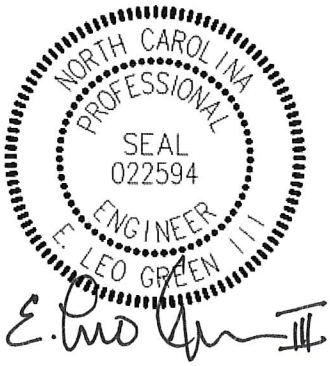
CONTRACT DOCUMENTS
LOWER BLOOMERY SWAMP SEWER IMPROVEMENTS
WILSON, NORTH CAROLINA



September 2022

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Green Engineering Project No. 22-140

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ADVERTISEMENT FOR BIDS

City of Wilson

1800 Herring Avenue

Wilson, North Carolina 27894

Sealed bids for "Lower Bloomery Swamp Sewer Improvements" including, but not limited to the following:

Part A: Station 45+55.20 to Station 69+17.65

- 2,160 LF 24-Inch Dia. PVC Gravity Sanitary Sewers
- 200 LF 24-Inch Dia. DI 401 Coated Gravity Sanitary Sewers
- 8 EA 6' Diameter Precast Concrete Manholes
- Two (2) 8" Dia. Lateral Line Connections
- By-Pass Pumping

Alternate Bid: Station 0+00.00 to Station 45+55.20

- 4,150 LF 24-Inch Dia. PVC Gravity Sanitary Sewers
- 400 LF 24-Inch Dia. DI 401 Coated Gravity Sanitary Sewers
- 12 EA 6' Diameter Precast Concrete Manholes
- Five (5) 8" Dia. Lateral Line Connections
- By-Pass Pumping

will be received by The City of Wilson at the Operations Center Conference Room located at 1800 Herring Avenue, Wilson, North Carolina until 11:00 AM, Wednesday, October 12, 2022, and then at said office publicly opened and read aloud.

The CONTRACT DOCUMENTS may be examined at the following locations:

City of Wilson – Wilson, North Carolina

Green Engineering, P.L.LC. – Wilson, North Carolina

Copies of the CONTRACT DOCUMENTS may be obtained at the office of Green Engineering, P.L.L.C. located at 303 Goldsboro St. East, Wilson, North Carolina 27893 upon a non-refundable payment of $100.00 for each set.

Bidders should make positive efforts to utilize businesses owned by minorities and women. The Owner has developed a goal of ten percent (10%) for participation of minority-owned and women-owned business enterprises in construction contracts awarded pursuant to NCGS 143-128. Bidders must comply with the Owner's requirements for W/MBE documentation.

BIDDERS shall be properly licensed under Chapter 87, General Statutes of North Carolina.

CONTRACTOR shall comply with the requirements of Article 2, Chapter 64 of the General Statutes. Further, if CONTRACTOR utilizes a subcontractor, CONTRACTOR shall require the subcontractor to comply with the requirements of Article 2 of Chapter 64 of the General Statutes.

A voluntary Pre-Bid Conference has been scheduled for 11:00 AM, Thursday, September 22, 2022, at the Operations Center Conference Room located at 1800 Herring Avenue, Wilson, North Carolina. All prospective Bidders are encouraged to attend. Questions will be received until 5:00 PM on Tuesday, October 4, 2022.

Written questions shall be e-mailed to Leo Green, III, Green Engineering, PLLC at elg3@greeneng.com by the date and time specified above. Firms will enter BID Title – "Lower Bloomery Swamp Sewer Improvements" as the subject for the email. Questions received prior to the submission deadline date, the Green Engineering and any additional terms deemed necessary by the City of Wilson will be posted in the form of an addendum to the **City of Wilson website:** https://vrapp.vendorregistry.com/Bids/View/BidsList?BuyerId=6cb6feea-36f1-43a9-ae1b-61fdecb8b52b and/or the **North Carolina Interactive Purchasing System (IPS)**, http://www.ips.state.nc.us, and shall become an Addendum to this Bid. No information, instruction or advice provided orally or informally by any City personnel or through Green Engineering, whether made in response to a question or otherwise concerning this Bid, shall be considered authoritative or binding. Vendors shall rely only on written material contained in an Addendum to this Bid. Inquiries submitted no later than the date and time noted in the project schedule. Questions answered verbally will be followed up by written addenda as deemed necessary; oral interpretations shall have no effect.

The OWNER reserves the right to reject any and all bids.

Carlton L. Stevens

Mayor, City of Wilson

Instructions to Bidders

ARTICLE 1 - DEFINED TERMS

1.01 Terms used in these Instructions to Bidders will have the meanings indicated in the General Conditions and Supplementary Conditions. Additional terms used in these Instructions to Bidders have the meanings indicated below which are applicable to both the singular and plural thereof:

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

B. Issuing Office--The office from which the Bidding Documents are to be issued and where the bidding procedures are to be administered.

C. Successful Bidder--The lowest responsible Bidder submitting a responsive Bid to whom OWNER (on the basis of OWNER's evaluations as hereinafter provided) makes an award.

ARTICLE 2 - COPIES OF BIDDING DOCUMENTS

2.01 Complete sets of the Bidding Documents in the number and for the fee, if any, stated in the Advertisement or Invitation to Bid may be obtained from the Issuing Office.

2.02 Complete sets of Bidding Documents must be used in preparing Bids; neither OWNER nor ENGINEER assumes any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.

2.03 OWNER and ENGINEER in making copies of Bidding Documents available on the above terms do so only for the purpose of obtaining Bids for the Work and do not confer a license or grant for any other use.

ARTICLE 3 - QUALIFICATIONS OF BIDDERS

3.01 To demonstrate Bidder's qualifications to perform the Work prior to award, within five days of OWNER's request, Bidder shall submit written evidence such as financial data, previous experience, present commitments, and such other data as may be called for.

ARTICLE 4 - EXAMINATION OF BIDDING DOCUMENTS, OTHER RELATED DATA, AND SITE

4.01 Subsurface and Physical Conditions

A. The Supplementary Conditions identify:

1. Those reports of explorations and tests of subsurface conditions at or contiguous to the Site that Engineer has used in preparing the Bidding Documents.

2. Those drawings of physical conditions in or relating to existing surface and subsurface structures at or contiguous to the Site (except Underground Facilities) that ENGINEER has used in preparing the Bidding Documents.

B. Copies of reports and drawings referenced in paragraph 4.01.A will be made available by OWNER to any Bidder on request. Those reports and drawings are not part of the Contract Documents, but the "technical data" contained therein upon which Bidder is entitled to rely as provided in paragraph 4.02 of the General Conditions has been identified and established in paragraph 4.02 of the Supplementary Conditions. Bidder is responsible for any interpretation or conclusion Bidder draws from any "technical data" or any other data, interpretations, opinions, or information contained in such reports or shown or indicated in such drawings.

4.02 Underground Facilities

A. Information and data shown or indicated in the Bidding Documents with respect to existing Underground Facilities at or contiguous to the Site is based upon information and data furnished to OWNER and ENGINEER by owners of such Underground Facilities, including OWNER, or other.

4.03 Hazardous Environmental Condition

A. The Supplementary Conditions identify those reports and drawings relating to a Hazardous Environmental Condition identified at the Site, if any, that ENGINEER has used in preparing the Bidding Documents.

B. Copies of reports and drawings referenced in paragraph 4.03.A will be made available by OWNER to any Bidder on request. Those reports and drawings are not part of the Contract Documents, but the "technical data" contained therein upon which Bidder is entitled to rely as provided in paragraph 4.06 of the General Conditions has been identified and established in paragraph 4.06 of the Supplementary Conditions. Bidder is responsible for any interpretation or conclusion Bidder draws from any "technical data" or any other data, interpretations, opinions, or information contained in such reports or shown or indicated in such drawings.

4.04 Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders with respect to subsurface conditions, other physical conditions and Underground Facilities, and possible changes in the Bidding Documents due to differing or unanticipated conditions appear in paragraphs 4.02, 4.03, and 4.04 of the General Conditions. Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders with respect to a Hazardous Environmental Condition at the Site, if any, and possible changes in the Contract Documents due to any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work appear in paragraph 4.06 of the General Conditions.

4.05 On request, OWNER will provide Bidder access to the Site to conduct such examinations, investigations, explorations, tests, and studies as Bidder deems necessary for submission of a Bid. Bidder shall fill all holes and clean up and restore the Site to its former condition upon completion of such explorations, investigations, tests, and studies.

4.06 Reference is made to Article 7 of the Supplementary Conditions for the identification of the general nature of other work that is to be performed at the Site by OWNER or others (such as utilities and other prime contractors) that relates to the Work for which a Bid is to be submitted. On request, OWNER will provide to each Bidder for examination access to or copies of Contract Documents (other than portions thereof related to price) for such other work.

4.07 It is responsibility of each Bidder before submitting a Bid to:

A. Examine and carefully study the Bidding Documents, including any Addenda and the other related data identified in the Bidding Documents;

B. Visit the Site and become familiar with and satisfy Bidder as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work;

C. Become familiar with and satisfy Bidder as to all Federal, State, and local Laws and Regulations that may affect cost, progress, or performance of the Work;

D. Carefully study all reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site (except Underground Facilities) which have been identified in the Supplementary Conditions as provided in paragraph 4.02 of the General Conditions, and carefully study all reports and drawings of a Hazardous Environmental Condition, if any, at the Site which have been identified in the Supplementary Conditions as provided in paragraph 4.06 of the General Conditions;

E. Obtain and carefully study (or assume responsibility for doing so) all additional or supplementary examinations, investigations, explorations, tests, studies, and data concerning conditions (surface, subsurface, and Underground Facilities) at or contiguous to the Site which may affect cost, progress, or performance of the Work or which relate to any aspect of the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, including any specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents, and safety precautions and programs incident thereto;

F. Agree at the time of submitting its Bid that no further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of its Bid for performance of the Work at the price bid and within the times and in accordance with the other terms and conditions of the Bidding Documents;

G. Become aware of the general nature of the work to be performed by OWNER and others at the Site that relates to the Work as indicated in the Bidding Documents;

H. Correlate the information known to Bidder, information and observations obtained from visits to the Site, reports and drawings identified in the Bidding Documents, and all additional examinations, investigations, explorations, tests, studies, and data with the Bidding Documents;

I. Promptly give ENGINEER written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder discovers in the Bidding Documents and confirm that the written resolution thereof by ENGINEER is acceptable to Bidder; and

J. Determine that the Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work.

4.08 The submission of a Bid will constitute an incontrovertible representation by Bidder that Bidder has complied with every requirement of this Article 4, that without exception the Bid is premised upon performing and furnishing the Work required by the Bidding Documents and applying any specific means, methods, techniques, sequences, and procedures of construction that may be shown or indicated or expressly required by the Bidding Documents, that Bidder has given ENGINEER written notice of all conflicts, errors, ambiguities, and discrepancies that Bidder has discovered in Bidding Documents and the written resolutions thereof by ENGINEER are acceptable to Bidder, and that the Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performing and furnishing the Work.

ARTICLE 5 - PRE-BID CONFERENCE

5.01 A Pre-Bid Conference is scheduled for 11:00 A.M., Tuesday, September 20, 2022 at the Operation Center Conference Room, located at 1800 Herring Avenue, Wilson, North Carolina. Representatives of OWNER and ENGINEER will be present to discuss the Project. ENGINEER will transmit to all prospective Bidders of record such Addenda as ENGINEER considers necessary in response to questions arising at the conference. Oral statements may not be relied upon and will not be binding or legally effective.

ARTICLE 6 - SITE AND OTHER AREAS

6.01 The Site is identified in the Bidding Documents. All additional lands and access thereto required for temporary construction facilities, construction equipment, or storage of materials and equipment to be incorporated in the Work are to be obtained and paid for by CONTRACTOR. Easement for permanent structures or permanent changes in existing facilities are to be obtained and paid for by OWNER unless otherwise provided in the Bidding Documents.

ARTICLE 7 - INTERPRETATIONS AND ADDENDA

7.01 All questions about the meaning or intent of the Bidding Documents are to be submitted to ENGINEER in writing. Interpretations or clarifications considered necessary by ENGINEER in response to such questions will be issued by Addenda mailed or delivered to all parties recorded by ENGINEER as having received the Bidding Documents. Questions received less than ten days prior to the date for opening of Bids may not be answered. Only questions answered by Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect.

7.02 Addenda may be issued to clarify, correct, or change the Bidding Documents as deemed advisable by OWNER or ENGINEER.

ARTICLE 8 - BID SECURITY

8.01 A Bid must be accompanied by Bid security made payable to OWNER in an amount of 5 % of Bidder's maximum Bid price and in the form of a certified or bank check or a Bid Bond (EJCDC No. 1910-28-C, 1996 Edition) issued by a surety meeting the requirements of paragraphs 5.01 and 5.02 of the General Conditions.

8.02 The Bid security of the Successful Bidder will be retained until such Bidder has executed the Contract Documents, furnished the required contract security and met the other conditions of the Notice of Award, whereupon the Bid security will be returned. If the Successful Bidder fails to execute and deliver the Contract Documents and furnish the required contract security within 15 days after the Notice of Award, OWNER may annul the Notice of Award and the Bid security of that Bidder will be Forfeited. The Bid security of other Bidders whom OWNER believes to have a reasonable chance of receiving the award may be retained by OWNER until the earlier of seven days after the Effective Date of the Agreement or 61 days after the Bid opening, whereupon Bid security furnished by such Bidders will be returned.

8.03 Bid security of other Bidders whom OWNER believes do not have a reasonable chance of

receiving the award will be returned within seven days after the Bid opening.

ARTICLE 9 - CONTRACT TIMES

9.01 The number of days within which, or the dates by which, the Work is to be (a) Substantially Completed and (b) also completed and ready for final payment are set forth in the Agreement.

ARTICLE 10 -LIQUIDATED DAMAGES

10.01 Provisions for liquidated damages, if any, are set forth in the Agreement.

ARTICLE 11 - SUBSTITUTE AND "OR-EQUAL" ITEMS

11.01 The Contract, if awarded, will be on the basis of materials and equipment specified or described in the Bidding Documents, or "or-equal" materials and equipment as defined in paragraph 6.05 of the General Conditions, or those substitute or materials and equipment approved by the ENGINEER and identified by Addendum. The materials and equipment described in the Bidding Documents establish a standard of required type, function and quality to be met by any proposed substitute or "or-equal" item. Request for ENGINEER's clarification of materials and equipment considered "or-equal" prior to the Effective Date of the Agreement must be received by the ENGINEER at least 5 days prior to the date for receipt of Bids. No item of material or equipment will be considered by ENGINEER as a substitute unless written request for approval has been submitted by Bidder and has been received by ENGINEER at least 15 days prior to the date for receipt of Bids. Each request shall conform to the requirements of paragraph 6.05 of the General Conditions. The burden of proof of the merit of the proposed item is upon the Bidder. ENGINEER's decision of approval or disapproval of a proposed item will be final. If ENGINEER approves any proposed substitute item, such approval will be set forth in an Addendum issued to all prospective Bidders. Bidders shall not rely upon approvals made in any other manner.

ARTICLE 12 - SUBCONTRACTORS, SUPPLIERS, AND OTHERS

12.01 If the Supplementary Conditions require the identity of certain Subcontractors, Suppliers, individuals, or entities to be submitted to OWNER in advance of a specified date prior to the Effective Date of the Agreement, the apparent Successful Bidder, and any other Bidder so requested, shall within five days after Bid opening, submit to OWNER a list of all such Subcontractors, Suppliers, individuals, or entities proposed for those portions of the Work for which such identification is required. Such list shall be accompanied by an experience statement with pertinent information regarding similar projects and other evidence of qualification for each such Subcontractor, Supplier, individual, or entity if requested by OWNER. IF OWNER or ENGINEER, after due investigation, has reasonable objection to any proposed Subcontractor, Supplier, individual, or entity, OWNER may, before the Notice of Award is given, request apparent Successful Bidder to submit a substitute, without an increase in the Bid.

12.02 If apparent Successful Bidder declines to make any such substitution, OWNER may determine such Bidder to be nonresponsive and reject the Bid. Declining to make requested substitutions will not constitute grounds for forfeiture of the Bid security of any Bidder. Any Subcontractor, Supplier, individual, or entity so listed and against which OWNER and ENGINEER makes no written objection prior to the giving of the Notice of Award will be deemed acceptable to OWNER and ENGINEER subject to revocation of such acceptance after the Effective Date of the Agreement as provided in paragraph 6.06 of the General Conditions.

12.03 CONTRACTOR shall not be required to employ any Subcontractor, Supplier, individual, or entity against whom CONTRACTOR has reasonable objection.

ARTICLE 13 - PREPARATION OF BID

13.01 The Bid form is included with the Bidding Documents. Additional copies may be obtained from ENGINEER.

13.02 All blanks on the Bid form shall be completed by printing in ink or by typewriter and the Bid signed. A Bid price shall be indicated for each section, Bid item, alternative, adjustment unit price item, and/or unit price item listed therein, or the words "No Bid," "No Change," or "Not Applicable" entered.

13.03 A Bid by a corporation shall be executed in the corporate name by the president or a vice-president or other corporate officer accompanied by evidence of authority to sign. If required by State where work is to be performed, the corporate seal

shall be affixed and attested by the secretary or an assistant secretary. The corporate address and state of incorporation shall be shown below the signature.

13.04 A Bid by a partnership shall be executed in the partnership name and signed by a partner (whose title must appear under the signature), accompanied by evidence of authority to sign. The official address of the partnership shall be shown below the signature.

13.05 A Bid by a limited liability company shall be executed in the name of the firm by a member and accompanied by evidence of authority to sign. The state of formation of the firm and the official address of the firm must be shown below the signature.

13.06 A Bid by an individual shall show the Bidder's name and official address.

13.07 A Bid by a joint venture shall be executed by each joint venturer in the manner indicated on the Bid form. The official address of the joint venture must be shown below the signature.

13.08 All names shall be typed or printed in ink below the signatures.

13.09 The Bid shall contain an acknowledgment of receipt of all Addenda, the numbers of which shall be filled in on the Bid form.

13.10 The address and telephone number for communication regarding the Bid shall be shown.

13.11 The Bid shall contain evidence of Bidder's authority and qualification to do business in the state where the Project is located or covenant to obtain such qualification prior to award of the Contract. Bidder's state contractor license number for the state of the Project, if any, shall also be shown on the Bid form.

ARTICLE 14 - BASIS OF BID; EVALUATION OF BIDS

14.01 Lump Sum (if applicable)

A. Bidders shall submit a Bid on a lump sum basis for the base Bid and include a separate price for each alternate described in the Bidding Documents as provided for in the Bid form. The price for each alternate will be the amount added to the base Bid if OWNER selects the alternate. In the evaluation of Bids, alternates will be applied in the same order as listed in the Bid form.
and / or

14.01 Unit Price (if applicable)

A. Bidders shall submit a Bid on a unit price basis for each item of Work listed in the Bid schedule.

B. The total of all estimated prices will be determined as the sum of the products of the estimated quantity of each item and the unit price Bid for the item. The final quantities and Contract Price will be determined in accordance with paragraph 11.03 of the General Conditions.

C. Discrepancies between the multiplication of units of Work and unit prices will be resolved in favor of the unit prices. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum. Discrepancies between words and figures will be resolved in favor of the words.

ARTICLE 15 - SUBMITTAL OF BID

15.01 Each prospective Bidder is furnished one copy of the Bidding Documents. The Bid form is to be completed and submitted with the Bid security.

15.02 A Bid shall be submitted no later than the date and time prescribed and at the place indicated in the advertisement or invitation to Bid and shall be enclosed in an opaque sealed envelope plainly marked with the Project title (and, if applicable, the designated portion of the Project for which the Bid is submitted), the name and address of Bidder, and shall be accompanied by the Bid security and other required documents. If a Bid is sent by mail or other delivery system, the sealed envelope containing the Bid shall be enclosed in a separate envelope plainly marked on the outside with the notation "BID ENCLOSED." A mailed Bid shall be addressed to the Owner as specified in the Advertisement for Bids.

ARTICLE 16 - MODIFICATION AND WITHDRAWAL OF BID

16.01 A Bid may be modified or withdrawn by an appropriate document duly executed in the manner that a Bid must be executed and delivered to the place where Bids are to be submitted prior to the date and time for the opening of Bids.

16.02 If within 24 hours after Bids are opened any Bidder files a duly signed written notice with OWNER and promptly thereafter demonstrates to the reasonable satisfaction of OWNER that there was a material and substantial mistake in the preparation of its Bid, that Bidder may withdraw its Bid, and the Bid security will be returned. Thereafter, if the Work is rebid or negotiated, that Bidder will be disqualified from further bidding on the Work.

ARTICLE 17 - OPENING OF BIDS

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

ARTICLE 18 - BIDS TO REMAIN SUBJECT TO ACCEPTANCE

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

ARTICLE 19 - AWARD OF CONTRACT

19.01 OWNER reserves the right to reject any or all Bids, including without limitation, nonconforming, nonresponsive, unbalanced, or conditional Bids. OWNER further reserves the right to reject the Bid of any Bidder whom it finds, after reasonable inquiry and evaluation, to be non-responsible. OWNER also reserves the right to waive all informalities not involving price, time, or changes in the Work and to negotiate contract terms with the Successful Bidder.

19.02 More than one Bid for the same Work from an individual or entity under the same or different names will not be considered. Reasonable grounds for believing that any Bidder has an interest in more than one Bid for the Work may be cause for disqualification of that Bidder and the rejection of all Bids in which that Bidder has an interest.

19.03 In evaluating Bids, OWNER will consider whether or not the Bids comply with the prescribed requirements, and such alternates, unit prices and other data, as may be requested in the Bid Form or prior to the Notice of Award.

19.04 In evaluating Bidders, OWNER will consider the qualifications of Bidders and may consider the qualifications and experience of Subcontractors, Suppliers, and other individuals or entities proposed for those portions of the Work for which the identity of Subcontractors, Suppliers, and other individuals or entities must be submitted as provided in the Supplementary Conditions.

19.05 OWNER may conduct such investigations as OWNER deems necessary to establish the responsibility, qualifications, and financial ability of Bidders, proposed Subcontractors, Suppliers, individuals, or entities to perform the Work in accordance with the contract Documents.

19.06 If the Contract is to be awarded, OWNER will award the Contract to the responsible Bidder whose Bid, conforming with all the material terms and conditions of the Advertisement for Bids, is lowest, price and other factors considered.

ARTICLE 20 - CONTRACT SECURITY AND INSURANCE

20.01 Article 5 of the General Conditions, as may be modified by the Supplementary Conditions, sets forth OWNER's requirements as to performance Bond, payment Bond, and insurance. **The CONTRACTOR shall be required to provide insurance coverage equal to or greater than the limits set forth in the Supplementary Conditions. Property insurance (Installation Floater, Builder's Risk, "All Risk" or open peril or special causes of loss policy form, as applicable) shall be required as defined in paragraph 5.06 of the General Conditions and paragraph SC-5.06.A.2 of the Supplementary Conditions.** When the Successful Bidder delivers the executed Agreement to OWNER, it must be accompanied by such Bonds and insurance certificates.

ARTICLE 21 - SIGNING OF AGREEMENT

21.01 When OWNER gives a Notice of Award to the Successful Bidder, it shall be accompanied by the required number of unsigned counterparts of the Agreement with the other contract Documents which are identified in the Agreement as attached thereto. Within 15 days thereafter, Successful Bidder shall sign and deliver the required number of counterparts of the Agreement and attached documents to OWNER. Within 45 days thereafter, OWNER shall deliver one fully signed counterpart to Successful Bidder with a complete set of the Drawings with appropriate identification.

ARTICLE 22 - SALES AND USE TAXES

22.01 OWNER is not exempt from State of North Carolina sales and use taxes on materials and equipment to be incorporated in the Work. Said taxes shall be included in the Bid.

ARTICLE 23 – WOMEN AND MINORITY OWNED BUSINESS ENTERPRISES

23.01 Bidders must make positive efforts to utilize businesses owned by minorities and women. The Owner has developed a goal of ten percent (10%) for participation of women-owned and minority-owned business enterprises in construction contracts awarded pursuant to NCGS 143-128. Bidders must comply with the Owner's requirements for W/MBE documentation. Copies of the resolution establishing W/MBE goals and required documentation are available upon request to the Owner.

ARTICLE 24 – RAIN DAYS

24.01 The following climatological summary, published by the Southeast Regional Climate Center, will be utilized to evaluate contractors' requests for additional contract time due to inclement weather:

Mean Number of Days With 0.10 Inches or Greater of Rain			
January	7	July	8
February	7	August	7
March	7	September	5
April	6	October	5
May	7	November	5
June	7	December	6

Credit for rain days will be allowed, and will begin to accrue, only when they exceed the number of expected rain days shown in the chart above for each respective month.

Bid Form

Project Identification: ***Lower Bloomery Swamp Sewer Improvements***
Wilson, North Carolina

Contract Identification and Number:

This Bid Is Submitted To: ***City of Wilson, North Carolina***

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

2.01 Bidder accepts all of the terms and conditions of the Advertisement and Instructions to Bidders, including without limitations those dealing with the dispositions of Bid security. The Bid will remain subject to acceptance for 60 days after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of OWNER.

3.01 In submitting this Bid, Bidder represents, as set forth in the Agreement, that:

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

Addendum No.	Addendum Date
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

B. Bidder has visited the Site and become familiar with and is satisfied as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.

C. Bidder is familiar with and is satisfied as to all Federal, State, and local Laws and Regulations that may affect cost, progress, and performance of the Work.

D. Bidder has carefully studied all: (1) reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site (except Underground Facilities) which have been identified in the Supplementary Conditions as provided in paragraph 4.02 of the General Conditions, and (2) reports and drawings of a Hazard Environmental Condition, if any, which has been identified in the Supplementary Conditions as provided in paragraph 4.06 of the General Conditions.

E. Bidder has obtained and carefully studied (or assumes responsibility for having done so) all additional or supplementary examinations, investigations, explorations, tests, studies, and data concerning conditions (surface, subsurface and Underground Facilities) at or contiguous to the Site which may affect cost, progress, or performance of the Work or which relate to any aspect of the means, methods, techniques, sequences, and procedures of construction to be employed by the Bidder, including applying the specific means, methods, techniques, sequences, and procedures of

construction expressly required by the Bidding Documents to be employed by Bidder, and safety precautions and programs incident thereto.

F. Bidder does not consider that any further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of this Bid for performance of the Work at the price(s) bid and within the times and in accordance with the other terms and conditions of the Bidding Documents.

G. Bidder is aware of the general nature of the Work to be performed by OWNER and others at the Site that relates to the Work as indicated in the Bidding Documents.

H. Bidder has correlated the information known to Bidder, information and observations obtained from visits to the Site, reports and drawings identified in the Bidding Documents, and all additional examinations, investigations, explorations, tests, studies, and data with the Bidding Documents.

I. Bidder has given ENGINEER written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and the written resolution thereof by ENGINEER is acceptable to Bidder.

J. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work for which this Bid is submitted.

4.01 Bidder further represents that this Bid is genuine and not made in the interest of or on the behalf of any undisclosed individual or entity and is not submitted in conformity with any agreement or rules of any group, association, organization, or corporation; Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid; Bidder has not solicited or induced any individual or entity to refrain from bidding; and Bidder has not sought by collusion to obtain for itself any advantage over any other Bidder or over OWNER.

5.01 The Work will be substantially completed within ___360___ Calendar Days after the date when the Contract Time commences to run as provided in paragraph 2.03 of the General Conditions.

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

PART A – SEWER IMPROVEMENTS STATION 45+55.20 TO STATION 69+17.65					
ITEM	**DESCRIPTION**	**UNIT**	**ESTIMATED QUANTITY**	**BID UNIT PRICE**	**BID AMOUNT**
1.	24" Dia. PVC Sewer (6-8) w/Stone Bedding	LF	200		
2.	24" Dia. PVC Sewer (8-10) w/Stone Bedding	LF	680		
3.	24" Dia. PVC Sewer (10-12) w/Stone Bedding	LF	980		
4.	24" Dia. PVC Sewer (12-14) w/Stone Bedding	LF	280		
5.	24" Dia. PVC Sewer (14-16) w/Stone Bedding	LF	60		
6.	24" Dia. DI 401 Coated Sewer (0-6) w/Stone Bedding	LF	130		
7.	24" Dia. DI 401 Coated Sewer (8-10) w/Stone Bedding	LF	120		
8.	6' ID Manhole (12-14) w/Bury Depth (6-8)	LF	1		
9.	6' ID Manhole (14-16) w/Bury Depth (8-10)	EA	1		
10.	6' ID Manhole (14-16) w/Bury Depth (12-14)	EA	1		
11.	6' ID Manhole (18-20) w/Bury Depth (14-16)	EA	1		
12.	6' ID Manhole (14-16) w/Bury Depth (8-10), Vented	EA	2		
13.	6' ID Manhole (14-16) w/Bury Depth (10-12), Vented	EA	1		
14.	6' ID Manhole (16-18) w/Bury Depth (8-10), Vented	EA	1		
15.	By-Pass Pumping	LS	1		
16.	Connect 24" Dia. PVC sewer line to Ex. MH #2 and block 15" Dia. Outlet from Ex. MH #2 to Ex. MH #2092 and abandon Ex. 15" Dia. Sewer line between the two manholes.	LS	1		
17.	8" Dia. Widgeon Drive Lateral Connection to include ±40 LF 8" Dia. PVC sewer line and by-pass pumping, if required.	LS	1		
18.	8" Dia. Greenfield School Lateral Connection to include ±40 LF 8" Dia. PVC sewer line and by-pass pumping, if required.	LS	1		
19.	24" RCP Storm Drainage	LF	60		
20.	Additional Stone Bedding	TONS	145		
21.	Select Backfill	CY	575		
22.	Silt Fence	LF	6300		
23.	Silt Fence Outlet	EA	16		
24.	Temporary Ditch Liner (Excelsior Matting)	SY	600		
25.	"Wattle" Check Dam	EA	23		
26.	Clearing and Grubbing	AC	1.5		
27.	Seeding and Mulching	AC	4		
28.	Gravel Construction Entrance	EA	5		
29.	Class A Rip Rap	SY	250		
30.	Anti-Flotation Collar	EA	5		
TOTAL – PART A					

If project Budget permits the City reserves the right to add all, or a portion of, the Alternate Bid Items listed below to this project:

PART B - ALTERNATE SEWER IMPROVEMENTS STATION 0+00.00 TO STATION 45+55.20					
ITEM	**DESCRIPTION**	**UNIT**	**ESTIMATED QUANTITY**	**BID UNIT PRICE**	**BID AMOUNT**
1.	24" Dia. PVC Sewer (8-10) w/Stone Bedding	LF	50		$
2.	24" Dia. PVC Sewer (10-12) w/Stone Bedding	LF	1,360		$
3.	24" Dia. PVC Sewer (12-14) w/Stone Bedding	LF	2,520		$
4.	24" Dia. PVC Sewer (14-16) w/Stone Bedding	LF	220		$
5.	24" Dia. PVC Sewer (16-18) w/Stone Bedding	LF	80		$
6.	24" Dia. DI 401 Coated Sewer (12-14) w/Stone Bedding	LF	40		$
7.	24" Dia. DI 401 Coated Sewer (14-16) w/Stone Bedding	LF	180		$
8.	24" Dia. DI 401 Coated Sewer (16-18) w/Stone Bedding	LF	120		$
9.	24" Dia. DI 401 Coated Sewer (18-20) w/Stone Bedding	LF	30		$
10.	24" Dia. DI 401 Coated Sewer (20-22) w/Stone Bedding	LF	40		$
11.	Core Ex. Manhole #2142 For 24" Pipe Connection	LS	1		$
12.	6' ID Manhole (16-18) w/Bury Depth (12-14)	EA	1		$
13.	6' ID Manhole (18-20) w/Bury Depth (12-14)	EA	4		$
14.	6' ID Manhole (16-18) w/Bury Depth (10-12), Vented	EA	1		$
15.	6' ID Manhole (16-18) w/Bury Depth (12-14), Vented	EA	1		$
16.	6' ID Manhole (18-20) w/Bury Depth (12-14), Vented	EA	5		$
17.	By-Pass Pumping	LS	1		$
18.	8" Dia. Marble Court Lateral Connection to include ±40 LF 8" Dia. PVC sewer line and by-pass pumping, if required.	LS	1		$
19.	8" Dia. Marble Court Lateral Connection to include ±100 LF 8" Dia. PVC sewer line, one (1) 5' Dia. doghouse manhole (10-12) w/bury depth (8-10) and by-pass pumping, if required.	LS	1		$
20.	8" Dia. Feldspar Court Lateral Connection to include ±50 LF 8" Dia. PVC sewer line, one (1) 5' Dia. manhole (10-12) w/bury depth (6-8) and by-pass pumping, if required.	LS	1		$
21.	8" Dia. Boyette Drive Lateral Connection to include ±40 LF 8" Dia. PVC sewer line and by-pass pumping, if required.	LS	1		$
22.	8" Dia. Millbrook Townhomes Lateral Connection to include ±40 LF 8" Dia. PVC sewer line and by-pass pumping, if required.	LS	1		$
23.	24" RCP Storm Drainage	LF	120		$
24.	Additional Stone Bedding	TONS	230		$
25.	Select Backfill	CY	1,000		$

PART B - ALTERNATE SEWER IMPROVEMENTS STATION 0+00.00 TO STATION 45+55.20					
ITEM	**DESCRIPTION**	**UNIT**	**ESTIMATED QUANTITY**	**BID UNIT PRICE**	**BID AMOUNT**
26.	Silt Fence	LF	11,600		$
27.	Silt Fence Outlet	EA	28		$
27.	Temporary Ditch Liner (Excelsior Matting)	SY	1,000		$
29.	"Wattle" Check Dam	EA	40		$
30.	Clearing and Grubbing	AC	2		$
31.	Seeding and Mulching	AC	6		$
32.	Gravel Construction Entrance	EA	7		$
33.	Class A Rip Rap	SY	400		$
TOTAL – PART B					**$**

A. Unit Prices, if applicable, have been computed in accordance with paragraph 11.03.B of the General Conditions.

B. Bidder acknowledges that estimated quantities are not guaranteed, and are solely for the purpose of comparison of Bids, and final payment for all Unit Price Bid items will be based on actual quantities provided, determined as provided in the contract Documents.

7.01 Bidder agrees that the Work will be substantially completed and ready for final payment in accordance with paragraph 14.07.B of the General Conditions on or before the dates or within the number of calendar days indicated in the Agreement.

7.02 Bidder accepts the provisions of the Agreement as to liquidated damages in the event of failure to complete the work within the times specified above, which shall be stated in the Agreement.

8.01 The following documents are attached to and made a condition of the Bid:

A. Identification of Minority Business Participation Form

B. Either Affidavit A – Listing of Good Faith Efforts or Affidavit B – Intent to Perform Contract with Own Workforce, as appropriate.

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

SUBMITTED on _____, _____

State Contractor License No. _____. (If applicable)

Employer's Tax ID No. _____

If Bidder is:

An Individual

Name (typed or printed): _____ SEAL, if required by State

By: _____

(Individual's signature)

Doing business as: _____

Business address: _____

_____

Phone No. (___)_____ FAX No. (___)_____ E-Mail Address _____

A Partnership

Partnership Name: _____ SEAL, if required by State

By: _____

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

Name (typed or printed): _____

Business address: _____

_____

Phone No. (___)_____ FAX No. (___)_____ E-Mail Address _____

A Corporation

Corporation Name: _____

State of Incorporation: _____

Type (General Business, Profession, Service, Limited Liability): _____

By: _____

(Signature -- attach evidence of authority to sign)

Name (typed or printed): _____

Title: _____ CORPORATE SEAL, if required by State

Attest _____

(Signature of Corporate Secretary)

Business address: _____

_____

Phone No. (___)_____ FAX No. (___)_____ E-Mail Address _____

Date of Qualification to do business is _____

A Joint Venture

Joint Venture Name: _____

By: _____

(Signature of joint venture partner -- attach evidence of authority to sign)

Name (typed or printed): _____

Title: _____

SEAL, if required by State

Business address: _____

_____

Phone No. (___)_____ FAX No. (___)_____ E-Mail Address _____

Joint Venture Name: _____

By: _____

(Signature of joint venture partner -- attach evidence of authority to sign)

Name (typed or printed): _____

Title: _____

SEAL, if required by State

Business address: _____

_____

Phone No. (___)_____ FAX No. (___)_____ E-Mail Address _____

Phone and FAX Number, and Address for receipt of official communications:

_____

_____

(Each joint venturer must sign. The manner of signing for each individual, partnership, and corporation that is party to the venture should be in the manner indicated above.)

STATE OF NORTH CAROLINA

COUNTY OF WILSON **AFFIDAVIT**

I,_____(the individual attesting below), being duly authorized by

and on behalf of_____ (the entity bidding on project hereinafter

"Employer") after first being duly sworn hereby swears or affirms as follows:

1. Employer understands that E-Verify is the federal E-Verify program operated by the United States Department of Homeland Security and other federal agencies, or any successor or equivalent program used to verify the work authorization of newly hired employees pursuant to federal law in accordance with NCGS §64-25(5).

2. Employer understands that Employers Must Use E-Verify. Each employer, after hiring an employee to work in the United States, shall verify the work authorization of the employee through E-Verify in accordance with NCGS§64-26(a).

3. Employer is a person, business entity, or other organization that transacts business in this State and that employs 25 or more employees in this State.

(mark Yes or No) YES_____ No_____

4. Employer's subcontractors comply with E-Verify, and if Employer is the winning bidder on this project Employer will ensure compliance with E-Verify by any subcontractors subsequently hired by Employer.

This_____day of_____, 20_____.

Signature of Affiant:

Print or Type Name: _____

State of North Carolina County of _____

Signed and sworn to (or affirmed) before me, this the _____

day of_____, 2022.

My Commission Expires:

_____

Notary Public

(Affix Official/Notarial Seal)

BID BOND

BIDDER (Name and Address):

_____

_____

_____

SURETY (Name and Address of Principal Place of Business):

_____

_____

_____

OWNER (Name and Address):

City of Wilson

1800 Herring Avenue

Wilson, North Carolina 27894

BID

BID DUE DATE: _____

PROJECT (Brief Description Including Location):

Lower Bloomery Swamp Sewer Improvements

Wilson, North Carolina

BOND

BOND NUMBER: _____

DATE (Not later than Bid due date): _____

PENAL SUM: _____ _____

(Words) (Figures)

IN WITNESS WHEREOF, Surety and Bidder, intending to be legally bound hereby, subject to the terms printed on the reverse side hereof, do each cause this Bid Bond to be duly executed on its behalf by its authorized officer, agent, or representative.

BIDDER	SURETY
_____(Seal)	_____(Seal)
Bidder's Name and Corporate Seal	Surety's Name and Corporate Seal
By: _____	By: _____
Signature and Title	Signature and Title (Attach Power of Attorney)
Attest: _____	Attest: _____
Signature and Title	Signature and Title

Note: (1) Above addresses are to be used for giving required notice.
(2) Any singular reference to Bidder, Surety, OWNER or other party shall be considered plural where applicable.

1. Bidder and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to pay to OWNER upon default of Bidder the penal sum set forth on the face of this Bond.

2. Default of Bidder shall occur upon the failure of Bidder to deliver within the time required by the Bidding Documents (or any extension thereof agreed to in writing by OWNER) the executed Agreement required by the Bidding Documents and any performance and payment Bonds required by the Bidding Documents.

3. This obligation shall be null and void if:
   3.1. OWNER accepts Bidder's Bid and Bidder delivers within the time required by the Bidding Documents (or any extension thereof agreed to in writing by OWNER) the executed Agreement required by the Bidding Documents and any performance and payment Bonds required by the Bidding Documents, or
   3.2. All Bids are rejected by OWNER, or
   3.3. OWNER fails to issue a Notice of Award to Bidder within the time specified in the Bidding Documents (or any extension thereof agreed to in writing by Bidder and, if applicable, consented to by Surety when required by paragraph 5 hereof).

4. Payment under this Bond will be due and payable upon default by Bidder and within 30 calendar days after receipt by Bidder and Surety of written notice of default from OWNER, which notice will be given with reasonable promptness, identifying this Bond and the Project and including a statement of the amount due.

5. Surety waives notice of and any and all defenses based on or arising out of any time extension to issue Notice of Award agreed to in writing by OWNER and Bidder, provided that the total time for issuing Notice of Award including extensions shall not in the aggregate exceed 120 days from Bid due date without Surety's written consent.

6. No suit or action shall be commenced under this Bond prior to 30 calendar days after the notice of default required in paragraph 4 above is received by Bidder and Surety and in no case later than one year after Bid due date.

7. Any suit or action under this Bond shall be commenced only in a court of competent jurisdiction located in the state in which the Project is located.

8. Notices required hereunder shall be in writing and sent to Bidder and Surety at their respective addresses shown on the face of this Bond. Such notices may be sent by personal delivery, commercial courier or by United States Registered or Certified Mail, return receipt requested, postage pre-paid, and shall be deemed to be effective upon receipt by the party concerned.

9. Surety shall cause to be attached to this Bond a current and effective Power or Attorney evidencing the authority of the officer, agent or representative who executed this Bond on behalf of Surety to execute, seal and deliver such Bond and bind the Surety thereby.

10. This Bond is intended to conform to all applicable statutory requirements. Any applicable requirement of any applicable statute that has been omitted from this Bond shall be deemed to be included herein as if set forth at length. If any provision of this Bond conflicts with any applicable statute, then the provision of said statute shall govern and the remainder of this Bond that is not in conflict therewith shall continue in full force and effect.

11. The term "Bid" as used herein includes a Bid, offer or proposal as applicable.

NOTICE OF AWARD

Dated _____

TO: _____
(BIDDER)

ADDRESS: _____

_____

_____

Contract: _____
(Insert name of Contract as it appears in the Bidding Documents)

Project: _____

OWNER's Contract No. _____

_____

You are notified that your Bid dated _____ for the above Contract has been considered. You are the apparent Successful Bidder and have been awarded a Contract for

_____

_____
(Indicate total Work, alternates or sections or Work awarded)

The Contract Price of your Contract is _____ Dollars ($ _____).

[Insert appropriate data if Unit Prices are used. Change language for Cost-Plus contracts]

Five (5) copies of each of the proposed Contract Documents (except Drawings) accompany this Notice of Award. *Five (5)* sets of the Drawings will be delivered separately or otherwise made available to you immediately.

You must comply with the following conditions precedent within fifteen days of the date you receive this Notice of Award.

1. Deliver to the OWNER *Five (5)* fully executed counterparts of the Contract Documents. [Each of the Contract Documents must bear your signature].

2. Deliver with the executed Contract Documents the Contract security (Bonds) as specified in the Instructions to Bidders (Article 20), [and] General Conditions (paragraph 5.01) [and Supplementary Conditions (paragraph SC-5.01).]

EJCDC No. 1910-22 (1996 Edition)
Prepared by the Engineers Joint Contract Documents Committee and endorsed by The Associated General Contractors of America and the Construction Specifications Institute.

3. (List other conditions precedent).

N/A

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

Within ten days after you comply with the above conditions, OWNER will return to you one fully executed counterpart of the Contract Documents.

_____
(OWNER)

By: _____
(AUTHORIZED SIGNATURE)

_____
(TITLE)

Copy to ENGINEER
(Use Certified Mail,
Return Receipt Requested)

CERTIFICATE OF OWNER'S ATTORNEY

I, the undersigned, _____, the duly authorized and acting legal representative of _____ do hereby certify as follows:

I have examined the attached contract(s) and performance and payment bond(s) and the manner and execution thereof, and I am of the opinion that each of the aforesaid agreements has been duly executed in proper form; and that the foregoing agreements constitute valid and legally binding obligations upon the parties executing the same in accordance with the terms, conditions, and provisions thereof.

This _____ day of _____, 2022

_____

(Signature)

EJCDC
STANDARD FORM OF AGREEMENT
BETWEEN OWNER AND CONTRACTOR
ON THE BASIS OF A STIPULATED PRICE

FUNDING AGENCY EDITION

THIS AGREEMENT is by and between City of Wilson (hereinafter called OWNER) and

_____(hereinafter called CONTRACTOR).

OWNER and CONTRACTOR, in consideration of the mutual covenants hereinafter set forth, agree as follows:

ARTICLE 1 - WORK

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

Lower Bloomery Swamp Sewer Improvements
Wilson, North Carolina

ARTICLE 2 - THE PROJECT

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

Lower Bloomery Swamp Sewer Improvements
Wilson, North Carolina

ARTICLE 3 - ENGINEER

3.01 The Project has been designed by *Green Engineering, P.L.L.C.*

who is hereinafter called ENGINEER and who is to act as OWNER's representative, assume all duties and responsibilities, and have the rights and authority assigned to ENGINEER in the Contract Documents in connection with the completion of the Work in accordance with the Contract Documents.

ARTICLE 4 – CONTRACT TIMES

4.01 *Time of the Essence*

A. All time limits for Milestones, if any, Substantial Completion, and completion and readiness for final payment as stated in the Contract Documents are of the essence of the Contract.

4.02 *Days to Achieve Substantial Completion*

A. The Work will be substantially completed within 360 Calendar Days after the date when the Contract Time commences to run as provided in paragraph 2.03 of the General Conditions.

4.03 *Liquidated Damages*

A. CONTRACTOR and OWNER recognize that time is of the essence of this Agreement and that OWNER will suffer financial loss if the Work is not completed within the time(s) specified in paragraph 4.02 above, plus any extensions thereof allowed in accordance with Article 12 of the General Conditions. The parties also recognize the delays, expense, and difficulties involved in proving in a legal or arbitration proceeding the actual loss suffered by OWNER if the Work is not completed on time. Accordingly, instead of requiring any such proof, OWNER and CONTRACTOR agree that as liquidated damages for delay (but not as a penalty), CONTRACTOR shall pay OWNER $ 500.00 for each day that expires after the time specified in paragraph 4.02 for Substantial Completion until the Work is substantially complete.

ARTICLE 5 - CONTRACT PRICE

5.01 OWNER shall pay CONTRACTOR for completion of the Work in accordance with the Contract Documents an amount in current funds equal to the sum of the amounts determined pursuant to paragraphs 5.01.A, 5.01.B, and 5.01.C below:

A. For all Work other than Unit Price Work, a Lump Sum of:

_____ ($_____)
(use words) (figure)

All specific cash allowances are included in the above price and have been computed in accordance with paragraph 11.02 of the General Conditions.

B. For all Unit Price Work, an amount equal to the sum of the established unit price for each separately identified item of Unit Price Work times the estimated quantity of that item as indicated in this paragraph 5.01.B:

UNIT PRICE WORK

No.	Item	Unit	Estimated Quantity	Unit Price	Total Estimated

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

As provided in paragraph 11.03 of the General Conditions, estimated quantities are not guaranteed, and determinations of actual quantities and classifications are to be made by ENGINEER as provided in paragraph 9.08 of the General Conditions. Unit prices have been computed as provided in paragraph 11.03 of the General Conditions.

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

ARTICLE 6 - PAYMENT PROCEDURES

6.01 *Submittal and Processing of Payments*

A. CONTRACTOR shall submit Applications for Payment in accordance with Article 14 of the General Conditions. Applications for Payment will be processed by ENGINEER as provided in the General Conditions.

6.02 *Progress Payments; Retainage*

A. OWNER shall make progress payments on account of the Contract Price on the basis of CONTRACTOR's Applications for Payment on or about the date established at the pre-construction conference for each month during performance of the Work as provided in paragraphs 6.02.A. 1 and 6.02.A.2 below. All such payments will be measured by the schedule of values established in paragraph 2.07.A of the General Conditions (and in the case of Unit Price Work based on the number of units completed) or, in the event there is no schedule of values, as provided in the General Requirements.

1 . Prior to Substantial Completion, progress payments will be made in an amount equal to the percentage indicated below but, in each case, less the aggregate of payments previously made and less such amounts as ENGINEER may determine or OWNER may withhold, in accordance with paragraph 14.02 of the General Conditions:

a. 95 % of Work completed (with the balance being retainage); and

b. 95% of cost of materials and equipment not incorporated in the Work but delivered and suitably stored in a location and manner agreed to in writing and pursuant to paragraph 14.02.A.1 of the General Conditions (with the balance being retainage).

6.03 *Final Payment*

A. Upon final completion and acceptance of the Work in accordance with paragraph 14.07 of the General Conditions, OWNER shall pay the remainder of the Contract Price as recommended by ENGINEER as provided in said paragraph 14.07.

ARTICLE 7 - INTEREST

7.01 All moneys not paid when due as provided in Article 14 of the General Conditions shall bear interest at the rate of __8__% per annum.

ARTICLE 8 - CONTRACTOR'S REPRESENTATIONS

8.01 In order to induce OWNER to enter into this Agreement CONTRACTOR makes the following representations:

A. CONTRACTOR has examined and carefully studied the Contract Documents and the other related data identified in the Bidding Documents.

B. CONTRACTOR has visited the Site and become familiar with and is satisfied as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.

C. CONTRACTOR is familiar with and is satisfied as to all federal, state, and local Laws and Regulations that may affect cost, progress, and performance of the Work.

D. CONTRACTOR has carefully studied all: (1) reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site (except Underground Facilities) which have been identified in the Supplementary Conditions as provided in paragraph 4.02 of the General Conditions and (2) reports and drawings of a Hazardous Environmental Condition, if any, at the Site which has been identified in the Supplementary Conditions as provided in paragraph 4.06 of the General Conditions.

E. CONTRACTOR has obtained and carefully studied (or assumes responsibility for having done so) all additional or supplementary examinations, investigations, explorations, tests, studies, and data concerning conditions (surface, subsurface, and Underground Facilities) at or contiguous to the Site which may affect cost, progress, or performance of the Work or which relate to any aspect of the means, methods, techniques, sequences, and procedures of construction to be employed by CONTRACTOR, including applying the specific means, methods, techniques, sequences, and procedures of construction, if any, expressly required by the Contract Documents to be employed by CONTRACTOR, and safety precautions and programs incident thereto.

F. CONTRACTOR does not consider that any further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract Documents.

G. CONTRACTOR is aware of the general nature of work to be performed by OWNER and others at the Site that relates to the Work as indicated in the Contract Documents.

H. CONTRACTOR has correlated the information known to CONTRACTOR, information and observations obtained from visits to the Site, reports and drawings identified in the Contract Documents, and all additional examinations, investigations, explorations, tests, studies, and data with the Contract Documents.

I. CONTRACTOR has given ENGINEER written notice of all conflicts, errors, ambiguities, or discrepancies that CONTRACTOR has discovered in the Contract Documents, and the written resolution thereof by ENGINEER is acceptable to CONTRACTOR.

J. The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.

ARTICLE 9 - CONTRACT DOCUMENTS

9.01 *Contents*

A. The Contract Documents consist of the following:

1 . This Agreement (pages 1 to _____, inclusive);

2. Performance Bond (pages _____ to _____, inclusive);

3. Payment Bond (pages _____ to _____, inclusive);

4. Other Bonds (pages _____ to _____, inclusive);

a. _____(pages _____ to _____ inclusive);

b. _____(pages _____ to _____ inclusive);

c. _____(pages _____ to _____ inclusive);

5. General Conditions (pages _____ to _____, inclusive);

6. Supplementary Conditions (pages _____ to _____, inclusive);

7. Specifications as listed in the table of contents of the Project Manual;

8. Drawings consisting of a cover sheet and sheets numbered _____ through _____, inclusive, with each sheet bearing the following general title:

9. Addenda (numbers _____ to _____ inclusive);

10. Exhibits to this Agreement (enumerated as follows):

a. Notice to Proceed (pages _____ to _____ inclusive);

b. CONTRACTOR's Bid (pages _____ to _____, inclusive);

c. Documentation submitted by CONTRACTOR prior to Notice of Award (pages _____ to _____ inclusive);

11. The following which may be delivered or issued on or after the Effective Date of the Agreement and are not attached hereto:

a. Written Amendments;

b. Work Change Directives;

c. Change Order(s).

B. The documents listed in paragraph 9.0l.A are attached to this Agreement (except as expressly noted otherwise above).

C. There are no Contract Documents other than those listed above in this Article 9.

D. The Contract Documents may only be amended, modified, or supplemented as provided in paragraph 3.05 of the General Conditions.

ARTICLE 10 - MISCELLANEOUS

10.01 *Terms*

A. Terms used in this Agreement will have the meanings indicated in the General Conditions.

10.02 *Assignment of Contract*

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

10.03 *Successors and Assigns*

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

10.04 *Severability*

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

10.05 *Other Provisions*

IN WITNESS WHEREOF, OWNER and CONTRACTOR have signed this Agreement in triplicate. One counterpart each has been delivered to OWNER, CONTRACTOR and ENGINEER. All portions of the Contract Documents have been signed, initialed or identified by OWNER and CONTRACTOR or identified by ENGINEER on their behalf.

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

OWNER:

By:_____

[CORPORATE SEAL]

Attest_____

Address for giving notices:

_____

_____

If OWNER is a public body, attach evidence of authority to sign and resolution or other documents authorizing execution of OWNER-CONTRACTOR Agreement.)

Designated Representative:

Name:_____

Title:_____

Address:_____

_____

Phone:_____

Facsimile:_____

CONTRACTOR:

By:_____

[CORPORATE SEAL]

Attest_____

Address for giving notices:

_____

_____

License No._____
(Where applicable)

Agent for service of process:_____

_____

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

Designated Representative:

Name:_____

Title:_____

Address:_____

_____

Phone:_____

Facsimile:_____

AGENCY Concurrence

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

By: _____ Title: _____
AGENCY Official

Date: _____

Performance Bond

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

CONTRACTOR (Name and Address):

SURETY (Name and Address of Principal Place of Business):

OWNER (Name and Address):

CONTRACT
Date:
Amount:
Description (Name and Location):

BOND
Date (Not earlier than Contract Date):
Amount:
Modifications to this Bond Form:

Surety and Contractor, intending to be legally bound hereby, subject to the terms printed on the reverse side hereof, do each cause this Performance Bond to be duly executed on its behalf by its authorized officer, agent or representative.

CONTRACTOR AS PRINCIPAL
Company: (Corp. Seal)

Signature: _____
Name and Title:

SURETY
Company: (Corp. Seal)

Signature: _____
Name and Title:
(Attach Power of Attorney)

(Space is provided below for signatures of additional parties, if required.)

CONTRACTOR AS PRINCIPAL
Company: (Corp. Seal)

Signature: _____
Name and Title:

SURETY
Company: (Corp. Seal)

Signature: _____
Name and Title:

EJCDC No. 1910-28-A (1996 Edition)
Originally prepared through the joint efforts of the Surety Association of America, Engineers Joint Contract Documents Committee, the Associated General Contractors of America, and the American Institute of Architects.

1. The CONTRACTOR and the Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner for the performance of the Contract, which is incorporated herein by reference.

2. If the CONTRACTOR performs the Contract, the Surety and the CONTRACTOR have no obligation under this Bond, except to participate in conferences as provided in paragraph 3.1.

3. If there is no OWNER Default, the Surety's obligation under this Bond shall arise after:

3.1. The OWNER has notified the CONTRACTOR and the Surety at the addresses described in paragraph 10 below, that the OWNER is considering declaring a CONTRACTOR Default and has requested and attempted to arrange a conference with the CONTRACTOR and the Surety to be held not later than fifteen days after receipt of such notice to discuss methods of performing the Contract. If the OWNER, the CONTRACTOR and the Surety agree, the CONTRACTOR shall be allowed a reasonable time to perform the Contract, but such an agreement shall not waive the OWNER's right, if any, subsequently to declare a CONTRACTOR Default; and

3.2. The OWNER has declared a CONTRACTOR Default and formally terminated the CONTRACTOR's right to complete the Contract. Such CONTRACTOR Default shall not be declared earlier than twenty days after the CONTRACTOR and the Surety have received notice as provided in paragraph 3.1; and

3.3. The OWNER has agreed to pay the Balance of the Contract Price to:

3.3.1. The Surety in accordance with the terms of the Contract;

3.3.2. Another contractor selected pursuant to paragraph 4.3 to perform the Contract.

4. When the OWNER has satisfied the conditions of paragraph 3, the Surety shall promptly and at the Surety's expense take one of the following actions:

4.1. Arrange for the CONTRACTOR, with consent of the OWNER, to perform and complete the Contract; or

4.2. Undertake to perform and complete the Contract itself, through its agents or through independent contractors; or

4.3. Obtain bids or negotiated proposals from qualified contractors acceptable to the OWNER for a contract for performance and completion of the Contract, arrange for a contract to be prepared for execution by the OWNER and the 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 Contract, and pay to the OWNER the amount of damages as described in paragraph 6 in excess of the Balance of the Contract Price incurred by the OWNER resulting from the CONTRACTOR Default; or

4.4. Waive its right to perform and complete, arrange for completion, or obtain a new contractor and with reasonable promptness under the circumstances;

4.4.1 After investigation, determine the amount for which it may be liable to the OWNER and, as soon as practicable after the amount is determined, tender payment therefor to the OWNER; or

4.4.2 Deny liability in whole or in part and notify the OWNER citing reasons therefor.

5. If the Surety does not proceed as provided in paragraph 4 with reasonable promptness, the Surety shall be deemed to be in default on this Bond fifteen days after receipt of an additional written notice from the OWNER to the Surety demanding that the Surety perform its obligations under this Bond, and the OWNER shall be entitled to enforce any remedy available to the OWNER. If the Surety proceeds as provided in paragraph 4.4, and the OWNER refuses the payment tendered or the Surety has denied pliability, in whole or in part, without further notice the OWNER shall be entitled to enforce any remedy available to the OWNER.

6. After the OWNER has terminated the CONTRACTOR's right to complete the Contract, and if the Surety elects to act under paragraph 4.1, 4.2, or 4.3 above, then the responsibilities of the Surety to the OWNER shall not be greater than those of the CONTRACTOR under the Contract, and the responsibilities of the OWNER to the Surety shall not be greater than those of the OWNER under the Contract. To a limit of the amount of this Bond, but subject to commitment by the OWNER of the Balance of the Contract Price to mitigation of costs and damages on the Contract, the Surety is obligated without duplication for:

6.1. The responsibilities of the CONTRACTOR for correction of defective Work and completion of the Contract;

6.2. Additional legal, design professional and delay costs resulting from the CONTRACTOR's Default, and resulting from the actions or failure to act of the Surety under paragraph 4; and

6.3. Liquidated damages, or if no liquidated damages are specified in the Contract, actual damages caused by delayed performance or non-performance of the CONTRACTOR.

7. The Surety shall not be liable to the OWNER or others for obligations of the CONTRACTOR that are unrelated to the 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, or successors.

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

9. 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 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.

10. Notice to the Surety, the OWNER or the CONTRACTOR shall be mailed or delivered to the address shown on the signature page.

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

12. Definitions.

12.1 Balance of the Contract Price: The total amount payable by the OWNER to the CONTRACTOR under the 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 Contract.

12.2. Contract: The agreement between the OWNER and the CONTRACTOR identified on the signature page, including all Contract Documents and changes thereto.

12.3. CONTRACTOR Default: Failure of the CONTRACTOR, which has neither been remedied nor waived, to perform or otherwise to comply with the terms of the Contract.

12.4. OWNER Default: Failure of the OWNER, which has neither been remedied nor waived, to pay the CONTRACTOR as required by the Contract or to perform and complete or comply with the other terms thereof.

Payment Bond

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

CONTRACTOR (Name and Address):

SURETY (Name and Address of Principal Place of Business):

OWNER (Name and Address):

CONTRACT
Date:
Amount:
Description (Name and Location):

BOND
Date (Not earlier than Contract Date):
Amount:
Modifications to this Bond Form:

Surety and Contractor, intending to be legally bound hereby, subject to the terms printed on the reverse side hereof, do each cause this Payment Bond to be duly executed on its behalf by its authorized officer, agent, or representative.

CONTRACTOR AS PRINCIPAL

Company: (Corp. Seal)

Signature: _____
Name and Title:

SURETY
Company: (Corp. Seal)

Signature: _____
Name and Title:
(Attach Power of Attorney)

(Space is provided below for signatures of additional parties, if required.)

CONTRACTOR AS PRINCIPAL
Company: (Corp. Seal)

Signature: _____
Name and Title:

SURETY
Company: (Corp. Seal)

Signature: _____
Name and Title:

EJCDC No. 1910-28-B (1996 Edition)
Originally prepared through the joint efforts of the Surety Association of America, Engineers Joint Contract Documents Committee, the Associated General Contractors of America, the American Institute of Architects, the American Subcontractors Association, and the Associated Specialty Contractors.

1. The CONTRACTOR and the 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 Contract, which is incorporated herein by reference.

2. With respect to the OWNER, this obligation shall be null and void if the CONTRACTOR:

2.1. Promptly makes payment, directly or indirectly, for all sums due Claimants, and

2.2. Defends, indemnifies and holds harmless the OWNER from all claims, demands, liens or suits by any person or entity who furnished labor, materials or equipment for use in the performance of the Contract, provided the OWNER has promptly notified the CONTRACTOR and the Surety (at the addresses described in paragraph 12) of any claims, demands, liens or suits and tendered defense of such claims, demands, liens or suits to the CONTRACTOR and the Surety, and provided there is no OWNER Default.

3. With respect to Claimants, this obligation shall be null and void if the CONTRACTOR promptly makes payment, directly or indirectly, for all sums due.

4. The Surety shall have no obligation to Claimants under this Bond until:

4.1. Claimants who are employed by or have a direct contract with the CONTRACTOR have given notice to the Surety (at the addresses described in paragraph 12) and sent a copy, or notice thereof, to the OWNER, stating that a claim is being made under this Bond and, with substantial accuracy, the amount of the claim.

4.2. Claimants who do not have a direct contract with the CONTRACTOR:

1. Have furnished written notice to the CONTRACTOR and sent a copy, or notice thereof, to the OWNER, within 90 days after having last performed labor or last furnished materials or equipment included in the claim stating, with substantial accuracy, the amount of the claim and the name of the party to whom the materials were furnished or supplied or for whom the labor was done or performed; and

2. Have either received a rejection in whole or in part from the CONTRACTOR, or not received within 30 days of furnishing the above notice any communication from the CONTRACTOR by which the CONTRACTOR had indicated the claim will be paid directly or indirectly; and

3. Not having been paid within the above 30 days, have sent a written notice to the Surety and sent a copy, or notice thereof, to the OWNER, stating that a claim is being made under this Bond and enclosing a copy of the previous written notice furnished to the CONTRACTOR.

5. If a notice required by paragraph 4 is given by the OWNER to the CONTRACTOR or to the Surety, that is sufficient compliance.

6. When the Claimant has satisfied the conditions of paragraph 4, the Surety shall promptly and at the Surety's expense take the following actions:

6.1. Send an answer to the Claimant, with a copy to the OWNER, within 45 days after receipt of the claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed.

6.2. Pay or arrange for payment of any undisputed amounts.

7. The Surety's total obligation shall not exceed the amount of this Bond, and the amount of this Bond shall be credited for any payments made in good faith by the Surety.

8. Amounts owed by the OWNER to the CONTRACTOR under the Contract shall be used for the performance of the Contract and to satisfy claims, if any, under any 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 Contract are dedicated to satisfy obligations of the CONTRACTOR and the Surety under this Bond, subject to the OWNER's priority to use the funds for the completion of the Work.

9. The Surety shall not be liable to the OWNER, Claimants or others for obligations of the CONTRACTOR that are unrelated to the Contract. The OWNER shall not be liable for payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligations to make payments to, give notices on behalf of, or otherwise have obligations to Claimants under this Bond.

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

11. No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the location in which the Work or part of the Work is located or after the expiration of one year from the date (1) on which the Claimant gave the notice required by paragraph 4.1 or paragraph 4.2.3, 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.

12. Notice to the Surety, the OWNER or the CONTRACTOR shall be mailed or delivered to the addresses shown on the signature page. Actual receipt of notice by Surety, the OWNER or the CONTRACTOR, however accomplished, shall be sufficient compliance as of the date received at the address shown on the signature page.

13. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the Contract 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. The intent is, that this Bond shall be construed as a statutory Bond and not as a common law bond.

14. Upon request of any person or entity appearing to be a potential beneficiary of this Bond, the CONTRACTOR shall promptly furnish a copy of this Bond or shall permit a copy to be made.

15. DEFINITIONS

15.1. 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 Contract. 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 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.

15.2. Contract: The agreement between the OWNER and the CONTRACTOR identified on the signature page, including all Contract Documents and changes thereto.

15.3. OWNER Default: Failure of the OWNER, which has neither been remedied nor waived, to pay the CONTRACTOR as required by the Contract or to perform and complete or comply with the other terms thereof.

This document has important legal consequences; consultation with an attorney is encouraged with respect to its use or modification. This document should be adapted to the particular circumstances of the contemplated Project and the Controlling Law.

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT FUNDING AGENCY EDITION

Prepared by

ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

and

Issued and Published Jointly By

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AMERICAN SOCIETY OF CIVIL ENGINEERS

This document has been accepted by
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Rural Utilities Service, Water and Waste Programs

These General Conditions have been prepared for use with the Owner-Contractor Agreement (No. 1910-8-A-1-FA) (1997 Edition). Their provisions are interrelated and a change in one may necessitate a change in the other. Comments concerning their usage are contained in the EJCDC User's Guide (No. 1910-50), which is a looseleaf compilation of narratives being produced over a five year period. For guidance in the preparation of Supplementary Conditions, see Guide to the Preparation of Supplementary Conditions (No. 1910-17) (1996 Edition).

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GENERAL CONDITIONS

ARTICLE 1 – DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

A. Wherever used in Contract Documents and printed with initial or all capital letter, the terms listed below will have the meanings indicated which are applicable to both the singular and plural thereof.

1. *Addenda*--Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the Contract Documents.

2. *AGENCY*--The Federal or state agency named as such in the Agreement.

3. *Agreement*—The written instrument which is evidence of the agreement between OWNER and CONTRACTOR covering the Work.

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

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

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

7. *Bidding Documents*--The Bidding Requirements and the proposed Contract Documents (including all Addenda issued prior to receipt of Bids).

8. *Bidding Requirements*--The Advertisement or Invitation to Bid, Instructions to Bidders, Bid security form, if any, and the Bid form with any supplements.

9. *Bonds*--Performance and payment bonds and other instruments of security.

10. *Change Order*--A document recommended by ENGINEER which is signed by CONTRACTOR and OWNER and AGENCY and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, issued on or after the Effective Date of the Agreement.

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

12. *Contract*--The entire and integrated written agreement between the OWNER and CONTRACTOR concerning the Work. The Contract supersedes prior negotiations, representations, or agreements whether written or oral.

13. *Contract Documents*--The Contract Documents establish the rights and obligations of the parties and include the Agreement, Addenda (which pertain to the Contract Documents), CONTRACTOR's Bid (including documentation accompanying the Bid and any post Bid documentation submitted prior to the Notice of Award), the Notice to Proceed, the Bonds, these General Conditions, the Supplementary Conditions, the Specifications and the Drawings as the same are more specifically identified in the Agreement, together with all Written Amendments, Change Orders, and ENGINEER's written interpretations and clarifications issued on or after the Effective Date of the Agreement. Approved Shop Drawings and the reports and drawings of subsurface and physical conditions are not Contract Documents. Only printed or hard copies of the items listed in this paragraph are Contract Documents. Files in electronic media format of text, data, graphics, and the like that may be furnished by OWNER to CONTRACTOR are not Contract Documents.

14. *Contract Price*--The moneys payable by OWNER to CONTRACTOR for completion of the Work in accordance with the Contract Documents as stated in the Agreement

(subject to the provisions of paragraph 11.03 in the case of Unit Price Work).

15. *Contract Times*--The number of days or the dates stated in the Agreement to: (i) achieve Substantial Completion; and, if applicable, (ii) complete the Work so that it is ready for final payment as evidenced by ENGINEER's written recommendation of final payment.

16. *CONTRACTOR*--The individual or entity with whom OWNER has entered into the Agreement.

17. *Cost of the Work*--See paragraph 11.01.A for definition.

18. *Drawings*--That part of the Contract Documents prepared or approved by ENGINEER which graphically shows the scope, extent, and character of the Work to be performed by CONTRACTOR. Shop Drawings and other CONTRACTOR submittals are not Drawings as so defined.

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

20. *ENGINEER*--The individual or entity named as such in the Agreement.

21. *ENGINEER's Consultant*--An Individual or entity having a Contract with ENGINEER to furnish services as ENGINEER's independent professional associate or consultant with respect to the Project and who is identified as such in the Supplementary Conditions.

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

23. *General Requirements*--Sections of Division 1 of the Specifications. The General Requirements pertain to all sections of the Specifications.

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

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

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

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

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

29. *Notice of Award*--The written notice by OWNER to the apparent successful bidder stating that upon timely compliance by the apparent successful bidder with the conditions precedent listed therein, OWNER will sign and deliver the Agreement.

30. *Notice to Proceed*--A written notice given by OWNER to CONTRACTOR fixing the date on which the Contract Times will commence to run and on which CONTRACTOR shall start to perform the Work under the Contract Documents.

31. *OWNER*--The individual, entity, public body, or authority with whom CONTRACTOR has entered into the Agreement and for whom the Work is to be performed.

32. *Partial Utilization*--Use by OWNER of a substantially completed part of the Work for the purpose for which it is intended (or a related purpose) prior to Substantial Completion of all the Work.

33. *PCBs*--Polychlorinated biphenyls.

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

35. *Project*--The total construction of which the Work to be performed under the Contract Documents may be the whole, or a part as may be indicated elsewhere in the Contract Documents.

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

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

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

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

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

41. *Site*--Lands or areas indicated in the Contract Documents as being furnished by OWNER upon which the Work is to be performed, including rights-of-way and easements for access thereto, and such other lands furnished by OWNER which are designated for the use of CONTRACTOR.

42. *Specifications*--That part of the Contract Documents consisting of written technical descriptions of materials, equipment, systems, standards, and workmanship as applied to the Work and certain administrative details applicable thereto.

43. *Subcontractor*--An individual or entity having a direct contract with CONTRACTOR or with any other Subcontractor for the performance of a part of the Work at the Site.

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

45. *Supplementary Conditions*--That part of the Contract Documents which amends or supplements these General Conditions.

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

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

48. *Unit Price Work*—Work to be paid for on the basis of unit prices.

49. *Work*--The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and

documentation necessary to produce such construction, and furnishing, installing, and incorporating all materials and equipment into such construction, all as required by the Contract Documents.

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

51. *Written Amendment*--A written statement modifying the Contract Documents, signed by OWNER, CONTRACTOR, and AGENCY upon recommendation of ENGINEER on or after the Effective Date of the Agreement and normally dealing with the nonengineering or nontechnical rather than strictly construction-related aspects of the Contract Documents.

1.02 *Terminology*

A. *Intent of Certain Terms or Adjectives*

1. Whenever in the Contract Documents the terms "as allowed," "as approved," or terms of like effect or import are used, or the adjectives "reasonable," "suitable," "acceptable," "proper," "satisfactory," or adjectives of like effect or import are used to describe an action or determination of ENGINEER as to the Work, it is intended that such action or determination will be solely to evaluate, in general, the completed Work for compliance with the requirements of and information in the Contract Documents and conformance with the design concept of the completed Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective shall not be effective to assign to ENGINEER any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility contrary to the provisions of paragraph 9.10 or any other provision of the Contract Documents.

B. *Day*

1. The word "day" shall constitute a calendar day of 24 hours measured from midnight to the next midnight.

C. *Defective*

1. The word "defective," when modifying the word "Work," refers to Work that is unsatisfactory, faulty, or deficient in that it does not conform to the Contract Documents or does not meet the requirements of any inspection, reference standard, test, or approval referred to in the Contract Documents, or has been damaged prior to ENGINEER's recommendation of final payment (unless responsibility for the protection thereof has been assumed by OWNER at Substantial Completion in accordance with paragraph 14.04 or 14.05).

D. *Furnish, Install, Perform, Provide*

1. The word "furnish," when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.

2. The word "install," when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.

3. The words "perform" or "provide," when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.

4. When "furnish," "install," "perform," or "provide" is not used in connection with services, materials, or equipment in a context clearly requiring an obligation of CONTRACTOR, "provide" is implied.

E. Unless stated otherwise in the Contract Documents, words or phrases which have a well-

known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2 - PRELIMINARY MATTERS

2.01 *Delivery of Bonds*

A. When CONTRACTOR delivers the executed Agreements to OWNER, CONTRACTOR shall also deliver to OWNER such Bonds as CONTRACTOR may be required to furnish.

2.02 *Copies of Documents*

A. OWNER shall furnish to CONTRACTOR up to five copies of the Contract Documents. Additional copies will be furnished upon request at the cost of reproduction.

2.03 *Commencement of Contract Times; Notice to Proceed*

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

2.04 *Starting the Work*

A. CONTRACTOR shall start to perform the Work on the date when the Contract Times commence to run. No Work shall be done at the Site prior to the date on which the Contract Times commence to run.

2.05 *Before Starting Construction*

A. *Contractor's Review of Contract Documents:* Before undertaking each part of the Work, CONTRACTOR shall carefully study and compare the Contract Documents and check and verify pertinent figures therein and all applicable field measurements. CONTRACTOR shall promptly report in writing to ENGINEER any conflict, error, ambiguity, or discrepancy which CONTRACTOR may discover and shall obtain a written interpretation or clarification from ENGINEER before proceeding with any Work affected thereby; however, CONTRACTOR shall not be liable to OWNER or ENGINEER for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless CONTRACTOR knew or reasonably should have known thereof.

B. *Preliminary Schedules:* Within ten days after the Effective Date of the Agreement (unless otherwise specified in the General Requirements), CONTRACTOR shall submit to ENGINEER for its timely review:

1. a preliminary progress schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract Documents;

2. a preliminary schedule of Shop Drawing and Sample submittals which will list each required submittal and the times for submitting, reviewing, and processing such submittal; and

3. a preliminary schedule of values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during performances of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

C. *Evidence of Insurance*: Before any Work at the Site is started, CONTRACTOR and OWNER shall each deliver to the other, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance which either of them or any additional insured may reasonably request) which CONTRACTOR and OWNER respectively are required to purchase and maintain in accordance with Article 5.

2.06 *Preconstruction Conference*

A. Before any Work at the Site is started, a conference attended by CONTRACTOR, ENGINEER, AGENCY and others as appropriate will be held to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in paragraph 2.05.B, procedures for handling Shop Drawings and other submittals, processing Applications for Payment, and maintaining required records.

2.07 *Initial Acceptance of Schedules*

A. Unless otherwise provided in the Contract Documents, at least ten days before submission of the first Application for Payment a conference attended by CONTRACTOR, ENGINEER, and others as appropriate will be held to review for acceptability to ENGINEER as provided below the schedules submitted in accordance with paragraph 2.05.B. CONTRACTOR shall have an additional ten days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall be made to CONTRACTOR until acceptable schedules are submitted to ENGINEER.

1. The progress schedule will be acceptable to ENGINEER if it provides an orderly progression of the Work to completion within any specified Milestones and the Contract Times. Such acceptance will not impose on ENGINEER responsibility for the progress schedule, for sequencing, scheduling, or progress of the Work nor interfere with or relieve CONTRACTOR from CONTRACTOR's full responsibility therefor.

2. CONTRACTOR's schedule of Shop Drawing and Sample submittals will be acceptable to ENGINEER if it provides a workable arrangement for reviewing and processing the required submittals.

3. CONTRACTOR's schedule of values will be acceptable to ENGINEER as to form and substance if it provides a reasonable allocation of the Contract Price to component parts of the Work.

ARTICLE 3 – CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE

3.01 *Intent*

A. The Contract Documents are complementary; what is called for by one is as binding as if called for by all.

B. It is the intent of the Contract Documents to describe a functionally complete Project (or part thereof) to be constructed in accordance with the Contract Documents. Any labor, documentation, services, materials, or equipment that may reasonably be inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the intended result will be provided whether or not specifically called for at no additional cost to OWNER.

C. Clarifications and interpretations of the Contract Documents shall be issued by ENGINEER as provided in Article 9.

3.02 *Reference Standards*

A. *Standards, Specifications, Codes, Laws, and Regulations*

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

2. No provision of any such standard, specification, manual or code, or any instruction of a Supplier shall be effective to change the duties or responsibilities of OWNER, CONTRACTOR, or ENGINEER, or any of their subcontractors, consultants, agents, or employees from those set forth in the Contract Documents, nor shall any such provision or instruction be effective to assign to OWNER, ENGINEER, or any of ENGINEER's Consultants, agents, or employees any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the Contract Documents.

3.03 *Reporting and Resolving Discrepancies*

A. *Reporting Discrepancies*

1. If, during the performance of the Work, CONTRACTOR discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents or between the Contract Documents and any provision of any Law or Regulation applicable to the performance of the Work or of any standard, specification, manual or code, or of any instruction of any Supplier,

CONTRACTOR shall report it to ENGINEER in writing at once. CONTRACTOR shall not proceed with the Work affected thereby (except in an emergency as required by paragraph 6.16.A) until an amendment or supplement to the Contract Documents has been issued by one of the methods indicated in paragraph 3.04; provided, however, that CONTRACTOR shall not be liable to OWNER or ENGINEER for failure to report any such conflict, error, ambiguity, or discrepancy unless CONTRACTOR knew or reasonably should have known thereof.

B. *Resolving Discrepancies*

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the Contract Documents shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between the provisions of the Contract Documents and ;

a. the provisions of any standard, specification, manual, code, or instruction (whether or not specifically incorporated by reference in the Contract Documents); or

b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

3.04 *Amending and Supplementing Contract Documents*

A. The Contract Documents may be amended to provide for additions, deletions, and revisions in the Work or to modify the terms and conditions thereof in one or more of the following ways; (i) a Written Amendment; (ii) a Change Order; or (iii) a Work Change Directive.

B. The requirements of the Contract Documents may be supplemented, and minor variations and deviations in the Work may be authorized, by one or more of the following ways; (i) a Field Order; (ii) ENGINEER's approval of a Shop Drawing or Sample; or (iii) ENGINEER's written interpretation or clarification.

3.05 *Reuse of Documents*

A. CONTRACTOR and any Subcontractor or Supplier or other individual or entity performing or furnishing any of the Work under a direct or indirect contract with OWNER: (i) shall not have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of ENGINEER or ENGINEER's Consultant, including electronic media editions; and (ii) shall not reuse any of such Drawings, Specifications, other documents, or copies on extensions of the Project or any other project without written consent of OWNER and ENGINEER and specific written verification or adoption by ENGINEER. This prohibition will survive final payment, completion, and acceptance of the Work, or termination or completion of the Contract. Nothing herein shall preclude CONTRACTOR from retaining copies of the Contract Documents for record purposes.

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

4.01 *Availability of Lands*

A. OWNER shall furnish the Site. OWNER shall notify CONTRACTOR of any encumbrances or restrictions not of general application but specifically related to use of the Site with which CONTRACTOR must comply in performing the Work. OWNER will obtain in a timely manner and pay for easements for permanent structures or permanent changes in existing facilities. If CONTRACTOR and OWNER are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, as a result of any delay in OWNER's furnishing the Site, CONTRACTOR may make a Claim therefor as provided in paragraph 10.05.

B. Upon reasonable written request, OWNER shall furnish CONTRACTOR with a current statement of record legal title and legal description of the lands upon which the Work is to be performed and OWNER's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.

C. CONTRACTOR shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

4.02 *Subsurface and Physical Conditions*

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

1. those reports of explorations and tests of subsurface conditions at or contiguous to the Site that ENGINEER has used in preparing the Contract Documents; and

2. those drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site (except Underground Facilities) that ENGINEER has used in preparing the Contract Documents.

B. *Limited Reliance by CONTRACTOR on Technical Data Authorized*: CONTRACTOR may rely upon the general accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data," CONTRACTOR may not rely upon or make any Claim against OWNER, ENGINEER, or any of ENGINEER's Consultants with respect to:

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

2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or

3. any CONTRACTOR interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions, or information.

4.03 *Differing Subsurface or Physical Conditions*

A. *Notice:* If CONTRACTOR believes that any subsurface or physical condition at or contiguous to the Site that is uncovered or revealed either:

1. is of such a nature as to establish that any "technical data" on which CONTRACTOR is entitled to rely as provided in paragraph 4.02 is materially inaccurate; or

2. is of such a nature as to require a change in the Contract Documents; or

3. differs materially from that shown or indicated in the Contract Documents; or

4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents; then CONTRACTOR shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by paragraph 6.16.A), notify OWNER and ENGINEER in writing about such condition. CONTRACTOR shall not further disturb such condition or perform any Work in connection therewith (except as aforesaid) until receipt of written order to do so.

B. *ENGINEER's Review*: After receipt of written notice as required by paragraph 4.03.A, ENGINEER will promptly review the pertinent condition, determine the necessity of OWNER's obtaining additional exploration or tests with respect thereto, and advise OWNER in writing (with a copy to CONTRACTOR) of ENGINEER's findings and conclusions.

C. *Possible Price and Times Adjustments*

1. The Contract Price or the Contract Times, or both, will be equitably adjusted to the extent that the existence of such differing subsurface or physical condition causes an increase or decrease in CONTRACTOR's cost of, or time required for, performance of the Work; subject, however, to the following:

a. such condition must meet any one or more of the categories described in paragraph 4.03.A; and

b. with respect to Work that is paid for on a Unit Price Basis, any adjustment in Contract Price will be subject to the provisions of paragraphs 9.08 and 11.03.

2. CONTRACTOR shall not be entitled to any adjustment in the Contract Price or Contract Times if:

a. CONTRACTOR knew of the existence of such conditions at the time CONTRACTOR made a final commitment to OWNER in respect of Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract; or

b. the existence of such condition could reasonably have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas required by the Bidding Requirements or Contract Documents to be conducted by or for CONTRACTOR prior to CONTRACTOR's making such final commitment; or

c. CONTRACTOR failed to give the written notice within the time and as required by paragraph 4.03.A.

3. If OWNER and CONTRACTOR are unable to agree on entitlement to or on the amount or extent, if any, or any adjustment in the Contract Price or Contract Times, or both, a Claim may be made therefor as provided in paragraph 10.05. However, OWNER, ENGINEER, and ENGINEER's Consultants shall not be liable to CONTRACTOR for any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by CONTRACTOR on or in connection with any other project or anticipated project.

4.04 *Underground Facilities*

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

1. OWNER and ENGINEER shall not be responsible for the accuracy or completeness of any such information or data; and

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

a. reviewing and checking all such information and data,

b. locating all Underground Facilities shown or indicated in the Contract Documents,

c. coordination of the Work with the Owners of such Underground Facilities, including OWNER, during construction, and

d. the safety and protection of all such Underground Facilities and repairing any damage thereto resulting from the Work.

B. *Not Shown or Indicated*:

1. If an Underground Facility is uncovered or revealed at or contiguous to the Site which was not shown or indicated, or not shown or indicated with reasonable accuracy in the Contract Documents, CONTRACTOR shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by paragraph 6.16.A), identify the owner of such Underground Facility and give written notice to that owner and to OWNER and ENGINEER. ENGINEER will promptly review the Underground Facility and determine the extent, if any, to which a change is required in the Contract Documents to reflect and document the consequences of the existence or location of the Underground Facility. During such time, CONTRACTOR shall be responsible for the safety and protection of such Underground Facility.

2. If ENGINEER concludes that a change in the Contract Documents is required, a Work Change Directive or a Change Order will be issued to reflect and document such consequences. An equitable adjustment shall be made in the Contract Price or Contract Times, or both, to the extent that they are attributable to the existence or location of any Underground Facility that was not shown or indicated or not shown or indicated with reasonable accuracy in the Contact Documents and that CONTRACTOR

did not know of and could not reasonably have been expected to be aware of or to have anticipated. If OWNER and CONTRACTOR are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment in Contract Price or Contract Times, OWNER or CONTRACTOR may make a Claim therefor as provided in paragraph 10.05.

