4 years	25%

(3) Components failing to perform as specified by the engineer, or as represented by the manufacturer, or as proven defective in service during the warranty period, shall be replaced, repaired, or satisfactorily modified by the manufacturer without cost of parts or labor to owner.

b) The warranty provided by the developer to the City shall become effective upon the issuance of a Permit to Operate by SCDHEC.

7. UNITARY RESPONSIBILITY - In order to unify responsibility for proper operation of the pump station, it is the intent of these specifications that all system components associated with the pumps (pumps, motors, installation hardware and controls, etc.) be furnished by a single manufacturer (unitary source) approved by the City. The system must be of standard catalog design, totally warranted by the manufacturer. Under no circumstances will a system consisting of parts compiled and assembled by a manufacturer's representative or distributor be accepted.

8. PUMP DESIGN:

a) The pumps shall be automatically and firmly connected to the discharge connection, guided by no less than two guide bars extending from the top of the station to the discharge connection. There should be no need for personnel to enter the wet well.

b) Sealing of the pumping unit to the discharge connection shall be accomplished by a machine metal-to-metal watertight connection.

9. PUMP CONSTRUCTION:

a) Major pump components shall be of gray cast iron, ASTM A48, Class 35B, with smooth surfaces devoid of blow holes or other irregularities.

b) All exposed nuts or bolts shall be ANSI type 304 stainless steel construction. All

metal surfaces coming into contact with the pumpage, other than stainless steel or brass, shall be protected by a factory applied spray coating of acrylic dispersion zinc phosphate primer with a polyester resin paint finish on the exterior of the pump.

c) Critical mating surfaces where watertight sealing is required shall be machined and fitted with Nitrile or Viton rubber O-rings. Fittings will be the result of controlled compression of rubber O-rings in two planes and O-ring contact of four sides without the requirement of specific torque limit.

d) The cable entry shall consist of a single cylindrical elastomer grommet, flanked by washers, all having a close tolerance fit against the cable outside diameter and the entry inside diameter and compressed by the body containing a strain relief function, separate from the function of sealing the cable.

10. MOTOR:

a) The pump motor shall be induction type with a squirrel-cage rotor, shell-type design, housed in an air filled, watertight chamber, NEMA B type.

b) The stator windings and stator leads shall be insulated with moisture resistant Class F insulation rated for 155 degrees C (311 degrees F). The stator shall be dipped and baked three times in Class F varnish and shall be heat-shrink fitted into the stator housing.

c) The motor shall be designed for continuous duty handling pumped media of 40 degrees C (104 degrees F) and capable of up to 15 evenly spaced starts per hour.

d) The motor and pump shall be designed and assembled by the same manufacturer.

e) The motor horsepower shall be adequate so that the pump is non-overloading throughout the entire pump performance curve from shut-off through run-out.

11. IMPELLER:

a) The impeller shall be of gray cast iron, Class 35B, dynamically balanced, double-shrouded non-clogging design having a long through-let without acute turns.

b) The impeller shall be capable of handling 3" spherical solids, fibrous materials, heavy sludge and other matter found in wastewater.

c) All impellers shall be coated with acrylic dispersion zinc phosphate primer.

12. ELECTRICAL CONTROL COMPONENTS:

a) Electrical control equipment shall be mounted within a NEMA 1 steel, dead-front type, control enclosure. Door shall be hinged and sealed with a neoprene gasket and equipped with captive closing hardware. Control components shall be mounted on a removable steel back panel secured to enclosure with collar studs. All control devices and instruments shall be mounted using threaded fastener, and shall be clearly labeled to indicate function.

b) Pump Station controls shall conform to third party safety certification. The enclosure and all components mounted on the subpanel or control cover shall conform to UL descriptions and procedures.

c) Motor branch components to be of highest industrial quality, secured to the subplate with machine screws and lockwashers. Mounting holes shall be drilled and tapped; Self-tapping screws shall not be used to mount any component.

d) A properly sized heavy-duty circuit breaker, with RMS interrupting rating of 14,000 amperes at 460 volts, shall be furnished for each pump motor. The circuit breakers must be sealed by the manufacturer after calibration to prevent tampering. An operating mechanism installed on each motor circuit breaker shall penetrate the control panel door. A pad-lockable operator handle shall be secured on the exterior surface. Interlocks must prevent opening the door until circuit breakers are in the "OFF" position.

e) An open-frame, across-the-line, MENA-rated magnetic starter with under-voltage release, and overload protection on all three phases, shall be furnished for each pump motor. Starters of NEMA size 1 and above shall allow addition of at least two auxiliary contacts. Starters rated "0", "00", or fractional sizes are not acceptable. Power contacts to be double-break type made of cadmium oxide silver. Coils to be epoxy molded for protection from moisture and corrosive atmospheres. Contacts and coils to be easily replaceable without removing the starter from its mounted position. Each starter shall have a metal mounting plate for durability. Overload relays to be block-type with melting alloy spindles, having visual trip indication with trip free operation. Pressing the overload-reset lever shall not actuate the control contact until after the overload spindle has reset. Resetting the overload reset lever will cause a snap-action control and not convertible to automatic reset. Trip settings shall be governed by the heater element only, and not by adjustable settings. Heater elements must provide NEMA Class 20 trip times, selected in accordance with actual motor nameplate data. An overload-reset pushbutton, mounted through the control panel door, shall permit resetting the overload relays without opening the control panel door.

f) The control panel shall be equipped with a secondary lightning arrestor to minimize damage to the pump motors and control from transient voltage surges. The arrestor shall utilize silicon-oxide varistors encapsulated in a non-conductive housing. The arrestor shall have a current rating of 60,000 amps, a Joule rating of 1500.

g) The control panel shall be equipped to monitor the incoming power and shut down the pump motors when required to protect the motor(s) from damage caused by phase reversal, phase loss, low voltage, and voltage unbalance. An integral time delay shall be provided to minimize nuisance trips. The motor(s) shall automatically restart when power conditions return to normal.

h) Control Circuits

(1) A normal-duty thermal-magnetic circuit breaker shall protect all control circuits by interrupting control power.

(2) Pump mode selector switches shall permit manual start or stop of each pump set individually, or permit automatic operation under control of the liquid level control system. Manual operation shall override all shutdown systems, except

the motor overload relays. Selector switches to be heavy-duty, oil-tight design with contacts rated NEMA A300 minimum.

(3) Pump alternator relay to be electro-mechanical industrial design. Relay contacts to be rated 10 amps minimum at 120 volts non-inductive. A switch shall permit the station operator to select automatic alteration of pumps, to select pump set number to be "lead" for each pumping cycle, or to select pump set number two to be "lead" pump for each pumping cycle.

(4) Six-digit elapsed time meter (non-reset type) shall be provided for each pump set to indicate total running time of each pump set in "hours" and "tenths of hours." A pilot light shall be wired in parallel to indicate that the motor is energized and should be running.

(5) A high pump temperature protection circuit shall override the level control and shutdown the pump motor(s) when required to protect the pump from excessive temperature. A thermostat shall be mounted on each pump casing and connected to a high pump temperature shutdown circuit. If casing temperature rises to a level sufficient to cause damage, the thermostat causes the pump shutdown circuit to interrupt power to the motor. A visible indicator located on the control panel door shall indicate motor stopped due to high pump temperature. The motor shall remain locked-out until the pump has cooled and circuit has been manually reset. Automatic reset of the circuit is not acceptable.

(6) A duplex ground fault receptacle providing 115 VAC, 60 Hz, single phase current, will be mounted on the side of the control enclosure. Receptacle circuit shall be protected by a 15 amp thermal-magnetic circuit breaker.

13. AUXILIARY POWER TRANSFORMER CONTROLS AND ACCESSORIES:

a) The pump station shall be equipped with a 3 KVA step-down transformer to supply 115 volt, AC, single-phase for the control and auxiliary equipment. The primary and secondary side of the transformer to be protected by a thermal magnetic circuit breaker sized to meet the power requirements of the transformer. An operating mechanism shall penetrate the control panel door, and a pad-lockable operator handle shall be secured on the exterior surface. Interlocks must prevent opening the door until circuit breakers are in "OFF" position.

b) All wiring, workmanship and schematic wiring diagrams shall comply with applicable standards and specifications of the NEC. All user serviceable wiring shall be type MTW or THW, 600 volts, color coded as follows:

(1)	Line and Load Circuits, AC or DC power	Black
(2)	AC Control Circuit Less than Line Voltage	Red
(3)	DC Control Circuit	Blue
(4)	Interlock Control Circuit from external source	Yellow
(5)	Equipment Grounding Conductor	Green
(6)	Current Carrying Ground	White
(7)	How With Circuit Breaker Open	Orange

c) Control circuit wiring inside the panel, with exception of internal wiring of individual component, shall be 16-gauge minimum, type MTW or THW, 600 volts. Power wiring to be 14-gauge minimum. Motor branch wiring shall be 10-gauge minimum. Motor branch and other power conductors shall not be loaded above 60 degrees C temperature rating, on circuits of 100 amps or less, nor above 75 degrees C on circuits over 100 amps. Wires must be clearly numbered at each end in conformance with applicable standards. All wire connectors in the control panel shall be ring tongue type with nylon-insulated shanks. All wires on the sub-plate shall be bundled and tied. All wires extending from components mounted on door shall terminate at a terminal block mounted on the back panel.

d) All wiring outside the panel shall be routed through conduit. Control wires connected to door mounted components must be tied and bundled in accordance with good commercial practice. Bundles shall be made flexible at the hinge side of the enclosure. Adequate length and flex shall allow the door to swing full open without undue stress abrasion. Bundles shall be held on each side of hinge by mechanical fastening devices. factory installed conduit shall conform to following requirements:

- (1) All conduit and fittings to be US listed.
- (2) Liquid-tight flexible metal conduit to be constructed of smooth, flexible galvanized steel core with smooth abrasion resistant, liquid tight polyvinyl chloride cover.
- (3) Conduit to be supported in accordance with articles 346, 347, and 350 of the NEC.
- (4) Conduit shall be sized according to the NEC.

e) Station manufacturer shall ground all electrical equipment inside the pump station to the control panel back plat. All paint must be removed from the ground-mounting surface before making final connections. The contractor shall provide an earth driven ground connection to the pump station at the main grounding lug in accordance with the NEC.

f) Permanent corrosion resistant name plate(s) shall be attached to the control and include the following information:

- (1) Equipment serial number
- (2) Supply voltage, phase and frequency
- (3) Current rating of the minimum main conductor
- (4) Electrical wiring diagram number
- (5) Motor horsepower and full load current
- (6) Motor overload heater element
- (7) Motor circuit breaker trip current rating

(8) Name and location of equipment manufacturer

g) Control components shall be permanently marked using the same identification keys shown on the electrical diagram. Labels shall be mounted adjacent to device being identified. Switches, indicators, and instruments mounted through the control panel door shall be labeled to indicate function, position, etc. Labels shall be mounted adjacent to, or above the device.

h) Liquid Level Monitoring Control

(1) The level monitoring and control system shall start and stop the pump motors in response to changes in wet wall level, as set forth herein.

(2) The level monitoring and control system shall be capable of operating as a conductivity probe-type system for liquid level control and with a float-ball system for high and low level alarms, as manufactured by ITT Flygt, DEVAR Inc., or manufacturer approved equal by the City.

(3) The level control system shall utilize the alternator relay to select first one pump set, then the second pump set, to run as lead pump for a pumping cycle. Alternation shall occur at the end of a pumping cycle.