4.05 *Reference Points*

A. OWNER shall provide engineering surveys to establish reference points for construction which in ENGINEER's judgement are necessary to enable CONTRACTOR to proceed with the Work. CONTRACTOR shall be responsible for laying out the Work, shall protect and preserve the established reference points and property monuments, and shall make no changes or relocations without the prior written approval of OWNER. CONTRACTOR shall report to ENGINEER whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

4.06 *Hazardous Environmental Condition at Site*

A. *Reports and Drawings*: Reference is made to the Supplementary Conditions for the identification of those reports and drawings relating to a Hazardous Environmental Condition identified at the Site, if any, that have been utilized by the ENGINEER in the preparation of the Contract Documents.

B. *Limited Reliance by CONTRACTOR or Technical Data Authorized:* CONTRACTOR may rely upon the general accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data", CONTRACTOR may not rely upon or make any Claim against OWNER, ENGINEER or any of ENGINEER's Consultants with respect to:

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

2. other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings; or

3. any CONTRACTOR interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions or information.

C. CONTRACTOR shall not be responsible for any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in Drawings or Specifications or identified in the Contract Documents to be within the scope of Work. CONTRACTOR shall be responsible for a Hazardous Environmental Condition created with any materials brought to the Site by CONTRACTOR, Subcontractors, Suppliers, or anyone else for whom CONTRACTOR is responsible.

D. If CONTRACTOR encounters a Hazardous Environmental Condition or if CONTRACTOR or anyone for whom CONTRACTOR is responsible creates a Hazardous Environmental Condition, CONTRACTOR shall immediately; (i) secure or otherwise isolate such condition; (ii) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by paragraph 6.16); and (iii) notify OWNER and ENGINEER (and promptly thereafter confirm such notice in writing). OWNER shall promptly consult with ENGINEER concerning the necessity for OWNER to retain a qualified expert to evaluate such condition or take corrective action, if any.

E. CONTRACTOR shall not be required to resume Work in connection with such condition or in any affected area until after OWNER has obtained any required permits related thereto and delivered to CONTRACTOR written notice: (i) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work; or (ii) specifying any special conditions under which such Work may be resumed safely. If OWNER and CONTRACTOR cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by CONTRACTOR, either party may make a Claim therefor as provided in paragraph 10.05.

F. If after receipt of such written notice CONTRACTOR does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then OWNER may order the portion of the Work that is in the area affected by such condition to be deleted from the Work. If OWNER and CONTRACTOR cannot agree as to entitlement to or on the amount or extent, if any, of an adjustment in Contract Price or Contract Times as a result of deleting such portion of the Work, then either party may make a Claim therefor as provided in paragraph 10.05. OWNER may have such deleted portion of the Work performed by OWNER's own forces or others in accordance with Article 7.

G. To the fullest extent permitted by Laws and Regulations, OWNER shall indemnify and hold harmless CONTRACTOR, Subcontractors, ENGINEER, ENGINEER's Consultants and the officers, directors, partners, employees, agents, other consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition; (i) was not shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be included within the scope of Work, and (ii) was not created by CONTRACTOR or by anyone for whom CONTRACTOR is responsible. Nothing in this paragraph 4.06.E shall obligate OWNER to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

H. To the fullest extent permitted by Laws and Regulations, CONTRACTOR shall indemnify and hold harmless OWNER, ENGINEER, ENGINEER's Consultants, and the officers, directors, partners, employees, agents, other consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition created by CONTRACTOR or by anyone for whom CONTRACTOR is responsible. Nothing in this paragraph 4.06.F shall obligate CONTRACTOR to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

I. The provisions of paragraphs 4.02, 4.03, and 4.04 are not intended to apply to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 5 – BONDS AND INSURANCE

5.01 *Performance, Payment and Other Bonds*

A. CONTRACTOR shall furnish performance and payment Bonds, each in an amount at least equal to the Contract Price as security for the faithful performance and payment of all CONTRACTOR's obligations under the Contract Documents. These Bonds shall remain in effect at least until one year after the date when final payment becomes due, except as provided otherwise by Laws or Regulations or by the Contract Documents. CONTRACTOR shall also furnish such other Bonds as are required by the Contract Documents.

B. All Bonds shall be in the form prescribed by the Contract Documents except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in the current list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (amended) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. All Bonds signed by an agent must be accompanied by a certified copy of such agent's authority to act.

C. If the surety on any Bond furnished by CONTRACTOR is declared bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the Project is located or it ceases to meet the requirements of paragraph 5.01.B, CONTRACTOR shall within 20 days thereafter substitute another Bond and surety, both of which shall comply with the requirements of paragraphs 5.01.B and 5.02.

5.02 *Licensed Sureties and Insurers*

A. All Bonds and insurance required by the Contract Documents to be purchased and maintained by OWNER or CONTRACTOR shall be obtained from surety or insurance companies that are duly licensed or authorized in the jurisdiction in which

the Project is located to issue Bonds or insurance policies for the limits and coverages so required. Such surety and insurance companies shall also meet such additional requirements and qualifications as may be provided in the Supplementary Conditions.

5.03 *Certificates of Insurance*

A. CONTRACTOR shall deliver to OWNER, with copies of each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by OWNER or any other additional insured) which CONTRACTOR is required to purchase and maintain. OWNER shall deliver to CONTRACTOR, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by CONTRACTOR or any other additional insured) which OWNER is required to purchase and maintain.

5.04 *CONTRACTOR's Liability Insurance*

A. CONTRACTOR shall purchase and maintain such liability and other insurance as is appropriate for the Work being performed and as will provide protection from claims set forth below which may arise out of or result from CONTRACTOR's performance of the Work and CONTRACTOR's other obligations under the Contract Documents, whether it is to be performed by CONTRACTOR, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable:

1. claims under workers' compensation, disability benefits, and other similar employee benefit acts;

2. claims for damages because of bodily injury, occupational sickness or disease, or death of CONTRACTOR's employees;

3. claims for damages because of bodily injury, sickness or disease, or death of any person other than CONTRACTOR's employees;

4. claims for damages insured by reasonably available personal injury liability coverage which are sustained: (i) by any person as a result of an offense directly or indirectly related to the employment of such person by CONTRACTOR, or (ii) by any person for any other reason;

5. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom; and

6. claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance or use of any motor vehicle.

B. The policies of insurance so required by this paragraph 5.04 to be purchased and maintained shall:

1. with respect to insurance required by paragraphs 5.04.A.3 through 5.04.A.6 inclusive, include as additional insureds (subject to any customary exclusion in respect of professional liability) OWNER, ENGINEER, ENGINEER's Consultants, and any other individuals or entities identified in the Supplementary Conditions, all of whom shall be listed as additional insureds, and include coverage for the respective officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of all such additional insureds, and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby;

2. include at lease the specific coverages and be written for not less than the limits of liability provided in the Supplementary Conditions or required by Laws or Regulations, whichever is greater;

3. include completed operations insurance;

4. include contractual liability insurance covering CONTRACTOR's indemnity obligations under paragraphs 6.07, 6.11, and 6.20;

5. contain a provision or endorsement that the coverage afforded will not be canceled, materially changed or renewal refused until at least 30 days prior written notice has been given to OWNER and CONTRACTOR and to each other additional insured identified in the Supplementary Conditions to whom a certificate of insurance has been issued (and the certificates of insurance furnished by the CONTRACTOR pursuant to paragraph 5.03 will so provide);

6. remain in effect at least until final payment and at all times thereafter when CONTRACTOR may be correcting, removing, or replacing defective Work in accordance with paragraph 13.07; and

7. with respect to completed operations insurance, and any insurance coverage written on a claims-made basis, remain in effect for at least two years after final payment (and CONTRACTOR shall furnish OWNER and each other additional insured identified in the Supplementary Conditions, to whom a certificate of insurance has been issued, evidence satisfactory to OWNER and any such additional insured of continuation of such insurance at final payment and one year thereafter).

5.05 *OWNER's Liability Insurance*

A. In addition to the insurance required to be provided by CONTRACTOR under paragraph 5.04, OWNER, at OWNER's option, may purchase and maintain at OWNER's expense OWNER's own liability insurance as will protect OWNER against claims which may arise from operations under the Contract Documents.

5.06 *Property Insurance*

A. Unless otherwise provided in the Supplementary Conditions, CONTRACTOR shall purchase and maintain property insurance upon the Work at the Site in the amount of the full replacement cost thereof (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). This insurance shall:

1. include the interests of OWNER, CONTRACTOR, Subcontractors, ENGINEER, ENGINEER's Consultants, and any other individuals or entities identified in the Supplementary Conditions, and the officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them, each of whom is deemed to have an insurable interest and shall be listed as an additional insured;

2. be written on a Builder's Risk "all-risk" or open peril or special causes of loss policy form that shall at lease include insurance for physical loss or damage to the Work, temporary buildings, false work, and materials and equipment in transit, and shall insure against at least the following perils or causes of loss; fire, lightning, extended coverage, theft, vandalism and malicious mischief, earthquake, collapse, debris removal, demolition occasioned by enforcement of Laws and Regulations, water damage, and such other perils or causes of loss as may be specifically required by the Supplementary Conditions;

3. include expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects);

4. cover materials and equipment stored at the Site or at another location that was agreed to in writing by OWNER prior to being incorporated in the Work, provided that such materials and equipment have been included in an Application for Payment recommended by ENGINEER;

5. allow for partial utilization of the Work by OWNER;

6. include testing and startup; and

7. be maintained in effect until final payment is made unless otherwise agreed to in writing by OWNER, CONTRACTOR, and ENGINEER with 30 days written notice to each other additional insured to whom a certificate of insurance has been issued.

8. contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 30 days prior written notice has been given to OWNER and CONTRACTOR and to each other additional insured to whom a certificate of insurance has been issued and will contain waiver provisions in accordance with paragraph 5.07.

B. CONTRACTOR shall purchase and maintain such boiler and machinery insurance or additional property insurance as may be required by the Supplementary Conditions or Laws and Regulations which will include the interests of OWNER, CONTRACTOR, Subcontractors, ENGINEER, ENGINEER's Consultants, and any other individuals or entities identified in the Supplementary Conditions, each of whom is deemed to have an insurable interest and shall be listed as an insured or additional insured.

C. OWNER shall not be responsible for purchasing and maintaining any property insurance specified in this paragraph 5.06 to protect the interests of CONTRACTOR, Subcontractors, or others in the Work to the extent of any deductible amounts that are identified in the Supplementary Conditions. The risk of loss within such identified deductible amount will be borne by CONTRACTOR, Subcontractors, or others suffering any such loss, and if any of them wishes property insurance coverage within the limits of such amounts, each may purchase and maintain it at the purchaser's own expense.

5.07 *Waiver of Rights*

A. OWNER and CONTRACTOR intend that all policies purchased in accordance with paragraph 5.06 will protect OWNER, CONTRACTOR, Subcontractors, ENGINEER, ENGINEER's Consultants, and all other individuals or entities identified in the Supplementary Conditions to be listed as insureds or additional insureds (and the officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them) in such policies and will provide primary coverage for all losses and damages caused by the perils or causes of loss covered thereby. All such policies shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any of the insureds or additional insureds thereunder. OWNER and CONTRACTOR waive all rights against each other and their respective officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them for all losses and damages caused by, arising out of or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Subcontractors, ENGINEER, ENGINEER's Consultants, and all other individuals or entities identified in the Supplementary Conditions to be listed as insureds or additional insureds (and the officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them) under such policies for losses and damages so caused. None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by OWNER as trustee or otherwise payable under any policy so issued.

B. OWNER waives all rights against CONTRACTOR, Subcontractors, ENGINEER, ENGINEER's Consultants, and the officers, directors, partners, employees, agents and other consultants and subcontractors of each and any of them for:

1. loss due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to OWNER's property or the Work caused by, arising out of, or resulting from fire or other peril whether or not insured by OWNER; and

2. loss or damage to the completed Project or part thereof caused by, arising out of, or resulting from fire or other insured peril or cause of loss covered by any property insurance maintained on the completed Project or part thereof by OWNER during partial utilization pursuant to paragraph 14.05, after Substantial Completion pursuant to paragraph 14.04, or after final payment pursuant to paragraph 14.07.

C. Any insurance policy maintained by OWNER covering any loss, damage or consequential loss referred to in paragraph 5.07.B shall contain provisions to the effect that in the event of payment of any such loss, damage, or consequential loss, the insurers will have no rights of recovery against CONTRACTOR, Subcontractors, ENGINEER, or ENGINEER's Consultants and the officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them.

5.08 *Receipt and Application of Insurance Proceeds*

A. Any insured loss under the policies of insurance required by paragraph 5.06 will be adjusted with CONTRACTOR and made payable to CONTRACTOR as fiduciary for the insureds, as their interests may appear subject to the requirements of any applicable mortgage clause and of paragraph 5.08.B. CONTRACTOR shall deposit in a separate account any money so received and shall distribute it in accordance with such agreement as the parties in interest may reach. If no other special agreement is reached, the damaged Work shall be repaired or replaced, the moneys so received applied on account thereof, and the Work and the cost thereof covered by an appropriate Change Order or Written Amendment.

B. CONTRACTOR as fiduciary shall have power to adjust and settle any loss with the insurers unless one of the parties in interest shall object in writing within 15 days after the occurrence of loss to CONTRACTOR's exercise of this power. If such

objection be made, CONTRACTOR as fiduciary shall make settlement with the insurers in accordance with such agreement as the parties in interest may reach. If no such agreement among the parties in interest is reached, CONTRACTOR as fiduciary shall adjust and settle the loss with the insurers and, if required in writing by any party in interest, CONTRACTOR as fiduciary shall give bond for the proper performance of such duties.

5.09 *Acceptance of Bonds and Insurance; Option to Replace*

A. If either OWNER or CONTRACTOR has any objection to the coverage afforded by or other provisions of the Bonds or insurance required to be purchased and maintained by the other party in accordance with Article 5 on the basis of non-conformance with the Contract Documents, the objecting party shall so notify the other party in writing within 10 days after receipt of the certificates (or other evidence requested) required by paragraph 2.05.C. OWNER and CONTRACTOR shall each provide to the other such additional information in respect of insurance provided as the other may reasonably request. If either party does not purchase or maintain all of the Bonds and insurance required of such party by the Contract Documents, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage. Without prejudice to any other right or remedy, the other party may elect to obtain equivalent Bonds or insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and a Change Order shall be issued to adjust the Contract Price accordingly.

5.10 *Partial Utilization, Acknowledgment of Property Insurer*

A. If OWNER finds it necessary to occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work as provided in paragraph 14.05, no such use or occupancy shall commence before the insurers providing the property insurance pursuant to paragraph 5.06 have acknowledged notice thereof and in writing effected any changes in coverage necessitated thereby. The insurers providing the property insurance shall consent by endorsement on the policy or policies, but the property insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy.

ARTICLE 6 - CONTRACTOR'S RESPONSIBILITIES

6.01 *Supervision and Superintendence*

A. CONTRACTOR shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. CONTRACTOR shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction, but CONTRACTOR shall not be responsible for the negligence of OWNER or ENGINEER in the design or specification of a specific means, method, technique, sequence, or procedure of construction which is shown or indicated in and expressly required by the Contract Documents. CONTRACTOR shall be responsible to see that the completed Work complies accurately with the Contract Documents.

B. At all times during the progress of the Work, CONTRACTOR shall assign a competent resident superintendent thereto who shall not be replaced without written notice to OWNER and ENGINEER except under extraordinary circumstances. The superintendent will be CONTRACTOR's representative at the Site and shall have authority to act on behalf of CONTRACTOR. All communications given to or received from the superintendent shall be binding on CONTRACTOR.

6.02 *Labor; Working Hours*

A. CONTRACTOR shall provide competent, suitably qualified personnel to survey, lay out, and construct the Work as required by the Contract Documents. CONTRACTOR shall at all times maintain good discipline and order at the Site.

B. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site shall be performed during regular working hours, and CONTRACTOR will not permit overtime work or the performance of Work on Saturday, Sunday, or any legal holiday without OWNER's written consent (which will not be unreasonably withheld) given after prior written notice to ENGINEER.

6.03 *Services, Materials, and Equipment*

A. Unless otherwise specified in the General Requirements, CONTRACTOR shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start-up, and completion of the Work.

B. All materials and equipment incorporated into the Work shall be as specified or, if not specified, shall be of good quality and new, except as otherwise provided in the Contract Documents. All warranties and guarantees specifically called for by the Specifications shall expressly run to the benefit of OWNER. If required by ENGINEER, CONTRACTOR shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

6.04 *Progress Schedule*

A. CONTRACTOR shall adhere to the progress schedule established in accordance with paragraph 2.07 as it may be adjusted from time to time as provided below.

1. CONTRACTOR shall submit to ENGINEER for acceptance (to the extent indicated in paragraph 2.07) proposed adjustments in the progress schedule that will not result in changing the Contract Times (or Milestones). Such adjustments will conform generally to the progress schedule then in effect and additionally will comply with any provisions of the General Requirements applicable thereto.

2. Proposed adjustments in the progress schedule that will change the Contract Times (or Milestones) shall be submitted in accordance with the requirements of Article 12. Such adjustments may only be made by a Change Order or Written Amendment in accordance with Article 12.

6.05 *Substitutes and "Or-Equals"*

A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the specification or description is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or-equal" item or no substitution is permitted, other items of material or equipment or material or equipment of other Suppliers may be submitted to ENGINEER for review under the circumstances described below.

1. *"Or-Equal" Items:* If in ENGINEER's sole discretion an item of material or equipment proposed by CONTRACTOR is functionally equal to that named and sufficiently similar so that no change in related Work will be required, it may be considered by ENGINEER as an "or-equal" item, in which case review and approval of the proposed item may, in ENGINEER's sole discretion, be accomplished without compliance with some or all of the requirements for approval of proposed substitute items. For the purposes of this paragraph 6.05.A.1, a proposed item of material or equipment will be considered functionally equal to an item so named if:

a. in the exercise of reasonable judgment ENGINEER determines that: (i) it is at least equal in quality, durability, appearance, strength, and design characteristics; (ii) it will reliably perform at least equally well the function imposed by the design concept of the completed Project as a functioning whole, and;

b. CONTRACTOR certifies that: (i) there is no increase in cost to the OWNER; and (ii) it will conform substantially, even with deviations, to the detailed requirements of the item named in the Contract Documents.

2. *Substitute Items*

a. If in ENGINEER's sole discretion an item of material or equipment proposed by CONTRACTOR does not qualify as an "or-equal" item under paragraph 6.05.A.1, it will be considered a proposed substitute item.

b. CONTRACTOR shall submit sufficient information as provided below to allow ENGINEER to determine that the item of material or equipment proposed is essentially equivalent to that named and an acceptable substitute therefor. Requests for review of proposed substitute items of material or equipment will not be accepted by ENGINEER from anyone other than CONTRACTOR.

c. The procedure for review by ENGINEER will be as set forth in paragraph 6.05.A.2.d, as supplemented in the General Requirements and as ENGINEER may decide is appropriate under the circumstances.

d. CONTRACTOR shall first make written application to ENGINEER for review of a proposed substitute item of material or equipment that CONTRACTOR seeks to furnish or use. The application shall certify that the proposed substitute item will perform adequately the functions and achieve the results called for by the general design, be similar in substance to that specified, and be suited to the same use as that specified. The application will state the extent, if any, to which the use of the proposed substitute item will prejudice CONTRACTOR's achievement of Substantial Completion on time, whether or not use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with OWNER for work on the Project) to adapt the design to the proposed substitute item and whether or not incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty. All variations of the proposed substitute item from that specified will be identified in the application, and available engineering, sales, maintenance, repair, and replacement services will be indicated. The application will also contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including costs of redesign and claims of other contractors affected by any resulting change, all of which will be considered by ENGINEER in evaluating the proposed substitute item. ENGINEER may require CONTRACTOR to furnish additional data about the proposed substitute item.

B. *Substitute Construction Methods or Procedures:* If a specific means, method, technique, sequence, or procedure of construction is shown or indicated in and expressly required by the Contract Documents, CONTRACTOR may furnish or utilize a substitute means, method, technique, sequence, or procedure of construction approved by ENGINEER. CONTRACTOR shall submit sufficient information to allow ENGINEER, in ENGINEER's sole discretion, to determine that the substitute proposed is equivalent to that expressly called for by the Contract Documents. The procedure for review by ENGINEER will be similar to that provided in subparagraph 6.05.A.2.

C. *Engineer's Evaluation:* ENGINEER will be allowed a reasonable time within which to evaluate each proposal or submittal made pursuant to paragraphs 6.05.A and 6.05.B. ENGINEER will be the sole judge of acceptability. No "or-equal" or substitute will be ordered, installed or utilized until ENGINEER's review is complete, which will be evidenced by either a Change Order for a substitute or an approved Shop Drawing for an "or equal." ENGINEER will advise CONTRACTOR in writing of any negative determination.

D. *Special Guarantee:* OWNER may require CONTRACTOR to furnish at CONTRACTOR's expense a special performance guarantee or other surety with respect to any substitute.

E. *ENGINEER's Cost Reimbursement:* ENGINEER will record time required by ENGINEER and ENGINEER's Consultants in evaluating substitute proposed or submitted by CONTRACTOR pursuant to paragraphs 6.05.A.2 and 6.05.B and in making changes in the Contract Documents (or in the provisions of any other direct contract with OWNER for work on the Project) occasioned thereby. Whether or not ENGINEER approves a substitute item so proposed or submitted by CONTRACTOR, CONTRACTOR shall reimburse OWNER for the charges of ENGINEER and ENGINEER's Consultants for evaluating each such proposed substitute.

F. *CONTRACTOR's Expense:* CONTRACTOR shall provide all data in support of any proposed substitute or "or-equal" at CONTRACTOR's expense.

6.06 *Concerning Subcontractors, Suppliers, and Others*

A. CONTRACTOR shall not employ any Subcontractor, Supplier, or other individual or entity (including those acceptable to OWNER as indicated in paragraph 6.06.B), whether initially or as a replacement, against whom OWNER may have reasonable objection. CONTRACTOR shall not be required to employ any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against whom CONTRACTOR has reasonable objection.

B. If the Supplementary Conditions require the identity of certain Subcontractors, Suppliers, or other individuals or entities to be submitted to OWNER in advance for acceptance by OWNER by a specified date prior to the Effective Date of the Agreement, and if CONTRACTOR has submitted a list thereof in accordance with the Supplementary Conditions, OWNER's acceptance (either in writing or by failing to make written objection thereto by the date indicated for acceptance or objection in the Bidding Documents or the Contract Documents) of any such Subcontractor, Supplier, or other individual or entity so identified may be revoked on the basis of reasonable objection after due investigation. CONTRACTOR shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity, and the Contract Price will be adjusted by the difference in the cost occasioned by such replacement, and an appropriate Change Order will be issued or Written Amendment signed. No acceptance by OWNER of any such Subcontractor, Supplier, or other individual or entity, whether initially or as a replacement, shall constitute a waiver of any right of OWNER or ENGINEER to reject defective Work.

C. CONTRACTOR shall be fully responsible to OWNER and ENGINEER for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as CONTRACTOR is responsible for CONTRACTOR's own acts and omissions. Nothing in the Contract Documents shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between OWNER or ENGINEER and any such Subcontractor, Supplier or other individual or entity, nor shall it create any obligation on the part of OWNER or ENGINEER to pay or to see to the payment of any moneys due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.

D. CONTRACTOR shall be solely responsible for scheduling and coordinating the Work of Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work under a direct or indirect contract with CONTRACTOR.

E. CONTRACTOR shall require all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work to communicate with ENGINEER through CONTRACTOR.

F. The divisions and sections of the Specifications and the identifications of any Drawings shall not control CONTRACTOR in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.

G. All Work performed for CONTRACTOR by a Subcontractor or Supplier will be pursuant to an appropriate agreement between CONTRACTOR and the Subcontractor or Supplier which specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of OWNER and ENGINEER. Whenever any such agreement is with a Subcontractor or Supplier who is listed as an additional insured on the property insurance provided in paragraph 5.06, the agreement between the CONTRACTOR and the Subcontractor or Supplier will contain provisions whereby the Subcontractor or Supplier waives all rights against OWNER, CONTRACTOR, ENGINEER, ENGINEER's Consultants, and all other individuals or entities identified in the Supplementary Conditions to be listed as insureds or additional insureds (and the officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them) for all losses and damages caused by, arising out of, relating to, or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work. If the insurers on any such policies require separate waiver forms to be signed by any Subcontractor or Supplier, CONTRACTOR will obtain the same.

6.07 *Patent Fees and Royalties*

A. CONTRACTOR shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation

in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if to the actual knowledge of OWNER or ENGINEER its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by OWNER in the Contract Documents. To the fullest extent permitted by Laws and Regulations, CONTRACTOR shall indemnify and hold harmless OWNER, ENGINEER, ENGINEER's Consultants, and the officers, directors, partners, employees or agents, and other consultants of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

6.08 *Permits*

A. Unless otherwise provided in the Supplementary Conditions, CONTRACTOR shall obtain and pay for all construction permits and licenses. OWNER shall assist CONTRACTOR, when necessary, in obtaining such permits and licenses. CONTRACTOR shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of opening of Bids, or, if there are no Bids, on the Effective Date of the Agreement. CONTRACTOR shall pay all charges of utility owners for connections to the Work, and OWNER shall pay all charges of such utility owners for capital costs related thereto, such as plant investment fees.

6.09 *Laws and Regulations*

A. CONTRACTOR shall give all notices and comply with all Laws and Regulations applicable to the performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither OWNER nor ENGINEER shall be responsible for monitoring CONTRACTOR's compliance with any Laws or Regulations.

B. If CONTRACTOR performs any Work knowing or having reason to know that it is contrary to Laws or Regulations, CONTRACTOR shall bear all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work; however, it shall not be CONTRACTOR's primary responsibility to make certain that the Specifications and Drawings are in accordance with Laws and Regulations, but this shall not relieve CONTRACTOR of CONTRACTOR's obligations under paragraph 3.03.

C. Changes in Laws or Regulations not known at the time of opening of Bids (or, on the Effective Date of the Agreement if there were no Bids) having an effect on the cost or time of performance of the Work may be the subject of an adjustment in Contract Price or Contract Times. If OWNER and CONTRACTOR are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in paragraph 10.05.

6. 10 *Taxes*

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

6.11 *Use of Site and Other Areas*

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

1. CONTRACTOR shall confine construction equipment, the storage of materials and equipment, and the operations of workers to the Site and other areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and other areas with construction equipment or other materials or equipment. CONTRACTOR shall assume full responsibility for any damage to any such land or area, or to the owner or occupant thereof, or of any adjacent land or areas resulting from the performance of the Work.

2. Should any claim be made by any such owner or occupant because of the performance of the Work, CONTRACTOR shall promptly settle with such other party by negotiation or otherwise

resolve the claim by arbitration or other dispute resolution proceeding or at law.

3. To the fullest extent permitted by Laws and Regulations, CONTRACTOR shall indemnify and hold harmless OWNER, ENGINEER, ENGINEER's Consultant, and the officers, directors, partners, employees, agents, and other consultants of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against OWNER, ENGINEER, or any other party indemnified hereunder to the extent caused by or based upon CONTRACTOR's performance of the Work.

B. *Removal of Debris During Performance of the Work:* During the progress of the Work CONTRACTOR shall keep the Site and other areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris shall conform to applicable Laws and Regulations.

C. *Cleaning:* Prior to Substantial Completion of the Work CONTRACTOR shall clean the Site and make it ready for utilization by OWNER. At the completion of the Work CONTRACTOR shall remove from the Site all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.

D. *Loading Structures:* CONTRACTOR shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall CONTRACTOR subject any part of the Work or adjacent property to stresses or pressures that will endanger it.

6.12 *Record Documents*

A. CONTRACTOR shall maintain in a safe place at the Site one record copy of all Drawings, Specifications, Addenda, Written Amendments, Change Orders, Work Change Directives, Field Orders, and written interpretations and clarifications in good order and annotated to show changes made during construction. These record documents together with all approved Samples and a counterpart of all approved Shop Drawings will be available to ENGINEER for reference. Upon completion of the Work, these record documents, Samples, and Shop Drawings will be delivered to ENGINEER for OWNER.

6.13 *Safety and Protection*

A. CONTRACTOR shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. CONTRACTOR shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:

1. all persons on the Site or who may be affected by the Work;

2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and

3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.

B. CONTRACTOR shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection. CONTRACTOR shall notify owners of adjacent property and of Underground Facilities and other utility owners when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property. All damage, injury, or loss to any property referred to in paragraph 6.13.A.2 or 6.13.A.3 caused, directly or indirectly, in whole or in part, by CONTRACTOR, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by CONTRACTOR (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of OWNER or ENGINEER or ENGINEER's Consultant, or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of

CONTRACTOR or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them). CONTRACTOR's duties and responsibilities for safety and for protection of the Work shall continue until such time as all the Work is completed and ENGINEER has issued a notice to OWNER and CONTRACTOR in accordance with paragraph 14.07.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).

6.14 *Safety Representative*

A. CONTRACTOR shall designate a qualified and experienced safety representative at the Site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs.

6.15 *Hazard Communication Programs*

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

6.16 *Emergencies*

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

6.17 *Shop Drawings and Samples*

A. CONTRACTOR shall submit Shop Drawings to ENGINEER for review and approval in accordance with the acceptable schedule of Shop Drawings and Sample submittals. All submittals will be identified as ENGINEER may require and in the number of copies specified in the General Requirements. The data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show ENGINEER the services, materials, and equipment CONTRACTOR proposes to provide and to enable ENGINEER to review the information for the limited purposes required by paragraph 6.17.E.

B. CONTRACTOR shall also submit Samples to ENGINEER for review and approval in accordance with the acceptable schedule of Shop Drawings and Sample submittals. Each Sample will be identified clearly as to material, Supplier, pertinent data such as catalog numbers, and the use for which intended and otherwise as ENGINEER may require to enable ENGINEER to review the submittal for the limited purposes required by paragraph 6.17.E. The numbers of each Sample to be submitted will be as specified in the Specifications.

C. Where a Shop Drawing or Sample is required by the Contract Documents or the schedule of Shop Drawings and Sample submittals acceptable to ENGINEER as required by paragraph 2.07, any related Work performed prior to ENGINEER's review and approval of the pertinent submittal will be at the sole expense and responsibility of CONTRACTOR.

D. *Submittal Procedures*

1. Before submitting each Shop Drawing or Sample, CONTRACTOR shall have determined and verified:

a. all field measurements, quantities, dimensions, specified performance criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;

b. all materials with respect to intended use, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work;

c. all information relative to means, methods, techniques, sequences, and procedures of construction and safety precautions and programs incident thereto; and

d. CONTRACTOR shall also have reviewed and coordinated each Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents.

2. Each submittal shall bear a stamp or specific written indication that CONTRACTOR has satisfied CONTRACTOR's obligations under the Contract Documents with respect to CONTRACTOR's review and approval of that submittal.

3. At the time of each submittal, CONTRACTOR shall give ENGINEER specific written notice of such variations, if any, that the Shop Drawing or Sample submitted may have from the requirements of the Contract Documents, such notice to be in a written communication separate from the submittal; and, in addition, shall cause a specific notation to be made on each Shop Drawing and Sample submitted to ENGINEER for review and approval of each such variation.

E. *ENGINEER's Review*

1. ENGINEER will timely review and approve Shop Drawings and Samples in accordance with the schedule of Shop Drawings and Sample submittals acceptable to ENGINEER. ENGINEER's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.

2. ENGINEER's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction (except where a particular means, method, technique, sequence, or procedure of construction is specifically and expressly called for by the Contract Documents) or to safety precautions or programs incident thereto. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.

3. ENGINEER's review and approval of Shop Drawings or Samples shall not relieve CONTRACTOR from responsibility for any variation from the requirements of the Contract Documents unless CONTRACTOR has in writing called ENGINEER's attention to each such variation at the time of each submittal as required by paragraph 6.17.D.3 and ENGINEER has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample approval; nor will any approval by ENGINEER relieve CONTRACTOR from responsibility for complying with the requirements of paragraph 6.17. D.1.

F. *Resubmittal Procedures:*

1. CONTRACTOR shall make corrections required by ENGINEER and shall return the required number of corrected copies of Shop Drawings and submit as required new Samples for review and approval. CONTRACTOR shall direct specific attention in writing to revisions other than the corrections called for by ENGINEER on previous submittals.

6.18 *Continuing the Work*

A. CONTRACTOR shall carry on the Work and adhere to the progress schedule during all disputes or disagreements with OWNER. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, except as permitted by paragraph 15.04 or as OWNER and CONTRACTOR may otherwise agree in writing.

6.19 *CONTRACTOR's General Warranty and Guarantee*

A. CONTRACTOR warrants and guarantees to OWNER, ENGINEER, and ENGINEER's Consultants that all Work will be in accordance with the Contract Documents and will not be defective. CONTRACTOR's warranty and guarantee hereunder excludes defects or damage caused by:

1. abuse, modification, or improper maintenance or operation by persons other than CONTRACTOR, Subcontractors, Suppliers, or any other individual or entity for whom CONTRACTOR is responsible; or

2. normal wear and tear under normal usage.

B. CONTRACTOR's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of CONTRACTOR's obligation to perform the Work in accordance with the Contract Documents:

1. observations by ENGINEER;

2. recommendation by ENGINEER or payment by OWNER of any progress or final payment;

3. the issuance of a certificate of Substantial Completion by ENGINEER or any payment related thereto by OWNER;

4. use or occupancy of the Work or any part thereof by OWNER;

5. any acceptance by OWNER or any failure to do so;

6. any review and approval of a Shop Drawing or Sample submittal or the issuance of a notice of acceptability by ENGINEER;

7. any inspection, test, or approval by others; or

8. any correction of defective Work by OWNER.

6.20 *Indemnification*

A. To the fullest extent permitted by Laws and Regulations, CONTRACTOR shall indemnify and hold harmless OWNER, ENGINEER, ENGINEER's Consultants, and the officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the performance of the Work, provided that any such claim, cost, loss, or damage:

1. is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom; and

2. is caused in whole or in part by any negligent act or omission of CONTRACTOR, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may be liable, regardless of whether or not caused in part by any negligence or omission of an individual or entity indemnified hereunder or whether liability is imposed upon such indemnified party by Laws and Regulations regardless of the negligence of any such individual or entity.

B. In any and all claims against OWNER or ENGINEER or any of their respective consultants, agents, officers, directors, partners, or employees by any employee (or the survivor or personal representative of such employee) of CONTRACTOR, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under paragraph 6.20.A shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for CONTRACTOR or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.

C. The indemnification obligations of CONTRACTOR under paragraph 6.20.A shall not extend to the liability of ENGINEER and ENGINEER's Consultants or to the officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of them arising out of:

1. the preparation or approval of, or the failure to prepare or approve, maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or

2. giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.

ARTICLE 7 - OTHER WORK

7.01 *Related Work at Site*

A. OWNER may perform other work related to the Project at the Site by OWNER's employees, or let other direct contracts therefor, or have other work performed by utility owners. If such other work is not noted in the Contract Documents, then:

1. written notice thereof will be given to CONTRACTOR prior to starting any such other work; and

2. if OWNER and CONTRACTOR are unable to agree on entitlement to or on the

amount or extent, if any, of any adjustment in the Contract Price or Contract Times that should be allowed as a result of such other work, a Claim may be made therefor as provided in paragraph 10.05.

B. CONTRACTOR shall afford each other contractor who is a party to such a direct contract and each utility owner (and OWNER, if OWNER is performing the other work with OWNER's employees) proper and safe access to the Site and a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work and shall properly coordinate the Work with theirs. Unless otherwise provided in the Contract Documents, CONTRACTOR shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. CONTRACTOR shall not endanger any work of others by cutting, excavating, or otherwise altering their work and will only cut or alter their work with the written consent of ENGINEER and the others whose work will be affected. The duties and responsibilities of CONTRACTOR under this paragraph are for the benefit of such utility owners and other contractors to the extent that there are comparable provisions for the benefit of CONTRACTOR in said direct contracts between OWNER and such utility owners and other contractors.

C. If the proper execution or results of any part of CONTRACTOR's Work depends upon work performed by others under this Article 7, CONTRACTOR shall inspect such other work and promptly report to ENGINEER in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of CONTRACTOR's Work. CONTRACTOR's failure to so report will constitute an acceptance of such other work as fit and proper for integration with CONTRACTOR's Work except for latent defects and deficiencies in such other work.

7.02 *Coordination*

A. If OWNER intends to contract with others for the performance of other work on the Project at the Site, the following will be set forth in Supplementary Conditions

1. the individual or entity who will have authority and responsibility for coordination of the activities among the various contractors will be identified;

2. specific matters to be covered by such authority and responsibility will be itemized; and

3. the extent of such authority and responsibilities will be provided.

B. Unless otherwise provided in the Supplementary Conditions, OWNER shall have sole authority and responsibility for such coordination.

ARTICLE 8 – OWNER'S RESPONSIBILITIES

8.01 *Communications to Contractor*

A. Except as otherwise provided in these General Conditions, OWNER shall issue all communications to CONTRACTOR through ENGINEER.

8.02 *Replacement of ENGINEER*

A. In case of terminations of the employment of ENGINEER, OWNER shall appoint an engineer to whom CONTRACTOR makes no reasonable objection, whose status under the Contract Documents shall be that of the former ENGINEER.

8.03 *Furnish Data*

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

8.04 *Pay Promptly When Due*

A. OWNER shall make payments to CONTRACTOR promptly when they are due as provided in paragraphs 14.02.C and 14.07.C.

8.05 *Lands and Easements; Reports and Tests*

A. OWNER's duties in respect of providing lands and easements and providing engineering surveys to establish reference points are set forth in paragraphs 4.01 and 4.05. Paragraph 4.02 refers to OWNER's identifying and making available to CONTRACTOR copies of reports of explorations and tests of subsurface conditions and drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site that have been utilized by ENGINEER in preparing the Contract Documents.

8.06 *Insurance*

A. OWNER's responsibilities, if any, in respect to purchasing and maintaining liability and property insurance are set forth in Article 5.

8.07 *Change Orders*

A. OWNER is obligated to execute Change Orders as indicated in paragraph 10.03.

8.08 *Inspections, Tests, and Approvals*

A. OWNER's responsibility in respect to certain inspections, tests, and approvals is set forth in paragraph 13.03.B.

8.09 *Limitations on OWNER's Responsibilities*

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

8.10 *Undisclosed Hazardous Environmental Condition*

A. OWNER's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in paragraph 4.06.

8.11 *Evidence of Financial Arrangements*

A. If and to the extent OWNER has agreed to furnish CONTRACTOR reasonable evidence that financial arrangements have been made to satisfy OWNER's obligations under the Contract Documents, OWNER's responsibility in respect thereto will be set forth in the Supplementary Conditions.

ARTICLE 9 – ENGINEER'S STATUS DURING CONSTRUCTION

9.01 *OWNER'S Representative*

A. ENGINEER will be OWNER's representative during the construction period. The duties and responsibilities and the limitations of authority of ENGINEER as OWNER's representative during construction are set forth in the Contract Documents and will not be changed without written consent of OWNER and ENGINEER.

9.02 *Visits to Site*

A. ENGINEER will make visits to the Site at intervals appropriate to the various stages of construction as ENGINEER deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and quality of the various aspects of CONTRACTOR's executed Work. Based on information obtained during such visits and observations, ENGINEER, for the benefit of OWNER, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. ENGINEER will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. ENGINEER's efforts will be directed toward providing the OWNER a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, ENGINEER will keep OWNER informed of the progress of the Work and will endeavor to guard OWNER against defective Work.

B. ENGINEER's visits and observations are subject to all the limitations on ENGINEER's authority and responsibility set forth in paragraph 9. 10, and particularly, but without limitation, during or as a result of ENGINEER's visits or observations of CONTRACTOR's Work ENGINEER will not supervise, direct, control, or have authority over or be responsible for CONTRACTOR's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of CONTRACTOR to comply with Laws and Regulations applicable to the performance of the Work.

9.03 *Project Representative*

A. If OWNER and ENGINEER agree, ENGINEER will furnish a Resident Project Representative to assist ENGINEER in providing more extensive observation of the Work. The responsibilities and authority and limitations thereon of any such Resident Project Representative and assistants will be as provided in paragraph 9. 10 and

in the Supplementary Conditions. If OWNER designates another representative or agent to represent OWNER at the Site who is not ENGINEER's Consultant, agent or employee, the responsibilities and authority and limitations thereon of such other individual or entity will be as provided in the Supplementary Conditions.

9.04 *Clarifications and Interpretations*

A. ENGINEER will issue with reasonable promptness such written clarifications or interpretations of the requirements of the Contract Documents as ENGINEER may determine necessary, which shall be consistent with the intent of and reasonably inferable from the Contract Documents. Such written clarifications and interpretations will be binding on OWNER and CONTRACTOR. If OWNER and CONTRACTOR are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, that should be allowed as a result of a written clarification or interpretation, a Claim may be made therefor as provided in paragraph 10.05.

9.05 Authorized Variations in Work

A. ENGINEER may authorize minor variations in the Work from the requirements of the Contract Documents which do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. These may be accomplished by a Field Order and will be binding on OWNER and also on CONTRACTOR, who shall perform the Work involved promptly. If OWNER and CONTRACTOR are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, as a result of a Field Order, a Claim may be made therefor as provided in paragraph 10.05.

9.06 *Rejecting Defective Work*

A. ENGINEER will have authority to disapprove or reject Work which ENGINEER believes to be defective, or that ENGINEER believes will not produce a completed Project that conforms to the Contract Documents or that will prejudice the integrity of the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. ENGINEER will also have authority to require special inspection or testing of the Work as provided in paragraph 13.04, whether or not the Work is fabricated, installed, or completed.

9.07 *Shop Drawings, Change Orders and Payments*

A. In connection with ENGINEER's authority as to Shop Drawings and Samples, see paragraph 6.17.

B. In connection with ENGINEER's authority as to Change Orders, see Articles 10, 11, and 12.

C. In connection with ENGINEER's authority as to Applications for Payment, see Article 14.

9.08 *Determinations for Unit Price Work*

A. ENGINEER will determine the actual quantities and classifications of Unit Price Work performed by CONTRACTOR. ENGINEER will review with CONTRACTOR the ENGINEER's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). ENGINEER's written decision thereon will be final and binding (except as modified by ENGINEER to reflect changed factual conditions or more accurate data) upon OWNER and CONTRACTOR, subject to the provisions of paragraph 10.05.

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

A. ENGINEER will be the initial interpreter of the requirements of the Contract Documents and judge of the acceptability of the Work thereunder. Claims, disputes and other matters relating to the acceptability of the Work, the quantities and classifications of Unit Price Work, the interpretation of the requirements of the Contract Documents pertaining to the performance of the Work, and Claims seeking changes in the Contract Price or Contract Times will be referred initially to ENGINEER in writing, in accordance with the provisions of paragraph 10.05, with a request for a formal decision.

B. When functioning as interpreter and judge under this paragraph 9.09, ENGINEER will not show partiality to OWNER or CONTRACTOR and will not be liable in connection with any interpretation or decision rendered in good faith in such capacity. The rendering of a decision by ENGINEER pursuant to this paragraph 9.09 with respect to any such Claim, dispute, or other matter (except any which have been waived by the making

or acceptance of final payment as provided in paragraph 14.07) will be a condition precedent to any exercise by OWNER or CONTRACTOR of such rights or remedies as either may otherwise have under the Contract Documents or by Laws or Regulations in respect of any such Claim, dispute, or other matter.

9.10 *Limitations on ENGINEER's Authority and Responsibilities*

A. Neither ENGINEER's authority or responsibility under this Article 9 or under any other provision of the Contract Documents nor any decision made by ENGINEER in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by ENGINEER shall create, impose, or give rise to any duty in contract, tort, or otherwise owed by ENGINEER to CONTRACTOR, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.

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

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

D. ENGINEER's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, Bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by paragraph 14.07.A will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals that the results certified indicate compliance with, the Contract Documents.

E. The limitations upon authority and responsibility set forth in this paragraph 9. 10 shall also apply to ENGINEER's Consultants, Resident Project Representative, and assistants.

ARTICLE 10 - CHANGES IN THE WORK; CLAIMS

10.01 *Authorized Changes in the Work*

A. Without invalidating the Agreement and without notice to any surety, OWNER may, subject to written approval by AGENCY at any time or from time to time, order additions, deletions, or revisions in the Work by a Written Amendment, a Change Order, or a Work Change Directive. Upon receipt of any such document, CONTRACTOR shall promptly proceed with the Work involved which will be performed under the applicable conditions of the Contract Documents (except as otherwise specifically provided).

B. If OWNER and CONTRACTOR are unable to agree on entitlement to, or on the amount or extent, if any, of an adjustment in the Contract Price or Contract Times, or both, that should be allowed as a result of a Work Change Directive, a Claim may be made therefor as provided in paragraph 10.05.

10.02 *Unauthorized Changes in the Work*

A. CONTRACTOR shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents as amended, modified, or supplemented as provided in paragraph 3.04, except in the case of an emergency as provided in paragraph 6.16 or in the case of uncovering Work as provided in paragraph 13.04.B.

10.03 *Execution of Change Orders*

A. OWNER and CONTRACTOR shall execute appropriate Change Orders recommended by ENGINEER (or Written Amendments) covering:

1. changes in the Work which are: (i) ordered by OWNER pursuant to paragraph 10.01.A, (ii) required because of acceptance of defective Work under paragraph 13.08.A or OWNER's correction of defective Work under paragraph 13.09, or (iii) agreed to by the parties;

2. changes in the Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive; and

3. changes in the Contract Price or Contract Times which embody the substance of any written decision rendered by ENGINEER pursuant to paragraph 10.05; provided that, in lieu of executing any such Change Order, an appeal may be taken from any such decision in accordance with the provisions of the Contract Documents and applicable Laws and Regulations, but during any such appeal, CONTRACTOR shall carry on the Work and adhere to the progress schedule as provided in paragraph 6.18.A.

10.04 *Notification to Surety*

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

10.05 *Claims and Disputes*

A. *Notice:* Written notice stating the general nature of each Claim, dispute, or other matter shall be delivered by the claimant to ENGINEER and the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto. Notice of the amount or extent of the Claim, dispute, or other matter with supporting data shall be delivered to the ENGINEER and the other party to the Contract within 60 days after the start of such event (unless ENGINEER allows additional time for claimant to submit additional or more accurate data in support of such Claim, dispute, or other matter). A Claim for an adjustment in Contract Price shall be prepared in accordance with the provisions of paragraph 12.01.B. A Claim for an adjustment in Contract Time shall be prepared in accordance with the provisions of paragraph 12.02.B. Each Claim shall be accompanied by claimant's written statement that the adjustment claimed is the entire adjustment to which the claimant believes it is entitled as a result of said event. The opposing party shall submit any response to ENGINEER and the claimant within 30 days after receipt of the claimant's last submittal (unless ENGINEER allows additional time).

B. *ENGINEER's Decision:* ENGINEER will render a formal decision in writing within 30 days after receipt of the last submittal of the claimant or the last submittal of the opposing party, if any. ENGINEER's written decision on such Claim, dispute, or other matter will be final and binding upon OWNER and CONTRACTOR unless:

1. an appeal from ENGINEER's decision is taken within the time limits and in accordance with the dispute resolution procedures set forth in Article 16; or

2. if no such dispute resolution procedures have been set forth in Article 16, a written notice of intention to appeal from ENGINEER's written decision is delivered by OWNER or CONTRACTOR to the other and to ENGINEER within 30 days after the date of such decision, and a formal proceeding is instituted by the appealing party in a forum of competent jurisdiction, within 60 days after the date of such decision or within 60 days after Substantial Completion, whichever is later (unless otherwise agreed in writing by OWNER and CONTRACTOR), to exercise such rights or remedies as the appealing party may have with respect to such Claim, dispute, or other matter in accordance with applicable Laws and Regulations.

C. If ENGINEER does not render a formal decision in writing within the time stated in paragraph 10.05.B, a decision denying the Claim in its entirety shall be deemed to have been issued 31 days after receipt of the last submittal of the claimant or the last submittal of the opposing party, if any.

D. No Claim for an adjustment in Contract Price or Contract Times (or Milestones) will be valid if not submitted in accordance with this paragraph 10.05.

ARTICLE 11 - COST OF THE WORK; CASH ALLOWANCES; UNIT PRICE WORK

11.01 *Cost of the Work.*

A. *Costs Included:* The term Cost of the Work means the sum of all costs necessarily incurred and paid by CONTRACTOR in the proper performance of the Work. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, the costs to be reimbursed

to CONTRACTOR will be only those additional or incremental costs required because of the change in the Work or because of the event giving rise to the Claim. Except as otherwise may be agreed to in writing by OWNER, such costs shall be in amounts no higher than those prevailing in the locality of the Project, shall include only the following items, and shall not include any of the costs itemized in paragraph 11.01.B.

1. Payroll costs for employees in the direct employ of CONTRACTOR in the performance of the Work under schedules of job classifications agreed upon by OWNER and CONTRACTOR. Such employees shall include without limitation superintendents, foremen, and other personnel employed full time at the Site. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, shall be included in the above to the extent authorized by OWNER.

2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to CONTRACTOR unless OWNER deposits funds with CONTRACTOR with which to make payments, in which case the cash discounts shall accrue to OWNER. All trade discounts, rebates and refunds and returns from sale of surplus materials and equipment shall accrue to OWNER, and CONTRACTOR shall make provisions so that they may be obtained.

3. Payments made by CONTRACTOR to Subcontractors for Work performed by Subcontractors. If required by OWNER, CONTRACTOR shall obtain competitive bids from subcontractors acceptable to OWNER and CONTRACTOR and shall deliver such bids to OWNER, who will then determine, with the advice of ENGINEER, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as CONTRACTOR's Cost of the Work and fee as provided in this paragraph 11.01.

4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed for services specifically related to the Work.

5. Supplemental costs including the following:

a. The proportion of necessary transportation, travel, and subsistence expenses of CONTRACTOR's employees incurred in discharge of duties connected with the Work.

b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of CONTRACTOR.

c. Rentals of all construction equipment and machinery, and the parts thereof whether rented from CONTRACTOR or others in accordance with rental agreements approved by OWNER with the advice of ENGINEER, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.

d. Sales, consumer, use, and other similar taxes related to the Work, and for which CONTRACTOR is liable, imposed by Laws and Regulations.

e. Deposits lost for causes other than negligence of CONTRACTOR, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and

royalty payments and fees for permits and licenses.

f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by CONTRACTOR in connection with the performance of the Work (except losses and damages within the deductible amounts of property insurance established in accordance with paragraph 5.06.D), provided such losses and damages have resulted from causes other than the negligence of CONTRACTOR, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of OWNER. No such losses, damages, and expenses shall be included in the Cost of the Work for the purpose of determining CONTRACTOR's fee.

g. The cost of utilities, fuel, and sanitary facilities at the Site.

h. Minor expenses such as telegrams, long distance telephone calls, telephone service at the Site, expressage, and similar petty cash items in connection with the Work.

i. When the Cost of the Work is used to determine the value of a Change Order or of a Claim, the cost of premiums for additional Bonds and insurance required because of the changes in the Work or caused by the event giving rise to the Claim.

j. When all the Work is performed on the basis of cost-plus, the costs of premiums for all Bonds and insurance CONTRACTOR is required by the Contract Documents to purchase and maintain.

B. *Costs Excluded:* The term Cost of the Work shall not include any of the following items:

1. Payroll costs and other compensation of CONTRACTOR's officers, executives, principals (of partnerships and sole proprietorships), general managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expediters, timekeepers, clerks, and other personnel employed by CONTRACTOR, whether at the Site or in CONTRACTOR's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in paragraph 11.01.A. 1 or specifically covered by paragraph 11.0l.A.4, all of which are to be considered administrative costs covered by the CONTRACTOR's fee.

2. Expenses of CONTRACTOR's principal and branch offices other than CONTRACTOR's office at the Site.

3. Any part of CONTRACTOR's capital expenses, including interest on CONTRACTOR's capital employed for the Work and charges against CONTRACTOR for delinquent payments.

4. Costs due to the negligence of CONTRACTOR, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.

5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in paragraphs 11.01.A and 11.01.B.

C. *CONTRACTOR's Fee*: When all the Work is performed on the basis of cost-plus, CONTRACTOR's fee shall be determined as set forth in the Agreement. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, CONTRACTOR's fee shall be determined as set forth in paragraph 12.01.C.

D. *Documentation*: Whenever the Cost of the Work for any purpose is to be determined pursuant to paragraphs 11.01.A and 11.01.B, CONTRACTOR will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in a form acceptable to ENGINEER an itemized cost breakdown together with supporting data.

11.02 *Cash Allowances*

A. It is understood that CONTRACTOR has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums as may be acceptable to OWNER and ENGINEER. CONTRACTOR agrees that:

1. the allowances include the cost to CONTRACTOR (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and

2. CONTRACTOR's costs for unloading and handling on the Site, labor, installation costs, overhead, profit, and other expenses contemplated for the allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment on account of any of the foregoing will be valid.

B. Prior to final payment, an appropriate Change Order will be issued as recommended by ENGINEER to reflect actual amounts due CONTRACTOR on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

11.03 *Unit Price Work*

A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Determinations of the actual quantities and classifications of Unit Price Work performed by CONTRACTOR will be made by ENGINEER subject to the provisions of paragraph 9.08.

B. Each unit price will be deemed to include an amount considered by CONTRACTOR to be adequate to cover CONTRACTOR's overhead and profit for each separately identified item.

C. OWNER or CONTRACTOR may make a Claim for an adjustment in the Contract Price in accordance with paragraph 10.05 if:

1. the quantity of any item of Unit Price Work performed by CONTRACTOR differs by more than 25 percent from the estimated quantity of such item indicated in the Agreement; and

2. CONTRACTOR believes that CONTRACTOR is entitled to an increase in Contract Price as a result of having incurred additional expense or OWNER believes that OWNER is entitled to a decrease in Contract Price and the parties are unable to agree as to the amount of any such increase or decrease.

ARTICLE 12 - CHANGE OF CONTRACT PRICE; CHANGE OF CONTRACT TIMES

12.01 *Change of Contract Price*

A. The Contract Price may only be changed by a Change Order or by a Written Amendment. Any Claim for an adjustment in the Contract Price shall be based on written notice submitted by the party making the claim to the ENGINEER and the other party to the Contract in accordance with the provisions of paragraph 10.05.

B. The value of any Work covered by a Change Order or of any Claim for an adjustment in the Contract Price will be determined as follows:

1. where the Work involved is covered by unit prices contained in the Contract Documents, by application of such unit prices to the quantities of the items involved (subject to the provisions of paragraph 11.03); or

2. where the Work involved is not covered by unit prices contained in the Contract Documents, by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with paragraph 12.0l.C.2); or

3. where the Work involved is not covered by unit prices contained in the Contract Documents and agreement to a lump sum is not reached under paragraph 12.0l.B.2, on the basis of the Cost of the Work (determined as provided in paragraph 11.01) plus a CONTRACTOR's

fee for overhead and profit (determined as provided in paragraph 12.01.C).

C. *CONTRACTOR's Fee:* The CONTRACTOR's fee for overhead and profit shall be determined as follows:

1. a mutually acceptable fixed fee; or

2. if a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:

a. for costs incurred under paragraphs 11.01.A.1 and 11.01.A.2, the CONTRACTOR's fee shall be 15 percent;

b. for costs incurred under paragraph 11.01.A.3, the CONTRACTOR's fee shall be five percent;

c. where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of paragraph 12.01.C.2.a is that the Subcontractor who actually performs the Work, at whatever tier, will be paid a fee of 15 percent of the costs incurred by such Subcontractor under paragraphs 11.01.A.1 and 11.01.A.2 and that any higher tier Subcontractor and CONTRACTOR will each be paid a fee of five percent of the amount paid to the next lower tier Subcontractor;

d. no fee shall be payable on the basis of costs itemized under paragraphs 11.01.A.4, 11.01.A.5, and 11.01.B;

e. the amount of credit to be allowed by CONTRACTOR to OWNER for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in CONTRACTOR's fee by an amount equal to five percent of such net decrease; and

f. when both additions and credits are involved in any one change, the adjustment in CONTRACTOR's fee shall be computed on the basis of the net change in accordance with paragraphs 12.01.C.2.a through 12.01.C.2.e, inclusive.

12.02 *Change of Contract Times*

A. The Contract Times (or Milestones) may only be changed by a Change Order or by a Written Amendment. Any Claim for an adjustment in the Contract Times (or Milestones) shall be based on written notice submitted by the party making the claim to the ENGINEER and the other party to the Contract in accordance with the provisions of paragraph 10.05.

B. Any adjustment of the Contract Times (or Milestones) covered by a Change Order or of any Claim for an adjustment in the Contract Times (or Milestones) will be determined in accordance with the provisions of this Article 12.

12.03 *Delays Beyond CONTRACTOR's Control*

A. Where CONTRACTOR is prevented from completing any part of the Work within the Contract Times (or Milestones) due to delay beyond the control of CONTRACTOR, the Contract Times (or Milestones) will be extended in an amount equal to the time lost due to such delay if a Claim is made therefor as provided in paragraph 12.02.A. Delays beyond the control of CONTRACTOR shall include, but not be limited to, acts or neglect by OWNER, acts or neglect of utility owners or other contractors performing other work as contemplated by Article 7, fires, floods, epidemics, abnormal weather conditions, or acts of God.

12.04 *Delays Within CONTRACTOR's Control*

A. The Contract Times (or Milestones) will not be extended due to delays within the control of CONTRACTOR. Delays attributable to and within the control of a Subcontractor or Supplier shall be deemed to be delays within the control of CONTRACTOR.

12.05 *Delays Beyond OWNER's and CONTRACTOR's Control*

A. Where CONTRACTOR is prevented from completing any part of the Work within the Contract Times (or Milestones) due to delay beyond the control of both OWNER and CONTRACTOR, an extension of the Contract Times (or Milestones) in an amount equal to the time lost due to such delay shall be CONTRACTOR's sole and exclusive remedy for such delay.

12.06 *Delay Damages*

A. In no event shall OWNER or ENGINEER be liable to CONTRACTOR, any Subcontractor, any Supplier, or any other person or organization, or to any surety for or employee or agent of any of them, for damages arising out of or resulting from:

1. delays caused by or within the control of CONTRACTOR; or

2. delays beyond the control of both OWNER and CONTRACTOR including but not limited to fires, floods, epidemics, abnormal weather conditions, acts of God, or acts or neglect by utility owners or other contractors performing other work as contemplated by Article 7.

B. Nothing in this paragraph 12.06 bars a change in Contract Price pursuant to this Article 12 to compensate CONTRACTOR due to delay, interference, or disruption directly attributable to actions or inactions of OWNER or anyone for whom OWNER is responsible.

ARTICLE 13 TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

13.01 *Notice of Defects*

A. Prompt notice of all defective Work of which OWNER or ENGINEER has actual knowledge will be given to CONTRACTOR. All defective Work may be rejected, corrected, or accepted as provided in this Article 13.

13.02 *Access to Work*

A. OWNER, ENGINEER, ENGINEER's Consultants, other representatives and personnel of OWNER, independent testing laboratories, and governmental agencies with jurisdictional interests will have access to the Site and the Work at reasonable times for their observation, inspecting, and testing. CONTRACTOR shall provide them proper and safe conditions for such access and advise them of CONTRACTOR's Site safety procedures and programs so that they may comply therewith as applicable.

13.03 *Tests and Inspections*

A. CONTRACTOR shall give ENGINEER timely notice of readiness of the Work for all required inspections, tests, or approvals and shall cooperate with inspection and testing personnel to facilitate required inspections or tests.

B. OWNER shall employ and pay for the services of an independent testing laboratory to perform all inspections, tests, or approvals required by the Contract Documents except:

1. for inspections, tests, or approvals covered by paragraphs 13.03.C and 13.03.D below;

2. that costs incurred in connection with tests or inspections conducted pursuant to paragraph 13.04.B shall be paid as provided in said paragraph 13.04.B; and

3. as otherwise specifically provided in the Contract Documents.

C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, CONTRACTOR shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish ENGINEER the required certificates of inspection or approval.

D. CONTRACTOR shall be responsible for arranging and obtaining and shall pay all costs in connection with any inspections, tests, or approvals required for OWNER's and ENGINEER's acceptance of materials or equipment to be incorporated in the Work; or acceptance of materials, mix designs, or equipment submitted for approval prior to CONTRACTOR's purchase thereof for incorporation in the Work. Such inspections, tests, or approvals shall be performed by organizations acceptable to OWNER and ENGINEER.

E. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by CONTRACTOR without written concurrence of ENGINEER, it must, if requested by ENGINEER, be uncovered for observation.

F. Uncovering Work as provided in paragraph 13.03.E shall be at CONTRACTOR's expense unless

CONTRACTOR has given ENGINEER timely notice of CONTRACTOR's intention to cover the same and ENGINEER has not acted with reasonable promptness in response to such notice.

13.04 *Uncovering Work*

A. If any Work is covered contrary to the written request of ENGINEER, it must, if requested by ENGINEER, be uncovered for ENGINEER's observation and replaced at CONTRACTOR's expense.

B. If ENGINEER considers it necessary or advisable that covered Work be observed by ENGINEER or inspected or tested by others, CONTRACTOR, at ENGINEER's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as ENGINEER may require, that portion of the Work in question, furnishing all necessary labor, material, and equipment. If it is found that such Work is defective, CONTRACTOR shall pay all Claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and OWNER shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount thereof, OWNER may make a Claim therefor as provided in paragraph 10.05. If, however, such Work is not found to be defective, CONTRACTOR shall be allowed an increase in the Contract Price or an extension of the Contract Times (or Milestones), or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, CONTRACTOR may make a Claim therefor as provided in paragraph 10.05.

13.05 *OWNER May Stop the Work*

A. If the Work is defective, or CONTRACTOR fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, OWNER may order CONTRACTOR to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of OWNER to stop the Work shall not give rise to any duty on the part of OWNER to exercise this right for the benefit of CONTRACTOR, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

13.06 *Correction or Removal of Defective Work*

A. CONTRACTOR shall correct all defective Work, whether or not fabricated, installed, or completed, or, if the Work has been rejected by ENGINEER, remove it from the Project and replace it with Work that is not defective. CONTRACTOR shall pay all Claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or removal (including but not limited to all costs of repair or replacement of work of others).

13.07 *Correction Period*

A. If within one year after the date of Substantial Completion or such longer period of time as may be prescribed by Laws or Regulations or by the terms of any applicable special guarantee required by the Contract Documents or by any specific provision of the Contract Documents, any Work is found to be defective, or if the repair of any damages to the land or areas made available for CONTRACTOR's use by OWNER or permitted by Laws and Regulations as contemplated in paragraph 6.11.A is found to be defective, CONTRACTOR shall promptly, without cost to OWNER and in accordance with OWNER's written instructions: (i) repair such defective land or areas, or (ii) correct such defective Work or, if the defective Work has been rejected by OWNER, remove it from the Project and replace it with Work that is not defective, and (iii) satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others or other land or areas resulting therefrom. If CONTRACTOR does not promptly comply with the terms of such instructions, or in an emergency where delay would cause serious risk of loss or damage, OWNER may have the defective Work corrected or repaired or may have the rejected Work removed and replaced, and all Claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all

costs of repair or replacement of work of others) will be paid by CONTRACTOR.

B. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications or by Written Amendment.

C. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this paragraph 13.07, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.

D. CONTRACTOR's obligations under this paragraph 13.07 are in addition to any other obligation or warranty. The provisions of this paragraph 13.07 shall not be construed as a substitute for or a waiver of the provisions of any applicable statute of limitation or repose.

13.08 *Acceptance of Defective Work*

A. If, instead of requiring correction or removal and replacement of defective Work, OWNER (and, prior to ENGINEER's recommendation of final payment, ENGINEER) prefers to accept it, OWNER may do so. CONTRACTOR shall pay all Claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) attributable to OWNER's evaluation of and determination to accept such defective Work (such costs to be approved by ENGINEER as to reasonableness) and the diminished value of the Work to the extent not otherwise paid by CONTRACTOR pursuant to this sentence. If any such acceptance occurs prior to ENGINEER's recommendation of final payment, a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work, and OWNER shall be entitled to an appropriate decrease in the Contract Price, reflecting the diminished value of Work so accepted. If the parties are unable to agree as to the amount thereof, OWNER may make a Claim therefor as provided in paragraph 10.05. If the acceptance occurs after such recommendation, an appropriate amount will be paid by CONTRACTOR to OWNER.

13.09 *OWNER May Correct Defective Work*

A. If CONTRACTOR fails within a reasonable time after written notice from ENGINEER to correct defective Work or to remove and replace rejected Work as required by ENGINEER in accordance with paragraph 13.06.A, or if CONTRACTOR fails to perform the Work in accordance with the Contract Documents, or if CONTRACTOR fails to comply with any other provision of the Contract Documents, OWNER may, after seven days written notice to CONTRACTOR, correct and remedy any such deficiency.

B. In exercising the rights and remedies under this paragraph, OWNER shall proceed expeditiously. In connection with such corrective and remedial action, OWNER may exclude CONTRACTOR from all or part of the Site, take possession of all or part of the Work and suspend CONTRACTOR's services related thereto, take possession of CONTRACTOR's tools, appliances, construction equipment and machinery at the Site, and incorporate in the Work all materials and equipment stored at the Site or for which OWNER has paid CONTRACTOR but which are stored elsewhere. CONTRACTOR shall allow OWNER, OWNER's representatives, agents and employees, OWNER's other contractors, and ENGINEER and ENGINEER's Consultants access to the Site to enable OWNER to exercise the rights and remedies under this paragraph.

C. All Claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred or sustained by OWNER in exercising the rights and remedies under this paragraph 13.09 will be charged against CONTRACTOR, and a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work; and OWNER shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount of the adjustment, OWNER may make a Claim therefor as provided in paragraph 10.05. Such claims, costs, losses and damages will include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of CONTRACTOR's defective Work.

D. CONTRACTOR shall not be allowed an extension of the Contract Times (or Milestones) because of any delay in the performance of the Work attributable to the exercise by OWNER of

OWNER's rights and remedies under this paragraph 13.09

ARTICLE 14 - PAYMENTS TO CONTRACTOR AND COMPLETION

14.01 *Schedule of Values*

A. The schedule of values established as provided in paragraph 2.07.A will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to ENGINEER. Progress payments on account of Unit Price Work will be based on the number of units completed.

14.02 *Progress Payments*

A. *Applications for Payments*

1. At least 20 days before the date established for each progress payment (but not more often than once a month), CONTRACTOR shall submit to ENGINEER for review an Application for Payment filled out and signed by CONTRACTOR covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that OWNER has received the materials and equipment free and clear of all Liens and evidence that the materials and equipment are covered by appropriate property insurance and other arrangements to protect OWNER's interest therein, all of which must be satisfactory to OWNER.

2. Beginning with the second Application for Payment, each Application shall include an affidavit of CONTRACTOR stating that all previous progress payments received on account of the Work have been applied on account to discharge CONTRACTOR's legitimate obligations associated with prior Applications for Payment.

3. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

B. *Review of Application*

1. ENGINEER will, within 10 days after receipt of each Application for Payment, either indicate in writing a recommendation of payment and present the Application to OWNER or return the Application to CONTRACTOR indicating in writing ENGINEER's reasons for refusing to recommend payment. In the latter case, CONTRACTOR may make the necessary corrections and resubmit the Application.

2. ENGINEER's recommendation of any payment requested in an Application for Payment will constitute a representation by ENGINEER to OWNER, based on ENGINEER's observations on the Site of the executed Work as an experienced and qualified design professional and on ENGINEER's review of the Application for Payment and the accompanying data and schedules, that to the best of ENGINEER's knowledge, information and belief:

a. the Work has progressed to the point indicated;

b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, to the results of any subsequent tests called for in the Contract Documents, to a final determination of quantities and classifications for Unit Price Work under paragraph 9.08, and to any other qualifications stated in the recommendation); and

c. the conditions precedent to CONTRACTOR's being entitled to such payment appear to have been fulfilled in so far as it is ENGINEER's responsibility to observe the Work.

3. By recommending any such payment ENGINEER will not thereby be deemed to have represented that: (i) inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed

inspections of the Work beyond the responsibilities specifically assigned to ENGINEER in the Contract Documents; or (ii) that there may not be other matters or issues between the parties that might entitle CONTRACTOR to be paid additionally by OWNER or entitle OWNER to withhold payment to CONTRACTOR.

4. Neither ENGINEER's review of CONTRACTOR's Work for the purposes of recommending payments nor ENGINEER's recommendation of any payment, including final payment, will impose responsibility on ENGINEER to supervise, direct, or control the Work or for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for CONTRACTOR's failure to comply with Laws and Regulations applicable to CONTRACTOR's performance of the Work. Additionally, said review or recommendation will not impose responsibility on ENGINEER to make any examination to ascertain how or for what purposes CONTRACTOR has used the moneys paid on account of the Contract Price, or to determine that title to any of the Work, materials, or equipment has passed to OWNER free and clear of any Liens.

5. ENGINEER may refuse to recommend the whole or any part of any payment if, in ENGINEER's opinion, it would be incorrect to make the representations to OWNER referred to in paragraph 14.02.B.2. ENGINEER may also refuse to recommend any such payment or, because of subsequently discovered evidenceor the results of subsequent inspections or tests, revise or revoke any such payment recommendation previously made, to such extent as may be necessary in ENGINEER's opinion to protect OWNER from loss because:

a. the Work is defective, or completed Work has been damaged, requiring correction or replacement;

b. the Contract Price has been reduced by Written Amendment or Change Orders;

c. OWNER has been required to correct defective Work or complete Work in accordance with paragraph 13.09; or

d. ENGINEER has actual knowledge of the occurrence of any of the events enumerated in paragraph 15.02.A.

C. *Payment Becomes Due*

1. Ten days after presentation of the Application for Payment to OWNER with ENGINEER's recommendation and Funding Agency approval (if applicable), the amount recommended will (subject to the provisions of paragraph 14.02.D) become due, and when due will be paid by OWNER to CONTRACTOR.

D. *Reduction in Payment*

1. OWNER may refuse to make payment of the full amount recommended by ENGINEER because:

a. claims have been made against OWNER on account of CONTRACTOR's performance or furnishing of the Work;

b. liens have been filed in connection with the Work, except where CONTRACTOR has delivered a specific Bond satisfactory to OWNER to secure the satisfaction and discharge of such Liens;

c. there are other items entitling OWNER to a set-off against the amount recommended; or

d. OWNER has actual knowledge of the occurrence of any of the events enumerated in paragraphs 14.02.B.5.a through 14.02.B.5.c or paragraph 15.02.A.

2. If OWNER refuses to make payment of the full amount recommended by ENGINEER, OWNER must give CONTRACTOR immediate written notice (with a copy to ENGINEER) stating the reasons for such action and promptly pay CONTRACTOR any amount remaining after deduction of the amount so withheld. OWNER shall promptly pay CONTRACTOR the amount so withheld, or any adjustment thereto agreed to by OWNER and CONTRACTOR, when CONTRACTOR corrects to OWNER's satisfaction the reasons for such action.

3. If it is subsequently determined that OWNER's refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by paragraph 14.02.C.1.

14.03 *CONTRACTOR's Warranty of Title*

A. CONTRACTOR warrants and guarantees that title to all Work, materials, and equipment covered by any Application for Payment, whether incorporated in the Project or not, will pass to OWNER no later than the time of payment free and clear of all Liens.

14.04 *Substantial Completion*

A. When CONTRACTOR considers the entire Work ready for its intended use CONTRACTOR shall notify OWNER and ENGINEER in writing that the entire Work is substantially complete (except for items specifically listed by CONTRACTOR as incomplete) and request that ENGINEER issue a certificate of Substantial Completion. Promptly thereafter, OWNER, AGENCY, CONTRACTOR, and ENGINEER shall make a prefinal inspection of the Work to determine the status of completion. If ENGINEER does not consider the Work substantially complete, ENGINEER will notify CONTRACTOR in writing giving the reasons therefor. If ENGINEER considers the Work substantially complete, ENGINEER will prepare and deliver to OWNER a tentative certificate of Substantial Completion which shall fix the date of Substantial Completion. There shall be attached to the certificate a tentative list of items to be completed or corrected before final payment. OWNER shall have seven days after receipt of the tentative certificate during which to make written objection to ENGINEER as to any provisions of the certificate or attached list. If, after considering such objections, ENGINEER concludes that the Work is not substantially complete, ENGINEER will within 14 days after submission of the tentative certificate to OWNER notify CONTRACTOR in writing, stating the reasons therefor. If, after consideration of OWNER's objections, ENGINEER considers the Work substantially complete, ENGINEER will within said 14 days execute and deliver to OWNER and CONTRACTOR a definitive certificate of Substantial Completion (with a revised tentative list of items to be completed or corrected) reflecting such changes from the tentative certificate as ENGINEER believes justified after consideration of any objections from OWNER. At the time of delivery of the tentative certificate of Substantial Completion ENGINEER will deliver to OWNER and CONTRACTOR a written recommendation as to division of responsibilities pending final payment between OWNER and CONTRACTOR with respect to security, operation, safety, and protection of the Work, maintenance, heat, utilities, insurance, and warranties and guarantees. Unless OWNER and CONTRACTOR agree otherwise in writing and so inform ENGINEER in writing prior to ENGINEER's issuing the definitive certificate of Substantial Completion, ENGINEER's aforesaid recommendation will be binding on OWNER and CONTRACTOR until final payment.

B. OWNER shall have the right to exclude CONTRACTOR from the Site after the date of Substantial Completion, but OWNER shall allow CONTRACTOR reasonable access to complete or correct items on the tentative list.

14.05 *Partial Utilization*

A. Use by OWNER at OWNER's option of any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which OWNER, ENGINEER, and CONTRACTOR agree constitutes a separately functioning and usable part of the Work that can be used by OWNER for its intended purpose without significant interference with CONTRACTOR's performance of the remainder of the Work, may be accomplished prior to Substantial Completion of all the Work subject to the following conditions.

1. OWNER at any time may request CONTRACTOR in writing to permit OWNER to use any such part of the Work which OWNER believes to be ready for its intended use and substantially complete. If CONTRACTOR agrees that such part of the Work is substantially complete, CONTRACTOR will certify to OWNER and ENGINEER that such part of the Work is substantially complete and request ENGINEER to issue a certificate of Substantial Completion for that part of the Work. CONTRACTOR at any time may notify OWNER and ENGINEER in writing that CONTRACTOR considers any such part of the Work ready for its intended use and substantially complete and request ENGINEER to issue a certificate of Substantial Completion for that part of the Work. Within a reasonable time after either such request, OWNER, CONTRACTOR, and ENGINEER shall make an inspection of that part of the Work to determine its status of completion. If ENGINEER does not consider that part of the Work to be substantially complete, ENGINEER will notify OWNER and CONTRACTOR in writing giving the reasons therefor. If ENGINEER considers that part of the Work to

be substantially complete, the provisions of paragraph 14.04 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.

2. No occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of paragraph 5.10 regarding property insurance.

14.06 *Final Inspection*

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

14.07 *Final Payment*

A. *Application for Payment*

1. After CONTRACTOR has, in the opinion of ENGINEER, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, Bonds, certificates or other evidence of insurance certificates of inspection, marked-up record documents (as provided in paragraph 6.12), and other documents, CONTRACTOR may make application for final payment following the procedure for progress payments.

2. The final Application for Payment shall be accompanied (except as previously delivered) by: (i) all documentation called for in the Contract Documents, including but not limited to the evidence of insurance required by subparagraph 5.04.B.7; (ii) consent of the surety, if any, to final payment; and (iii) complete and legally effective releases or waivers (satisfactory to OWNER) of all Lien rights arising out of or Liens filed in connection with the Work.

3. In lieu of the releases or waivers of Liens specified in paragraph 14.07.A.2 and as approved by OWNER, CONTRACTOR may furnish receipts or releases in full and an affidavit of CONTRACTOR that: (i) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (ii) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which OWNER or OWNER's property might in any way be responsible have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, CONTRACTOR may furnish a Bond or other collateral satisfactory to OWNER to indemnify OWNER against any Lien.

B. *Review of Application and Acceptance*

1. If, on the basis of ENGINEER's observation of the Work during construction and final inspection, and ENGINEER's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, ENGINEER is satisfied that the Work has been completed and CONTRACTOR's other obligations under the Contract Documents have been fulfilled, ENGINEER will within ten days after receipt of the final Application for Payment, indicate in writing ENGINEER's recommendation of payment and present the Application for Payment to OWNER for payment. At the same time ENGINEER will also give written notice to OWNER and CONTRACTOR that the Work is acceptable subject to the provisions of paragraph 14.09. Otherwise, ENGINEER will return the Application for Payment to CONTRACTOR, indicating in writing the reasons for refusing to recommend final payment, in which case CONTRACTOR shall make the necessary corrections and resubmit the Application for Payment.

C. *Payment Becomes Due*

1. Thirty days after the presentation to OWNER of Application for Payment and accompanying documentation, the amount recommended by ENGINEER will become due and, when due, will be paid by OWNER to CONTRACTOR.

14.08 *Final Completion Delayed*

A. If, through no fault of CONTRACTOR, final completion of the Work is significantly delayed, and if ENGINEER so confirms, OWNER shall, upon receipt of final Application for Payment and recommendation of ENGINEER, and without terminating the Agreement, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance to be held by OWNER for Work not fully completed or corrected is less than the retainage stipulated in the Agreement, and if Bonds have been furnished as required in paragraph 5.01, the written consent of the surety to the payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by CONTRACTOR to ENGINEER with the Application for such payment. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of Claims. The remaining balance of any sum included in the final Application for Payment but held by OWNER for Work not fully completed and accepted will become due when the Work is fully completed and accepted.

14.09 *Waiver of Claims*

A. The making and acceptance of final payment will constitute:

1. a waiver of all Claims by OWNER against CONTRACTOR, except Claims arising from unsettled Liens, from defective Work appearing after final inspection pursuant to paragraph 14.06, from failure to comply with the Contract Documents or the terms of any special guarantees specified therein, or from CONTRACTOR's continuing obligations under the Contract Documents; and

2. a waiver of all Claims by CONTRACTOR against OWNER other than those previously made in writing which are still unsettled.

ARTICLE 15 - SUSPENSION OF WORK AND TERMINATION

15.01 *OWNER May Suspend Work*

A. At any time and without cause, OWNER my suspend the Work or any portion thereof for a period of not more than 90 consecutive days by notice in writing to CONTRACTOR and ENGINEER which will fix the date on which Work will be resumed. CONTRACTOR shall resume the Work on the date so fixed. CONTRACTOR shall be allowed an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such suspension if CONTRACTOR makes a Claim therefor as provided in paragraph 10.05.

15.02 *OWNER May Terminate for Cause*

A. The occurrence of any one or more of the following events will justify termination for cause:

1. CONTRACTOR's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the progress schedule established under paragraph 2.07 as adjusted from time to time pursuant to 6.04);

2. CONTRACTOR's disregard of Laws or Regulations of any public body having jurisdiction;

3. CONTRACTOR's disregard of the authority of ENGINEER; or

4. CONTRACTOR's violation in any substantial way of any provisions of the Contract Documents.

B. If one or more of the events identified in paragraph 15.02.A occur, OWNER may, after giving CONTRACTOR (and the surety, if any) seven days written notice, terminate the services of CONTRACTOR, exclude CONTRACTOR from the Site, and take possession of the Work and of all CONTRACTOR's tools, appliances, construction equipment, and machinery at the Site, and use the same to the full extent they could be used by CONTRACTOR (without liability to CONTRACTOR for trespass or conversion), incorporate in the Work all materials and equipment stored at the Site or for which OWNER has paid CONTRACTOR but which are stored elsewhere, and finish the Work as OWNER may deem expedient. In such case, CONTRACTOR shall not be entitled to receive any further payment until the Work is finished. If the unpaid balance of the Contract Price exceeds all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by OWNER arising out of or relating to completing the Work,

such excess will be paid to CONTRACTOR. If such claims, costs, losses, and damages exceed such unpaid balance, CONTRACTOR shall pay the difference to OWNER. Such claims, costs, losses, and damages incurred by OWNER will be reviewed by ENGINEER as to their reasonableness and, when so approved by ENGINEER, incorporated in a Change Order. When exercising any rights or remedies under this paragraph OWNER shall not be required to obtain the lowest price for the Work performed.

C. Where CONTRACTOR's services have been so terminated by OWNER, the termination will not affect any rights or remedies of OWNER against CONTRACTOR then existing or which may thereafter accrue. Any retention or payment of moneys due CONTRACTOR by OWNER will not release CONTRACTOR from liability.

15.03 *OWNER May Terminate For Convenience*

A. Upon seven days written notice to CONTRACTOR and ENGINEER, OWNER may, without cause and without prejudice to any other right or remedy of OWNER, elect to terminate the Contract. In such case, CONTRACTOR shall be paid (without duplication of any items):

1. for completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;

2. for expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses;

3. for all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred in settlement of terminated contracts with Subcontractors, Suppliers, and others; and

4. for reasonable expenses directly attributable to termination.

B. CONTRACTOR shall not be paid on account of loss of anticipated profits or revenue or other economic loss arising out of or resulting from such termination.

15.04 *CONTRACTOR May Stop Work or Terminate*

A. If, through no act or fault of CONTRACTOR, the Work is suspended for more than 90 consecutive days by OWNER or under an order of court or other public authority, or ENGINEER fails to act on any Application for Payment within 30 days after it is submitted, or OWNER fails for 30 days to pay CONTRACTOR any sum finally determined to be due, then CONTRACTOR may, upon seven days written notice to OWNER and ENGINEER, and provided OWNER or ENGINEER do not remedy such suspension or failure within that time, terminate the Contract and recover from OWNER payment on the same terms as provided in paragraph 15.03. In lieu of terminating the Contract and without prejudice to any other right or remedy, if ENGINEER has failed to act on an Application for Payment within 30 days after it is submitted, or OWNER has failed for 30 days to pay CONTRACTOR any sum finally determined to be due, CONTRACTOR may, seven days after written notice to OWNER and ENGINEER, stop the Work until payment is made of all such amounts due CONTRACTOR, including interest thereon. The provisions of this paragraph 15.04 are not intended to preclude CONTRACTOR from making a Claim under paragraph 10.05 for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to CONTRACTOR's stopping the Work as permitted by this paragraph.

ARTICLE 16 - DISPUTE RESOLUTION

16.01 *Methods and Procedures*

A. Dispute resolution methods and procedures, if any, shall be as set forth in the Supplementary Conditions. If no method and procedure has been set forth, and subject to the provisions of paragraphs 9.09 and 10.05, OWNER and CONTRACTOR may exercise such rights or remedies as either may otherwise have under the Contract Documents or by Laws or Regulations in respect of any dispute.

ARTICLE 17 – MISCELLANEOUS

17.01 *Giving Notice*

A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended, or if delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the giver of the notice.

17.02 *Computation of Times*

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

17.03 *Cumulative Remedies*

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

17.04 *Survival of Obligations*

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

17.05 *Controlling Law*

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

ARTICLE 18 – FEDERAL REQUIREMENTS

18.01 *AGENCY Not a Party*

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

18.02 *Contract Approval*

A. OWNER and CONTRACTOR will furnish OWNER'S attorney such evidence as required so that OWNER'S attorney can complete and execute the following "Certificate of Owner's Attorney" (Exhibit GC-A) before OWNER submits the executed Contract Documents to AGENCY, if applicable, for approval.

B. Concurrence by AGENCY in the award of the Contract, if applicable, is required before the Contract is effective.

18.03 *Conflict of Interest*

A. CONTRACTOR may not knowingly contract with a supplier or manufacturer if the individual or entity who prepared the plans and specifications has a corporate or financial affiliation with the supplier or manufacturer.

B. OWNER's officers, employees, or agents shall not engage in the award or administration of this Contract if a conflict of interest, real or apparent, would be involved. Such a conflict would arise when: (i) the employee, officer or agent; (ii) any member of their immediate family; (iii) their partner or (iv) an organization that employs, or is about to employ, any of the above, has a financial interest in CONTRACTOR. OWNER's officers, employees, or agents shall neither solicit nor accept gratuities, favors or anything of monetary value from CONTRACTOR or subcontractors.

18.04. *Gratuities*

A. If OWNER finds after a notice and hearing that CONTRACTOR, or any of CONTRACTOR's agents or representatives, offered or gave gratuities (in the form of entertainment, gifts, or otherwise) to any official, employee, or agent of OWNER or AGENCY in an attempt to secure this Contract or favorable treatment in awarding, amending, or making any determinations related to the performance of this Contract, OWNER may, by

written notice to CONTRACTOR, terminate this Contract. OWNER may also pursue other rights and remedies that the law or this Contract provides. However, the existence of the facts on which OWNER bases such findings shall be an issue and may be reviewed in proceedings under the dispute resolution provisions of this Contract

B. In the event this Contract is terminated as provided in paragraph 18.04.A, OWNER may pursue the same remedies against CONTRACTOR as it could pursue in the event of a breach of this Contract by CONTRACTOR. As a penalty, in addition to any other damages to which it may be entitled by law, OWNER may pursue exemplary damages in an amount (as determined by OWNER) which shall not be less than three nor more than ten times the costs CONTRACTOR incurs in providing any such gratuities to any such officer or employee.

18.05 *Audit and Access to Records*

A. For all negotiated contracts and negotiated modifications (except those of $10,000 or less), OWNER, AGENCY, the Comptroller General, or any of their duly authorized representatives, shall have access to any books, documents, papers, and records of the CONTRACTOR, which are pertinent to the Contract, for the purpose of making audits, examinations, excerpts and transcriptions. CONTRACTOR shall maintain all required records for three years after final payment is made and all other pending matters are closed.

18.06 *Small, Minority and Women's Businesses*

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

18.07 *Anti-Kickback*

A. CONTRACTOR shall comply with the Copeland Anti-Kickback Act (18 USC 874) as supplemented in Department of Labor regulations (29 CFR Part 3). This act provides that CONTRACTOR shall be prohibited from inducing, by any means, any person employed in the construction, completion, or repair of public facilities, to give up any part of the compensation to which they are otherwise entitled. OWNER shall report all suspected or reported violations to AGENCY.

18.08 *Violating Facilities*

A. Where this Contract exceeds $100,000 CONTRACTOR shall comply with all applicable standards, orders or requirements issued under section 306 of the Clean Air Act (42 USC 1857(h)), section 508 of the Clean Water Act (33 USC 1368), Executive Order 11738, and Environmental Protection Agency regulations (40 CFR Part 15) which prohibit the awarding of non-exempt federal contracts, grants, or loans to facilities included on EPA's list of violating facilities. CONTRACTOR will report violations to the EPA.

18.09 *State Energy Policy*

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

18.10 *Equal Opportunity Requirements*

A. If this Contract exceeds $10,000, CONTRACTOR shall comply with Executive Order 11246, entitled "Equal Employment Opportunity," as amended by Executive Order 11375, and as supplemented in Department of Labor regulations (41 CFR Part 60).

B. CONTRACTOR's compliance with Executive Order 11246 shall be based on its implementation of the Equal Opportunity Clause, specific affirmative active obligations required by the Standard Federal Equal Employment Opportunity Construction Contract Specifications,

as set forth in 41 CFR Part 60-4 and its efforts to meet the goals established for the geographical area where the Contract is to be performed. The hours of minority and female employment and training must be substantially uniform throughout the length of the Contract, and in each trade, and CONTRACTOR shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from CONTRACTOR to CONTRACTOR or from project to project for the sole purpose of meeting CONTRACTOR's goals shall be a violation of the Contract, the Executive Order, and the regulations in 41 CFR Part 60-4. Compliance with the goals will be measured against the total work hours performed.

C. CONTRACTOR shall provide written notification to the Director of the Office of Federal Contract Compliance Programs within 10 working days of award of any construction subcontract in excess of $10,000 at any tier for construction work under the Contract resulting from this solicitation. The notification shall list the name, address, and telephone number of the subcontractor; employer identification number; estimated dollar amount of subcontract; estimated starting and completion dates of the subcontract; and the geographical area in which the Contract is to be performed.

18.11 *Restrictions on Lobbying*

A. CONTRACTOR and each subcontractor shall comply with Restrictions on Lobbying (Public Law 101121, Section 319) as supplemented by applicable AGENCY regulations. This Law applies to the recipients of contracts and subcontracts that exceed $100,000 at any tier under a Federal loan that exceeds $150,000 or a Federal grant that exceeds $100,000. If applicable, CONTRACTOR must complete a certification form on lobbying activities related to a specific Federal loan or grant that is a funding source for this Contract. Necessary certification and disclosure forms shall be provided by OWNER.

18.12 *Environmental Requirements*

A. When constructing a project involving trenching and/or other related earth excavations, CONTRACTOR shall comply with the following environmental constraints:

1. Wetlands -- When disposing of excess, spoil, or other construction materials on public or private property, CONTRACTOR shall not fill in or otherwise convert wetlands.

2. Floodplains -- When disposing of excess, spoil, or other construction materials on public or private property, CONTRACTOR shall not fill in or otherwise convert 100 year floodplain areas delineated on the latest Federal Emergency Management Agency Floodplain Maps.

3. Historic Preservation -- Any excavation by CONTRACTOR that uncovers an historical or archaeological artifact shall be immediately reported to OWNER and a representative of AGENCY. Construction shall be temporarily halted pending the notification process and further directions issued by AGENCY after consultation with the State Historic Preservation Officer (SHPO).

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

Supplementary Conditions

These Supplementary Conditions amend or supplement the Standard General Conditions of the Construction Contract Funding Agency Edition (No. 1910-8-FA, 1997 Edition) and other provisions of the Contract Documents as indicated below. All provisions which are not so amended or supplemented remain in full force and effect.

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

SC-1.01.A.4. Add the following language to the end of paragraph 1.01.A.4:

The Application for Payment form to be used on this Project is RD 1924-18.

SC-1.01.A.10. Add the following language to the end of paragraph 1.01.A.10:

The Change Order form to be used on this Project is RD 1924-7.

SC-1.01.A.21. Add the following language to the end of paragraph 1.01.A.21:

The ENGINEER's Consultants on this project, if any, will be duly qualified and registered to perform their discipline in North Carolina.

SC-2.03.A. Delete paragraph 2.03.A in its entirety and insert the following in its place:

A. The Contract Times will commence to run on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 60 days after the Effective Date of the Agreement.

SC-4.02. Add the following new paragraphs immediately after paragraph 4.02.B:

C. In the preparation of Drawings and Specifications, ENGINEER or ENGINEER's Consultants relied upon reports, if any, of exploration and tests of subsurface conditions at the Site.

D. In the preparation of Drawings and Specifications, ENGINEER or ENGINEER's Consultants relied upon drawings, if any, of physical conditions in or relating to existing surface and subsurface structures (except Underground Facilitates) which are at or contiguous to the Site.

E. Copies of reports and drawings referred to in SC-4.02.C and SC-4.02.D that are not included with Bidding Documents may be examined at the office of Green Engineering, P.L.L.C.; 303 North Goldsboro Street; Wilson, North Carolina 27893 during regular business hours. These reports and drawings are not part of the Contract Documents, but the "technical data" contained therein upon which the CONTRACTOR may rely as identified and established above are incorporated therein by reference. CONTRACTOR is not entitled to rely upon other information and data utilized by ENGINEER and ENGINEER's Consultants in the preparation of the Drawings and Specifications.

SC-4.06. Add the following new paragraphs immediately after paragraph 4.06.A:

1. In the preparation of Drawings and Specifications, ENGINEER or ENGINEER's Consultants relied upon reports, if any, of Hazardous Environmental Conditions at the Site.

2. In the preparation of Drawings and Specifications, ENGINEER or ENGINEER's Consultants relied upon drawings, if any, of Hazardous Environmental Conditions which are at or contiguous to the Site.

3. Copies of reports and drawings referred to in SC-4.06.A.1 and SC-4.06.A.2 that are not included with Bidding Documents may be examined at the office of Green Engineering, P.L.L.C.; 303 North Goldsboro Street; Wilson, North Carolina 27893 during regular business hours. These reports and drawings are not part of the Contract Documents, but the "technical data" contained therein upon which the CONTRACTOR may rely as identified and established above are incorporated therein by reference. CONTRACTOR is not entitled to rely upon other information and data utilized by ENGINEER and ENGINEER's Consultants

in the preparation of the Drawings and Specifications.

SC-5.04. Add the following new paragraph immediately after paragraph 5.04.B:

C. The limits of liability for insurance required by paragraph 5.04 of the General Conditions shall provide coverage for not less than the following amounts or greater where required by Laws and Regulations:

1. Workers' Compensation, and related coverages under paragraphs 5.04.A.1 and A.2 of the General Conditions:

a. State:	Statutory
b. Applicable Federal (e.g., Longshoremen's)	Statutory
c. Employer's Liability	Statutory

2. Contractor's General Liability under paragraphs 5.04.A.3 and A.6 of the General Conditions which shall include completed operations and product liability coverages and eliminate the exclusion with respect to property under the care, custody, and control of the Contractor:

a. General Aggregate	$ 2,000,000
b. Products - Completed Operations Aggregate	$ 1,000,000
c. Personal and Advertising Injury	$ 1,000,000
d. Each Occurrence (Bodily Injury and Property Damage)	$ 1,000,000

e. Property Damage liability insurance will provide Explosion, Collapse, and Underground coverages where applicable.

f. Excess or Umbrella Liability	
1) General Aggregate	$ 5,000,000
2) Each Occurrence	$ 5,000,000

3. Automobile Liability under paragraph 5.40.A.6 of the General Conditions:

a. Combined Single Limit of	$ 1,000,000

4. The Contractual Liability coverage required by paragraph 5.04.B.4 of the General Conditions shall be provided by the CONTRACTOR as part of the CONTRACTOR'S General Liability coverage.

5. The Contractor shall provide General Liability coverage in an amount to satisfy the requirements stipulated in any easement and/or encroachment agreement obtained for the construction of the project.

SC-5.06.A. In the case of multiple prime contractors on a single Site, each prime contractor for the Project will need to provide property insurance as required in paragraph 5.06.A of the General Conditions.

SC-5.06.A.2 Amend paragraph to read: be written on a Builder's Risk, "all risk" or open peril or special causes of loss policy form in the amount of bid for above ground structures and on an Installation Floater form in the amount of the total bid less any amount included on the Builder's Risk, etc. form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, false work, and materials and equipment in transit, and shall insure against at least the following perils or causes of loss; fire, lightning, extended coverage, theft, vandalism and malicious mischief, earthquake, collapse, debris removal, demolition occasioned by enforcement of Laws and Regulations, water damage, and such other perils or causes of loss as may be specifically required by the Supplementary Conditions:

SC-6.05.C. Amend the paragraph by making two subparagraphs under the title C. Engineer's Evaluation. The paragraph text is retitled, 6.05.C.2 After Effective Date of Agreement. A new paragraph is added before this paragraph to read as follows:

1. During Bidding. The Contract, if awarded, will be on the basis of materials and equipment specified or described in the Bidding Documents, or "or-equal" materials and equipment as defined in paragraph 6.05 of the General Conditions, or those substitute or materials and equipment approved by the ENGINEER and identified by Addendum. The materials and equipment described in the Bidding Documents establish a standard of required type, function, and quality to be met by any proposed substitute or "or-equal" item. Request for ENGINEER's clarification of materials and equipment considered "or-equal" prior to the Effective Date of the Agreement

must be received by the ENGINEER at least 5 days prior to the date for receipt of Bids. No item of material or equipment will be considered by ENGINEER as a substitute unless written request for approval has been submitted by Bidder and has been received by ENGINEER at least 15 days prior to the date for receipt of Bids. Each request shall conform to the requirements of paragraph 6.05 of the General Conditions. The burden of proof of the merit of the proposed item is upon the Bidder. ENGINEER's decision of approval or disapproval of a proposed item will be final. If ENGINEER approves any proposed substitute item, such approval will be set forth in an Addendum issued to all prospective Bidders. Bidders shall not rely upon approvals made in any other manner.

SC-6.06. Add the following new paragraphs immediately after paragraph 6.06G.

H. Within five (5) days of the bid opening and prior to the Notice of Award, the apparent successful Bidder shall provide to the ENGINEER a list of all subcontractors to be employed on this project. The apparent successful Bidder shall also identify the Amount of Work that each Subcontractor is employed to perform. The apparent successful Bidder shall complete a subcontractor form, to be provided by ENGINEER, showing a summary of subcontractor work on this project.

I. Prime Contractors shall not sublet the contract, nor any portion thereof, without the written consent of the OWNER. If the OWNER gives such consent, the CONTRACTOR shall perform with his own organization work amounting to at least 40% of the total contract amount and total labor. The subcontractor summary form, mentioned in SC-6.06H above, shall be used by the CONTRACTOR to demonstrate compliance with the above requirements. A subcontractor shall not sublet, sell, transfer, assign, or otherwise dispose of this contract with the CONTRACTOR, nor any portion thereof, or of this right title, or interest therein.

SC-7.01.A. The prime CONTRACTORS on this project are identified in their respective contract documents and within the official minutes of the project preconstruction conference.

SC-7.02.A.1. Delete paragraphs 7.02.A.1-3 in their entirety and insert the following:

1. The General CONTRACTOR shall be responsible for coordination of the activities among the other prime contractors and subcontractors on the Site to ensure a safe, efficient working environment. This authority covers scheduling delivery of materials, storage of materials, sequencing of construction involving different crafts, resolving interface issues between crafts, scheduling testing, and all other aspects of the Work that do not impact the design or function of the Work.

SC-9.03.A. Add the following language at the end of paragraph 9.03:

The Duties, Responsibilities, and Limitations of Authority of the Resident Project Representative will be as stated in Exhibit D of the OWNER-ENGINEER Agreement, 1910-1-FA, 1997 Edition, as amended and executed for this specific Project.

SC-11.03.C.1. Delete paragraph 11.03.C.1 in its entirety.

SC-14.02.A.2. Delete paragraph 14.02.A.2. in its entirety.

SC-16.01 Add the following new paragraphs immediately after paragraph 16.01.A.

B. Arbitration will not be used to settle claims disputes, and other matters. The parties involved shall attempt to resolve any claims, disputes or other matters by good faith negotiation. If such a negotiation is not successful, then litigation may be pursued as provided in paragraph SC-16.01C no later than 60 days after substantial completion of the project.

C. The contract Documents shall be constructed, governed, and interpreted under the law of the State of North Carolina. If any dispute should arise pertaining to these contract documents, such disputes shall be litigated and decided solely in the District Court Division or in the Superior Court Division of the General Court of Justice in the county where the project is being performed.

SC-18.08 Delete paragraph 18.08.A in its entirety and insert the following in its place:

A. Where this Contract exceeds $100,000 CONTRACTOR shall comply with all the requirements of the Clean Air Act (42 U.S.C. §7414) and Section 308 of the Water Pollution Control Act (33 U.S.C. §1318) relating to inspection, monitoring, entry, reports, and information, as well as all other requirements specified in Section 114 of the Clean Air Act and Section 308 of the Water Pollution Control Act and all regulations and guidelines issued thereunder after the award of the contract. In so doing the Contractor further agrees:

1. As a condition for the award of contract, to notify the Owner of the receipt of any communication from the Environmental Protection Agency (EPA) indicating that a facility to be utilized in the performance of the contract is under consideration to be listed on the EPA list of Violating Facilities. Prompt notification is required prior to contract award.

2. To certify that any facility to be utilized in the performance of any nonexempt contractor subcontract is not listed on the EPA list of Violating Facilities pursuant to 40 CFR Part 32 as of the date of contract award.

3. To include or cause to be included the above criteria and the requirements in every nonexempt subcontract and that the Contractor will take such action as the Government may direct as a means of enforcing such provisions.

APPENDIX TO GENERAL AND SUPPLEMENTARY CONDITIONS

1. HEALTH AND SAFETY REGULATIONS FOR CONSTRUCTION

The Contractor shall be responsible for the safety, efficiency, and adequacy of his equipment and methods, and for any damage which results from their failure or their improper construction, maintenance, or operation.

The Contractor shall maintain a current and accurate record of all cases of death, occupational disease, and injury requiring medical attention or causing loss of time from work, arising out of and in the course of employment on work under this Contract.

2. NORTH CAROLINA SALES TAX REPORTS

In order that the Owner may fully recover all taxes to which he is legally entitled, which were paid on construction materials by the Contractor, the following procedures shall be followed by the Contractor on this project:

A. The Contractor shall furnish the Owner, through the Engineer, documentary evidence showing materials used and sales taxes paid by the Contractor and each Subcontractor.

B. The documentary evidence shall consist of a certified statement by the Contractor, and each of his Subcontractors individually, showing total purchases of materials from each separate vendor and total sales taxes paid each vendor. The certified statement shall show the name of the vendor, the invoice number, or numbers, covered and inclusive dates of such invoices. Copies of each invoice shall be attached to the certified statement.

C. Materials used from the Contractor's or Subcontractor's warehouse stock shall be shown in the certified statement at warehouse stock prices.

D. The Contractor shall not be required to certify the Subcontractor's statements.

E. The Contractor shall submit this documentary evidence to the Engineer monthly, covering all items involved during the pay period, along with his request for payment. Prior to final project acceptance and payment, the Contractor shall furnish to the Engineer a sworn affidavit that all project items on which N. C. Sales Tax has been paid appears in the project documentation.

3. BASIS FOR DETERMINING RESPONSIVENESS AND RESPONSIBILITY OF LOW BIDDER

For this Contract, responsiveness is defined by:

A. The completeness and regularity of the Bid Form.

B. A Bid Form without modifications unless requested in the technical specifications.

Responsibility may be based on whether the Bidder:

A. Maintains a permanent place of business.

B. Has adequate equipment to do the work properly and within the time limit established.

C. Has adequate financial status to meet his obligations contingent to work.

4. WITHHOLDING PAYMENT

A. The Engineer may withhold or, on account of subsequently discovered evidence, nullify the whole or part of any approved partial payment estimate to such extent as may be necessary to protect the Owner from loss on account of:

(a) Defective work not remedied.

(b) Claims filed or reasonable evidence indicating probable filing of claims.

(c) Failure to Contractor to make payments properly to subcontractors or for material or labor.

(d) A reasonable doubt that the work can be completed for the balance then unpaid.

(e) Damage to another Contractor.

(f) Performance of work in violation of the terms of the contract documents.

B. Where work on unit price items are substantially complete but lack clean-up and/or corrections ordered by the Engineer, amounts shall be deducted from unit prices in partial payment estimates to amply cover such clean-up and corrections.

C. When the above grounds are cured, payment shall be made for amounts withheld because of them.

5. HIGHWAY AND RAILROAD ENCROACHMENTS

All work performed within highway or railroad rights-of-way shall be in strict accordance with the terms and conditions of the encroachment agreement(s) issued by the land owner or controlling authority. Should there be a conflict between these contract documents and the encroachment agreement(s), the more stringent condition, as determined by the Engineer, shall prevail.

Copies of existing encroachment agreement(s) are available to the Bidder, upon request to the Engineer.

6. CONFLICTS IN GENERAL CONDITIONS, SUPPLEMENTARY CONDITIONS AND/OR APPENDIX

Should there be any conflict between the General Conditions, Supplementary Conditions and/or this Appendix, the more stringent condition, as determined by the Engineer, shall prevail.

GENERAL TERMS AND CONDITIONS

1. **DEFAULT**: In case of default by the contractor, the City of Wilson may procure the articles or services from other sources and hold the contractor responsible for any excess cost occasioned thereby.

2. **BID BOND/DEPOSIT:** No proposal shall be considered or accepted by the City of Wilson unless, at the time of its filing, the proposal shall be accompanied by a deposit with the City of Wilson of cash, a cashier's check or a certified check on a bank or trust company insured by the Federal Deposit Insurance Corporation in an amount equal to but not less than five percent (5%) of the proposal. In lieu of making the cash deposit, as provided above, bidders may file a Bid Bond executed by a corporate surety licensed under the laws of North Carolina to execute the contract in accordance with the bid bond. This deposit shall be retained by the City of Wilson if the successful bidder fails to execute the contract within ten (10) days after the award or fails to give satisfactory surety as required. Bid bond shall be enclosed in a separate sealed envelope with "Bid Bond" printed on the envelope.

3. **PERFORMANCE AND PAYMENT BONDS:** Performance and Payment Bonds, issued in accordance with Article 3 of Chapter 44A of the General Statutes, each having a penal sum in the full amount of the contract sum, will be required on such contract(s) as may be awarded. This will be required of contractor after award is made.

4. **GOVERNMENTAL RESTRICTIONS**: In the event any Governmental restrictions are imposed which necessitate alternation of the material, quality, workmanship or performance of the items prior to delivery, it shall be the responsibility of the contractor to notify, in writing, the issuing purchasing office at once, indicating the specific regulation, which required such alternations. The City of Wilson reserves the right to accept any such alternations, including any price adjustments occasioned thereby, or to cancel the contract.

5. **AVAILABILITY OF FUNDS:** Any and all payments to the contractor are dependent upon and subject to the availability of funds to the City for the purpose set forth in this agreement.

6. **TAXES**: Any applicable taxes shall be invoiced as a separate item. The City is not exempt from local or North Carolina sales tax.

7. **SITUS AND GOVERNING LAWS:** This Contract is made under and shall be governed and construed in accordance with the laws of the State of North Carolina, without regard to its conflict of laws rules, and within which state all matters, whether sounding in Contract or tort or otherwise, relating to its validity, construction, interpretation and enforcement shall be determined.

8. **PAYMENT TERMS:** Payment terms are Net not later than 30 days after receipt of a correct invoice or acceptance of goods, whichever is later. Invoices are preferred by the City to be sent by e-mail to cowaccts@wilsonnc.org

9. **NON-DISCRIMINATION:**

    a. The Vendor will take necessary action to comply with all Federal and State requirements concerning fair employment and employment of people with disabilities, and concerning the treatment of all employees without regard to discrimination on the basis of any prohibited

grounds as defined by Federal and State law.

b. The vendor will take necessary action to ensure its internal employee policies and procedures are consistent with Executive Order #82 (Roy Cooper, December 6, 2018), which extends workplace protections and accommodations to pregnant employees.

10. **CONDITION AND PACKAGING:** Unless otherwise provided by special terms and conditions or specifications, it is understood and agreed that any item offered or shipped has not been sold or used for any purpose and shall be in first class condition. All containers/packaging shall be suitable for handling, storage or shipment.

9. **INTELLECTUAL PROPERTY WARRANTY AND INDEMNITY**: Vendor shall hold and save the City, its officers, agents and employees, harmless from liability of any kind, including costs and expenses, resulting from infringement of the rights of any third party in any copyrighted material, patented or patent-pending invention, article, device or appliance delivered in connection with The Contract.

10. **TERMINATION FOR CONVENIENCE:** If this contract contemplates deliveries or performance over a period of time, the City may terminate this contract at any time by providing 60 days' notice in writing from the City to the Vendor. In that event, any or all finished or unfinished deliverables prepared by the Vendor under this contract shall, at the option of the City, become its property. If the contract is terminated by the City as provided in this section, the City shall pay for those items for which such option is exercised, less any payment or compensation previously made.

11. **ADVERTISING:** Vendor agrees not to use the existence of The Contract or the name of the City as part of any commercial advertising or marketing of products or Services. A Vendor may inquire whether the City is willing to act as a reference by providing factual information directly to other prospective customers.

12. **ACCESS TO PERSONS AND RECORDS**: An independent auditor shall have access to persons and records as a result of all contracts or grants entered into by the City of Wilson in accordance with General Statute 147-64.7.

13. **ASSIGNMENT:** No assignment of the Vendor's obligations nor the Vendor's right to receive payment hereunder shall be permitted. However, upon written request approved by the issuing purchasing authority and solely as a convenience to the Vendor, the City may:

    a) Forward the Contractor's payment check directly to any person or entity designated by the Contractor, and

    b) Include any person or entity designated by Vendor as a joint payee on the Contractor's payment check. In no event shall such approval and action obligate the City to anyone other than the contractor and the contractor shall remain responsible for fulfillment of all Contract obligations.

14. **INSURANCE:** *A copy of Contractors Insurance Certificate is required to be submitted upon award.*

COVERAGE - During the term of the Contract, the Vendor at its sole cost and expense shall provide commercial insurance of such type and with such terms and limits as may be reasonably associated with the Contract. As a minimum, the Vendor shall provide and maintain the following coverage and limits:

a) **Worker's Compensation** - The Vendor shall provide and maintain Worker's Compensation Insurance, as required by the laws of North Carolina, as well as employer's liability coverage with minimum limits of $500,000.00, covering all of Vendor's employees who are engaged in any work under the Contract in North Carolina. If any work is sub-contracted, the Vendor shall require the sub-Contractor to provide the same coverage for any of his employees engaged in any work under the

Contract within the State.

b) **Commercial General Liability** - General Liability Coverage on a Comprehensive Broad Form on an occurrence basis in the minimum amount of $1,000,000.00 Combined Single Limit. Defense cost shall be in excess of the limit of liability.

c) **Automobile** - Automobile Liability Insurance, to include liability coverage, covering all owned, hired and non-owned vehicles, used within North Carolina in connection with the Contract. The minimum combined single limit shall be $250,000.00 bodily injury and property damage; $250,000.00 uninsured/under insured motorist; and $2,500.00 medical payment.

REQUIREMENTS - Providing and maintaining adequate insurance coverage is a material obligation of the Vendor and is of the essence of The Contract. All such insurance shall meet all laws of the State of North Carolina. Such insurance coverage shall be obtained from companies that are authorized to provide such coverage and that are authorized by the Commissioner of Insurance to do business in North Carolina. The Vendor shall at all times comply with the terms of such insurance policies, and all requirements of the insurer under any such insurance policies, except as they may conflict with existing North Carolina laws or The Contract. The limits of coverage under each insurance policy maintained by the Vendor shall not be interpreted as limiting the Vendor's liability and obligations under the Contract.

15. **GENERAL INDEMNITY:** The Vendor shall hold and save the City, its officers, agents, and employees, harmless from liability of any kind, including all claims and losses accruing or resulting to any other person, firm, or corporation furnishing or supplying work, Services, materials, or supplies in connection with the performance of The Contract, and from any and all claims and losses accruing or resulting to any person, firm, or corporation that may be injured or damaged by the Vendor in the performance of The Contract and that are attributable to the negligence or intentionally tortious acts of the Vendor provided that the Vendor is notified in writing within 30 days from the date that the City has knowledge of such claims. The Vendor represents and warrants that it shall make no claim of any kind or nature against the City's agents who are involved in the delivery or processing of Vendor deliverables or Services to the City. The representation and warranty in the preceding sentence shall survive the termination or expiration of The Contract.

16. **CONFIDENTIALITY:** Any City information, data, instruments, documents, studies or reports given to or prepared or assembled by or provided to the Vendor under The Contract shall be kept as confidential, used only for the purpose(s) required to perform The Contract and not divulged or made available to any individual or organization without the prior written approval of the City.

17. **COMPLIANCE WITH LAWS:** Vendor shall comply with all laws, ordinances, codes, rules, regulations, and licensing requirements that are applicable to the conduct of its business and its performance in accordance with The Contract, including those of federal, state, and local agencies having jurisdiction and/or authority.

18. **ENTIRE AGREEMENT:** This document and any others incorporated specifically by reference represent the entire agreement between the parties and supersede all prior oral or written statements or agreements. This document, any addenda hereto, and the Vendor's proposal are incorporated herein by reference as though set forth verbatim.

    All promises, requirements, terms, conditions, provisions, representations, guarantees, and warranties contained herein shall survive the contract expiration or termination date unless specifically provided otherwise herein, or unless superseded by applicable Federal or State statutes of limitation.

19. **AMENDMENTS:** This Contract may be amended only by a written amendment duly executed by the City and the Vendor.

20. **FORCE MAJEURE:** Neither party shall be deemed to be in default of its obligations hereunder if and so long as it is prevented from performing such obligations as a result of events beyond its reasonable control, including without limitation, fire, power failures, any act of war, hostile foreign action, nuclear explosion, riot, strikes or failures or refusals to perform under subcontracts, civil insurrection, earthquake, hurricane, tornado, or other catastrophic natural event or act of God.

21. **SOVEREIGN IMMUNITY:** Notwithstanding any other term or provision in The Contract, nothing herein is intended nor shall be interpreted as waiving any claim or defense based on the principle of sovereign immunity or other state or federal constitutional provision or principle that otherwise would be available to the City under applicable law.

22. **E-VERIFY**: Contractor understands that E-Verify is the federal E-Verify program operated by the United States Department of Homeland Security and other federal agencies, or any successor or equivalent program used to verify the work of authorization of newly hired employees pursuant to federal law in accordance with NCGS 64-25 et seq. Contractor is aware of and in compliance with the requirements of E-Verify and Article 2 of Chapter 64 of the North Carolina General Statutes. To the best of Contractor's knowledge, any subcontractors employed by it as a part of this contract are in compliance with the requirements of E-Verify and Article 2 of Chapter 64 of the North Carolina General Statue.

23. **IRAN DIVESTMENT ACT CERTIFICATION**: Contractor certifies that, as of the date listed (2017), it is not on the Final Divestment List as created by the State Treasurer pursuant to N.C.G.S. Chapter 147 Article 6E. In compliance with the requirements of the Iran Divestment Act and N.C.G.S. Chapter 147 Article 6E, Contractor shall not utilize in the performance of the contract any subcontractor that is identified on the Final Divestment List.

24. **EVALUATION OF BID:** All qualified proposals/bids will be evaluated and award made to the firm(s) whose proposal/bid is deemed to be in the best interest of the City of Wilson, all factors considered. The City of Wilson reserves the right to reject any and all offers if determined in its best interest.

25. **BID/PROPOSAL PUBLIC RECORD:** All proposals/bids received become the property of the City of Wilson and information included therein or attached thereto shall become public record upon their delivery to the city. Submission of a bid/proposal in response to a request constitutes acceptance of all terms and conditions and requirements contained in the request.

26. **RECOMMENDATION OF AWARD:** The recommendation of award by city council represents a preliminary determination and not a legally binding acceptance of the bid or proposal until the city has executed a written agreement in a form agreeable by an authorized city official.

27. **COST FOR PROPOSAL PREPARATION:** Any costs incurred by Vendor in preparing or submitting offers are the Vendor's sole responsibility; the City will not reimburse any Vendor for any costs incurred or associated with the preparation of proposals.

28. **INSPECTION AT VENDOR'S SITE:** The City reserves the right to inspect, at a reasonable time, the equipment, item, plant or other facilities of a prospective Vendor prior to Contract award, and during the Contract term as necessary for the City's determination that such equipment, item, plant or other facilities conform with the specifications/requirements and are adequate and suitable for the proper and effective performance of the Contract.

29. **PRICE ADJUSTMENTS:** A requested price increase may only become effective after approval of the

Purchasing Manager in writing. Price increases will need to have sufficient justification as to the reason why the increase is being requested. The City will need 30 days written notice before price increases can become effective, failure to notify the City of a price increase will result in payment of invoice at prior written contracted/agreed upon pricing until the conditions are met. A price decrease will only need to be communicated to the Purchasing Manager for documentation purposes.

30. **LIQUIDATED DAMAGES:** Liquidated damages, if stated in the Contract Documents, is an amount reasonably estimated in advance to cover the losses incurred by the Owner by reason of failure on the Contractor to complete the work within the specified time of completion.

31. **VENDOR REGISTRATION:** All vendors (new, current or potential) must register with our Vendor Registration system through Vendor Registry at the following link.
https://vrapp.vendorregistry.com/Vendor/Register/Index/city-of-wilson-nc-vendor-registration

ATTACHMENT C: FEDERAL U.G. CONTRACT PROVISIONS *(signature needed below)*

1. **REMEDIES.** The City shall have the right to declare default of the contract for breach by the Contractor of any material term or condition of the contract as determined by the City. Material breach by the Contractor shall include, but specifically shall not be limited to failure to begin work under the contract within the time specified; failure to provide workmen, equipment, or materials adequate to perform the work in conformity with the contract by the completion date; unsatisfactory performance of the work; refusal or failure to replace defective work; failure to maintain satisfactory work progress; failure to comply with equal employment opportunity contract requirements; insolvency or bankruptcy, or any act of insolvency or bankruptcy; failure to satisfy any final judgment within 10 calendar days after entry thereof; and making an assignment for benefit of creditors.

2. **TERMINATION FOR CAUSE AND CONVENIENCE.** The City may terminate this Contract at any time at its complete discretion upon thirty (30) calendar days' notice in writing from the City to Contractor prior to the date of termination. In addition, all finished or unfinished documents and other materials produced by Contractor pursuant to this Contract shall, at the request of the City be turned over to it and become its property. If the Contract is terminated by the City in accordance with this section, the City will pay Contractor at the rate set out in Section 2.1 for all services performed as of the date of termination.

3. **EQUAL EMPLOYMENT OPPORTUNITY**. During the performance of this contract, the contractor agrees as follows:

   a. The contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, sexual orientation, gender identity, or national origin. The contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, sexual orientation, gender identity, or national origin. Such action shall include, but not be limited to the following:

      Employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this nondiscrimination clause.

   b. The contractor will, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, sexual orientation, gender identity, or national origin.

   c. The contractor will not discharge or in any other manner discriminate against any employee or applicant for employment because such employee or applicant has inquired about, discussed, or disclosed the compensation of the employee or applicant or another employee or applicant. This provision shall not apply to instances in which an employee who has access to the compensation information of other employees or applicants as a part of such employee's essential job functions discloses the compensation of such other employees or applicants to individuals who do not otherwise have access to such information, unless such disclosure is in response to a formal complaint or charge, in furtherance of an investigation, proceeding, hearing, or action, including an investigation conducted by the employer, or is consistent with the contractor's legal duty to furnish information.

d. The contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice to be provided advising the said labor union or workers' representatives of the contractor's commitments under this section and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

e. The contractor will comply with all provisions of Executive Order 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.

f. The contractor will furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the administering agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

g. In the event of the contractor's noncompliance with the nondiscrimination clauses of this contract or with any of the said rules, regulations, or orders, this contract may be canceled, terminated, or suspended in whole or in part and the contractor may be declared ineligible for further Government contracts or federally assisted construction contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

h. The contractor will include the portion of the sentence immediately preceding paragraph (1) and the provisions of paragraphs (1) through (8) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The contractor will take such action with respect to any subcontract or purchase order as the administering agency may direct as a means of enforcing such provisions, including sanctions for noncompliance:

Provided, however, that in the event a contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the administering agency, the contractor may request the United States to enter into such litigation to protect the interests of the United States.

The applicant further agrees that it will be bound by the above equal opportunity clause with respect to its own employment practices when it participates in federally assisted construction work: Provided, That if the applicant so participating is a State or local government, the above equal opportunity clause is not applicable to any agency, instrumentality or subdivision of such government which does not participate in work on or under the contract.

The applicant agrees that it will assist and cooperate actively with the administering agency and the Secretary of Labor in obtaining the compliance of contractors and subcontractors with the equal opportunity clause and the rules, regulations, and relevant orders of the Secretary of Labor, that it will furnish the administering agency and the Secretary of Labor such information as they may require for the supervision of

such compliance, and that it will otherwise assist the administering agency in the discharge of the agency's primary responsibility for securing compliance.

The applicant further agrees that it will refrain from entering into any contract or contract modification subject to Executive Order 11246 of September 24, 1965, with a contractor debarred from, or who has not demonstrated eligibility for, Government contracts and federally assisted construction contracts pursuant to the Executive Order and will carry out such sanctions and penalties for violation of the equal opportunity clause as may be imposed upon contractors and subcontractors by the administering agency or the Secretary of Labor pursuant to Part II, Subpart D of the Executive Order. In addition, the applicant agrees that if it fails or refuses to comply with these undertakings, the administering agency may take any or all of the following actions: Cancel, terminate, or suspend in whole or in part this grant (contract, loan, insurance, guarantee); refrain from extending any further assistance to the applicant under the program with respect to which the failure or refund occurred until satisfactory assurance of future compliance has been received from such applicant; and refer the case to the Department of Justice for appropriate legal proceedings.

4. **DAVIS-BACON ACT.** Compliance with the Davis-Bacon Act.
   a. All transactions regarding this contract shall be done in compliance with the Davis-Bacon Act (40 U.S.C. 3141- 3144, and 3146-3148) and the requirements of 29 C.F.R. pt. 5 as may be applicable. The contractor shall comply with 40 U.S.C. 3141-3144, and 3146-3148 and the requirements of 29 C.F.R. pt. 5 as applicable.
   b. Contractors are required to pay wages to laborers and mechanics at a rate not less than the prevailing wages specified in a wage determination made by the Secretary of Labor.
   c. Additionally, contractors are required to pay wages not less than once a week.

5. **COPELAND ANTI-KICKBACK ACT.** Compliance with the Copeland "Anti -Kick back" Act
   a. Contractor. The contractor shall comply with 18 U.S.C. § 874, 40 U.S.C. § 3145, and the requirements of 29 C.F.R. pt. 3 as may be applicable, which are incorporated by reference into this contract.
   b. Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clause above and such other clauses as FEMA may by appropriate instructions require, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all of these contract clauses.
   c. Breach. A breach of the contract clauses above may be grounds for termination of the contract, and for debarment as a contractor and subcontractor as provided in 29 C.F.R. § 5.12."

6. **CONTRACT WORK HOURS AND SAFETY STANDARDS ACT.** Compliance with the Contract Work Hours and Safety Standards Act.
   a. Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers

or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

b. Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph (b)(1) of this section the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (b)(1) of this section, in the sum of $26 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (b)(1) of this section.

c. Withholding for unpaid wages and liquidated damages. The City of Wilson shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (b)(2) of this section.

d. Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (b)(1) through (4) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (b)(1) through (4) of this section.

7. **RIGHTS TO INVENTIONS MADE UNDER A CONTRACT OR AGREEMENT.**

a. Applicability. This requirement applies to "funding agreements," but it does not apply to the Public Assistance, Hazard Mitigation Grant Program, Fire Management Assistance Grant Program, Crisis Counseling Assistance and Training Grant Program, Disaster Case Management Grant Program, and Federal Assistance to Individuals and Households – Other Needs Assistance Grant Program, as FEMA awards under these programs do not meet the definition of "funding agreement."

b. Funding Agreements Definition. The regulation at 37 C.F.R. § 401.2(a) defines "funding agreement" as any contract, grant, or cooperative agreement entered into between any Federal agency, other than the Tennessee Valley Authority, and any contractor for the performance of experimental, developmental, or research work funded in whole or in part by the Federal government. This term also includes any assignment, substitution of parties, or subcontract of any type entered into for the performance of experimental, developmental, or research work under a funding agreement as defined in the first sentence of this paragraph.

8. **CLEAN AIR ACT AND THE FEDERAL WATER POLLUTION CONTROL ACT.**

Clean Air Act

a. The contractor agrees to comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act, as amended, 42 U.S.C. § 7401 et seq.

b. The contractor agrees to report each violation to the City of Wilson and understands and agrees that the City of Wilson will, in turn, report each violation as required to assure notification to the Federal Emergency Management Agency, and the appropriate Environmental Protection Agency Regional Office.

c. The contractor agrees to include these requirements in each subcontract exceeding $150,000 financed in whole or in part with Federal assistance provided by FEMA.

Federal Water Pollution Control Act

d. The contractor agrees to comply with all applicable standards, orders, or regulations issued pursuant to the Federal Water Pollution Control Act, as amended, 33 U.S.C. 1251 et seq.

e. The contractor agrees to report each violation to the City of Wilson and understands and agrees that the City of Wilson will, in turn, report each violation as required to assure notification to the Federal Emergency Management Agency, and the appropriate Environmental Protection Agency Regional Office.

f. The contractor agrees to include these requirements in each subcontract exceeding $150,000 financed in whole or in part with Federal assistance provided by FEMA.

9. **DEBARMENT AND SUSPENSION.**

a. This contract is a covered transaction for purposes of 2 C.F.R. pt. 180 and 2 C.F.R. pt. 3000. As such, the contractor is required to verify that none of the contractor's principals (defined at 2 C.F.R. § 180.995) or its affiliates (defined at 2 C.F.R. § 180.905) are excluded (defined at 2 C.F.R. § 180.940) or disqualified (defined at 2 C.F.R. § 180.935).

b. The contractor must comply with 2 C.F.R. pt. 180, subpart C and 2 C.F.R. pt. 3000, subpart C, and must include a requirement to comply with these regulations in any lower tier covered transaction it enters into.

c. This certification is a material representation of fact relied upon by the City of Wilson. If it is later determined that the contractor did not comply with 2 C.F.R. pt. 180, subpart C and 2 C.F.R. pt. 3000, subpart C, in addition to remedies available to City of Wilson, the Federal Government may pursue available remedies, including but not limited to suspension and/or debarment.

d. The bidder or proposer agrees to comply with the requirements of 2 C.F.R. pt. 180, subpart C and 2 C.F.R. pt. 3000, subpart C while this offer is valid and throughout the period of any contract that may arise from this offer. The bidder or proposer further agrees to include a provision requiring such compliance in its lower tier covered transactions.

10. **BYRD ANTI-LOBBYING AMENDMENT.**

Byrd Anti-Lobbying Amendment, 31 U.S.C. § 1352 (as amended)

a. Contractors who apply or bid for an award of $100,000 or more shall file the

required certification. Each tier certifies to the tier above that it will not and has not used Federal appropriated funds to pay any person or organization for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, officer or employee of Congress, or an employee of a Member of Congress in connection with obtaining any Federal contract, grant, or any other award covered by 31 U.S.C. § 1352. Each tier shall also disclose any lobbying with non-Federal funds that takes place in connection with obtaining any Federal award. Such disclosures are forwarded from tier to tier up to the recipient who in turn will forward the certification(s) to the awarding agency.

Required Certification. If applicable, contractors must sign and submit to the non-federal entity the following certification.

APPENDIX A, 44 C.F.R. PART 18 – CERTIFICATION REGARDING LOBBYING

Certification for Contracts, Grants, Loans, and Cooperative Agreements

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

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

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

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

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

The Contractor, _____, certifies or affirms the truthfulness and accuracy of each statement of its certification and disclosure, if any. In addition, the Contractor understands and agrees that the provisions of 31 U.S.C. Chap.38, Administrative Remedies for False Claims and Statements, apply to this certification and disclosure, if any.

11. **PROCUREMENT OF RECOVERED MATERIALS.**

a. In the performance of this contract, the Contractor shall make maximum use of products containing recovered materials that are EPA-designated items unless the product cannot be acquired—
    - Competitively within a timeframe providing for compliance with the contract performance schedule;
    - Meeting contract performance requirements; or
    - At a reasonable price.

b. Information about this requirement, along with the list of EPA- designated items, is available at EPA's Comprehensive Procurement Guidelines web site, https://www.epa.gov/smm/comprehensive - procurement-guideline-cpg program.

c. The Contractor also agrees to comply with all other applicable requirements of Section 6002 of the Solid Waste Disposal Act.

12. **DOMESTIC PREFERENCES FOR PROCUREMENT**

The contractor shall provide a preference for the purchase, acquisition, or use of goods, products, or materials produced in the United States (including but not limited to iron, aluminum, steel, cement, and other manufactured products.

13. **PROHIBITION ON CERTAIN TELECOMMUNICATIONS AND VIDEO SURVEILLANCE SERVICES OR EQUIPMENT**

The products and services supplied and or provided meet the conditions of 2 CFR part 200.216, which prohibits use of certain telecommunications and video surveillances services or equipment.

_____

Signature of Contractor's Authorized Official

_____

Name and Title of Contractor's Authorized Official

_____

Date

GUIDELINES FOR RECRUITMENT AND SELECTION OF MINORITY BUSINESSES IN ACCORDANCE WITH NORTH CAROLINA SENATE BILL 914

In accordance with G.S. 143-128.2 (effective January 1, 2002) these guidelines establish goals for minority participation in single-prime bidding, separate-prime bidding, construction manager-at-risk, and alternative contracting methods on construction projects in the amount of $300,000 or more. The legislation provides that the Public Entity shall have a verifiable ten percent (10%) goal for participation by minority businesses in the total value of work for each project for which a contract or contracts are awarded. These requirements are published to accomplish that end.

SECTION A: INTENT

It is the intent of these guidelines that the Public Entity, as awarding authority for construction projects, and the contractors and subcontractors performing the construction contracts awarded, shall cooperate and, in good faith, do all things legal, proper and reasonable to achieve the statutory goal of ten percent (10%) for participation by minority businesses in each construction project as mandated by GS 143-128.2. Nothing in these guidelines shall be construed to require contractors or awarding authorities to award contracts or subcontracts to make purchases of materials or equipment from minority business contractors or minority business subcontractors who do not submit the lowest responsible, responsive bid(s).

SECTION B: DEFINITIONS

1. Minority - A person who is a citizen or lawful permanent resident of the United States and who is:

    a. Black; that is, a person having origins in any of the black racial groups in Africa;

    b. Hispanic; that is, a person of Spanish or Portuguese culture with origins in Mexico, South or Central America, or the Caribbean Islands, regardless of race;

    c. Asian American; that is, a person having origins in any of the original peoples of the Far East, Southeast Asia, Asia, the Indian subcontinent and the Pacific Islands;

    d. American Indian; that is, a person having origins in any of the original peoples of North America; or

    e. Female.

2. Minority Business - Means a business:

    a. In which at least fifty-one percent (51%) is owned by one or more minority persons, or in the case of a corporation, in which at least fifty-one percent (51%) of the stock is owned by one or more minority persons or socially and economically disadvantaged individuals; and

    b. Of which the management and daily business operations are controlled by one or more of the minority persons or socially and economically disadvantaged individuals who own it.

3. Socially and Economically Disadvantaged Individual - Means the same as defined in 15 U.S.C. 637. "Socially disadvantaged individuals are those who have been subjected to racial or ethnic prejudice or cultural bias because of their identity as a member of a group without regard to their individual qualities". Economically disadvantaged individuals are those socially disadvantaged individuals whose ability to compete in the free enterprise system has been impaired due to diminished capital and credit opportunities as compared to others in the same business area who are not socially disadvantaged".

4. Public Entity - Means local governmental units.

5. Owner - The local government unit named in the contract.

6. Designer – Any person, firm, partnership, or corporation, which has contracted with the Public Entity to perform architectural or engineering work.

7. Bidder - Any person, firm, partnership, corporation, association, or joint venture seeking to be awarded a public contract or subcontract.

8. Contract - A mutually binding legal relationship, or any modification thereof, obligating the seller to furnish equipment, materials or services, including construction, and obligating the buyer to pay for them.

9. Contractor - Any person, firm, partnership, corporation, association, or joint venture which has contracted with the Public Entity to perform construction work or repair.

10. Subcontractor - A firm under contract with the prime contractor or construction manager-at-risk for supplying materials, labor and/or installation. The subcontractor may or may not provide materials in his subcontract.

SECTION C: RESPONSIBILITIES

1. Office for Historically Underutilized Businesses, Department of Administration (hereinafter referred to as HUB Office).

   The HUB Office has established a program which allows interested persons or businesses qualifying as a minority business under G.S. 143-128.2 to obtain certification in the State of North Carolina procurement system. The information provided by the minority businesses will be used by the HUB Office to:

   a. Identify those areas of work for which there are minority businesses, as requested.

   b. Make available to interested parties a list of prospective minority business contractors and subcontractors.

   c. Assist in the determination of technical assistance needed by minority business contractors.

In addition to being responsible for the certification/verification of minority businesses that want to participate in the State construction program, the HUB Office will:

a. Maintain a current list of minority businesses. The list shall include the areas of work in which each minority business is interested.

b. Inform minority businesses on how to identify and obtain contracting and subcontracting opportunities through the Public Entity.

c. Inform minority businesses of the contracting and subcontracting process for public construction building projects.

d. Work with the North Carolina trade and professional organizations to improve the ability of minority businesses to compete in the public construction building projects.

e. The HUB Office also oversees the minority business program by:

(1) Monitoring compliance with the program requirements.

(2) Assisting in the implementation of training and technical assistance programs.

(3) Identifying and implementing outreach efforts to increase the utilization of minority businesses.

(4) Reporting the results of minority business utilization to the Secretary of the Department of Administration, the Governor, and the General Assembly.

2. Owner

Before awarding a contract, the owner shall do the following:

a. Develop and implement a minority business participation outreach plan to identify minority businesses that can perform public building projects and to implement outreach efforts to encourage minority business participation in these projects to include education, recruitment and interaction between minority businesses and non-minority businesses.

b. Attend the scheduled pre-bid conference.

c. At least 10 days prior to the scheduled day of bid opening, notify minority businesses that have requested notices from the Public Entity for public construction or repair work and minority businesses that otherwise indicated to the Office for Historically Underutilized Businesses an interest in the type of work being bid or the potential contracting opportunities listed in the proposal. The notification shall include the following:

(1) A description of the work for which the bid is being solicited.

(2) The date, time and location where bids are to be submitted.

(3) The name of the individual within the owner's organization who will be available to answer questions about the project.

(4) Where bid documents may be reviewed.

(5) Any special requirements that may exist.

d. Utilize other media, as appropriate, likely to inform potential minority businesses of the bid being sought.

e. Maintain documentation of any contacts, correspondence or conversation with minority business firms made in an attempt to meet the goals.

f. Review, jointly with the designer, all requirements of G.S. 143-128.2(c) and G.S. 143-128.2(f) – (i.e. bidders' proposals for identification of the minority businesses that will be utilized with corresponding total dollar value of the bid and an affidavit listing good faith efforts, or an affidavit of self-performance of work, if the contractor will perform work under contract by its own workforce) - prior to recommendation of award.

g. Evaluate documentation to determine that the good faith effort has been achieved for minority business utilization prior to recommendation of award.

h. Make documentation showing evidence of implementation of owner's responsibilities available for review by the HUB Office, upon request.

3. Designer

Under the single-prime bidding, separate-prime bidding, construction manager-at-risk or alternative contracting method, the designer will:

a. Attend the scheduled pre-bid conference to explain minority business requirements to the prospective bidders.

b. Assist the owner to identify and notify prospective minority business prime and subcontractors of potential contracting opportunities.

c. Maintain documentation of any contacts, correspondence or conversation with minority business firms made in an attempt to meet the goals.

d. Review jointly with the owner, all requirements of G.S. 143-128.2(c) and G.S.143-128.2(f) – (i.e. bidders' proposals for identification of the minority businesses that will be utilized with corresponding total dollar value of the bid and an affidavit listing good faith efforts, or an affidavit of self-performance of work, if the contractor will perform work under contract by its own workforce) - prior to recommendation of award.

e. Make documentation showing evidence of implementation of designer's responsibilities available for review by the HUB Office, upon request.

4. Prime Contractor(s), Construction Manager-at-Risk and Its First-Tier Subcontractors

Under the single-prime bidding, the separate-prime biding, construction manager-at-risk and alternative contracting methods, contractor(s) will:

a. Attend the scheduled pre-bid conference.

b. Identify or determine those work areas of a subcontract where minority businesses may have an interest in performing subcontract work.

c. At least ten (10) days prior to the scheduled day of bid opening, notify minority businesses of potential subcontracting opportunities listed in the proposal. The notification will include the following:

(1) A description of the work for which the sub-bid is being solicited.

(2) The date, time and location where sub-bids are to be submitted.

(3) The name of the individual within the company who will be available to answer questions about the project.

(4) Where bid documents may be reviewed.

(5) Any special requirements that may exist, such as insurance, licenses, bonds and financial arrangements.

If there are more than three (3) minority businesses in the general locality of the project who offer similar contracting or subcontracting services in the specific trade, the contractor(s) shall notify three (3), but may contact more, if the contractor(s) so desires.

d. During the bidding process, comply with the contractor(s) requirements listed in the proposal for minority participation.

e. Identify on the bid, the minority businesses that will be utilized on the project with corresponding total dollar value of the bid and an affidavit listing good faith efforts as required by G.S. 143-128.2(c) and G.S. 143-128.2(f).

f. Make documentation showing evidence of implementation of Prime Contractor(s), Construction Manager-at-Risk and First-Tier Subcontractor responsibilities available for review by the HUB Office, upon request.

g. Upon being named the apparent low bidder, the bidder shall provide one of the following: (1) an affidavit (Affidavit C) that includes a description of the portion of work to be executed by minority businesses, expressed as a percentage of the total contract price, which is equal to or more than the applicable goal; (2) Affidavit D, if the percentage is not equal to the applicable goal, then documentation of all good faith efforts taken to meet the goal. Failure to comply with these requirements is grounds for rejection of the bid and subsequent award to the next lowest responsible and responsive bidder.

h. During the construction of a project, at any time, if it becomes necessary to replace a minority business subcontractor, immediately advise the owner, the designer and the Director of the HUB Office, in writing, of the circumstances involved. The prime contractor shall make a good faith effort to replace a minority business subcontractor with another minority business subcontractor.

i. If during the construction of a project, additional subcontracting opportunities become available, make a good faith effort to solicit sub-bids from minority businesses;

j. It is the intent that these requirements apply to all contractors performing as prime contractor, first-tier subcontractor or construction manager-at-risk.

5. Minority Business Responsibilities

Minority businesses who are contacted by owners or bidders must respond promptly as to whether or not they wish to submit a bid.

SECTION D: DISPUTE PROCEDURES

It is the policy of this State that disputes involving a person's rights, duties or privileges, should be settled through informal procedures. To that end, minority business disputes arising under these guidelines should be resolved as governed under G.S. 143-128(g).

MINORITY BUSINESS CONTRACT PROVISIONS (CONSTRUCTION)

APPLICATION:

The Guidelines for Recruitment and Selection of Minority Businesses in Accordance with North Carolina Senate Bill 914 are hereby made a part of these contract documents. These guidelines shall apply to all contractors regardless of ownership.

MINIMUM COMPLIANCE REQUIREMENTS:

All written statements, affidavits or intentions made by the Bidder shall become a part of the agreement between the Contractor and the Public Entity for performance of this contract. Failure to comply with any of these statements, affidavits or intentions, or with the minority business guidelines shall constitute a breach of the contract. A finding by the Public Entity that any information, submitted either prior to award of the contract or during the performance of the contract, is inaccurate, false or incomplete, shall also constitute a breach of the contract. Any such breach may result in termination of the contract in accordance with the termination provisions contained in the contract.

INSTRUCTIONS:

1. In accordance with G.S. 143-128.2(c), each bidder shall complete and submit the *"Identification of Minority Business Participation"* form, and Affidavits A and/or B (as applicable) with the bid. The proposed low bidder shall submit to the Owner Affidavits C and/or D (as applicable) within 72 hours of being notified of being the low bidder.

   Note #1: An Affidavit C showing the portion of the work to be expended with minority business enterprises is equal to or greater than the verifiable percentage goal "shall give rise to the presumption" of adequate good faith efforts. No additional documentation from the Contractor, other than subcontracts with DBEs and their DBE certifications, will be required by the Public Entity.

   Note #2: An Affidavit D showing the portion of the work to be expended with minority business enterprises is below the verifiable percentage goal requires additional documentation, including the documentation listed in Affidavit D itself.

   Note #3: G.S. 143-128.2(d) limits substitution of subcontractors.

   Failure to file a required affidavit or documentation that demonstrates that the contractor made the required good faith effort is grounds for rejection of the bid [G.S. 143-128.2(c)].

2. The Owner shall complete and / or procure the following items within ten (10) working **days** of the notification of tentative award to the low bidder:

   a. The *"Owner's Affidavit of Good Faith Efforts"* or the *"Owner's Intent to Perform Work with Own Workforce (Force Account)"*, as applicable.

b. Documentation of the Owner's good faith efforts including the following:

(1) the Owner's minority business participation outreach plan,

(2) the roster from the pre-bid meeting,

(3) the solicitation list the Owner maintains pursuant to G. S. 143-128.2 (e)(3),

(4) any list of contractors received from the Office of Historically Underutilized Businesses,

(5) solicitation letters sent to at least three of the contractors identified above. This solicitation letter must include all the elements laid out below [G. S. 143-128.2 (e)(3) a through e].

i. A description of the work for which the bid is being solicited.
ii. The date, time, and location where bids are to be submitted.
iii. The name of the individual within the Public Entity who will be available to answer questions about the project.
iv. Where bid documents may be reviewed.
v. Any special requirements that may exist.

c. The Owner's affidavits of publication, or other documentation of advertising,

d. Appropriate affidavits of good faith efforts for each Contractor,

e. Documentation of each Contractor's good faith efforts including the following:

(1) If the Contractor completed Affidavit C, the Owner will require no additional documentation from the Contractor, other than verification of subcontracts and DBE certifications for each proposed DBE subcontractor. [G.S. 143-128.2(c)(1) a.]

(2) If the Contractor completed Affidavit D, all the documentation listed in Affidavit D, including DBE certifications for each proposed DBE subcontractor.

3. After being awarded the contract, the Contractor will send to the Owner executed copies of each subcontract awarded to a DBE subcontractor.

Note that G. S. 143-128.2(d) limits substitution of and requires good faith efforts be made to find DBE substitute subcontractors.

Note that G.S. 143-128.2(c)(2) requires the Contractor to provide to the Owner, within 30 days of award, a list of all identified subcontractors, whether DBE or not.

OWNER'S GOOD FAITH EFFORTS:

As laid out in G.S. 143-128.2 (e) the Owner must make all the good faith efforts listed below:

Before awarding a contract, a Public Entity shall do the following:

1. Develop and implement a minority business participation outreach plan to identify minority businesses that can perform public building projects and to implement outreach efforts to encourage minority business participation in these projects to include education, recruitment, and interaction between minority businesses and nonminority businesses.

2. Attend the scheduled pre-bid conference.

3. At least 10 days prior to the scheduled day of bid opening, notify minority businesses that have requested notices from the Public Entity for public construction or repair work and minority businesses that otherwise indicated to the Office of Historically Underutilized Businesses an interest in the type of work being bid or the potential contracting opportunities listed in the proposal. The notification shall include the following:

   a. A description of the work for which the bid is being solicited.

   b. The date, time, and location where bids are to be submitted.

   c. The name of the individual within the Public Entity who will be available to answer questions about the project.

   d. Where bid documents may be reviewed.

   e. Any special requirements that may exist.

4. Utilize other media, as appropriate, likely to inform potential minority businesses of the bid being sought.

CONTRACTOR'S GOOD FAITH EFFORTS:

The good faith efforts to be made by the bidders/contractors (including subcontractors that further subcontract), as laid out in G.S. 143-128.2 (f), follow. Each contractor must earn at least 50 points with the good faith efforts listed below.

1. Contacting minority businesses that reasonably could have been expected to submit a quote and that were known to the Contractor or available on State or local government maintained lists at least 10 days before the bid or proposal date and notifying them of the nature and scope of the work to be performed. (10 points)

2. Making the construction plans, specifications and requirements available for review by prospective minority businesses, or providing these documents to them at least 10 days before the bid or proposals are due. (10 points)

3. Breaking down or combining elements of work into economically feasible units to facilitate minority participation. (15 points)

4. Working with minority trade, community, or contractor organizations identified by the Office of Historically Underutilized Businesses and included in the bid documents that provide assistance in recruitment of minority businesses. (10 points)

5. Attending any pre-bid meetings scheduled by the Public Entity. (10 points)

6. Providing assistance in getting required bonding or insurance or providing alternatives to bonding or insurance for subcontractors. (20 points)

7. Negotiating in good faith with interested minority businesses and not rejecting them as unqualified without sound reasons based on their capabilities. Any rejection of a minority business based on lack of qualification should have the reasons documented in writing. (15 points)

8. Providing assistance to an otherwise qualified minority business in need of equipment, loan capital, lines of credit, or joint pay agreements to secure loans, supplies, or letters of credit, including waiving credit that is ordinarily required. Assisting minority businesses in obtaining the same unit pricing with the bidder's suppliers in order to help minority businesses in establishing credit. (25 points)

9. Negotiating joint venture and partnership arrangements with minority businesses in order to increase opportunities for minority business participation on a public construction or repair project when possible. (20 points)

10. Providing quick pay agreements and policies to enable minority contractors and suppliers to meet cash-flow demands. (20 points)

Identification of Minority Business Participation

I,_____,
(Name of Bidder)
do hereby certify that on this project, we will use the following minority business enterprises as construction subcontractors, vendors, suppliers or providers of professional services.

Firm Name, Address and Phone #	Work type	*Minority Category

*Minority categories: Black, African American (**B**), Hispanic (**H**), Asian American (**A**) American Indian (**I**), Female (**F**) Socially and Economically Disadvantaged (**D**)

The total value of minority business contracting will be ($)_____.

State of North Carolina AFFIDAVIT A – Listing of Good Faith Efforts

County of _____

(Name of Bidder)

Affidavit of_____

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

Bidders must earn at least 50 points from the good faith efforts listed for their bid to be considered responsive. (1 NC Administrative Code 30 I.0101)

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

The undersigned, if apparent low bidder, will enter into a formal agreement with the firms listed in the Identification of Minority Business Participation schedule conditional upon scope of contract to be executed with the Owner. Substitution of contractors must be in accordance with GS143-128.2(d) Failure to abide by this statutory provision will constitute a breach of the contract.

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

Date:_____ Name of Authorized Officer:_____

Signature:_____

Title:_____

SEAL

State of North Carolina, County of_____

Subscribed and sworn to before me this _____day of _____20____

Notary Public_____

My commission expires _____

State of North Carolina --AFFIDAVIT B-- Intent to Perform Contract with Own Workforce.

Affidavit of_____
(Name of Bidder)

I hereby certify that it is our intent to perform 100% of the work required for the _____

_____contract.
(Name of Project)

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

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

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

Date:_____Name of Authorized Officer:_____

Signature:_____

Title:_____

SEAL

State of North Carolina, County of _____

Subscribed and sworn to before me this _____day of _____20___

Notary Public _____

My commission expires_____

State of North Carolina - AFFIDAVIT C - Portion of the Work to be Performed by Minority Firms

(Note this form is to be submitted only by the apparent lowest responsible, responsive bidder.)

If the portion of the work to be executed by minority businesses as defined in GS143-128.2(g) is equal to or greater than 10% of the bidders total contract price, then the bidder must complete this affidavit. This affidavit shall be provided by the apparent lowest responsible, responsive bidder within **72 hours** after notification of being low bidder.

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

_____
(Project Name)

Project ID#_____ Amount of Bid $_____

I will expend a minimum of _____% of the total dollar amount of the contract with minority business enterprises. Minority businesses will be employed as construction subcontractors, vendors, suppliers or providers of professional services. Such work will be subcontracted to the following firms listed below.

Attach additional sheets if required

Name and Phone Number	*Minority Category	Work description	Dollar Value

*Minority categories: Black, African American (**B**), Hispanic (**H**), Asian American (**A**) American Indian (**I**), Female (**F**) Socially and Economically Disadvantaged (**D**)

Pursuant to GS143-128.2(d), the undersigned will enter into a formal agreement with Minority Firms for work listed in this schedule conditional upon execution of a contract with the Owner. Failure to fulfill this commitment may constitute a breach of the contract.

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

Date:_____ Name of Authorized Officer:_____

Signature:_____

SEAL

Title:_____

State of North Carolina, County of _____

Subscribed and sworn to before me this _____ day of _____ 20_____

Notary Public_____

My commission expires_____

State of North Carolina AFFIDAVIT D – Good Faith Efforts

(Note this form is to be submitted only by the apparent lowest responsible, responsive bidder.)

If the goal of 10% participation by minority business **is not** achieved, the Bidder shall provide the following documentation to the Owner of his good faith efforts within **72 hours** after notification of being low bidder:

(Name of Bidder)

Affidavit of: _____

I do certify the attached documentation as true and accurate representation of my good faith efforts.

(Attach additional sheets if required)

Name and Phone Number	*Minority Category	Work description	Dollar Value

*Minority categories: Black, African American (**B**), Hispanic (**H**), Asian American (**A**) American Indian (**I**), Female (**F**) Socially and Economically Disadvantaged (**D**)

Documentation of the Bidder's good faith efforts to meet the goals set forth in these provisions. Examples of documentation include, but are not limited to, the following evidence:

A. Copies of solicitations for quotes to at least three (3) minority business firms from the source list provided by the State for each subcontract to be let under this contract (if 3 or more firms are shown on the source list). Each solicitation shall contain a specific description of the work to be subcontracted, location where bid documents can be reviewed, representative of the Prime Bidder to contact, and location, date and time when quotes must be received.

B. Copies of quotes or responses received from each firm responding to the solicitation.

C. A telephone log of follow-up calls to each firm sent a solicitation.

D. For subcontracts where a minority business firm is not considered the lowest responsible sub-bidder, copies of quotes received from all firms submitting quotes for that particular subcontract.

E. Documentation of any contacts or correspondence to minority business, community, or contractor organizations in an attempt to meet the goal.

F. Copy of pre-bid roster.

G. Letter documenting efforts to provide assistance in obtaining required bonding or insurance for minority business.

H. Letter detailing reasons for rejection of minority business due to lack of qualification.

I. Letter documenting proposed assistance offered to minority business in need of equipment, loan capital, lines of credit, or joint pay agreements to secure loans, supplies, or letter of credit, including waiving credit that is ordinarily required.

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

Date:_____ Name of Authorized Officer:_____

Signature:_____

Title:_____

SEAL

State of North Carolina, County of _____

Subscribed and sworn to before me this _____ day of _____ 20_____

Notary Public_____

My commission expires _____

Instructions for Affidavit D

Submitting Affidavit D indicates the bidder has not achieved the verifiable percentage goal for DBE participation. Therefore, the bidder must document the good faith efforts claimed in Affidavit A. The table below outlines the required documentation for each good faith effort listed in Affidavit A.

If you claimed this Good Faith Effort on Affidavit A…	**you must substantiate it with the following documentation (cited in Affidavit D).**
Contacted minority businesses that reasonably could have been expected to submit a quote and that were known to the contractor, or available on State or local government maintained lists, at least 10 days before the bid date and notified them of the nature and scope of the work to be performed	1. Owner requires three solicitations to DBEs for each subcontract specialty – if three DBEs are listed in the source solicitation list for that subcontract specialty. 2. Each solicitation must include the information listed in G.S. 143-128.2 (e)(3) a through e (see instructions). 3. For any subcontract specialty where a DBE was solicited and responded but not used, Owner needs proposals from the DBE and the low bidder (to ensure the DBE was underbid).
Made the construction plans, specifications and requirements available for review by prospective minority businesses, or providing these documents to them at least 10 days before the bids are due.	Generally taken care of by the Engineer and Owner making the approved plans and specifications and bid documents widely available (typically: Owner's office, Engineer's office, AGC, and/or F.W. Dodge).
Breaking down or combining elements of work into economically feasible units to facilitate minority participation.	Owner will review the nature of subcontracts and determine if they are of reasonable size and scope.
Worked with minority trade, community, or contractor organizations identified by the Office of Historically Underutilized Businesses and included in the bid documents that provide assistance in recruitment of minority businesses.	Documentation of any contacts or correspondence to minority business, community, or contractor organizations in an attempt to meet the goal
Attending any prebid meetings scheduled by the public owner	The Owner will submit a copy of the prebid roster.
Providing assistance in getting required bonding or insurance or providing alternatives to bonding or insurance for subcontractors.	Letter documenting efforts to provide assistance in obtaining required bonding or insurance for minority business.
Negotiated in good faith with interested minority businesses and did not reject them as unqualified without sound reasons based on their capabilities. Any rejection of a minority business based on lack of qualification should have the reasons documented in writing.	1. For subcontracts where a minority business firm is not considered the lowest responsible sub-bidder, copies of quotes or responses received from each firm (DBE or not) responding to the solicitation. 2. Letter detailing reasons for rejection of minority business due to lack of qualification.
Providing assistance to an otherwise qualified minority business in need of equipment, loan capital, lines of credit, or joint pay agreements… Assisting DBE in obtaining the same unit pricing as the bidder with bidder's suppliers	Letter documenting proposed assistance offered to minority business.
Negotiating joint venture and partnership arrangements with minority businesses.	The existence of such a joint venture or partnership itself, or letter documenting proposed joint venture and partnership arrangements offered to minority business.
Providing quick pay agreements and policies to enable minority contractors and suppliers to meet cash-flow demands.	Letter documenting proposed assistance offered to minority business.

Owner's Checklist and Affidavit of the Good Faith Efforts

Project Owner_____ Project # _____

Project Name_____

Affidavit of_____
(Name of Owner's Authorized Representative)

I have made a good faith effort to comply with G.S. 143-128.2(e) under each of the following areas:
(A "public entity" is required to make all of the efforts identified in order to have achieved a "good faith effort")

- ❑ Developed and implement a minority business participation outreach plan to identify minority businesses that can perform public building projects and to implement outreach efforts to encourage minority business participation in these projects to include education, recruitment, and interaction between minority businesses and nonminority businesses.
- ❑ Attended the scheduled prebid conference.
- ❑ At least 10 days prior to the scheduled day of bid opening, notified minority businesses that have requested notices from the Owner for public construction or repair work and minority businesses that otherwise indicated to the Office of Historically Underutilized Businesses an interest in the type of work being bid or the potential contracting opportunities listed in the proposal. The notification included the following:
  a. A description of the work for which the bid is being solicited.
  b. The date, time, and location where bids are to be submitted.
  c. The name of the individual within the public entity who will be available to answer questions about the project.
  d. Where bid documents may be reviewed.
  e. Any special requirements that may exist.
- ❑ Utilized other media, as appropriate, likely to inform potential minority businesses of the bid being sought.

I have attached to this affidavit the following documentation of the Owner's good faith efforts:

- ❑ the Owner's minority business participation outreach plan,
- ❑ the roster from the prebid meeting,
- ❑ the solicitation list the Owner maintains pursuant to G.S. 143-128.2 (e)(3),
- ❑ printouts of any list of contractors developed from the Office of Historically Underutilized Businesses or any other web-based resource,
- ❑ The Owner's affidavits of publication, or other documentation of advertising,

I have attached to this affidavit the following documentation of each proposed Contractor's good faith efforts:

- ❑ Appropriate affidavits of good faith efforts for each proposed Contractor,
- ❑ DBE certifications for each proposed DBE subcontractor,
- ❑ For each proposed Contractor that completed Affidavit D, all the documentation listed in Affidavit D, and
- ❑ Verifications of subcontracts (optional).

The undersigned hereby certifies that the Owner has complied with the steps laid out in the resolution of this unit of local government and in the minority business participation outreach plan applying to this project, and that he or she has read this certification and is authorized to bind the Owner to the commitments herein contained.

Date:_____ Authorized Representative:_____

Signature:_____

Title:_____

SEAL

State of North Carolina, County of_____

Subscribed and sworn to before me this _____day of _____20_____

Notary Public_____

My commission expires _____

State of North Carolina -- Owner's Intent to Perform Work with Own Workforce.(Force Account)

Project Owner_____Project # _____

Affidavit of_____
(Name of Owner)

I hereby certify that it is our intent to perform 100% of the work required for the

_____

_____**Project.**
(Name of Project)

In making this certification, the Owner states that the Owner will perform all elements of the work on this project with his/her own current work forces (force account); and

The Owner agrees to provide any additional information or documentation requested by the Public Water Supply Section in support of the above statement; and

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

Date:_____ Authorized Representative: _____

Signature: _____

Title: _____

SEAL

State of North Carolina, County of_____

Subscribed and sworn to before me this _____day of _____20____

Notary Public_____

My commission expires _____

Quick Reference for Requirements of Session Law 2001-496 (Senate Bill 914)

Owner's Responsibilities

Authority	Action	Documentation/ Responsibility	When Required
G.S. 143-128.2(a)	Adopt a 10 % minority goal. Local entity may continue to use a different verifiable goal adopted prior to December 1, 2001. Local entity may establish a different verifiable goal upon proper documentation.	• Provide a Resolution that establishes a "verifiable percentage goal." • Provide a Certification that states the "verifiable percentage goal" applies to the current project. • If verifiable goal different than 10%, then provide sufficient evidence to justify the goal (e.g. disparity study).	Resolution and Certification submitted with application
G.S. 143-129(a) amended by S. L. 2001-496	Formal Bidding	• Threshold increased from $100,000 to $300,000 for construction. **DBE requirements apply**. • Threshold increased from $30,000 to $90,000 for purchase of materials, supplies, and equipment.	N/A
G.S. 143-131(b)	Informal Bidding	• Threshold from $5,000 to $300,000 for construction. **DBE requirements apply**. • Document all efforts. • No requirement to formally advertise. Must submit your efforts to recruit DBEs, including type of project, total $ amount of project, and total $ amount to DBE contractor. • Use informal bid projects to increase DBE participation.	N/A
G.S. 143-128.2(e)	Good Faith Efforts (GFE) 1. Develop and implement a DBE outreach program 2. Pre-bid Conference 3. Notify DBEs 4. Use Media as appropriate	• Solicit DBE firm and make it feasible for DBEs to submit successful bids. • Identify DBE firms that can perform projects (i.e. create DBE list). • Promote interaction between DBEs and non-DBE firms. • Discuss and ensure DBE program is reviewed, contact HUB office for inquiries. • Notice to DBEs to include: description of work, date, time and location for bid submittal, contact person, where bid documents can be reviewed and any other special requirements. • Use media outlets, general circulation newspapers, local and statewide DBE newspapers and radio stations.	Send notice of bidding opportunity at least10 days prior to scheduled bid opening

This quick reference outlines the changes made by Session Law 2001-496 (Senate Bill 914).

Quick Reference for Requirements of Session Law 2001-496 (Senate Bill 914)

Bidders' Responsibilities

Authority	Action	Documentation/ Responsibility	When Required
G.S. 143-28.2(c)(1) including (a) & (b)	Provide an affidavit listing GFE. If performing all the work you must submit an affidavit stating such.	"*Identification of Minority Business Participation*" Form, and either Affidavit A or B, as appropriate	"on the bid"
G.S. 143-28.2 (c)(1)(a)	Provide more detailed documentation of list of DBEs solicited or awarded, amount contracted, and percentage. If not meeting the "verifiable percentage goal," then document your solicitation efforts (Affidavit D).	Affidavit C or D (including documentation specified in Affidavit D), as appropriate	72 hours after notification of apparent low bidder
G.S. 143-28.2(c)(2)	Provide a listing of all expected subcontracts (whether DBE or not).	Provide a listing of all expected subcontracts (DBE or not).	within 30- days (statute)
G.S. 143-128.2(f)	Earn fifty points with the good faith efforts listed below. 1. Contact DBE using resources available. 10 points 2. Make plans & specification available for review. 10 points 3. Breakdown or combine elements of work into economically feasible units of work. 15 points 4. Work with DBE trade community or contractor organizations that provide assistance in recruiting DBE firms. 10 points 5. Attend pre-bid meetings scheduled by the public owner. 10 points 6. Provide assistance in getting required bonding or insurance or provide alternatives to bonding or insurance for subcontractors. 20 points 7. Negotiate in good faith with interested minority businesses and not reject them as unqualified without sound reasons based on their capabilities. Any rejection of a minority business based on lack of qualification should have the reasons documented in writing. 15 points 8. Provide assistance to an otherwise qualified minority business in need of equipment, loan capital, lines of credit, or joint pay agreements to secure loans, supplies, or letters of credit, including waiving credit that is ordinarily required. Assist minority businesses in obtaining the same unit pricing with the bidder's suppliers in order to help minority businesses in establishing credit. 25 points 9. Negotiate joint venture and partnership arrangements with minority businesses in order to increase opportunities for minority business participation on a public construction or repair project when possible. 20 points 10. Provide quick pay agreements and policies to enable minority contractors and suppliers to meet cash-flow demands. 20 points	• Use media outlets, general circulation newspapers, local and statewide DBE newspapers and radio stations. List provided by Owner or other state and local agencies. • Identify DBEs on bid list.	Provide Notice at least 10 days prior to scheduled opening bids indicating work to be performed.

This quick reference outlines the changes made by Session Law 2001-496 (Senate Bill 914).

NOTICE TO PROCEED

Dated _____

TO: _____
(CONTRACTOR)

ADDRESS: _____

_____

_____

Contract: _____
(Insert name of Contract as it appears in the Contract Documents)

Project: _____

OWNER'S CONTRACT NO. _____

You are notified that the Contract Times under the above contract will commence to run on _____. By that date, you are to start performing your obligations under the Contract Documents. In accordance with Article 4 of the Agreement the date of Substantial Completion is _____ and the date of readiness for final payment is _____.

Before you may start any Work at the Site, paragraph 2.05.C of the General Conditions provides that you and Owner must each deliver to the other (with copies to Engineer and other identified additional insureds) certificates of insurance which each is required to purchase and maintain in accordance with the Contract Documents.

Also, before you may start any Work at the Site, you must (add other requirements)

_____

_____

_____
(OWNER)

By: _____
(AUTHORIZED SIGNATURE)

_____
(TITLE)

Copy to ENGINEER

_____

[1](Use Certified Mail, Return Receipt Requested)

EJCDC No. 1910-23 (1996 Edition)
Prepared by the Engineers Joint Contract Documents Committee and endorsed by The Associated General Contractors of America and the Construction Specifications Institute.

FORM APPROVED
OMB NO. 0575-004

Form RD 1924-18
(Rev. 6-97)

UNITED STATES DEPARTMENT OF AGRICULTURE
RURAL DEVELOPMENT
FARM SERVICE AGENCY

PARTIAL PAYMENT ESTIMATE

CONTRACT NO.

PARTIAL PAYMENT ESTIMATE NO.

PAGE

OWNER:	CONTRACTOR:	PERIOD OF ESTIMATE FROM _____ TO _____

CONTRACT CHANGE ORDER SUMMARY

No.	Agency Approval Date	Amount	
		Additions	Deductions
TOTALS			
NET CHANGE			

ESTIMATE

1. Original Contract . . . . . _____
2. Change Orders . . . . . _____
3. Revised Contract (1+2) . . . . . _____
4. Work Completed* . . . . . _____
5. Stored Materials* . . . . . _____
6. Subtotal (4+5) . . . . . _____
7. Retainage* . . . . . _____
8. Previous Payments . . . . . _____
9. Amount Due (6-7-8) . . . . . _____

* Detailed breakdown attached

CONTRACT TIME

Original (days) _____
Revised _____
Remaining _____

On Schedule ☐ Yes ☐ No

Starting Date _____

Projected Completion _____

CONTRACTOR'S CERTIFICATION:

The undersigned Contractor certifies that to the best of their knowledge, information and belief the work covered by this payment estimate has been completed in accordance with the contract documents, that all amounts have been paid by the contractor for work for which previous payment estimates was issued and payments received from the owner, and that current payment shown herein is now due.

Contractor _____

By _____

Date _____

APPROVED BY OWNER:

Owner

By _____ _____

Date _____ _____

ARCHITECT OR ENGINEER'S CERTIFICATION:

The undersigned certifies that the work has been carefully inspected and to the best of their knowledge and belief, the quantities shown in this estimate are correct and the work has been performed in accordance with the contract documents.

Architect or Engineer _____

By _____

Date _____

ACCEPTED BY AGENCY:

The review and acceptance of this estimate does not attest to the correctness of the quantities shown or that the work has been performed in accordance with the contract documents.

By _____

Title _____

Date _____

According to the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number. The valid OMB control number for this information collection is 0575-0042. The time required to complete this information collection is estimated to average 30 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

TYPICAL UNIT PRICE BREAKDOWN *

ITEM	DESCRIPTION	CONTRACT (revised)			THIS PERIOD		TOTAL TO DATE		% COM-PLETE
		QUANTITY	UNIT PRICE	AMOUNT	QUANTITY	AMOUNT	QUANTITY	AMOUNT	
			$	$		$		$	
	TOTALS								

TYPICAL LUMP SUM PRICE BREAKDOWN *

ITEM	DESCRIPTION	SCHEDULED VALUE	WORK COMPLETED		% COM-PLETE
			THIS PERIOD	TO DATE	
		$	$	$	
	TOTALS				

TYPICAL STORED MATERIALS AND RETAINAGE BREAKDOWN *

MATERIALS STORED AT END OF THIS PAYMENT PERIOD			
DESCRIPTION	QUANTITY	UNIT VALUE	AMOUNT
		$	$

RETAINAGE			
	THIS ESTIMATE	PERCENT	RETAINED
WORK COMPLETED:	$	%	$
STORED MATERIALS:			
OTHER (explain)			
TOTAL			

* As a minimum, detailed breakdowns should contain this information.

RD 1924-18
REVERSE

WORK CHANGE DIRECTIVE

No. _____

DATE OF ISSUANCE _____ EFFECTIVE DATE _____

OWNER _____
CONTRACTOR _____
Contract: _____
Project: _____
OWNER's Contract No. _____ ENGINEER's Project No. _____

You are directed to proceed promptly with the following change(s):
Description:

Purpose of Work Change Directive:

Attachments: (List documents supporting change)

If OWNER or CONTRACTOR believe that the above change has affected Contract Price any Claim for a Change Order based thereon will involve one or more of the following methods as defined in the Contract Documents.

Method of determining change in
Contract Price:

☐ Unit Prices
☐ Lump Sum
☐ Cost of the Work_____

Estimated increase (decrease) in Contract Price:
$_____.
If the change involves an increase, the estimated amount is not to be exceeded without further authorization.

Estimated increase (decrease) in Contract Times:
Substantial Completion: _____ days;
Ready for final payment: _____ days.

RECOMMENDED:

_____
ENGINEER
By: _____

AUTHORIZED:

_____
OWNER
By: _____

EJCDC No. 1910-8-F (1996 Edition)
Prepared by the Engineers Joint Contract Documents Committee and endorsed by The Associated General Contractors of America and the Construction Specifications Institute.

OMB NO. 0575-0042

Form RD 1924-7
(Rev. 2-97)

UNITED STATES DEPARTMENT OF AGRICULTURE
RURAL DEVELOPMENT AND
FARM SERVICE AGENCY

CONTRACT CHANGE ORDER

ORDER NO.

DATE

STATE

CONTRACT FOR

COUNTY

OWNER

TO _____
(Contractor)

You are hereby requested to comply with the following changes from the contract plans and specifications:

Description of Changes (Supplemental Plans and Specifications Attached)	DECREASE in Contract Price	INCREASE in Contract Price
	$	$
TOTALS	$ _____	$ _____
NET CHANGE IN CONTRACT PRICE	$ _____	$ _____

JUSTIFICATION:

The amount of the Contract will be (Decreased)(Increased) By The Sum Of: _____

_____ Dollars ($ _____).

The Contract Total Including this and previous Change Orders Will Be: _____

_____ Dollars ($ _____).

The Contract Period Provided for Completion Will Be (Increased)(Decreased)(Unchanged): _____ Days.

This document will become a supplement to the contract and all provisions will apply hereto.

Requested _____ _____
(Signature of Owner) (Date)

Recommended _____ _____
(Signature of Owner's Architect/Engineer) (Date)

Accepted _____ _____
(Signature of Contractor) (Date)

Approved by Agency _____ _____
(Name and Title) (Date)

Certification _____ _____
(Signature of Owner's Finance Officer) (Date)

This change order has been pre-audited in accordance with the Local Government Budget and Fiscal Control Act.

Public reporting burden for this collection of information is estimated to average 15 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to U.S. Department of Agriculture, Clearance Officer, STOP 7602, 1400 Independence Avenue, S.W., Washington, D.C. 20250-7602. **Please DO NOT RETURN this form to this address.** Forward to the local USDA office only. You are not required to respond to this collection of information unless it displays a currently valid OMB control number.