(4) The level control system shall be provided with pump start and stop delays to prevent simultaneous motor starts and to reduce the potential of hydraulic surges during motor shutdown.

(5) The level control system shall utilize the conductivity probe-type system which shall continuously monitor the wet well level, permitting the operator to read wet well level at any time. Upon operator selection of automatic operation, conductivity probe-type system shall start the motor for one pump set when the liquid level in the wet well rises to the "lead pump start level". When the liquid is lowered to the "lead pump stop level", the conductivity probe-type system shall stop these pumps. These actions shall constitute one pumping cycle. Should the wet well level continue to rise, the conductivity probe-type system shall start the second pump set with the liquid reaches the "lag pump start level" so that all pumps are operating. These levels shall be adjustable as described below.

(6) The conductivity probe-type system shall include integral components to perform all pressure sensing, signal conditioning. EMI and RFI suppression. DC power supply and 120 volt outputs. Components shall be solid state, and shall be integrated with other components to perform as described below.

(7) The conductivity probe-type system shall be capable of operating on a supply voltage of 108 volts to 132 volts AC, 60 Hz, in an ambient temperature range of -10 degrees C (14 degrees F) through +55degrees C (131 degrees F). Control range shall be 0 to ----.0 feet of water with an overall repeat accuracy of ± 0.1 feet of water. Memory shall be retained using a non-volatile lithium battery back-up.

(8) The conductivity probe-type system shall consist of the following integral components, display, and output relays:

- (a) The conductivity probe-type system shall incorporate a digital back-lighted LCD panel display which, upon operator selection, shall indicate liquid level in the wet-well, and the preset start and stop level for both lead and lag pumps. The display shall include 20 0.19-inch high alphanumeric characters calibrated to read out directly in feet of water, accurate to within one-tenth foot (0.1 foot), with a full-scale indication of not less than 12 feet. The display shall be easily convertible to indicate English or metric units.
- (b) Level adjustments shall be electronic comparator set points to control the levels at which the lead and lag pumps start and stop. Each of the level settings shall be adjustable and accessible to the operator without opening the cover panel. Controls shall be provided to permit the operator to read the selected levels on the display. Such adjustments shall not require hard wiring, the use of electronic test equipment, or artificial level simulation.
- (c) An alarm silence pushbutton and relay shall be provided to permit maintenance personnel to de-energize the audible alarm device while corrective actions are underway. After silencing the alarm device, manual reset of the alarm condition shall clear the alarm silence relay automatically. The pushbutton shall be oil-tight design with contacts rated NEMA A300 minimum.
- (d) Station manufacturer will supply on 1515-volt AC alarm light fixture with vapor-tight red globe, guard, conduit box, and mounting base. The design must prevent rain water from collecting in the gasketed area of the fixture, between the base and globe. The alarm light will be shipped loose for installation by the contractor.
- (e) Station manufacturer will supply on 115-volt AC Weatherproof alarm horn with projector, conduit box, and mounting base. The design must prevent rain water from collecting in any part of the horn. The alarm horn will be shipped loose for installation by the contractor.
- (9) The level control system shall be provided with two (2) submersible switches to serve as high-level and low-level alarms. When tripped, the high-level float will initiate local and SCADA alarms and attempt to start both the lead and standby pumps. When tripped, the low-level float will initiate local and SCADA alarms and attempt to de-energize all pumps.
- (a) Switches shall have the ability to be wired as either NO or NC and provided with 100 feet of cable, unless otherwise specified by the design engineer.
- (b) Switches shall be Flygt type ENM-10 582 8836, or approved equal
- (c) Provide 4-float, T-type bracket with cord snubbers to mount to wall or wet well and hand switches. Bracket shall be constructed of 304 stainless steel and include 316 stainless steel mounting hardware.

i) Telemetry - Each pump station shall be supplied with a SCADA RTU. The work to be accomplished under this specification shall consist of furnishing the equipment necessary for modifying the existing automatic control and monitoring system. The equipment shall be designed, fabricated, programmed, tested, started-up, and warranted by a single supplier.

j) On-site Generator System

(1) General

(a) All pump stations shall have an automatic standby power generation system conforming to these specifications

(b) The system shall consist of a diesel-fueled standby generator in a weather proof enclosure complete with all equipment and accessories required to automatically supply power to the pump station during a utility power failure. The engine generator set shall start the two wastewater pumps in sequence and will run both simultaneously under full load. Simultaneous starting is not required.

(c)

(2) Engine

(a) Engine block material: cast iron

(b) Cylinder head material: cast iron

(c) Crankshaft material: Hardened steel

(d) Pistons: Aluminum alloy

(e) Valve seats: Replaceable

(f) Maximum rate RPM: 1800

(3) Engine Governor

(a) Type: Mechanical

(b) No-load to full load frequency regulation: 5.0%

(c) Steady state regulation: $\pm 0.33\%$

(d) Over-speed shutdown: Automatic solid state

(4) Engine Lubrication System

(a) Oil pump: Gear type

(b) Oil filter: Full-flow cartridge

- (c) Low-oil pressure shutdown: Automatic
- (5) Engine Cooling System
 - (a) Type of system: Pressurized, closed recovery
 - (b) High temperature shutdown: Automatic
 - (c) Low coolant level shutdown: Automatic
 - (d) Fan: Pusher type with guard
 - (e) Engine block heater: 1000 watts (min), 120 VAC, thermostatically controlled
 - (f) Coolant: Water/ethylene glycol (-34 degree protection)
- (6) Engine Fuel System
 - (a) Fuel: #2 Diesel
 - (b) Fuel filter: 5 micron
 - (c) Injection type: Direct
 - (d) Fuel pump: Mechanical, engine driven
 - (e) Fuel tank: Integral, UL listed, double -walled, steel fuel storage
 - (f) Fuel tank capacity: 24 hours (min.) @ rated load
 - (g) Fuel tank accessories: Fuel level indicator; low-fuel indicator switch (on at 20% capacity); Screened vent for double wall cavity; and Drain port
- (7) Engine Exhaust System
 - (a) Silencer: Critical
 - (b) Mounting: External with weather cap
 - (c) Connection: Flexible stainless steel pipe
- (8) Engine Combustion Air Intake
 - (a) Air cleaner: Replaceable dry cartridge
- (9) Engine Electrical
 - (a) Starter motor: 12 or 24 volt

- (b) Battery charge alternator: 30 amp (min)
 - (c) Crank limiter: Solid state
 - (d) Battery: 2-12 volt (series or parallel, as appropriate)
 - (e) Battery mounting: Rack inside enclosure
 - (f) Polarity: Negative ground
 - (g) Standby charger: 10 amp, automatic float
- (10) Generator
- (a) General Specifications
 - (i) Generator type: 4 pole, revolving field
 - (ii) Output: 12 lead, re-connectable
 - (iii) Stator: "Skewed" design
 - (iv) Housing: Drip-proof design, self-ventilated
 - (v) Rotor insulation: Class F
 - (vi) Stator insulation: Class F
 - (vii) Bearings: Sealed, pre-lubed
 - (viii) Engine coupling: Direct, flexible disc
 - (ix) Protection: Output circuit breaker (manual reset)
 - (b) Generator Excitation:
 - (i) Exciter type: Brushless
 - (ii) Protection: Manual circuit breaker
 - (c) Generator Regulation
 - (i) Type: Solid state
 - (ii) Regulation: $\pm 2\%$ steady state
 - (iii) Voltage adjustment: 5% manual rheostat
 - (d) Generator Set Controls on Control Panel
 - (i) Engine Gauges: Oil pressure; Coolant temperature; and Battery charging ammeter
 - (ii) Annunciator: Low oil-pressure shutdown; high temperature/low coolant level shutdown; Overcrank shutdown; Overspeed shutdown; and Low fuel
 - (iii) Engine hour meter: 99,999.0 hour
 - (iv) Remote engine hour meter located at transfer switch: 99,999.0 hour
 - (v) Engine control switch: Off/Manual/Automatic
 - (e) Generator Controls and Indicators

- (i) Gauges: AC frequency; Output voltage; and Output current
 - (ii) Gauge Selector switch: 3 position with "OFF"
 - (iii) Manual voltage adjustment: Rheostat, 5% adjustment range
 - (f) Alarm Output Contacts
 - (i) Generator Fail
 - (ii) Generator Operating
 - (iii) Low Fuel
 - (iv) Alarm output contacts are to be wired to the local monitoring
 - (g) Generator Set Enclosure Mounting
 - (i) Access panels: Lockable (keyed alike), hinged and removable
 - (ii) Hardware: Stainless steel
 - (iii) Finish: Baked enamel over zinc-coated steel
 - (iv) Mounting: Welded steel base with vibration insulators
 - (v) Mounting location: Top of fuel tank
- (11) Automatic Transfer Switch
- (a) The automatic transfer switch to be supplied as part of the standby power system shall meet all applicable requirements set forth by the NEC and OSHA. The transfer switch shall also conform to the requirements specified below:
 - (b) Enclosure Mounting type: Surface
 - (c) Enclosure type: NEMA 3R, lockable
 - (d) Electrical Ratings
 - (i) Operating voltage: Compatible with station voltage
 - (ii) Operating current: No less than main disconnect
 - (iii) Withstand and closing rating: 10,000 amps, RMS, Symm. (min)
 - (e) Transfer Switch
 - (i) Operating mechanism: Single solenoid
 - (ii) Holding mechanism: Mechanical
 - (iii) Interlock: Mechanical and electric
 - (iv) Contact material: Silver alloy
 - (v) Neutral delay: 0.1-10 seconds
 - (f) Timer Setting Ranges

- (i) Utility dropout: 70-95%
- (ii) Utility pick-up: 70-95%
- (iii) Utility interrupt delay: 0.1-10 seconds
- (iv) Engine minimum run: 5-30 minutes
- (v) Engine warm-up: 5-180 seconds
- (vi) Return to utility delay: 1-30 minutes
- (vii) Engine cool-down: 1-30 minutes
- (viii) Standby voltage: 70-90%
- (ix) Standby frequency: 80-90%
- (x) Exerciser: Once per week

(g) Operation Selectors:

- (i) Exercise: With/Without load
- (ii) Engine warm-up bypass: On/Off
- (iii) Neutral delay: On/Off
- (iv) Mode Selector: Manual test/Standby/Off

(12) Standby Power System Capacity - The standby power system shall be capable of providing continuous standby power for the wastewater pump station. The generator set shall be capable of starting the two pump motor loads sequentially with the full miscellaneous load applied, with no more than 30% dip. ***The minimum acceptable generator set rating shall be 25 KW for any station.*** The Contractor shall coordinate the starting requirements of the exact pumps being furnished on the project with the generator set supplier to insure that the generator set has adequate motor starting capability.

(13) Installation - The generator set shall be mounted and anchored to a reinforced concrete pad, located to provide adequate access for fueling and services. The exact dimension of the pad, conduit entries and anchor bolts shall be based on the manufacturer's shop drawings. The pad shall have outer dimensions 1-foot greater than the footprint of the base tank, to provide 6 inches of exposure on all sides. The minimum thickness of the pad shall be 12 inches, with a single mat of #6 rebar, 12-inches OCEW and located in the lower third of the concrete thickness. The weight of the mounting pad shall be equal to or greater than the weight of the generator set. All exposed edges shall be chamfered or rounded with an edging tool.