CERTIFICATE OF SUBSTANTIAL COMPLETION

DATE OF ISSUANCE _____

OWNER _____
CONTRACTOR _____
Contract: _____
Project: _____

OWNER's Contract No. _____ ENGINEER's Project No. _____

This Certificate of Substantial Completion applies to all Work under the Contract Documents or to the following specified parts thereof:

To _____
OWNER

And To _____
CONTRACTOR

The Work to which this Certificate applies has been inspected by authorized representatives of OWNER, CONTRACTOR and ENGINEER, and that Work is hereby declared to be substantially complete in accordance with the Contract Documents on

_____
DATE OF SUBSTANTIAL COMPLETION

A tentative list of items to be completed or corrected is attached hereto. This list may not be all-inclusive, and the failure to include an item in it does not alter the responsibility of CONTRACTOR to complete all the Work in accordance with the Contract Documents. The items in the tentative list shall be completed or corrected by CONTRACTOR within _____ days of the above date of Substantial Completion.

EJCDC No. 1910-8-D (1996 Edition)
Prepared by the Engineers' Joint Contract Documents Committee and endorsed by The Associated General Contractors of America and the Construction Specifications Institute.

The responsibilities between OWNER and CONTRACTOR for security, operation, safety, maintenance, heat, utilities, insurance and warranties and guarantees shall be as follows:

OWNER:_____

_____

_____

CONTRACTOR:_____

_____

_____

_____

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

_____

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

_____

Executed by ENGINEER on _____
Date

_____
ENGINEER

By: _____
(Authorized Signature)

CONTRACTOR accepts this Certificate of Substantial Completion on _____
Date

_____
CONTRACTOR

By: _____
(Authorized Signature)

OWNER accepts this Certificate of Substantial Completion on _____
Date

_____
OWNER

By: _____
(Authorized Signature)

REGULATORY PERMITS

DIVISION I - GENERAL REQUIREMENTS

DETAILED SPECIFICATIONS

SECTION 0101 - PROJECT DESCRIPTION

PART 1.00 - GENERAL

1.01 Description

The scope of work in this project includes:

Part A: Station 45+55.20 to Station 69+17.65

- 2,160 LF 24-Inch Dia. PVC Gravity Sanitary Sewers
- 200 LF 24-Inch Dia. DI 401 Coated Gravity Sanitary Sewers
- 8 EA 6' Diameter Precast Concrete Manholes
- Two (2) 8" Dia. Lateral Line Connections
- By-Pass Pumping

Alternate Bid: Station 0+00.00 to Station 45+55.20

- 4,150 LF 24-Inch Dia. PVC Gravity Sanitary Sewers
- 400 LF 24-Inch Dia. DI 401 Coated Gravity Sanitary Sewers
- 12 EA 6' Diameter Precast Concrete Manholes
- Five (5) 8" Dia. Lateral Line Connections
- By-Pass Pumping

All Construction shall comply with the latest edition of **City of Wilson, NC – Manual of Specifications, Standards & Design**.

The intent of this Section is to provide a general project description to aid each Bidder in understanding the overall scope of the project and the work included in the Contract.

PART 2.00 - PRODUCTS

All material and product descriptions are included in the other applicable sections of these specifications and/or as shown on the project drawings.

PART 3.00 - EXECUTION

As described in the Bid proposed, these detailed specifications and the project drawings.

END OF SECTION

DIVISION 1 - GENERAL REQUIREMENTS

DETAILED SPECIFICATIONS

SECTION 0110 - PROJECT MEETINGS

PART 1.00 - GENERAL

1.01 Description

The work covered in this section includes attendance and participation in (1) preconstruction conference and monthly project meetings.

The purpose of the preconstruction conference is to enable all of the parties having an interest in this project to meet, exchange preliminary ideas and schedules, and lay the groundwork for the project.

The periodic project meetings shall be conducted by the Engineer throughout the construction period to enable orderly review of progress during construction and to provide for systematic discussion of problems.

These periodic project meetings, in general, will be held monthly at the job site, or at a location and time schedule mutually acceptable to the Contractor, Engineer, and other involved parties.

1.02 Quality Assurance

Persons designated by the Contractor to attend and participate in project meetings shall have all required authority to commit the Contractor to solutions as agreed upon in the project meetings.

1.03 Submittals

A. Agenda Items

To the maximum extent possible, advise the Engineer, at least 24 hours in advance of the project meeting, regarding all items to be added to the agenda.

B. Minutes

The Engineer will compile minutes of each project meeting and will distribute copies to the Owner and the Contractor. The Contractor may make and distribute such other copies as he wishes.

PART 2.00 - PRODUCTS

No products are required in this Section.

PART 3.00 - EXECUTION

3.01 Meeting Schedule

Coordinate with Engineer to establish a mutually acceptable schedule for project meetings.

3.02 Meeting Location

If possible, project meetings shall be held at the job site; otherwise, location will be worked out with Engineer.

3.03 Attendance

The Contractor shall have a representative present at the preconstruction conference and all periodic project meetings, unless previous arrangements are approved by the Engineer.

To the maximum extent practicable, the Contractor shall assign the same person or persons to represent his interest at all project meetings throughout the construction period. Subcontractors, suppliers, and others may be invited to attend project meetings in which their aspects of the work are involved.

END OF SECTION

DIVISION I - GENERAL REQUIREMENTS

DETAILED SPECIFICATIONS

SECTION 0120 - SUBMITTALS & SUBSTITUTIONS

PART 1.00 - GENERAL

1.01 Description

Wherever possible throughout the Contract Documents, the minimum acceptable quality of workmanship and materials has been defined either by manufacturer's name and catalog number or by reference to recognized industry standards.

To ensure that the specified materials and products are furnished and installed in accordance with the design intent, the herein established procedures shall be followed for submittal of design data and for its review and approval, or rejection, by the Engineer.

1.02 Product Handling

Make all pre-submittals, shop drawings, requests for substitutions, and other items in strict accordance with the provisions of this Section of the specifications.

PART 2.00 - PRODUCTS

2.01 Pre-submittals and Shop Drawings

Data shall include all drawings, design, performance curves, construction materials, installation requirements, capabilities, and any additional information available to allow the Engineer to adequately evaluate the product for the proposed application.

Scale of drawings shall be sufficiently large to show all pertinent features of the items and its method of connection to the work.

Number of sets of each submittal shall be as follows:

A. Pre-submittals - 2 sets
B. Shop Drawings - 5 sets

2.02 Colors

Unless the precise color is specifically described in the Contract Documents, whenever a choice of color is available in a specified product, submit accurate color charts to the Engineer for his review and selection.

2.03 Substitutions

A. Engineer's approval required:

1. The Contract is based on the materials, equipment, and methods described in the Contract Documents.

2. The Engineer will consider proposals for substitution of materials, equipment, and methods only when such proposals are accompanied by full and complete technical data and all other information required by the Engineer to evaluate the proposed substitution.

3. Do not substitute materials, equipment, or methods unless such substitution has been specifically approved for this work by the Engineer.

B. "Or equal":

1. Where the phrase "or equal" or "or approved equal" occurs in the Contract Documents, do not assume that material, equipment, or methods will be approved as equal unless the item has been specifically approved for this work by the Engineer.

2. The decision of the Engineer shall be final.

2.04 Operation and Maintenance Manuals

A. General:

O&M Manuals shall be furnished by the manufacturer for all equipment, unless otherwise specifically directed by the Engineer. These manuals shall be prepared in durable binders approximately 8 1/2" by 11" in size and with at least the following items:

1. Identification on, or readable through, the front cover stating general nature of the manual.

2. Neatly typewritten index near the front of the manual, furnishing immediate information as to location in the manual of all emergency data regarding the installation.

3. Complete instructions regarding operation and maintenance of all equipment involved.

4. Complete nomenclature of all replaceable parts, their part numbers, current cost, and name and address of nearest vendor of parts.

5. Copy of all guarantees and warranties issued.

B. Extraneous data:

Where contents of manuals include manufacturer's catalog pages, clearly indicate the precise items included in this installation and delete, or otherwise clearly indicate, all manufacturer's data with which this installation is not concerned.

C. Number of copies required:

Unless otherwise specifically directed by the Engineer, deliver three (3) copies of the manual to the Engineer.

2.05 Other Submittals Required

A. Construction Schedule - Updated every 4 months
B. Project Cash Flow (Cumulative)
C. Monthly Partial Payment Requests
D. Sales Tax Reports
E. Subcontractor Approval Request
F. Bonds for Highway Department (where applicable)
G. Insurance Certificate for Railroad (where applicable)
H. Payrolls (EPA & HUD Projects only)
I. As-Built Construction Drawings

PART 3.00 - EXECUTION

3.01 Prequalification of Equipment

When the detailed specification for any equipment or material requires prequalification, these submittals shall be sent or delivered to the Engineer at least fifteen (15) days prior to the scheduled date for receiving and opening bids.

3.02 Shop Drawings

The Contractor shall submit shop drawings to the Engineer for all products, equipment, and material to be used on this project, regardless of whether the item is listed in the specifications or not. Pipe manufacturer's certification of materials shall be acceptable for specified items.

Shop drawings should be submitted at least fifteen (15) days in advance of anticipated project usage to allow for the Engineer's review and approval, or rejection.

Unapproved items shall not be acceptable on this project.

3.03 Submittal Schedule

The following provides a listing of the minimum submittal times for the other items listed in Part 2.00 of this specification:

A. Colors - Fifteen (15) days prior to need
B. O&M Manuals - Prior to 40% project completion
C. Construction Schedule - Prior to preconstruction conference
D. Projected Cash Flow - Prior to preconstruction conference
E. Partial Payment Requests - Monthly
F. Sales Tax Reports - Monthly, with Payment Requests
G. Payrolls - Weekly (when required)
H. Subcontractor Approval Request - Fifteen (15) days prior to need
I. Highway Bonds - Seven (7) days prior to highway work
J. Railroad Bonds - Fifteen (15) days prior to railroad work

3.04 Miscellaneous Submittals

To be resolved with the Engineer at least fifteen (15) days prior to need.

3.05 As-Built Construction Drawings

The Contractor shall maintain and keep up-to-date a set of "as-built" drawings of the project work. These shall be protected and kept on the project for inspection. At project completion these "as-built" drawings shall be turned over to the Engineer.

3.06 Submittal Revisions

A revised Construction Schedule shall be submitted to the Engineer within seven (7) days after the construction progress varies 10% of more from the current Construction Schedule for two consecutive months, or at any other time when the Contractor desires to permanently alter the planned schedule.

END OF SECTION

DIVISION 1 - GENERAL REQUIREMENTS

DETAILED SPECIFICATIONS

SECTION 0140 - TEMPORARY FACILITIES AND CONTROLS

PART 1.00 - GENERAL

1.01 Description

The temporary facilities and controls covered in this Section include, but are not necessarily limited to:

A. All utilities, including water, sewer, gas, electricity and/or telephone, except as noted otherwise in these specifications
B. Field offices and sheds
C. Storage yards
D. Sanitary facilities
E. Safety measures

1.02 Product Handling

Use all means necessary to maintain temporary facilities and control in proper and safe condition throughout progress of the work. In the event of loss or damage, immediately make all repairs and replacements necessary to the approval of the Engineer and at no additional cost to the Owner.

PART 2.00 - PRODUCTS

2.01 Temporary Utilities

A. General:

Each contractor shall provide and pay all costs for all gas, water, and electric required for the performance of the work, by he or his subcontractors.

B. Temporary gas and water:

C. Temporary electricity:

(1) Furnish and install all necessary temporary wiring.

(2) Furnish and install area distribution boxes so located that the individual trades may use their own construction-type extension cords to obtain adequate power and artificial lighting at all points where required by inspectors and for safety (when required for buildings).

2.02 Field Office

When field offices are located at the job, the Contractor shall make the field office available to the Engineer or his representatives.

2.03 Sanitary Facilities

Furnish and install all required temporary toilet buildings with sanitary toilets for use of all workmen; comply with all minimum requirements of the Health Department or other public agency having jurisdiction; maintain in a sanitary condition at all times.

2.04 Safety Measures

The Contractor shall comply with all safety and health requirements of:

A. Contract General Conditions; Special Conditions; Supplemental Conditions; FmHA, EPA, and/or HUD Conditions (when applicable)

B. Occupational Safety and Health Act of 1970 (P.L. 91-596) with any amendments

C. North Carolina Department of Labor

D. U.S. Department of Labor Safety and Health Regulations promulgated under Section 107 of the Contract Work Hours and Safety Standards Act (P.L. 91-54)

E. Associated General Contractors' "Manual of Accident Prevention in Construction"

F. Local Health Department

2.05 Use of Explosives

When the use of explosives is necessary for the prosecution of the work, the Contractor shall exercise the utmost care not to endanger life or property. The Contractor shall be responsible for any and all damage or injury to persons or property resulting from the use of explosives. Such responsibility shall include, but shall in no way be limited to all damages arising from all forms of trespass to adjacent property as a result of blasting by the Contractor.

All explosives shall be stored in a secure manner, in compliance with all laws, and all such storage places shall be marked clearly "DANGEROUS EXPLOSIVES."

The Contractor shall notify each public utility company having facilities in close proximity to the site of the work of his intention to use explosives. This notice shall be given sufficiently in advance to enable the utility companies to take whatever steps they may consider necessary to protect their property from injury. The Contractor shall also give the Engineer, all occupants of adjacent property, and all other Contractors working in or near the project notice of his intention to use explosives.

2.06 Protection and Restoration of Property

The Contractor shall be responsible for the protection from his activities of all public and private property on and adjacent to the work and shall use every reasonable precaution necessary to prevent damage or injury thereto. He shall use suitable precautions to prevent damage to pipes, conduits, and other underground structures, and to poles, wires, cables, and other overhead structures.

The Contractor shall protect carefully from disturbance or damage all land monuments and property markers until the Engineer has witnessed or otherwise referenced their location and shall not remove them until directed.

The Contractor shall be responsible for the removal, preservation, and resetting of all mail boxes disturbed by the construction operations. The mail boxes and their supports, when reset, shall be left in as good a condition as they were before removal. The Contractor will not be required to furnish new material except as required to repair damage resulting from construction operations.

The Contractor will be held responsible for all damage or injury to property of any character resulting from any act, omission, negligence, or misconduct in the prosecution of the work. When any direct or indirect damage or injury is done to public or private property by or on account of any act, omission, negligence, or misconduct in the execution of the work, he shall either restore at his own expense such property to a condition similar or equal to that existing before such damage or injury was done, or shall make good such damage or injury in a manner acceptable to the owner of the damaged property. In case of failure on the part of the Contractor to restore such property or make good such damage or injury the Project Owner may be the Contractor's expense repair, rebuild, or otherwise restore such property in such manner as the Engineer may consider necessary.

PART 3.00 - EXECUTION

3.01 Removal

Maintain all temporary facilities and controls as long as needed for the safe and proper completion of the work; remove all such temporary facilities and control as rapidly as progress of the work will permit or as directed by the Engineer.

END OF SECTION

DIVISION 1 - GENERAL REQUIREMENTS

DETAILED SPECIFICATIONS

SECTION 0150 - PROJECT CLOSEOUT

PART 1.00 - GENERAL

1.01 Description

The work covered by this Section includes, but is not limited to, the following items:

A. Final Project Inspections
B. Operation and Maintenance Manuals

PART 2.00 - PRODUCTS

2.01 Final Inspections

At such time as the Contractor and the Project Inspector together agree that the Work has been completed in accordance with the project drawings and the contract documents, the Contractor shall request, in writing, that the Engineer conduct a final inspection.

The Engineer shall notify the other parties who need to make inspections, including where applicable but not limited to the Owner, N. C. Department of Transportation, N. C. Department of Environmental Quality (sewers) and water works.

The Engineer shall coordinate the final inspections with the Owner, the Contractor and all others requiring such inspections.

Upon completion of his final inspection, the Engineer shall provide the Contractor with his "punch list" of items needing additional work. Punch lists from other agencies involved shall be provided to the Contractor also for his attention and correction.

When the Contractor has completed all work to the satisfaction of all agencies involved, the Engineer shall issue to the Contractor a letter of project acceptance, stating the acceptance date and the project warranty period.

2.02 Operation and Maintenance Manuals

The Contractor shall bind and furnish operation and maintenance manuals as required by these detailed specifications for all equipment items in accordance with the Submittals schedule.

PART 3.00 - EXECUTION

Shall be as described in these Detailed Specifications.

END OF SECTION

DIVISION 1 - GENERAL REQUIREMENTS

DETAILED SPECIFICATIONS

SECTION 0151 – TEMPORARY BYPASS PUMPING SYSTEM

PART 1.00 - GENERAL

1.01 Scope

A. Under this item, the Contractor shall furnish all materials, labor, equipment, power, maintenance, etc. for the purpose of diverting the existing flow around the work area for the duration of the project.

B. The Contractor shall be responsible for the maintenance and operation of this system for the duration of the project and shall be responsible for any mechanical, electrical or other failures of this system during this time.

C. The Contractor shall provide one stand-by pump meeting the requirements of Paragraph 2.01 of this Section that matches the performance curve of the bypass pump.

D. The Contractor shall employ the services of a vendor who can demonstrate to the engineer that he specializes in the design and operation of temporary bypass pumping systems. The vendor shall provide at least five (5) references of projects of a similar size and complexity as this project performed by his firm within the past three years. The bypass system shall meet the requirements of all codes and regulatory agencies having jurisdiction.

1.02 Requirements For Bypass Pumping

A. The Contractor shall submit to the Engineer detailed plans and a description outlining all provisions and precautions to be taken by the Contractor regarding the handling of existing wastewater flows. This plan must be specific and complete, including such items as schedules, locations, elevations, capacities of equipment, materials and all other incidental items necessary and/or required to insure proper protection of the facilities, including protection of the access and bypass pumping locations from damage due to the discharge flows, and compliance with the requirements and permit conditions specified in these Contract Documents. No construction shall begin until all provisions and requirements have been reviewed by the Engineer.

B. The plan shall include but not limited to details of the following:

1. Staging areas for pumps;

2. Sewer plugging method and types of plugs;

3. Number, size, material, location and method of installation of suction piping;

4. Number, size, material, method of installation and location of installation of discharge piping;

5. Bypass pump sizes, capacity, number of each size to be on site and power requirements;

6. Calculations of static lift, friction losses, and flow velocity (pump curves showing pump operating range shall be submitted);

7. Standby power generator size, location;

8. Downstream discharge plan;

9. Method of protecting discharge manholes or structures from erosion and damage;

10. Thrust and restraint block sizes and locations;

11. Sections showing suction and discharge pipe depth, embedment, select fill and special backfill;

12. Method of noise control for each pump and/or generator;

13. Any temporary pipe supports and anchoring required;

14. Design plans and computation for access to bypass pumping locations indicated on the drawings;

15. Calculations for selection of bypass pumping pipe size;

16. Schedule for installation of and maintenance of bypass pumping lines;

17. Plan indicating selection location of bypass pumping line locations.

PART 2.00 – PRODUCTS

2.01 Equipment

A. All pumps used shall be fully automatic self-priming units that do not require the use of foot valves or vacuum pumps in the priming system. The pumps may be electric or diesel powered. All pumps used must be constructed to allow dry running for long periods of time to accommodate the cyclical nature of effluent flows.

B. The Contractor shall provide the necessary stop/start controls for each pump.

C. The Contractor shall include one stand-by pump of each size to be maintained on site.
Back-up pumps shall be on-line, isolated from the primary system by a valve.

D. Discharge Piping - In order to prevent the accidental spillage of flows all discharge systems shall be temporarily constructed of rigid pipe with positive, restrained joints. Under no circumstances will aluminum "irrigation" type piping or glued PVC pipe be allowed. Discharge hose will only be allowed in short sections and by specific permission from the engineer.

2.02 System Description

A. Design Requirements:

1. Bypass pumping systems shall have sufficient capacity to pump a peak flow of 2.40 mgd and shall be capable of pumping an average flow of 1.20 mgd without large flow variations due to pump cycling. The Contractor shall provide all pipeline plugs, pumps of adequate size to handle peak flow, and temporary discharge piping to ensure that the total flow of the main can be safely diverted around the section to be repaired. Bypass pumping system will be required to be operated 24 hours per day.

2. The Contractor shall have adequate standby equipment available and ready for immediate operation and use in the event of an emergency or breakdown. One standby pump for each size pump utilized shall be installed at the mainline flow bypassing locations, ready for use in the event of primary pump failure.

3. Bypass pumping system shall be capable of bypassing the flow around the work area and of releasing any amount of flow up to full available flow into the work area as necessary for satisfactory performances of work.

4. The Contractor shall make all arrangements for bypass pumping during the time when the main is shut down for any reason. System must overcome

any existing force main pressure on discharge.

B. Performance Requirements:

1. It is essential to the operation of the existing sewerage system that there is no interruption in the flow of sewage throughout the duration of the project. To this end, the Contractor shall provide, maintain and operate all temporary facilities such as dams, plugs, pumping equipment (both primary and back-up units as required), conduits, all necessary power, and all other labor and equipment necessary to intercept the sewage flow before it reaches the point where it would interfere with his work, carry it past his work and return it to the existing sewer downstream of his work.

2. The design, installation and operation of the temporary pumping system shall be the Contractor's responsibility. The bypass system shall meet the requirements of all codes and regulatory agencies having jurisdiction.

3. The Contractor shall provide all necessary means to safely convey the sewage past the work area. The Contractor will not be permitted to stop or impede the main flows under any circumstances.

4. The Contractor shall maintain sewer flow around the work area in a manner that will not cause surcharging of sewers, damage to sewers and that will protect public and private property from damage and flooding.

5. The Contractor shall protect water resources wetlands and other natural resources.

PART 3.00 – EXECUTION

3.01 Field Quality Control And Maintenance

A. Test:

1. The Contractor shall perform leakage and pressure tests of the bypass pumping discharge piping using clean water prior to actual operation. The engineer will be given 24 hours notice prior to testing.

B. Inspection:

1. Contractor shall inspect bypass pumping system every two hours to ensure that the system is working correctly.

C. Maintenance Service:

1. The Contractor shall insure that the temporary pumping system is properly

maintained and a responsible operator shall be on hand at all times when pumps are operating.

D. Extra Materials:

1. Spare parts for pumps and piping shall be kept on site as required.

2. Adequate hoisting equipment for each pump and accessories shall be maintained on the site.

3.02 Preparation

A. Precautions

1. Contractor is responsible for locating any existing utilities in the area the Contractor selects to locate the bypass pipelines. The Contractor shall locate his bypass pipelines to minimize any disturbance to existing utilities and shall obtain approval of the pipeline locations from the Owner and the Engineer. All costs associated with relocating utilities and obtaining all approvals shall be paid by the Contractor.

2. During all bypass pumping operation, the Contractor shall protect the Pumping Station and main and all local sewer lines from damage inflicted by any equipment. The Contractor shall be responsible for all physical damage to the Pumping Station and main and all local sewer lines caused by human or mechanical failure.

3.03 Installation and Removal

A. The Contractor shall remove manhole sections or make connections to the existing sewer and construct temporary bypass pumping structures only at the access location indicated on the Drawings and as may be required to provide adequate suction conduit.

B. Plugging or blocking of sewage flows shall incorporate primary and secondary plugging device. When plugging or blocking is no longer needed for performance and acceptance or work, it is to be removed in a manner that permits the sewage flow to slowly return to normal without surge, to prevent surcharging or causing other major disturbances downstream.

C. When working inside manhole or force main, the Contractor shall exercise caution and comply with OSHA requirements when working in the presence of sewer gases, combustible oxygen-deficient atmospheres, and confined spaces.

END OF SECTION

00825 - PRODUCT SUBSTITUTIONS

(Last rev ~~5/5/10~~, 9/18/19) R1

1. Product Substitutions

A. **Product Substitutions**:

1) Trade names, brand names, and/or manufacturer's information used in these specifications are for the purposes of establishing quality. Bids on products or other qualified manufacturers are acceptable provided request is made in writing not less than 10 days prior to scheduled receipt of bids, and provided the product has been previously approved by the City of Wilson's Product and Design Review Committee (PDRC) and provided that:

a. No major changes in the construction, design intent, or to any services or modifications to other equipment of the project would be required. Changes required to accommodate substituted items or the cost to repair and damage resulting from effecting such changes or modifications made necessary or caused by substitution shall be made by the Contractor at no additional cost or time delay.

b. Features of quality, capacity, construction, performance, appearance, size, arrangement, and general utility including economy of operation of substitutes offered, either parallel or exceed those of specified products.

2) Technical data covering the proposed substitution shall be furnished with the request.

2. Product and Design Review Committee

A. **Product and Design Review Committee** (PDRC) – How to have your products and designs approved by the City of Wilson:

1) **Evaluation Process**:

a. Who is Eligible? Anyone interested in having their company's products and designs approved by the City of Wilson.

2) **How to apply**:

a. The committee meets on the second Friday of each month or as needed.

b. **Formal Request**: A formal written request must be submitted to the committee at least 60 days prior to the date of the presentation. This request should include the preferred meeting date as well as an alternate date. In addition, 7 copies of this request must be submitted along with 7 copies of all literature, specifications, and materials that might affect the decision of the committee. The submittal must include the following: detail information

about the product, cost of the product and installation if applicable, discussion of the benefit, detail list of references of current users of the product and a discussion on the product's availability to the City of Wilson and time related to ordering and delivery. A sample of the product, a video and/or photos my also be provided during the presentation.

c. **Presentation**: There will be a 30-minute time limit for each presentation. Questions will be answered in a 15-minute time period after the presentation. You will be notified of your presentation date within 30 days after receipt of your request. Requests should be in writing, but phone calls will be accepted by the PDRC Committee Chairman. Representatives at the meeting should be in a position to offer any type of background on product use and locations, design, and reference checks. These representatives should also have the authority to approve a trial run in our service area.

d. **Applications**: Send all applications to:

Mr. Bill Bass, PE, Public Works Director, City Engineer, Committee Chairman
1800 Herring Avenue
Post Office Box 10
Wilson, NC 27894-0010

3) **Product and Design Review Subcommittee Members**

The PRDC is composed of the following subcommittees and members. Requests for will be forwarded to the applicable subcommittee for review and consideration.

a. **Water**:
   1. City Engineer
   2. Water Resources Manager
   3. Water Distribution ORC
   4. Construction Inspector
   5. Civil Engineer

b. **Sewer**
   1. City Engineer
   2. Sanitary Sewer ORC
   3. Construction Inspector
   4. Civil Engineer

c. **Stormwater Management**
   1. City Engineer
   2. Water Resources Manager
   3. Sanitary Sewer ORC
   4. Construction Inspector
   5. Civil Engineer
   6. Stormwater Project Manager

d. **Traffic**

1. City Engineer
2. Assistant Public Services Director/Administration
3. Traffic Services Supervisor
4. Construction Inspector
5. Civil Engineer

e. **Streets**
1. City Engineer
2. Assistant Public Services Director/Administration
3. Construction Inspector
4. Civil Engineer
5. Street Superintendent

4) **Results**: Within 45 days after the presentation, the committee chairman will notify the designer or vendor in writing about the committee's findings. A two-thirds vote of the members is required to approve that product or design for use in the applicable division/department.

5) The City of Wilson reserves the right to limit the number of approved manufacturers and products as they deem necessary in order to control parts inventory, maintenance, and training requirements.

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00950 - MEASUREMENT & PAYMENT (CITY FUNDED PROJECTS)

(Last revised ~~4/23/12~~, 9/10/19) R2

SELECTED LINKS TO SECTIONS WITHIN THIS SPECIFICATION

Base Course & Paving
Curb & Gutter, Driveways, Sidewalks & Misc. Concrete
Earthwork
Items Miscellaneous to all sections
Trenching, Backfilling & Compaction of Utilities
Sanitary Sewer
Storm Drainage
Water Distribution

1.1 TRENCHING, BACKFILLING AND COMPACTION OF UTILITIES

Measurements for purpose of payment shall be in accordance with the unit quantities stated in the proposal as defined below. Whenever units of measure, (i.e. linear feet, each, and similar units of measurement) are mentioned in a proposal, it shall be interpreted to mean the unit installed in accordance with the plans and specifications, and ready for use. Prices for the following bid items shall include all labor, materials, tools, equipment, and other incidentals necessary to complete the work as shown on the plans and in accordance with these specifications.

A. **Aggregate Backfill:**

Measurement: Coarse granular fill will be measured by the cubic yard in place in the trench.

Payment: Price per cubic yard for coarse granular fill shall include all materials, equipment, and labor required to furnish and install #57 or #67 stone in the locations designated by the City Engineer.

B. **Bedding, Haunching, Crushed Stone for Sewer Mains:**

Measurement: Bedding stone is considered incidental to the cost of the pipe.

Payment: Not a pay item.

C. **Excavation and Backfill:**

Measurement and Payment: All excavation and backfill shall be included in the cost of the other items bid – not a pay item.

When the removal of existing structures or materials is classified separately as a contract pay item, payment will be made in accordance with the contract price; otherwise, such work will be considered as incidental work and will not be paid for directly, but the cost shall be included in the unit price for other items of work. In either case, such price or prices shall be full compensation for all labor, materials, tools, equipment, and incidentals necessary to complete the work.

D. **Exploratory Excavation**

Measurement: Such excavation, where ordered by the City Engineer will be measured by the cubic yard.

Payment: The cost of such excavation, where ordered by the City Engineer, will be paid at the contract unit price bid, per cubic yard.

E. **Foundation Stone:**

Measurement: Foundation stone used in stabilizing the bottom of trenches will be field measured in the trench by the cubic yard, complete in place.

Payment: When the City Engineer directs the use of foundation stone, foundation stone shall be paid for at the contract unit price for foundation stone by the cubic yard. Payment shall include all materials and labor incidental to the placing of the stone and any additional extra depth of trench or excavation necessary to accommodate the stone including disposal of unusable material necessary to allow for placement of the foundation stone.

F. **Pavement Removal and Replacement**

Measurement: Where pavement is encountered, as shown on the plans, pavement removal and replacement will be measured by the square yard regardless of the existing pavement material or depth. See Specification Section 02275 – *Trenching, Backfilling, and Compaction of Utilities*, paragraph 3.7, *Pavement Repair and Replacement*.

Payment: This item will be paid for at the contract unit price per square yard for pavement removal and replacement. The unit price bid shall include all labor, tools, equipment, and material necessary to complete the work and shall include, but is not necessarily limited to, saw cutting the pavement, removal of existing pavement materials which are not suitable for backfilling the trench from the job, placement of suitable backfill material, and the cost for compaction and compaction testing by a certified and approved laboratory. In the case of pavement cut and removal, such price or prices shall include the cost of the required permit for cutting pavement, unless permit fees are included as a bid item in the Contract Documents. Extra width will not be measured for payment and there will be no extra payment for any of the above work, the cost of which shall be included in the unit price bid for pavement removal and replacement.

G. **Portland Cement Concrete Sidewalk**

Measurement: Where existing concrete sidewalk is encountered, as shown on the plans, removal and replacement will be measured by the square yard of sidewalk ordered removed and replaced by the City Engineer, regardless of the depth of the existing sidewalk.

Payment: This item will be paid for at the contract unit price per square yard for removal and replacement of concrete sidewalk, depth to match the depth removed with no extra compensation for depth. The unit price bid shall include all labor, tools,

equipment, and material necessary to complete the work and shall include, but is not necessarily limited to, saw cutting the sidewalk, removal of all existing materials, which are not suitable for backfill in the trench from the job, compaction of the trench and replacement of the sidewalk.

H. **Remove and Replace Asphalt Drive and Remove and Replace Concrete Drive**

Measurement: Where either an existing asphalt or concrete drive is encountered, as shown on the plans, pavement removal and replacement will be measured by the square yard regardless of the existing pavement material or depth.

Payment: This item will be paid for at the contract unit price per square yard for removal and replacement of either asphalt or concrete drives. The unit price bid shall include all labor, tools, equipment, and material necessary to complete the work and shall include, but is not necessarily limited to, saw cutting the pavement, removal of all paving materials which are not suitable for backfill in the trench from the job, and compaction of the trench. There will be no extra payment for any of the above work, the cost of which shall be included in the unit price bid for removal and replacement of asphalt or concrete drives.

I. **Paving and Resurfacing**

[Pay: By the ton using Terminal Prices for adjustment]

Measurement: Asphalt concrete pavement shall be measured by the actual number of tons of plant mix completed and accepted on the job. Measurement for all roadways will be based on plan quantities and field measurements, verified by tonnage tickets unless otherwise directed by the City Engineer. At the discretion of the City Engineer, coring's at quarter points of the street cross-section may be requested to verify thickness and density of asphalt.

Payment: Asphalt concrete pavement will be paid for at the "Contract Unit Price" bid per ton for the type of asphalt concrete specified. However, the "Contract Unit Price" per ton will be adjusted to account for variations either up or down in the price of asphalt binder from a "Base Price Index" to yield an "Adjusted Contract Unit Price." The "Adjusted Contract Unit Price" is the price paid at the time the paving/work is placed or performed. The "Adjusted Contract Unit Price" shall be full compensation for asphalt concrete pavement, complete in place, including all materials, labor, tools, equipment, tack coat, maintenance of traffic, and all other incidentals necessary. Adjusting manholes, cleanouts, valve boxes, etc. will be paid separately at the bid price for each when adjusted by the Contractor. Payment will be made on a per ton basis.

PRICE ADJUSTMENT - ASPHALT BINDER FOR PLANT MIX:

When it is determined that the monthly selling price of asphalt binder on the first business day of the calendar month during which the last day of the partial payment period occurs varies either upward or downward from the "Base Price Index," the "Contract Unit Price" for asphalt binder for plant mix will be adjusted.

The "Base Price Index" provided for asphalt binder for plant mix, per ton, shall be used to compute the "Adjusted Contract Unit Price." The "Base Price Index" to be included

in a proposal/contract along the applicable date will be the Monthly Price Index in effect 2 months prior the month in which the contract is let. The "Base Price Index" will remain fixed throughout the life of the contract. This "Base Price Index" represents an average of F.O.B. selling prices of asphalt binder at supplier's terminals.

Price adjustments for asphalt binder for plant mix will be made in accordance with Section 620 of the NCDOT *Standard Specifications.*

[BIDDING NOTE: In preparation of the bid documents, the City must indicate the "Base Price Index" for asphalt binder for plant mix per ton in the form of proposal. Along with this price, show the date of the selling prices of asphalt binder at supplier's terminal. The price and date is obtained from the NCDOT's website and then inserted into the bid documents.]

The following is a link to the NCDOT website showing the terminal price:

https://connect.ncdot.gov/projects/construction/Pages/Pavement-Construction-Prices.aspx

J. **Rock Excavation, Trench:**

Measurement: Where rock excavation is to be measured for payment, quantities will be as determined by the City. Rock excavation will be measured by the cubic yard. For pay purposes, dimensions shall be computed as the difference in elevation between the top and bottom of the rock (as determined by the City) multiplied by the specified trench width for the pipe size being laid. Where rock is encountered in the bottom of the trench, the maximum depth for payment purposes shall be 6 inches below the bottom of the pipe. Rock excavation shall consist of the removal and satisfactory disposal of all materials, which in the opinion of the City Engineer, cannot be excavated except by a track-mounted power excavator, equivalent to a Caterpillar Model No. 325 or equivalent equipped with new rock teeth. Practical excavation is defined as the ability to remove at least 30 cubic yards during one hour of continuous digging. Trenches in excess of 10 feet in width and pits in excess of 30 feet in either length or width are classified as open excavation.

Payment: Rock excavation will be paid for at the contract unit price per cubic yard for rock excavation and shall include all labor, materials, insurance, mats, signage, traffic control, tools, equipment and incidentals necessary to excavate and dispose of rock off site, backfilling the excavated trench to the bottom of the pipe with select backfill material, and shall include the cost of removing all excavated materials which are not suitable for backfill. No payment will be made for rock that has been excavated subsequent to ripping operations.

K. **Sheeting and Bracing (Piling)**

Measurement and Payment: Payment for sheeting and bracing, except when ordered to be left in place, and all other work incidental to sheeting and bracing, shall not be made separately unless specified or as shown on the plans or as directed by the City Engineer, but shall be included in the bid price for other items.

When specified, payment for "Steel Sheet Piling" shall be made at the contract unit price bid per linear foot (horizontal).

When specified, payment for "Steel Sheet Piling Left in Place" shall be made at the contract unit price bid per linear foot.

L. **Select Fill:**

Measurement: Trench excavation determined to be unusable by the City Engineer, or his representative, resulting from material which may be unsatisfactory (as defined in paragraph 2.1.1F of *Section 02275, Trenching, Backfilling, and Compaction of Utilities*), non-compactable, naturally wet (when removed from trench) and otherwise unusable due to too high a moisture content for compaction (as opposed to unprotected soil exposed carelessly to rain which becomes unusable in which case there is no claim for payment for trench borrow). Measurement shall be made along the centerline of the pipe and the pay quantity shall be determined based upon the depth of fill placed times the maximum trench width (pipe outside diameter plus 2 feet). Selected granular backfill in excess of the maximum quantity, as specified, shall be furnished and placed by the Contractor.

Payment: Select Fill will be paid for at the contract unit price by the compacted cubic yard, in place, and shall include all material, equipment, and labor to furnish, haul, placement, compact the approved material, and haul off unsuitable material, complete in place, in the locations as designated on the drawings or as approved by the City Engineer.

M. **Other:** Other items shall be paid for as stated in the Proposal.

1.2 WATER

Measurements for purpose of payment shall be in accordance with the unit quantities stated in the proposal as defined below. Whenever units of measure, (i.e. linear feet, each, and similar units of measurement) are mentioned in a proposal, it shall be interpreted to mean the unit installed in accordance with the plans and specifications, and ready for use. Prices for the following bid items shall include all labor, materials, tools, equipment, and other incidentals necessary to complete the work as shown on the plans and in accordance with these specifications.

A. **Bedding Stone for Water Pipe:**

Measurement: When called for in the proposal or on the plans or when directed by the City Engineer or Water Resources Manager, aggregate material used for bedding water lines will be measured by the cubic yard of pipe bedding material placed.

Payment: Pipe bedding stone will be paid for at the contract unit price per cubic yard for pipe bedding material, complete and in place.

B. **Blow-Offs:**

Measurement: Blow-offs will be measured on a per each basis for the number of blow-offs installed.

Payment: Blow-offs will be paid for at the contract unit price per blow-off for the size specified, and all materials incidental to the installation of the blow-off, complete in place. This price shall include, but is not necessarily limited to, Kupferles's blow off service, piping, tapped MJ plug, joint restraint system, fittings, valve box(es), sawing asphalt and placement of reinforced concrete valve box collar (per detail 514.02), bedding material, concrete collar, blocking, and other related incidentals as shown on **Standard Detail 514.01**.

C. **Concrete Encasement**

Measurement: Payment for furnishing concrete encasement will be at the unit price bid per cubic yard for the class of concrete stated in the proposal.

Payment: The unit priced stated in the proposal shall include the cost of additional depth of excavation, forming, the furnishing and placing of concrete, cofferdams, laying of pipe line to grade but excluding the cost of the pipe itself, complete in place, including all labor, equipment, and material, necessary and all other work incidental to the complete installation of the concrete encasement in accordance with the specification and details shown on the plans. Payment will be made to neat lines of construction shown on the plans with no allowance being made for extra ditch width.

D. **Concrete Piers**:

Measurement: Reinforced concrete piers shall be measured on an each basis based on the height and the structural details shown on the contract drawings.

Payment: This item will be paid for at the contract unit price bid for concrete piers complete in place, including all labor, equipment, and material, necessary for furnishing, excavating, disposal of excess material, stone bedding, reinforcement, anchor bolts, steel straps, concrete, testing, forming, concrete finishing, backfilling, restoration of grade, and all other work incidental to the complete installation of the concrete piers in accordance with the specification and details shown on the plans. Payment will be made to neat lines of construction shown on the plans with no allowance being made for extra ditch width.

E. **Connecting to Existing Mains**

Not a pay item. Fittings and specialty items used in making the connections will be measured and paid for at the unit price bid by the Contractor for "Fittings" and at the unit price bid for "Tapping Sleeves and Valve."

F. **Dechlorination**

Not a pay item. The associated work, materials, and labor involved in dechlorinating water is incidental to the cost of the water main construction and shall be included in other bid items.

G. **Ductile Iron Pipe (For Mains):**

Measurement: Measured horizontally along centerline of pipe by the linear foot of various sizes. All pipes shall be measured from the exact beginning of the pipe to the end of the line without deduction for fittings (i.e. fittings and valves) and shall be made

through casings. 6-inch hydrant leg lead-in pipe is not included but is considered incidental to the cost of hydrant installation.

Payment: The accepted quantities of water line pipe will be paid for at the contract unit price per linear foot of the various types, depths, and size pipe specified (fittings, valves, and specialty items are paid separately), complete in place. This price shall include labor, equipment, materials, trench excavation (excluding select fill and rock as defined in item 1.1 J, of this document), shoring, or use of trench box, installation, concrete thrust blocking, making connections to existing mains, installing in existing casing, pumping, backfilling, compaction, testing of failed trenches, disposal of excess material, pressure testing, chlorinating, dechlorination, bacteriological testing, and all other work incidental to the complete installation of the mains in accordance with these specifications. Fittings, valves, and specialty items are paid separately.

H. **Ductile Iron Pipe, Bored and Jacked**

Measurement: Measurement of Ductile Iron Pipe, bored and jacked, shall be measured by the linear feet of pipe installed. Bored and jacked Ductile Iron Pipe shall include any excavation, any backfill, bore, jacking, the pipe, dewatering, clean up, restoration and any other work required for a complete and acceptable in place installation.

Payment: Ductile Iron Pipe, bored and jacked will be paid for at the contract unit price per linear foot for pipe bored, complete, and acceptable in place. The price shall be full compensations for pipe, labor, equipment, and all other work incidental to the complete installation of the mains in accordance with these specifications. Fittings, valves, and specialty items are paid separately. Payment will only be made upon acceptance by the City of Wilson and the Consulting Engineer that the bore is installed to the proper elevation and grade. Any deviations, errors, or unacceptable conditions noted by the City of Wilson or the Wilson County office of the North Carolina Department of Transportation (if applicable) will be the responsibility of the Contractor to correct to the full satisfaction of the above-mentioned parties without additional compensation.

I. **Encasement Pipe (bored):**

Measurement: Steel casing pipe of the wall thickness and diameter specified will be measured by the linear feet of steel casing pipe installed.

Encasement of water lines by the dry bore and jacking method shall include any excavation, any backfill, the encasement pipe, bore, jacking, spiders, the end seals, dewatering, clean up, restoration and any other work required for a complete and acceptable in place installation.

Payment: Steel casing pipe will be paid for at the contract unit price per linear foot per diameter per thickness for steel casing pipe bored, complete, and acceptable in place. Payment will only be made upon acceptance by the City of Wilson and the Consulting Engineer that the bore is installed to the proper elevation and grade and ready for the installation of the designed carrier pipe without any additional compensation. Any deviations, errors, or unacceptable conditions noted by the City of Wilson or the Wilson County office of the North Carolina Department of Transportation (if applicable) will be the responsibility of the Contractor to correct to the full satisfaction of the above-

mentioned parties. Lines either off on grade or alignment shall be rejected or corrected in a manner approved by the City's Engineer or Water Resources Manager. *Regardless of the number of withdrawal and reattempts, the bore shall be paid one time for a successful bore on a linear foot basis*. The cost of the carrier pipe is not to be included.

J. **Encasement Pipe (open cut):**

Measurement: Steel casing pipe of the wall thickness and diameter specified will be measured by the linear feet of steel casing pipe installed.

Encasement of water lines by the open cut method shall include any excavation, any backfill, the encasement pipe, spiders, the ends seals, dewatering, clean up, restoration and any other work required for a complete in place installation.

Payment: Steel casing pipe will be paid for at the contract unit price per linear foot per diameter per thickness for steel casing pipe installed by the pipe open cut, complete and in place. Lines either off on grade or alignment shall be rejected or corrected in a manner approved by the City's Engineer or Water Resources Manager. The cost of the carrier pipe is not to be included.

K. **Excavation and Backfill:**

Measurement and payment: All excavation and backfill for water mains shall be included in the cost of the other items bid – this is not a pay item.

L. **Fittings and Accessories:**

Measurement: Fittings and specialty items used in conjunction with ductile iron or C900 PVC pipe will be measured per each.

Payment: Payment for ductile iron fittings shall include all labor, equipment and all materials necessary for installing, making connections to existing mains, tie rods, wedge action restrainer glands, backfilling, testing, sterilizing, and all other work incidental to the complete installation of these fittings in accordance with the specifications.

M. **Fire Hydrants:**

Measurement: Fire hydrants will be measured by the number of hydrants installed on an each basis.

Payment: Price shall include all labor, equipment, and all materials (including extensions and fittings), necessary to install the hydrant including construction staking, #57 stone, drainage pit, thrust restraint, 6-inch hydrant leg lead in pipe, testing and disinfecting, complete and in place. Valves will be paid for separately. The cost of surveying for staking hydrant location is to be included in the cost of the hydrant unless an item is provided in the proposal for utility construction staking whereupon the costs shall then be included in that line item. Pavement repair, select fill, and stone for trench stabilization are not to be included in the bid price for the fire hydrant.

N. **Fire Hydrants Removal:**

Measurement: Fire hydrants will be measured by the number of existing fire hydrants removed on an each basis.

Payment: Price shall include all labor, equipment, and all materials necessary to remove the hydrant including excavation, backfilling, topsoil, seeding or sod replacement, capping the hydrant lateral, curb/gutter and sidewalk replacement, and delivery of old hydrant to the Public Services Department (the hydrant shall remain the property of the City). Pavement repair, select fill, and stone for trench stabilization are not to be included in the bid price for the fire hydrant removal.

O. **Fire Vaults and Large Meter Vaults:**

Measurement: Vaults for backflow prevention devices, detector check, RPZ, or large meters (meters larger than 2 inches) shall be paid lump sum. Cost for vault is to include all labor, materials, equipment, backfill, compaction, etc. complete and in place. The cost of the vault is to also include the insulated enclosure (below ground vaults are not permitted) and concrete pad, stone bedding, the backflow prevention device and/or meter, gate valves, post indicator valves (if applicable), fittings, check valves, couplings, sleeves, fire department connection (if applicable), hatch, floor drain (if applicable) and drain line, pipe stands, vents, ladder, painting of pipe and fittings (if applicable), defect repair, testing, etc. necessary to render a complete unit as shown on the contract drawings.

Payment: Vault payment will be paid as lump sum.

P. **Foundation Stone:**

Measurement: Foundation stone used in stabilizing the bottom of trenches will be field measured in the trench by the cubic yard, complete in place.

Payment: When the City Engineer directs the use of foundation stone, foundation stone shall be paid for at the contract unit price for foundation stone by the cubic yard. Payment shall include all materials and labor incidental to the placing of the stone and any additional extra depth of trench or excavation necessary to accommodate the stone including disposal of unusable material necessary to allow for placement of the foundation stone.

Q. **Miscellaneous Fittings**

Measurement: By the piece.

Payment: Payment for ductile iron fittings where specified on the plans shall be made per piece Cost of accessories shall be included in the price of the fitting.

R. **PVC Pipe (when applicable):**

Measurement: Measured horizontally along centerline of pipe by the linear foot of various sizes. All pipes shall be measured from the exact beginning of the pipe to the end of the line without deduction for fittings (i.e. fittings and valves) and shall be made through casings. 6-inch hydrant leg lead-in pipe is not included but is considered incidental to the cost of hydrant installation.

Payment: The accepted quantities of PVC water line pipe will be paid for at the contract unit price per linear foot of the various types and size pipe specified (fittings, valves, and specialty items are paid separately), complete in place. This price shall include all labor, equipment, materials, trench excavation (excluding rock and select fill), shoring, or use of trench box, installation, concrete thrust blocking, detectable warning tape, copper wire with valve boxes, making connections to existing mains, installing in existing casing, pumping, backfilling, compaction, testing of failed trenches, disposal of excess material, pressure testing, chlorinating, dechlorination, and bacteriological testing and all other work incidental to the complete installation of the mains in accordance with these specifications. No special payment will be made for fittings, specialty items, or pipe used in making connections to existing mains where such connections are noted on the plans.

S. **HDPE Water Pipe for Horizontal Directional Drilling (HDD) Applications (when applicable):**

Measurement: Measured horizontally along centerline of pipe by the linear foot of various sizes. All pipes shall be measured from the exact beginning of the pipe to the end of the line without deduction for lengths of fittings, connections, valves, flushing connections. Air/vacuum and air release valve manholes are paid separately. 6-inch hydrant leg lead-in pipe is not included but is considered incidental to the cost of hydrant installation.

Payment: The accepted quantities of PVC water line pipe will be paid for at the contract unit price per linear foot of the various types, depths, and size pipe specified (fittings, valves, and specialty items are paid separately), complete in place for horizontal directional drilling method of installing HDPE pipe. This price shall include all labor, equipment, materials, trench excavation in open-cut areas (excluding rock and select fill), shoring, or use of trench box, installation, concrete thrust blocking, detectable warning tape or copper wire per applicable specs and details, making connections to existing mains, pumping, backfilling and compaction of open cut areas, testing of failed trenches, disposal of excess material, pressure testing, chlorinating, dechlorination, and bacteriological testing and all other work incidental to the complete installation of the mains in accordance with these specifications. No special payment will be made for fittings, specialty items, or pipe used in making connections to existing mains where such connections are noted on the plans.

T. **Removal and Disposal of Asbestos Cement Pipe**

Measurement: When the amount of pipe to be removed is less than 12 feet, the Contractor shall be paid a lump sum per each event. When the amount removed exceeds 12 feet, the Contractor shall be paid the lump sum plus the bid price per linear foot for pipe removed in excess of 12 feet.

Payment: Asbestos Cement Pipe removal will be paid for at the contract unit price per lump sum and/or by the foot as bid and shall include all labor, materials, and equipment to excavate, remove and properly dispose of pipe. Contractor shall provide documentation to the City as to the legal disposition of the pipe in accordance with the Solid Waste Disposal Act, as amended from time to time.

U. **Tapping Sleeve and Valve:**

Measurement: Tapping sleeve and valve will be measured by the number of each size installed.

Payment: Tapping sleeve and valve price shall include furnishing all materials, equipment, and labor to make a wet tap on an existing line, complete in place, to include valve, valve box, sawing asphalt and placement of reinforced concrete valve collar (per details C06.05 and 516.02), stainless steel tapping tee sleeve, tap, tapping machine, anchor blocks, excavations, backfill, disinfection, and testing of sleeve. Wet taps will be paid for at the contract unit price per tap for the size specified, complete in place.

V. **Testing and Sterilizing**

Not a pay item. The associated work, materials, and labor involved in testing and sterilizing water mains is incidental to the cost of the water main construction and shall be included in other bid items.

W. **Restraint Flange, Retainer Glands and Retainer Clamps:**

Measurement: Wedge action restrainer glands, retainer glands, and retainer clamps are considered incidental to the cost of construction.

Payment: Not a pay item.

X. **Thrust Restraints**

Not a pay item. Concrete blocking shall be installed as required for all tees, bends etc. per the applicable standard details. No separate payment shall be made for thrust restraints. The cost of thrust restraints is considered incidental to the cost of the contract unit price bid for each applicable fitting bid.

Y. **Tunneling:**

Measurement: Tunneling will be measured by the linear feet of tunnel installed.

The tunneling method shall include any and all excavation, shoring and bracing, any backfill, steel liner plates and bolts, ventilation system for workers, lagging, spiders, grout plugs, sand-cement grouting of voids, steel drain pipe, french drain, concrete paved invert, the ends seals, dewatering, clean up, restoration and any other work required for a complete in place installation.

Payment: Tunneling will be paid for at the contract unit price per linear foot for diameter installed by the tunneling cut, complete and in place. Payment will only be made upon acceptance by the City of Wilson and the Consulting Engineer that the tunnel is installed to the proper elevation and grade and ready for the installation of the designed carrier pipe without any additional compensation. Any deviations, errors, or unacceptable conditions noted by the City of Wilson or the Johnston County office of the North Carolina Department of Transportation (if applicable) will be the responsibility of the Contractor to correct to the full satisfaction of the above-mentioned parties. Unit price does not include the carrier pipe.

Z. **Valves – Air Release Valve & Manhole:**

Measurement: Air/Vacuum Release valves will be measured on a per each basis for the number of units installed.

Payment: Air release valves will be paid for at the contract unit price per air release valve and manhole for the size specified, and all materials incidental to the installation of the air release valve and manhole, complete in place. This price shall include, but is not necessarily limited to, bedding stone, the direct tap and/or saddle, brass plumbing valves, brass street ells and screen, including the doghouse manhole, concrete grade rings (if applicable), and frame and cover, grade adjustments to iron frame if necessary, sawing asphalt and placement of reinforced concrete manhole collar (per details C06.04 and 736.02), and other incidentals as shown on **Standard Detail 516.01**.

AA. **Valve with Box:**

Measurement: Gate valves and inserting valves will be measured by the number of each size and type of valve installed.

Payment: Gate valves and inserting valves will be paid for at the contract unit price, complete in place, per valve for the type and size specified, complete in place. This price shall include all labor, equipment, and materials necessary for installing, valve footing (if applicable), sawing asphalt and placement of reinforced concrete valve box collar (per details C06.05 and 516.02), furnishing, backfilling, testing, slot cut in valve box for tracer wire, copper wire with valve box, sterilizing and all other work incidental to the complete installation of the valves, with necessary valve box, in accordance with the specifications. Cost for any accessory kit to be included in price of valve.

BB. **Valve Box Removal:**

Measurement: Valve box removal will be measured by the number of each valve box removed.

Payment: Payment for valve box removal shall be made at the contract unit price for each valve box removed and delivered to the Water Resources Department. Valve box removal shall include removal of valve and, when present, concrete collar, placement of select fill material, compaction, and pavement repair. This price shall include all labor, equipment, materials necessary for removal of valve boxes and all other work incidental to the complete removal of the valve boxes in accordance with the specifications.

CC. **Small Water Services (2" or less), Water Tubing (Pipe) – by open cut:**

Measurement: Measurement of water services shall be made on a per service basis regardless of service pipe material or length.

Payment: The water service pipe shall be paid for at the contract unit bid per service of the size indicated on the drawings, complete and in place, at a minimum depth of 24 inches. The price shall include all equipment, labor, and materials for installation, making tap, furnishing and running service line, setting meter box and setter as applicable, tail piece extension and marker post if applicable, testing and disinfection

complete in place in accordance with **Standard Details 515.01, 515.02 and 519.02,** as applicable, curb/gutter and sidewalk replacement if necessary. The City will furnish and set meter.

DD. **Small Water Services (2" or less), Water Tubing (Pipe) – by Jacking or Boring:**

Measurement: Measurement of jacked water services shall be made on a per service basis regardless of service pipe material or length.

Payment: The jacked service shall be paid for at the contract unit bid price per service of the size indicated on the drawings, complete and in place. The price shall include all equipment, labor, and materials for installation, making tap, running or punching service line, setting meter box and setter as applicable, testing and disinfection complete in place in accordance with **Standard Details 515.01, 515.02 and 519.02**. The City will furnish and set meter.

EE. **Water Service Line Replacement:**

Measurement: Water service line replacement shall be measured on an each basis.

Payment: Water service line replacement shall include all materials, labor, and equipment for installation, furnishing pipe, running service line, removal and reconnection of service, testing, disinfection, sidewalk (if necessary) and curb removal and replacement, complete in place. Payment for pavement removal and replacement is paid under *Pavement Removal and Replacement.*

FF. **Other: Other items shall be paid for as stated in the Proposal.**

1.3 SEWER

Measurements for purpose of payment shall be in accordance with the unit quantities stated in the proposal as defined below. Prices for the following bid items shall include all labor, materials, tools, equipment, and other incidentals necessary to complete the work as shown on the plans and in accordance with these specifications.

A. **Bedding Stone, Granular:**

Measurement: Stone for pipe bedding shall be measured by the ton in place in the trench, as ordered by the City Engineer. Stone tickets are required to be turned in to a City representative at the end of the day.

Payment: Price per ton for granular bedding stone shall include all materials, equipment, and labor required to furnish and place stone in the trench locations designated by the City Engineer.

B. **Building Connections/Service Laterals:**

Measurement: Measurement of building connections/service lateral shall be made on a per service basis, regardless of service pipe material, as required to comply with **Standard Detail 733.01**. A standard service shall be defined as the length of pipe and fittings, with associated materials, labor, and equipment, including the CO box,

required to run from the centerline of the main to the CO box placed 3 feet behind the back of curb or, where no curb and gutter exists, the edge of pavement; all in accordance with **Standard Detail 733.01**.

Measurement of Building Connections/Service Lateral Extensions: When ordered by the City Engineer to lengthen or extend the service beyond that the standard CO box location shown on **Standard Detail 733.01**, building connections/service lateral extensions shall be measured along the center line of the pipe beginning 3 feet from the back of the curb or edge of pavement where no curb and gutter exists, and ending at the centerline of the extended cleanout location.

Payment: Payment for service laterals shall be at the contract unit price bid, per service, for the sized indicated and shall include bedding, bends, wyes, saddles (if applicable), adapters, long sweep wyes, cleanout riser and plugs, cleanout box, brick, stone, and other incidentals as necessary, curb/gutter and sidewalk replacement (if necessary) complete in place as shown on **Standard Detail 733.01.** Any temporary pumps required to by-pass sewer around work areas shall be provided at no additional cost.

Payment for Building Connections/Service Lateral Extensions: Building connections/service lateral extensions shall be paid by the linear foot along the center line of the pipe and shall only include the extra length of pipe, excavation, bedding stone, and fittings, if applicable.

C. **Bypass Pumping:**

Measurement: Bypass pumping is considered incidental to the cost of the pipe unless otherwise shown in the proposal.

Payment: Not a pay item.

D. **Carrier Pipes (Installed in either Steel Encasements or Tunnel Liners)**

Measurement: Measurement shall be along the centerline of the pipe.

Payment: Payment for carrier pipes will be made at the contract unit price bid per linear foot and shall include all necessary materials, tools, and equipment necessary to install the pipe. The unit price does not include the casing pipe (see the individual pay items *Encasement Pipe* and *Tunneling*). The unit price shall include the cost of excavation, bedding, backfilling, cleanup, and testing.

E. **Combination Sewer Force Main Air Valve and Air Release Manhole**

Measurement: Measurement for combination air valve and air release manholes on force mains shall be on an each basis.

Payment: Payment for combination air valve and air release manholes shall be paid for at the contract unit price bid for combination air valve and air release manholes. The price shall include all labor, material, equipment, stone bedding, precast doghouse manhole, cast iron frame and cover, bedding, tap and saddle, valve, concrete grade rings (if applicable), grade adjustments to iron frame if necessary, and

other incidentals and piping as necessary, complete in place as shown on **Standard Detail 734.01**.

F. **Concrete Encasement**

Measurement: Payment for furnishing concrete encasement will be at the unit price bid per cubic yard for the class of concrete stated in the proposal, such price to be paid in addition to that paid per foot of sewer main.

Payment: The unit prices stated in the proposal shall include the cost of additional depth of excavation, forming, the furnishing and placing of concrete, cofferdams, and laying of pipe line to grade but excluding the pipe itself, complete in place, including all labor, equipment, and material, necessary and all other work incidental to the complete installation of the concrete encasement in accordance with the specification and details shown on the plans. Payment will be made to neat lines of construction shown on the plans with no allowance being made for extra ditch width.

G. **Concrete – Miscellaneous Unformed:**

Measurement: Concrete, except that used in manholes, will be measured in cubic yards of unformed concrete actually placed. Typical uses include concrete collars (slope anchors), cradles, and all other miscellaneous concrete related to sewer line installation.

Payment: This item will be paid for at the contract unit price per cubic yard for un-formed concrete for collars, cradles, and all other miscellaneous concrete related to sewer line installation, in place, including all material, equipment, and labor, to place the concrete in the locations shown on the construction drawings and/or as directed by the City Engineer or Water Resources Manager including the cost of removing and disposing of the material replaced by the concrete. Payment will be made only for the quantities and dimensions (made to neat lines of construction) as shown on drawings or applicable details. Price does not include pipe.

H. **Concrete Piers**

Measurement: Reinforced concrete piers shall be measured on an each basis based on the height and the structural details shown on the contract drawings.

Payment: This item will be paid for at the contract unit price bid for concrete piers complete in place, including all labor, equipment, and material, necessary for furnishing, excavating, disposal of excess material, stone bedding, reinforcement, anchor bolts, steel straps, concrete, testing, forming, concrete finishing, backfilling, restoration of grade, and all other work incidental to the complete installation of the concrete piers in accordance with the specification and details shown on the plans. Payment will be made to neat lines of construction shown on the plans with no allowance being made for extra ditch width.

I. **Connections to Other Sewers or to Appurtenances**

Measurement: Measurement shall be made on an each basis for connections made to other sanitary sewers and appurtenances.

Payment: Connections to other sewers or appurtenances shall be made on a lump sum basis and shall be full compensation for removing, repairing, and/or replacing pipe and/or structures and shall be full compensation for the completed work in place including all materials, labor, tools, and equipment.

J. **Ductile Iron Sewer Line**

Measurement: See pay item 1.3.T, Measurement of Sewer Pipe.

Payment: See pay item 1.3.T, Measurement of Sewer Pipe.

K. **Encasement Pipe (bored):**

Measurement: Steel casing pipe of the wall thickness and diameter specified will be measured by the linear feet of steel casing pipe installed.

Encasement of sewer mains by the dry bore and jacking method shall include any excavation, any backfill, the encasement pipe, bore, jacking, spiders, end seals, dewatering, clean up, restoration and any other work required for a complete in place installation.

Payment: Steel casing pipe will be paid for at the contract unit price bid per linear foot per diameter per thickness for steel casing pipe bored, complete and acceptable in place. Payment will only be made upon acceptance by the City of Wilson and the Consulting Engineer that the bore is installed to the proper elevation and grade and ready for the installation of the designed carrier pipe without any additional compensation. Any deviations, errors, or unacceptable conditions noted by the City of Wilson or the Wilson County office of the North Carolina Department of Transportation (if applicable) will be the responsibility of the Contractor to correct to the satisfaction of the above-mentioned parties. Lines either off on grade or alignment shall be rejected or corrected in a manner approved by the City Engineer or Water Resources Manager. *Regardless of the number of withdrawal and reattempts, the bore shall be paid one time for a successful bore on a linear foot basis*. The cost of the carrier pipe is not to be included.

L. **Encasement Pipe (open cut):**

Measurement: Steel casing pipe of the wall thickness and diameter specified will be measured by the linear feet of steel casing pipe installed.

Encasement of sewer mains by the open cut method shall include any excavation, any backfill, the encasement pipe, spiders, the ends seals, dewatering, clean up, restoration and any other work required for a complete in place installation.

Payment: Steel casing pipe will be paid for at the contract unit price bid per linear foot per diameter per thickness for steel casing pipe installed by the pipe open cut, complete and in place. Lines off either on grade or alignment shall be rejected and corrected in a manner approved by the City Engineer or Water Resources Manager. The cost of the carrier pipe is not to be included.

M. **Excavation and Backfill:**

Measurement and Payment: All excavation and backfill shall be included in the cost of the other items bid – not a pay item.

When the removal of existing structures or materials is classified separately as a contract pay item, payment will be made in accordance with the contract price; otherwise, such work will be considered as incidental work and will not be paid for directly, but the cost shall be included in the unit price for other items of work. In either case, such price or prices shall be full compensation for all labor, materials, tools, equipment, and incidentals necessary to complete the work.

N. **Force Mains: Ductile Iron Pipe or C900 PVC Fusible Piper:**

Measurement: Measured horizontally along centerline of pipe by the linear foot of various sizes. All pipes shall be measured from the exact beginning of the pipe to the end of the line without deduction for fittings (i.e. fittings and valves) and shall be made through casings where applicable.

Payment: The accepted quantities of sewer force main pipe will be paid for at the contract unit price per linear foot of the material type and size pipe specified (fittings, valves, and specialty items are paid separately), complete in place. This price shall include labor, equipment, materials, trench excavation (excluding select fill and rock as defined in item 1.1 J, of this document), shoring, or use of trench box, installation, concrete thrust blocking, making connections to existing mains, installing in existing casing, pumping, backfilling, compaction, testing of failed trenches, disposal of excess material, pressure testing, and all other work incidental to the complete installation of the mains in accordance with these specifications. Fittings, valves, and specialty items are paid separately.

O. **HDPE Gravity Sewer Pipe**

Measurement: See pay item 1.3.T, Measurement of Sewer Pipe.

Payment: See pay item 1.3.T, Measurement of Sewer Pipe.

P. **Manholes – Standard and Drop:**

Measurement: Manholes shall be measured on an each basis for a basic 6-foot deep manhole inclusive of frame and cover and base. For all depths in excess of 6 feet, manholes shall be measured by the vertical foot of depth of the manhole constructed in 2-foot increments (e.g. 0 to 6', 6.1' to 8.0', 8.1' to 10.0', etc.). For determining the additional depth of manhole to be paid for at the unit price bid per vertical foot, manholes shall be measured from the invert of the pipe outlet to the top of the manhole frame and cover and recorded to the nearest 1/10 of a foot.

Where more than one type or size (diameter) designation is shown on the drawings, or called for in the special provisions, a separate bid item of the following form shall cover each:

1) Type (or Size) Manhole, per each.
2) Depth of Manhole, per vertical foot.
3) Drop Manhole Connection, per vertical foot.

Payment: Manholes shall be paid for at the contract unit price bid for a 6-foot deep manhole on an each basis plus a unit price per vertical foot for all depths in excess of 6 feet deep in 2-foot increments (e.g. 0 to 6', 6.1' to 8.0', 8.1' to 10.0', etc.). Price shall include furnishing and constructing manholes complete-in-place including excavation, connection to existing sewers if necessary (including inside drops where they occur), complete invert forming in accordance with the standards and drawings, rubber boots, bedding stone, furnishing and bolting castings to cone, gaskets, parging interior joints, vent pipe if required (see **Standard Detail 732.10**), grade adjustment and grade rings if applicable (see **Standard Detail C06.03**), sawing asphalt and placement of reinforced concrete manhole collar (per details C06.04 and 736.02), flex-seal sealant at grade ring adjustments (see **Standard Detail 732.11**), exterior sealing system (**Standard Detail 732.11**), vacuum testing, backfill and compaction complete in every detail. See **Standard Details 732.01, 732.03, 732.04,** and **732.05**.

Q. **Manholes – Doghouse:**

Measurement: Manholes shall be measured on an each basis for a basic manhole inclusive of frame and cover and a base constructed in accordance with **Standard Detail 732.02**. For all depths in excess of 6 feet, manholes shall be measured by the vertical foot of depth of the manhole constructed in 2-foot increments (e.g. 0 to 6', 6.1' to 8.0', 8.1' to 10.0', etc.). For determining the additional depth of manhole to be paid for at the unit price bid per vertical foot, manholes shall be measured from the invert of the pipe outlet to the top of the manhole frame and cover and recorded to the nearest 1/10 of a foot.

Where more than one type or diameter designation is shown on the drawings, or called for in the special provisions, a separate bid item of the following form shall cover each:

1) Type (or Diameter) Manhole, per each.
2) Depth of Manhole, per vertical foot.
3) Drop Manhole Connection, per vertical foot.

Payment: Doghouse manholes shall be paid for at the contract unit price bid for a 6 foot deep manhole on an each basis plus a unit price per vertical foot for all depths in excess of 6 feet deep, in 2-foot increments (e.g. 0 to 6', 6.1' to 8.0', 8.1' to 10.0', etc.). Price shall include furnishing and constructing manholes complete-in-place including excavation, base construction, complete invert forming in accordance with the standards and drawings, rubber boots if applicable, bedding stone, inside drops where they occur, furnishing and bolting castings to cone if applicable, gaskets, parging interior joints, vent pipe if required (see **Standard Detail 732.10**), grade adjustment and grade rings, if applicable (see **Standard Detail C06.03**), sawing asphalt and placement of reinforced concrete manhole collar (per details C06.04 and 736.02), flex-seal sealant at grade ring adjustments (see **Standard Detail 732.11**), exterior sealing system (see **Standard Detail 732.11**), vacuum testing, backfill and compaction complete in every detail. See **Standard Detail 732.02**.

R. **Manhole Frames and Covers – Standard and Watertight:**

Measurement and Payment: Not a pay item. The cost, setting, and final adjustment of the standard and watertight manhole frames and covers are covered under the cost of the manhole for the type manhole specified. See **Standard Details C06.01** and **735.01**.

S. **Manhole - Precast Concrete Riser Ring:**

Measurement and Payment: Not a pay item. The cost, setting, and final adjustment of manhole grade rings are covered under the cost of the manhole for the type of manhole specified. See **Standard Detail C06.03**.

T. **Measurement of Sewer Pipe**

Measurement: Sewer pipe shall be measured from center to center of manholes and depth of cut from invert to original ground line at centerline. No deductions in length will be made for branches and appurtenances along the line. For all depths in excess of 6 feet, sewer pipe shall be measured by the vertical foot of depth of the line constructed in 2-foot increments (e.g. 0 to 6', 6.1' to 8.0', 8.1' to 10.0', etc.). The Contractor must determine the original ground line immediately prior to any trench excavation. It is the Contractor's responsibility to provide this information to the City within 24 hours of the beginning of the trench excavation activities.

Payment: Sewer pipe shall be paid for at the contract unit price bid for a 6 foot deep line on a per linear foot basis plus a unit price per vertical foot for all depths in excess of 6 feet deep, in 2-foot increments (e.g. 0 to 6', 6.1' to 8.0', 8.1' to 10.0', etc.). Payment will be made at the contract unit price bid per linear foot as stated in the proposal for the type of pipe specified and shall include trench excavation (excluding rock and select fill), shoring or use of trench box, installation, pumping, backfilling, compaction, testing of failed trenches, disposal of excess material, pressure testing, and cleanup complete in place.

U. **PVC Sewer Line**

Measurement: See pay item 1.3.T, Measurement of Sewer Pipe.

Payment: See pay item 1.3.T, Measurement of Sewer Pipe.

V. **Pump Stations**

Measurement: Sanitary sewer lift stations shall be measured based on an each basis.

Payment: Sanitary sewer lift stations shall be paid for at the contract lump sum price bid based on the contract drawings. Payment shall cover complete installation including, but not necessarily limited to, auxiliary generator or Dri-Prime backup pump as applicable, emergency backup pump valved connection, valve vault, fencing and gates, odor control/water tank pad, wetwell and valve vault, pumps, non-freeze yard hydrant, graveled fenced enclosure, access road, shower and eye wash station, water service and meter, electrical service, disconnect, and meter, area light, control panel, manufacturers start up, witness and operational test, operational manuals, etc. complete in place.

W. **Testing:**

Not a pay item. The associated work, materials and labor involved in testing sewer mains and manholes is considered incidental to the cost of the sewer main construction and shall be included in other bid items.

X. **Tunneling:**

Measurement: Tunneling will be measured by the linear feet of tunnel installed.

The tunneling method shall include any and all excavation including disposal of excavated material, shoring and bracing, any backfill, steel liner plates and bolts, ventilation system for workers, lagging, spiders, grout plugs, sand-cement grouting of voids, steel drain pipe, French drain, concrete paved invert, the ends seals, dewatering, clean up, restoration and any other work required for a complete in place installation.

Payment: Tunneling will be paid for at the contract unit price per linear foot for diameter installed by the tunneling cut, complete and acceptable in place. Payment will only be made upon acceptance by the City of Wilson and the Consulting Engineer that the tunnel is installed to the proper elevation and grade and ready for the installation of the designed carrier pipe without any additional compensation. Any deviations, errors, or unacceptable conditions noted by the City of Wilson or the Nashville office of the North Carolina Department of Transportation (if applicable) will be the responsibility of the Contractor to correct to the satisfaction of the above-mentioned parties. Unit price does not include the carrier pipe.

Y. **Other:** Other items shall be paid for as stated in the Proposal.

1.4 STORM DRAINAGE

A. **Catch Basins and Drop Inlets (Precast or Block):**

Measurement: Precast or block catch basins and drop inlets will be measured on an each basis for the specified size and depth shown on the plans.

Payment: Precast or block catch basins and drop inlets will be paid for at the contract unit price per each for the specified size and depth shown on the plans. Price shall include all labor, material, and equipment necessary for installation, backfill, pouring of concrete invert, cutting or sawing, concrete collars, stone, invert forming, iron castings, and mortaring of required components, etc., complete in place, and in accordance with the requirements of paragraphs 3.3 and 3.4 of Section 02630, *Storm Drainage*.

B. **Flared End Section:**

Measurement: Flared end section, will be measured on an each basis.

Payment: Flared end section will be paid for at the contract unit price per each of the size indicated on the drawings and shall include all equipment, labor, materials for installation, excavation, backfill, stone if required, sealing and mortaring, complete in place.

C. **Head/Endwalls:**

Measurement: Head/endwalls will be measured on an each basis.

Payment: Head/endwalls will be paid for at the contract unit price per each of the size and type indicated on the drawings and shall include all equipment, labor, materials for installation, excavation, weep holes, shoring removal and replacement, curing, finishing, backfill, sealing and mortaring, complete in place.

D. **Manholes - Standard:**

Measurement: Storm drainage manholes shall be measured on an each basis for the specified diameter and depth shown on the plans.

Payment: Standard manholes will be paid for at the contract unit price for the specified diameter and depth shown on the plans, complete in place. Price shall include excavation, bedding stone, complete invert pouring and forming of concrete in accordance with the standard details and drawings, iron castings, concrete grade rings (if required), gaskets, backfill, and compaction, etc.

E. **Manhole Frames and Covers – Standard:**

Measurement: Manhole frames and covers are considered incidental to the cost of the precast structure on which it will be placed.

Payment: Not a pay item.

F. **Manhole, Abandonment:**

Measurement: Manhole abandonment will be measured on an each basis.

Payment: Manhole abandonment will be paid for at the contract unit price per each, complete in place, in accordance with the requirements paragraph 3.4 of *Section 02530, Sanitary Sewer*.

G. **Rip Rap, Dry**:

Measurement: Dry rip rap will be measured by the ton.

Payment: Dry rip rap will be paid for at the contract unit price per ton for the size indicated on the drawings and shall include all materials (including Geotextile fabric), labor, and equipment necessary for a complete in place installation.

H. **Rip Rap, Grouted:**

Measurement: Grouted rip rap will be measured by the ton.

Payment: Grouted rip rap will be paid for at the contract unit price per ton for the size indicated on the drawings, with the top 6 inches grouted, and shall include all materials (including geo-textile fabric), labor, and equipment necessary for a complete in place installation.

I. **Storm Pipe; Reinforced Concrete, Corrugated Aluminum, & HDPE**:

Measurement: Storm pipe will be measured from the exact beginning of the pipe to the end of the pipe for the size and class pipe specified.

Payment: Storm pipe will be paid for at the contract unit price per linear foot for pipe of the wall thickness, class, and pipe size specified, complete in place. This price shall include pipe, trench excavation (excluding rock), stone bedding if specified, shoring or use of trench box, installation, pumping, joint compound, backfilling (excluding select fill), compaction, and disposal of excess material.

J. **Other**: Other items shall be paid for as stated in the Proposal.

1.5 EARTHWORK

A. **Geotextile Stabilization Fabric**

Measurement: Geotextile stabilization fabric will be measured in square yards based on surface measurements of material installed. Material waste will not be included in the measurement.

Payment: Geotextile stabilization fabric will be paid for at the contract unit price bid in square yards for the type of material specified on the plans or by the City Engineer and shall include all labor, equipment, materials, lapping, seaming if applicable, waste disposal, etc. necessary for a complete in place installation.

B. **Offsite Borrow:**

Measurement: Off-site borrow will be measured in its original position by cross sectioning the area excavated for borrow. The number of cubic yards will be computed from cross section measurements by the average end method. When it is impractical to measure the borrow, and if approved by the City Engineer, truck tally measurements will be made in accordance with paragraph A of Section 3.11 – *Method of Volume Measurement*, Division 02200 - *Earthwork.*

Payment: Off-site borrow will be paid at the contract unit price per cubic yard for material placed, compacted, and complete in place, including all excavation, loading, hauling, erosion control of borrow source, placement, spreading and compaction of borrow material.

C. **Onsite Borrow:** Material obtained from the site by cut and fill areas or other areas onsite that are designated to be used as borrow material is not a pay item for material but payment will be made by regular excavation.

D. **Unclassified (Regular) Excavation:**

Measurement: Unclassified regular excavation will be measured in its original position by cross sectioning the excavation area. The number of cubic yards will be computed from cross section measurements by the average end method. When it is impractical to measure by cross-section method, other acceptable methods, involving 3-dimensional measurements may be used if approved by the City Engineer.

In cut sections, excavation of topsoil and root mat and material down to subgrade elevation or to a point of 1 foot below the top of existing natural grade or to the depth specified on the plans, which ever is greater, will be measured as regular excavation. When areas of unsuitable material are shown on the plans, excavation 1 foot below the elevation of such material shown on the plans will be measured as regular excavation.

In fill sections, excavation of topsoil and root mat and material down to subgrade elevation or to an elevation of 1 foot below the bottom of topsoil and root mat, whichever is greater, will be measured as regular excavation. When areas of unsuitable material are shown on the plans, excavation down to a point 1 foot below the elevations of such material shown on the plans will be measured as regular excavation.

Payment: Regular excavation will be paid at the contract unit price per cubic yard of excavation and shall include all labor, equipment, and material required, complete in place, including all excavation, loading, moving of cut and fill material, placement, spreading and compaction of material.

E. **Rock Excavation (other than trenches and pits):**

Measurement: Rock excavation will be measured by the City Engineer or his representative in its original position, after which the rock shall be excavated to the depth specified by the City Engineer and then measured by the cubic yard. Rock excavation shall consist of the removal and satisfactory disposal of all materials, which cannot be dislodged and excavated with modern, track-mounted, heavy-duty excavating equipment without drilling, blasting, or ripping. Rock is defined as material which cannot be effectively excavated during general grading with a D-8 or equivalent dozer drawing a new single-tooth ripper. Effective excavation is defined as the ability to remove 10 cubic yards or more of material after one hour of continuous ripping. Typical of materials classified as Rock in Open Excavation are boulders larger than 1-1/2 cubic yards or more in volume, solid rock, rock in ledges, and rock-hard cementitious aggregate deposits.

Payment: Rock excavation will be paid for at the contract unit price per cubic yard for rock excavation and shall include all labor, materials, insurance, mats, signage, traffic control, storage containers, and equipment to excavate and dispose of rock off site.

F. **Classified Excavation (Undercut):**

Measurement: The material shown on the plans as classified excavation (undercut) or determined by the City Engineer to be unsuitable and designated as classified excavation (undercut) and not included in regular excavation will be measured by cross sectioning the undercut area. The number of cubic yards will be computed by average end method. When it is impractical to measure by cross-section method because of erratic locations of isolated deposits, other acceptable methods, involving 3-dimensional measurements may be used if approved by the City Engineer.

Removal and satisfactory disposal of all unsuitable material located below subgrade elevation or 1 foot below the top of the existing natural grade, whichever is greater, 1 foot below the elevation of unsuitable material shown on the plans, or 1 foot below

original ground in fill sections where topsoil and root mat are not required to be removed, will be measured as undercut excavation.

Payment: Classified excavation (undercut) will be paid for at the contract unit price per cubic yard for classified excavation (undercut) and shall include all labor, equipment, and material required, complete in place, including all excavation and disposal of material.

G. **Unclassified Excavation for Widening of Pavement:**

Measurement: Unclassified excavation for widening of pavement along existing paved areas and removal of existing paved areas will consist of the removal and satisfactory disposal of all materials except solid rock and concrete structures necessary for the construction of street widening projects including sidewalk and curb and gutter projects. Measured will be made by cross sectioning the widened area. The number of cubic yards will be computed by average end method. No payment for materials removed without authorization from the City Engineer or beyond the lines and grades set by the City Engineer.

Payment: Unclassified excavation for pavement widening will be paid for at the contract unit price per cubic yard for unclassified excavation for widening of pavement. The price shall include all labor, equipment, and materials, including sawing or cutting the existing pavement or concrete, excavation of and disposal of material, preparing the grade, etc., complete in place.

H. **Unclassified Excavation for Removal of Existing Concrete Structures:**

Measurement: Unclassified excavation for removal of existing concrete structures shall consist of the removal and satisfactory disposal of all materials in concrete structures that may be designated for removal by the City Engineer or shown to be removed on plans. These structures shall include sidewalks, steps, retaining walls, concrete pavement, and other minor structures; measured by the cubic yard in terms of material removed from its original positions. No payment for materials removed without authorization from the City Engineer or beyond the lines and grades set by the City Engineer.

Payment: Unclassified excavation for removal of existing concrete structures will be paid for at the contract unit price per cubic yard for unclassified excavation for the type listed. The price shall include all labor, equipment, and materials necessary to remove and dispose of, off site, any required structures, complete in place, including sawing or cutting the existing concrete if required.

I. **Other: Other items shall be paid for as stated in the Proposal.**

1.6 BASE COURSE & PAVING

A. **Adjusting Manholes and Valves for Resurfacing:**

Measurement: Manhole and valve box adjusting will be measured on an each basis for the type of structure adjusted.

Payment: Manhole and valve box adjusting by the method of removing and adjusting the frame and cover. Manholes shall be adjusted as shown on **Standard Detail C06.03**. Manhole and valve box adjustments will be paid for at the contract unit price per each for adjusting manholes and valves, and shall include all labor, equipment, materials (inclusive of concrete grade rings for manholes), feathering asphalt to castings if necessary, etc. for a complete in place installation.

B. **Aggregate Base Course:**

Measurement: Aggregate base course will be measured by the ton (or, if approved by the City Engineer, in square yards of the thickness as shown on the plans). The quantity shall be determined on scales equipped with a dial and an automatic printer, all of which have been approved and sealed in accordance with Section 106-7, *Scales and Public Weighmaster,* NCDOT *Standard Specifications for Roads and Structures*, latest revision.

Payment: **Payment**: Aggregate base course will be paid at the contract unit price bid per ton for ABC (or by the square yards of a specified depth as shown on the plans, if approved by the City). Price shall include all material, equipment, and labor required to furnish and install the stone, complete in place.

C. **Asphalt Concrete Pavement:**

[Pay: By the ton using Terminal Prices for adjustment]

Measurement: Asphalt concrete pavement shall be measured by the actual number of tons of plant mix completed and accepted on the job. Measurement for all roadways will be based on plan quantities and field measurements, verified by tonnage tickets unless otherwise directed by the City Engineer. At the discretion of the City Engineer, coring's at quarter points of the street cross-section may be requested to verify thickness and density of asphalt.

Payment: Asphalt concrete pavement will be paid for at the "Contract Unit Price" bid per ton for the type of asphalt concrete specified. However, the "Contract Unit Price" per ton will be adjusted to account for variations either up or down in the price of asphalt binder from a "Base Price Index" to yield an "Adjusted Contract Unit Price." The "Adjusted Contract Unit Price" is the price paid at the time the paving/work is placed or performed. The "Adjusted Contract Unit Price" shall be full compensation for asphalt concrete pavement, complete in place, including all materials, labor, tools, equipment, tack coat, maintenance of traffic, and all other incidentals necessary. Adjusting manholes, cleanouts, valve boxes, etc. will be paid separately at the bid price for each when adjusted by the Contractor. Payment will be made on a per ton basis.

PRICE ADJUSTMENT - ASPHALT BINDER FOR PLANT MIX:

When it is determined that the monthly selling price of asphalt binder on the first business day of the calendar month during which the last day of the partial payment period occurs varies either upward or downward from the "Base Price Index," the "Contract Unit Price" for asphalt binder for plant mix will be adjusted.

The "Base Price Index" provided for asphalt binder for plant mix, per ton, shall be used to compute the "Adjusted Contract Unit Price." The "Base Price Index" to be included in a proposal/contract along the applicable date will be the Monthly Price Index in effect 2 months prior the month in which the contract is let. The "Base Price Index" will remain fixed throughout the life of the contract. This "Base Price Index" represents an average of F.O.B. selling prices of asphalt binder at supplier's terminals.

Price adjustments for asphalt binder for plant mix will be made in accordance with Section 620 of the NCDOT *Standard Specifications.*

[BIDDING NOTE: In preparation of the bid documents, the City must indicate the "Base Price Index" for asphalt binder for plant mix per ton in the form of proposal. Along with this price, show the date of the selling prices of asphalt binder at supplier's terminal. The price and date is obtained from the NCDOT's website and then inserted into the bid documents.]

The following is a link to the NCDOT website showing the terminal price:

https://connect.ncdot.gov/projects/construction/Pages/Pavement-Construction-Prices.aspx

D. **Asphalt Concrete Paved Flumes, Walks, etc.:**

Measurement: Asphalt concrete paved flumes, walks, etc. will be measured in square yards for a depth of 4 inches.

Payment: Asphalt concrete paved flumes, walks, etc. will be paid for at the contract unit price bid in square yards for a depth of 4 inches and shall be installed in accordance with applicable NCDOT details and specifications, including all labor, equipment, and materials necessary for a complete in place installation.

E. **Asphalt Surface Treatment:**

Measurement: Per square yard of area covered.

Payment: Asphalt surface treatment will be paid per square yard of area covered. This price shall include all labor, equipment, and materials to furnish and install, complete in place.

F. **Foundation Stone:**

Measurement: Foundation stone for roadways will be measured by the cubic yard of foundation stone placed.

Payment: Foundation stone, if approved by the City Engineer, will be paid for at the contract unit price for foundation stone by the cubic yard. Price shall include removal and disposal of unusable material and placement of stone, complete in place.

G. **Manhole and Valve Box Adjustment with Iron Riser Rings (for Resurfacing) – Preferred Method:**

Measurement: Manhole and valve box iron riser adjusting rings are required for resurfacing and measured on an each basis with no regard to ring size (1", 1 ½" or 2").

Payment: Manhole and valve box adjustments for resurfacing will be paid on an each basis for the type of riser ring frame installed at the contract unit price and shall include all labor, material, and equipment necessary to install a riser ring, saw cutting the existing/new asphalt after paving, and placement of a reinforced concrete manhole or valve collar (per details C06.04, C06.05, 516.02, and 736.02, as applicable), complete in place.

H. **Manhole Adjustment with Precast Concrete Manhole Riser Rings (for Resurfacing):**

Measurement: When required or ordered by the City Engineer to be raised/adjusted with concrete riser rings, manhole frames and covers, shall be measured per manhole based on Standard Detail C06.03.

Payment: Manhole adjustment , as shown on **Standard Detail C06.03**, will be paid at the contract unit price per manhole and shall include all labor, material, and equipment necessary to raise the existing frame, and once paved, saw cutting the existing/new asphalt and placement of a reinforced concrete manhole collar (per details C06.04 and 736.02), complete in place.

I. **Manhole and Valve Box Replacement for Resurfacing:**

Measurement: Manhole and valve box replacement will be measured on an each basis for the type of frame installed.

Payment: Manhole and valve box replacement for resurfacing will be paid on an each basis for the type of frame installed at the contract unit price and shall include all labor, material, and equipment necessary to remove and install a new frame, saw cutting the existing/new asphalt and placement of a reinforced concrete valve collar (per details C06.05 and 516.02).complete in place.

J. **Pavement Repair or Street Rehab:** This item shall cover pavement repair in areas where it becomes necessary to remove and replace the existing pavement in failed areas or areas where patching is required as part of roadway work or in locations as otherwise requested by the City Engineer.

Measurement: Work and materials for pavement repair will be measured in the following manner.

1). **Unclassified excavation for pavement repair** will be measured in cubic yards of pavement, temporary maintenance stone, or other unclassified material removed.

2). **Aggregate base stone for pavement repair** will be measured in square

yards, generally 6 inches deep, but thickness shall be as shown on the plans or as directed by the City Engineer.

3). **Asphalt base (B 25.0X) for pavement repair** (when specified) will be measured by the ton (see paragraph 1.6C, above). The thickness is generally 4 inches deep, but thickness shall be as shown on the plans or as directed by the City Engineer.

4). **Asphalt surface (S 9.5B) for pavement repair** will be measured by the ton (see paragraph 1.6C, above). The thickness is generally 3" deep, but thickness shall be as shown on the plans or as directed by the City Engineer.

5). **Surface treatment for surface treated pavement repair** will be measured in square yards.

6). **Temporary pavement repair** will be measured in terms of square yards consisting of a combination of material as defined in these specifications.

Payment: Work and materials for pavement repair will be paid for in the following manner.

1). **Unclassified excavation for pavement repair** will be paid for at the contract unit bid price per cubic yard. This price shall include all labor, equipment, and material to saw-cut, excavate, remove and dispose of material, and all work and grading to prepare the surface for paving, complete in place.

2). **Aggregate base stone for pavement repair** will be paid for at the contract unit price bid per square yard generally 6 inches deep, but thickness shall be installed according to the plans for ABC. This price shall include all labor, equipment, and material necessary to furnish and install the stone, complete in place.

3). **Asphalt base (B 25.0X) for pavement repair** will be paid for at the contract unit price bid per ton (see paragraph 1.6C, above) for the type of base mix as shown on the plans or as directed by the City Engineer. This price shall include all labor, materials, and equipment, including tack, necessary to furnish and install the asphalt, complete in place. Core samples shall be taken by the Contractor in areas directed by the City. The average depth of the asphalt will be determined from these samples. The unit price paid will be reduced proportionately for each 1/8 inch thickness below the specified thickness. Thicknesses less than 75% of that specified shall receive an additional overlay at the minimum depth recommended by NCDOT for the type of asphalt specified for this project. No additional payment will be made for thicknesses greater than that designed.

4). **Asphalt surface (S9.5B) for pavement repair** will be paid for at the contract unit price bid per ton (see paragraph 1.6C, above) for a particular thickness and type as shown on the plans or as directed by the City Engineer. This price shall include all labor, materials, and equipment, including tack, necessary to furnish and install the asphalt, complete in place. Core samples shall be taken by the Contractor in areas directed by the City. The average depth of the asphalt will be determined from these samples. The unit price paid will be

reduced proportionately for each 1/8 inch thickness below the specified thickness. Thicknesses less than 75% of that specified shall receive an additional overlay at the minimum depth recommended by NCDOT for the type of asphalt specified for this project as the surface course. No additional payment will be made for thicknesses greater than that designed.

5). **Surface treatment for surface treated pavement repair** will be paid for at the contract unit price bid per square yard for surface treatment for pavement repair. This price shall be full compensation for one prime coat and two seal coats, complete in place.

6). **Temporary pavement repair** will be paid for at the contract unit price bid per square yard for temporary pavement repair. This price shall include aggregate stone to the depth specified on the plans, seal coat, and cold patch, as defined in these specifications and all labor, materials and equipment necessary, complete in place.

K. **Pavement Profiling - Milling:**

Measurement: Pavement profiling will be measured in square yards for the first 2 inches and then by the square yard for each additional inch of depth of material profiled and removed thereafter.

Payment: Pavement profiling will be paid for at the contract unit price bid per square yards for the first 2 inches and then by the square yard for each additional inch of depth and shall include all labor, materials, and equipment necessary to remove and dispose of the material, complete in place.

L. **Petro-mat, or approved equal:**

Measurement: Petro-mat, or approved equal, will be measured in square yards based on surface measurements of area covered.

Payment: Mat will be paid for at the contract unit price bid in square yards for the type of material specified in these specifications and shall include all labor, equipment, and materials necessary for a complete in place installation.

M. **Portland Cement Treated Aggregate:**

Measurement: Portland cement treated aggregate will be measured in square yards of material with thickness as shown on the plans or as directed by the City Engineer.

Payment: Portland cement treated aggregate will be paid at the contract unit price bid for square yards with thickness as shown on the plans or as directed by the City Engineer. This price shall include all material, equipment, and labor required to furnish and install the Portland cement treated aggregate, complete in place.

N. **Prime Coat** (when specified by City Engineer)**:**

Measurement: Liquid asphalt material will be measured by the gallon.

Payment: Liquid asphalt material will be paid for at the contract unit price bid per gallon. This price shall include all labor, equipment, and materials to furnish, install, and maintenance of the treatment until surface course is applied, complete in place.

O. **Tack Coat: (Not a pay item, incidental to other items bid)**

1.7 CURB & GUTTER, DRIVEWAYS, SIDEWALKS, AND MISCELLANEOUS CONCRETE ITEMS

A. **New Concrete Sidewalk, 4 inches thick:**

Measurement: New sidewalk shall be measured per square yard of finished concrete at the width and depth specified in the contract.

Payment: New sidewalk shall be paid for at the contract unit price bid per square yard of finished concrete. This price shall include all labor, equipment, and material for excavation (includes grading), excess spoil removal, backfilling, expansion joint material, formwork, finishing, curing, etc. for a complete in place installation, as shown on **Standard Detail 404.03** and installed at the locations as shown on the construction drawings and/or as directed by the City Engineer.

B. **Replacement of Concrete Sidewalk:**

Measurement: Replacement of sidewalk will be measured per square yard of finished concrete.

Payment: Replacement of sidewalk will be paid for at the contract unit price bid per square yard at a depth specified in the contract. This price shall include all labor, equipment, and material for excavation (includes grading), excess spoil removal, removal and disposal of existing sidewalk, backfilling, expansion joint material, formwork, finishing, curing, etc. for a complete in place installation as shown on **Standard Detail 404.03** and installed at the locations as shown on the construction drawings and/or as directed by the City Engineer.

C. **New Concrete Driveways and Entrances:**

Measurement: New concrete driveways and entrances per design thickness will be measured in square yards of finished concrete.

Driveways formed in conjunction with standard curb, and curb and gutter, shall be measured in square yards as follows:

1) Residential Drives (**Standard Detail 404.01**):
    i. The width shall be taken as the average width (i.e. drive width at the right of way plus 5 feet; allowing for taper width at back of curb).
    ii. The length shall be measured from the back edge of the driveway at the right-of-way or the back edge of the driveway shown on the plans, as applicable, to the back edge of the curb extended.

2) Commercial Drives (**Standard Detail 404.02**):

The area shall be computed based on the radii shown on the plans and confined between the back edge of the curb extended and either the right-of-way or the back edge of the driveway shown on the plans, as applicable.

Payment: New concrete driveways and entrances will be paid for at the contract unit price bid per square yard at a depth as specified in the design. This price shall include all labor, equipment, and material for excavation (includes grading), excess spoil removal, backfilling, expansion material, formwork, finishing, curing, etc. for a complete in place installation, as shown on **Standard Details 404.01** and **404.02** and installed at the locations as shown on the construction drawings and/or as directed by the City Engineer.

D. **Replacement of Concrete Driveways and Entrances:**

Measurement: Replacement of concrete driveways and entrances will be measured in square yards of finished concrete.

Driveways formed in conjunction with standard curb, and curb and gutter, shall be measured in square yards as follows:

1) Residential Drives (**Standard Detail 404.01**):
   i. The width shall be taken as the average width (i.e. drive width at the right of way plus 5 feet; allowing for taper width at back of curb).
   ii. The length shall be measured from the back edge of the driveway at the right-of-way or the back edge of the driveway shown on the plans, as applicable, to the back edge of the curb extended.

2) Commercial Drives (**Standard Detail 404.02**):
   The area shall be computed based on the radii shown on the plans and confined between the back edge of the curb extended and either the right-of-way or the back edge of the driveway shown on the plans, as applicable.

Payment: Replacement of concrete driveways and entrances will be paid for at the contract unit price bid per square yard at depth as specified in the design. This price shall include all labor, equipment, and material for excavation, removal and disposal of existing concrete, backfilling, expansion material, formwork, finishing, curing, etc. for a complete in place installation as shown on **Standard Details 404.01** and **404.02** and installed at the locations as shown on the construction drawings and/or as directed by the City Engineer.

E. **New Concrete Curb and Gutter, City Standard (See Standard Detail 402.01):**

Measurement: New concrete curb and gutter, City standard will be measured per linear foot along the face of the curb for the entire length of the work including portion of curb shaped for curb ramps and through driveways for the type curb and gutter installed.

Payment: New concrete curb and gutter, City standard will be paid for at the contract unit price per linear foot and shall include all labor, equipment, and material for excavation, grading, formwork, stone bedding, backfilling, expansion material, finishing, curing, etc. for a complete in place installation as shown on the **Standard**

Detail 402.01 and installed at the locations as shown on the construction drawings and/or as directed by the City Engineer.

F. **Replacement of Concrete Curb and Gutter, City Standard (See Standard Detail 402.01):**

Measurement: Replacement of concrete curb and gutter, City standard will be measured per linear foot along the face of the curb for the entire length of the work including portion of curb shaped for curb ramps and through driveways for the type of curb and gutter installed.

Payment: Replacement of concrete curb and gutter will be paid for at the contract unit price bid per linear foot. This price shall include all labor, equipment, and material for excavation, removal and disposal of existing concrete, backfilling, stone bedding, expansion material, formwork, finishing, curing, etc. for a complete in place installation as shown on **Standard Detail 402.01** and installed at the locations as shown on the construction drawings and/or as directed by the City Engineer.

G. **Vertical Concrete Curb:**

Measurement: Vertical concrete curb will be measured in linear feet along the face of the curb including curb ramps and driveway openings.

Payment: Vertical concrete curb will be paid in linear foot the contract unit price for 6"X12" curb. Prices shall include all labor, equipment, and material for excavation, formwork, stone bedding, backfilling, expansion joint material, finishing, curing, etc. for a complete in place installation and installed at the locations as shown on the construction drawings and/or as directed by the City Engineer.

H. **Concrete Curb Ramp:**

Measurement: Concrete curb ramps will be measured per ramp for the type ramp designated.

Payment: Concrete curb ramps will be paid for at the contract unit price bid per ramp. This price shall include all labor, equipment, and material for excavation, removal and disposal of existing concrete, backfilling, stone bedding, expansion material, formwork, finishing, detectable warning surface, curing, etc. for a complete in place installation as shown on the standard details and installed at the locations as shown on the construction drawings and/or as directed by the City Engineer.

I. **Formed Concrete for Retaining Walls, Piers, Steps, and other misc. Concrete Structures:**

Measurement: Formed concrete for retaining walls, piers, steps, and other misc. concrete structures will be measured per structure specified on the drawings or applicable details.

Payment: Formed concrete for retaining walls, piers, steps, and other misc. concrete structures will be paid for at the contract unit price bid per structure, complete in place. All backfilling will be included in bid price for concrete. Payment will be made only for the quantities and dimensions as shown on drawings or applicable details.

J. **Concrete Paved Ditches:**

Measurement: Concrete paved ditches will be measured per square yard of paved ditch based on measurements as defined on the applicable details or construction drawings, at the thickness specified

Payment: Concrete paved ditches will be paid for at the contract unit price per square yard and shall include all labor, equipment, and material for excavation, formwork, stone bedding, backfilling, expansion material, finishing, curing, etc. for a complete in place installation and installed at the locations as shown on the construction drawings and/or as directed by the City Engineer, at the thickness specified.

K. **Tree Well in Sidewalk :**

Measurement: Tree wells will be measured on an each basis.

Payment: Tree wells will be paid for at the contract unit price per each and shall include all labor, equipment, and materials to install the tree well, complete in place.

L. **Wheel Bumpers:**

Measurement: Wheel bumpers will be measured on an each basis.

Payment: Wheel bumpers will be paid for at the contract unit price per each and shall include all labor, equipment, and materials to install the wheel block, complete in place.

1.8 ITEMS MISCELLANEOUS TO ALL SECTIONS

A. **Clearing and Grubbing Wooded Areas:**

Measurement: Measurement for clearing and grubbing will be by the acre. The disturbance shall not exceed width as defined in the construction limits criteria.

Payment: Price per acre for clearing and grubbing in wooded areas shall include all material, equipment, and labor required to clear and grub wooded areas in accordance with these specifications. The price shall also include the removal and disposal of items.

B. **Construction Entrance**

Measurement: Construction entrance for erosion control will be measured on an each basis. Size and depth of stone shall be based on the dimensions, type and depth of stone as specified in the NCDENR, Land Quality Section *Erosion and Sediment Control Planning and Design Manual*, latest revision.

Payment: Construction entrance for erosion control will be paid for at the contract unit price per each and shall include all materials, stone, including Geotextile fabric, labor, and equipment necessary for a complete in place installation as well as maintenance.

C. **Flowable Fill Concrete:**

Measurement: Measurement shall be by the cubic yard of concrete placed, regardless of the specified strength.

Payment: Paid for in place by the cubic yard.

D. **Incidental Stone (ABC)**

Measurement:

1. **Incidental stone aggregate** (ABC) will be measured by the ton that has been stockpiled or incorporated into the completed and accepted work; verified by weight tickets. The aggregate will be measured at the quarry by being weighed in trucks on certified platform scales or other certified weighing devices. Weight tickets shall list the date ticket was issued, the location of the quarry or plant where material came from, and the tonnage loaded/delivered. No deductions will be made for any moisture contained in the aggregate at the time of weighing.

   Incidental stone base which has been stockpiled and cross-sectioned or stockpiled and verified by weight tickets will not be measured more than one time.

   When incidental stone is placed in a stone base, this quantity will be measured as provided in paragraph 2, below.

2. **Incidental Aggregate placed in a base course** will be measured by the ton; verified by weight tickets, for the actual number of tons of aggregate which has been incorporated into the completed and accepted work (see paragraph 1 for quarry/weight ticket requirements). Maintenance, repair and restoration of the base course and subgrade is incidental to the work of this section. If segregation during handling, hauling or placing occurs and the Engineer requires a change in methods or mixing on the road to correct this segregation, this work will be incidental to the work of this section. Removal and replacement of aggregate which is contaminated with foreign materials or outside the gradation limits will be incidental to the work of this section.

Payment: Paid at the contract unit price per ton for incidental stone aggregate.

E. **Silt Fence Barrier:**

Measurement: Silt fence barrier for erosion control will be measured by the linear foot.

Payment: Silt fence barrier for erosion control will be paid for at the contract unit price per linear foot and shall include all material, labor, and equipment necessary for a complete in place installation. The price shall also include the removal, maintenance, and disposal of silt fence upon stabilization of ground cover.

F. **Segmental Retaining Walls (SRW)**

Measurement: The unit of measurement for furnishing and fabricating the SRW shall be the vertical square foot of wall surface from the top of the leveling pad to the top of

the wall or wall coping. Guardrails, barriers, and handrails shall be measured separately.

Payment: The accepted quantities of SRW will be paid at the contract unit price, which shall be full compensation for design (if applicable), testing, equipment, tools, labor, and installation of the SRW including face units, caps, leveling pad (stone or concrete), subgrade preparation, unclassified excavation, classified excavation (Undercut), unit drainage fill, soil reinforcement, pins (if applicable), steel tie-backs, steel reinforcing (if applicable), and reinforced backfill and other miscellaneous materials necessary for a complete installation. Foundation stone and off-site select granular borrow will be paid separately.

G. **SRW - Granular fill for**

Measurement: The quantities of off-site granular borrow for backfill material hauled in and placed in the reinforced earth zone will be measured in cubic yards.

Payment: For Contractor furnished granular backfill material for the reinforced earth zone, the Contractor will be paid for the quantity of material furnished, hauled, placed, and compacted for the contract unit price per cubic yard.

H. **SRW - Excavation**

Measurement: Excavation for preparing the reinforced earth zone for construction is considered incidental to the wall construction.

Payment: Not a pay item.

I. **Sodding, Fertilizing, Seeding and Fine Grading:**

Measurement:

1. **Seeding:** Measurement of surfaces to be seeded shall be measured by the acre for the class specified.

2. **Sodding:** Measurement of surfaces sodded shall be measured by the square yard for the type grass specified.

3. Sodding, fertilizing, seeding, and fine grading shall be provided as described section in Section 02920, *Seeding, Sodding, and Groundcover.* Extra compensation will not be made for additional seeding beyond all limits of construction as defined in applicable section.

Payment:

1. **Seeding:** Payment for fine grading, fertilizing, and seeding will be made at the contract unit price per acre for fine grading, fertilizing, and seeding as described in Section 02920, *Seeding, Sodding, and Groundcover.*

2. **Sodding:** Payment for fine grading, sodding, and required soil amendments will be at the contract unit price per square yard for sodding, fine grading, and soil amendments as described in Section 02920, *Seeding, Sodding, and Groundcover.*

3. No compensation will be made for reseeding, if required. The cost of restoring areas located beyond the designated area(s) shall be borne by the Contractor.

J. **Temporary Access or Haul Roads**

Measurement: Any grading or excavation required for equipment travel during the course of construction as well as erosion control, removal, restoration, seeding and ground cover shall be included in other items bid.

Payment: Included in other items bid. Not a pay item.

K. **Work Zone Traffic Control**:

Work Area Traffic Control shall conform to the both the MUTCD, latest revision and Section 1089 *Traffic Control* of the NCDOT Specifications for Roadways and Structures, latest edition.

Measurement: Lump Sum for all Work Area Traffic Control.

Payment: Payment shall be Lump Sum and shall include all devices such as signage (conforming to the MUTCD), barricades, flaggers if needed, reflective garments, lights, light towers if needed, arrow boards, channelizing devices, drums, cones, message boards, temporary crash cushions, attenuators, etc., and all other items shown on the approved traffic control plan. Payment shall include cost of the development of a Traffic Control Plan (if applicable), labor and equipment, safety officer, set up, phasing, take-down and maintenance. Payment will be made at the contract lump sum price for Work Area Traffic Control.

Temporary pavement markings and portable concrete barriers are excluded and, if needed, will be paid as a separate line item.

L. **Undercut Excavation:**

Measurement: The material shown on the plans as undercut excavation or determined by the City Engineer to be unsuitable and designated as undercut excavation, and not included in regular excavation, will be measured by cross sectioning the undercut area. The number of cubic yards will be computed by average end method. When it is impractical to measure by cross-section method because of erratic locations of isolated deposits, other acceptable methods, involving 3-dimensional measurements may be used if approved by the City Engineer.

Removal and satisfactory disposal of all unsuitable material located below subgrade elevation or 1 foot below the top of the existing natural grade, whichever is greater, 1 foot below the elevation of unsuitable material shown on the plans, or 1 foot below original ground in fill sections where topsoil and root mat are not required to be removed, will be measured as undercut excavation.

Payment: Undercut excavations will be paid for at the contract unit price per cubic yard for undercut excavation and shall include all labor, equipment, and material required, complete in place, including all excavation and disposal of material.

END OF SECTION 00950

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02200 – EARTHWORK

(Last revised ~~5/18/10~~, 9/18/19) R1

SELECTED LINKS TO SECTIONS WITHIN THIS SPECIFICATION

Part 1 – General
Part 2 – Products
Part 3 – Execution
Cleanup
Clearing and Grubbing
Compaction – Frequency
Compaction Requirements
Earthwork Volume Measurement
Geotextile Fabric
NPDES
Placement Soil Stab Fabric
Quality Assurance/Quality Control
Rock Definition – Open Excavation
Rock Excavation
Subgrade Preparation
Testing Frequency
Undercut Excavation, Definition

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Requirements and Supplementary Conditions applicable to this specification.

B. Section 00950 – Measurement & Payment

C. Section 02275 – Trenching, Backfilling, and Compaction of Utilities

D. Section 02510 – Water Distribution

E. Section 02530 – Sanitary Sewer

F. Section 02630 – Storm Drainage

G. Section 02632 – Segmental Concrete Retaining Wall System

H. Section 02920 – Seeding, sodding, and Groundcover

I. NCDEQ Division of Energy, Mineral, and Land Resources, Land Quality Section's "Erosion and Sedimentation Control Planning and Design Manual" latest revision.

J. City of Wilson *Pre-Approved Material/Product List*

K. City of Wilson *Right-of-Way Regulations and Procedures*, latest edition

1.2 SUMMARY

A. This section includes:

1) Site clearing and grubbing.

2) Stripping and stockpiling topsoil.

3) Excavation and embankment placement.

4) Preparing subgrades for pavements, walks, curb & gutter, and turfed areas.

B. Construction and materials related to this section but covered elsewhere:

1) Erosion Control: North Carolina Sediment Control Law.

1.3 DEFINITIONS

For the purposes of this specification, the following definitions refer to earthwork that comes under the authority of the City of Wilson as specified within this division and other divisions of this manual.

A. **Borrow**: Borrow shall consist of approved fill material imported from off-site.

B. **City Engineer**: The City Engineer or his designated representative.

C. **Clearing**: Clearing shall consist in the felling, cutting up, and satisfactory disposal of trees and other vegetation designated for removal in accordance with these specifications.

D. **Competent Person**: Competent Person means one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.

E. **Contractor**: Refers to a Contractor licensed in the State of North Carolina to perform grading and earthwork construction.

F. **Fill (in terms of volume)**: In terms of volume, fill is defined as a compacted post-construction volume in-place.

G. **Easement**: An instrument that depicts/describes and conveys rights and privileges to the City for the placement, access to and maintenance of a utility line across and/or on the property of a second party. Ownership of the land remains with the second party.

H. **Grubbing**: Grubbing shall consist of the removal of roots 1 ½ inch and larger, organic matter, debris and stumps and the disposal thereof.

I. **Classified Excavation (undercut)**: Classified excavation shall consist of the removal and satisfactory disposal of all unsuitable material located below subgrade elevation. Where excavation to the finished grade section results in a subgrade or slopes of muck, peat, matted roots, etc., the Contractor shall remove such material below the grade shown on the plans or as directed; and areas so excavated shall be backfilled with approved select fill or stone as ordered by the City Engineer. See also paragraph P, Unclassified Excavation.

J. **Rock in Open Excavation**: All boulder, solid ledges, bedded deposits, unstratified masses, and conglomerations of material so firmly cemented as to possess the characteristics of solid rock. Rock in open excavations includes removal and disposal on-site of materials and obstructions encountered in general excavation other than trenches and pits that cannot be dislodged and excavated with modern, track-mounted, heavy-duty excavating equipment without drilling, blasting, or ripping. Rock is defined as material which cannot be effectively

excavated during general grading with a D-8 or equivalent dozer drawing a new single-tooth ripper. Effective excavation is defined as the ability to remove 10 cubic yards or more of material after one hour of continuous ripping. Typical of materials classified as Rock in Open Excavation are boulders larger than 1-1/2 cubic yards or more in volume, solid rock, rock in ledges, and rock-hard cementitious aggregate deposits.

K. **Rock Excavation for Trenches and Pits**: Rock excavation for trenches and pits includes removal and disposal off-site of materials and obstructions encountered that cannot be practically excavated with a track-mounted power excavator, equivalent to a Caterpillar Model No. 325 or equivalent equipped with new rock teeth. Practical excavation is defined as the ability to remove at least 30 cubic yards during one hour of continuous digging. Trenches in excess of 10 feet in width and pits in excess of 30 feet in either length or width are classified as open excavation.

L. **Select Fill Material**: Nonplastic material, free of organic material, used as foundation for subbase, shoulder surfacing, fill, backfill, or other specific purposes.

M. **Structures**: Incidental 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.

N. **Subgrade**: Surface or elevation remaining after completing the excavation, or top surface of a fill or backfill immediately below subbase or topsoil materials, as applicable.

O. **Topsoil**: See Section 02920 – *Seeding, Sodding, and Groundcover.*

P. **Unclassified Excavation**: Removal and disposal of any and all material above subgrade elevation or within the 12 inches of existing natural grade, whichever is greater, except solid rock and undercut excavation, located within the limits of construction.

1.4 SUBMITTALS

A. Submit product data and a sample of separation fabric and fully document each with specific location or stationing information, date and other pertinent information.

B. **Material Test Reports**: Provide from a qualified testing agency test results and interpretation for compliance of the following requirements indicated:

1) Classification according ASTM D2487 of each on-site or borrow soil proposed for backfill, unless otherwise directed by the City Engineer.

2) Laboratory compaction curve according to ASTM D698 for each on-site or borrow soil material proposed for fill or backfill.

3) Laboratory compaction curve according to ASTM D1557 for each on-site borrow soil material proposed for fill and backfill.

C. **Blasting**:

1) Insurance Certificate naming the City of Wilson as "Additional Insured." See paragraph 3.4 – Rock for other blasting insurance requirements.

2) Qualifications, proposed procedures, and schedule shall be submitted at least 2 weeks prior to commencing any blasting operations.

3) Permits from City and local Fire Department and City officials.

4) Blasters shall, at all times, have their license and blasting permits on the job site, and shall allow examination of same by any official that may have jurisdiction.

5) If required by the City Engineer, seismic survey agency report, for record purposes.

D. **Product Data**:

1) Stabilization/Separation fabric

1.5 TESTING SERVICES

A. The Testing Laboratory shall be approved by the City Engineer and will be responsible for conducting and interpreting tests. The Testing Laboratory shall state in each report whether or not the test specimens conform to all requirements of the Contract Documents and specifically note any deviation.

B. Specific test and inspection requirements shall be as specified herein.

1.6 QUALITY ASSURANCE

A. **Geotechnical Testing Agency Qualifications**: An independent testing agency qualified according to ASTM E329 to conduct soil materials and rock-definition testing as documented according to ASTM D3740 and ASTM E548. Testing Lab to be AMRL (AASHTO Materials Reference Laboratory) and CCRL (Cement and Concrete Reference Laboratory) certified.

B. Comply with all codes, laws, ordinances, and regulations of governmental authorities having jurisdiction over this part of the work.

C. NCDEQ Division of Energy, Mineral, and Land Resources, Land Quality Section's "Erosion and Sedimentation Control Planning and Design Manual" latest revision.

D. Comply with applicable requirements of NFPA 495, *"Explosive Materials Code."*

1.7 QUALITY STANDARDS

A. Materials and operations shall comply with the latest revision of the Codes and Standards listed below:

American Society for Testing and Materials

ASTM C33 Concrete Aggregates

ASTM C136 Standard Test Method for Sieve Analysis of Fine and

Coarse Aggregates Sieve Analysis of Fine and Coarse Aggregate

ASTM D422 Standard Test Method for Particle-Size Analysis of Soils (for classification purposes only)

ASTM D698 Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3) (Standard Proctor).

ASTM D1556 Standard Method of Test for Density of Soil in Place by the Sand-Cone Method

ASTM D1557 Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3) (Modified Proctor)

ASTM D1883 Standard Test Method for CBR (California Bearing Ratio) of Laboratory-Compacted Soils

ASTM D2049 Standard Method of Test for Relative Density of Cohesionless Soils

ASTM D2167 Standard Method of Test for Density of Soil in Place by the Rubber-Balloon Method

ASTM D2487 Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).

ASTM D2922 Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

ASTM D2937 Standard Test Method for Density of Soil in Place by the Drive-Cylinder Method

ASTM D4253 Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table.

ASTM D4254 Test Method for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density.

ASTM D4318 Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

American Association of State Highway & Transportation Officials

AASHTO T99 The Moisture-Density Relations of Soils using a 5.5-pound Rammer and a 12-inch drop.

AASHTO M145 The Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes.

AASHTO T180 The Moisture Density Relations of Soils using a

	10-pound Rammer and an 18-inch drop.
AASHTO T191	Density of Soil In-Place by the Sand-Cone Method
AASHTO T204	Density of Soil In-Place by the Drive Cylinder Method – Replaced by ASTM D2937
AASHTO T205	Density of Soil In-Place by the Rubber-Balloon Method – Replaced by ASTM D2167

1.8 STANDARD ABBREVIATIONS

AASHTO	American Association of State Highway & Transportation Officials
ANSI	American National Standards Institute
AREA	American Railway Engineers Association
ASTM	ASTM International, formerly *American Society for Testing and Materials*
EPA	Environmental Protection Agency
MSDS	Material Safety Data Sheets
MUTCD	Manual on Uniform Traffic Control Devices
NCDEQ	NC Department of Environment Quality
NCDOT	North Carolina Department of Transportation
NPDES	National Pollutant Discharge Elimination System
OHSA	Occupational Safety and Health Administration
PWS	NCDEQ, Water Resources, Public Water Supply
USACE	United States Army Corps of Engineers

1.9 PROJECT CONDITIONS

A. **Demolition**: Demolish and completely remove from the site existing utilities, structures or surface features indicated on the plans to be removed. Coordinate with applicable utility companies to shut off services if lines are active.

B. **Environmental** - Wetlands: Before crossing or entering into any jurisdictional wetlands, Contractor shall verify whether or not a wetlands permit has been obtained for the encroachment and whether special restrictions have been imposed. Care shall be taken to prevent draining or otherwise destroying non-permitted wetlands. Restore as stated on either the project drawings, the contract documents, and/or as noted in the permit. All crossings, disturbance, and encroachments into wetlands shall be subject to USACE and NCDEQ Division of Water Resources approval and permitting requirements and conditions.

C. **Environmental - Buffer Crossing Requirements**: Before crossing streams or ditches or working within 50 feet of ponds, lakes, or rivers, the Contractor shall verify whether the project is exempt or if a permit has been obtained to encroach into such buffers or other such regulated waters, and to what extent work is permitted to occur. Unless otherwise permitted, shown on the contract drawings, or exempted by NCDEQ, roadways crossing stream, river, pond, or lake buffers are to be as near perpendicular as possible (the crossing is considered to be perpendicular if it intersects the stream or surface water between an angle of 75 and 105 degrees). Do not disturb more than 40 linear feet (longitudinal) of riparian buffer without approval from NCDEQ. When permitted to encroach into zone one of a buffer (the lower 30 feet beside the stream or water), adhere to all of the following Best Management Practices during construction.

1) Woody vegetation is cleared by hand. No grading allowed.
2) Stumps to remain except in trench where trees are cut. Minimize disturbance to roots in buffer zone.
3) Backfill trench with the excavated soil immediately following installation.
4) Do not use fertilizer except for the one-time application to reestablish vegetation.
5) Minimize removal of woody vegetation, the amount of disturbed area, and the time the disturbed area remains disturbed.
6) Take measures to ensure diffuse flow of water through the buffer after construction.
7) In wetland areas, use mats to minimize soil disturbance.
8) Schedule work in buffers to ensure exposure of denuded surface in the buffer is kept to a minimum

D. **Safety**

The Contractor shall keep the surface over and along the roadways and other excavation in a safe and satisfactory condition during the progress of the work.

E. **Geotechnical Investigation**

1) Where a Geotechnical report has been provided to the Contractor by the City of Wilson, the data on sub-surface soil conditions is not intended as a representation or warranty of the continuity of such conditions between borings or indicated sampling locations. It shall be expressly understood that the City of Wilson will not be responsible for any interpretations or conclusions drawn there from by the Contractor. The data is made available for the convenience of the Contractor.

2) In addition to any report that may be made available to the Contractor, the Contractor is responsible for performing any other soil investigations felt necessary for proper evaluation of the site for the purposes of planning and/or bidding the project, at no additional cost to the City of Wilson.

F. **Protection of pavement**

Debris from the site shall be removed in such a manner as to prevent spillage. Keep pavement and area adjacent to site clean and free from mud, dirt, dust, and debris at all times.

1.10 SERVICE INTERRUPTION

For service interruption, operation of valves, taps, fire hydrant operation, etc., contact the Water Resources Division at 296-3403. Provide a minimum of 48 hours' notice or desired utility interruption or necessary operation of valves or hydrants.

1.11 COORDINATION

A. Coordinate tie-in to municipal water mains with the City Engineer and/or the Water Resources Manager. Except as needed for fire suppression purposes, the City of Wilson will be the sole operator of all valves and hydrants on the City's water distribution system. When no customers will be affected, the City shall be notified at least 24 hours in advance of a request for the City to operate valves.

   Service is to be continuously maintained to customers in the project areas except for the minimum amount of time required to make connections to the existing system. However, if service is to be interrupted by shutting off a main(s), adequate notification to water customers shall be given by the Contractor prior to any interruption of service. Residents are to be notified at least 24 hours in advance of cut off using flyers (contractor's phone number is to be listed first on all notices). if work has not commenced within 1week of notification, Contractor is to renotify residents before starting.

   In the case of an emergency, a Contractor or plumber will be permitted to employ measures with respect to valve and fire hydrant operation as required for the protection of life and property. Notification must be made to the City as soon as possible after the emergency occurs stating what the emergency was and the measures taken to mitigate the emergency.

B. Coordinate tie-ins to municipal roadway system with the City of Wilson.

C. At the direction of the City Engineer and/or Water Resources Manager, temporary bypass pumping of sewerage flow may be required to be provided. See *Section 02530 – Sanitary Sewer* for bypass pumping requirements and procedures.

D. When traffic signals, loops, or their appurtenances are likely to be damaged or interfere with construction, coordinate temporary operation with the applicable agency having jurisdiction of the signals. Provide a minimum of 1 weeks notice prior to anticipated disturbance or interruption. At the discretion of the City Engineer, the notice may be required to be published in the newspaper.

E. **Repair of pavement markings**: When cuts are made through any paved surface and the cuts extend through the pavement markings, the replaced pavement shall be marked to match the existing.

F. **Benchmark/Monument Protection**: Protect and maintain benchmarks, monuments or other established reference points and property corners. If disturbed or destroyed, they must be replaced at own expense by a Licensed Professional Surveyor to full satisfaction of Owner/City of Wilson.

G. Before Digging, contact ***"NC One Call"*** at 811 for location services.

811
Know what's **below.**
Call before you dig.

1.12 PUBLIC CONVENIENCE

The contractor shall at all times so conduct his work as to ensure the least possible inconvenience to the general public and the residents in the vicinity of the work. Fire hydrants on or adjacent to the work shall be kept accessible to fire fighting equipment at all times. Temporary provisions shall be made by the Contractor to ensure the proper functioning of all gutters, sewer inlets, drainage ditches, and irrigation ditches, which shall not be obstructed except as approved by the City Engineer.

1.13 TRAFFIC CONTROL

A. When working within any NCDOT System road or highway, conform to the *Manual on Uniform Traffic Control Devices*, latest revision (MUTCD) as well as the NCDOT Standard Specifications for Roads and Structures, latest revision.

B. Traffic Maintenance shall comply with the latest revision of the NCDOT Standard Specifications for Roads and Structures, Division 9 – *Signing* and Division 11 – *Work Zone Traffic Control*, as well as other applicable sections.

C. A traffic control plan shall be submitted to the City Engineer and NCDOT (if applicable) for approval.

D. When traffic signals or their appurtenances are likely to be damaged or interfere with construction, coordinate temporary operation with the NCDOT or the City Engineer. Provide 1 weeks' notice prior to anticipated disturbance or interruption.

E. Whenever it becomes necessary to leave a section of trench open after completion of the days' work, the contractor shall provide barricades and lights to protect the public. Operate warning lights during hours from dusk to dawn each day and as otherwise required for inclement weather and visibility.

1.14 EROSION AND SEDIMENTATION CONTROL AND NPDES MONITORING, CONTROLS, AND LIMITATIONS FOR PERMITTED DISCHARGES

The Project Engineer shall submit a sedimentation and erosion control plan to the appropriate authority and obtain all necessary construction permits. The Contractor shall follow the requirements stipulated in the approved permit and plans as well as all local and state requirements regarding sedimentation and erosion control.

Permittees (owner and/or Engineer) who have an approved E&SC Plan and permit are required to submit an electronic Notice of Intent (e-NOI) form in order to obtain a Certificate of Coverage (COC). Once DEM has issued a Certificate of Coverage (COC) to the owner/permittee, following a preconstruction conference, placement of erosion control measures/construction may commence.

Permittees and their Contractors are required to implement the approved Erosion and Sedimentation Control (E&SC) Plan, adhere to materials handling protocols, inspect their sites and maintain records.

After the completion of a project, the final step is to submit an electronic Notice of Termination (e-NOT) form to end coverage under the NCG01 Permit.

It is the Contractor's responsibility to adhere to the requirements of the approved E&SC permit and plans as well as periodically monitor the Stormwater Discharge Outfall points

at the specified frequency and maintain reports as required under NCG01 and NCG25. See NCDEQ Energy, Mineral and Land website for more information, filing e-NOI, e-NOT, and Modification Forms and for the applicable "Self-Inspection and Monitoring Forms."

PART 2 – PRODUCTS

2.1 SOIL MATERIALS

General: Provide borrow material when sufficient satisfactory soil material is not available from excavations.

2.1.1 MATERIAL CLASSIFICATION

A. **Excavation**: All excavation material shall be classified as Undercut Excavation, Unclassified Earth Excavation, or Rock.

B. **Off-site Borrow** shall be select fill material approved by the City Engineer from an off-site borrow source. See section 1.3 of this specification for the definition of select fill material.

Rip Rap and Rip Rap Bedding: Rip Rap and Rip Rap Bedding shall conform to Section 1042 – *Rip Rap Materials* of the NCDOT *Standard Specifications for Roadways and Structures*, latest revision for Class A, B, 1, and 2 rip rap.

C. **Structures, Backfill around**: Backfill shall be approved by the City Engineer and shall be free from large or frozen lumps, wood, or rocks more than 3 inches in their greatest dimension or other extraneous material. Porous backfill shall be #57 or #67 clean stone.

D. **Topsoil**: Topsoil meeting the definition prescribed in section 1.3 obtained either from on-site or an off-site source.

2.1.2 SOIL CLASSIFICATION

A. **Satisfactory Soils**: ASTM D2487 soil classification group (Unified Soil Classification System) GC, SM, SC, ML, CL, CH and MH or a combination of these group symbols. However CH and MH are permitted provided the soils have a Liquid Limit (LL) of ≤ 60 and a Plasticity Index (PI) of ≤ 30. Soils shall be free of rock or gravel larger than 3 inches in any dimension, debris, organic matter, waste, frozen materials, muck, roots, vegetation, and other deleterious matter.

B. **Unsatisfactory soils**: ASTM D2487 soil classification group (Unified Soil Classification System) CH and MH soils having a LL of > 60 and a PI of > 30, OH, OL, and PT; soils which contain rock or gravel larger than 3 inches in any dimension, debris, organic matter, waste frozen materials, vegetation, and other deleterious matter. Unsatisfactory soils also include satisfactory soils not maintained within +/- 3% of optimum moisture content at time of compaction, unless otherwise approved by the City Engineer.

2.2 MISCELLANEOUS

2.2.1 GEOTEXTILE FABRIC:

Geotextile fabric shall be protected from mud, dirt, dust, sunlight, and debris during transport and storage. Material shall be inert to commonly encountered chemicals; resistant to mildew, rot, insects, and rodents; and biologically and thermally stable. Geotextile fabric for subsurface installation shall not be exposed to direct sunlight for more than 24 hours before or during installation. All geo-fabric to be used within the right-of-way of a City street must be approved by the City Engineer.

A. **Filter Fabric for Rip Rap**: Filter Fabric for Rip Rap and Rip Rap Beddings shall conform to Section 1056 – *Geosynthetics* of the NCDOT *Standard Specifications for Roadways and Structures*, latest revision for Type 2 engineering fabric.

B. **Soil Stabilization Fabric**: Generally, soil stabilization fabric shall conform to the requirements of Section 1056 – *Geosynthetics* of the NCDOT *Standard Specifications for Roadways and Structures*, latest revision for Type 4 engineering fabric. However, provide fabric meeting Geotechnical Engineers recommendations for the application and use intended.

C. **Fabric for Subsurface Drains**: Non-woven needle-punched fabric shall conform to Section 1056 – *Geosynthetics* of the NCDOT *Standard Specifications for Roadways and Structures*, latest revision for Type 1 engineering fabric.

D. **Silt Fence Fabric**: Silt fence fabric shall conform to Section 1056 – *Geosynthetics* of the NCDOT *Standard Specifications for Roadways and Structures*, latest revision for Type 3 engineering fabric, Class A or B as specified or shown on the plans.

PART 3 – EXECUTION

3.1 GENERAL

3.1.1 GENERAL REQUIREMENTS APPLYING TO ALL AREAS

A. Contractor shall plan construction to minimize disturbance to properties adjacent to the project site and be within the construction limits shown on the plans.

B. The City Engineer reserves the right to limit the width of land to be disturbed and to designate on the drawings or in the field certain areas or items within this width to be protected from damage.

C. **Access and/or Haul Roads**: Any grading or excavation required for equipment travel during the course of construction as well as erosion control, access or haul road removal, restoration, seeding and ground cover shall be provided by the Contractor.

D. The Contractor shall be responsible for damage to areas or items designated by the City Engineer to be protected. Repairs to, replacement of, or reparations for areas or items damaged shall be made at the Contractor's expense and to the satisfaction of the City Engineer before acceptance of the completed project.

E. The Contractor shall protect all existing buildings or structures.

F. Any fences disturbed by the Contractor shall be repaired with new materials to a condition equal to or better than their original condition or to the satisfaction of the City Engineer at no additional cost.

G. The Contractor shall obtain written permission from property owners for use of any access other than ones located within rights-of-way or easements. Written permission shall contain conditions for use and restoration agreements between the property owner and the Contractor.

H. All areas disturbed shall be restored to a condition equal to or better than their original condition and shall be graded to drain.

I. The Contractor shall replace or repair all damaged or destroyed hedgerows and property corners using the services of a licensed Professional Surveyor.

3.1.2 CONSTRUCTION LIMITS

A. The Contractor shall not disturb any areas outside the limits contained in this section without express written permission from the City Engineer.

B. Except as indicated on the plans, no "clear cutting" of timber shall be permitted within the construction limits. The Contractor shall make select cutting of trees, taking smallest trees first, that are mandatory for the construction. The decision of the City Engineer shall be final on the determination of which trees are to be cut.

C. Should it become necessary to move the position of any underground structure, the Contractor may be required to do such work and shall be paid on a force account basis or on an extra work basis as directed by the City Engineer. Method of payment shall be agreed upon by the City Engineer and the Contractor prior to commencing work.

D. If existing utilities are found to interfere with the permanent facilities being constructed under this section, immediately notify the City Engineer and secure instructions. Do not proceed with permanent relocation of utilities until instructions are received from the City Engineer.

E. **Specific requirements applying to developed subdivision/lots**

1) Unless directed otherwise by the City Engineer, all trees, shrubs, hedges, or other ornamental plantings located outside of the construction limits, easements, or public rights-of-way shall be protected by the Contractor. The City Engineer reserves the right to designate certain trees located within the construction limits for protection where deemed desirable.

2) The Contractor shall protect septic systems or springs located outside the construction limits.

3) Excavated or blasted rock shall be removed from the site unless otherwise ordered by the City Engineer.

F. **Specific requirements applying to undeveloped areas**

1) In wooded areas, the clearing shall be limited to the easement or right-of-way limits unless indicated otherwise on the City of Wilson approved construction drawings, in which case, the work shall be confined to the limits defined on the plans. All permanent easements and rights-of-way shall be fully cleared as determined by the City Engineer. the City Engineer reserves the right to designate certain trees located within the construction limits for protection where deemed desirable.

3.1.3 PROTECTION OF EXISTING UTILITIES AND STRUCTURES

A. **Subsurface obstructions**

1) **Subsurface obstructions**: Take necessary precautions to protect existing utilities from damage due to any construction activity. The Contractor shall locate existing utilities, culverts, and structures (above or below ground), before any excavation starts and coordinate work with utility companies. The Contractor shall be responsible for notifying utility companies when working within the vicinity of the existing utilities. Omission from or inclusion of located utility items on plans do not constitute non-existent or definite location. Even though for convenience, the utility may be shown on the plans, the Contractor is responsible for and shall call for utility location a minimum of 48 hours prior to excavations. Contact underground damage protection services NC One Call at 800-632-4949 or current locator service. Secure and examine local utility surveyor records for available location data including building service lines.

811 Know what's below. Call before you dig.

Unless shown to be removed, protect active utility lines shown on the drawings or otherwise made known to the Contractor prior to excavation. In excavating, care must be taken not to remove or injure any subsurface structure. All existing gas pipes, water pipes, steam pipes, telephone lines, cable TV lines, electrical conduits, sewers, drains, fire hydrants, and other structures which, in the opinion of the utility company, do not require relocation shall be carefully supported, shored up, the flow maintained, if applicable, and the line/main protected from damage by the Contractor. If damaged, the Contractor shall give immediate notice to the proper authorities. The utility shall be restored, at the Contractor's expense, by the appropriate utility to original or better condition. Where pipes, conduits, or sewers are removed leaving dead ends in the ground, such ends shall be carefully plugged or bulk headed by the Contractor at the Contractor's expense. The Contractor shall be responsible for any damage to persons or property caused by such breaks. This includes water taps and sewer cleanouts installed by a contractor during new construction to be taken over by the City of Wilson.

2) The Contractor shall be responsible for anticipating and locating underground utilities and obstructions. When construction appears to be in close proximity to existing utilities, test pits shall be made a sufficient distance ahead of the work to verify the exact locations and inverts of the utility to allow for changes in grade or utility relocation.

3) If active utility lines are encountered, and are not shown on the Drawings or otherwise made known to the Contractor, promptly take necessary steps to assure that service is not interrupted.

4) Should it become necessary to move the position of any underground structure, when approved by the City Engineer, the Contractor may be required to do such work and shall be paid on a force account basis or on an extra work basis.

5) If existing utilities are found to interfere with the permanent facilities being constructed under this Section, immediately notify the City Engineer and secure his instructions. Do not proceed with permanent relocation of utilities until written instructions are received from the City Engineer.

B. **Protection of Surface Features**

1) Whenever construction is to take place on or near a paved street, the Contractor shall provide pads or take necessary precautions to protect the pavement from damage by the construction equipment. Pavement damaged by cleated or tracked equipment, or by any other means, shall be repaired by the Contractor at his expense to the satisfaction of the City Engineer.

2) Where joining existing pavements, the Contractor shall use care to cut the existing pavement in sharp, neat lines. If the existing road to be cut is located within another jurisdiction other than the City of Wilson or within NCDOT rights of way, the Contractor is responsible for contacting the person or persons responsible for said road about pavement repair/replacement.

3) Avoid overloading or surcharge a sufficient distance back from edge of excavation or fill to prevent sloughing, slides, or caving. Maintain and trim excavated materials in such manner to be as little inconvenience as possible to public and adjoining property.

4) Provide full access to public and private premises, to fire hydrants, at street crossings, sidewalks and other points as designated by the City Engineer to prevent serious interruption of travel.

5) Protect and maintain benchmarks, monuments, or other established points and reference points and if disturbed or destroyed, items shall be replaced by a Licensed Land Surveyor to full satisfaction of the City Engineer and the jurisdictional agency.

6) See 1.11 Coordination, paragraph D regarding traffic signal conflicts.

C. **Procedures for repairing damaged utility services**

1) If a located service is interrupted as a result of work performed by a public or private party, immediately repair the damaged utility at no additional cost to the City. Notification shall be made to the Utility owner.

2) **House services**: If a service pipe supplying water or sewer service to an adjoining house is broken, the Contractor shall repair it at once and at his expense. The City may, at the Contractor's expense, repair any such service without prior notice to the Contractor.

3) If damage results from the action of either a public or private party on a newly constructed project to be accepted by the City of Wilson (e.g. water, sanitary sewer, storm sewer, or street), immediate notification shall be given to the City Engineer or City Inspector. All damages or interruption shall be the responsibility of the party causing the damage.

3.1.4 PROTECTION OF PERSONS AND PROPERTY

A. Barricade open holes and depressions occurring as part of the work, and post warning lights on property adjacent to or part of public access.

B. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, washout, and other hazards created by operations under this or other related sections.

C. **Protection and Restoration of Property:** The Contactor shall not enter upon private property for any purpose without first obtaining written permission. He shall use every precaution necessary to prevent damage or injury to any public or private property, trees, fences, monuments, and underground structures, etc., on and adjacent to the site of the work. He shall protect from disturbance or damage all land monuments and property markers until an authorized agent has witnessed or otherwise referenced their locations, and shall not remove them until directed.

The Contractor shall be responsible for all damage or injury to property of any character resulting from any act, omission, neglect, or misconduct in his manner or method of executing said work, from his nonexecution of work, or from defective work or materials, and he shall not be released from said responsibility until the work shall have been completed and accepted.

When or where any direct or indirect damage or injury is done to public or private property by or on account of any act, omission, neglect, or misconduct in the execution of the work, he shall restore such property, at his own expense, to a condition equal to or better than that existing before such damage or injury was done, by repairing, rebuilding, or otherwise restoring, and may be directed or he may make good such damage or injury in an acceptable manner.

The Contractor shall, at his own expense, sustain in their places and protect from direct or indirect injury all pipes, poles, conduits, walls, roadways, buildings, and other structures, utilities and property in the vicinity of his work. Such sustaining and supporting shall be carefully done by the Contractor and as required by the Company or party owning the structures or Agency controlling it. The Contractor shall take all risks attending the presence or proximity of pipes, poles, conduits, walls, thereof and any costs associated will be deducted from any monies due the Contractor. **Failure of the City Engineer or his/her authorized representative to direct the correction of unsafe conditions or practices shall not relieve the Contractor of his responsibility hereunder**.

3.2 CLEARING AND GRUBBING

A. **Description**: This work shall consist of clearing, grubbing, removing, and disposing of all vegetation and debris within the limits of construction, as

designated on the plans or as required by the City Engineer. The work shall also include the preservation from injury or defacement of all vegetation or objects designated to remain. Clearing shall consist of cutting, removal, and satisfactory disposal of all trees, down timber, brush, rocks, projected roots, stumps, rubbish, laps, and other material within easement.

B. A preconstruction meeting shall be held with appropriate forestry personnel (if applicable) and the City prior to any clearing, if required. The City Engineer may require tree protection fencing in sensitive areas, where specifically identified trees are desired to be protected, and when required by the landscape ordinance.

C. The area within the limits of construction or as designated shall be cleared and grubbed of all trees, stumps, roots, brush, undergrowth, hedges, heavy growth of grasses or weeds, debris and rubbish of any nature that, in the opinion of the City Engineer, is unsuitable for foundation material. Nonperishable items that are not deleterious to the project and will be a minimum of 5 feet below the finish elevation of the earthwork or slope of the embankment may be left in place.

D. The Contractor shall provide barricades, fences, coverings, or other types of protection necessary to prevent damage to existing improvements, not indicated to be removed, and improvements on adjoining property. All improvements damaged by this work shall be restored to their original condition to a condition acceptable to the owner or other parties or authorities having jurisdiction. Trees and shrubs that are to remain within the construction limits will be indicated on the drawings or conspicuously marked on site. Unless otherwise noted, trees within the construction limits shall become the property of the Contractor and shall be removed from the site.

E. Contractor shall protect existing trees and other vegetation indicated by the City Engineer to remain in place against limb, bark or root damage such as cutting, breaking, or skinning of roots, skinning and bruising of bark, smothering of trees by stockpiling construction materials or excavated materials within drip line, excess foot or vehicular traffic, or parking of vehicles within drip line. When such damage does occur, all rough edges of scarred areas shall be removed in accordance with accepted horticultural practices.

F. Carefully and cleanly, cut roots and branches of trees indicated to remain where the roots and branches obstruct construction of a proposed utility line. If directed by the City Engineer, the Contractor shall provide protection for roots and branches over 1 ½ inches diameter that is cut during construction operations. Coat the cut faces with emulsified asphalt, or other coating especially formulated for horticultural use on cut or damaged plant tissues. Temporarily cover all exposed roots with wet burlap to prevent roots from drying out. Provide earth cover as soon as possible.

G. Trees and vegetation designated to remain shall be repaired or replaced at Contractor's expense in a manner acceptable to the City Engineer if they are damaged by construction operations. Repair tree damage as directed by a qualified tree surgeon.

H. Debris from the site shall be removed in such a manner as to prevent spillage. Keep pavement and area adjacent to site clean and free from mud, dirt, dust, and debris at all times.

I. The method of stripping, clearing, and grubbing the site shall be at the discretion of the Contractor. However, all stumps, roots and other debris protruding through the ground surface or in excavated areas shall be completely removed and disposed of off the site by the Contractor.

J. **Marginal Areas**: In marginal areas, with the City Engineer's permission, remove trees where the following conditions exist.

1) **Root Cutting**: When clearing up to the "clearing limits," the Contractor shall also remove any tree which is deemed marginal such that when the roots are cut and the tree could be rendered unstable by the effects of high winds and in danger of toppling into either the right-of-way or onto private property.

2) **Slender Bending Trees**: Where young, tall, thin trees are left unsupported by the clearing operation, and are likely to bend over into the right-of-way, the Contractor, during the clearing operation, shall selectively remove those trees which are located outside and adjacent to the clearing limits and City right-of-way or easement as well. During the course of construction and during the one-year warranty period, the Contractor shall remove such young trees that overhang into the right-of-way or cleared area.

K. **Stripping of Topsoil**: Remove the existing topsoil to a depth of 6 inches or to the depth encountered from all areas in which excavation will occur. The topsoil shall either be stored in stockpiles separate from the excavated trench material if the topsoil is to be respread or otherwise disposed of off-site. Topsoil stockpiles shall be graded to freely drain surface water, and shall have a silt fence placed around the base of the stockpile.

L. **Disposal**: All brush, treetops, stumps, and debris shall be hauled away and disposed of in accordance with all applicable laws and regulations. The Contactor shall clean up debris resulting from clearing operations continuously with the progress of the work and remove promptly all salvageable material that becomes his property and is not to be reused in construction. Sale of material on the site is prohibited.

Disposal of cleared material shall be in accordance with all local and state laws. Trees cut down on the construction site will be hauled away from the site for proper disposal unless instructed otherwise by the City. Stumps of trees cut down outside of the excavation area will be removed. Perishable material shall not be disposed of at the construction site. Brush, limbs, roots, and stumps from trees shall be disposed of in a NCDEQ approved and permitted land clearing and inert debris type landfill. The Contractor will be responsible for obtaining all applicable permits and paying all fees for the disposal of excess material.

3.3 UNCLASSIFIED EXCAVATION, UNDERCUTTING, BORROW, EMBANKMENT:

3.3.1 DESCRIPTION

Prior to beginning grading or embankment operations in any area, all necessary clearing and grubbing in that area shall have been performed in accordance with these specifications.

Should the Contractor, through negligence or other fault, excavate below the designated grades, he shall replace the excavation with approved satisfactory

materials, in an approved method, at his own expense. All material determined unsatisfactory shall be disposed of in waste areas as directed. Topsoil shall not be used in embankments but shall be handled and placed as directed.

The Contractor shall satisfy himself as to the character, quantity, and distribution of all materials to be excavated. No payment will be made for any excavated material that is used for purposes other than those designated.

3.3.2 CONSTRUCTION METHODS

A. **Excavation**: Excavation shall be performed as indicated on the plans or as directed by the City Engineer to the lines, grades, and elevations, and shall be finished to a reasonable smooth and uniform surface. During the process of excavation, the grade shall be maintained and surface shall be shaped and rolled so that it will be well drained at all times.

When solid rock is incurred in the excavation, the rock shall be removed to a minimum depth of 12 inches below the surface of the subgrade. Material unsatisfactory for subgrade foundation shall be removed to a depth specified to provide a satisfactory foundation. The portion so excavated shall be refilled with suitable material obtained from the grading operations or borrow area and thoroughly compacted by rolling. The City Engineer must approve material obtained from on site grading operation. For areas that do not require fill, scarify and compact to a depth of 6 inches.

Any removal, manipulation, aeration, replacement, and recompaction of suitable materials necessary to obtain the required density shall be considered as incidental to the construction operations, and shall be performed by the Contractor at no additional cost to the City.

No rock, stone, or rock fragments, larger than 3 inches in their greatest dimension will be permitted in the top 12 inches of the subgrade. No rock, stone, or rock fragments larger than 8 inches in their greatest dimension will be permitted in the remainder of the fill.

B. **Stabilization of soft subgrade with Geotextile**: The use of Geotextile material for subgrade stabilization shall be approved by the City Engineer (or a Geotechnical Engineer if required) and shall meet the requirements of paragraphs 2.2.1.B – *Soil Stabilization Fabric* and 3.9 – *Placement of Soil Stabilization Fabric.*

C. **Borrow**: Borrow shall not be used until all suitable, on-site, excavated material has been placed in the embankment, unless authorized by the City Engineer. Unless otherwise designated on the plans and contract documents, the Contractor shall make his own arrangements for obtaining select fill material for borrow and pay all costs involved. If the Contractor places more borrow than is required, and thereby causes a waste of excavation, the amount of such waste, unless authorized, will not be included for payment.

D. **Embankments**:

1) **Evaluation of Subgrade**: Prior to placement of compacted fill, the City Engineer or his representative shall carefully inspect the exposed subgrade.

2) **Evaluation of Subgrade**: Prior to placement of compacted fill, the City Engineer or his representative shall carefully inspect the exposed subgrade. The Contractor shall then proof roll the exposed subgrade, in the presence of the City Engineer or his representative. The inspection shall include, but not be limited to, proof rolling the prepared subgrade with a rubber-tired fully loaded dump truck that has a minimum gross weight of at least 30,000 pounds (H15). No other method will be acceptable. Any unsatisfactory materials thus exposed shall be removed and replaced with satisfactory select material as approved by the City Engineer. Provide the necessary amount of select fill compacted to the density requirements outlined in this specification. See also paragraph 3.3.2.F.2) g through i ,*Improvement's to Areas Failing a Proofroll*, below regarding repair of failed proofroll areas.

3) **Preparation of Ground Surface for Embankments or Fills**. Before fill is placed, scarify existing grade to a minimum depth of 6 inches. In areas where the existing or proposed ground surface is steeper than one vertical to four horizontal (4:1), plow surface in a manner to bench and break up surface so that fill material will bind with the existing surface.

4) Embankments shall be made of satisfactory soil material and shall be built in successive horizontal layers of not more than 8 inches in loose depth for the full width of the cross sections.

The material entering the embankment in each of the layers shall be within a tolerance of plus or minus +/- 20% of the optimum moisture content before rolling to obtain the prescribed density. Wetting or drying of the material and manipulation when necessary to secure uniform moisture content throughout the layer shall be required. Should the material be too wet to permit proper compaction or rolling, all work on the embankment shall be delayed until the material has dried to the required moisture content. If high moisture is due to negligence of Contractor due to improper drainage, the City Engineer may require removal and replacement of material.

Fill material shall not be placed on frozen ground or areas covered with ice and/or snow or areas with a moisture content above optimum.

E. **Undercut Excavation**:

Undercut Excavation: Undercut excavation shall consist of the removal and satisfactory disposal of all unsuitable material located below subgrade elevation. Where excavation to the finished grade section results in a subgrade or slopes of muck, peat, matted roots, etc., the Contractor shall remove such material below the grade shown on the plans or as directed; and areas so excavated shall be backfilled with approved select borrow as ordered by the City Engineer.

For definition of undercut excavation, see *paragraph 1.3 I – Classified Excavation (Undercut)*.

F. **Preparation of subgrade areas to receive curb and gutter, stone base or concrete pavement**:

1) **Areas to be surfaced**: After all excavation, undercutting, and backfilling has been completed, the subgrade shall be properly shaped and thoroughly

compacted. The compactive effort shall include all areas beneath curb and gutter, stone base or concrete pavement and shall extend at least a minimum of 1 foot beyond the back of the curb and gutter. Compaction shall be in accordance with Table 02200-2A.

2) **Proofrolling Subgrade**:

Purpose: The purpose of proofrolling the subgrade is to determine the location and extent of areas below the subgrade surface that require corrective undercutting. Proof rolling is not designed or intended to fail an embankment, but to point out areas of non-uniform compaction.

Procedure: The Contractor shall proofroll the exposed subgrade, in the presence of the City Engineer or his representative. The inspection shall include, but shall not be limited to, proof rolling the prepared subgrade with a rubber-tired fully loaded tandem axle (no contact by floating axle[s] if present) dump truck that has a minimum gross weight of at least 30,000 pounds (H15 with tandem axles spaced a minimum of 40 inches and not more than 96 inches apart) with a +2-ton tolerance. The aggregate tonnage will be measured at the quarry by being weighed in trucks on certified platform scales or other certified weighing devices. Weight tickets shall list the date ticket was issued, the location of the quarry or plant where material came from, and the tonnage loaded and provided to the inspector prior to commencement of proofrolling.

Requirements and Limitations of Proofrolling:

a. **Truck Loading During Proofrolling**: Following a passing proofroll of the stone base, all trucks delivering stone or asphalt over an approved stone base shall be limited in weight to a load equal to or less than the proofroll test load and the equivalent tandem axle load.

b. **Exception**:

If the asphalt/stone delivery trucks proposed to pass over an approved and accepted stone base are expected to be greater in weight than the minimum H15 proofroll test load specified above, the contractor shall increase the weight of the proofroll test truck to correspond the anticipated load and number of axles (i.e. the haul in load cannot exceed the proofroll test load).

Trucks with more than a total of 3 axles (triaxles, quads and quints) shall not have an axle load exceeding that permitted by the Bridge Formula Weights (USDOT FHA). In such cases, no single axle shall exceed 20 kips and the total tandem axle load shall not exceed 34 kips. The total gross weight of the truck shall not exceed 80 kips.

Contractor to provide weighmaster ticket and USDOT FHA chart showing the corresponding axle load based on both axle spacing, number of axles, weight distribution, and gross weight. (See Federal Bridge Formula Table) Unless otherwise permitted by the City Engineer, test axles tire pressure

shall be between 68 to 72 psi minimum (tire inflated with air only); assumes tests are being performed on a good subgrade.

c. Alternative Proofrolling Method: As an alternative, and in lieu of the above proofrolling procedures, at the contractor's option the contractor may proofroll the streets in accordance with Section 260, *Proof Rolling* of the NCDOT Standard Specification for Roads and Structures, latest edition.

d. A minimum of 3 non-lapping proofrolling passes shall be made on each street/roadway section.

e. The curb and gutter subgrade shall also be included in the proofrolling with proofrolling extending to 12 inches beyond the back of curb.

f. **Proofrolling Speed Range**: 2.6 mph to 3.4 mph. Average walking speed is 3.1 mph+/-.

g. Proof rolling shall be performed in lengths of not less than one block as measured from center of intersection to center of intersection, from center of intersection to end of cul-de-sac, or 750 linear feet. No other method will be acceptable for verifying roadway stone base or pavement subgrade.

h. **Generally Applied Failure Criteria for New Construction**: Unstable or non-uniform subgrade; soft spots. Rutting 1-inch (1/2" for reconstruction), or the same in elastic (rebound) movement with substantial cracking or substantial lateral movement.

Improvements to Areas Failing a Proofroll:

i. Any unsatisfactory materials thus exposed shall be removed and replaced with satisfactory select material as approved by the City Engineer. Provide the necessary amount of select fill compacted to the density requirements outlined in this specification.

j. Should the developer disagree with the representative of the City about the need for repairs to the subgrade, the developer or his project engineer may hire a Licensed Professional Engineer to perform CBR tests on the prepared subgrade. If the Engineer certifies that the full width and length of the subgrade will provide adequate support for the design pavement section and the anticipated loading for the design life of the paved area, the area may be paved without making repairs to the subgrade.

k. All areas failing proofrolling shall be repaired and re-proofrolled prior to placement of stone base to allow time for bridging/consolidation of the subgrade.

l. See paragraph 3.3 *Aggregate Base Course* in Section 02740 *Base Course and Paving* for stone base compaction and density requirements.

3) **Curb and gutter, sidewalks and driveway aprons**: The subgrade shall be constructed true to grade and cross section as may be shown on the drawings or standard details. Compaction shall be in accordance with Table 02200-2A.

All subgrade shall be graded and protected as to prevent an accumulation of standing water, and consequent subgrade saturation, in the event of rain.

G. **Grading tolerances of finished surface**: Earthwork shall conform to the lines, grades, and typical cross sections shown on the plans, standard details, or as established by the City Engineer. Changes in grade shall be accomplished by smooth curves.

1) Shape subgrade under pavement and curb and gutter to within ½ inch of required subgrade elevations.

2) Finish pavement and curb and gutter to within ¼ inch of required finish elevations.

3) Shape subgrade under sidewalks to within 0.10 foot of required subgrade elevations.

4) Finish sidewalks to within 0.10 foot of required finish elevations.

5) For all other areas, subgrade and finish elevations shall be within 0.10 foot of required corresponding elevations.

H. **Backfill of Curb and Gutter and sidewalks**: Immediately after the removal of forms for curb and gutter, sidewalks and driveways, the space between the back of the curb, sidewalks, and driveways shall be backfilled and smoothed off in a manner to prevent the accumulation of standing water.

3.4 ROCK:

3.4.1 GENERAL

A. Blasting procedures shall conform to all applicable local, state, and federal laws and ordinances and shall be performed in accordance with OSHA *Standard 29 CFR part 1910.109 Explosives and Blasting Agents*, NCDOT Rules for Transporting Explosives, and local Fire Department Regulations. Prior to any blasting, a blasting permit shall be obtained. The approval of the City Engineer and Fire Marshall shall be obtained before any blasting takes place and the City Engineer may fix the hours of blasting if he/she deems it necessary. The use of explosives shall be in accordance with approved methods that safeguard lives and property. Explosives shall only be handled, placed, and detonated by persons licensed in this work. It is the responsibility of the Contractor to provide proper notification to appropriate parties.

B. **Rock Excavation – Definition**: See paragraph 1.3 J for definition of rock excavation in open excavation.

C. The minimum insurance coverage for blasting shall be as specified by current NC Fire Prevention Code or more as determined by the City Engineer and Fire Marshall. The coverage shall include explosion and collapse. If blasting occurs within 200 feet of any underground structure or utility, underground coverage will be required. The City and the property owners shall be named as "additional insured."

Storage: Store explosives in accordance with the Occupational Safety and Health Act and with other Federal, State and Local ordinances and regulations. The Contractor shall keep explosive materials that are on the job site in special constructed boxes provided with locks. These boxes shall be plainly identified as to their contents. Detonators shall be stored separately from explosives. Failure to comply with this specification shall be grounds for suspension of blasting operations until full compliance is made. No blasting shall be allowed unless a galvanometer is employed to check cap circuits.

D. The City may prohibit blasting when the method of detonation or the means of protection provided is inadequate. Blasting conducted with or without direct supervision of the City will not relieve the Contractor of the responsibilities stipulated herein.

E. Blasters shall not explode or attempt to explode blasting powder or high explosives unless it is performed with a suitable electric blasting machine. Electric current from batteries, telephone, or power lines shall not be used for detonation.

F. A minimum of 3 minutes prior to the detonation, the blaster shall inform competent flagmen, equipped with red flags, stationed at reasonable distances from the blast area at every avenue of approach, to warn all persons.

G. Immediately after the loading and tamping of the drill hole and before fixing the blast, the material to be blasted shall be covered on all exposed sides with blasting mats, or other approved protective material. After the protection has been applied, the blast shall be fired without unnecessary delay.

3.4.2 BLASTING PROCEDURE

A. The Contractor shall provide a blast warning signal system. The blast warning signal system shall consist of one or more air horns located at the blast site. The air horn(s) shall be audible a minimum of 1 mile from the blast site. The signals shall be one long horn five minutes prior to the blast, one short horn 1 minute prior to the blast, and one long horn after the blast to signal all clear. The Contractor shall erect two clear and legible blast warning signal signs at locations determined by the City Engineer and Fire Marshall. The signs shall list the blast warning signal system, the Contractor Superintendent's name and telephone number, and the City representative's name and telephone number.

B. The Contractor shall establish test pits at up to two representative locations along the alignment and up to three locations adjacent to the site proposed to be blasted to determine if the rock is "rippable" with a D-8 or equivalent dozer drawing a new single-tooth ripper (see paragraph 1.3 G for definition of rock excavation in open trenches). If these procedures do not offer reasonable production for rock excavation, then blasting will be allowed unless otherwise indicated.

C. The Contractor shall notify in writing all property Owners within 250 feet of the proposed blast at least 1 week prior to the proposed blast and verbally on the day of the scheduled blast.

D. Blasting shall be limited to mid-morning hours on days of clear-to-partly cloudy skies with increasing surface temperature and light wind. The Contractor shall provide monitoring equipment to monitor all blasting. A copy of monitor record shall be given to the City daily.

E. The use of unconfined explosives shall be prohibited.

F. Unless otherwise stipulated in Title 13 of the NC Administrative Code, chapter 7, the maximum allowable peak particle velocity shall be 1.25 inches per second for all structures located 0 to 300 feet from the blasting site. The maximum allowable peak particle velocity shall be 1.00 inch per second for all structures located 301 to 5,000 feet from the blasting site. The maximum allowable peak particle velocity shall be 0.75 inch per second for all structures located 5,001 feet and beyond from the blasting site.

G. To minimize vibration, minimum-scaled distance (SD) of 50 shall be used to determine maximum explosive weight per delay. A test blast shall be conducted to verify the scaled distance. The maximum explosive weight per delay shall not exceed the distance from the blast to the nearest structure divided by 50 squared. Maximum explosive weight per delay may be revised pending outcome of test blast. The recommendations indicated for blasting criteria in no way relieves the Contractor of his liability.

H. The peak overpressure of air blast shall not exceed 0.015 pound per square inch or 138 decibels.

I. Preblast meetings shall be scheduled with the City Engineer and Fire Marshall to document hole depths and spacing, charge weight per delay, shot scheduling, and weather conditions. The Contractor shall obtain accurate measured distances from structures to center of blast area prior to determining the safe maximum charge-weight per delay and loading blast holes.

J. Preblast and post blast surveys shall be performed by the Contractor. The Contractor may review this data and supplement it as he sees fit or conduct separate survey after written permission is obtained from the property Owners. In this event, the written permission shall be submitted to the City Engineer and Fire Marshall prior to entering upon private property. The preblast and post blast surveys will include all occupied buildings within 250 feet of blasting areas. The Contractor is strongly encouraged to have a representative present during these surveys. The preblast and post blast surveys performed by the City or the property owner in no way relieve the Contractor of his liability.

K. The City reserves the right to monitor production blasting. In this event, the Contractor shall provide the City Engineer and Fire Marshall ample notice of scheduled blasts (minimum of 24 hours) to allow set-up of monitoring equipment.

3.4.3 DISPOSAL OF ROCK

Excavated rock shall be hauled off the site at the Contractor's expense. Borrow required to replace excavated rock shall be provided by the Contractor and shall be included in the unit price bid for rock excavation in open trenches. No rocks or boulders shall be used as backfill in any part of the site unless otherwise approved by the City Engineer. Where rock has scattered over adjoining property as a result of blasting, the Contractor shall remove the rock and restore the area to its original condition at no cost to the City.

3.5 SUBGRADE COMPACTION TESTING AND CONTROL

A. **Testing**

Testing of embankment/borrow shall be performed by an independent laboratory approved by the City and the Contractor. The Contractor shall be responsible for excavation for testing if required.

Quality Assurance vs. Quality Control:

Quality Assurance (QA) testing, and the associated cost, is the responsibility of the City. Quality Assurance testing by the City is used to confirm that the Contractor is generally performing his/her work in compliance with these specifications.

Quality Control (QC) testing is the necessary and required testing that is to be performed by the Contractor to assure that he/she is meeting and complying with the requirements of these specifications. The associated cost for QC testing is the Contractor's responsibility. The Contractor is also responsible for "re-testing" costs incurred by the City when the City tests results (tests for Quality Assurance) results in a "failure."

Quality Control (QC) testing for City funded projects: The City shall pay for the cost of Quality Control by having the Contractor include the cost for testing in the unit cost of the project; not as a separate pay item. The Contractor shall pay for all costs associated with re-testing.

B. **Quality Assurance (QA):**

In the course of placement of embankment fill/borrow or in utility trench backfill, the City Engineer may require additional "Field Density Determinations" or compaction tests. Such tests will be at the City's expense. When compaction tests are called for by the City, the City Engineer will determine the location of the tests and the City shall engage a qualified testing firm to perform the test. A representative of the City will observe tests and a copy of the test results and inspection report will be submitted by the testing firm directly to the City Engineer. When the tests indicate that the density failed to meet the requirements of Tables 02200.2A and 2200.2B, the Contractor shall comply with paragraph 3.6 D, Failure of Compactive Efforts.

Payment for failed QA density tests: For City funded projects, payment for failed in-place density tests shall be made by the Contractor by deducting the testing cost from the forthcoming retainage. For other projects in which the City will ultimately assume ownership and maintenance, the testing costs for failed in-place density tests shall be billed directly to the Contractor.

C. **Quality Control (QC):** The Contractor shall perform in-field density tests in accordance with Table 02200-1. Inspection reports shall be submitted by the testing firm directly to the City Engineer. See paragraph 3.6 C, Passing Test.

1) All test results shall be provided to the City Engineer as they become available from the testing agency.

2) The Geotechnical testing firm is to perform laboratory tests (ASTM D698, Standard Proctor) to establish a moisture-density relationship for all materials that are proposed to be used as fill.

3) Contractor shall give a 24-hour notice to Geotechnical testing firm for subgrade testing, subgrade confirmation, or inspections.

4) **Minimum Compaction Testing Frequency**:

The following testing frequency shall be employed on both City funded projects and projects proposed to be turned over to the City for maintenance and/or ownership.

Table 02200-1	
Testing Frequency	
Location	**Frequency**
Buildings and structures	1 test group[a] for every 5,000 square feet
Road	1 test group[a] for every 300 feet of road
Parking Lots	1 test group[a] for every 10,000 square feet
Unpaved areas	1 test group[a] for every 20,000 square feet
Pipe Trenches in Roadways	1 test group[a] for every 100 feet 1 test in each lateral (not to be taken at surface of trench)
Proof Roll	Entire footprint of roadway to 1-foot beyond back of C&G
Exception: Where additional tests are required to determine the extent of unacceptable compaction (having been determined by the initial QA/QC test).	

[a] One test group consists of compaction tests on each layer of fill and backfill material.

D. **Site access for testing:** Ensure City, at all times, has immediate access to the site for the testing of all soils related work. Ensure excavations are in a safe condition for testing personnel.

3.6 SUBGRADE PREPARATION AND COMPACTION REQUIREMENTS

A. **Confirmation of Initial Geotechnical Report/Design Assumptions** *(for roadway projects to be turned over to the City)*: Prior to placement of stone base over the subgrade, the Geotechnical Engineer or his representative shall confirm the initial test results and design assumptions by visual classification and hand augur borings. If the visual findings are at variance with the initial testing and design assumptions, recommendations for modifications to the subgrade shall be provided to the designer, the Grading Contractor, and the City Engineer. The City Engineer shall approve the proposed recommendations prior to incorporation of the measures. See Table 2200.4.

B. **Minimum Compaction Requirements**: Compaction percentages are percentages of maximum dry density as determined by indicated ASTM Standards. Unless noted otherwise on drawings or more stringently by other sections of these specifications, place and ensure degree of compaction of embankment and borrow materials does not fall below the following percentages of the maximum density at optimum moisture content.

C. **Passing Test:** Average of 3 test results meeting the applicable provisions of tables 2200.2A and 2200.2B (below) with no one test failing by more than -3 percentage points. Moisture content tolerance is to be within +/- 3 percentage points of the optimum moisture content unless otherwise specified by the City Engineer or Geotechnical Engineer.

Table 2200.2A Minimum Compaction Limits		
Location	**Density**	
Site and Public Roadways		
Embankment/borrow under roadway pavement surfaces, sidewalks, and curb and gutter	Top 12 inches	100% of the maximum dry density by ASTM D698 (Standard Proctor), AASHTO T99.
	Up to within 12 inches	95% of the maximum dry density by ASTM D698 (Standard Proctor), AASHTO T99.
Roadway Shoulders	95% of the maximum dry density by ASTM D698 (Standard Proctor), AASHTO T99.	
Under turf, sodded, planted, or seeded non-traffic areas	90% of the maximum dry density by ASTM D698 (Standard Proctor), AASHTO T99.	
Stone Base	100% of the maximum dry density by ASTM D698 (Standard Proctor), AASHTO T99.	

Table 2200.2B		
Location	**Density**	
Building Structures		
Embankment/borrow beneath and within 5 feet of buildings, under foundations, and scarified existing subgrade beneath buildings.	Top 12 inches	100% of the maximum dry density by ASTM D698 (Standard Proctor)
	Up to within 12 inches	95% of the maximum dry density by ASTM D698 (Standard Proctor)
Outside structures next to walls and any other structural exterior member	90% of the maximum dry density by ASTM D698 (Standard Proctor)	
Backfill less than 10 feet from exterior retaining walls	90% of the maximum dry density by ASTM D698 (Standard Proctor)	

D. **Failure of compactive efforts or proofrolling**: If compaction efforts should fail to provide a stable subgrade in accordance with the requirements in paragraph 3.6 C, Passing Test after subgrade materials have been shaped and brought to

optimum moisture, such unstable materials shall be removed to the extent directed by the Geotechnical Engineer and/or the City Engineer and replaced and compacted using new material and must pass compaction test prior to proceeding to the next stage of construction and at no expense to the City.

The costs associated with excavation and re-compaction of areas that have failed will be the Contractors responsibility.

See paragraph 3.3.2.F *Preparation of areas to receive asphalt pavement or concrete* of this specification for requirements for repair of areas failing a proofroll. All areas failing proofrolling shall be re-proofrolled following completion of repair.

E. **Compaction Lifts**:

Table 2200.3	
Compaction Lift Thickness of	
Lift Thickness (inches)	**Location**
6	Inside street rights-of-way
12	Outside street rights-of-way

F. In-place testing of soils shall be tested based on the following:

Table 02200.4	
In-Place Density Tests	
Soil Type/Classification	**Reference Standard**
GW, GP, GM, GC, SW, SP	• Sand Cone Method (ASTM D1556) • Nuclear Method ASTM D2922) [by percentage of Standard Proctor Density according to ASTM D 698]
SM, SC, ML, CL	• Sand Cone Method (ASTM D1556) • Rubber Balloon Method (ASTM D2167) • Nuclear Method ASTM D2922) • Drive-Tube Method (ASTM D2937) [by percentage of Standard Proctor Density according to ASTM D 698]

G. **Field Testing Limitations:**

1) When field density testing is incorporated according to Table 02200-1, subgrade adequacy is to be confirmed by proof rolling in the presence of the City Engineer or his representative. I

2) In-place field density tests of the roadway or pad subgrade in cut sections (excavation) is not required.

3) Testing/adequacy of intermittent undercut areas and repair areas (e.g. around manholes and boxes) that have been backfilled with select fill and compacted will be confirmed by proof rolling.

3.7 STRUCTURES: EXCAVATION, FILLING, AND BACKFILLING

A. **General**

See Section 02275 - *Trenching, Backfilling, and Compaction of Utilities* for excavation and backfilling for structures (manholes, catch basins, etc.). See NCDOT *Standard Specifications for Roads and Structures, latest revision* for excavation and backfilling for retaining walls.

B. **Protective Measures for Structures**

1) **Drainage**: Control grading around structures so that the ground is pitched to prevent water from running into excavated areas or damaging structures. Maintain excavations where foundations, floor slabs, equipment support pads or fill material are to be placed free of water. Provide pumping required, keeping excavated spaces clear of water during construction. Should any water be encountered in the excavation, notify City Engineer. Provide free discharge of water by trenches, wells, or other means as necessary and drain to point of disposal.

2) **Frost Protection**: Do not place foundations, footings, or fill material on frozen ground. When freezing temperatures may be expected, do not excavate to full depth indicated, unless foundations, footings or fill material can be placed immediately after excavation has been completed and approved. Protect excavation from frost if placing of concrete or fill is delayed.

3) **Protection of Structure:** Prevent new and existing structures from becoming damaged due to construction operations or other reasons. For catch basins, provide temporary weep holes with a non-woven filter fabric to relieve hydrostatic pressure on walls.

3.8 RIP RAP AND RIP RAP BEDDING PLACEMENT

Placement of Rip Rap and Rip Rap Bedding shall conform to Section 876 – *Rip Rap* of the NCDOT *Standard Specifications for Roadways and Structures*, latest revision.

3.9 PLACEMENT OF SOIL STABILIZATION FABRIC

Placement of soil stabilization fabric shall conform to the requirements of Section 270 – *Fabric for Soil Stabilization* of the NCDOT *Standard Specifications for Roadways and Structures*, latest revision and in accordance with the recommendations and directions of the City Engineer and/or a Geotechnical Engineer for the application and use intended.