(14) Tests - The Contractor shall provide start-up and testing services utilizing personnel specifically authorized to perform such services by the standby power system manufacturer. The start-up services shall be scheduled with the City with no less than 3-days' notice. The start-up and testing service shall include a complete inspection of the installation, initial break-in of the engine, testing the system performance, and servicing the engine. The following tests shall be performed in the presence of the City or its representative:

- (a) Generator output voltage unloaded and loaded, each phase, based on 2-hour load bank test.
- (b) Voltage dip as loads are applied

- (c) Complete operating sequence (simulated utility power failure and restoration)
 - (d) Pressure test engine cooling system for leaks
 - (e) Test battery charging systems
 - (f) Test operation of all safety systems
 - (g) Upon completion of break-in and testing, the engine shall be serviced as follows:
 - (i) Change engine oil and filter
 - (ii) Verify anti-freeze protection (-34 degrees F)
 - (iii) Refill fuel tank (tank shall be left full)
 - (iv) Check belt tension
 - (v) Check battery connections and state of charge
 - (h) During this start-up period, City maintenance personnel shall be fully instructed in the proper maintenance of the standby power system.
- (15) Manufacturer
- (a) The generator set, controls, and transfer switch shall be furnished by a single supplier. The generator set and accessory equipment shall be supplied by Caterpillar/Olympian, Onan/Cummings, Kohler, or approved equal.
 - (b) The supplier shall be the authorized dealer of the engine-generator set manufacturer, and shall be fully qualified and authorized to provide service and parts for the engine and generator at any time during the day or night. Parts and service shall be available 24-hours per day, 7 days per week, from a location within a 100-mile radius of the location of the installed generator set.
- (16) Shop Drawings - Prior to purchase of standby power generation equipment, the Contractor shall submit not less than four sets of data to the City for approval, including equipment data, accessories, sizing calculations, etc. as may be appropriate to determine compliance with these specifications.
- (17) Operating Instructions - Six (6) complete copies of operating instructions and parts list shall be provided prior to acceptance of the unit. Parts list shall include schedule of type and quantity of parts recommended for stock.
- (18) Spare Parts to be furnished
- (a) Engine fan & accessory drive belts: 1 set
 - (b) Oil, fuel and air filters: 2 sets

(c) Spare indicator lamps and fuses: 2 sets

(d) Spare parts shall be boxed and labeled with the pumps station identification

(19) Warranty - The complete standby power generating system shall be warranted for one year after the acceptance of the sewer pump station by the City. The warranty shall cover all defects in equipment, parts, assembly and installation. The warranty shall be issued in writing by the supplier and delivered to the City.

I. LOW PRESSURE SEWER SYSTEMS (LPSS):

1. LOCATION/APPROVAL:

a) Low pressure sewer systems (LPSS) are permitted in the Rock Hill service territory when approved by the Director of Water and Sewer Utilities in areas adjacent to Lake Wylie/Catawba River or in areas where gravity service would involve numerous small lift stations.

2. DESIGN:

a) Developer shall have LPSS designed by a professional engineer licensed in the state of South Carolina.

b) In addition to Construction Drawings and specifications, the developer shall include a design memorandum detailing the design procedures used for the LPSS. The design memorandum shall include the following:

(1) Hydraulic calculations demonstrating that the total dynamic head (TDH) does not exceed 100 feet at any existing or potential grinder pump location.

(2) Profiles of all low pressure sewer lines demonstrating that the system will be under positive pressure at all times. Specifically, the discharge elevation shall be above all intervening high points.

(3) Calculations indicating determination of pressure main sizing. Initial pipe line sizing shall be based on providing a minimum of 3.0 fps velocity at a discharge calculated according to the following equation:

$$Q \text{ (in gpm)} = 15 + 0.5D$$

Where D = the number of dwelling units upstream of the reach under investigation.

(4) Calculation of final pipe size may be adjusted based on evidence from hydraulic calculations, provided that such calculations indicate that a minimum of 2.0 fps can be achieved in all lines with no more than 5% (or a minimum of 2 pumps operating simultaneously through the line under determination.

(5) Determination of Hazen-Williams coefficient. A Hazen-Williams coefficient, C, of 140 to 150 may be used, provided that if C=150, the nominal pipe

size only may be used, and an allowance for minor losses associated with fittings should be included in the hydraulic calculations.

(6) Calculation of Impeller Diameters for each pump. The impeller diameter of individual pumps in a system with varying pump elevations shall be sized such that full size impellers are used at pumps at the lowest elevations, and reduced size impellers are used at higher pumps, such that the TDH of any one pump is within 20% of all other pumps.

(7) Calculations of the maximum flow discharged from the LPSS with all pumps operating. This condition will be experienced upon restoration of power following a system-wide power outage. If the maximum flow calculated, included in other pressure sewers, exceeds the rated maximum pumping capacity of any downstream pump stations, the discharge shall be into a gravity sewer of sufficient diameter and length to provide 150 gallons of storage capacity per grinder pump within the gravity pipeline.

(8) Private LPSS shall connect to the City's sanitary sewer system at a stub from the property line side of the dual ball valve/check valve assembly according to the service connection Standard Details.

3. MATERIALS AND INSTALLATION FOR LPSS:

a) Unless superseded or modified by Special Provision, all materials, apparatus, supplies, methods of manufacture, or construction shall conform to the specifications for same contained in the City's Standard Specifications.

b) Pipes: Force main piping for LPSS shall be 6" diameter and smaller.

c) Valves – All valves on LPSS shall be plug or ball valves as specified below. Valve operation shall be open left.

(1) Plug Valves – All valves on low pressure sewer mains shall be eccentric plug valves as follows.

(a) Plug valves shall be non-lubricated, with a plug facing of a material specifically recommended by the valve manufacturer for the indicated service and shall have stainless steel permanently lubricated upper and lower plug stem bearings. Valve seats shall be nickel. Valves shall be designed with adjustable seals which are replaceable without removing the bonnet. The bearing and seal area shall be protected with grit seals. Area of port opening for all valves shall be no less than 81% of full pipe area.