3.10 SUBSURFACE DRAINAGE SYSTEMS

See Section 2630 – *Storm Drainage* and Section 02275 – *Trenching, Backfilling, and Compaction of Utilities* for both materials and construction requirements regarding subsurface drainage systems

3.11 METHOD OF VOLUME MEASUREMENT

Contractors are required to furnish accurate counts of all excavation and/or fill moved which is to be paid for under a Contract unit price. The volumes shall be measured by either "truck tally" or by "cross-sectioning," whichever method is approved by the City

Engineer or stated in the proposal and/or bid documents. When a truck count is used, the City Engineer or their representative shall verify the count independently.

A. **Truck Tally Method:**

Excavation: When unclassified excavation or undercut volumes are to be counted by the truck tally method, "swell" is to be incorporated into the truck volume in the amount of 15%. Unless otherwise agreed to or justified by a Geotechnical Engineer, the following pay volumes are to be used for either unclassified or undercut excavation:

Tandem:	13 CY
Tri-axle:	15 CY

Borrow: When either off-site or on-site borrow is to be counted by the truck tally method, "shrinkage" is to be incorporated into the truck volume in the amount of 15% (shrinkage of truck volume placed compared to compacted fill volume) utilizing the following pay volumes:

Tandem:	10 CY
Tri-axle:	12 CY

Loading Truck: A qualified truckload is one that is loaded up to within approximately 6" of the top of the dump bed, prior to dumping.

B. **Average-End-Method:**

Excavation and fill can be computed using the average-end-method. When used, this method is to be employed using the existing contours shown on the Contract Drawings and the Contractors actual surveyed finished contours (surveyed by a licensed Professional Surveyor). In so doing, the finished contours are to be plotted at the same scale as the original drawing and a transparency furnished to the Engineer for comparison to design grades. The volume computations are also to be submitted along with the Surveyors seal and a certification as to the volumes measured.

The Contractor, at his discretion and with the prior approval of the Engineer, may survey the "stripped" site (the site after topsoil has been removed) and compute the volumes based on the stripped site and the "designed" finished grade as shown on the Contract Drawings. As before, a transparency to the same scale and the Surveyors computations and certification are to be submitted to the Engineer for comparison and verification.

C. **Volume Formulas:**

Unless otherwise approved, the following formulas are to be used in computing cut and fill:

Fill Formula

Net Fill = Raw Fill Vol. – Unclassified Excavation X (1 - Shrink Factor) + Strip Vol. - Undercut or waste Fill placed in Fill Slopes X (1 - Shrink Factor) - Pavement Section or Building Floor Pad

Cut Formula

Net Cut = Raw Cut - Strip Vol. + Pavement Section or Building Floor Pad

3.12 CLEANUP AND RESTORATION OF SITE

A. During the progress of the work, the Contractor shall keep the premises and the vicinity of the work clear from unsightly and disorderly piles of debris. Suitable locations shall be specified for the various construction materials and for debris. The materials shall be kept in their storage locations, except as needed for the work and debris shall be promptly and regularly collected and deposited in the specified location.

B. Upon completion of grading operations, the Contractor shall fine grade the site, removing all surplus excavated material, leaving the area free from surface irregularities. He shall dispose of all surplus material, dirt, and rubbish from the site and shall keep the site free of mud and dust to the satisfaction of the City Engineer. The Contractor may be required to sprinkle the street to prevent dust nuisance and/or sweep the street to remove mud or debris.

C. When working on the shoulders of paved roads, the Contractor shall keep the pavement clean of all loose earth, dust, mud, grave, etc., and shall restore roadway shoulders and ditches as required by either the NCDOT or the right-of-way owner.

D. After all work is completed, the Contractor shall remove all tools and other equipment, leaving the site free, clean, and in good condition.

E. The Contractor shall keep the surface over and along the roadways and other graded areas in a safe and satisfactory condition during the progress of the work.

3.13 SEEDING, SODDING, AND GROUNDCOVER

3.13.1 GENERAL

A. Seeding, Sodding, and Groundcover shall comply with the applicable provisions and requirements of Section 02920, *Seeding, Sodding and Groundcover*.

B. Seeding and groundcover includes seedbed preparation, liming, fertilizing, seeding, and mulching of all disturbed areas. Areas inside or outside the limits of construction that are disturbed by the Contractor's operation and activity shall be seeded and mulched.

Unless called for otherwise on the Erosion and Sedimentation Control Plan, in areas where natural sod or vegetation has been disturbed, the area shall be seeded in accordance with **Standard Detail 350.01**.

If the construction activity disturbed a landscaped lawn, the seeding shall be modified to restore ground cover comparable to the existing lawn.

C. Seeding shall be carried out as soon as practical after the construction in any one area, and shall be maintained against erosion through the completion of the project. Seeding shall be accomplished as work progresses.

The Contractor shall be responsible for proper care of the seeded area during the period that vegetation is being established. In the event of an erosive rain before an adequate stand of vegetation has been established, damaged areas shall be repaired, fertilized, seeded, and mulched at the Contractor's expense.

Seeding on rights of way of NCDOT maintained roads shall be in accordance with NCDOT specifications and the requirements of the approved encroachment permit.

D. **Temporary Seeding**: Temporary and permanent seeding shall be carried out in accordance with the approved E&SC permit and plans as well as the applicable requirements of the NCDEQ Land Quality Erosion and Sediment Control Planning and Design Manual. Unless otherwise noted as more restrictive on either the approved E&SC plans and permit or in the Erosion and Sediment Control Planning Design Manual, denuded areas to be graded during the construction phases that are not to be brought to final grade within 21 calendar days shall receive temporary seeding and mulching. Areas to be stabilized with permanent vegetation must be seeded or planted within 15 working days or 90 calendar days after final grade is reached, unless temporary stabilization is applied. Temporary seeding shall also be used to stabilize finished grade areas if the time of year is outside the specified permanent seeding periods.

E. **Stockpile Area**: The Contractor is responsible for securing equipment storage, material lay down, and stockpile storage area for his work. As such, the Contractor is responsible for the necessary erosion control measures, including but not necessarily limited to, a construction entrance, silt fence, protection of streams/buffers, clean up and restoration of site to the satisfaction of the City and the NCDEQ, Department of Water Quality, Land Quality Section. Stockpile and/or waste areas must be maintained within the limits of the areas protected by the proposed measures and otherwise temporarily seeded if to be left stockpiled over 21 days.

3.14 MISCELLANEOUS

3.14.1 DUST CONTROL

The Contractor shall be required to sprinkle with water or to apply dust-allaying materials to ensure that dust is held to an absolute minimum. Dust control is considered incidental and shall be carried out at the Contractor's expense.

3.14.2 SALVAGE OF USEABLE MATERIALS

All materials such as iron castings, paving blocks, brick, pipe and etc., removed during excavation that is useable on this project shall be used after approval of its use by the City Engineer or the applicable owner of the street right-of-way. Such material shall be stockpiled on site. Unnecessary abuse and damage to these items shall be the Contractors responsibility and the cost of replacement may be deducted from the retainage.

End of Section 02200

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02275 - TRENCHING, BACKFILLING AND COMPACTION OF UTILITIES

(Last revised ~~8/22/13~~, 9/18/19) R4

SELECTED LINKS TO SECTIONS WITHIN THIS SPECIFICATION

Part 1- General
Part 2 – Products
Part 3 – Execution
Backfilling
Bedding Definitions
Bedding for Pipe
Blasting
Cleanup & Restoration
Clearing and Grubbing
Common Trench Backfill
Compaction – Min Require'ts
Def-Common Trench Backfill
Def-Select Earth Backfill
Dewatering
Erosion Control, NPDES
Flowable Fill Concrete
Foundation Preparation
Highway Crossings
Minimum Pipe Cover
Pavement Repair
River & Creek Crossings
Rock Excavation
Seeding & Groundcover
Select Earth Backfill
Trench Backfilling
Unclassified Trench Excavation

PART 1 – GENERAL

1.1 GENERAL:

A. The Contractor shall furnish all labor, materials, tools, equipment, and perform all work and services necessary for or incidental to the furnishing and installation, complete, of all operations in connection with excavation, trenching, and backfilling of underground utilities as shown on drawings and as specified, in accordance with provisions of the Contract Documents, and completely coordinated with work of all other trades.

Although such work is not specifically indicated, furnish and install all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure, complete and compatible installation.

Work included in the project consists of, but is not necessarily limited to, methods of installation of the following:

1) Sanitary Sewer Pipe Installation & appurtenances.

2) Water Distribution Pipe Installation & appurtenances.

3) Relocation of piping systems.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions apply to this specification.

B. AWWA C600: *Standard for Installation of Ductile-Iron Water Mains and their Appurtenances*

C. AWWA C605: *Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings*

D. AWWA C900: *Pressure Pipe and Fabricated Fittings (4" through 12") for Water Distribution*

E. City of Wilson *Pre-Approved Material/Product List*

F. City of Wilson *Right-of-Way Regulations and Procedures*, latest edition

G. Section 00825 – Product Substitutions

H. Section 00950 – Measurement and Payment

I. Section 02530 – Sanitary Sewer

J. Section 02510 – Water Distribution

K. Section 02630 – Storm Drainage

L. Section 02920 – Seeding, Sodding, and Groundcover

M. NCDEQ Division of Energy, Mineral, and Land Resources, Land Quality Section's *Erosion and Sedimentation Control Planning and Design Manual*, latest revision.

N. Standard *29 CFR Part 1926, OSHA Subpart P "Excavation and Trenching,"* latest edition.

O. UNI-PUB-06: *Installation Guide for PVC Solid-Wall Sewer Pipe (4-60 inch)*

P. UNI-PUB-09: *Installation Guide for PVC Pressure Pipe*

1.3 SUMMARY

A. This section includes:

1) Excavating and backfilling trenches for buried water, sewer, storm drainage, buried utility structures, and appurtenances.

2) Preparing subgrade for buried water and sewer, buried utility structures, and appurtenances.

B. Construction and materials related to this section but covered elsewhere:

1) Erosion Control: *North Carolina Sediment Control Law*.

1.4 DEFINITIONS

For the purposes of this specification, the following definitions refer to sanitary sewer, water distribution, and storm drainage systems that come under the authority of the City of Wilson as specified within this section and other sections of this manual.

A. **Backfill**: Soil materials used to fill an excavated trench.

1) **Initial Backfill** (Carefully Compacted Select Earth Backfill): Backfill placed beside and over the top 12-inches of the pipe in a trench, including haunches to support sides of pipe.

2) **Final Backfill** (Common Trench Backfill): Backfill placed over the initial backfill to fill a trench.

In terms of volume, backfill is defined as a compacted post-construction volume in-place.

B. **Bedding Course**: Layer of clean coarse stone placed over the excavated subgrade in a trench to bring the trench bottom up to grade before laying pipe. When natural materials encountered in trenches are of fine grains and migration of material into the bedding is possible, use well graded bedding material without voids (coarse sand; [Unified Soil Classification System] SC, SM).

C. **Borrow**: Borrow shall consist of approved fill material imported from off-site.

D. **City Engineer**: The Director of Engineering or his designated representative.

E. **City**: Refers to the City of Wilson

F. **Classified Excavation (undercut)**: Classified excavation shall consist of the removal and satisfactory disposal of all unsuitable material located below subgrade elevation. Where excavation to the finished grade section results in a subgrade or slopes of muck, peat, matted roots, etc., the Contractor shall remove such material below the grade shown on the plans or as directed; and areas so excavated shall be backfilled with approved select fill or stone as ordered by the City Engineer. See also paragraph AA, Unclassified Excavation.

G. **Clearing**: Clearing shall consist in the felling, cutting up, and satisfactory disposal of trees and other vegetation designated for removal in accordance with these specifications.

H. **Competent Person**: Competent Person means one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.

I. **Contractor**: Refers to a Contractor licensed in the State of North Carolina to perform public utility construction.

J. **Easement**: An instrument that depicts/describes and conveys rights and privileges to the City for the placement, access to and maintenance of a utility line across and/or on the property of a second party. Ownership of the land remains with the second party.

K. **Force Main**: Pressurized sanitary sewer main.

L. **Foundation Stone**: Clean well-graded stone, authorized by the City Engineer, used to strengthen and/or provide support to an otherwise weak subgrade. Foundation stone is placed and the subgrade improved before bedding stone is placed. Where voids may cause migration of native or backfill material, use well graded material without voids (coarse sands; [Unified Soil Classification System] SC, SM).

M. **Grubbing**: Grubbing shall consist of the removal of roots 1 ½ inch and larger, organic matter, debris and stumps and the disposal thereof.

N. **Haunching:** Layer of clean coarse stone placed and compacted up to the springline of the pipe. Where voids may cause migration of native or backfill material, use well graded material without voids (coarse sands; [Unified Soils Classification System] SC, SM).

O. **Public Sanitary Sewer System**: Any sewer facility or line owned and maintained by the City of Wilson.

P. **Rock Excavation for Trenches and Pits**: Rock excavation for trenches and pits includes removal and disposal off-site of materials and obstructions encountered that cannot be practically excavated with a track-mounted power excavator equivalent to a Caterpillar Model No. 325 or equivalent equipped with new rock teeth. Practical excavation is defined as the ability to remove at least 30 cubic yards during one hour of continuous digging. Trenches in excess of 10 feet in width and pits in excess of 30 feet in either length or width are classified as open excavation.

Q. **Rock in Open Excavation**: All boulder, solid ledges, bedded deposits, unstratified masses, and conglomerations of material so firmly cemented as to possess the characteristics of solid rock. Rock in open excavations includes removal and disposal on-site of materials and obstructions encountered in general excavation other than trenches and pits that cannot be dislodged and excavated with modern, track-mounted, heavy-duty excavating equipment without drilling, blasting, or ripping. Rock is defined as material which cannot be effectively excavated during general grading with a D-8 or equivalent dozer drawing a new single-tooth ripper. Effective excavation is defined as the ability to remove 10 cubic yards or more of material after one hour of continuous ripping. Typical of materials classified as Rock in Open Excavation are boulders larger than 1-1/2 cubic yards or more in volume, solid rock, rock in ledges, and rock-hard cementitious aggregate deposits.

R. **Shall**: Means a mandatory requirement.

S. **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.

T. **Subgrade**: Surface or elevation remaining after completing the trench excavation or, the top surface of a backfill (stone or soil) immediately below the pipe conduit or pipe bedding, as applicable.

U. **Topsoil**: See Division 02920 – *Seeding, Sodding, and Groundcover.*

V. **Trench Borrow**: Trench borrow shall consist of approved material imported from off-site for use as fill or backfill required to be placed in trenches either as initial carefully controlled select earth backfill or final common trench backfill. Trench borrow shall not be used until all suitable trench excavation material has been placed in the trench, unless authorized by the City Engineer. Unless otherwise designated on the plans and in the contract documents, the Contractor shall make his own arrangements for obtaining borrow and pay all costs involved.

W. **Water Main**: Exterior water systems for both domestic water and fire suppression needs.

X. **Water Distribution ORC**: The City's *Operator in Responsible Charge* over the City of Wilson's water distribution system; a manager in the Water Resources Department.

Y. **The Director of Water Resources**: The Director of Water Resources, Water Distribution ORC or their authorized representative.

Z. **Wastewater Collection ORC**: The City's *Operator in Responsible Charge* over the City of Wilson's wastewater collection system; a manager in the Water Resources Department Division.

AA. **Unclassified Excavation**: Removal and disposal of any and all material above subgrade elevation, except solid rock and undercut excavation, located within the limits of construction. See also paragraph F, Classified Excavation.

BB. The following are industry abbreviation for various pipe materials:

1) **AC**: Asbestos Cement Pipe

2) **CAP**: Corrugated Aluminum Pipe

3) **CI**: Cast Iron Pipe

4) **DIP**: Ductile Iron Pipe

5) **HDPE**: High Density Polyethylene Pipe

6) **PCP**: Plain Concrete Pipe

7) **PVC**: Polyvinyl Chloride Plastic Pipe

8) **RCP**: Reinforced Concrete Pipe.

1.5 SUBMITTALS

A. Submit product data and a sample of drainage fabric or separation fabric and fully document each with specific location or stationing information, date, and other pertinent information.

B. **Material Test Reports**: Provided from a qualified testing agency which either indicate or interpret test results for compliance of the following requirements indicated:

1) Classification according ASTM D2487 of each on-site or borrow soil proposed for backfill, unless otherwise directed by City Engineer.

2) Laboratory compaction curve according to ASTM D698 for each on-site or borrow soil material proposed for backfill.

C. **Blasting**:

1) Insurance Certificate naming the City as "additional Insured." See paragraph 3.8.1 – *Blasting* for other blasting insurance requirements.

2) Qualifications, proposed procedures, and schedule shall be submitted at least 2 weeks prior to commencing any blasting operations.

3) Permits from local Fire Department and City officials.

4) Blasters shall, at all times, have their license and blasting permits on the job site, and shall allow examination of same by any official that may have jurisdiction.

5) If required by the City Engineer, seismic survey agency report, for record purposes.

B. **Product Data**:

1) Each type of plastic warning tape

2) Stabilization/Separation fabric

3) Drainage Fabric

1.6 QUALITY ASSURANCE

A. **Geotechnical Testing Agency Qualifications**: An independent testing agency qualified according to ASTM E329 to conduct soil materials and rock-definition testing as documented according to ASTM D3740 and ASTM E548. Testing Lab to be AMRL (AASHTO Materials Reference Laboratory) and CCRL (Cement and Concrete Reference Laboratory) certified.

B. Comply with all codes, laws, ordinances, and regulations of governmental authorities having jurisdiction over this part of the work.

C. The contractor shall comply with North Carolina Department of Environment and Natural Resources, *Erosion and Sedimentation Control Handbook*, latest revisions.

D. Comply with applicable requirements of NFPA 495, *Explosive Materials Code,* latest revisions.

E. ASCE Manuals and Reports on Engineering Practice, Manual of Practice No. 60; WEF Manual of Practice No. FD-5: *Gravity Sanitary Sewer Design and Construction*, latest edition.

F. Comply with the Uni-Bell PVC Pipe Association *Handbook of PVC Pipe: Design and Construction,* latest edition. Dallas: for the installation of PVC piping, latest revisions.

1.7 QUALITY STANDARDS

A. Materials and operations shall comply with the latest revision of the Codes and Standards listed below:

American Society for Testing and Materials

ASTM C33	Concrete Aggregates
ASTM D698	Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3) (Standard Proctor).
ASTM D1556	Standard Method of Test for Density of Soil in Place by the Sand-Cone Method
ASTM D1557	Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3) (Modified Proctor).
ASTM D2049	Withdrawn and replaced with D4253
ASTM D2167	Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method
ASTM D2487	Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System).
ASTM D2922	Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
ASTM D3740	Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction
ASTM D4253	Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table.
ASTM D4254	Test Method for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density.
ASTM D4318	Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
ASTM E329	Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection
ASTM E548	Standard Guide for General Criteria Used for Evaluating Laboratory Competence

American Association of State Highway & Transportation Officials

AASHTO T99	The Moisture-Density Relations of Soils using a 5.5-pound Rammer and a 12-inch drop.

AASHTO T180	The Moisture Density Relations of Soils using a 10-pound Rammer and an 18-inch drop.
AASHTO M145	The Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes.
AASHTO T204	Density of Soil In-Place by the Drive Cylinder Method – Replaced by ASTM D2937
AASHTO T205	Density of Soil In-Place by the Rubber-Balloon Method – Replaced by ASTM D2167

American Water Works Association

AWWA C600	Installation of Ductile Iron Water Mains and Their Appurtenances.

North Carolina Administrative Code

13 NCAC 07	NC Office of Occupational Safety and Health

B. Standard Abbreviations:

AASHTO	American Association of State Highway Transportation Officials.
ACI	American Concrete Institute
ACPA	American Concrete Pipe Association
ANSI	American National Standards Institute
AREA	American Railway Engineers Association
ASCE	American Society of Civil Engineers
ASTM	ASTM International, formerly American Society for Testing and Materials
AWWA	American Water Works Association
BATFE	Bureau of Alcohol, Tobacco, Fire Arms and Explosive
CISPI	Cast Iron Soil Pipe Institute
DWQ	Division of Water Quality
FS	Federal Specifications
MSDS	Material Safety Data Sheets
MSHA	Mine Safety and Health Administration (MSHA) regulations.
NCDEQ	NC Department of Environment Quality

NCDOT	North Carolina Department of Transportation
NCMA	National Concrete Masonry Association
NCPI	National Clay Pipe Institute
NSF	National Sanitation Federation International
NPDES	National Pollutant Discharge Elimination System
OSHA	Occupational Safety and Health Administration
PWS	NCDEQ, Water Resources, Public Water Supply
USACE	United States Army Corps of Engineers
WEF	Water Environment Federation

1.8 TESTING SERVICES

A. The testing laboratory shall be approved by the City Engineer and will be responsible for conducting and interpreting tests. The testing laboratory shall state in each report whether or not the test specimens conform to all requirements of the Contract Documents and specifically note any deviation.

B. Specific test and inspection requirements shall be as specified herein.

1.9 PROJECT CONDITIONS

A. **Demolition**: Demolish and completely remove from the site existing underground utilities indicated on the plans to be removed. Coordinate with applicable utility companies to shut off services if lines are active.

B. Environmental - Wetlands: Before crossing or entering into any jurisdictional wetlands, contractor shall verify whether or not a wetlands permit has been obtained for the encroachment and whether special restrictions have been imposed in that permit. Care shall be taken to prevent draining or otherwise destroying non-permitted wetlands. Restore as stated on either the project drawings, the contract documents, and/or as noted in the permit. All crossings, disturbances, and encroachments into wetlands shall be subject to US Army COE and NCDEQ Division of Water Quality approval and permitting requirements and conditions.

C. **Environmental - Buffer Crossing Requirements:** Before crossing streams or ditches or working within 50 feet of ponds, lakes, or rivers, the Contractor shall verify whether either the line is exempt or a permit has been obtained to encroach into a nutrient sensitive river basin buffer and if so, to what extent work is permitted to occur. Unless otherwise permitted, shown on the contract drawings, or exempted by NCDEQ or other proper authority, water and sewer crossing stream, river, pond, or lake buffers are to be as near perpendicular as possible (the crossing is considered to be perpendicular if it intersects the stream or surface water between an angle of 75 and 105 degrees). Do not disturb more than 40

linear feet (longitudinal) of riparian buffer. When permitted to encroach into zone 1 (the lower 30 feet beside the stream or water), adhere to all of the following minimum, but not necessarily limited to, Best Management Practices in during construction.

1) Woody vegetation is cleared by hand. No grading allowed.
2) Stumps to remain except in trench where trees are cut. Minimize disturbance to roots in buffer zone.
3) Backfill trench with the excavated soil immediately following installation.
4) Do not use fertilizer except for the one-time application to reestablish vegetation.
5) Minimize removal of woody vegetation, the amount of disturbed area, and the time the disturbed area remains disturbed.
6) Take measures to ensure diffuse flow of water through the buffer after construction.
7) In wetland areas, use mats to minimize soil disturbance.
8) Schedule work in buffers to ensure exposure of denuded surface in the buffer is kept to a minimum

D. **Safety**

The contractor shall keep the surface over and along the trenches and other excavation in a safe and satisfactory condition during the progress of the work.

E. **Geotechnical Investigation**

1) Where a Geotechnical report has been provided to the Contractor by the City of Wilson, the data on sub-surface soil conditions is not intended as a representation or warranty of the continuity of such conditions between borings or indicated sampling locations. It shall be expressly understood that the City of Wilson will not be responsible for any interpretations or conclusions drawn there from by the Contractor. The data is made available for the convenience of the Contractor.

2) In addition to any report that may be made available to the Contractor, the Contractor is responsible for performing any other soil investigations felt necessary for proper evaluation of the site for the purposes of planning and/or bidding the project, at no additional cost to the City of Wilson.

F. **Protection of pavement**

Debris from the site shall be removed in such a manner as to prevent spillage. Keep pavement and area adjacent to site clean and free from mud, dirt, dust, and debris at all times. Employ the necessary measures required to meet this requirement.

1.10 SERVICE INTERRUPTION

For service interruption, operation of valves, taps, fire hydrant operation, etc, contact the Water Resources Department at 296-3403. Provide a minimum of 48 hours notice or desired utility interruption or necessary operation of valves or hydrants.

1.11 COORDINATION

A. Coordinate tie-in to municipal water mains with the City Engineer and/or the Director of Water Resources. Except as needed for fire suppression purposes, the City of Wilson will be the sole operator of all valves and hydrants on the City's water distribution system. When no customers will be affected, the City shall be notified at least 24 hours in advance of a request for the City to operate valves.

   Service is to be continuously maintained to customers in the project areas except for the minimum amount of time required to make connections to the existing system. However, if service is to be interrupted by shutting off a main(s), adequate notification to water customers shall be given by the Contractor prior to any interruption of service. Residents are to be notified at least 24 hours in advance of cut off using flyers.

   In the case of an emergency, a Contractor or plumber will be permitted to employ measures with respect to valve and fire hydrant operation as required for the protection of life and property. Notification must be made to the City as soon as possible after the emergency occurs stating what the emergency was and the measures taken to mitigate the emergency.

B. Coordinate tie-ins to municipal roadway system with the City of Wilson.

C. At the direction of the City Engineer and/or Director of Water Resources, temporary bypass pumping of sewerage flow may be required to be provided. See paragraph 3.6, *Bypass Pumping* of Specification *Section 02530 – Sanitary Sewer* for bypass pumping requirements and procedures.

D. When traffic signals, loops, or their appurtenances are likely to be damaged or interfere with construction, coordinate temporary operation with the applicable agency having jurisdiction of the signals. Provide a minimum of 1 weeks' notice prior to anticipated disturbance or interruption. At the discretion of the City Engineer, the notice may be required to be published in the newspaper.

E. **Repair of pavement markings**: When cuts are made through any paved surface and the cuts extend through the pavement markings, the replaced pavement shall be marked to match the existing.

F. **Benchmark/Monument Protection**: Protect and maintain benchmarks, monuments or other established reference points and property corners. If disturbed or destroyed, they must be replaced at Contractor's own expense by a Licensed Professional Surveyor and to the full satisfaction of Owner/City of Wilson.

G. Contact ***"NC One Call"*** at 811 before digging.

1.12 PUBLIC CONVENIENCE

The contractor shall at all times so conduct his work as to ensure the least possible inconvenience to the general public and the residents in the vicinity of the work. Fire hydrants on or adjacent to the work shall be kept accessible to fire fighting equipment at all times. Temporary provisions shall be made by the Contractor to ensure the proper functioning of all gutters, sewer inlets, drainage ditches, and irrigation ditches, which shall not be obstructed except as approved by the City Engineer.

1.13 TRAFFIC CONTROL

A. When working within any NCDOT System road or highway, conform to the *Manual on Uniform Traffic Control Devices*, latest revision (MUTCD) as well as the NCDOT *Standard Specifications for Roads and Structures*, latest revision.

B. Traffic Maintenance shall comply with the latest revision of the NCDOT *Standard Specifications for Roads and Structures*, Division 9 – *Signing* and Division 11 – *Work Zone Traffic Control*, as well as other applicable sections.

C. A traffic control plan shall be submitted to the City of Wilson Police Department and NCDOT (if applicable) for approval.

D. When traffic signals or their appurtenances are likely to be damaged or interfere with construction, coordinate temporary operation with the NCDOT or the City Engineer. Provide a 1 week notice prior to anticipated disturbance or interruption.

E. Whenever it becomes necessary to leave a section of trench open after completion of the days work, the contractor shall provide barricades and lights to protect the public. Operate warning lights during hours from dusk to dawn each day and as otherwise required for inclement weather and visibility.

1.14 EROSION AND SEDIMENTATION CONTROL AND NPDES MONITORING, CONTROLS, AND LIMITATIONS FOR PERMITTED DISCHARGES

The Project Engineer shall submit a sedimentation and erosion control plan to the appropriate authority and obtain all necessary construction permits. The Contractor shall follow the requirements stipulated in the approved permit and plans as well as all local and state requirements regarding sedimentation and erosion control.

Permittees (owner and/or Engineer) who have an approved E&SC Plan and permit are required to submit an electronic Notice of Intent (e-NOI) form in order to obtain a Certificate of Coverage (COC). Once DEM has issued a Certificate of Coverage (COC) to the owner/permittee, following a preconstruction conference, placement of erosion control measures/construction may commence.

Permittees and their Contractors are required to implement the approved Erosion and Sedimentation Control (E&SC) Plan, adhere to materials handling protocols, inspect their sites and maintain records.

After the completion of a project, the final step is to submit an electronic Notice of Termination (e-NOT) form to end coverage under the NCG01 Permit.

It is the Contractor's responsibility to adhere to the requirements of the approved E&SC permit and plans as well as periodically monitor the Stormwater Discharge Outfall points at the specified frequency and maintain reports as required under NCG01 and NCG25. See NCDEQ Energy, Mineral and Land website for more information, filing e-NOI, e-NOT, and Modification Forms and for the applicable "Self-Inspection and Monitoring Forms."

PART 2 – PRODUCTS

2.1 SOIL, BEDDING AND BACKFILL

2.1.1 MATERIAL CLASSIFICATION

A. **Bedding Material**: NCDOT #57 stone. For concrete pipe bedding material, see **Standard Detail 631.01**.

B. **Excavation**: All excavation material shall be classified as either Rock or Unclassified Earth Excavation. Prices bid for the various sizes of pipe shall include excavation and backfilling.

C. **Flowable Fill Concrete Backfill** (Controlled Low Strength Material): Concrete strength shall be liquid enough to flow, be self-leveling, excavatable, and have a minimum 28-day compressive strength of 30-psi but not more than 100-psi. Non-excavatable flowable fill concrete shall have a minimum 28-day compressive strength of 125-psi but no more than 200-psi (to be excavatable by machine equipment). Materials shall comply with the recommendations within chapter 4 – Materials of ACI 229R, latest revision, which include cement, aggregates, fly ash, water, admixtures, slag and other non standard materials).

   Excavatable is an application where it may be necessary to remove the flowable fill at a later date. Non-excavatable is an application where it is not necessary to remove or otherwise excavate the flowable fill at a later date.

D. **Foundation Stone**: Foundation/Trench Stabilization Material: #57 stone. For Concrete Pipe foundation stone, see **Standard Detail 631.01**.

E. **Select Earth Backfill**: Select earth backfill shall be free of debris, roots, frozen materials, organic matter, rock, or gravel larger than 1-inch in any dimension, or other harmful matter and shall generally meet NCDOT *Standard Specifications for Roads and Structures*, Section 1016 – *Select Material* for properties and gradation, Class II or III unless otherwise approved by the City Engineer. Stone screenings meet the intent of this specification.

F. **Common Trench Backfill**:

   1) **Satisfactory Soils**: ASTM D2487 soil classification group (Unified Soil Classification System) GW, GP, GM, SW, SM, SC, ML, and CL (Classes IA, IB, II, III and IVA soils; see **Standard Detail 511.02**) or a combination of these group symbols; free of rock or gravel larger than 3 inches in any dimension, debris, waste frozen materials, vegetation, and other deleterious matter.

   2) **Unsatisfactory soils**: ASTM D 2487 soil classification group GC, CH, MH, OH, OL and PT (Classes IVA & V soils; see **Standard Detail 511.02)**; soils which contain rock or gravel larger than 3 inches in any dimension, debris, waste frozen materials, vegetation, clumps of clay larger than 3 inches in any dimension, and other deleterious matter. Unsatisfactory soils also include satisfactory soils not maintained within +/- 3% of optimum moisture content at time of compaction, unless otherwise approved by the City Engineer.

G. **Structures, Backfill around**: Backfill shall be approved by the City Engineer and shall be free from large or frozen lumps, wood, or rocks more than 3 inches in their greatest dimension or other extraneous material. The top 12 inches are to be free

of material greater than 1-inch in their greatest dimension. Porous backfill shall be either #67 or #57 clean stone.

H. **Topsoil**: Topsoil shall consist of friable clay loam, free from roots, stones, and other undesirable material and shall be capable of supporting a good growth of grass. Topsoil shall be free of material greater than 1-inch in any dimension. See division 02920 – Seeding, Sodding, and Groundcover.

2.1.2 PIPE BEDDING DEFINITIONS

A. **Pipe Bedding Definitions (Water & Sewer)**

1) **Class D Bedding** is that condition existing when the ditch is excavated slightly above grade by excavation equipment and cut to finish grade by hand. Bell holes are dug, to prevent point loading the pipe bells, so that pipe bears uniformly upon the trench bottom. Existing soil should be shovel sliced or otherwise compacted under the hunching of the sewer pipe to provide some uniform support. Soil is tamped to 90% of the standard Proctor maximum dry density around the pipe to a point one foot above the pipe. The remainder of the soil to the ground surface is to be compacted to the density specified in Table 2275.3. In poor soils, granular bedding material is generally a more practical, cost effective installation. The bedding factor for class D bedding is 1.1.

A Class D bedding generally equates to a Type 1 Laying Condition as shown on **Standard Detail 511.02**.

2) **Class C Bedding** is that condition where the sewer pipe is bedded in compacted granular material. The granular bedding has a minimum thickness of one-eighth the outside sewer pipe diameter, but not less than 4 inches or more than 6 inches, and shall extend up the sides of the sewer pipe one-sixth of the pipe outside diameter. The remainder of the sidefills, to a minimum depth of 6 inches over the top of the pipe, consists of lightly compacted backfill. The remainder of the soil to ground surface is to be compacted to the density specified in Table 2275.3. The bedding factor for class C bedding is 1.5.

A Class C bedding is similar to a Type 3 Laying Condition as shown on **Standard Detail 511.02** except that the pipe has a minimum of 4 inches of stone bedding that extends up one-sixth of the pipe OD.

3) **Class B Bedding** is that condition where the sewer pipe is bedded in carefully compacted granular material. The granular bedding has a minimum thickness of one-eighth the outside sewer pipe diameter, but not less than 4 inches or more than 6 inches, between the barrel and the trench bottom, and covering the full width of the trench.

The haunch area of the sewer pipe must be fully supported; therefore, the granular material should be shovel sliced or otherwise compacted under the pipe haunch to the springline of the pipe. Both granular haunching (to the springline) and initial backfill to a minimum depth of 12 inches above the top of the sewer pipe should be placed and compacted. The initial backfill material, to a depth of 12 inches above the top of the pipe, should be compacted to no less than 90% of the standard Proctor maximum dry

density. The remainder of the soil to the ground surface is to be compacted to the density specified in Table 2275.3. The bedding factor for class B bedding is 1.9.

A Class B bedding generally equates to a Type 4 Laying Condition as shown on **Standard Detail 511.02** except that the haunches are backfilled with stone up to the springline of the pipe.

4) **Class B-1 Bedding** (*PVC pipe applications*) is the same as Class B Bedding except that granular backfill is placed to the ***top of the pipe*** rather than to the springline of the pipe. The remainder of the soil to the ground surface is to be compacted to the density specified in Table 2275.3.

   A Class B-1 bedding generally equates to a Type 5 Laying Condition as shown on **Standard Detail 511.02**.

5) **Class A Bedding** is that condition when the sewer pipe is bedded in a cast-in-place concrete cradle of either plain or reinforced concrete having a thickness equal to one-fourth the inside pipe diameter, with a minimum of 4 inches and a maximum of 15 inches under the pipe barrel and extending up the sides for a height equal to one-fourth the outside pipe diameter. The cradle width shall have a width at least equal to the outside diameter of the sewer pipe barrel plus 8 inches. The bedding factor for class A bedding is 2.2.

   The haunching and initial backfill material above the concrete cradle should be crushed stone or a well graded granular material and carefully compacted to 12 inches above the crown of the sewer pipe. The remainder of the soil to the ground surface is to be compacted to the density specified in Table 2275.3.

2.2 MISCELLANEOUS

2.2.1 GEOTEXTILE FABRIC

Geotextile fabric shall be protected from mud, dirt, dust, sunlight, and debris during transport and storage. Material shall be inert to commonly encountered chemicals; resistant to mildew, rot, insects, and rodents; and biologically and thermally stable. Geotextile fabric for subsurface installation shall not be exposed to direct sunlight for more than 24 hours before or during installation.

A. **Filter Fabric for Rip Rap**: Filter Fabric for Rip Rap and Rip Rap Beddings shall conform to Section 1056 – *Geosynthetics* of the NCDOT *Standard Specifications for Roadways and Structures*, latest revision for Type 2 engineering fabric.

B. **Soil Stabilization Fabric**: Generally, soil stabilization fabric shall conform to the requirements of Section 1056 – *Geosynthetics* of the NCDOT *Standard Specifications for Roadways and Structures*, latest revision for Type 4 engineering fabric. However, provide fabric meeting Geotechnical Engineers recommendations for the application and use intended.

C. **Fabric for Subsurface Drains**: Non-woven needle-punched fabric shall conform to Section 1056 – *Geosynthetics* of the NCDOT *Standard Specifications for Roadways and Structures*, latest revision for Type 1 engineering fabric.

D. **Silt Fence Fabric**: Silt fence fabric shall conform to Section 1056 – *Geosynthetics* of the NCDOT *Standard Specifications for Roadways and* **Structures**, latest revision for Type 3 engineering fabric, Class A or B as specified or shown on the plans.

2.2.2 WARNING TAPE

Metallic Underground Warning Tape: Metallic detectable underground warning tape shall consist of a solid aluminum foil core, 35-gauge minimum, encased on each side with plastic (minimum overall thickness 5 mils) and be 3 inches wide with black lettering imprinted on a color coded background that conforms to APWA uniform color code specification (BLUE) and silver with black ink letters. Minimum tensile strength shall be 22 lbs/inch. Soil tolerance range to be pH 2.5 to pH 11.0. On one side of the tape, the text shall include the wording "WATER (or SEWER if a sewer force main) LINE BELOW" repeated along the length of the tape. A detectable warning tape shall be used with all water and sewer mains. Underground warning tape is to be placed 12 to 18 inches above top of pipe. See **Standard Detail 511.01**.

Standard color code for tape and wire.

Blue:	Water Systems
Green:	Sewer Force Mains

2.2.3 LOCATOR WIRE:

Number 12 AWG blue insulated single-strand solid or stranded copper locator wire shall be installed above all non-ferrous water and sewer mains; attached every 5 feet to the mains with zip ties. Electrical conductivity along the pipe shall be continuous and uninterrupted between valve boxes. Clamps used to bond wire to conductor to metal (in instances where both PVC and ductile iron are used in the same run of pipe) shall be heavy-duty stainless steel approved by the City Engineer. A sufficient excess length of wire shall be left in each valve box to provide at least a 6 to 12 inches length of wire above finished grade. See **Standard Detail 511.01**.

2.2.4 DEFORMED REINFORCING STEEL

Reinforcing Steel bars shall meet ASTM A615 *Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement*, Grade 60, latest revision.

2.2.5 WELDED WIRE FABRIC

Welded wire fabric shall meet ASTM A185 *Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete*, latest revision.

PART 3 – EXECUTION

3.1 PREPARATION

3.1.1 GENERAL REQUIREMENTS APPLYING TO ALL AREAS

A. Contractor shall plan construction to minimize disturbance to properties adjacent to the water or sewer lines.

B. The City Engineer reserves the right to limit the width of land to be disturbed and to designate on the drawings or in the field certain areas or items within this width to be protected from damage.

C. **Access and/or Haul Roads**: Any grading or excavation required for equipment travel during the course of construction as well as erosion control, access or haul road removal, restoration, seeding and ground cover shall be provided by the Contractor.

D. The Contractor shall be responsible for damage to areas or items designated by the City Engineer to be protected. Repairs to, replacement of, or reparations for areas or items damaged shall be made to the satisfaction of the City Engineer and affected property owners before acceptance of the completed project.

E. The Contractor shall protect all buildings or structures located along the utility line. Hand trenching, shoring, or other methods may be required.

F. Any fences disturbed by the Contractor shall be repaired to a condition equal to or better than their original condition or to the satisfaction of the City Engineer. This may require the use of new material.

G. Contractor shall limit width of disturbed area through garden areas to a width absolutely necessary for construction of utility line.

H. Contractor shall obtain written permission from property owners for use of any access other than ones located within public rights-of-way or easements. Written permission shall contain conditions for use and restoration agreements between property owner and Contractor.

I. All areas disturbed shall be restored to a condition equal to or better than their original condition and shall be graded to drain.

J. The Contractor shall replace or repair all damaged or destroyed hedgerows and property corners using the services of a licensed Professional Surveyor.

3.1.2 CONSTRUCTION LIMITS

A. Contractor shall not disturb any areas outside the limits contained in this section without express written permission from the City Engineer.

B. Except as indicated on the plans, no "clear cutting" of timber shall be permitted within the construction limits. Contractor shall make select cutting of trees, taking smallest trees first, that are mandatory for the construction of the utility line. The decision of the City Engineer shall be final on the determination of which trees are to be cut.

C. Should it become necessary to move the position of any underground structure, the Contractor may be required to do such work and shall be paid on a "force account" basis or on an "extra work" basis as directed by the City Engineer.

Method of payment shall be agreed upon by the City Engineer and the Contractor prior to commencing work.

D. If existing utilities are found to interfere with the permanent facilities being constructed under this section, immediately notify the City Engineer and secure instructions. Do not proceed with permanent relocation of utilities until instructions are received from the City Engineer.

E. The widths measured from the centerline of the water or sewer lines shall be as shown on the contract drawings. The Contractor shall protect all areas outside these construction limits unless written variations are granted by the City Engineer.

F. **Specific requirements applying to developed subdivision/lots**

1) Unless directed otherwise by the City Engineer, all trees, shrubs, hedges, or other ornamental plantings located outside of the construction limits, easements, or public rights-of-way shall be protected by the Contractor. The City Engineer reserves the right to designate certain trees located within the construction limits for protection where deemed desirable.

2) The contractor shall protect septic systems or springs located outside the construction limits.

3) Excavated or blasted rock shall be removed from the site unless otherwise ordered by the City Engineer.

G. **Specific requirements applying to undeveloped areas**

1) In wooded areas, the clearing shall be limited to the easement or right-of-way limits unless indicated differently on the City of Wilson approved construction drawings, in which case, the work shall be confined to the limits defined on the plans. All permanent easements and rights-of-way shall be fully cleared as determined by the City Engineer. The City Engineer reserves the right to designate certain tree located within the construction limits for protection where deemed desirable.

2) In areas where livestock and pets are kept, the Contractor shall notify property owner prior to commencing work and keep owner advised of progress of work. Fences shall be kept secure at all times and livestock and pets protected from open ditches, machinery, blasting, and other hazards.

3.1.3 PROTECTION OF EXISTING UTILITIES AND STRUCTURES

A. **Subsurface obstructions**

1) **Subsurface obstructions**: Take necessary precautions to protect existing utilities from damage due to any construction activity. The Contractor shall locate existing utilities, culverts, and structures (above or below ground), before any excavation starts and coordinate work with utility companies. The Contractor shall be responsible for notifying utility companies when working within the vicinity of the existing utilities. Omission from or inclusion of located utility items on plans do not constitute non-existent or definite location. Even though for convenience, the utility may be shown

on the plans, the Contractor is responsible for and shall call for utility location a minimum of 48 hours prior to excavation. Contact underground damage protection services NC One Call or current locator service. Secure and examine local utility surveyor records for available location data including building service lines.

2) Unless shown to be removed, protect active utility lines shown on the drawings or otherwise made known to the Contractor prior to trenching. In excavating, care must be taken not to remove or injure any subsurface structure. All existing gas pipes, water pipes, steam pipes, telephone lines, cable TV lines, electrical conduits, poles, sewers, drains, fire hydrants, and other structures which, in the opinion of the utility company, do not require relocation shall be carefully supported, shored up, the flow maintained, if applicable, and the line/main/obstruction protected from damage by the Contractor. If damaged, the Contractor shall give immediate notice to the proper authorities. The utility shall be restored, at the Contractor's expense, by the appropriate utility to original or better condition. Where pipes, conduits, or sewers are removed leaving dead ends in the ground, such ends shall be carefully plugged or bulk headed by the Contractor at the Contractor's expense and in accordance with the requirements of the affected utility agency. The Contractor shall be responsible for any damage to persons or property caused by such breaks. This includes water taps and sewer cleanouts installed by a contractor during new construction to be taken over by the City of Wilson.

3) The Contractor shall be responsible for anticipating and locating underground utilities and obstructions. When construction appears to be in close proximity to existing utilities, the trench(es) shall be opened a sufficient distance ahead of the work or test pits made to verify the exact locations and inverts of the utility to allow for changes in line and grade.

4) If active utility lines are encountered, and are not shown on the Drawings or otherwise made known to the Contractor, promptly take necessary steps to assure that service is not interrupted.

5) Should it become necessary to move the position of any underground structure, when approved by the City Engineer, the Contractor may be required to do such work and shall be paid on a "force account" basis or on an "extra work" basis.

6) If existing utilities are found to interfere with the permanent facilities being constructed under this Section, immediately notify the City Engineer and secure instructions. Do not proceed with permanent relocation of utilities until written instructions are received from the City Engineer.

B. **Protection of Surface Features**

1) Whenever the utility line is to be placed in or near a paved street, the Contractor shall provide pads or take necessary precautions to protect the pavement from damage by the construction equipment. Pavement damaged by cleated or tracked equipment, or by any other means, shall be

repaired by the Contractor at his expense to the satisfaction of the City Engineer.

2) Where a utility line is placed in an existing paved area, the Contractor shall use care to cut in sharp, neat lines ahead of the excavating/ditching equipment and parallel to the pipe on each side as may be applicable. If the existing road to be cut is located within another jurisdiction other than the City of Wilson or within NCDOT rights of way, the Contractor is responsible for contacting the local representative or NCDOT, respectively about pavement repair/replacement.

3) Avoid overloading or surcharge by keeping equipment and material a sufficient distance back from edge of excavation to prevent slides or caving. Maintain and trim excavated materials in such manner to be as little inconvenience as possible to public and adjoining property.

4) Provide full access to public and private premises, to fire hydrants, at street crossings, sidewalks and other points as designated by the City Engineer to prevent serious interruption of travel.

5) Protect and maintain benchmarks, monuments, or other established points and reference points, and if disturbed or destroyed, items shall be replaced by a Licensed Professional Surveyor to the full satisfaction of the City Engineer and/or the jurisdictional agency.

6) See paragraph 1.11 D, *Coordination*, regarding traffic signals.

C. **Procedures for repairing damaged utility services**

1) If a located service is interrupted as a result of work under this Section, immediately restore service by repairing the damaged utility at no additional cost to the City. Notification shall be made to the Utility owner.

2) **House services**: If a service pipe supplying water or gas to an adjoining house is broken, the Contractor shall have service repaired it at once and at his expense. The City may, at the Contractor's expense, repair any such service without prior notice to the Contractor.

3) If damage results from the action of either a public or private party on a newly constructed project to be accepted by the City of Wilson (e.g. water, sanitary sewer, storm sewer, or street), immediate notification shall be given to the City Engineer or City Inspector. All damages or interruption shall be the responsibility of the party causing the damage.

4) Notify the City or PNG if services or mains are damaged. Gas repairs are to be made by either the City or PNG. The repairs made to services or mains damaged by either the Contractor's or his/her subcontractors will be at Contractor's expense.

3.1.4 PROTECTION OF PERSONS AND PROPERTY

A. Barricade open holes and depressions occurring as part of the work, and post warning lights on property adjacent to or part of public access.

B. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, washout, and other hazards created by operations under this or other related sections.

C. **Protection and Restoration of Property:** The contactor shall not enter upon private property for any purpose without first obtaining permission. He shall use every precaution necessary to prevent damage or injury to any public or private property, trees, fences, monuments, and underground structures, etc., on and adjacent to the site of the work. He shall protect carefully from disturbance or damage all land monuments and property markers until an authorized agent has witnessed or otherwise referenced their locations, and shall not remove them until directed.

The Contractor shall be responsible for all damage or injury to property of any character resulting from any act, omission, neglect, or misconduct in his manner or method of executing said work, from his nonexecution of work, or from defective work or materials, and he shall not be released from said responsibility until the work shall have been completed and accepted.

When or where any direct or indirect damage or injury is done to public or private property by or on account of any act, omission, neglect, or misconduct in the execution of the work, the contractor shall restore such property, at his own expense, to a condition equal to or better than that existing before such damage or injury was done. The contractor shall make good such damage or injury in an acceptable manner by repairing, rebuilding or otherwise restoring as directed.

The Contractor shall, at his own expense, sustain in their places and protect from direct or indirect injury all pipes, poles, conduits, walls, roadways, buildings, and other structures, utilities and property in the vicinity of his work. Such sustaining and supporting shall be carefully done by the Contractor and as required by the Company or party owning the structures or Agency controlling it. The Contractor shall take all risks attending the presence or proximity of pipes, poles, conduits, walls, thereof and any costs associated will be deducted from any monies due the Contractor. Failure of the City Engineer or his/her authorized representative to direct the correction of unsafe conditions or practices shall not relieve the Contractor of his responsibility hereunder.

3.1.5 CLEARING AND GRUBBING

A. **Description**: This work shall consist of clearing, grubbing, removing, and disposing of all vegetation and debris within the limits of construction, as designated on the plans or as required by the City Engineer. The work shall also include the preservation from injury or defacement of all vegetation or objects designated to remain. Clearing shall consist of cutting, removal, and satisfactory disposal of all trees, down timber, brush, rocks, projected roots, stumps, rubbish, laps, and other material within the limits of construction.

B. A preconstruction meeting shall be held with appropriate urban forestry personnel (as may be applicable) and the City prior to any clearing, if required. The City Engineer may require tree protection fencing in sensitive areas, where specifically

identified trees are desired to be protected, and when required by the landscape ordinance.

C. The area within the limits of construction or as designated shall be cleared and grubbed of all trees, stumps, roots, brush, undergrowth, hedges, heavy growth of grasses or weeds, debris and rubbish of any nature that, in the opinion of the City Engineer, is unsuitable for foundation material. Nonperishable items that are not deleterious to the project and will be a minimum of 5 feet below the finish elevation of the earthwork or slope of the embankment may be left in place.

D. The Contractor shall provide barricades, fences, coverings, or other types of protection necessary to prevent damage to existing improvements, not indicated to be removed, and improvements on adjoining property. All improvements damaged by this work shall be restored to their original condition and to a condition acceptable to the owner or other parties or authorities having jurisdiction. Trees and shrubs that are to remain within the construction limits will be indicated on the drawings or conspicuously marked on site. Unless otherwise noted, trees within the construction limits shall become the property of the Contractor and shall be removed from the site.

E. Contractor shall protect existing tress and other vegetation indicated by the City Engineer to remain in place against limb, bark or root damage such as cutting, breaking, or skinning of roots, skinning and bruising of bark, smothering of trees by stockpiling construction materials or excavated materials within drip line, excess foot or vehicular traffic, or parking of vehicles within drip line. When such damage does occur, all rough edges of scarred areas shall be removed in accordance with accepted horticultural practices.

F. Carefully and cleanly, cut roots and branches of trees indicated to remain where the roots and branches obstruct construction of the proposed utility line. If directed by the City Engineer, the Contractor shall provide protection for roots and branches over 1 ½ inches diameter that are cut during construction operations. Coat the cut faces with emulsified asphalt, or other coating especially formulated for horticultural use on cut or damaged plant tissues. Temporarily cover all exposed roots with wet burlap to prevent roots from drying out. Provide earth cover as soon as possible.

G. If they are damaged by construction operations, trees and vegetation designated to remain shall be repaired or replaced at Contractor's expense in a manner acceptable to the City Engineer. The City Engineer may require that the tree and/or vegetation damage be repaired as directed by a qualified tree surgeon.

H. Debris from the site shall be removed in such a manner as to prevent spillage. Keep pavement and area adjacent to site clean and free from mud, dirt, dust, and debris at all times.

I. The method of stripping, clearing, and grubbing the site shall be at the discretion of the Contractor. However, all stumps, roots and other debris protruding through the ground surface or in excavated areas shall be completely removed and disposed of off the site by the Contractor.

A. **Marginal Areas**: In marginal areas, with the City Engineer's permission, remove trees where the following conditions exist.

1) **Root Cutting**: When clearing up to the "clearing limits," the Contractor shall also remove any tree which is deemed marginal such that when the roots are cut a tree could be rendered unstable by the affects of high winds and thus in danger of toppling into either the right-of-way or onto private property.

2) **Slender Bending Trees**: Where young, tall, thin trees are left unsupported by the clearing operation, and are likely to bend over into the right-of-way, the Contractor, during the clearing operation, shall selectively remove those trees which are located outside and adjacent to the clearing limits and City right-of-way or easement as well. During the course of construction and during the one-year warranty period, the Contractor shall remove such young trees that overhang into the right-of-way or cleared area. Removal outside of a public right-of-way or easement require permission from a private property owner. Coordinate owner contact with the City's inspector.

J. **Stripping of Topsoil**: Remove the existing topsoil to a depth of 6 inches or to the depth encountered from all areas in which excavation will occur. The topsoil shall either be stored in stockpiles separate from the excavated trench material if the topsoil is to be respread or otherwise disposed of off-site. Topsoil stockpiles shall be graded to freely drain surface water, and shall have a silt fence placed around the base of the stockpile and/or other measures required by the Erosion and Sedimentation Control Plan/Permit.

K. **Disposal**: All brush, tree tops, stumps, and debris shall be hauled away from site or otherwise disposed of in a manner acceptable to the City Engineer. The contactor shall clean up debris resulting from clearing operations continuously with the progress of the work and remove promptly all salvageable material that becomes his property and is not to be reused in construction. Sale of material on the site is prohibited.

Disposal of cleared material shall be in accordance with all local and state laws. Trees cut down on the construction site will be hauled away from the site for proper disposal unless instructed otherwise by the City. Stumps of trees cut down outside of the excavation area will be removed. Perishable material shall not be disposed of at the construction site. Brush, laps, roots, and stumps from trees shall be disposed of in a NCDEQ approved and permitted land clearing and inert debris type landfill. The Contractor will be responsible for obtaining all applicable permits and paying all fees for the disposal of excess material.

3.1.6 DEWATERING

A. **Water in trenches**: When ground water in encountered, the contractor shall remove the water that accumulates in the trenches or pits, which would affect the construction of the lines or their appurtenances, by pumping, bailing, well-pointing, or other approved dewatering method and shall perform all work necessary to keep the trenches or pits entirely clear from water while bedding is being placed, the pipe is being laid, masonry units are being placed, and structures are either being set or constructed. All water removed from the trench shall be conveyed in a proper manner to a suitable point of discharge and shall comply with applicable erosion and sedimentation control laws. Pipe laying and pipe jointing shall be made in the "dry."

B. Maintain dewatering systems until dewatering is no longer required.

C. No pipe shall be constructed in water and water shall not be allowed to drain through the pipe. The open end of the pipe shall be kept closed with a tight fitting plug to prevent washing of any foreign matter into or through the line.

D. No structure shall be constructed in water and water shall not be allowed to flow over or rise upon any concrete masonry structure until the work has been accepted or permission has been otherwise granted by the City Engineer.

E. The contractor shall dispose of water from the trenches in such a manner to cause no injury to public health, pubic or private property, work completed or in progress, street surfaces, or which may cause any interference with the use of the streets. Water, if odorless and stable, may be discharged into an existing storm drain, channel, or street gutter in a manner approved by the City Engineer. When required by the City Engineer, a means shall be provided for desilting (filtering) the water before discharge. Under no circumstances shall water be discharged to a sanitary sewer main or structure.

F. Prevent surface water from ponding on prepared subgrades and from flooding project site and the surrounding area. Reroute surface water runoff away from or around excavated areas.

G. Do not allow water to accumulate in excavations. Unless otherwise directed by the City Engineer, the cost of shoring, sheeting, well pointing, gravel bedding and other dewatering devices shall be included in the unit price of each respective item bid. Do not use excavated trenches as temporary drainage ditches.

H. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation. Include cost of de-watering in proposal for water or sewer lines. No additional remuneration for this item is permitted.

I. Where underground streams or springs are encountered, provide temporary drainage, well pointing, or bailing. Notify the City Engineer of such conditions.

J. Backfilling shall not take place when the trench contains water in an amount to create soupy conditions.

3.2 TRENCH EXCAVATION

3.2.1 GENERAL

A. **Classification of Excavated Material**: All excavated material shall be classified as either earth or rock. Prices bid for the various sizes of pipe shall include excavation and backfilling; such excavation shall be classified as earth. Rock excavation shall be paid for as a separate item.

B. Remove all material of whatever nature, including but not limited to clay, silt, and gravel. Provided the material meets the requirements of paragraph 2.1.1 *Material Classification*, subparagraph F, *Common Trench Backfill*, material of a compactable nature that can be re-used as trench backfill shall be replaced and re-compacted to the requirements set forth in these specifications.

C. **Unsuitable Material and Wasting**: When directed by the Owner's Engineer or the City Engineer, unsuitable material in the trench shall be removed to an

appropriate depth and width. At the contractor's expense, dispose of all unsuitable material, of whatever nature, to a site which legally can accept such material as fill. Adhere to all applicable laws and ordnances regarding permitting of waste site, erosion control, zoning, etc. as may be applicable.

D. Excavation shall be performed in accordance with OSHA Standard *29 CFR Part 1926, Subpart P - Excavations*.

E. **Sanitary and Storm Sewer Alignment and Grade**: Offset stakes set at each manhole, catch basin, or curb inlet shall indicate the line and grade of the sewer. Alignment and grade of the pipe by the Contractor shall be established by laser beam. The contractor shall employ personnel experienced in the use of laser beams. The alignment and grade of the sewer shall be constructed as indicated on the approved plans. Prior to making changes in the field, the City Engineer shall approve any change in grade or alignment which deviates from the approved plans.

F. Concrete collars shall be installed when either shown on the approved plans or directed by the City Engineer.

3.2.2 PIPE COVER

A. **General**: Where lines transverse public property or are subject to other governmental or utility company jurisdiction, provide depth, bedding, cover, and other requirements as set forth by the legally constituted authority having jurisdiction, but in no case less than the depth shown in the Contract Documents.

B. **Minimum Cover**: Unless shown otherwise on the construction documents, provide minimum trench depth indicated below to maintain a minimum cover over the top of the installed item. Minimum cover on pipe is measured perpendicular from top of pipe or fittings to original ground or proposed finished grade as applicable and shall be per **Table 2275.1**, below. Where the minimum cover is not provided, either use Ductile Iron Pipe or encase the pipe(s) in concrete as indicated. Provide NCDOT Class A concrete.

Table 2275.1 Minimum Cover Above Top of Main Pipe Lines			
Utility	**Condition**		
	Subject to vehicular traffic	**NOT subject to vehicular traffic**	**With Concrete Encasement**
Sanitary Sewer	36[b] inches (use DIP if < 36 inches of cover)	24[b] inches (use DIP if < 36 inches of cover)	As Designed
Sewer Services	At depth shown on plans but no less than 36[b] inches (use DIP if < 36 inches of cover)	At depth shown on plans but no less than 12[b] inches	As Designed
Water Distribution	36[a] inches for lines 8 inches and smaller; 42 inches for lines larger than 8 inches	36[a] inches for lines 8 inches and smaller; 42 inches for lines larger than 8 inches	24 inches (encasement, if required, shall extend to at least 5 feet beyond each side of a ditch or culvert crossing)
Water services	30[a] inches	30[a] inches	As Designed
Storm Drainage	As designed but no less than 12[c] inches for reinforced concrete pipe	As designed	As Designed

[a]**Minimum/Maximum Cover for Water Pipe**: The City Engineer must approve all installations of water line with less than 30 inches of cover or greater than 72 inches of cover. Lines which have less than 30 inches of cover at ditch or culvert crossings shall be Ductile Iron and encased in a steel casing. The casing shall extend through all areas until the depth of cover above the DIP is greater than 30 inches.

[b]**Minimum/Maximum Cover for Sewer Pipe**: The City Engineer must approve all installations of sewer lines with 24 inches of cover or less or with greater than 18 feet of cover. Ductile iron pipe is required where depth of pipe exceeds 12 feet or the line is placed in fill.

[c]**Minimum/Maximum Cover for Storm Drainage Pipe**: The City Engineer must approve all installations of storm drainage lines in areas subject to traffic load with less than 12 inches of cover or with greater than 12 feet of cover. The pipe class, trench width, and/or the bedding class shall be modified for the depths exceeding 12 feet of cover to accommodate the extra depth/loads. Pipe subject to vehicular traffic shall be reinforced concrete pipe. No plain concrete pipe is permitted in traffic areas.

C. Water lines which have less than 30 inches of cover at ditch or culvert crossings shall be required by the City Engineer to be encased. The casing shall extend through all areas until the depth of cover above the DIP is greater than 30 inches.

3.2.3 TRENCHING

A. **General**: The trench for gravity pipe shall be excavated to conform to **Standard Details 511.02** (water and sewer pipe embedment), **631.01** (storm drainage), and **731.01** (sewer) as applicable. Where it is necessary to remove existing pavement, prepared road surfaces, sidewalks and curbs, these structures/surfaces must be replaced by the Contractor. When making a pavement cut, the Contractor shall use care to saw cut in sharp, neat lines ahead of the excavating/ditching equipment and parallel to the pipe on each side as may be applicable. If necessary due to damage, edges of existing pavement shall be re-cut and trimmed to square, straight edges after the pipe system has been installed and prior to placement of the new base and pavement. See **Standard Detail C01.03**.

All trenching shall be open-cut from the surface. No tunneling or boring will be allowed without the consent of the City Engineer. All trenches shall be excavated to the lines and grades as shown on the plans. Where utility lines are in an existing paved area, the edges of the pavement for the utility line shall be cut in a straight line, parallel to the pipe.

Trenches shall be excavated in straight lines, in general, following the contour of the ground, and shall be accurately graded in order to establish a true elevation of the invert of the pipe. Trenches for water lines may be curved within the limits of curvature of the pipe as allowed by AWWA C600. In no case shall the trench alignment exceed the allowable vertical or horizontal pipe deflection of offset recommended by the pipe manufacturer.

1) **Trench Width**: The sides of trench shall be uniform and vertical. The width of the trench at the top of the pipe shall be a width that will permit the proper construction of joints and compaction of backfill around the pipe and shall be equal to the largest outside diameter of the pipe plus 12 inches on each side of the pipe, measured transverse to the pipe at the top of the pipe. The sides of the trenches shall be vertical unless otherwise approved by the City Engineer. Unless otherwise shown in the standard details, vertical walls should project at least 2 feet above the top of the pipeline laid to existing construction grade unless the finished grade fill depth is less than 2 feet. Lowering trench wall height may necessitate a change in either pipe or bury classification. Notwithstanding, this section is subject to OSHA guidelines and regulations regarding trench protection and shoring.

   Every effort shall be made to maintain the width of the pipe plus 24 inches but trench width must also be wide enough to provide adequate space for laying and connecting pipe and appurtenances. Sufficient space shall be allowed at the joints for the free use of wrenches for tightening of bolts.

   The minimum trench width should generally be no less than 36 inches in order to accommodate a "Rammax" walk behind or infrared remote controlled trench roller/compactor (24- to 33-inch drum).

   In excavating for the trench, it is essential that the trench bottom be uniform in grade and remains static during backfilling and under all subsequent trench conditions. To ensure a uniform depth of stone, the grade of the bottom of the trench shall be graded to within 0.04 foot (1/2-inch) of the plan specified grade. The stone shall be graded to the same tolerance.

   Care shall be taken not to over excavate the trench. All trenches excavated below grade (over excavated) shall be refilled to grade with clean #57

stone. No extra compensation shall be allowed for this work unless such excavations are ordered by the City Engineer.

2) **Trench Depth**:

   a. **General**: All trenches shall be excavated to accommodate the bedding as shown in **Standard Details 511.01, 511.02,** (water and sewer), **631.01** (storm drainage), and **731.01** (sanitary sewer) as applicable. No extra compensation will be made for stone bedding used to bring the trench up to grade other than that required in **Standard Detail C01.02** where yielding or wet subgrade is encountered.

   b. **Water**: Trench depth shall generally conform to that shown on the plans and in conformity to the requirements of Table 2275.1, *Minimum Cover above top of Main Pipe Lines*.

   c. **Gravity sewer**: Excavate to the depth and grades shown on the plans. Trench depth shall generally conform to the requirements of Table 2275.1, *Minimum Cover above top of Main Pipe Lines*.

   d. **Storm drainage**: Excavate to the depth and grades shown on the plans. Trench depth shall generally conform to the requirements of Table 2275.1, *Minimum Cover above top of Main Pipe Lines*.

3) **Open trench exposure**: Once trench is opened, proceed immediately and with dispatch to place specified materials in trench, or to otherwise utilize trench for intended purpose. Long stretches of open trench ahead of pipe laying shall be avoided. Excavating, pipe laying, and backfilling must move forward at approximately equal rates of progress. The contractor shall only open as much ditch as he can completely install pipe, backfill, compact, and cleanup within that working day. The contractor shall string out the pipe that can be installed in one day, and unless approved otherwise by the City Engineer, no more than 300 feet of trench shall be open in advance of the completed work in any section. There shall be no trenches left open without proper supervision during working hours or after work has been completed for day. Any exception to this construction practice must be approved, in writing, by the City Engineer. Schedule work and order materials so that trenches are not left open for a longer period than is reasonably necessary. If the contractor should fail to heed the aforementioned requirement, the City Engineer may refuse payment until these conditions are complied with.

4) **Containment of Sediment (solids and mud)**: The contractor shall at all times so conduct his work to ensure that all solids and mud are contained within the trench. This containment shall be by the employment of a brick or block weir at the junction of new construction and the existing City system in order to trap material for the Contractor's removal and City's inspection prior to acceptance. The installation and removal of this dam shall be at the Contractor's expense and shall be removed before the line is televised.

3.2.4 SHEETING AND BRACING, TRENCH BOXES

A Certified Competent Person designated by the Contractor shall be on-site at all times excavation or pipe installation is being conducted.

Provided there is no indication of a potential cave-in, trench walls may generally have vertical sides if less than 5 feet in depth (measured from subgrade elevation to existing grade). In excess of this depth, the entire side must be laid back or either shoring or a trench box, certified for the depths being used, must be used. The contractor shall be required to furnish, put in place, and maintain such sheeting, bracing, etc. as may be required to support the sides of the trenches. Brace and sheet trenches in full observation of the requirements of OSHA *Subpart P – Excavations*. Trench wall slopes and/or benching shall conform to the requirements of OSHA based on Soil Classification (Stable Rock, type A, B, or C type) and account for trench depth, surcharge loads, stored equipment or material, traffic, etc. When trenches are 4 feet or more in depth, a safe means of egress (stairway, ladder, ramp or other safe means) from the trench excavations shall be provided. Such egress shall be placed so that no more than 25 feet of lateral travel by employees is required to the egress.

Brace trenches running near walls or columns, to prevent any settlement or other disturbance of walls or columns.

Do not remove sheeting until backfilling has progressed to the stage that no damage to piping, utility service, or conduit will result due to removal of sheeting. All shoring and form material shall be removed before backfilling. When sheeting, bracing, or trench boxes are required, in order to prevent damage to existing facilities or structures, or as a matter of safety, or as directed by the City Engineer, the costs are to be included in the unit prices as bid for sanitary sewers, storm drains, water lines or structures as applicable and there shall be no additional cost for these items.

Sloping trench walls: If trench walls are to be sloped or benched, contractor is responsible for determining the proper and applicable slope based on soil type in order to meet OSHA requirements. Laying back slopes also applies for areas where the top of the trench box is lower than the top of the bank. Contractor shall employ the services of a Geotechnical Engineer for direction and guidance if unstable or difficult soils are encountered. In any event, the Contractor shall hold the City harmless for injuries and/or damages resulting from failure to properly adhere to trench protection regulations/requirements in force at the time of a failure or mishap including, but not limited to, damage to utilities, equipment, structures, paving, etc.

3.2.5 ROCK:

A. **Rock Excavation**: See paragraph 1.4 P, Rock Excavation for Trenches and Pits and paragraph 1.4 Q, Rock in Open Excavations for definition of rock excavation.

B. When rock is encountered in the trench, the City Engineer must be notified before any rock is blasted or removed. Do not perform rock excavation work until rock has been cross-sectioned, classified, and approved for removal by the City Engineer. The City Engineer will measure the rock, after which, the rock shall be excavated to a depth 6 inches below the grade of pipe and the bottom of trench brought back to grade by using an approved fill material. See paragraph 3.8, *Blasting* for other requirements regarding rock excavation.

C. Intermittent drilling, blasting, or ripping performed to increase production and not necessary to permit excavation of material encountered will be deemed to be unclassified excavation

D. All over blasted rock which has been loosened must be removed prior to backfilling.

E. The Contractor must use overburden, mats, or other means to minimize flyrock. Any damage caused by flyrock or excessive vibration will be the responsibility of the Contractor.

F. **Cushioning pipe in rock**: Special precautions shall be exercised to prevent any pipe from resting on rock or any other hard projection that might cause breakage of pipe. At no time shall the pipe bell or the pipe barrel rest on rock. A minimum of 6 inches of sand or soil (select earth) cushioning is required between the barrel of the pipe and rock. A minimum of 12 inches of clearance is required between the sides of the pipe and the rock. Thicker cushioning may be required for deeper pipe on a case-by-case basis. See **Standard Detail C01.01**.

G. **Disposal of Rock:** Rock excavated from the trench shall be hauled off the site at the Contractor's expense. Borrow required to replace excavated rock shall be provided by the Contractor and shall be included in the unit price bid for rock excavation. No rocks or boulders shall be used as backfill in any part of the trench. Where rock has scattered over adjoining property as a result of blasting, the Contractor shall remove the rock and restore the area to its original condition at no cost to the City.

3.2.6 PREPARATION OF FOUNDATION FOR PIPE LAYING

A. Excavation of trenches for all pipes lines shall be done to line and grade as established by the design Engineer. The bedding surface shall provide a firm, stable, and uniform support through the entire length of the pipe. Recesses shall be excavated to accommodate bells and joints. When bedded firmly on the subgrade, the pipe shall be on the exact grade of the completed water, sewer, or storm drainage line.

In excavating for the trench, it is essential that the trench bottom be uniform in grade and remains static during backfilling and under all subsequent trench conditions. To ensure a uniform depth of stone, the grade of the bottom of the trench shall be graded to within 0.04 foot (1/2-inch) of the plan specified grade. The stone shall be graded to the same tolerance.

Excavation in Class II, III, or IV soils shall be made to grade to provide undisturbed bedding in accordance with AWWA C600. (See **Standard Detail 511.02, sheets 2 & 3** for classification definitions.)

B. **Unsuitable Trench Subgrade/Foundation Improvement**: Excavation in Class V, wet, yielding, unstable, inadequately supporting, or mucky soils shall be excavated 6 inches or more below the specified grade. The material shall be removed for the full width of the trench and the excavated area strengthened for foundation purposes. The over excavated material shall be replaced with thoroughly compacted Class I, II, or III materials as directed by the City Engineer. The trench bottom shall provide a stable and continuous support for the pipe system with bell holes provided to permit jointing. See **Standard Detail C01.02.**

Whenever the bottom of the trench is such that it cannot be reasonably stabilized, the City Engineer may require the utility to be laid in a concrete mud mat, concrete encasement, cradles, in cradles supported on piles, or a combination of these materials. When necessary, the Contractor shall provide for the temporary diversion of water in order to maintain the pipe foundation in a dry condition.

Observe the following requirements when unstable trench bottom materials are encountered:

1) Notify the City when unstable materials are encountered and define by drawing station locations and limits when encountered.

2) Remove unstable trench bottom materials as directed and replace with subgrade stabilization material specified.

B. **Over-excavation**: Unauthorized over-excavation consists of removal of material beyond indicated subgrade elevations or side dimensions, without specific approval of the City Engineer. Exercise care to avoid excavations below established grade where firm earth conditions exist. Where unauthorized excavations have been carried beyond points required, restore these areas to the elevations and dimensions shown on the drawings with approved fill material and compact as specified (as noted in the preceding paragraph). In no case shall the pipe be brought to grade by blocking under the barrel of the pipe. A uniform support shall be provided for the entire length of the pipe. Unauthorized excavation shall be replaced at Contractor's expense.

3.2.7 TRENCH PREPARATION FOR PIPE

A. **Preparation of trenches for Gravity Sewer pipelines**

The bottom of the trench for gravity pipelines shall be excavated to a minimum over depth as shown on **Standard Detail 731.01** to provide for improved pipe bedding material for the entire length of the gravity pipeline, including sewer lateral connections, except in rock where bedding shall be a minimum of 3 inches deep (see **Standard Detail C01.01** and paragraph 3.2.5 F, above). The bedding shall be shaped so that the bottom of the pipe rests on the bed. Bell holes and depressions as required of the joint shall be dug after the bedding has been graded and shaped, and shall be only of such length, depth, and width as required for properly making the particular type of joint. The trench for gravity sewers and lateral connections shall then be backfilled and compacted as indicated in Table 2275.3.

B. **Preparation of Trenches for Storm Drainage Pipelines**

The bottom of the trench for storm drainage pipelines shall be excavated to a minimum over depth as shown on the construction drawings in accordance with the applicable type laying condition specified (as shown on **Standard Detail 631.01**) to provide for pipe bedding for the entire length of the gravity pipeline, including lateral connections if any, except in rock where foundation bedding shall be prepared as specified on **Standard Detail 631.01**. Unless otherwise directed by the City Engineer, the bedding shall be shaped to conform to **Standard Detail 631.01**. Bell holes and depressions as required of the joint shall be dug after the bedding has been graded and shaped, and shall be only of such length, depth,

and width as required for properly making the particular type of joint. Rock larger than 3 inches shall be removed from the trench bottom and any voids filled with compacted NCDOT Class II or III material. The trench for storm drainage and lateral connections, if any, shall then be backfilled and compacted as indicated **Standard Detail 631.01, Table 2** taking care to compact in no more than 8-inch lifts with the fill brought up evenly on both sides of the pipe at the same time to avoid unbalanced pressures. The balance of the trench backfill up to pavement subgrade, or finished grade as applicable, shall conform to Table 2275.3 of this specification.

Where an unsuitable foundation is encountered, provide a stone foundation with NCDOT Type 4 soil stabilization fabric as shown on **Standard Detail 631.01**.

C. Preparation of trenches for Water Mains and Force Mains

The trenches for water lines and sewage force mains shall be graded to avoid local high points. Trenches shall be graded either level or on a continuous upslope to the high points designated on the drawings. Trenches shall be of such depth as to provide a minimum cover over the top of the pipe as noted in Table 2275.1. The trenches shall have 4 inches of loose soil in the bottom before pipe is placed, so pipe is firmly and continuous in contact with the soil. Pipe shall not bridge any areas. Rock larger than 3 inches shall be removed from the trench bottom and any voids filled with soil or clean stone. Bell holes shall be provided at each joint to permit proper joint assembly and proper pipe support. Rock shall be removed 6 inches below pipe and the void filled with coarse sand (SC, SM).

Unless directed otherwise by the City Engineer, DIP water mains and force mains shall have a **Type 1** laying condition with Class **D bedding**. Bedding for DIP water mains shall conform to **Standard Details 511.01** and **511.02** as applicable. PVC water main pipe bedding shall conform to **Standard Detail 731.01**. (See also paragraph 2.1.2, Bedding Definitions)

D. Surface or Ground Water in Trenches/Pipe

When ground water is encountered, the Contractor shall pump, or otherwise remove any water that accumulates in the trenches and shall perform all work necessary to keep the trenches clear from water while pipe is being laid. No pipe shall be laid in water and the pipe shall not be used as a means of draining ground water from the trench. All water removed from the trench shall be conveyed in a proper manner to a suitable point of discharge and shall comply with the applicable erosion and sedimentation laws. See paragraph 3.1.6 – *Dewatering*, of this specification.

The open end of water or sewer pipe shall be kept closed with a watertight plug to prevent washing of any foreign matter into the line. At the conclusion of the workday, or at any other time when pipe laying is not in progress, a watertight plug shall be placed in the bell of the last joint of pipe laid.

Storm drainage pipe shall either be plugged and/or an appropriate sediment trap placed at the upstream end to prevent siltation.

3.2.8 TRENCHING IN FILL

In areas where trenching for pipe will be in fill, the fill shall be brought to an elevation of at least 12 inches above the top of the pipe, and then the trench excavated in the compacted fill, as herein specified for trench excavation.

3.2.9 SUBSURFACE DRAINAGE

Installation of subsurface drainage systems shall conform to the requirements of Section 815 – *Subsurface Drainage* of the NCDOT *Standard Specifications for Roadways and Structures*

3.2.10 EXCAVATION FOR STRUCTURES

A. Excavate to provide a minimum of 12 inches of horizontal clearance between outer surface of structure and trench wall.

B. Where rock is encountered so that a built-in-place manhole, precast structure (such as a manhole or vault), or other structure will bear over rock, remove the rock to a minimum of 8 inches below the foundation or footing of the structure and place an 8 inch cushion of clean #57 stone over the rock.

3.2.11 WATER MAIN BEND BLOCKING INSTALLATION

A. Excavate area to receive poured-in-place concrete blocking to exact dimensions shown in **Standard Detail 512.01**. Blocking is to be placed in undisturbed residual soils. If blocking is to be placed in areas where boulders or stumps have been removed or in areas of loosely compacted fills, such as in landscaped areas (outside of pavements or parking lots), contact the City Engineer for directions.

B. Concrete shall be minimum NCDOT Class A Concrete plain concrete.

C. Wrap bolts in plastic or provide other acceptable means of protection, approved by the City Engineer before pouring concrete blocking.

3.2.12 DEPOSITION OF EXCAVATED MATERIAL

A. All excavated material shall be placed on one side of the trench (a minimum of 2 feet from the edge of excavation but no less that that specified/required by OSHA regulations) away from the roadway unless permission is given by the City's representative to place it on both sides. Excavated materials shall be so placed as not to endanger the work and so that free access may be had at all times to all parts of the trench and to all fire alarm boxes, fire hydrants and gate valves on water pipes, which are located in the vicinity. Excavated material shall be placed to in such a way as to inconvenience the public as little as possible. All fences and walls shall be protected and, if damaged, shall be repaired or replaced in as good or better condition as before it was disturbed. Protect shade trees from stockpiling of material.

B. Exercise care when stockpiling excavated material on the bank in order to prevent surcharging the bank of the trench and potentially rendering the excavation unstable.

C. **Wasting of Unsuitable Material:** Material of an uncompactable nature, material unsatisfactory for backfill, trash, and excess material shall be removed from project site and disposed at the Contractor's expense. Where removal of unsatisfactory

material is due to negligence on the part of the Contractor (i.e. resulting from inadequate shoring or bracing, failure to dewater, improper material storage exposing it to rain or flooding, or other failure to meet specified requirements), work shall be performed at no additional cost to the City. If additional material is required, the contractor shall supply same from an approved borrow pit at no additional cost to the City. Rock excavated from the trench shall be hauled off the site at the Contactor's expense.

3.3 BEDDING

3.3.1 BEDDING DEFINITIONS: see paragraph 2.1.2, *Pipe Bedding Definitions* (Water & Sewer).

3.3.2 MINIMUM BEDDING REQUIREMENTS (by utility type):

A. **Sewer Pipe Bedding**: Unless otherwise noted below, provide #57 or smaller stone trench bedding material.

1) **Minimum Bedding Allowed DIP Gravity Pipe**: Minimum Type 4 Laying Condition (**Standard Detail 511.02**). The minimum bedding depth shall be 3 to 4 inches under the pipe with an additional 1 inch depth of cushioning material added for each additional 2 feet of depth in excess of 16 feet up to a maximum of 12 inches of cushioning material.

2) **Haunching DIP Gravity Pipe**: The remainder of bedding for DIP shall be brought up to a depth of 1/8 the OD of the pipe. However, when the foundation is determined by the City Engineer or his representative to be unsuitable, the pipe shall be bedded to the spring line of the pipe. See **Standard Detail 511.02**, Type 4 laying condition.

3) **Bedding and Haunching SDR 35 PVC and C900 PVC Gravity Pipe**: PVC pipe to have Type 5 laying condition (**Standard Detail 511.02**) with the remainder of bedding shall be brought to the top of pipe. The minimum bedding depth shall be 3 to 4 inches under the pipe with an additional 1 inch depth of cushioning material added for each additional 2 feet of depth in excess of 16 feet up to a maximum of 12 inches of cushioning material. See also **Standard Detail 731.01**.

4) **Minimum Bedding Allowed for DIP and C900 PVC Force Mains**: Bedding for DIP force mains shall be Type 1 Laying Condition with excavation of trench bottom for bells as shown on **Standard Detail 511.02**. Bedding for C900 PVC force mains shall be Type 5 laying Condition as shown on **Standard Detail 511.02**.

5) **Minimum Bedding Allowed for PVC Services**: Bedding for PVC services shall be Type 5 laying Condition as shown on **Standard Detail 511.02** except the total trench width may no less than 24 inches.

D. **Bedding Water Pipe and Water Service Pipe**: Unless otherwise directed by the City Engineer, do not bed water pipe and water service pipe in stone. DIP water mains to be Type 1 Laying Condition with excavation of trench for bottom of bells as shown on **Standard Detail 511.02**. Bedding for C900 PVC water mains shall be Type 4 laying Condition as shown on **Standard Detail 511.02**.

E. **Bedding in Rock**: For rock areas, bed pipe in accordance with paragraph 3.2.5 F *Cushioning pipe in rock* and **Standard Detail C01.01**.

F. **Bedding for Storm Drainage Pipe**: See paragraph 3.2.7.B, above.

G. **Bedding for Structures**: The bottom of manhole bases and other precast structures and appurtenances shall be excavated to minimum over depth of 6 inches, but no less than as indicated in the applicable standard details, below the bottom of the structure. The structures shall be placed on clean stone bedding that has been firmly consolidated. Bedding material shall be shaped, graded, and compacted so that the entire bottom of the structure rests level on the material for its entire area.

3.3.3 BEDDING MATERIAL PLACEMENT

A. Unless otherwise specified, the bottom of the pipe trench for sanitary sewer (gravity and pressure), and where indicated by the City Engineer, storm drainage pipe shall be excavated to below the bottom of the pipe, to provide for the compacted bedding materials, except as specified in rock. Bedding material shall be placed, shaped, and compacted so that at least the bottom of the pipe rests uniformly upon the material for the entire length of the pipe. Bell holes and depressions required for the jointing of pipe shall be dug after the compacted bedding material has been graded and shaped and shall be only of the length, depth, and width required to make the joint properly. Care shall be taken to ensure bedding fills the voids beneath the pipe haunches, by poking with a shovel or tamper. See **Standard Details 511.01, 511.02, 631.01,** and **731.01,** as applicable.

3.4 BACKFILLING (MATERIALS AND METHODS)

3.4.1 BACKFILLING

A. **GENERAL**:

1) **Materials**: See *paragraph 2.1.1 - Material Classification* for Select Earth Backfill and Common Trench Backfill classification. In areas of extensive rock excavation, where there is a shortage of suitable backfill, the contractor shall, at his own expense, haul suitable material in to be placed over the pipe.

2) Pipe and fittings shall be inspected before backfilling.

3) Except as otherwise specified or directed for special conditions, backfill trenches to the ground surface with Common Trench Backfill material approved by the City Engineer. After the pipe has been brought to grade on a proper foundation, earth fill shall be placed carefully about the pipe and tamped properly to hold the pipe in position. Exercise extreme care in backfilling operations to avoid displacing joints and appurtenances or causing any horizontal or vertical misalignment, separation, or distortion. Repair damages, distortions, or misalignments to the full satisfaction of the City Engineer. Pipe shall be removed if broken or damaged during installation. Backfill shall closely follow the pipe installation. Unless otherwise directed or permitted by the City Engineer, all pipe laid shall be

backfilled during the same day, and prior to the completion of the day's work, to provide a firm continuous support and covering for the pipe.

4) Reopen trenches that have been improperly backfilled, to a depth as required for proper compaction. Refill and compact as specified, or otherwise correct to the approval of the City Engineer.

5) Do not allow or cause any of the work performed or installed to be covered up or enclosed by work prior to required inspections, tests, and approvals. Should any of the work be so enclosed or covered up before it has been approved, uncover all such work and, after approvals have been given, refill and compact as specified, all at no additional cost to the City.

6) Observe specific pipe manufacturer's recommendations regarding methods of backfilling and compaction.

7) Ensure compaction of each lift to requirements stated in these specifications.

8) All pipe areas shall be graded and maintained in such a condition that erosion or saturation will not damage the pipe bed or backfill.

9) Heavy equipment shall not be operated over any pipe until it has been properly backfilled and compacted with a vibratory compaction device (i.e. Rammax walk behind or infrared remote controlled trench roller/compactor (24- to 33-inch drum), NOT A PLATE TAMP) and has a minimum cover as required by the plans. Pipe that is misaligned, shows excessive settlement, or has been otherwise damaged by the Contractor's operations, shall be removed and replaced at no cost to the City.

10) **Installation of Warning Tape:** See paragraph 3.17.2, Identification of Water Lines for installation requirements. See paragraph 2.2.2 Warning Tape for product specifications.

B. **METHODS**:

Provide backfill and compaction methods of following types:

1) **Carefully Compacted SELECT EARTH BACKFILL**: Furnish carefully compacted select earth backfill where indicated on drawings and specified for compacted backfill conditions up to 12 inches above top of pipe. See paragraph 2.1 *Soil, Bedding, and Backfill* for definition of Select Earth Backfill. Comply with the following:

Care shall be taken to prevent any disturbance of the pipe or damage to newly made joints. The filling of the trench shall be carried on simultaneously on both sides of the pipe in such a manner that injurious side pressures do not occur such that the pipe could be displaced or dislodged. Do not backfill on muddy or frozen soil.

Sheeting and shoring generally should be removed only when the trench below it has become substantially filled, and every precaution shall be taken to prevent any slides of material from the sides of the trench onto or against the pipe.

a. Unless otherwise approved by the City Engineer, place backfill in lifts not exceeding 6 inches (loose thickness).

b. Hand place, shovel slice, and hand tamp carefully compacted backfill solidly around pipe. Only hand tamping shall be used to compact earth around the pipeline. When the backfill has been brought to 12 inches above the top of the barrel, vibratory compaction devices (i.e. Rammax Trench Compactor walk behind or infrared remote controlled trench roller/compactor (24- to 33-inch drum), NOT A PLATE TAMP) shall be used to compact the remainder of the soil.

2) **COMMON TRENCH (FINAL) BACKFILL** Perform remaining backfill in accordance with drawings or as directed by the City Engineer. See paragraph 2.1 *Soil, Bedding, and Backfill* for definition of Common Trench Backfill. Comply with the following:

a. Unless otherwise specified or approved by the City Engineer, backfill the remainder of the trench, from 12 inches above the pipe to grade, with clean earth fill free of stones larger than 3 inches in diameter. Top 12 inches to be free of material greater than 1 inch. Material shall be free from all perishable and objectionable materials (organic). Before placing any backfill, all rubbish, forms, blocks, wires, or other unsuitable material shall be removed from excavation. The backfilling shall be placed in layers not over 6 inches thick in the street right of way and 12-inch layers outside of the street right of way. See Table 2275.4. Final backfill shall be tamped with a vibratory compaction device (i.e. Rammax Trench Compactor walk behind or infrared remote controlled trench roller/compactor (24- to 33-inch drum), NOT A PLATE TAMP). See Table 02275.3 below, for specific density requirements.

b. All areas within the limits designated on the drawings, including adjacent transition areas, shall be uniformly graded. The contractor shall finish surfaces within the specified tolerances with uniform levels or slopes between points where elevations or existing grades are shown.

1. Finish subgrade areas that are to receive topsoil. Bring such areas to within 0.10 foot of required subgrade elevations.

2. Shape subgrade under sidewalks to line, grade, and cross-section. Subgrade is to be brought to within 0.10 foot of required subgrade elevations.

3. Shape subgrade under pavement to line, grade, and cross-section. Bring to within ½ inch of required subgrade elevations.

c. **Surface Protection – Traffic**: The contractor shall protect newly graded areas from traffic and erosion, repair, and re-establish grade in settled, eroded, or rutted areas. Where compacted areas are disturbed by subsequent construction or adverse weather, the contractor shall scarify the surface, reshape, and re-compact to the required density.

On City funded projects, should the contractor fail to maintain any trench within 2 days after notice from the City Engineer, the City may address/remediate the trench problem and the cost of such work may be retained from monies due the contractor. In case of emergency, the City Engineer may refill any dangerous trench failures or depressions without prior notice to the Contractor.

3) **Structure Backfill**: Backfill placed within 2 feet of manholes and other special structures shall be of the same quality as that specified for backfill around water, sewer or storm drainage lines. Take care to prevent wedging action of the backfill against structure by carrying the material uniformly around the structure so approximately the same elevation is maintained in each lift. If necessary to prevent damage to structure, provide temporary bracing of structure walls. Material shall be solidly tamped with a mechanical or pneumatic tamper in such a way as to avoid damaging the structures or producing unequal pressures. The Contractor shall refill all excavations as rapidly as practical after completion of the structural work therein, or after the excavations have served their purpose.

3.5 COMPACTION/DENSITY

Soil shall be compacted using equipment suitable for the material and the work area location. Power driven hand tampers shall be used for compacting materials adjacent to structures. Use hand tamper for recompaction over underground utilities.

A. **Testing**

Testing of backfill shall be performed by an independent laboratory approved by the City and the Contractor. The Contractor shall be responsible for excavation for testing.

Quality Assurance vs. Quality Control:

Quality Assurance (QA) testing, and the associated cost, is the responsibility of the City. Quality Assurance testing by the City is used to confirm that the Contractor is generally performing his/her work in compliance with these specifications.

Quality Control (QC) testing is the necessary and required testing that is to be performed by the Contractor to assure that he/she is meeting and complying with the requirements of these specifications. The associated cost for QC testing is the contractor's responsibility. The contractor is also responsible for "re-testing" costs incurred by the City when the City's test results (tests for Quality Assurance) results in a "failure."

Quality Control (QC) testing for City funded projects: The City shall pay for the cost of Quality Control by having the Contractor include the cost for testing in the unit cost of the project; not as a separate pay item. The Contractor shall pay for all costs associated with re-testing.

B. **Quality Assurance (QA):**

In the course of backfilling trenches for utility installations, the City Engineer may require "Field Density Determinations" or compaction tests. When compaction tests are called for, the City Engineer will determine the location of the tests and

the City shall engage a qualified testing firm to perform the test. A representative of the City will observe tests and a copy of the test results and inspection report will be submitted by the testing firm directly to the City Engineer. When the tests indicate that the density failed to meet the requirements of Table 2275.3, the Contractor shall comply with paragraph 3.5 G, Failure of Compactive Efforts.

Payment for failed QA density tests: For City funded projects, payment for failed in-place density tests shall be made by the Contractor by deducting the testing cost from the forthcoming retainage. For other projects in which the City will ultimately assume ownership and maintenance, the testing costs for failed in-place density tests shall be billed directly to the Contractor.

C. **Quality Control (QC):** The Contractor shall perform in-field density tests in accordance with Table 02275.2. Inspection reports shall be submitted by the testing firm directly to the City Engineer. See paragraph 3.5 F, Passing Test.

1) All test results shall be provided to the City Engineer as they become available from the testing agency.

2) The Geotechnical testing firm is to perform laboratory tests (ASTM D698, standard Proctor) to establish a moisture-density relationship for all materials that are proposed to be used as fill.

3) Contractor shall give a 24-hour notice to Geotechnical testing firm for subgrade testing, subgrade confirmation, or inspections.

4) **Minimum Compaction Testing Frequency**:

The following testing frequency shall be employed on both City funded projects and projects proposed to be turned over to the City for maintenance and/or ownership.

Table 2275.2	
Testing Frequency	
Location	**Frequency**
Trench areas in road crossings	1 test group[a] per road crossing, and/or
Trench areas	1 test per 200 linear feet per two feet of fill thickness
Exception: Where additional tests are required to determine the extent of unacceptable compaction (having been determined by the initial QA/QC test). In this case, the costs for these additional tests are the responsibility of the Contractor.	

[a]One test group consists of a compaction test on each layer of backfill material in the trench segment.

D. **Site access for testing**: Ensure the City, at all times, has immediate access to the site for the testing of all soils related work. Ensure excavations are in a safe condition for testing personnel.

E. **Minimum Compaction Requirements:** Compaction percentages are percentages of maximum dry density as determined by indicated ASTM

Standards. Unless noted otherwise on drawings or more stringently by other sections of these specifications, place and ensure degree of compaction of trench backfill and/or borrow material does not fall below the following percentages of the maximum density at optimum moisture content.

Table 2275.3 Minimum Compaction Limits (Cohesive Soils)		
Location	**Density**	
Beneath and within 5 feet of buildings	100% of the maximum dry density by ASTM D698 (standard Proctor), AASHTO T-99.	
Areas under roadway pavement surfaces, curb and gutter, and sidewalks	Top 12 inches	100% of the maximum dry density by ASTM D698 (standard Proctor), AASHTO T-99.
	Up to within 12 inches	95% of the maximum dry density by ASTM D698 (standard Proctor), AASHTO T-99.
Roadway shoulders	95% of the maximum dry density by ASTM D698 (standard Proctor), AASHTO T-99.	
Under turf, sodded, planted, or seeded non-traffic areas	90% of the maximum dry density by ASTM D698 (standard Proctor), AASHTO T-99.	

F. **Passing Test:** Average of 3 test results meeting the applicable provisions of Table 2275.3 (above) with no one test failing by more than -3 percentage points. Moisture content tolerance is to be within +/- 3 percentage points of the optimum moisture content unless otherwise specified by the City Engineer or Geotechnical Engineer.

G. **Failure of compactive efforts:** If compaction efforts should fail to provide a stable subgrade in accordance with the requirements in paragraph 3.5 F, Passing Test after subgrade materials have been shaped and brought to optimum moisture, such unstable materials shall be removed to the extent directed by the Geotechnical Engineer and/or the City Engineer and replaced and compacted using new material and must pass compaction test prior to proceeding to the next stage of construction and at no expense to the City.

The costs associated with excavation and re-compaction of areas that have failed will be the Contractors responsibility.

H. **Compaction Lifts:**

Table 2275.4 Compaction Lift Thickness	
Lift Thickness (inches)	**Location**
6	Inside street rights-of-way
12	Outside street rights-of-way

I. In-place testing of soils shall be tested based on the following:

Table 02275.5	
In-Place Density Tests	
Soil Type/Classification	**Reference Standard**
Crushed Rock	ASTM D2049 by percentage of relative density ASTM D1557 or D698 (standard Proctor)
GW, GP, SW and SP	ASTM D2049 by percentage of relative density ASTM D1557 or D698 (standard Proctor)
GM, GC, SM, SC, ML, CL	ASTM D2167, D1556, D2922, or D2937 by percentage of standard Proctor Density according to ASTM D698 or AASHTO T-99

3.6 SERVICE CUTS, DIRECTIONAL BORED OR PUNCHED SERVICES

A. **Open trenches**: Sewer lateral and water service connections that cross paved streets shall be installed by saw cutting the pavement and opening the trench. The open trench width shall be no wider than 36 inches.

Lateral connection trenches in non-paved areas shall be buried as specified for gravity sewers and for water lines, as applicable. See Table 2275.1.

Do not bed water service pipe, except when rock is encountered.

B. **Directional Boring or Punching**: At the direction of the City Engineer, service pipes may be required to be "punched" or "directionally bored" beneath the pavement.

3.7 PAVEMENT REPAIR AND REPLACEMENT

A. **General**: This work shall consist of replacing subbase stone, and bituminous material in the street in areas where it becomes necessary to remove the original pavement for sewer, water main, and storm drainage trenches. Pavement repair shall be as shown on the drawings or as determined by the City Engineer. However, the pavement surface repair shall conform to the minimum requirements shown on **Standard Detail C01.03**. The pavement patch shall provide a uniform and smooth driving surface free of humps or depressions.

B. **Construction in Public Rights of Way**: Water, sewer, and storm drainage lines installed in or across NCDOT roads shall be installed in accordance with, if applicable, the requirements stipulated in the approved encroachment permit and the latest requirements of both the NCDOT *Standard Specifications for Roads and Structures* and the *Roadway Standard Drawings*. All water, sewer and storm drainage lines installed in or across City streets shall be in accordance with these specifications and the applicable standard details.

When it is necessary to remove the existing pavements, prepared road surfaces, sidewalks, or curbing, it shall be the responsibility of the Contractor to replace these surfaces to original or better condition. The Contractor shall be responsible for contacting the City or the NCDOT, as applicable. Unless specified more

stringently by the owner of the right of way, the backfill shall be compacted in accordance with Table 2275.3.

Contractor shall replace pavement base such that there is a minimum of 36 inches of compacted stone screenings immediately below the proposed pavement surface compacted to 100% of the maximum dry density (ASTM D698). Pavement shall be S-9.5B and shall match the existing asphalt depth but may be no less than 2 inches in thickness. All patches greater than 2 inches in thickness shall be placed in appropriate lifts. See **Standard Detail C01.03**.

C. When water, sewer and/or storm drainage lines are installed in or across roadways that have been macadamized or graveled, the Contractor shall save the gravel or stone, refill the upper 12 inches of the trench with the material, and supply sufficient new stone or gravel to return the roadway to the original grade. It shall be the Contractor's responsibility to maintain the original grade by adding gravel or ABC until the ditch is stable and the pipeline accepted by the City. Maintain area as outlined in paragraph *3.4.1 B.2).c - Surface Protection - Traffic*.

D. **Cutting Pavement**: See also **Standard Detail C01.03** and paragraph *3.1.3 B – Protection of Surface Features*. Perform cutting operations prior to installation of line to avoid excessive removal of asphalt.

E. **Protection of Pavement**: See paragraph *3.1.3 B – Protection of Surface Features*.

3.8 BLASTING

3.8.1 GENERAL

A. Blasting procedures shall conform to all applicable local, state, and federal laws and ordinances and shall be performed in accordance with OSHA *Standard 29 CFR Part 1910.109*, NCDOT Rules for Transporting Explosives, and local Fire Department Regulations. Prior to any blasting, a blasting permit shall be obtained. The approval of the City Engineer and Fire Marshall shall be obtained before any blasting takes place and the City Engineer may fix the hours of blasting if he/she deems it to be necessary. The use of explosives shall be in accordance with approved methods that safeguard lives and property. Explosives shall only be handled, placed, and detonated by persons licensed in this work. It is the responsibility of the Contractor to provide proper notification to appropriate parties.

B. **Rock Excavation**: See *paragraph 3.2.5 - Rock* for the definition of rock.

C. The minimum insurance coverage for blasting shall be as specified by current NC Fire Prevention Code or more as determined by the City Engineer and Fire Marshall. The coverage shall include explosion and collapse. If blasting occurs within 200 feet of any underground structure or utility, underground coverage will be required. The owner and the property owners shall be named as "additional insured."

D. No blasting shall be allowed unless a galvanometer is employed to check cap circuits.

E. The City may prohibit blasting when the method of detonation or the means of protection provided is inadequate. Blasting conducted with or without direct

supervision of the City will not relieve the Contractor of the responsibilities stipulated herein.

F. Blasters shall not explode or attempt to explode blasting powder or high explosives unless it is performed with a suitable electric blasting machine. Electric current from batteries, telephone, or power lines shall not be used for detonation.

G. A minimum of 3 minutes prior to the detonation, the blaster shall inform competent flagmen, equipped with red flags, stationed at reasonable distances from the blast area at every avenue of approach, to warn all persons.

H. Immediately after the loading and tamping of the drill hole and before fixing the blast, the material to be blasted shall be covered on all exposed sides with blasting mats, or other approved protective material. After the protection has been applied, the blast shall be fired without unnecessary delay.

I. **Storage of Explosive Materials**:

1) Magazines sites shall be secured in accordance with OHSA, Bureau of Alcohol, Tobacco, Fire Arms and Explosive (BATFE) and Mine Safety and Health Administration (MSHA) regulations.
2) Magazine sites must be labeled with appropriate warning signs that indicate the contents and are visible from each approach. The signs shall be placed so that a bullet passing through them will not strike the magazine. The magazines areas shall be fenced and locked with a single lock.
3) Only explosive material and essential non-sparking equipment (pens and inventory records) used for the operation of the magazine may be stored in the magazines.
4) A current BATFE Storage permit will be posted in each magazine.
5) Metal magazines will be grounded and equipped with electrical bonding connections between all conductive portions so the entire structure is at the same electrical potential.
6) Ground checks shall be conducted on the blast magazines and prill silos at least annually. Records shall be kept with the electrical department.
7) All explosive material must be stored in approved magazines according to the Institute of Makers of Explosives (IME) safety publication 22.
8) Magazine keys shall be kept in the key card box and accessed only by authorized personnel approved by the Blast Foreman.
9) Metal magazines will be grounded and equipped with electrical bonding connections between all conductive portions so the entire structure is at the same electrical potential.
10) Magazines must be a sufficient distance from power lines so that the power lines, if damaged, would not contact the magazine.
11) Explosive material storage areas and magazines including nitrate storage areas shall be kept clean and clear of rubbish, brush, dry grass, and trees for 25 feet in all directions. Other combustibles will not be allowed to accumulate within 50 feet of these magazines.
12) Only authorized personnel shall be allowed access to blasting material storage areas.
13) Explosive material, blasting agents, and detonator (blasting caps) shall be stored in separate magazines.

14) Magazines shall only be used for the storage of explosives materials. Only explosive material and essential non-sparking equipment used for the operation of the magazine may be stored in the magazines.
15) The explosives shall be stored in their own containers (boxes).
16) Explosive material will be stored to facilitate use of oldest stock first and stacked in a stable manner, but not more than eight (8) feet high.
17) Explosives and Detonator Magazines shall be secured with two locks at all times when unattended and protected with covers to deter access.
    a. The locks shall be case hardened with a minimum of 3/8 inch shank and no less than five (5) tumblers.
18) Drop trailers containing blasting agents must be kept locked with a single lock when unattended and king pins must be secured against transport.
19) Nitrate Silos.
20) Must be well ventilated, located in a secure place.
21) The diesel oil storage and fuel depot must always be separated from the ammonium nitrate area to avoid the danger of explosion in the event of a fire.
22) The ammonium nitrate must be kept dry.
23) If present, the electrical wiring located in the nitrate silo must be equipped with the relevant safety devices to prevent hazards and losses.
24) Water should be used to facilitate nitrate spillage clean-up when necessary
25) Detonators shall be stored separately from explosives.

Failure to comply with this specification shall be grounds for suspension of blasting operations until full compliance is made.

J. **Explosive Transport**:

1) Explosive material will be transported without undue delay to the storage area or blasting site.
2) Closed non-conductive containers (cargo areas/spaces) will be used to carry explosives and detonators to and from blast sites. Separate containers will be used for explosives and detonators.
3) Explosive material and detonators will not be transported on the same vehicle unless they are separated in compartments by 4 inches of hardwood or the equivalent per IME Safety Publication 22 and the detonators are kept in closed non-conductive container. The hardwood partition must be fastened to the vehicle or conveyance.
4) The vehicles used to transport explosives will be:
    a. Equipped with a minimum of two multipurpose dry chemical fire extinguishers or one such extinguisher and an automatic fire suppression system.
    b. Posted with warning signs that indicate the contents and are visible from all four sides. The signs must be removed when explosive material is not being transported.
    c. Equipped with side and end enclosures higher than the explosive being transported.
    d. Equipped with a cargo space that has no sparking material exposed in the compartment. Explosive material must never be transported in the operator's compartment.
    e. Occupied only by qualified persons necessary for handling the explosive material.
    f. Attended at all times while explosives are present:

1. Attended means qualified persons are present or the cargo areas/spaces are locked.
2. In no instance will explosives be left in the cargo areas/spaces of the blasting truck overnight.
3. Must be secured with parking brake applied and bermed or chocked when not being operated.

5) The explosive (prill) mixing truck shall be calibrated so that the mixture is appropriate for the product being used and the required powder factor needed.
6) Only qualified personnel shall attempt removal of rocks lodged between the dual tires of vehicles.

3.8.2 BLASTING PROCEDURE

A. The Contractor shall provide a blast warning signal system. The blast warning signal system shall consist of one or more air horns located at the blast site. The air horn(s) shall be audible a minimum of 1 mile from the blast site. The signals shall be one long horn five minutes prior to the blast, one short horn 1 minute prior to the blast, and one long horn after the blast to signal all clear. The Contractor shall erect two clear and legible blast warning signal signs at locations determined by the City Engineer and Fire Marshall. The signs shall list the blast warning signal system, the Contractor Superintendent's name and telephone number, and the City's representative's name and telephone number.

B. The Contractor shall establish test pits at up to two representative locations along the alignment and up to three locations adjacent to the site proposed to be blasted to determine if the rock is "rippable" with a track backhoe Caterpillar No. 325 or equivalent and the feasibility of rock excavation by "hoe ramming" (see paragraph 1.4 P, above for definition of rock excavation in open trenches and pits). If these procedures do not offer reasonable production for rock excavation, then blasting will be allowed unless otherwise indicated.

C. The Contractor shall notify in writing all property Owners within 250 feet of the proposed blast at least 1 week prior to the proposed blast and verbally on the day of the scheduled blast.

D. Blasting shall be limited to mid-morning hours on days of clear-to-partly cloudy skies with increasing surface temperature and light wind. The Contractor shall provide monitoring equipment to monitor all blasting. A copy of monitor record shall be given to the City daily.

E. The use of unconfined explosives shall be prohibited.

F. Unless otherwise stipulated in Title 13 of the NC Administrative Code, chapter 7, the maximum allowable peak particle velocity shall be 1.25 inches per second for all structures located 0 to 300 feet from the blasting site. The maximum allowable peak particle velocity shall be 1.00 inch per second for all structures located 301 to 5,000 feet from the blasting site. The maximum allowable peak particle velocity shall be 0.75 inch per second for all structures located 5,001 feet and beyond from the blasting site.

G. To minimize vibration, minimum scaled distance (SD) of 50 shall be used to determine maximum explosive weight per delay. A test blast shall be conducted to verify the scaled distance. The maximum explosive weight per delay shall not exceed the distance from the blast to the nearest structure divided by 50 squared.

Maximum explosive weight per delay may be revised pending outcome of test blast. The recommendations indicated for blasting criteria in no way relieves the Contractor of his liability.

H. The peak overpressure of air blast shall not exceed 0.015 pound per square inch or 138 decibels.

I. Preblast meetings shall be scheduled with the City Engineer and Fire Marshall to document hole depths and spacing, charge weight per delay, shot scheduling, and weather conditions. The Contractor shall obtain accurate measured distances from structures to center of blast area prior to determining the safe maximum charge-weight per delay and loading blast holes.

J. Preblast and post blast surveys shall be performed by the Contractor. The Contractor may review this data and supplement it as he sees fit or conduct separate survey after written permission is obtained from the property Owners. In this event, the written permission shall be submitted to the City Engineer and Fire Marshall prior to entering upon private property. The preblast and post blast surveys will include all occupied buildings within 250 feet of blasting areas. The Contractor is strongly encouraged to have a representative present during these surveys. The preblast and post blast surveys performed by the City or the property owner in no way relieve the Contractor of his liability.

K. The City reserves the right to monitor production blasting. In this event, the Contractor shall provide the City Engineer and Fire Marshall ample notice of scheduled blasts (minimum of 24 hours) to allow set-up of monitoring equipment.

3.9 HIGHWAY CROSSING

A. Pipeline crossing shall be installed in a steel casing pipe installed by the "dry bore and jacking" method. Length of steel pipe shall be welded to the preceding length installed. The carrier pipe shall be protected by spiders constructed as shown on **Standard Detail C07.03**. The ductile iron carrier pipe shall be as specified for sewer and water pipe and shall be mechanical joint ductile iron pipe. If, in the opinion of the Contractor, boring and jacking of the highway crossing is not possible due to rock, he shall test drill, in the presence of the City Engineer at the proposed crossing locations, at least 3 evenly spaced points in the placement along the crossing alignment. Upon verifying the presence of rock at a depth that would conflict with the boring and jacking operation, the Contractor shall make application to the City or the NCDOT, as applicable, to allow open cutting of the crossing. The Contractor shall be responsible for providing all data and shall pay any fees required for this application. If the trench is allowed to be open cut, casing pipe shall be provided and the trench shall be backfilled entirely with flowable fill concrete to the bottom of the pavement base course and the pavement restored within one day of placing the pipe.

B. The steel casing pipe shall be of the thickness as specified in **Standard Detail C07.03**. Refer to specification Division 02530, *Sanitary Sewer* and Section 02510, *Water Distribution* for casing pipe specifications.

C. Installation shall be in accordance with AREA.

D. The jacking operation shall be carried on in such a manner that settlement of the ground or the highway above the pipeline will not occur. The use of water or other

fluids in connection with the boring and jacking operation shall not be allowed. Excavation shall be made by auger or manual methods, at the Contractor's option, to suit the conditions encountered. The contractor shall repair or replace, as directed by the City Engineer, at his own expense, casing pipe damaged during the jacking operation.

E. After installation of the casing pipe, the carrier pipe, if required, shall be installed. The ends of the casing shall be plugged in accordance with **Standard Detail C07.03**.

F. All operations of the Contractor shall be subordinate to the free and unobstructed use of the highway right of way for passage of traffic without delay or danger to life, equipment, or property. The contractor shall provide all necessary bracing, bulkheads, and shields to ensure complete safety to all traffic at all times.

3.10 RAILROAD CROSSING/TRACKS

Crossing of railroad tracks with water, sewer or storm drainage lines shall be by the method shown on the contract drawings and approved by the applicable Railroad Company. It is the responsibility of the Project Engineer and Contractor to contact the Railroad Company and to comply with all Railroad Company requirements for specifications, drawings, permits, etc. All water, sewer, and storm drainage lines installed beneath railroad tracks shall be in accordance with the Railroad Company's policies, procedures, and permits requirements. The railroad right of way and track structure shall be fully restored to its original pre-existing condition and to the full satisfaction of the Railroad Company. The work shall not interrupt the use of the railroad tracks or in any way endanger the traffic on them.

3.11 UNDERGROUND RIVER OR CREEK CROSSINGS

In accordance with the contract drawings, underground river or creek crossings shall be made either by horizontal directional drilling (HDD) with HDPE pipe or constructed in the dry by providing a temporary cofferdam or bulkhead. River or creek crossings shall be in accordance with the requirements of the City Engineer, NCDEQ, The US Army Corps of Engineers, and all other agencies having jurisdiction. Unless horizontal directional drilling is specified in the contract documents, river or creek crossings shall be made by providing a temporary cofferdam or bulkhead using ductile iron pipe for the crossing.

River or creek crossings shall be as near to perpendicular as possible to the stream.

A. **Cofferdam Method**: The Contractor shall construct the river crossing in the "dry" by providing a temporary cofferdam or bulkhead of non-erodible material. The cofferdam shall not obstruct more than one-half of the water surface at any time and shall not extend more than 3 feet above the normal water surface. The Contractor shall not be allowed to operate construction equipment on the native steam bottom, except during removal of the cofferdam. The contractor shall be advised that the level in the river can fluctuate rapidly.

    1) Non-erodible material shall be defined as heavy coarse aggregate as specified on the plans. An earth core for the cofferdam may be constructed over the propose excavations; however, the non-erodible materials shall be in place prior to the placement of the earth, so that the erodible earth does not come in contact with the flowing water.

2) A bulkhead may be constructed in lieu of the cofferdam. The bulkhead shall be made of wood, steel or some like material suitable to withstand the hydraulic forces to permit construction in a dry trench.

3) Construct the crossings as indicated. The Contractor shall then remove the cofferdam, bulkhead, or whatever equipment or material that was used to construct the crossing. The bottom of the river in the construction area shall be restored to its original cross section. All disturbed areas on the banks of the river shall be seeded and mulched in accordance with *paragraph 3.16 – Seeding and Groundcover*.

4) Comply with all terms and conditions of all permits issued by the US Army Corps of Engineers and/or NCDEQ for this work.

5) The pipe and joints of water or sewer main entering or crossing streams shall be tested in place and shall exhibit zero infiltration. This testing shall be done prior to encasing in concrete.

B. **Horizontal Directional Drilling (HDD) Method**: HDPE pipe shall be installed by horizontal directional drilling using a surface mounted rig, first to drill a guided hole along a bore path consisting of a shall arc and then to pull a string of pipe into the hole. Pull back is facilitated by a back-reamer, which enlarges the hole to approximately one and a half times the pipe diameter. Drilling fluids are injected into the bore hole to stabilize the hole and lubricate the pipe and drilling string. Tracking equipment is used to guide and direct the drilling. See Division 02510, *Water Distribution* for installation, testing and other requirements for horizontal directional drilling.

3.12 SURFACE/SUBSURFACE WATER CROSSINGS

Surface water crossings, with pipe above the water, shall be adequately supported by pipe support piers or beams. Subsurface water crossings, with pipe under the streambed, shall have the pipe encased in concrete or steel when the cover is less than 3 feet. For subsurface water main stream crossings, see **Standard Details C07.04 and C07.05** for additional limitations on cover and for other requirements relating to stream subsurface stream crossings.

3.13 CONCRETE COLLARS ON SEWER MAINS

Concrete collars shall be used on sewer lines with slopes 10% or greater. When concrete collars are specified or shown on the drawings, at least one concrete collar shall be placed before the bell of each joint of pipe. Additional collars may be required by the City.

3.14 PLACEMENT OF RIP RAP AND RIP RAP BEDDING

Placement of Rip Rap and fabric shall conform to Section 876 – *Rip Rap* of the NCDOT *Standard Specifications for Roadways and Structures*, latest revision.

3.15 CLEANUP AND RESTORATION OF SITE

A. During the progress of the work, the Contractor shall keep the premises and the vicinity of the work clear from unsightly and disorderly piles of debris. Suitable locations shall be specified for the various construction materials and for debris. The materials shall be kept in their storage locations, except as needed for the

work and debris shall be promptly and regularly collected and deposited in the specified location.

B. Upon completion of section of pipeline and appurtenances, the Contractor shall fine grade the ground adjacent thereto, removing all surplus excavated material, leaving the area free from surface irregularities. He shall dispose of all surplus material, dirt, and rubbish from the site; and shall keep the site free of mud and dust to the satisfaction of the City Engineer. The contractor may be required to flush or sprinkle the street to prevent dust nuisance.

C. When working on the shoulders of paved roads, the Contractor shall keep the pavement clean of all loose earth, dust, mud, gravel, etc., and shall restore road surfaces, shoulders, and ditches as required by either the NCDOT or the right-of-way owner.

D. **Grading Easements**: Easements shall be graded to have cross slopes of 4% or less. The ground surfaces of easements shall be graded and cleared in such a way to promote proper drainage and allow mowing by vehicular equipment without damage to equipment from rock(s) and other debris.

E. After all work is completed, the contractor shall remove all tools and other equipment, leaving the site free, clean, and in good condition.

F. The contractor shall keep the surface over and along the trenches and other excavation in a safe and satisfactory condition during the progress of the work and for a period of one year after the work has been competed. He shall be held responsible for any accidents that may occur on the account of the defective condition of such surface.

3.16 SEEDING & GROUNDCOVER

Seeding and groundcover includes seedbed preparation, liming, fertilizing, seeding, and mulching of all disturbed areas. Areas inside or outside the limits of construction that are disturbed by the Contractor's operation and activity shall be seeded and mulched.

A. Seeding, Sodding, and Groundcover shall comply with the applicable provisions and requirements of Division 02920, *Seeding, Sodding and Groundcover*.

B. Seeding and groundcover includes seedbed preparation, liming, fertilizing, seeding, and mulching of all disturbed areas. Areas inside or outside the limits of construction that are disturbed by the Contractor's operation and activity shall be seeded and mulched.

Unless called for otherwise on the Erosion and Sedimentation Control Plan, in areas where natural sod or vegetation has been disturbed, the area shall be seeded in accordance with **Standard Detail 350.01**.

C. Seeding and groundcover includes seedbed preparation, liming, fertilizing, seeding, and mulching of all disturbed areas. Areas inside or outside the limits of construction that are disturbed by the Contractor's operation and activity shall be seeded and mulched.

Unless called for otherwise on the Erosion and Sedimentation Control Plan, in areas where natural sod or vegetation has been disturbed, the area shall be seeded in accordance with **Standard Detail 350.01**.

If the line is installed through a landscaped lawn, sod shall be placed to restore ground cover to the existing lawn.

D. Seeding shall be carried out as soon as practical after the construction in any one area, and shall be maintained against erosion through the completion of the project. Seeding shall be accomplished as work progresses and shall be in accordance with Sediment and Erosion Control regulations.

The Contractor shall be responsible for proper care of the seeded area during the period that vegetation is being established. In the event of an erosive rain before an adequate stand of vegetation has been established, damaged areas shall be repaired, fertilized, seeded, and mulched at the Contractor's expense.

Seeding on rights of way of NCDOT maintained roads shall be in accordance with NCDOT specifications and the requirements of the approved encroachment permit.

E. **Temporary Seeding**: Temporary and permanent seeding shall be carried out in accordance with the approved E&SC permit and plans as well as the applicable requirements of the NCDEQ Land Quality Erosion and Sediment Control Planning and Design Manual. Unless otherwise noted as more restrictive on either the approved E&SC plans and permit or in the Erosion and Sediment Control Planning Design Manual, denuded areas to be graded during the construction phases that are not to be brought to final grade within 21 calendar days shall receive temporary seeding and mulching. Areas to be stabilized with permanent vegetation must be seeded or planted within 15 working days or 90 calendar days after final grade is reached, unless temporary stabilization is applied. Temporary seeding shall also be used to stabilize finished grade areas if the time of year is outside the specified permanent seeding periods.

F. **Stockpile Area**: The contractor is responsible for securing a material lay down and stockpile storage area for this contract. As such, the contractor is responsible for the necessary erosion control measures, including but not necessarily limited to, a construction entrance, silt fence, protection of streams/buffers, clean up and restoration of site to the satisfaction of both the City of Wilson and the NCDEQ, Department of Water Quality, Land Quality Section. Stockpile and/or waste areas must be maintained within the limits of the areas protected by the proposed measures and otherwise temporarily seeded if to be left stockpiled over 21 days.

3.17 MISCELLANEOUS

3.17.1 DUST CONTROL

The contractor shall be required to sprinkle with water or to apply dust allaying materials in the vicinity of dwellings, schools, churches, stores, or other places, where in the opinion of the City Engineer, it is necessary to ensure that dust is held to an absolute minimum. Dust control is considered incidental and shall be carried out at the Contractor's expense.

3.17.2 IDENTIFICATION OF NEW WATER LINES & FORCE MAINS

Underground Warning Tape

For all pipe, a metallic warning tape shall be placed 12 to 18 inches directly above the top of the pipe. See **Standard Detail 511.01**.

The metallic warning tape shall be per paragraph 2.2.2, *Warning Tape* of this specification. No separate payment will be made for warning tape as it is considered to be incidental to the cost of construction of the line being installed.

3.17.3 FLOWABLE FILL CONCRETE BACKFILL

When directed by the City Engineer, the Contractor shall backfill trenches or undercut areas with excavatable flowable fill concrete plant mix to allow for future re-excavation of filled area (see paragraph 2.1.1.C for flowable fill specifications). Except for structural applications, traffic can be placed on mixture within an hour or two after placement. Final surfacing of pavements; however, should be delayed if possible at least 24 hours to allow for shrinkage and hydration of concrete. Depending on depth, a settlement of 2" to 3" is to be expected.

3.17.4 SALVAGE OF USEABLE MATERIALS

All materials such as paving blocks, brick, castings, and pipe etc., removed during excavation that is useable on this project shall only be reused after approval of its use by the City Engineer or the applicable owner of the street right-of-way. Such material shall be stockpiled on site. Unnecessary abuse and damage to these items shall be the Contractors responsibility for replacement at Contractors expense.

End of Section 02275

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02530 – SANITARY SEWER

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SELECTED LINKS TO SECTIONS WITHIN THIS SPECIFICATION

Part 1 – General
Part 2 – Products
Part 3 – Execution
Air/Vacuum Release Valve
Bypass Pumping
Concrete Encasements
Ductile Iron Pipe - spec
DIP Fittings
HDPE Gravity Pipe Spec
Iron Castings
Line Air Pressure Test - Table
Low Press Air Test Gravity Lines
Manhole Corrosion Protection
Manholes Precast - Spec
Manhole Vent Pipes
Manhole Vacuum Test
Pipe Laying
Pipe Separation Req'ts
Pump Station & Force Mains
PVC Pipe
PVC Pipe C900 - Fusible
PVC C900 Fusible - Install
Rubber Boot Spec
Service Connections
Steel Encasement Pipe
Testing
Tunneling
Tunnel Liner - Spec
UG Damage Protection
Witness Testing - Pump Station

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

The latest edition or version of the following shall apply:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions apply to this specification.

B. American Concrete Institute (ACI) 308, *Guide to Curing Concrete*

C. American Concrete Institute (ACI) 318, *Building Code Requirements for Structural Concrete*

D. AWWA C600: *Standard for Installation of Ductile-Iron Water Mains and their Appurtenances*

E. AWWA C900-16: *Pressure Pipe and Fabricated Fittings (4" through 60") for Water Distribution*

F. AWWA C906: *Polyethylene (PE) Pressure Pipe and Fittings, 4 In. Through 65 In. for Waterworks*

G. City of Wilson *Pre-Approved Material/Product List*

H. City of Wilson *Right-of-Way Regulations and Procedures*, latest edition

I. National Electrical Code (NEC)

J. National Electrical Manufacturers Association (NEMA)

K. North Carolina State Building Code: *Building Code*, Section 1609 *Wind Loads*

L. North Carolina State Building Code: *Plumbing Code*

M. Section 02275 – TRENCHING, BACKFILLING AND COMPACTION OF UTILITIES.

N. Standard Rules of American Institute of Electrical Engineers

O. Uni-Bell Handbook, Latest Edition

P. UNI-B-6: *Installation Guide for Solid-Wall PVC Sewer Pipe*

Q. Uni-B-6-98: *Recommended Practice for Low-Pressure Air Testing of Installed Sewer Pipe*

R. UNI-B-9-90: *Recommended Performance Specification for Polyvinyl Chloride (PVC) Profile Wall Gravity Sewer pipe and Fittings Based on Controlled Inside Diameter (Nominal Pipe Sizes 4-48 inches)*

S. UNI-PUB-06: *Installation Guide for PVC Solid-Wall Sewer Pipe (4-60 inch)*

T. UNI-PUB-09: *Installation Guide for PVC Pressure Pipe*

1.2 SUMMARY

A. This section includes sanitary sewer piping and specialties for municipal sewer and services outside of building structures.

1.3 DEFINITIONS

For the purposes of this specification, the following definitions refer to sanitary sewer collection and pressure systems that come under the authority of City of Wilson as specified within this section and other sections of this manual.

A. **City Engineer**: The City Engineer or his or her authorized representative.

B. **City**: Refers to the City of Wilson.

C. **Cleanouts**: A riser pipe off of a service line that provides access to the line for the purpose of line cleaning.

D. **Contractor**: Refers to a Contractor licensed in the State of North Carolina to perform public utility construction.

E. **Force Main**: Pressurized sanitary sewer main.

F. **Lift/Pump Station:** A combination wetwell/pump station and appurtenances.

G. **Easement**: An instrument that depicts/describes and conveys rights and privileges to the City for the placement, access to and maintenance of a utility line across and/or on the property of a second party. Ownership of the land remains with the second party.

H. **Interceptor/Outfall**: Sewer that receives flow from a number of gravity mains or trunk sewers; usually placed along a stream or river. Ordinarily, interceptors are not permitted to be tapped except at existing or new manholes.

I. **Main or Trunk Sewer**: Exterior gravity sanitary sewer systems receiving flow from one or more laterals or mains.

J. **Public Sanitary Sewer System**: Any sewer facility or line owned and maintained by the City of Wilson.

K. **Sewer Service**: Exterior domestic sewer piping serving a private residence, business, commercial facility, or industrial user. This line beyond the right-of-way, easement line, or cleanout in its entirety, belongs to the customer/user for operation and maintenance.

L. **Shall**: Means a mandatory requirement.

M. **Wastewater Collection ORC**: The City's "Operator in Responsible Charge" over the City of Wilson's wastewater collection system; a manager in the Water Resources Department.

N. **Director of Water Resources:** The City's Director of Water Resources, Water Distribution ORC or their authorized representative.

O. The following are industry abbreviation for various pipe materials:

1) **AC**: Asbestos Cement Pipe
2) **CI**: Cast Iron Pipe
3) **DIP**: Ductile Iron Pipe
4) **HDPE:** High Density Polyethylene
5) **RCP**: Reinforced Concrete Pipe
6) **PVC**: Polyvinyl Chloride Pipe

1.4 PERFORMANCE

A. Gravity Flow, Nonpressure Piping Pressure Ratings: At least equal to the system test pressure.

B. Force Main Pressure Ratings: At least equal to the system operating pressure plus 50 psi, but no less than 150 psi.

1.5 SUBMITTALS

A. Submit product data for the following. For third party projects, the Developer/Project Engineer shall perform all product review/certification and make a submittal at the end of the project to the City. The engineer shall be duly licensed in North Carolina.

1) Piping Specialties.
2) Air & vacuum release valves and accessories.
3) Autodialers.
4) Sewage Pumps and appurtenances, operating manuals.
5) Auxiliary Generators.
6) Alarm Devices.
7) Precast Concrete Manhole Castings.
8) Piping Paint.

B. Submit shop drawings for the following:

1) Precast Concrete Vaults and wetwells, including frames and covers, ladders, drains, access hatches, wall sleeves, valve support stands, pumps, and motors.

C. **Coordination Drawings**: Show manholes and other structures in vicinity, pipe sizes and elevations, elevations of lift station elements such as influent lines, floats, etc.

D. **Computations**:

1) Buoyancy calculations for wetwells, manholes, interceptor/outfalls, and mains with shallow cover.

2) Provide structural calculations for any elevated main and pier system where span of the main exceeds the joint length. Provide calculations for all aerial mains, and their supporting structures that are subject to hydrodynamic forces.

E. **Bypass Pumping**: Bypass pumping operations must be approved by the City before starting. Provide a detailed written plan of how the bypass pumping operation shall be performed two weeks prior to the operation. See Section 3.6 of this specification.

F. **Project Closeout**: Submit 3 copies of manufacturer's maintenance and operation manuals on all sewage pumps and/or package lift stations and appurtenant devices.

1.6 QUALITY ASSURANCE

A. Materials and operations shall comply with the latest revision of the Codes and Standards listed in Section 1.7, below.

B. Piping materials shall be marked clearly and legibly.

1) Ductile Iron Pipe shall show on or near bell:

a. Weight,
b. Class or nominal thickness,
c. The letters "DI" or "Ductile,"
d. Manufacturer's identifying mark,
e. Year in which pipe was made, and
f. Casting period.

2) PVC pipe shall show identification marks, at intervals not to exceed 5 feet, as follows:

a. Nominal pipe diameter,
b. PVC cell classifications,
c. Company, plant, shift, ASTM, SDR and date designation,
d. Service designation or legend.

e. All PVC pipe shall bear the National Sanitation Foundation seal of approval.

3) Steel pipe shall be marked as follows. Each length of pipe and each special section shall be legibly marked by paint stenciling, die stamping or hot-roll marking to show the following:

a. Manufacturer's name or mark,
b. Size and weight of the pipe or special section,
c. The type of steel from which the pipe or special section was made.

C. *Gravity Sanitary Sewer Design and Construction*, ASCE Manuals and Reports on Engineering Practice – NO. 60, WPCF Manual of Practice NO. FD-5.

D. AWWA C600: Installation of Ductile Iron Water Mains and Appurtenances.

E. NC Department of Environmental Quality (NCDEQ), Division of Water Resources, NCAC Title 15A 2T *Waste Not Discharged to Surface Waters*, latest revision.

1.7 QUALITY STANDARDS

A. Materials and operations shall comply with the latest revision of the Codes and Standards listed within this specification. The use of ASTM standard specification references without a year designation implies the most current applicable specification.

B. Standard Abbreviations:

AASHTO	American Association of State Highway Transportation Officials.
ACI	American Concrete Institute
ACPA	American Concrete Pipe Association
ANSI	American National Standards Institute
AREA	American Railway Engineers Association
ASCE	American Society of Civil Engineers
ASSE	American Society of Sanitary Engineers
ASTM	American Society for Testing and Materials
AWWA	American Water Works Association
CISPI	Cast Iron Soil Pipe Institute
CRSI	Concrete Reinforcing Steel Institute
FS	Federal Specifications

MSDS	Material Safety Data Sheets
NCDEQ	North Carolina Department of Environmental Quality
NCDOT	North Carolina Department of Transportation
NCMA	National Concrete Masonry Association
NCPI	National Clay Pipe Institute
NSF	National Sanitation Federation International
OSHA	Occupational Safety and Health Administration
UL	Underwriters Laboratories, Inc.
WEF	Water Environment Federation

1.8 PRODUCT DELIVERY, STORAGE AND HANDLING

Materials used for the construction of gravity sewer, pressure mains and appurtenances in the City's sewer collection system shall be new, free of defects, and meet the highest standards set forth. The City's authorized representative must inspect, review, and approve all materials to be used for sewer main and appurtenances prior to installation. At the option of the City, any material installed without inspection will have to be sufficiently removed for inspection and review. Any additions, deletions, or changes from the City's approved plan set must be submitted to the City for approval, prior to making changes in the field.

A. **PIPE CONDITION/PIPE EXAMINATION:**

1) **New Pipe Inspection**: Inspect materials thoroughly, including the interior, upon arrival. Examine materials for damage and to ensure that the right pipe has been delivered to the site. Remove damaged or rejected materials from site. Pipe shall be protected during handling against impact shocks and free fall. Pipe shall be kept clean at all times, and no pipe shall be used in the work that does not conform to the appropriate ASTM Specifications.

2) **Pre-Installation Inspection**: Prior to being installed, each section of the pipe shall be carefully examined for damage and conformity with these specifications. All pipe damaged or deemed not to conform to these specifications shall be rejected and removed from site. All pipe in which the spigots and bells cannot be made to fit properly, or pipe, which has chipped bells or spigots, will be rejected. The faces of all spigot ends and all shoulders or sockets on the bells must be true. Examine bell and spigot for uniformity and smoothness of liner and barrel.

B. Protect pipe coating during handling using methods recommended by the manufacturer. Use of bare cables, chains, hooks, metal bars, or narrow skids in contact with coated pipe is not permitted.

C. Prevent damage to pipe during transit. Repair abrasions, scars, and blemishes to the satisfaction of the City. If repair of satisfactory quality cannot be achieved, replace damaged material immediately.

D. Observe manufacturer's directions for delivery and storage of materials and accessories.

E. Protect stored piping from entry of water or dirt into pipe. Protect bells and flanges of special fittings from entry of moisture and dirt.

F. Support pipe to prevent sagging or bending as recommended by manufacturer. Do not store plastic pipe, structures, and fittings in direct sunlight for more than one week.

G. Handle precast concrete manholes and other structures according to manufacturer's written rigging instructions.

H. Construct piping to accurate lines and grades and support as shown in drawings or prescribed in specifications. When temporary supports are used, ensure that sufficient rigidity is provided to prevent shifting or distortion of pipe.

1.9 PRODUCT SUBSTITUTIONS

The City Engineer or Water Resources will approve materials not specified but deemed equal, on a case-by-case basis. The City's Product and Design Review Committee (PDRC) meets monthly or on an "as-needed" basis to evaluate new products for incorporation into these specifications. If submitting new products, submit in accordance with Section 00825 *Product Substitution*. New materials approved for the sewer collection system will be incorporated into these specifications after approval by the PDRC.

1.10 PROJECT CONDITIONS

1.10.1 SEPARATION OF WATER AND SANITARY AND/OR STORM SEWERS

A. Follow the NCDEQ standards for separation of water mains and sanitary sewers lines. The following separations pertain to potable water mains. See also 15A NCAC 02U .0403 *Design Criteria for Distribution Lines,* 15A NCAC 02T .0305 *Design Criteria* and .0909 *Design Criteria for Distribution Lines* for requirements relating to other reclaimed water mains separation requirements for both potable water and sanitary sewer mains. See also **Standard Detail C01.04**.

B. **PARALLEL INSTALLATIONS:**

1) **Preferred/Normal Conditions** – Sewer mains or sewer manholes shall be constructed at least 10 feet horizontally from water lines whenever possible. The distance shall be measured edge-to-edge.

2) **Unusual Conditions** – When local conditions prevent a horizontal separation of at least 10 feet, the sewer main or sanitary sewer manhole may be laid closer to a water line provided that:

a. The sewer line shall be placed in a separate trench, with elevation of the top of the sewer line at least 18 inches below the bottom of the water line; or

b. The sewer shall be placed in the same trench as the water, and located to one side, on a bench of undisturbed earth, and the elevation of the top of the sewer line at least 18 inches below the bottom of the water main; or

c. If it is impossible to obtain proper horizontal and vertical separation as described above or anytime the sewer line is above the water main, both the water main and sewer line must be constructed of DIP complying with public water supply design standards and must be pressure tested to 150-psi to assure watertightness before backfilling. The sewer manhole shall be of watertight construction and tested in place.

C. **SEWER MAINS CROSSING BELOW WATER MAINS:**

1) **Preferred/Normal Condition** – Sewer line shall be constructed to cross below water lines whenever possible and shall be laid to provide a vertical separation of at least 18 inches between the bottom elevation of the water line and the top of the sewer.

2) **Unusual Conditions** – When local conditions or barriers prevent an 18-inch vertical separation as described in *Preferred/Normal Conditions* (paragraph immediately above), one of the following construction methods shall be used:

a. Both the water main and sewer line shall be constructed of ferrous materials and with joints that are equivalent to water main standards for a distance of 10 feet on each side of the point of crossing. Both the water main and sewer shall be pressure tested at 150-psi to assure water tightness before backfilling.

or

b. Either the water main or the sewer main may be encased in a watertight encasement pipe which extends 10 feet on both sides of the crossing, measured perpendicular to the water main. The encasement pipe shall be of materials approved by NCDEQ for use in water main construction (e.g. DIP, steel). If the sewer main is encased, the DIP sewer carrier pipe shall be DIP continuous from manhole to manhole. If the water main carrier pipe is encased, the water shall be constructed of either DIP or PVC meeting these specifications.

D. **SEWER MAINS CROSSING ABOVE WATER MAINS:**

1) **Unusual Conditions** – When local conditions prevent an 18 inch vertical separation, as described in paragraph C, *Sewer Mains Crossing Below Water Mains*, *Preferred/Normal Condition*, above, the following construction shall apply:

a. Whenever it is necessary for a water main to cross under a sewer, both the water main and the sewer shall be constructed of ferrous materials and with joints equivalent to water main standards for a distance of 10 feet on each side of the point of crossing. A section of water main pipe shall be centered at the point of crossing. Both the water main and sewer shall be pressure tested at 150-psi to assure watertightness

before backfilling. The sewer line shall be ductile iron from manhole to manhole.

b. Provide adequate structural support for the sewers to prevent excessive deflection of the joints, which can result in settling on and/or breaking the water line.

E. **SEWER MAINS AND OTHER UTILITIES:**

1) **Horizontal Separation – Preferred/Normal Condition** – Sewer lines shall be constructed to provide at least a 10-foot of horizontal separation from a water main and 3 feet of horizontal separation from other utilities whenever possible. The distance shall be measured edge-to-edge.

a. Reclaimed water mains shall be constructed with a 2-foot minimum horizontal separation from a sewer main or manhole.

2) **Vertical Separation – Preferred/Normal Condition** – Whenever it is necessary for storm sewers or another utility (excluding reclaimed water) to cross a sewer main, a 24-inch vertical separation shall be maintained between the lines (see paragraph H, *Storm Drainage System*) for vertical clearances between sanitary sewers and storm sewers). When local conditions prevent a 24-inch vertical separation, the following construction shall apply:

b. For storm sewers, engineering solutions such as Ductile Iron Pipe or structural bridging to prevent crushing of the underlying pipe shall be employed.

c. Similarly, for other utilities, provide adequate structural support for the utility to prevent excessive deflection of the joints, which can result in settling on and/or breaking the sewer line.

d. The sewer line shall be constructed of AWWA approved Ductile Iron Pipe and shall be continuous from manhole to manhole.

e. Reclaimed Water Mains: Reclaimed water mains shall be constructed with at least an 18-inch vertical separation with the reclaimed water mains above the sewer mains.

f. Gas: Sanitary sewers crossing gas mains 6 inches and larger shall be constructed of DIP and shall run continuous from manhole to manhole.

F. **SANITARY SEWER MANHOLES**: No water main shall be allowed to pass through or come in contact with any part of a sewer manhole. A minimum of 3 feet of horizontal separation shall be maintained between water mains and sanitary sewer manholes provided that the applicable provisions of paragraph B, *Parallel Installations, Unusual Conditions*, above, are also met.

G. **SANITARY SEWER AND WATER SERVICES**: DWQ permits the collection system, not the taps into the sewer main except in the case of private permits. The Minimum Design Criteria for Gravity Sewers does not mention taps nor are they

shown on the as-built drawing plan and profiles. As such, 15 NCAC 02T rules define a sewer service as follows:

> *Building Sewer* means that part of the drainage system that extends from the end of the building drain and conveys the discharge from a single building to a public gravity sewer, private gravity sewer, individual sewage disposal system or other point of disposal.

The NC State Plumbing Code has an identical definition. Consequently, the separation requirements for water and sewer services fall under the requirements the *NC State Building Code: Plumbing Code (IPC with North Carolina Amendments),* Section 603.2 *Separation of Water Service and Building Sewer*, latest revision. Those provisions are generally as follows:

a. Water service pipe and the building sewer shall be separated by 5 feet of undisturbed or compacted earth.

b. A minimum 12-inch vertical separation with bottom of water above top of sewer and pipe material meets the provisions of this specification.

c. Water can be located in same trench with sewer if pipe material meets the provisions of this specification.

d. Separation is not required if water is sleeved to a point 5 feet either side of the sewer centerline with pipe material meeting Table 605.3, Table 702.2 or Table 702.3 of the NC State Building Code: Plumbing Code, latest revision.

H. **STORM DRAINAGE SYSTEM**: Sewers shall have a minimum horizontal separation of 10 feet from surface drainage ditches, streams, lakes or impoundments. A 24-inch vertical separation shall be provided between a storm sewer and a sanitary sewer line. If unable to meet this separation, DIP sewer must be specified with the DIP running continuous from manhole to manhole. See 15A NCAC 02T .0305 for other setbacks pertaining to reservoirs used as a source of drinking water and certain other classified waters.

A distance of 50 feet shall be maintained between sewers and water classified as wetlands.

No gravity sewer or sewer lateral shall pass through a storm drain pipe or manhole system unless a hardship is proven to exist.

I. **NEW UTILITIES AND EXISTING SEWER MAINS**: When installing a new utility adjacent to or in close proximity to an *existing* sewer main, the new utility line shall be installed to provide the minimum horizontal and vertical clearances specified in paragraph E, *Sewer Mains and other Utilities*.

J. **PROTECTION OF WELLS** – A distance of 100 feet shall be maintained between any private well and a gravity sewer, force main or manhole structure. If this separation cannot be maintained, DIP with joints equivalent to public water supply design standards and pressure tested to 150-psi to assure weathertightness, shall be used. However, given the sewer meets these requirements, no gravity sewer,

force main, or manhole structure shall pass or be placed within 25 ft of a private well or 50 feet of a public water supply well, source or structure.

1.11 SERVICE INTERRUPTION

A. Contact the City to coordinate interruption of services. If interruption is necessary, the interruption shall be arranged to occur at such a time to cause the least disruption and minimize loss of service. At the direction of the City Engineer, or Water Resources temporary service may be required to be provided. Provide a minimum of 48 hours' notice of the proposed utility interruption.

1.12 COORDINATION

A. Coordinate tie-in to municipal sewer mains and manholes with the City Engineer who will arrange with Water Resources. Connections to the City's sewer systems (manholes, wetwells, force mains or any other part of the sewer system) must be witnessed by a representative of the City; otherwise, the City will not accept the new system.

B. Service is to be continuously maintained to customers in the project areas except for the minimum amount of time required to make connections with the existing system. At the direction of the City Engineer or Water Resources, temporary pumping/bypass of sewerage flow may be required to be provided. See paragraph 3.6, Bypass Pumping for bypass pumping requirements and procedure.

C. When traffic signals, loops, or their appurtenances are likely to be damaged or interfere as a result of the construction, coordinate temporary operation with the applicable agency having jurisdiction of the signals. Provide a minimum of a 1-week notice prior to anticipated disturbance or interruption. At the discretion of the City Engineer or Water Resources, the notice may be required to be published in the newspaper.

D. **Repair of pavement markings**: When cuts are made through any paved surface and the cuts extend through the pavement markings, the replaced pavement shall be marked to match the existing.

E. Contact ***"NC One Call"*** at 811 before digging.

811
Know what's **below.**
Call before you dig.

PART 2 – PRODUCTS

2.1 PIPE & FITTINGS

The following references provide the minimum standards as they apply to the specific item listed. In all cases, the latest revision shall apply.

2.1.1 DUCTILE IRON PIPE

Ductile iron pipe shall be Grade 60-42-10 and manufactured in accordance with all applicable requirements of AWWA C151/ANSI A21.51 *American National Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water* and ASTM A746, *Standard Specification for Ductile Iron Gravity Sewer Pipe* for 8-inch and larger diameter pipe, thickness class rated, class 50 minimum. The thickness of Ductile

Iron Pipe shall be determined by considering trench load in accordance with ANSI C150 and AWWA A21.50. (Public Sewers shall be no less than 8-inch diameter).

Interior Lining:

Lining shall be 100% solids, ceramic epoxy lining that is abrasion-resistant and specifically designed for wastewater immersion and fume environments. Lining shall provide low permeation to H_2S gas, protect against microbiological influenced corrosion (MIC), and provide chemical resistance to ductile iron pipe and fittings for severe wastewater.

Unless otherwise permitted herein, all internal surfaces of ductile iron pipe and fittings shall be lined with Tnemec Series 431 Perma-Shield PL, a 100% solids epoxy liner, for sewer pipe only. Series 431 Perma-Shield PL is a modified polyamine ceramic epoxy containing 20% by volume of ceramic microspheres for abrasion resistance (no silica fume, fly ash, or alumina dust). Pipe to be delivered to the application facility without asphalt, cement lining, or any other lining on the interior surface. All oils, small deposits of asphalt paint, grease, and soluble deposits shall be removed in accordance with NAPF 500-03-01 Solvent Cleaning prior to abrasive blasting. Surface shall be coated within eight hours of surface preparation. Dry finish thickness to be 40 mils minimum and 60 mils maximum. Finish is to be glossy 5024 Sewer Pipe Green.

SewperCoat Alternate: SewperCoat calcium aluminate mortar lining, as manufactured by Lafarge Calcium Aluminates (or approved equal), is an acceptable alternative to Tnemec Series 431 Perma-Shield PL when pipe is to be used for sewer only. SewperCoat is a calcium aluminate mortar made of fused calcium aluminate cement and fused calcium aluminate aggregates. The thickness of the lining shall be the thickness identified on AWWA C104, Sec. 4.7, paragraph 4.7.1, latest revision but no less than 0.125 inch for 6-inch through 12-inch and 0.1875 inch for 14-inch through 24-inch pipe. The lining thickness may taper to less than the specified at the ends of the pipe. Cracks, other than closed hairline cracks and/or fine crazing shall not be acceptable. Loose areas of cement lining are not allowable. A seal coat shall be applied to the lining as identified on AWWA C104, Sec. 4.11.

Protecto 401 Ceramic Epoxy Alternate: Protecto 401Ceramic Epoxy lining, as manufactured by Induron Protective Coatings (or an approved equal), is an acceptable alternative to Tnemec Series 431 Perma-Shield PL.

Lining Material

Protecto 401 Ceramic Epoxy material shall be an amine cured novolac epoxy containing at least 20% by volume of ceramic quartz pigment. Lining material minimum requirements:

- Pipe Preparation Prior to Lining: Prior to lining, all pipe and fittings shall be delivered to the application facility without asphalt, cement lining, or any other lining on the interior surface. The entire interior of the ductile iron pipe and fittings shall not have been lined with any substance prior to application of the

Protecto 401 lining and no coating shall have been applied to the first 6 inches of the exterior of spigot ends.

- Protecto 401 shall have a permeability rating of 0.00 when tested according to Method A of ASTM E96, Procedure A with at test duration of 30 days.

- After surface preparation and within 12 hours of surface preparation, the interior shall receive 40 mils nominally dry film thickness when pipe is to be used for sewer only. No lining shall take place when the substrate or ambient temperature is below 40 degrees F. The surface must be dry and dust free. When flange pipe or fittings are included in the project, the lining shall not be used on the face of the flange.

- Abrasion Resistance: No more than 3 mills loss after one million cycles using European Standard EN 598: 1994 Section 7.8 Abrasion Resistance.

- Coating of Bell Sockets and Spigot Ends: Due to the tolerances involved, the gasket area and spigot end up to 6 inches back from the end of the spigot end must be coated with 6 mils nominal, 10 mils maximum using Protecto 401 Joint Compound. The Joint Compound shall be applied by brush to ensure coverage. Care should be taken that the Joint Compound is smooth without excess buildup in the gasket seat or on the spigot ends. Coating of the gasket seat and spigot ends shall be done after the application of the lining.

- Touch-Up and Repair: Protecto 401 Joint Compound shall be used for touch-up or repair in accordance with manufacturer's recommendations.

- Protecto 401 is not for use as a Potable Water Lining.

Outside Coating:

Outside coat shall be a minimum of 1 mil bituminous paint according to ANSI/AWWA C151/A21.21 Section 51-8.1.

Each joint of ductile iron pipe shall be hydrostatically tested, before the outside coating and inside lining are applied, at the point of manufacturer to 500 psi. Testing may be performed prior to machining bell and spigot. Failure of ductile iron pipe shall be defined as any rupture or leakage of the pipe wall.

All materials used in production of the pipe are to be tested in accordance with AWWA C151 for their adequacy within the design of the pipe, and certified test results are to be provided to the City upon request. All certified tests, hydrostatic and material, are to be performed by an independent testing laboratory at the expense of the pipe manufacturer.

Push-on and mechanical joint pipe shall be as manufactured by the American Cast Iron Pipe Company, McWane Ductile, United States Pipe and Foundry Company.

Handling:

Line pipe and fittings must be handled only from the outside of the pipe and fittings. No forks, chains, straps, hooks, etc. shall be placed inside the pipe and fittings for lifting, positioning, or laying. The pipe shall not be dropped or unloaded by rolling.

Care should be taken not to let the pipe strike sharp objects while swinging or being off loaded. Ductile iron pipe should never be placed on grade by use of hydraulic pressure from an excavator bucket or by banging with heavy hammers.

B. **DUCTILE IRON JOINTS:**

Pipe joints may be either push-on or mechanical joint pipe sizes 8 inches through 48 inches in diameter. Rubber Gasket Joints and Mechanical Joints shall comply with AWWA C111/ANSI A21.11, *American National Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings*, ASTM A536 *Standard Specification for Ductile Iron Castings*. Acceptable pipe joints are as follows:

1) **Push-on Joint, Ductile Iron Pipe** shall conform to AWWA C151/ANSI A21.51 *Ductile-Iron Pipe, Centrifugally Cast, for Water* (such as *"Fastite," "Tyton,"* or *"Bell-Tite."*). The dimensions of the bell, socket, and plain end shall be in accordance with the manufacturer's standard design dimensions and tolerances. The gasket shall be of such size and shape to provide an adequate compressive force against the plain end and socket after assembly to affect a positive seal. Gaskets shall be vulcanized natural or vulcanized synthetic rubber, and comply with AWWAC111/ANSI A21.11 *American National Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings*.

2) **Mechanical Joint, Ductile Iron Pipe** shall be used only at the specific locations indicated on the drawings or as approved by the City.

   a. The mechanical joint shall consist of:

      i. A bell cast integrally with the pipe or fitting and provided with an exterior flange having cored or drilled bolt holes and interior annular recesses for the sealing gasket and the spigot of the pipe or fitting;

      ii. A pipe or fitting spigot;

      iii. Mechanical Joint Gaskets to be plain rubber (Styrene Butadiene [SBR]) per AWWA C111/ANSI A21.11;

      iv. Separate ductile iron follower gland having cored or drilled bolt holes; and

      v. Alloy steel Tee Head bolts and hexagon nuts. All threads are Coarse-Thread Series Class 2A, External and Class 2B, Internal, per ANSI B1.1. Nuts to be furnished in accordance with ASTM A563, *Standard Specification for Carbon and Alloy Steel Nuts*.

   b. The joint shall be designed to permit normal expansion, contraction, and deflection of the pipe or fitting while maintaining a leak proof joint connection. The mechanical joint shall conform to the requirements of Federal Specification WW-P-421 and AWWA C111/ANSI A21.11.

   c. **Mechanical Joint Bolt Torque**: See Section 3.1.2, paragraph B, *Mechanical Joint Bolt Torque*, below.

C. **DUCTILE IRON FITTINGS:**

Fittings shall be ductile iron at least class 54 thickness and shall conform to AWWA C110/ANSI A21.10 *American National Standard for Ductile-Iron and Gray-Iron Fittings, 3-inch through 48-inch, for Water and Other Liquids* or AWWA C153/ANSI 21.53 *American National Standard for Ductile-Iron Compact Fittings, 3-inch through 24-inch and 54-inch through 64-inch, for Water Service,* pipe sizes 4 inches through 48 inches with the exception of manufacturer's proprietary design dimensions and thicknesses for iron, in accordance with AWWA C110/ANSI A21.10. All ductile iron fittings shall have a minimum working pressure rating of 350 psi and minimum iron strength of 25,000 psi. All fittings shall be lined with the same type coating as being provided with the pipe. *Do not mismatch pipe to fitting coatings.* See paragraph 2.1.1, above. The fittings shall be tested and the manufacturer shall provide certified test results when requested by the City. This testing shall include hydrostatic proof testing of fittings. Glands, gaskets, and bolts shall conform to AWWA C111/ANSI A 21.11 *Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.* Acceptable types of fittings include Push-On Joint and Mechanical Joint.

1) **Full Body Mechanical Joint Fittings:** Full body ductile iron mechanical joint fittings shall conform to AWWA C110/ANSI A21.10. Glands, Gaskets and Bolts shall conform to AWWA C111/ANSI A21.11.

2) **Mechanical Joint Fittings – Compact:** Compact fittings shall comply with AWWA C153/ANSI A21.53. Glands, Gaskets and Bolts shall conform to AWWA C111/ANSI A21.11.

3) **Mechanical Joint Restraint Systems:** Mechanical joint restraint systems shall consist of multiple gripping wedges incorporated into a follower gland meeting the applicable requirements of ANSI/AWA C110/A21.10. Mechanical joint restraint systems (gland body, wedges and wedge actuating components) shall be constructed of grade 65-45-12 ductile iron material in accordance with ASTM 536. For applications requiring restraint 30 inches and greater, an alternate grade of iron meeting the material requirements of ASTM A536 is acceptable provided the device meets all the end product performance requirements. An identification number consisting of the year, day, plant and shift, shall be cast into each gland body. Sizes 3-inch through 16-inch shall be rated at 350-psi minimum working pressure and sizes 18 inches and larger rated at 250-psi minimum working pressure. Ratings are for water pressure and must include a minimum safety factor of 2 to 1 in all sizes. Bolt heads are to be "auto-torque" twist off. Mechanical joint restraint systems shall accommodate all classes of ductile iron pipe (pressure class 350 through pressure class 150 and class 56 through 50) and appurtenances such as valves and hydrants without damage to the fitting, pipe or cement linings. Consult with manufacturer when use is intended for grey iron pipe. All components shall be manufactured and assembled in the United States. See **Standard Detail 512.07** for a common application of the restraint system.

   See Pre-Approved Product List for acceptable manufacturers and models of mechanical joint restraint systems.

2.1.2 PVC PIPE

A. PVC SOLID WALL PIPE AND FITTINGS (GRAVITY PIPE)

1) **PVC Solid Wall Gravity Pipe**: PVC Solid Wall Sewer Gravity Pipe and Fittings, Bell and Spigot Joints shall comply with ASTM D3034, Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings, SDR 35 minimum (8 inches - 15 inches). Pipe shall be made of PVC plastic having a cell classification of 12454 B or 12454 C or 12364 C or 13364 B, with a minimum tensile modulus of 500,000 psi as defined in ASTM D1784, *Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds*, and shall be appropriately marked. Laying lengths shall be a minimum of 12.5 feet for pipes 15 inches or less and 11 feet for the pipes greater than 15 inches.

   PVC pipe strength shall be capable of withstanding stiffness, flattening, and impact test as scheduled or referenced in ASTM D3034 or ASTM F949. Smooth wall pipe shall have a Standard Dimension Ratio (SDR) of 35 or less. All PVC pipe shall have a minimum pipe stiffness of 46 psi when measured at 5 percent vertical ring deflection and tested in accordance with ASTM F477, *Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe*.

   With the exception of services, PVC Fittings shall not be used with pipes 8 inches and larger in diameter.

2) **PVC GRAVITY PIPE JOINTS:** Joints for solid wall PVC sewer gravity pipe and fittings and elastomeric flexible seals (Gaskets) shall be compatible with pipe and shall meet the requirements of ASTM D3212 *Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals*. Rubber Gaskets shall be used which conform to the requirements of ASTM F477, *Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe*.

B. C900 PVC PIPE FOR GRAVITY SEWER AND SEWER FORCE MAINS (4-inch through 24-inch)

1) C900-16 PVC gravity and pressure pipe, 4-inch through 24-inch, with bell end with gasket and spigot end shall comply with AWWA C900, Pressure Class 165, DR 25. Pipe shall also meet ASTM D2122, *Standard Method of Determining Dimensions of Thermoplastic Pipe and Fittings*, and ASTM D3139, *Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals*. Pipe shall have a bell with an integral wall section with a factory installed, solid cross section elastomeric ring in accordance with ASTM F477, *Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.*

2) The pipe shall be extruded from Class 12454-A or 12454-B PVC compound as defined in ASTM D1784. Stress due to working pressure cannot exceed the HDB[1] (4000 psi) ÷ 2.5 safety factor (HDS = 1,600 psi). The pipe outside

[1] Hydrostatic Design Basis

diameters shall conform to dimensions of Ductile Iron Pipe. All pipe furnished shall be in conformance with AWWA C900, latest revision.

3) The minimum pipe stiffness shall be 364 psi.

4) In accordance with ASTM D1599, *Standard Test Method for Resistance to Short-Time Hydraulic Failure Pressure of Plastic Pipe, Tubing, and Fittings,* a minimum pipe burst of 755 psi shall be withstood without failure.

5) The pipe must be able to withstand an impact of 100 foot-pounds without visible evidence of shattering or splitting as specified in ASTM D2444, *Standard Test Method for Determination of the Impact Resistance of Thermoplastic Pipe and Fittings by Means of a Tup (Falling Weight*).

6) Pipe shall be homogenous throughout. It shall be free from voids, cracks, inclusion, and other defects. It shall be as uniform as commercially practical in color, density, and other physical properties. Pipe surfaces shall be free from nicks and scratches. Joining surfaces of spigots and joints shall be free from gouges and imperfections that could cause leakage.

7) Each length of pipe furnished shall bear identification marking that will remain legible after normal handling, storage, and installation. Markings shall be applied in a manner that will not weaken or damage the pipe. Markings shall be applied at intervals of not more than 5 feet on the pipe. The minimum required markings are given in the list below. Marking requirements shall be in conformance with AWWA C900.

   a. Nominal Size and OD Base (e.g. 12CI)
   b. PVC
   c. Dimension Ratio (e.g., DR 18)
   d. AWWA pressure rating (e.g. PR 150)
   e. AWWA designation number (AWWA C900)
   f. Manufacturer's name or trademark
   g. Manufacturer's production code, including day, month, year, shift, plant, and extruder of manufacture.

8) C900 pressure pipe for force mains shall be used with ductile iron fittings (restrained joint).

C. **Fusible C900 Pipe Pressure Pipe for Wastewater (Force Mains) Conforming to AWWA C900 Dimensionality (4 to 12 inches)**:

1) Fusible PVC pipe shall conform to AWWA C900-16 standard, ASTM D1784 *Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds* with cell classification 12454. Pipe to be rated at 235-psi operating pressure at 73°F. Pipe to be DIPS O.D., DR-18.

2) Fusible PVC pipe shall be manufactured in standard joint lengths of 20', 30', 40' or custom lengths as may be specified.

3) Fusible PVC shall be extruded with plain ends. The ends shall be square to the pipe and free of any bevel or chamfer. There shall be no bell or gasket of any kind incorporated into the pipe.

4) Fusible PVC pipe shall be green in color for wastewater use.

5) Pipe shall be marked as follows:
   a. Nominal size
   b. PVC
   c. Dimension Ratio or SDR
   d. AWWA Pressure Class
   e. Extrusion production-record code
   f. Trademark or trade name
   g. Cell Classification 12454

6) Pipe shall be homogeneous throughout and be free of visible cracks, holes, foreign material, blisters, or visible deleterious faults.

7) Fusible C900 pipe shall be joined per the manufacturer's recommendations.

8) Installation shall not exceed manufacture's bending radius and safe pulling force.

9) No solvent cement weld pipe or fittings will be accepted.

10) Affidavit of compliance to this specification shall be available upon request.

11) Fusion Joints: Unless otherwise specified, fusible PVC pipe lengths shall be assembled in the field with butt-fused joints. The Contractor shall follow the pipe manufacturer's written guidelines for this procedure.

12) Fittings: See paragraph 2.1.1.C, above.

D. **PVC PIPE FOR SMALL SEWER FORCE MAINS (2-inch and 3-inch)**

2-inch and 3-inch PVC pressure pipe, bell end with gasket and spigot end shall comply with ASTM D2241, *Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)*, SDR 21, Class 200 minimum. Materials shall meet ASTM D1784, *Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds*.

Joints for solid wall PVC sewer gravity pipe and fittings and elastomeric flexible seals (gaskets) shall be compatible with pipe and shall meet the requirements of ASTM D3212 *Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals*. Rubber gaskets shall be used which conform to the requirements of ASTM F477, *Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe*.

2.1.3 DIRECTIONALLY BORED HDPE PIPE FOR SEWER FORCE MAINS

A. All polyethylene pipe, tubing, and fittings shall conform to all applicable provisions and requirements of the latest revision of AWWA C901, AWWA C906, or CSA B137.1 and, by inclusion, all appropriate standard references therein. Polyethylene compounds utilized in the manufacture of products furnished under this specification shall have a grade of PE24 with a minimum cell classification of

PE 234363(C, D, or E) for PE2406-2606 materials, or a grade of PE34 with a minimum cell classification of PE 345464(C or E) for PE3408/PE3608 materials, as defined in ASTM D3350. In conformance with AWWA C901, AWWA C906, or CSA B137.1, they shall have a PPI recommended Hydrostatic Design Basis (HDB) of 1250 psi (PE2406/2606) or 1600 psi (PE3408/PE3608) at a temperature of 73.4°F (23°C).

All materials which come in contact with water, including lubricants, shall be evaluated, tested, and certified for conformance with ANSI/NSF Standard 6.1.

Clean re-work material of the same type grade, and cell classification generated from the manufacturer's own pipe and fitting production may be used by the same manufacturer as long as the pipe, tubing, and fittings produced meet the requirements of AWWA C901, AWWA C906, or CSA B137.1.

B. **Reference standards**

AWWA C901: Polyethylene (PE) Pressure Pipe and Tubing, 1/2-inch through 3-inch for Water Service.

AWWA C906: Polyethylene (PE) Pressure Pipe and Tubing, 4-inch through 63-inch for Water Service.

ASTM D2657: Standard Practice for Heat Joining Polyolefin Pipe and Fittings.

ASTM D2683: Standard Specification for Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing.

ASTM D2837: Standard Test Method for Obtaining Hydrostatic Design Basis of Thermoplastic Pipe Materials.

ASTM D3261: Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing.

ASTM D3350: Standard Specification for Polyethylene Plastic Pipe and Fittings Materials.

ASTM F714: Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter.

ASTM F1055: Standard Specification for Electrofusion Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene Pipe and Tubing.

PPI TR-3: Policies and Procedures for Developing Recommended Hydrostatic Design Stresses for Thermoplastic Pipe Materials.

PPI TR-4: Recommended Hydrostatic Strengths and Design Stresses for Thermoplastic Pipe and Fitting Compounds.

ANSI/NSF: Standard Number 61 for Drinking Water Systems Components – Health Effects.

NSF Standard #14: Plastic Piping Components and Related Materials.

CSA B137.1: Polyethylene Pipe, Tubing, and Fittings for Cold Water Pressure Services.

C. **Qualification of Manufactures**

The manufacturer shall have manufacturing and quality control facilities capable of producing and assuring the quality of the pipe and fittings required by these specifications. Given reasonable notice, the manufacturer's production facilities shall be open for inspection by City or their representative. Qualified manufacturers shall be approved by the Project Engineer. Approved manufacturers include Plexco Performance Pipe Division-Chevron Chemical Company.

D. **Manufacturer's Quality Control**

The manufacturer of the Polyethylene pipe and fittings shall have an established quality control program responsible for inspecting incoming and outgoing materials. Incoming polyethylene materials shall be inspected for density, melt flow rate, and contamination. The cell classification properties of the material shall be certified by the supplier. Incoming materials shall be approved by Quality Control before processing into finished goods. Outgoing products shall be tested as required in AWWA C901 or AWWA C906, as applicable.

E. **Pipe and Tubing**

Pipe and tubing furnished under this specification shall be manufactured using compounds complying with the requirements of paragraph A above. Dimensional performance characteristics shall conform to the requirements of AWWA C901, C906, or CSA B137.1. The pipe's DR (Dimension Ratio) and Working Pressure (WPR) shall be as specified or shown on the drawings.

F. **Fittings**

Polyethylene fittings furnished under this specification shall be manufactured using compounds complying with the requirements of paragraph A above and all appropriate requirements of AWWA C901, C906, or CSA B137.1 Socket type fittings shall comply with ASTM D2683. Butt fusion fittings shall comply with ASTM D3261. Electrofusion fittings shall comply with ASTM F1055. Mechanical fittings produced from material not listed in paragraph A above, shall be approved only after submission of appropriate test data and service histories indicating their acceptability for the intended service. In all cases, the specifications and requirements of the fittings supplied shall comply with the appropriate section of AWWA C901, C906, or CSA B137.1.

G. **Pressure Class**

The Pressure Class of the Polyethylene pipe and fittings shall be specified on the basis of the Working Pressure Rating of the water system as defined in AWWA C906. Recurring positive pressure surges of up to one half of the pipe's nominal pressure class and occasional pressure surges of up to 100% of the pipe's nominal pressure class may be ignored due to the fatigue endurance of the polyethylene materials. Non-polyethylene fittings shall be specified and used in accordance with the surge tolerance of the particular appurtenance in use.

H. **Marking**

Pipe and tubing shall be marked in accordance with either of AWWA C901, AWWA C906, or CSA B137.1, whichever applies. Marking shall be legible and shall remain legible under normal handling and installation practices. Indent marking may be utilized provided; 1) the marking does not reduce the wall thickness to less than the minimum value for the pipe or tubing, 2) it has been demonstrated that these marks have no effect on the long term strength of the pipe or tubing and, 3) the marks do not provide leakage channels when elastomeric gasket compression fittings are used to make the joints.

Fittings shall be marked on the body or hub. Marking shall be in accordance with either ASTM D2683, ASTM D3261, AWWA C906, or ASTM F1055, depending on fitting type and the standard that applies. Mechanical fittings shall be marked with size, body material designation code, pressure rating and manufacturer's name or trademark.

Pipe to be marked with green stripe(s) for sewer.

I. **Workmanship**

Pipe, tubing, and fittings shall be homogeneous throughout and free of visible cracks, holes, foreign inclusions, blisters, dents, or other injurious defects. The pipe, tubing, and fittings shall be as uniform as commercially practicable in color, opacity, density, and other physical prosperities.

J. **Pipe Cover/Bury:** See paragraph 2.1.4.B, below.

2.1.4 HIGH DENSITY POLYETHYLENE (HDPE) GRAVITY SEWER PIPE (OR PIPE BURSTING)

A. Materials used for the manufacture of polyethylene pipe shall be PE4710 high density polyethylene meeting ASTM D3350 cell classifications 445574E (Gray) with a standard grade HDB rating of 1600 pounds per square inch at 73 °F.

Polyethylene pipe shall be manufactured in accordance the requirements of ASTM D3035 and ASTM F714 and AWWA C906 (IPS) for pipe sizes 4-inch through 18-inch.

Pipe diameter shall be as indicated on the Contract Drawings. However, in order to maintain the internal pipe diameter relatively equal to DIP sizes, pipe greater than 12 inches shall generally be up-sized 1-inch greater than the nominal pipe diameter. Gravity applications shall be a minimum of DR 17 unless otherwise indicated on the Contract Drawings. Molded fittings shall be manufactured and tested in accordance with ASTM D 3261 and shall be so marked.

Pipe shall be legibly marked in accordance with the requirements specified in ASTM F714.

Pipe lengths shall be as from the manufacturer. Length shall be such that the pipe is easily transportable in accordance with both the manufacturer's recommendations and all applicable laws and regulations.

Pipe to be marked with 4 single green stripes denoting IPS sewer and 3 sets of dual stripes for DIPS sewer.

B. Pipe Cover/Bury: AWWA M55 Pipe Design and Installation describes a Design Window, for which minimal calculations are necessary to verify if the pipe can withstand the anticipated external loads. Furthermore, no calculations are required for HDPE operating within the Design Window and having a DR21 (or less). The Design Window specifications are:

- Pipe made from stress-rated PE material.
- Essentially no surcharge (surface) load imposed over the pipe, no ground water above the surface, and provisions for preventing flotation of shallow cover pipe have been provided.
- The embedment materials are coarse-grained, compacted to ≥ 85% Standard Proctor Density and have an E' (modulus of soil reaction) value ≥ 1000 psi. The native soil must be stable; i.e., the native soil must have an E' ≥ 1000 psi.
- The unit weight of the native soil ≤ 120 pcf.
- The pipe is installed in accordance with manufacturer's recommendations for controlling shear and bending loads and minimum bending radius, and installed in accordance with ASTM International D2774, Standard Practice for Underground Installation of Thermoplastic Pressure Piping for pressure pipes, or ASTM International D2321, Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications for non-pressure pipes.
- Minimum depth of cover is 2 ft; except when subject to AASHTO H20 truck loadings, in which case the minimum depth of cover is 3 ft or one pipe diameter.
- Maximum depth of cover is 25 ft.

2.1.5 PIPE FOR SERVICE CONNECTIONS

A. **PVC Pipe**: Pipe for 4-inch and 6-inch service connections shall be schedule 40 solid wall PVC pipe with solvent cement weld joints meeting ASTM D1785, *Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120 or* ASTM D2665 *Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings,* and meeting ASTM D2564, *Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems.*

B. **Ductile Iron Pipe Service and Fittings**: Ductile iron pipe for sewer services, when permitted by the City Engineer, shall be minimum thickness class 51 for 4-inch service pipe and minimum class 50 for 6-inch service, slip joint pipe with mechanical joint fittings. Pipe and fittings shall meet the requirements of paragraph 2.1.1 Ductile Iron Pipe.

High-density polyethylene (HDPE) service pipe for horizontal directional drilling: High-Density Polyethylene pipe shall be manufactured in accordance the requirements of ASTM D3035 and ASTM F714 and AWWA C906 (DIPS) for pipe sizes 4-inch through 6-inch. Materials used for the manufacture of polyethylene pipe shall be PE 4710 high density polyethylene meeting ASTM D3350 cell classifications 445574E with a standard grade HDB rating of 1600 pounds per square inch at 73 °F.

The minimum pressure class/SDR rating acceptable shall be Class 200/SDR 9. The pipe shall be DIPS and shall have an interior diameter no less than the piping that it is connected to.