(b) Valves that are 12" and smaller shall be rated at 175 psi. Valves that are 15 inches or larger shall be rated at 150 psi. Bi-directional shut-off is required.

(c) Plug valves shall be as manufactured by Dezurik Corporation, Milliken Valve Co., Keystone Valve, Pratt, or approved equal.

- (i) Buried valves 4-inches and larger and other valves specifically indicated shall have mechanical joint ends conforming to ANSI A21.11.
 - (ii) Buried valves 3-inches and smaller shall have schedule 80 threaded ends and shall be connected to the pressure main by schedule 80 PVC threaded by socket adapters.
 - (d) Buried plug valves shall have 2-inch operating levers, and other miscellaneous items required for a complete installation shall be provided in accordance with the requirement and recommendations of the manufacturer.
 - (e) Extension stems, stem guides, operating levers, and other miscellaneous items required for a complete installation shall be provided in accordance with the requirements and recommendation of the manufacturer.
 - (f) Buried plug valves shall be provided with adjustable valve boxes. Valve boxes shall be cast iron conforming to ASTM A48, Class 30. Valve box castings shall be fully bituminous seal coated. Valve box shall be a Tyler 462A or approved equal.
- (2) Thermoplastic ball valves – Thermoplastic ball valves shall be used at each service connection and shall be made of PVS Thermoplastic. The valves shall be furnished with Teflon seats and true union threaded ends. Thermoplastic ball valves shall be manufactured by Hayward, Incorporated or approved equal.
- (3) Thermoplastic ball check valves – Thermoplastic ball check valves shall be used at each service connection and shall be made of PVC Thermoplastic. The valves shall be furnished with elastomeric seats and true union threaded ends. Thermoplastic ball check valves shall be as manufactured by Hayward, Incorporated or approved equal.
- d) Service Boxes and Lids: All service connections and clean-outs shall be placed in an appropriately sized box in accordance with the Standard Details, and shall be as manufactured by Brooks Products Company (36 Series) or approved equal.
- (1) Concrete boxes shall be made of concrete mix, 1-2-1 (one part cement, two parts granite screenings, and one part 3/8" granite stone). The meter boxes shall be concrete machine-made and tamped with pneumatic tamps to ensure the proper density. All concrete items shall be steam-cured 24 hours and yard-cured for two weeks.
 - (2) All service connection boxes shall be made of green plastic with the physical dimensions shown on the Standard Details, and constructed of standard thermoplastic materials using the structural foam approach, and shall be manufactured by Brooks Products Company (Series 1730). The plastic composition shall be uniform and substantially resistant to moderate acid attack, ultraviolet ray action, and weathering as may be encountered in outdoor application and semi-

buried service.

(3) Plastic lids shall be furnished with “snap lock” tabs, interchangeable with existing City of Rock Hill meter boxes, and imprinted with the words “Pressure Sewer” on the lid.

e) Installation of PVC low pressure pipe: PVC low pressure sewer main shall be installed substantially in accordance with ASTM D2321. The following exceptions shall be taken to the Standard:

(1) Installing Valves and Fittings: Valves and fittings shall be installed in the manner specified for cleaning, laying and jointing pipe. Valves shall be installed at locations shown on the Construction Drawings and/or as directed by the Engineer.

(a) Valve Boxes: A valve box shall be installed at every buried plug valve. The valve box shall not transmit shock or stress to the valve and shall be centered and plumb over the operating nut, with the box cover flush with the pavement or other existing surface. Where the box is not in pavement, the top section shall be anchored by and 18”x18”x6” concrete pad or an approved pre-cast pad, set flush with the existing terrain. The top section will be grouted into the precast concrete pad. The location of the valve will be identified by the letters “PSV” imprinted onto the curb adjacent to the pressure sewer valve.

(2) Alignment and Grade: Unless specifically approved by the Director of Water and Sewer Utilities, the curb must be in place and backfilled, and the area between curb and street right-of-way line graded smooth and to finished grade before the low pressure sewer mains are installed. The pressure sewer mains shall be installed on the opposite side of the road from the water main as shown in the Standard Details. The LPSS shall be laid and maintained at the required lines and grades with fittings and valves at the required locations, spigots centered in bells, and all valve stems plumb. After curb and gutter has been installed the location and depth of the pressure sewer main and valves, etc., will be checked for conformance to these Standard Specifications. Any deficiencies will be corrected to the satisfaction of the City prior to testing and activation of the mains.

(3) Depth of Pipe Installation. Unless otherwise indicated on the Construction Drawings or required by existing utility location, all pipes shall be installed at the depths indicated on the Standard Details. The Contractor is instructed to check Construction Drawings and blow-up views for additional requirements. The Contractor may be required to vary the depth of the pipe to achieve minimum clearance from existing utilities while maintaining the minimum cover specified whether or not the existing pipelines, conduits, cables, mains, etc., are shown on the Construction Drawings. PVC pressure sewer shall be installed with 12-inch clearance above other utilities or 18 inches below other utilities.

f) Testing: The water for testing purposes can be taken from the nearest available water main under the supervision of the City’s inspector and leakage will be measured by the City with a meter furnished by the City. If service connection or other openings are not available for the purposes of expelling air, the Contractor shall provide air release of sufficient

size (as determined by the Engineer) in accordance with the Standard Details. The test pressure will be 100 psi at the low point of the section under test.

(1) Allowable leakage will be determined by Table 6 in AWWA C600 or the formula $L=0.000083 \cdot S$, where S is the length of pipe under test and D is the pipe diameter. Add 0.0050 gal/hr for each 1-1/2 inch lateral.

(2) During the last stages of the test and without any reduction in pressure progressing from the end opposite the test pump, each mainline valve will be closed and pressure released to determine if the valve is holding pressure (minimum 10 minutes per valve closing).

g) 1.5-inch Service Connections: On 3-inch mains and smaller, the 1.5-inch laterals shall be connected to the street main with schedule 80 PVC solvent weld wyes. On 4-inch mains and larger, the 1.5-inch laterals shall be connected to the street main with a mechanical joint tee plugged and tapped for a threaded by solvent-weld schedule 80 PVC Adapter. The 1.5-inch service lateral shall be connected to the property line where a service connection meter box shall be installed. The service connection shall contain the following fittings in accordance with the Standard Details, 45-degree solvent weld elbow, solvent-weld nipple, solvent-weld by threaded adapter, two (2) true union threaded ball valves, threaded adapter, threaded 1.5"x1.5"x1.5" tee, threaded adapter, threaded nipple, true union ball check valve, threaded x solvent-weld nipple, 1.5"x1.25" solvent-weld reducing bushing. The top of the 1.5" tee shall have threaded 1.5"x0.75" reducing bushing and a brass 0.75 hose bib.

J. INSTALLATION AND APPROVAL REQUIREMENTS:

1. HANDLING AND INSTALLATION:

a) Contractor shall off-load equipment at installation site using equipment of sufficient size and design to prevent injury or damage.

b) Station manufacturer shall provide written instruction for proper handling.

c) Immediately after off-lading, Contractor shall inspect complete pump station and appurtenances for shipping damage or missing parts. Any damage or discrepancy shall be noted in a written claim with shipper prior to accepting delivery. Validate all station serial numbers and parts list with shipping documentation. Notify the manufacturer's representative of any unacceptable conditions noted with shipper.

d) Install, level, align and lubricate pump station as indicated on the Construction Drawings. Installation must be in accordance with written instructions supplied by manufacturer at time of delivery.

e) Suction pipe connections shall be vacuum tight. Fasteners at all pipe connections must be tight. Install pipe with supports and thrust blocks to prevent strain and vibration on pump station piping. Install and secure all service lines (level control, air release valve or pump drain lines) as required in wet well.

2. TESTING:

a) Check motor and control data plates for compatibility to site voltage. Install and test the station ground prior to connecting line voltage to station control panel.

b) Prior to applying electrical power to any motors or control equipment, check all wiring for tight connection. Verify that protective devices (fuses and circuit breakers) conform to project design documents. Manually operate circuit breakers and switches to ensure operation without binding. Open all circuit breakers and disconnects before connecting utility power. Verify line voltage, phase sequence and ground before actual start-up.

c) After all anchor bolts, piping and control connections are installed, completely fill the grout dam in the pump station base with non-shrink grout.

d) Leak testing shall be conducted on all force main piping as described in these specifications for pipe installation. The water for testing purposes can be taken from the nearest available water main under the supervision of the City Inspector and leakage shall be measured by the City with a meter furnished by the City. If service connection or other openings are not available for expelling air, the Contractor shall provide air release of sufficient size (as determined by the Engineer) in accordance with the Standard Details. The pressure test shall be the greater of (1) 100 psi at the low point of the section under test, or (2) 1.5 time the working pressure at the low point of the section under test.

(1) Allowable leakage will be determined by Table 6 in AWWA C600 or the formula $L=0.000083 \cdot S$, where S is the length of pipe under test and D is the pipe diameter. Add 0.0050 gph for each 1-1/2 inch lateral.

(2) During the last stages of the test and without any reduction in pressure progressing from the end opposite the test pump, each mainline valve will be closed and pressure released to determine if the valve is holding pressure (minimum 10 minutes per valve closing).

e) Prior to acceptance by City, an operational test of all pumps, drives, and control systems shall be conducted to determine if the installed equipment meets the purpose and intent of the specifications. Tests shall demonstrate that all equipment is electrically, mechanically, structurally, and otherwise acceptable; it is safe and in optimum working condition and conforms to the specified operating characteristics.

f) After construction debris and foreign material has been removed from the wet well, Contractor shall supply clear water volume adequate to operate station through several pumping cycles. Observe and record operation of pumps, suction, and discharge gage readings, ampere draw, pump controls, and liquid level controls. Check calibration of all instrumentation equipment, test manual control devices, and automatic control systems. Be alert to any undue noise, vibration or other operational problems.

3. START-UP:

a) Coordinate station start-up with manufacturer's technical representative. The representative or factory service technician will inspect the completed installation. He will calibrate and adjust instrumentation, correct or supervise correction of defects or malfunctions and instruct operating personnel in proper operation and maintenance

procedures.

b) Prior to acceptance, inspect interior and exterior of pump station for dirt, splashed material or damaged paint. Clean or repair accordingly. Remove from the job site all tools, surplus materials, scrap and debris.

c) The pump station should be placed into service immediately. If operation is delayed, drain water from pumps and piping. Open motor circuit breakers and protect station controls and interior equipment from cold and moisture.

d) Prior to pump station operation, contractor to provide weather durable sign with a 24-hour emergency phone number to be located on the structure of the pumping station. See standard detail.

e) A start-up report must be supplied to the City by the manufacturer's technical representative of the pump station start-up conditions.

f) Operation and maintenance manuals must be supplied to City by the Contractor.

Segmental Retaining Wall Specifications

Part 1: General

- 1.01 **Description**
Work shall consist of furnishing all materials, labor, equipment, and supervision to install a segmental retaining wall system to the lines, grades, design and dimensions shown on the plans, or as established by the owner or owner's engineer.
- 1.02 **Related Work**
A. Section -Site Preparation
B. Section -Earthwork
- 1.03 **Reference Standards**
A. NCMA Design Manual for Segmental Retaining Walls
B. AASHTO Mechanically Stabilized Earth Walls Design and Construction Guidelines (MSEW)
C. ASTM C140-Sampling and Testing Concrete Masonry Units
D. ASTM D4595-Test Method of Tensile Properties of Geotextiles by the Wide-Width Strip Method
E. GRI-GG4-Determination of the Long Term Design Strength of Geosynthetics
- 1.04 **Delivery, Storage and Handling**
A. The Contractor shall inspect the materials upon delivery to assure that the proper material has been received.
B. The Contractor shall store and handle materials so as to protect materials from damage. Damaged material shall not be incorporated into the segmental retaining wall.

Part 2: Materials

- 2.01 **Concrete Segmental Retaining Wall (SRW) Units**
A. SRW units shall be RidgeRock II Retaining Wall Units or pre-approved equal.
B. Concrete segmental retaining wall units shall conform to the requirements of NCMA TEK 2-4 and have a minimum 28 days compressive strength of 3000 psi and a maximum absorption of 10 pcf as determined in accordance with ASTM C140. The units shall have adequate freeze/thaw protection and meet the requirements of ASTM C1262.
C. All SRW units shall be sound and free of cracks or other defects that would interfere with the placement or performance of the units.
D. SRW unit dimensions shall not differ more than $\pm 1/8$ inch, except for height, which shall not differ more than $\pm 1/16$ inch, as measured in accordance with ASTM C140.
E. SRW unit to unit shear resistance shall be provided by integrated concrete connectors, reinforcing pins or other mechanical connections specific to each block system.
F. A high strength cap adhesive shall be used to bind the cap unit to the wall
- 2.02 **Geosynthetic Reinforcement**
A. Geosynthetic Reinforcement shall consist of GridLok high strength geogrid or pre-approved equal. Type, length and placement shall be as designated on the retaining wall plans.
B. The geogrid type, strength and placement shall be as shown on the plans. The design properties of the block/grid system shall be determined by the procedures outlined in the Geosynthetic Research Institute, GRI-GG4, and NCMA SRWU-1.
- 2.03 **Aggregate Fill**
The aggregate fill shall be a clean crushed stone or granular fill meeting the following gradation:

<u>Sieve Size</u>	<u>Percent Passing</u>
1 inch	100
3/4 inch	75-100
No. 4	0-60
No. 40	0-50
No. 200	0-5

- 2.04 **Reinforced Backfill**
The reinforced backfill shall consist of Aggregate Base Course (ABC) stone and must possess the frictional properties specified by the final wall design engineer. ABC stone produced at the quarry that does not satisfy all of the gradation criteria for NCDOT approval ("out-of-spec" ABC) is acceptable for this project.

Part 3: Installation

- 3.01 **Excavation**
A. Contractor shall excavate to the lines and grades shown on the grading plans.
- 3.02 **Foundation Preparation**
A. The foundation soil shall be excavated to the leveling pad dimensions indicated on the plans.
B. The foundation soil shall be evaluated by the engineer to confirm the design bearing strength of the foundation soils. Soils not meeting the design bearing strength shall be replaced with suitable fill.
- 3.03 **Leveling Pad Installation**
A. A minimum 6 inch thick layer of compacted granular material shall be placed as shown on the construction drawings.
B. The granular base shall be compacted to 95% of the Standard Proctor maximum dry density. The base shall be capable of providing a firm level bearing pad on which to place the first course of Segmental Retaining Wall (SRW) Units.

3.04 Retaining Wall Unit Installation

- A. All materials shall be installed at the elevation and orientation shown on the plans.
- B. The retaining wall units shall be installed adjacent to each other along the alignment of the wall.
- C. Fill the Segmental Retaining Wall Units with drainage aggregate (Section 2.03).
- D. Extend the drainage aggregate a minimum of 12 inches behind the retaining wall units.
- E. Clean the top of the units so that they are free of aggregate.
- F. Offset the second course of SRW units in a running bond configuration, and engage with the lower course through the mechanical connections specific to each block system (Section 2.01.E). Repeat the above procedure until the proper height is achieved.
- G. Terminate the end of the wall by turning the units at a radius into the embankment.

3.05 Cap Unit Installation

- A. Place the Cap Unit over the last course of retaining wall units.
- B. Use a high strength cap adhesive designed exclusively for segmental retaining walls to bond the cap to the wall.

3.06 Geosynthetic Installation

- A. Install the geosynthetic reinforcement at the elevations shown on the construction drawings.
- B. The geosynthetic shall be installed by placing the primary strength direction of the product over the SRW Unit (extended to the face of the unit), placing the next course of retaining wall units over the geosynthetic and pulling the geosynthetic taut. Anchor the end of the geosynthetic with pins or stakes to maintain tension prior to fill placement.

3.07 Backfill Placement

- A. The backfill shall be placed in maximum loose lift thicknesses of 10 inches, and compacted to 95% of Standard Proctor density.
- B. Backfill shall be spread and compacted in such a manner that eliminates the development of slack in the geosynthetic.
- C. Only hand operated compaction equipment shall be allowed within 3 feet of the front of the wall face.
- D. Tracked construction equipment shall not operate directly upon the geosynthetic reinforcement. A minimum backfill thickness of 6 inches is required prior to operation of tracked vehicles over the geosynthetic reinforcement. Turning of tracked vehicles shall be kept to a minimum to prevent fill and geosynthetic displacement.
- E. Rubber tired equipment may pass over the geosynthetic reinforcement at slow speeds less than 10 mph. Sudden braking and turning must be avoided.
- F. At the end of the day's operation, slope the backfill away from the wall to direct runoff away from the wall face. The contractor shall not allow surface runoff to enter the wall construction site.

3.08 Aggregate Fill Placement

- A. The aggregate fill shall be placed as directed on the construction plans.
- B. Install a minimum 4 inch drainage pipe behind the base of the wall to collect drainage from the drainage fill.

Part 4: Measurement and Payment

The unit of measure for furnishing the Retaining Wall System shall be the vertical projected face area from the top of the leveling pad to the top of the cap unit.