Joints: Joints shall be of a heat fusion joining system. Pipe and fittings shall be thermal butt fusion, saddle fusion, or socket fusion in accordance with manufacturer recommended procedures and ASTM D2161. At the point of fusion, the outside diameter and minimum wall thickness of the fitting shall match the outside diameter and minimum wall thickness specifications of ASTM D1248 for the same size pipe.

Joining of the pipes and fittings shall be performed in accordance with ASTM D2774. Depending upon the installation requirements and site location, joining shall be performed within or outside the excavation. Joints of the pipe sections shall be smooth on the inside and internal projection beads shall not be greater than 3/16 inch.

The tensile strength at yield of the butt-fusion joints shall not be less than the pipe. A specimen of the pipe cut across the butt-fusion joints shall be tested in accordance with ASTM D638.

2.1.6 STEEL PIPE (Use of steel pipe - approved on a case-by-case basis)

A. **STEEL PIPE FOR AERIAL CREEK CROSSINGS, ENCASEMENT, BORING APPLICATIONS, AND VENT PIPES:**

Pipe shall be unwrapped high strength steel, spiral welded or smooth-wall seamless manufactured in accordance with ASTM A139 *Standard Specification for Electric-Fusion (Arc)-Welded Steel Pipe (NPS 4 and Over) and ASTM A283/A283M Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates,* Grade "B" steel with a minimum yield strength of 35,000 psi or ASTM A252 *Standard Specification for Welded and Seamless Steel Pipe Piles*, Grade 2 steel with a minimum yield strength of 35,000 psi. All encasement pipes shall meet the applicable NCDOT, Municipal, or AREA specifications but shall be no less than 6 inches larger than the outside diameter of the carrier pipe bell. The steel pipe shall be capable of withstanding the design load. Unless otherwise shown on the approved drawings, no interior lining and exterior coating shall be required except that all exposed metal is to be coated with epoxy or asphaltic material. The pipe shall have welded joints and be in at least 18-foot lengths.

1) **Steel Encasement Pipe for Aerial Creek Crossings** (*without encasement and carrier pipe*): The outside of the pipe shall have one coat of zinc chromate primer conforming to Federal Specification TT-P-1757 and afterwards painted with coal-tar enamel.

2) **Steel Encasement Pipe for Boring Applications:** Encasement pipe shall meet applicable NCDOT and AREA specifications. Casing pipe shall include pipe carriers (spiders) to support carrier pipe (interior of pipe to be uncoated).

   a. **Spiders/Skids for Encasement Pipes**: See Pre-Approved Product List for acceptable spider/skid manufacturers and models. Also, see paragraph 3.1.4B and **Standard Detail C07.03** for location of spiders. For bolted connections, bolts, and nuts shall be stainless steel.

b. **Casing Wall Thickness**: Refer to **Standard Detail C07.03** for standard wall thickness based on diameter and location (i.e. highway, rail).

c. **Steel Casing End Seals**: Casing end seals shall be 8-inch thick brick masonry with a 1-inch diameter weep hole constructed as shown on **Standard Detail C07.03**.

d. **Rail Applications**: Encasement for rail applications, encasement pipe to be coal-tar coated, lined and wrapped except, if permitted by Rail agency, the interior shall be left unlined to permit ease of carrier pipe/spider installation.

3) **Steel Vent Pipes for Sanitary Sewer Manholes**: The vent pipe shall be made from Schedule 40 Stainless Steel. See **Standard Detail 732.10**.

2.1.7 TUNNEL LINERS

A. Grout mix for filling voids in between carrier pipe and tunnel shall consist of the following materials properly mixed in proportions by weight.

1) 1.0 Part Cement.

2) 3.0 Parts Fine Sand, 100 Percent Shall Pass No. 16 Sieve.

3) 0.5 to 0.6 Part Water – water should be sufficient to provide a consistency of thick cream when well mixed.

4) 2% approved additive (Bentonite, Septamine Seaex, Hydrocide liquid, etc.).

B. Tunnel lining construction shall comply with the "*Specification for Steel Tunnel Liner Plates*" in the American Railway Engineering Association (AREA) Manual for Railway Engineering, latest revision and AASHTO Standard Specification for Highway and Bridges, latest edition. The design and shape of the liner plates shall be such that erection and assembly of the liner plate structure can be completely and readily effected from inside the tunnel. Plates shall be accurately curved to suit the tunnel cross section, and all dimensions shall be of the size and accuracy such that plates of similar curvature shall be interchangeable. All plates shall be connected by bolts on both longitudinal and circumferential joints.

C. The steel lining shall consist of plates 16, 18, or 24 inches wide. Each circumferential ring shall be composed of the number and length plates necessary to complete the required shape shown on the drawings. The nominal tunnel diameter shall be of sufficient size to install the carrier pipe.

D. Plates shall be one-piece steel meeting the requirements of ASTM A1011 *Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength*, or ASTM A1008 *Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable*. Plates

shall have an ultimate tensile strength of at least 42,000 psi and yield strength of 28,000 psi. Nominal plate dimensions shall provide the sectional properties shown in Article 1.13.9 (or latest update) of the AASHTO Standard Specifications for Highway Bridges. Thickness tolerances shall conform to Paragraph 14 of AASHTO M167 *Standard Specification for Corrugated Steel Structural Plate, Zinc-Coated, for Field-Bolted Pipe, Pipe-Arches, and Arches*. Gage thickness shall be a minimum of 8 gage. The liner plate and bolts shall be galvanized in accordance with ASTM A153 *Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware*. In addition, the liner plates shall be asphalt coated to meet AREA Article 1.14.13 (or latest update). For two flange plates, the minimum thickness shall be 0.135 inches. Plates shall be manufactured by Armco Steel Corporation, Commercial Shearing, Incorporated, Republic Steel Corporation, or equal.

E. Grout holes 1½ inches or 2 inches (or larger) in diameter shall be provided in each ring to permit grouting as the erection of the tunnel liner plates progresses. Grout hole screw plugs shall be provided in plates.

   The minimum provision for grouting openings shall be one opening in a top plate of the tunnel at locations not to exceed 54" apart. Additional plates with grouting openings are to be installed at the top quarter points on each side between the top openings. The opening shall be staggered, but shall not exceed 54" in any one line. Grout vent pipes will be required at a minimum of one per monolithic pour.

F. Steel bolts shall meet requirements of ASTM A449 *Standard Specification for Hex Cap Screws, Bolts and Studs, Steel, Heat Treated, 120/105/90 ksi Minimum Tensile Strength, General Use* for plate thickness equal to or greater than 0.209 inch and ASTM A307 *Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength* for plate thickness less than 0.209 inch. The nut shall meet requirements of ASTM A307, Grade A.

G. Steel casing pipe for boring through soil shall be grade B, meet requirements of ASTM A139 *Standard Specification for Electric-Fusion (Arc)-Welded Steel Pipe (NPS 4 and Over)*, and have wall thickness to meet AREA Specifications. No interior lining and exterior coating shall be required.

2.1.8 CARRIER PIPE FOR CASINGS AND TUNNELS

Carrier pipe shall be mechanical joint or restrained joint ductile iron pipe of the class indicated on the drawings but no less than pressure class 250 psi (minimum thickness class 50). See paragraph 2.1.1, Ductile Iron Pipe.

2.1.9 FORCE MAINS:

Force mains 4-inch and larger shall be ductile iron, PVC C900 or HDPE. For 3-inch and smaller force mains, comply with ASTM D2241 per paragraph 2.1.2.C. For HDPE force mains, pipe shall comply with paragraph 2.1.2 D.

Pipe joints shall be push on or mechanical joint type. Fittings shall be mechanical joint with appropriate restraints.

2.2 MISCELLANEOUS APPURTENANCES AND MATERIAL

2.2.1 GATE VALVES

A. Gate valves (4 inches through 12 inches) shall follow the specifications as written in Section 02510 – *Water Distribution*, paragraph 2.2.6.

B. Gate Valves 1-1/2 Inches in Diameter and Smaller: 125 psi; bronze; rising-stem; single wedge; disc type; screwed ends.

C. Gate Valves 2 Inches in Diameter: Stainless Steel Body; non-rising stem, single wedge disc, 200 WOG, and handwheel. ASTM/ASME B16.34, API 598, ANSI B1.20.1 (NPT threaded connections).

2.2.2 PLUG VALVES

Plug valves shall be non-lubricated, eccentric type with resilient faced plugs and with mechanical joint ends for buried service. Port area shall be at least 80% of the full pipe area. Bodies shall be semi-steel or cast iron. Seats shall have a welded in overlay of not less than 90% pure nickel on all surfaces contacting the plug face. Valve shall have stainless steel permanently lubricated upper and lower plug stem bushings. Valves shall be of the bolted bonnet design, and shall be designed so that they can be repacked without removing bonnet from valve. All nuts, bolts, springs, and washer shall be cadmium plated.

All plug valves 6" and greater shall be equipped with an actuator. All gearing shall be enclosed, suitable for running in oil, and the actuator shall be submersible with seals provided on all shafts to prevent entry of water into actuator shall clearly indicate valve position and an adjustable stop shall be provided with a nut operator and extension stem of suitable length.

Valves for buried or submerged service to be provided with handwheel or cylinder actuators extended above ground.

Valves shall be as manufactured by Dresser, DeZurik, Keystone, Kennedy or approved equal.

2.2.3 VALVE BOXES

Valve boxes valves shall follow the specifications as written in Section 02510 – *Water Distribution*, paragraph 2.3.11.

2.2.4 AIR RELEASE AND VACUUM VALVES

Iron Body: Combination air release and vacuum valves are to be used to bleed air during filling of force mains and to automatically vent air that collects in the force mains. The valve shall be a NPT threaded cast iron body with a stainless steel float assembly and stainless steel trim. Air/Vacuum and air release cast iron body and cover shall conform to ASTM A48 *Specification for Gray Iron Castings,* Class 35 and/or ASTM A126*, Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings*, as applicable. The valve outlet is to be protected from debris entering the outlet of the valve. Plumbing valves shall be all brass. The air release and vacuum valves shall be furnished with a back flushing hose with quick disconnect and brass valve assembly. Valves shall be designed for a maximum cold water pressure of 300 psig. Combination air release and vacuum valves shall be located as shown on the drawings or as otherwise directed

by the City. The valve shall be housed in a precast concrete manhole and shall be installed in accordance with **Standard Detail 734.01**.

Composite Body – Short Version: The air valve is intended for use with raw wastewater liquids carrying solid particles. The valve shall have a 2-inch NPT male threaded connection and a 1 ½" NPT female discharge orifice. The body shall be a conical-shaped reinforced nylon/stainless steel SAE 316 body with foamed polypropylene float assembly and with stainless steel SAE 316 spring, washer, stem, and ball valve. The air release and vacuum valves shall be furnished with a discharge outlet to enable connection of a vent hose/pipe. Valves shall be designed for a 150-psi working pressure and a test pressure of 250 psi. The valve outlet is to be protected from debris entering the outlet of the valve. Plumbing valves shall be all brass.

See Pre-Approved Product List for acceptable air release valve manufacturers and models.

2.2.5 BEDDING

A. Bedding material, shall be clean coarse aggregate No. 57 or smaller, and shall meet the requirements of Section 1005 of the NCDOT *Standard Specifications for Roads and Structures*.

1) **Minimum Bedding Allowed DIP Gravity Pipe**: Minimum Type 4 Laying Condition (**Standard Detail 511.02**). The minimum bedding depth shall be 3 to 4 inches under the pipe with an additional 1-inch depth of cushioning material added for each additional 2 feet of depth in excess of 16 feet up to a maximum of 12 inches of cushioning material.

2) **Haunching DIP Gravity Pipe**: The remainder of bedding for DIP shall be brought up to a depth of 1/8 the OD of the pipe. However, when the foundation is determined by the City Engineer or Water Resources to be unsuitable, the pipe shall be bedded to the spring line of the pipe. See **Standard Detail 511.02**, Type 4 laying condition.

3) **Bedding and Haunching SDR 35 PVC and C900 PVC Gravity Pipe**: PVC pipe to have Type 5 laying condition (**Standard Detail 511.02**) with the remainder of bedding shall be brought to the top of pipe. The minimum bedding depth shall be 3 to 4 inches under the pipe with an additional 1-inch depth of cushioning material added for each additional 2 feet of depth in excess of 12 feet up to a maximum of 12 inches of cushioning material. See also **Standard Detail 731.01**.

4) **Minimum Bedding Allowed for DIP and C900 PVC Force Mains**: Bedding for DIP force mains shall be Type 1 Laying Condition with excavation of trench bottom for bells as shown on **Standard Detail 511.02**. Bedding for C900 PVC force mains shall be Type 5 laying Condition as shown on **Standard Detail 511.02**.

5) **Minimum Bedding Allowed for PVC Services**: Bedding for PVC services shall be Type 5 laying Condition as shown on **Standard Detail 511.02** except the total trench width may be no less than 24 inches.

6) **Unsuitable Subgrade**: When unsuitable subgrade is encountered, foundation and bedding stone shall be placed as shown on **Standard Detail C01.02**.

7) **Manholes**: Manholes are to be placed on a minimum of 12 inches of #57 stone. See **Standard Details 732.02, 732.03, 732.04, 732.05,** and **732.06**.

2.2.6 SOLID CONCRETE BRICK (for modifications to manholes)

Solid concrete brick, standard and jumbo, shall conform to the requirements of ASTM C90, *Standard Specification for Loadbearing Concrete Masonry Units* for Type II and ASTM C139, *Standard Specification for Concrete Masonry Units for Construction of Catch Basins and Manholes*, nominal dimensions 4" x 4" x 8". Brick is to be substantially free from chips and cracks.

2.2.7 CONCRETE

Concrete class (NCDOT) correlation to design compressive strength at 28 days ('C):

Class	28-day Compressive Strength (f'c)
AA	4500 psi
A	3000 psi
B	2500 psi

Ready mixed concrete shall comply with ASTM C94, *Standard Specification for Ready-Mixed Concrete.* All exposed concrete shall be air entrained. Concrete strength shall be as specified on the Standard Details and drawings. Unless otherwise specified, all concrete shall be minimum class A.

2.2.8 MORTAR FOR CONCRETE BLOCK & CLAY BRICK

Mortar shall be type M, ASTM C270, *Standard Specification for Mortar for Unit Masonry* and ASTM C144, *Standard Specification for Aggregate for Masonry Mortar.* Mortar shall be prepared from cement in perfect condition and shall be prepared in boxes for that purpose. No mortar that has stood beyond forty-five minutes shall be used. In the absence of premixed mortars meeting the preceding ASTM standards, proportion by volume for the different types of application shall be as follows:

Brick masonry = 1 part cement to 2 parts sand

Pointing = 1 part cement to 1 part sand

2.2.9 IRON CASTINGS: MANHOLE FRAMES AND COVERS

A. **General**: Standard manhole frames and covers shall be manufactured from Class 35B gray iron, meeting the requirements of ASTM A48, *Standard Specification for Gray Iron Castings,* as noted in section 3.1 of AASHTO M306 *Standard Specification for Drainage, Sewer, Utility, and Related Castings*. Standard manhole frames and covers shall be built to the dimensions and configurations

shown on **Standard Detail C06.01.** The minimum inside diameter of the opening shall be 21 13/16 inches. Manholes castings are to be uncoated. The bearing surface of the frames and covers shall be machined and the cover shall seat firmly into the frame without rocking. Covers are to be with the words "Sanitary Sewer." See **Standard Details C06.01** and **735.01**.

Watertight Frames and Covers: Watertight bolt-down frames and covers shall have 4 stainless steel bolts at 90 degrees. Frame is to have four 1-inch diameter holes in flange at 90 degrees. Bolt down frames and covers are to be utilized whenever a manhole top is set lower than 2-foot above the 100-year base flood elevation. Minimum inside diameter of the opening shall be 20 ½ inches. See **Standard Detail 735.01**.

Weights shall not vary more than 5% +/- of the weight shown on **Standard Detail C06.01** and **735.01**.

B. **Bolting Down Watertight Frames to Manhole**: For units not cast into the manhole top, frame shall otherwise be drilled and bolted into cone sections with a minimum of 4 bolts. Bolts shall be stainless steel expansion bolts by manufacturers such as Hilti, Rawl or Liebig. This requirement shall apply for watertight frames and covers only. See **Standard Detail 732.04**.

C. **Cast Iron Riser Rings** (for non-watertight applications): Manhole riser rings shall be manufactured from Class 35B gray iron, meeting the requirements of ASTM A48, *Standard Specification for Gray Iron Castings,* as noted in section 3.1 of AASHTO M306. Manhole riser rings shall be uncoated and provided in 1-inch, 1 ½-inch and 2-inch heights. Placement of rings in combination is not acceptable. A ring must bed/nest in the original frame and not in another ring. See **Standard Detail C06.04**.

D. See Pre-Approved Product List for acceptable casting manufacturers and models.

2.2.10 IRON CASTINGS: SEWER CLEANOUT BOX

General: Sewer cleanout frames and covers shall be manufactured from Class 30 gray iron, meeting the requirements of ASTM A48, *Standard Specification for Gray Iron Castings*. Standard sewer cleanout frame and covers shall be built to the dimensions and configurations shown on **Standard Detail 733.01**. The lid is to read "sewer".

See Pre-Approved Product List for acceptable sewer cleanout boxes manufacturers.

2.2.11 MANHOLE (PRECAST) EXTERIOR JOINT SEALANT

Mating precast concrete castings shall be sealed with an external sealing system (external joint wrap/water vapor retarder) as shown on **Standard Detail 732.11**. The seal shall be a continuous seamless bands made of high quality material meeting ASTM E1745, *Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs*, Type III with a minimum thickness of 60 mils. Exterior joint sealing system shall also meet ASTM C877, *Standard Specification for External Sealing Bands for Concrete Pipe, Manholes, and Precast Box Sections*. Each unit shall have a 2-inch wide mastic

strip on the top and bottom of the band. The mastic shall be non-hardening butyl rubber sealant.

See Pre-Approved Product List for acceptable manufacturers of manhole exterior joint sealant systems.

2.2.12 MANHOLE FLEXIBLE INTERIOR COATING SEALANT (FLEX-SEAL)

Internal sealant system shall prevent leakage of water into the manhole though the frame joint area and the area above the manhole cone including all extensions to the chimney area. The seal shall remain flexible allowing for repeated vertical or horizontal movements of the frame due to frost lift, ground movement, or the thermal movement of pavement. The product shall have a minimum elongation of 800% and a Durometer hardness of 75. The manhole sealant shall conform the physical requirements of ASTM D412 *Standard Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers-Tension* with a minimum of 170 mils thickness for durability and resistance elongation and tearing. The lining product shall have an aromatic urethane primer resin on the complete surface. Sealant shall equal or exceed "Flex-Seal" as manufactured by Sealing Systems, Inc., Loretto, MN. See **Standard Detail 732.11**.

See Pre-Approved Product List for acceptable manufacturers of manhole interior coating sealants.

2.2.13 PORTLAND CEMENT

Type I, CSA normal, ASTM C150 *Standard Specification for Portland Cement.*

2.2.14 PRECAST REINFORCED CONCRETE STRUCTURES

A. Manholes of precast reinforced concrete shall be designed and manufactured in accordance with ASTM C478, *Standard Specification for Precast Reinforced Concrete Manhole Sections*, or latest revision. Manhole diameters shall be 4-ft. minimum. The wall shall be a minimum of 5 inches thick and have a 6-inch minimum base. Rubber boot and stainless steel clamps, meeting the requirements of ASTM C923, *Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals*, shall be supplied with the manhole bases to tie the pipe to the base section of the manhole. Concrete used in the construction of the manholes shall have a minimum 28-day strength of 4000-psi air entrained (with 4 to 6 percent air) conforming to ASTM C33, *Standard Specification for Concrete Aggregates* and ASTM C94 *Standard Specification for Ready-Mixed Concrete*. Manhole units shall consist of standard modular precast riser sections, modular riser sections, and a monolithic base (except doghouse bases are to be used when placing manholes over existing mains). Where conditions do not favorably accommodate the use of an eccentric cone, eccentric precast reinforced concrete flat tops are to be used. In areas of high H_2S concentration, provide protection of manhole by providing linings or coatings on the interior of the manhole such as Polyethylene, PVC, Reinforced Thermosetting Resin (RTR), or "Strong-Seal".

Unless otherwise permitted by the City, manholes will be precast reinforced concrete. Brick or block manholes are not permitted.

Refer to the **Standard Detail 732.01** for boot to pipe connection detail.

Extended Bases: Manholes over 12 feet in depth, as measured from top of casting to effluent invert, shall have extended bases with appropriate reinforcing.

Manhole Diameter based on pipe size:

Line Size	Minimum Diameter
8 inches	4-foot in diameter[b]
12 through 18 inches	5-foot in diameter
24 inches through 36 inches	6-foot in diameter
42 inches	7-foot in diameter
48 inches	8-foot in diameter
54 inches	9-foot in diameter
Exceptions will be made when there is a conflict with existing utilities. In such cases, the manhole diameter must be approved by the City Engineer.	

[a]NOTE: The number of connections or angle of connections may require a larger diameter manhole.
[b]Manholes over 12 feet in depth shall also be a minimum of 5-foot diameter.

See **Standard Details 732.03, 732.04, 732.05,** and **732.06**.

Joint Seal: All buried joints shall also have an external joint sealing system placed around the exterior perimeter of the manhole joint. See paragraph 2.2.11 of this specification. See also **Standard Details 732.03, 732.04, 732.05,** and **732.11**.

See Pre-Approved Product List for acceptable precast concrete structure/manhole manufacturers.

B. **Joint Sealant**: Either an "O" ring or "mastic" joint seal shall be used.

The "O" ring joint shall conform to the requirements of ASTM C443, *Standard Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets,* latest revision.

Preformed plastic gaskets shall meet Federal Specification SS-S-00210 (210-A) *Sealing Compound, Preformed Plastic, for Expansion Joints and Pipe Joints*, Type 1, Rope Form or Type 2, Flat Type. Sag or flow resistance and chemical resistance shall meet ASTM C990 *Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants*, latest revision. Preformed butyl gaskets shall be used with structures meeting ASTM C478 and ASTM C990. Minimum rope diameter to be 3/4-inch or as required for the size structure.

See Pre-Approved Product List for acceptable joint sealer manufacturers.

C. **Manhole Steps**

Manhole steps shall be steel reinforced polypropylene. Steps shall have a footing surface at least 10 inches wide and shall protrude at least 5 inches away from the manhole wall. The step surface shall have a tread plate or other safety surface.

Steps shall be provided on 16-inch centers and be located directly below the manhole cover on the eccentric cone section. Steps shall be located directly over the outlet pipe on the base. See **Standard Detail C06.06**.

D. **Flexible Pipe-to-Manhole Connector**: A flexible Pipe-to-Manhole connector shall be employed in the connection of the sanitary sewer to precast manholes.

The connector shall be the sole element relied on to assure a flexible watertight seal of the pipe to the manhole. No adhesives or lubricants shall be employed in the installation of the connector into the manhole. The rubber for the connector shall comply with ASTM C923 *Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals*, and consist of EPDM and elastomers designed to be resistant to ozone, weather elements, chemicals, including acids, alkalis, animal and vegetable fats, oils and petroleum products from spills.

All stainless steel elements of the connector shall be totally non-magnetic Series 304 Stainless, excluding the worm screw for tightening the steel band around the pipe, which shall be Series 305 Stainless. The worm screw for tightening the steel band shall be torqued by a breakaway torque wrench available from the precast manhole supplier, and set for 60-70 inch/lbs.

The connector shall be of a size specifically designed for the pipe material and size being utilized on the project.

See **Standard Detail 732.01**.

See Pre-Approved Product List for acceptable manufacturers and models of flexible pipe-to-manhole connectors.

E. **Joints at Existing Manholes (Clay Brick and Concrete Brick)**

For 12 inch and smaller pipe, a virgin PVC waterstop concrete manhole adapter (Fernco Joint Sealer Company - CMA series or equal), sized for the respective pipe, shall be placed over the pipe, centered horizontally within the manhole wall and the space between the pipe and manhole completely filled with non-shrink grout (water plug or approved equal).

For 15-inch and larger sewers, the annular space shall be complete filled with nonshrink grout. Standard brick and mortar shall then be place completely around the pipe outside the manhole, supported on the extended base and entirely coated with at least 3/4 inch of mortar. Particular care shall be exercised in placing the bedding in order to achieve adequate and uniform support of the manhole and the pipe through the first joint outside the manhole.

2.2.15 TRANSITION COUPLINGS

A. Where it is necessary to join different types of pipe (e.g. DIP to SDR 35 PVC, and only when approved by the City Engineer or Water Resources, rigid couplings encased in stone shall be used. Couplings shall conform to the applicable proportions of ASTM A746, Standard Specification for Ductile Iron Gravity Sewer Pipe, and ASTM D3034, *Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings, and* AWWA C900, *Polyvinyl Chloride (PVC) Pressure Pipe.* See **Standard Detail 733.03**.

B. See Pre-Approved Product List for acceptable coupling manufacturers and models.

C. Poured concrete collars are not permitted.

D. Fernco couplings are not permitted.

2.2.16 WARNING TAPE, LOCATOR WIRE

A. **Locator Wire**: Size 12 gauge insulated single-strand solid or multi-strand copper wire shall be installed above all non-ferrous force mains; attached every 5 feet to the main with zip ties. Electrical conductivity along the pipe shall be continuous and uninterrupted between valve boxes. A sufficient excess length of wire shall be left in each valve box to provide at least a 6 to 12 inches length of wire above finished grade. See **Standard Detail 511.01**.

B. **Metallic underground warning tape**: Metallic detectable underground warning tape shall consist of a solid aluminum foil core, 35 gauge minimum, encased on each side with plastic (minimum overall thickness 5 mils) and be 3 inches wide with black lettering imprinted on a color coded background that conforms to APWA uniform color code specification (ANSI Z535.1 Safety Colors) GREEN and silver with black ink letters. Minimum tensile strength shall be 22 lbs/inch. Soil tolerance range to be pH 2.5 to pH 11.0. On one side of the tape, the text shall include the wording "SEWER LINE BELOW" repeated along the length of the tape. A detectable warning tape shall be used with all water mains. Underground warning tape is to be placed directly over the pipe 12 to 18 inches above the pipe. See **Standard Detail 511.01**.

Standard color code for tape and wire:

Green: Sewer Systems

See Pre-Approved Product List for acceptable underground warning tape manufacturers.

2.2.17 YARD FLUSHING HYDRANTS – NON-FREEZE

Yard hydrants are to be comprised of a galvanized steel riser with heavy cast iron head assembly with a removable ¾-inch brass male discharge hose fitting. Head to be equipped with an adjustable link, rod guide, long life graphite packing, and a one-piece variable flow plunger with automatic drain feature to prevent freezing. Valve body to have a Buna-N plunger with a solid brass core, integral valve seat cast into a bronze valve body and a 1/8-inch drain hole on the valve body. Valve body to have female iron pipe thread. Rated maximum working pressure to be 125-psi. See **Standard Detail 739.01**.

See Pre-Approved Product List for acceptable freezeless yard flushing hydrant manufacturers.

PART 3 – EXECUTION

INSTALLATION – PIPE AND FITTINGS

3.1 PIPE AND FITTINGS

3.1.1 CONSTRUCTION – ALL PIPE

A. **Trench width shall be per Standard Detail 731.01**.

B. **Bedding Pipe**: Bedding for gravity pipe to be in accordance with the approved plans but no less than the minimum bedding and bedding type stated in paragraph 2.2.5 Bedding.

C. Unless otherwise shown on the approved plans, and approved by the City Engineer or Water Resources, the minimum cover shall not be less than 3 feet. See also Table 2275.1 of Specification *Section 02275 Trenching, Backfilling and Compaction of Utilities*.

D. **Protection of Existing Sewers**: Sewer lines under construction shall be plugged with a mechanical plug at the first manhole upstream from the point of connection. Plug shall be placed in the outlet connection and secured with a steel cable. Plug shall remain in place until acceptance of lines by the City's authorized representative. Water, stone, dirt, or any other debris shall not be allowed to enter the City's sanitary sewer system during flushing operations or at any other time. Construction taking place in the vicinity of any existing City sewer lines or manholes shall not cause any inflow of surface water or debris to enter the City's sanitary sewer system. Existing City manholes located in construction sites are to remain accessible at all times. The Owner and/or Contractor shall be responsible for any damages incurred to the City's sanitary sewer system and any fines imposed by NCDEQ, Division of Water Quality due to sewer spills or overflows.

E. **Pipe Laying Direction**: Place piping beginning at low point and progress uphill. Place on grade, with unbroken continuity in invert, horizontally and vertically, and on alignment as indicated on plans. Place bell ends of piping facing upstream. Install gaskets, seals, sleeve, and couplings according to manufacturer's written instructions for using lubricants, cements, and other installation requirements.

F. **Directional changes in gravity lines**: Use manholes for changes in direction of gravity lines.

G. **Handling New Pipe**: Lined pipe and fittings must be handled only from the outside of the pipe and fittings. No forks, chains, straps, hooks, etc. shall be placed inside the pipe and fittings for lifting, positioning, or laying. The pipe shall not be dropped or unloaded by rolling. Care should be taken not to let the pipe strike sharp objects while swinging or being off loaded. Ductile iron pipe should never be placed on grade by use of hydraulic pressure from an excavator bucket or by banging with heavy hammers.

H. **Stringing out Pipe**: Only the amount of pipe that will be used in one day may be strung out. When pipe is strung out, it shall be set on high ground and in a position to prevent silt deposits, storm water, or other matter from entering the pipe prior to its placement in the trench.

I. **Pipe Laying**: The foundation for sewer pipe shall be a firm flat bottom trench with a minimum of 4-inches of compacted stone for gravity sewer mains. The pipe and fittings shall be laid in the trench so that its interior surface shall conform to the grade and alignment as shown on the plans. Pipe laying shall be done in such a way as to disturb as little as possible the pipe that has already been laid. The alignment and grade of the sewer main may be field adjusted whenever, in the opinion of the City, it is necessary, so long as the adjustments are within that allowed by NCDEQ based on regulations in affect at the time of the change and so long as the changes are consistent with City's policy in affect at the time of the change.

Before laying, the bell and spigot is to be wiped free from any dirt or other foreign matter. All surfaces of the portion of the pipe to be joined, and the factory-made jointing material, shall be clean and dry. Lubricants, primer, adhesives, etc., shall be used as recommended by the pipe or joint manufacturer's specifications. The jointing material or factory-fabricated joints shall then be placed, fitted, and adjusted in such workmanlike manner as to obtain the degrees of water tightness required.

Trenches shall be kept as dry as possible during bedding, laying and jointing and for as long a period as required until the trench is backfilled. As soon as possible after the joint is made, sufficient bedding material shall be placed along each side of the pipe to offset conditions that might tend to move the pipe off line or grade. The greatest care shall be used to secure water tightness and to prevent damage to or disturbing of the joints during the backfilling process, or at any other time.

All special fittings, such as wyes and other connections, shall be installed at the points indicated on the plans, in accordance with the Standard Detail drawings. Use appropriate adaptors to tie connection pipe to wyes or saddles. Plug end of connection with appropriate plug.

After the trench foundation has been properly graded to receive the pipe, the pipe shall be carefully lowered into the trench with approved methods. Under no circumstances shall the pipe or accessories be dropped or dumped into the trench. All damaged pipe shall be replaced.

Any defects due to settlement shall be corrected by the Contractor.

J. **Temporary Suspension of Work**: When the trench is left for the night or if pipe laying is suspended, the upper end of the pipe shall be plugged to keep out dirt, water, animals and other foreign matter or substances. This plug shall be kept in the end of the pipe line at all times when laying is not in actual progress.

K. **Cutting or Fitting Pipe**: Whenever a pipe requires cutting, to fit in the line or to bring it to the required location, the work shall be done in a satisfactory manner with an approved cutting tool or tools which will leave a smooth end at right angles to the axis of the pipe and not otherwise damage the pipe or liner. When the cut end is to be assembled in a *Fastite* bell, an adequately smooth (without sharp edges) 15º bevel should be ground or filed on the cut edge to prevent damage to or dislodgement of the gasket during assembly. The method of cutting pipe shall be in accordance with manufacturer's recommendations. No welding, flame cutting or flame tapping will be allowed. Such cuts shall be made by the Contractor.

L. **Surface Water Crossings**: Surface water crossings (wet lands, floodplains, etc.) with pipe underground shall be ductile iron pipe with a steel encasement. Pipe material shall remain constant between manholes. No transition of pipe material between manholes is permitted. See **Standard Details C07.04** and **C07.05**.

M. **Ravine/Channel Crossings**: Ravine and channel crossings are typically to be made perpendicular to the ravine or channel crossed. However, construction shall conform to the approved plans and permits; a copy of the latter the contractor shall have in his/her possession prior to beginning construction. Pipe support piers, as shown on **Standard Detail 736.01**, or steel girders, as applicable, shall adequately support surface water crossings with pipe above the water. Crossings shall be in a steel encasement pipe. Kraft paper shall be placed between pipe and all points of contact with concrete and stainless steel straps. Disturbed banks are to be stabilized with rip rap placed over a non-woven fabric or as shown on the approved plans and permit.

N. **Crossing Conflicts**: All drains, gutters, culverts, and sewers for surface drainage are to be kept open or if unavoidably closed, other provisions are to be made for this drainage.

3.1.2 DUCTILE IRON PIPE

A. **CONSTRUCTION:**

Gravity DIP shall conform to the same foundation and backfill requirements as those prescribed for water mains. Minimum laying length shall be 18 feet except for tie-in at a structure. However, bury limitations shall govern as follows. Refer to paragraph 2.2.5 Bedding for minimum bedding and bedding type for DIP.

Table 02530.1
Bury Limitations on DIP

Pipe	Maximum Bury to Invert of Pipe[a]	
	Type 4 Laying Condition[b]	Type 5 Laying Condition[c]
8-inch DIP, Class 50	34 feet	50 feet
10-inch DIP, Class 50	28 feet	45 feet
12-inch DIP, Class 50	28 feet	44 feet
14-inch DIP, Class 50	28 feet	44 feet
16-inch DIP, Class 50	28 feet	44 feet

[a]See **Standard Detail 511.02** for a description of Types 4 and 5 Laying Condition.
[b]Type 4 laying condition is equivalent to a class C bedding.
[c]Type 5 laying condition is equivalent to a Class B Bedding (stone backfilled to top of pipe).

Maximum bury for pipe diameters 18 inches and larger to be per approved plans for the depth of bury and pipe class shown on the drawings.

See **Standard Detail 731.01** for typical DIP gravity sewer laying conditions (type 4 laying condition minimum per **Standard Detail 511.02**).

B. **MECHANICAL JOINT BOLT TORQUE:**

Where mechanical joint fittings are required, unless otherwise advised by the manufacturer, the minimum bolt torque shall comply with Table 2 of AWWA C600 for mechanical joints, as follows:

Bolt Size (Inches)	Torque (Ft-Lbs)
5/8	45-60
3/4	75-90
1	100-120
1 1/4	120-150

C. See also Section 02275 – Trenching, Backfilling, and Compaction of Utilities.

3.1.3 PVC PIPE

A. Installation shall comply with *Underground Installation of Flexible Thermoplastic Sewer Pipe*, ASTM D2321, *Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications*. .

B. **Bury Limitations**:

Table 02530.2 Bury Limitations on all PVC		
Pipe	**Bedding**	**Maximum Bury to top of pipe**
PVC SDR 35	Class B-1[a] w/ DOT # 57 or #67 stone (Type 5[b] Laying Condition)	12 feet
PVC C900	Class B-1[a] w/ DOT #57 or #67 stone (Type 5[b] Laying Condition)	12 feet

[a]See paragraph 2.1.2 for Pipe Bedding Definitions in Specification Section 02275.
[b]See **Standard Detail 511.02** for description of Type Laying Condition.

Minimum cover shall not be less than 3 feet.

3.1.4 HORIZONTAL DIRECTIONAL DRILLING (HDD) OF HDPE PIPE FORCE MAINS

A. HDPE pipe shall be installed by Horizontal Directional Drilling (HDD) using a surface mounted rig, first to drill a guided hole along a bore path consisting of a shallow arc and then to pull a string of pipe into the hole. Pull back is facilitated by a back-reamer, which enlarges the hole to approximately one and a half times the pipe diameter. Drilling fluids are injected into the bore hole to stabilize the hole and lubricate the pipe and drill-string. Tracking equipment is used to guide and direct the drilling.

1) Mechanical Restraint

When Polyethylene pipe is pressurized, it expands slightly and shortens slightly. Shortening may be enough to disjoin unrestrained mechanical joints that are in line with PE pipe. Disjoining can be prevented by installing external joint restraints at mechanical connections, by installing line anchors, or by a

combination of both. Contractor shall install mechanical connections with joint restraint at each connection to mechanical joint pipe.

Note: Poisson Effect pipe shortening must be taken into account whenever the pipe is pressurized, both during the pressure testing, and when it is placed in service. Because pressures are usually higher during pressure testing (up to 150% of the system pressure rating), pipe expansion and Poisson Effect pipe shortening may be slightly greater during pressure testing. Before pressure testing, all mechanical joint restraints must be completely installed and secured per manufacturer's instructions. Concrete in-line anchors and thrust blocking (if used) must be fully cured (minimum of 21 days for 3,000 psi or 7 days for 4,500 psi concrete) and properly backfilled before testing. Restraint is not required at PE to PE butt fusion joints. Restraint is not required at bolted flanged joints.

Mechanical coupling: Stainless steel internal stiffeners shall be used on all couplings to increase the seal. All couplings shall have restraint devices per the manufacturer's recommendation and installed per the Manufacturer's direction.

B. **Installation and Testing**

The Manufacturer shall supply an Installation Manual to City Engineer, which outlines guidelines for handling, joining, installing, embedding, and testing of the Polyethylene Pipeline. These guidelines shall be used as reference material by the City Engineer or Water Resources in their determination of the required procedures.

Joints between plain ends of Polyethylene pipe shall be made by butt fusion when possible. The pipe manufacturer's fusion procedures shall be followed at all times as well as the recommendations of the fusion machine manufacturer. The wall thicknesses of the adjoining pipes and fittings shall have the same DR at the point of fusion.

When saddle connections are fusion welded, the Manufacturer's recommended saddle fusion procedures shall be used.

If mechanical fittings (which are designed for, or tested and found acceptable for use with Polyethylene pipe) are utilized for transitions between pipe materials, repairs, joining pipe sections, saddle connections, or at other locations; the recommendation of the Mechanical Fitting manufacturer must be followed. These procedures may differ from other pipe materials.

On each day butt fusions are to be made, the first fusion of the day shall be a trial fusion. The trial fusion shall be allowed to cool completely, and then fusion test straps shall be cut out. The test strap shall be 12 inches long or 30 times the wall thickness in length (minimum) and 1 inch or 1.5 times the wall thickness in width (minimum). Bend the test strap until the ends of the strap touch. If the fusion fails at the joint, a new trail fusion shall be made, cooled completely, and tested. Butt fusion of pipe to be installed shall not commence until a trail fusion has passed the bent strap test.

Socket and Straddle fusions shall be tested by a bent strap test as described by the Pipe manufacturer. The pipe manufacturer shall provide visual guidelines for inspecting the butt, saddle, and socket fusion joints.

Pressure testing shall be conducted in accordance with manufacturer's recommended procedure. Pressure testing shall use water as the test media. Pneumatic testing is prohibited.

C. **Shop Drawings**

Contractor shall submit shop drawings and details on the proposed HDPE pipe, fittings, bore methods, etc., for review and approval of City Engineer or Water Resources before ordering material or beginning installation of the HDPE. Contractor shall also submit to City Engineer or Water Resources proposed subcontractor's name as well as references on who he/she plans to use on this project. All subcontractors/installers must be approved by City Engineer or Water Resources.

3.1.5 HIGH DENSITY POLYETHYLENE (HDPE) GRAVITY SEWER PIPE

1) Laying: Refer to paragraph 3.1.1 Construction – All Pipe.

2) Joining:

a. Joints between plain end pipes shall be made by butt fusion techniques in accordance with ASTM D2657 Standard Practice for Heat Fusion Joining of Polyolefin Pipe and Fittings. However, the recommendations of the pipe manufacturer shall govern the fusion process, including the specification for the ideal temperature for fusion.

b. Butt fusion shall be performed between pipe ends that have the same outside diameter and are not different in wall thickness.

c. Saddles: Joints between the main and saddle branch fittings shall be made either using saddle fusion technique or tapping saddles. The butt fusion and saddle fusion procedures used shall be procedures that are recommended by the pipe and fitting Manufacturer.

d. The contractor shall ensure that persons making heat fusion joints have received training in the Manufacturer's recommended procedure.

e. Fittings shall not be joined to mainline piping using heat fusion joining techniques.

f. Polyethylene pipe may be joined to other materials by means of mechanical couplings or mechanical joint adapters.

g. External and internal beads shall not be removed unless otherwise directed by the City Engineer or Water Resources.

3.1.6 FUSIBLE C900 PVC PIPE (FOR FORCE MAINS):

A. General:

1) Fusible C900 PVC pipe shall be handled in a safe and non-destructive manner before, during, and after the fusion process and in accordance with this specification and pipe supplier's guidelines.

2) Fusible PVC pipe will be fused by qualified fusion technicians, as documented by the pipe supplier.

3) Each fusion joint shall be recorded and logged by an electronic monitoring device (data logger) connected to the fusion machine.

4) Only appropriately sized and outfitted fusion machines that have been approved by the pipe supplier shall be used for the fusion process. Fusion machines must incorporate the following elements:

   a. Heat Plate: Heat plates shall be in good condition with no deep gouges or scratches. Plates shall be clean and free of any debris or contamination. Heater controls shall function properly; cord and plug shall be in good condition. The appropriately sized heat plate shall be capable of maintaining a uniform and consistent heat profile and temperature for the size of pipe being fused, per the pipe supplier's guidelines.

   b. Carriage: Carriage shall travel smoothly with no binding at less than 50 psi. Jaws shall be in good condition with proper inserts for the pipe size being fused. Insert pins shall be installed with no interference to carriage travel.

   c. General Machine: Overview of machine body shall yield no obvious defects, missing parts, or potential safety issues during fusion.

   d. Data Logging Device: An approved data logging device with the current version of the pipe supplier's recommended and compatible software shall be used. Datalogging device operations and maintenance manual shall be with the unit at all times. If fusing for extended periods of time, an independent 110V power source shall be available to extend battery life.

5) Other equipment specifically required for the fusion process shall include the following:

   a. Pipe rollers shall be used for support of pipe to either side of the machine.

   b. A weather protection canopy that allows full machine motion of the heat plate, fusion assembly and carriage shall be provided for fusion in inclement weather, extreme temperatures, and /or windy weather, per the pipe supplier's recommendations.

   c. An infrared (IR) pyrometer for checking pipe and heat plate

temperatures.

d. Fusion machine operations and maintenance manual shall be kept with the fusion machine at all times.

e. Only facing blades specifically designed for cutting fusible PVC pipe shall be used.

B. Joint Recording:

Each fusion joint shall be recorded and logged by an electronic monitoring device (data logger) connected to the fusion machine. The fusion data logging and joint report shall be generated by software developed specifically for the butt-fusion of fusible polyvinyl chloride pipe. The software shall register and/or record the parameters required by the pipe supplier and these specifications. Data not logged by the data logger shall be logged manually and be included in the Fusion Technician's joint report.

C. General Installation:

1) Installation guidelines from the pipe supplier shall be followed for all installations.

2) The fusible PVC pipe will be installed in a manner so as not to exceed the recommended bending radius.

3) Where fusible PVC pipe is installed by pulling in tension, the recommended Safe Pulling Force established by the pipe supplier shall not be exceeded.

D. Preparation Prior to Making Connections into Existing Piping Systems:

1) Approximate locations for existing piping systems are shown in the construction documents. Prior to making connections into existing piping systems, the contractor shall:

a. Field verify location, size, piping material, and piping system of the existing pipe.

b. Obtain all required fittings, which may include saddles, sleeve type couplings, flanges, tees, or others as shown in the construction documents. See also paragraph 2.1.1.B (Ductile Iron Fittings).

c. Have installed all temporary pumps and/or pipes in accordance with established connection plans.

2) Unless otherwise approved, new piping systems shall be completely assembled and successfully tested prior to making connections into existing pipe systems.

E. Pipe Systems Connections:

1) Pipe connections shall be installed per applicable standards and

regulations, as well as per the connection manufacturer's guidelines and as indicated in the construction documents. Pipe connections to structures shall be installed per applicable standards and regulations, as well as per the connection manufacturer's guidelines.

F. Tapping Fusible C900 Pipe:

1) NO taps allowed on Force mains.

G. Testing:

2) Testing shall comply with all applicable statutes, standards, regulations, and laws.

3) Hydrostatic Testing and Leakage Testing for Pressure Piping:

a. Hydrostatic and leakage testing for piping systems that contain mechanical jointing as well as fused PVC jointing shall comply with AWWA C605. See paragraph 3.9.13 *Pressure Tests & Leakage* of this Specification for testing and leakage requirements.

b. If hydrostatic testing and leakage testing are performed at separate times, follow procedures as outlined in AWWA C605.

4) Partial Testing:

a. Segments of the pipe may be tested separately in accordance with standard testing procedure, as approved by the City Engineer or Water Resources.

3.1.7 STEEL PIPE

All operations of the Contractor shall be subordinate to the free and unobstructed use of the right of way of the passage of traffic without delay or danger to life, equipment, or property.

A. **ENCASEMENT PIPE (Stream Crossings and Aerial):**

General: Where required, steel encasement pipe shall meet the length as shown on the plans and the thickness and diameter as shown on **Standard Detail C07.03**. Boring across roads and railways shall be performed by dry boring and jacking a steel encasement pipe under the pavement or rail. The encasement shall be located in an area that is relatively free from material such as rock and stone that may hamper the boring operation. If requested by the City Engineer or Water Resources, the Contractor shall submit a complete plan and schedule for pipe installation prior to the commencement of such work. The submission shall include complete details of the sheeting, shoring and bracing for the protection of the roadbed and the materials and equipment pertinent to the boring operation. The Contractor shall not proceed with the pipe installation until he/she has received approval of the plan and schedule from the City Engineer or Water Resources.

Construction shall be executed in such a manner as to prevent settlement of the ground surface above the pipeline. The installation of the pipeline shall follow the heading or tunneling excavation as closely as possible.

All operations of the Contractor shall be subordinate to the free and unobstructed use of the right of way of the passage of traffic without delay or danger to life, equipment, or property. Installation shall be in accordance with the *NCDOT Standard Specifications for Roads and Bridges*, latest revision or AREA, as applicable.

The pipe shall be beveled and prepared for field welding at the circumferential joints. Joining of steel casing pipe shall meet the requirements of AWWA C206, AWWA *Standard for Field Welding of Steel Water Pipe*. Field welded joints shall be performed by ANSI/AWS D1.1 certified welders and shall be full penetration single vee groove, butt type welds around the entire circumference of the pipe. The pipe shall be in at least 18-foot lengths. Casing shall be installed by either dry boring and jacking or open cut, as indicated on the drawings.

Encasement ends shall be enclosed using enclosed using brick and mortar as shown on **Standard Detail C07.03**. The steel encasement pipe shall be of leak proof construction. All exposed metal is to be coated with epoxy or asphaltic material.

All carrier piping shall be mechanical joint ductile iron pipe with restrained joints supported by spiders.

Aerial Crossings: Kraft paper shall be placed between pipe and all points of contact with concrete and stainless steel straps. Upon completion of intallation, paint the exteior of the pipe with coal tar enamel.

Creek Crossings: Sewers crossing creeks shall be encased in a steel casing with concrete anchors placed at each end of steel casing. Depending on clearance from stream bed, City Engineer or Water Resources may require full concrete encasement of steel casing on sewer lines. Concrete anchors shall be set to provide a minimum of 12 inches of projection beyond the anchor for attachement of end seals. Creek crossings chall conform to **Standard Details C07.04** and **C07.05**, as applicable.

B. **Manufactured Spiders/Skids**: The spiders necessary to support the carrier pipe inside of the steel encasement pipe shall be in accordance with paragraph *2.1.4A 2a, Spiders/Skids for Encasement Pipes*. Unless otherwise shown on the drawings, one spider shall be placed at each bell end, one at each spigot end, and one centered between the two pipe ends (3 spiders per joint) of the carrier pipe. A spider is also required at each end of the encasement pipe (see **Standard Detail C07.03** for location of spiders). Spiders are to be bolted together using stainless steel.

See Pre-Approved Product List for acceptable spider/skid manufacturers and models.

3.2 TUNNELING METHOD

A. **GENERAL**:

1) The contractor shall submit shop drawings to City Engineer for approval prior to construction. All liner plates and ribs used in the tunnel shall be of one type. All material removed shall be disposed of off the site, at an approved locations, by the Contractor.

2) All operations of the Contractor shall be subordinate to the free and unobstructed use of the rights of way for passage of traffic without delay or danger to life, equipment, or property. The Contractor shall provide all necessary bracing, bulkheads, and shields to ensure complete safety to all traffic at all times. The Contractor shall provide all traffic control devices as necessary and as shown on the approved traffic control plan at no additional cost.

B. **TUNNELING (BORING METHOD):**

1) Commence boring operation from a pit, with the bottom excavated to grade, and sheeted or shored if necessary. A steel pipe shall be jacked in place as a casing pipe. Boring through rock shall be oversized to allow installation of carrier pipe but no casing pipe shall be required unless liner plate is necessary for safety reasons.

2) Smoothly pave the bottom of the tunnel with concrete. Pull the carrier pipe in place a joint at a time. Securely block each section in place.

C. **TUNNELING (HAND MINING):**

1) Commence tunneling operation from a pit, with the bottom excavated to grade, and sheeted or shored if necessary.

2) Trim the periphery of the tunnel smoothly to fit the outside of the steel liner plate as nearly as practical. All blasting shall conform to requirements for blasting in *Section 02275 – Trenching, Backfilling and Compaction of Utilities.*

3) Install the steel liner plates immediately after the excavated material has been removed, and remove the material not more than 24 inches ahead of the installed liner plates.

4) Grout all voids between the soil and tunnel liner plates. Start grouting at the bottom of the tunnel liner plates and proceed upward progressively and simultaneously on both sides of the tunnel. Install liner plates no more than 6 feet ahead of grout section. Prohibit traffic over ungrouted sections of tunnel unless this section is in solid rock. Thoroughly dry-mix grout ingredients before adding water. After adding water, mix the batch for 3 minutes. Batches shall be of size to allow continuous placement of freshly mixed grout. Grout not used within 30 minutes after mixing shall be discarded. Placing shall be quick and continuous. Placement shall be under pressure with a grout pump. The period between installation of the tunnel liner plate and the placing of grout shall not exceed 7 hours, without the approval of the City. Upon completion of grouting, fill grout plugs with provided grout hole plugs.

A pump shall be provided for placing the grout which shall be capable of exerting sufficient pressure to assure the filling of all voids between the liner

plate and the undisturbed ground. Minimum acceptable pressure to fill voids will be 5 psi. The maximum grouting pressure shall be 30 psi.

Pumping of grout shall be done:

i. At the completion of the installation of approximately each 6' of liner plate,
ii. At more frequent intervals than 6' if conditions indicate the necessity, and
iii. At the end of a work shift or for stopping of work for any reason.

5) Smoothly pave the bottom of the tunnel with concrete. After installation of the tunnel liner plates, the Contractor shall pour concrete pavement on the bottom quadrant (invert) of the tunnel, the surface of the pavement being parallel to the inner plate, with screed rails embedded in it, on line and grade for the installation of pipe in the tunnel.

6) The periphery of the tunnel shall be trimmed smooth to fit the outside of the steel liner plate as nearly as is practical, so that the void outside the plates is a minimum.

7) After installation of the casing pipe or the tunnel liner, pull the carrier pipe in place a joint at a time. Securely block each section in place. Each joint of the carrier pipe shall be supported at three points by steel saddles or by steel spiders, strapped to the carrier pipe with steel straps. The carrier pipe shall be blocked, in place to prevent flotation.

8) Close up tunnel liner ends to protect against entrance or foreign matter. The open ends of the casing pipe or tunnel shall be closed off by an 8-inch grout or masonry block wall prior to backfilling. A steel drain line to a 1 cubic yard French drain or to daylight shall be provided.

9) If installation is under railway tracks, all permits shall be obtained and Railway Company shall be notified prior to such installation. The same shall apply to contacting the applicable Municipality or NCDOT if installation is under a roadway.

3.3 MANHOLE CONSTRUCTION

A. **Standard Manholes:** Manholes shall be constructed in accordance with **Standard Details 732.02, 732.03, 732.04, 732.05, 732.06, 732.10,** and **732.11**. The Contractor shall exercise care in the ordering of manholes so that the use of grade rings for leveling and adjustments can be minimized. Contractor is to seal all riser/riser and riser/cone joints, both on the inside and the outside of the manhole, with hydraulic cement. Flex-seal sealant is to be used on the interior of the cone section at the interior adjustment ring area. **Infi-Shield®** external sealing systems are then to be placed on the exterior joints of manholes. See **Standard Detail 732.11**.

1) **Standard Manholes**: Standard manholes shall be those greater than 5 feet in depth measured from the base of the cover frame to the top of the concrete footing.

2) **Shallow manholes**: Shallow manholes shall be 5 feet or less in depth measured from the base of the cover frame to invert out, shall have an

eccentric cone section, and shall be capable of supporting HS-20 traffic loading. See **Standard Detail 732.05**.

Non-shrink grout shall be placed around pipe where pipe meets precast invert in manhole to provide for a smooth transition for sewage flow.

Manholes shall be installed plumb.

In the case of either integrally cast or expanding sleeve boots, the pipe exterior and boot interior shall be thoroughly lubricated prior to pipe insertion. The exterior of the boot under the bands shall be thoroughly lubricated with pipe soap. Puckering of boots shall not be allowed.

Flexible sleeve boots shall not be used with concrete pipe or on pipe larger than 18 inches in diameter.

When applicable, during installation of manhole, if frame and cover is near or within wheel path in roadway, turn cone to place out of wheel path.

B. **Drop Manholes:**

Exterior drop manholes shall be installed per **Standard Detail 732.06**. Exterior drop connections on new manholes shall consist of Ductile Iron Pipe and joint fittings. Exterior drop connections on existing manholes shall be in accordance with **Standard Detail 732.06**. Interior drops are not permitted on existing manholes unless approved by the City Engineer or Water Resources and then on a case-by-case basis.

Manholes shall conform to PART 2 - PRODUCTS.

C. **Flexible Pipe-to-Manhole Connector**: When it is necessary to field core a manhole and install a flexible pipe-to-manhole connector in precast concrete sanitary sewer manholes, the connector shall be installed per the manufacturer's recommendations. See **Standard Detail 732.01**.

D. **Precast Concrete Doghouse Manholes**: When it is necessary to install a manhole over an existing sewer main, a precast concrete doghouse manhole shall be installed over the main. A 12-inch thick base of #57 stone is to be placed over firm subgrade and shall extend a minimum of 12 inches beyond the exterior wall of the riser. Four 8x8x16 solid concrete blocks are be centered with the riser and the riser set upon the block. A minimum of an 8-inch thick reinforced concrete base shall be poured over the #57 stone base and around the base of doghouse manhole riser that has been set over the existing sewer. The annular space of the precast manhole, around the main, shall be filled with grout and a shelf formed to the springline of the existing main. The crown/top of the main shall be removed once the shelf has been formed and has set sufficiently and all upstream lines tested and approved by the City. See **Standard Detail 732.02**. See paragraph 3.5 Connecting Existing Sewers for modifying existing sewers and controlling existing flow.

E. **Manhole Inverts**:

When a precast invert or Moorbase is not used, inverts shall be formed (with a doghouse only). Manhole inverts may be formed using either brick covered with

grout or formed entirely of grout. Inverts shall be constructed a shown on **Standard Details 732.01, 732.03, 732.04, 732.05,** and **732.06**. The depth of the channel shall be 3/4 of the pipe ID with vertical wall from the springline of the pipe up. The bench shall then be sloped to the manhole walls at ½ inch per foot. The channel shall be "U" shaped (see sheet 3 of **Standard Detail 732.03** for example). Curved channels due to changes in pipe alignment shall be constructed in such a way as to provide gentle curves as shown on **Standard Detail 732.01**.

The internal cavity between the boot and the manhole wall will be completely filled with non-shrink grout and filleted at the manhole wall. The face where the pipe enters or leaves the manhole shall be struck smooth and the channel shall form a smooth flow line from the pipe entry to pipe exit.

F. **Combination Air Valve/Air Release Manholes:** Combination air valve/air release manholes shall be installed per **Standard Detail 734.01**. Manholes shall be minimum 8'-0" inside diameter for cuts of up to 10 feet with 30" minimum clearance provided around valves as shown in the detail. To provide the minimum 30-inch clearance between the top of the air valves and the bottom of the flat top, the force main will have to be lowered accordingly as shown in the "Force Main Profile Example" in the detail to provide a uniform positive or negative grade up to and down from the air valves, respectively. A full joint of ductile iron pipe shall be centered in the manhole. All annular spaces of pipe penetrating the manhole shall be grouted. A maximum of two 6-inch precast concrete risers will be allowed on top of the flat top section. Air testing of the manhole is not required.

G. **Installation of Manhole frames and Covers**: Frames and covers shall be installed to manhole in accordance with **Standard Details C06.03, 732.03, 732.04, 732.05, 732.10** and **732.11**, as applicable. Frame and covers shall be installed to finished elevation. Adjustments shall be made as necessary to achieve finished elevation. On all manholes, an approved butyl rubber (mastic) sealant is to be placed between the iron frame and concrete casting or grade adjustment ring. Frames are to be mortared to the manhole cone as shown on the standard detail applicable to the location/situation. Frames are to be bolted for watertight applications only.

H. **Manhole Steps:** Steps **(Standard Detail C06.06)** are to be located over the outlet pipe. Steps shall be firmly anchored in the riser/cone/base sections by the precast manhole manufacturer. See the applicable standard manhole detail.

I. **Grade Rings/Adjustments**: In street rehabilitation work, the combination of grade rings and/or brick shall not exceed 3 precast rings or a maximum of 12 inches for brick riser rings nor more than 24 inches from the top of the iron casting and the first step inside the cone section before removal of the cone is necessary to effect adjustment. See **Standard Detail C06.03**.

J. **Replacement/Rehabilitation of Existing Manholes:**

Replacement of manholes: The City reserves the right to require replacement of the existing manhole with a new manhole. The City will provide the manhole but the Contractor shall pick up and install it. When a new manhole is necessary, the old manhole must be completely removed and a new precast manhole constructed in its place.

Any tie-in's performed on sanitary sewer manholes must be machine-core drilled with a neoprene flexible boot and adjustable band, except brick manholes. The core shall be the size specified with a smooth finish. If connecting to existing brick manhole, seal penetration and add "Strong-Seal" on perimeter of manhole. Coordinate with the City.

K. **Connection to Existing Manholes**

Connection to existing sewer shall be made at manholes whenever possible. For connection of encased pipe, the casing shall be flush with the outside wall and shall be encased with at least 8 inches of stone on the outside of the manhole. Existing manholes to which connections are made shall be rehabilitated, as directed by the City Engineer or Water Resources, to the degree necessary to correct any apparent signs of infiltration or inflow. See paragraph 3.3 I, *Replacement/Rehabilitation of Existing Manholes* and paragraph 3.5 Connecting to Existing Sewers.

Upon completion of the connection to existing sewers, existing lines no longer needed shall be sealed or plugged and the invert rebuilt to reflect the new flow patterns.

L. **Testing of New Manholes**: Manholes are to be subjected to a vacuum test. Manholes shall be vacuum tested after installation in accordance with the manhole vacuum testing procedures outlined in Section 3.9.1, paragraph F, item 11. Service connections tied into manholes shall be tested in conjunction with the manhole.

3.4 ABANDONING SEWER LINES & MANHOLES

A. **Sewer lines**: When an existing sewer line is designated to be abandoned in place, the low end of the line is to be plugged and lean concrete grout (flowable fill) pumped into the line until it is completely filled.

B. **Manholes**: When an existing manhole, either partially or wholly, is designated to be abandoned and the sewer lines, either entering or exiting the manhole, have been abandoned according to the preceding paragraph, the upper portion of the manhole is to be removed to within 36 inches of the proposed finished grade, or as determined by the City Engineer or Water Resources. Below pavement, backfill with flowable fill concrete. Outside of pavement, backfill with stone screenings, compacted in place.

3.5 CONNECTION TO EXISTING SEWERS

A. Unless otherwise required or shown on the plans, connection to existing sewer mains shall be made at manholes. See paragraph 3.3 J, *Connection to Existing Manholes*.

B. **Setting New Manhole on and Existing Line**

1. Whenever a new line extension requires a new manhole to be set on an existing line, the existing line inside the new manhole shall not be broken out until the new line has been accepted by the City.

2. If the line is accidentally broken during the setting of the new manhole, the new line in the manhole shall be plugged. Contactor shall furnish plugs and the labor required to install the plugs.

3. If plugs are installed and/or water still enters the existing line, the amount of flow shall be estimated and the contractor billed for treatment of the flow.

4. See also paragraph 3.3.D Precast Doghouse Manhole for doghouse manhole construction and **Standard Detail 732.02**.

C. Where required or shown on the plans, connection to existing sewer shall be made in a manner that will maintain existing sewage flow on a continuous basis. The new line shall be plugged in the existing manhole immediately upon finishing the line to the next manhole. The plug is to ensure that no water from any source enters the existing system and has to be treated by the wastewater treatment plant. The plug will be removed only upon acceptance of the new line by the City after a final TV inspection. Any water which accumulates in the pipe shall be pumped out prior to the TV inspection and may not be pumped into any existing sewer line.

D. **Bypass Pumping**: Where existing flow cannot be maintained, interruption of service shall be minimized such that no by-pass of sanitary sewage to any natural waterway or storm drain occurs nor shall such interruption create a public health hazard by sewage back up or overflows. Sewage by-pass pumping shall comply with the requirements of *paragraph 3.6, Bypass Pumping*, below.

3.6 BYPASS PUMPING

A. The bypass system shall be of sufficient capacity to handle peak flow of the pipe. Provide the necessary labor and supervision to set up and operate the pumping and bypassing system. Contractor shall comply with local City sound ordinance. If pumping is required between the hours of 8:00 PM and 6:00 AM, engines shall be equipped as specified in paragraph E, below, in order to keep noise to a minimum. The equipment shall be manned continuously. During bypass pumping operations, the Contractor shall provide the necessary labor to continually monitor the operation and ensure uninterrupted and sufficient pumping at all times.

B. Contractor shall provide all materials and labor as necessary to maintain flows in the existing sewer interceptor and all collector and lateral lines at all times and under all weather conditions. Interruption of flows will not be permitted. Overflows from bypass operations will not be permitted to enter into any streams or bodies of water. **The Contractor will be solely responsible for any legal actions taken by the state regulatory agencies if such overflows occur during construction**.

C. Bypass pumping equipment shall include pumps, conduits, engines, and related equipment necessary to divert the flow or sewage around the section in which work is to be performed. In addition, the Contactor shall maintain at the same location and in operable condition, duplicate equipment to be used in case there is equipment failure. In this event, the Contractor shall promptly repair or replace the failed equipment to the satisfaction of the City Engineer.

D. The new sewer line may be used by the Contractor to carry the sanitary flows after the new pipe has passed inspection and testing. Any "temporary" connections to the new sewer line shall be approved by the City.

E. Engine driven equipment for bypass pumping equipment shall have "critical grade mufflers." If equipment is operated between the hours of 8:00 PM and 6:00 AM, this equipment shall also be provided with sound attenuation enclosure consisting of a three sided enclosure with roof constructed of 2 x 4 frame with ½-inch plywood sheathing and 2-inch Styrofoam panels attached to the inside of the entire enclosure. The enclosure shall be portable in order to allow the enclosure to be moved when bypass pumping equipment is moved. These conditions are subject to any other additional stipulations that may be required by local City sound ordinances.

F. **Plan Requirements**: The plan should include, but is not necessarily limited to, the following details:

1) Staging areas for the pumps.
2) Sewer plug method and type of plugs or gates to be used.
3) Number, size, material, locations, and method of installation of suction piping.
4) Bypass pump sizes, capacity, number of each size to be on site, and power requirements.
5) Calculations of static lift, friction loss, and flow velocity.
6) Stand-by power.
7) Downstream discharge plan.
8) Method of noise control for each pump.
9) Temporary pipe supports and anchoring required.
10) Heavy equipment needed for installation of pumps and piping.
11) Stand-by/back-up pumpset for the bypass application.
12) Detail plan for 24-hour monitoring.
13) Fueling of pumpsets on demand.

G. **Sewer Overflows – Penalties**: The Contractor shall make every effort to avoid causing sewer overflows. All sewer overflows shall result in the following disciplinary actions:

Incident	Penalty
First Violation	$2,000
Second Violation	$5,000
Third Violation	$10,000
Fourth Violation	Termination of Contract

For all sewer overflows, the Contractor shall be responsible, and shall reimburse the City, for any damages, operational costs, fines, or other effects.

1) **Unplanned Service Outages**: The Contractor shall make every effort to avoid causing unplanned service outages. All Contractor caused service outages shall be investigated by the City Engineer or Water Resources. If the investigation determines that the Contractor could have avoided the service outage, then the outage shall result in disciplinary action as shown above.

3.7 SERVICE CONNECTIONS

A. **Service Connections**: Six-inch and larger line service connections shall be made at manholes only using core boring and a rubber boot. 4-inch sewer laterals shall be connected to both new mains and mains under construction that have not been accepted by means of an in-line monolithic wye (see **Standard Details 733.01**). The service shall include the in-line wye, bends, combination wye, and clean-out stack with meter box constructed as shown on **Standard Detail 733.01**. Both the cleanout and the service material shall be capped or plugged to exclude entry of water or earth. See **Standard detail 733.01** for requirements for plugging both the stack and the service line.

B. Location of Service: Unless directed otherwise by the City Engineer, service connections shall extend to a point within the right-of-way or easement. In streets with curb and gutter, the preferred cleanout location is 3 feet from back of clean out box to back of curb. In easements, the preferred cleanout location is at the easement line. Service connections shall not be located in driveways, sidewalks, or the street. See **Standard Detail C07.01**.

C. **New Services**: Unless otherwise permitted by the City Engineer, all sewer services shall be PVC Schedule 40 pipe solvent cement joint pipe and fittings. The laying and joining of service connection pipe shall conform to the same requirements as stipulated for main installation. Sewer services are to be connected to main except at manholes on cul-de-sacs. When connecting to manholes, services are to come in at the bottom of the manhole or as shown on the approved plans. See paragraph G, below for service connections to manholes.

D. **Bored Services**: Where laterals are bored, the face of the bore cut shall be a minimum distance of five feet from the edge of the pavement on either side unless the City Engineer or Water Resources gives approval to the contrary.

E. **Service Connections to Existing Sewer Mains (Service Saddles):** Service connections to existing mains shall be made by cutting in a hole with a mechanical circular-type saw cutter, designed for the particular use, and rendering a smooth uniform cut with no damage to the main and is one that retrieves the plug (coupon). Saddle service coupon shall be given to the City's Inspector for review and approval. Service saddles shall be fully encased with #57 stone and special attention shall be given to embedment of the service pipe from the saddle through the lateral trench. The cost for such cut-ins shall be included in the cost of the lateral.

The remainder of the service shall match the configuration required for a new service (**Standard Detail 733.01**). Backfill under and around wye with #57 stone. The cost for such cut-ins shall be included in the cost of the lateral. See **Standard Detail 733.02**.

Service Saddle Properties:

The service saddle body is to be cast from ductile (nodular) iron, meeting or exceeding ASTM A 536, Grade 65-45-12. Gasket is to be made from Buna-N (NBR) for sewer service applications in accordance with ASTM D2000. Unless otherwise approved, the saddle to have a pipe stop molded into the inside wall of the gasket.

Strap is to be type 304 (18-8) Stainless Steel, 3 1/2 inches wide to spread out clamping forces on the pipe. M.I.G. and T.I.G welds. Bolts and Nuts to be type 304 (18-8) Stainless Steel. Bolts to have 1/2" National Coarse roll thread. Nuts coated to prevent galling. Straps, nuts and bolts to be passivated for resistance to corrosion. Acetyl and stainless steel washers are used to reduce friction.

Shop coat to be fusion bonded epoxy, liquid epoxy applied to cast parts for corrosion protection.

The saddle shall be capable of a 7-psi working pressure when properly installed on a pipe within the correct outside diameter range.

F. **Service Connection to Manholes**: Service connections must enter at the bench of the manhole whenever possible but shall not enter a manhole lower than the top of the effluent main. If not practical, services may be located above the bench but may not enter the cone or any joints. Service connections in manholes shall also be core bored and booted and shall be separated by a minimum of 2 times the pipe OD (either vertically or horizontally) from other services or mains. No taps shall be made by knocking a hole into the manhole wall. When connections are made at deep manholes, a standard drop connection shall be provided. The invert of manhole service connections shall be located such that a pipe half-diameter channel formed through the bench shall be required.

Service connections shall not be made to manholes located in intersections unless directed otherwise by the City Engineer or Water Resources.

G. **Deep Sewer Service Connections**: For service connection to deep sewer with confined trenches, the service shall extend from the connection upward at a 45 degree angle to a point near the trench wall, shall then bend 45 degrees up to a vertical riser which shall parallel the vertical trench wall to a point no less than 36 inches below finished grade and shall then turn using 2 consecutive 45 degree bends to provide a lateral service to match the grade and slope of the building sewer. For all other service connections, the service shall extend from the connection upward at 45 degrees to a point where it shall bend 45 degrees to match the grade and slope of the building sewer. Vertical stacks or standpipe services are not allowed. See **Standard Detail 733.01**, sheet 2.

H. **Final Cleanout Grade Adjustment**: When final grade has been achieved, a cast iron meter box is to be set over the cleanout. The top of the cleanout plug is to be set 2 inches below the bottom of the meter box lid. The lid is to read "sewer". See **Standard Detail 733.01**.

I. **Cleanout Spacing:** Cleanouts shall also be provided at all horizontal or vertical changes in direction. Cleanout spacing shall meet the requirements of the *NC State Building Code, Plumbing Code*, latest edition.

J. **Grade**: Minimum grade for 4-inch services preferably shall be ¼-inch per foot but no less than 1.0%. Minimum grade for 6-inch services are to be laid preferably at a 1/8-inch per foot, but no less than 0.6%.

K. During service installation or line rehabilitation on existing mains, the Contractor shall be responsible for the maintenance of all sewer house connections and the proper treatment and/or by-pass of effluent sewer around work areas.

L. Any services or utilities damaged by the Contractor shall be properly repaired.

M. Sewer lines shall be **air tested** (low-pressure air test) after the complete installation of all sewer services. Laterals shall be tested with the main line.

3.8 CONCRETE ENCASEMENTS

All concrete encasements shown on the plans shall be constructed per **Standard Detail C07.05**.

The earth may be used for side and bottom forms provided such sides can be excavated uniformly smooth and to the size and shape specified. Care must be taken during the pouring operation to ensure that the pipe does not float or move from the buoyant affects of the concrete. Misalignments of the crossings shall be cause for total removal and replacement of the encasement by the Contractor.

Once the concrete is set, measures shall be taken to cure the concrete by covering it with plastic. Water shall not be allowed to run over the concrete for at least 48 hours.

Forms will be required if the subgrade and sides are not firm, or will not hold shape.

Exercise care to avoid spilling concrete into creek.

See also paragraph 3.1.4 A for steel encasement construction requirements.

3.9 TESTING

3.9.1 GENERAL

A. Unless otherwise specified (see also paragraph 1.10.1 B2c), all sanitary sewer pipe shall be tested after backfilling has been completed and before final acceptance by the City. Upon completion of entire pipe installation, the City shall inspect the work in part or as a whole and make such tests as necessary to verify that the work has been carried out in accordance with the plans and specifications.

B. All manholes shall be of the specified size, shape, and material, and shall have their tops set to the grade as shown on the approved drawings provided by the designer.

C. The Contractor shall provide all equipment, material, water, labor, etc. needed to perform any and all tests in accordance with the procedures listed herein. All equipment, materials, etc. used shall be checked and approved by the City prior to its use. It shall be the responsibility of the Contractor to ensure pipe to be tested is clean before any tests are made. Frame and covers shall be tested with manhole tests.

D. The following tests shall apply for the respective pipe materials as required by the following specifications.

Table 02530.3 Table of Testing Applications				
Material	**Air Test**	**Vacuum Test**	**Mandrel Test**	**TV Inspection**
PVC/HDPE Gravity pipe[a]	X		X	X
DIP	X			X
Manholes		X		

[a]PVC/HDPE Pressure Pipe (Force Mains) Pressure & Leakage Testing: See paragraph 3.9.13 *Pressure Test & Leakage*

E. Testing and inspection shall promptly follow installation of wastewater pipe including services.

F. **TEST AND INSPECTION:**

1) **General Testing Requirements**:

All services shall be installed complete.

All visible leaks, broken or cracked pipe shall be repaired prior to testing.

Testing is to be performed before stone base or pavement is put down.

2) **Contractor to Furnish Testing Equipment and Personnel**: Furnish all pumps, gauges, instruments, test equipment and personnel required for inspections and testing operations.

Provide lights and mirrors and inspect lines in presence of the City's authorized representative.

3) **Final Inspections/Tests**: All final testing and inspections shall be performed in the presence of the City's authorized representative. The City requires a 48-hour notice prior to inspection and testing. If the desired inspection will land on a weekend or holiday, contact the City Engineer to determine if the inspection or test can be scheduled at that time.

4) **Flushing**: Contractor shall flush all sand, dirt and debris from lines prior to inspection. If during any of the inspections sewer lines and manholes are found to contain mud and other debris, the Contractor shall be required to re-flush or clean this material from the system by whatever means necessary. Mud and other debris shall not be allowed to enter the existing sanitary sewer system. The Contractor shall be responsible for the cost of water used to flush the system.

5) Contractor is to inspect the system for conformance with line and grade shown on the plans and provide record drawing measurements on Record Drawings.

6) Also see Section 5 *Acceptance* and Section 6 *Specific Information Regarding Record Drawings* as well as the Sewer Inspection Checklist in

the *City of Wilson Plan Review, Permitting, Construction and Acceptance, Appendix B* for other applicable requirements.

7) **Backfill Testing**: Testing of backfill shall be performed during construction as follows:

Compaction Testing Frequency:

Table 2230.2	
Testing Frequency	
Location	**Frequency**
Trench areas in road crossings	1 test group[a] per road crossing, and/or
Trench Areas	As determined by the City Engineer
Exception: Where additional tests are required to determine the extent of acceptable compaction (having been determined by the initial QA/QC test). In this case, the costs for these additional tests are the responsibility of the Contractor.	

[a]One test group consists of a compaction test on each layer of backfill material in the trench segment.

Refer to Table 2275.3 of *Trenching, Backfilling, and Compaction of Utilities* for the minimum compaction limits for trench backfill, Table 2275.4 for the required compaction lift thickness, and Table 2275.5 for the ASTM/AASHTO reference standard applicable to the soil type/classification.

Quality Control (QC) compaction tests are the responsibility of the Contractor. The City will perform such additional Quality Assurance (QA) tests they may deem necessary at their expense.

8) **Visual Line Inspection**: Visual inspections are required by the City. When required, sewer lines shall be visually inspected from every manhole by use of television cameras. The lines shall exhibit a fully circular pattern when viewed from one manhole to the next. Lines, which do not exhibit a true line and grade, have obstruction or structural defects, shall be corrected to meet these specifications and the sewer barrel left clean for its entire length. See paragraph 12, below for method of recording inspection.

9) **Pipe Deflection Test**: Deflection testing shall be performed for all semi-rigid and flexible pipe 8 inches or larger. Deflection shall not exceed 5% (95% of the ASTM base inside diameter). Testing shall be conducted in the presence of the City's authorized representative and shall utilize a mandrel go/no-go gauge complete with proving ring. Mandrel shall be approved by the City for this test. Arm mandrels shall have a minimum of 9 arms.

The mandrel device shall be cylindrical in shape and constructed with a minimum of nine evenly spaced arms or prongs. Mandrels with less than nine arms will not be approved for use. The "D" mandrel dimension shall

carry a tolerance of plus or minus 0.01 inch. Allowance for piping wall thickness tolerances or ovality (from heat, shipping, poor production, etc.) shall not be deducted from the "D" dimension but shall be counted in as a part of the 5% or lesser deflection allowance.

The mandrel shall be hand pulled through by the Contractor in the presence of the City's authorized representative. Any sections of the sewer not passing the mandrel shall be uncovered and the Contractor shall re-round or replace the sewer to the satisfaction of the City's authorized representative. The repaired section shall be retested.

The inspection shall be conducted no earlier than 30 days after reaching final trench backfill grade.

Contact length shall be measured between points of contact of the mandrel arm.

The inspector shall be responsible for approving the mandrel. Proving rings may be used to assist in this. Drawings of the mandrel with complete dimensions shall be furnished by the Contractor to the City for each diameter and specification of pipe.

10) **Primary test method – Low Pressure Air Test**: Sewer lines shall be **air tested** after the complete installation of all sewer services. Sewer laterals are to be tested along with main. The Contractor shall be responsible for furnishing all equipment and labor for the low pressure air test at no additional cost to the City.

The portion of the line being tested shall be accepted if the portion under the test meets or exceeds the requirements of ASTM F1417 *Standard Test Method for Installation Acceptance of Plastic Gravity Sewer Lines Using Low-Pressure Air.* This requirement shall be accomplished by performing the test as follows: the time required in minutes for the pressure to decrease from 3.5 to 2.5 psig greater than the average back pressure of any groundwater that may be over the pipe shall not be less than the time shown for the given diameters in Table I *Line Pressure Air Test Table.* If the system does not meet the foregoing requirements, the Contractor will be required to locate and repair the leaks at no cost to the City and repeat the tests until the allowable leakage is obtained.

Procedure:

It is imperative that proper plugs be installed on the laterals at the cleanout stack. All plugs should be properly installed to withstand the test pressures without requiring external bracing or blocking. Before tests are made, all wyes, tees, or end of side sewer stubs shall be plugged with flexible-joint caps, or acceptable alternate, securely fastened to withstand the internal test pressures. Such plugs or caps shall be readily removable, and their removal shall provide a socket suitable for making a flexible-jointed lateral connection or extension.

Air leakage testing of installed system shall be performed with a continuous monitoring gauge no less than 4 inches in diameter with minimum divisions

of 0.10 psi and an accuracy of plus or minus 0.04 psi. All air used shall pass through a single, above ground control panel visible to the City.

Individual air hoses shall be used from control panel to pneumatic plugs, from control panel to sealed line for introducing low pressure air, and from sealed line to control panel for continually monitoring the air pressure rise in the sealed line. After all pipes are cleaned, air shall be slowly supplied to the plugged pipe installation until the internal air pressure reaches 4.0 psig (greater than average groundwater backpressure that may submerge the pipe). Throttle the air supply to maintain that constant pressure for at least 2 minutes. The air pressure supply shall then be disconnected from the system or shut-off. Do not enter manhole during test. Do not exceed 9.0 psig in the system.

Observe the continuous monitoring gauge while decreasing the pressure to no less than 3.5 psig (greater than groundwater pressure). At a reading of 3.5 (adjusted), or any convenient observed pressure reading between 3.5 and 4.0 psig (adjusted), timing shall commence with a stopwatch or other timing device that is at least 99.8% accurate. Regulate the pressure for at least 2 minutes to permit the air/ground temperature to reach equilibrium before commencing test.

Measure the time interval for pressure to drop 1.0 psig.

If the time, shown in Table I for the designated line size and length, elapses before the air pressure drops 1.0 psig, the section undergoing the test may be discontinued once the prescribed time has elapsed even though the 1.0-psig drop has not occurred. Record all readings.

If the pressure drops 1.0 psig before the appropriate time shown in Table I has elapsed, the air loss rate shall be considered excessive, and the section of pipe has failed the test. Record all readings.

If service lateral sewers are included in the test section, their lengths may be ignored for computing the required test times. The test will be slightly more severe. In the event a test section, having a total surface area less than 625 square feet, fails to pass the air test when lateral sewers have been ignored, the test time shall be recomputed to include all laterals.

If the sections fail the air test, the Contractor shall determine the source or sources of leakage and shall repair or replace all defective material and workmanship. No sealant shall be used in the newly installed sewers to correct the leaks.

The extent and type of repair that may be allowed shall be subject to the approval of the City. The repaired pipe installation shall be retested and required to meet the requirements of this test.

Safety Note: The air pressure test may be dangerous if, because of ignorance or carelessness, a line is improperly prepared. It is extremely important that the various plugs be installed and braced in such a way as to prevent blowouts. A force of 250 lbs is exerted on an 8-inch plug by an internal pressure of 5 psi. It should therefore be realized that sudden expulsion of a poorly installed plug, or a plug that is partially deflated before

the pressure is released, can be dangerous. As a safety precaution, pressurizing equipment should include a pressure regulator set at, for example, 10 psi to avoid over-pressurizing and damaging an otherwise acceptable line. **No one shall be permitted in the manholes during testing**.

TABLE I
Line Pressure Air Test Using Low-Pressure Air
SPECIFICATION TIME REQUIRED FOR A 1.0 PSIG PRESSURE DROP
FOR SIZE AND LENGTH OF PIPE INDICATED FOR Q = 0.0015
(Excerpted from ASTM F 1417)

Pipe Diameter (in.)	Minimum Time (min:sec)	Length For Minimum Time (ft.)	Time For Longer Length (sec.)	Specification Time for Length (L) Shown (min:sec)							
				100 ft.	150 ft.	200 ft.	250 ft.	300 ft.	350 ft.	400 ft.	450 ft.
4	3:46	597	.380 L	3:46	3:46	3:46	3:46	3:46	3:46	3:46	3:46
6	5:40	398	.854 L	5:40	5:40	5:40	5:40	5:40	5:40	5:42	6:24
8	7:34	298	1.520 L	7:34	7:34	7:34	7:34	7:36	8:52	10:08	11:24
10	9:26	239	2.374 L	9:26	9:26	9:26	9:53	11:52	13:51	15:49	17:48
12	11:20	199	3.418 L	11:20	11:20	11:24	14:15	17:05	19:56	22:47	25:38
15	14:10	159	5.342 L	14:10	14:10	17:48	22:15	26:42	31:09	35:36	40:04
18	17:00	133	7.692 L	17:00	19:13	25:38	32:03	38:27	44:52	51:16	57:41
24	22:40	99	13.674 L	22:47	34:11	45:34	56:58	68:22	79:46	91:10	102:33

11) **Manhole Vacuum Testing**

Either the manholes alone, or the manholes with the main and services together may be vacuum tested as indicated below unless otherwise allowed by the City. Vacuum testing shall meet ASTM C1244 *Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test Prior to Backfill.* Only new manholes are to be vacuum tested. Vacuum testing of existing manholes is not required.

The same test times applicable for manholes shall apply to the combined and simultaneous testing of manholes, mains and services (i.e. no increase in test times shall be employed by adding the sewer mains in the combination test).

The test shall be made using an inflatable compression band, vacuum pump, and appurtenances specifically designed for vacuum testing manholes. Equipment to be manufactured by Peter A Glazier & Associates, Worcester, MA or approved equal. The Contractor shall be responsible for furnishing all equipment and labor for the vacuum test at no additional cost to the City.

Manholes and mains may be tested by vacuum test immediately after assembly of the manhole, frames and connecting pipes, and before any backfill is placed around the manholes. However, the final test and acceptance shall be based only upon a test after the manhole is backfilled and the cover frame castings are grouted in place. Testing devices shall be installed on the iron manhole frame.

All lift holes shall be plugged with nonshrink grout and all pipes shall be plugged, taking care to securely brace the plugs and pipe. Stubouts, manhole boots, and pipe plugs shall be secured to prevent movement while the vacuum is drawn.

Manholes shall be tested from the top of the casting, including the casting-to-cone joint (adjusting ring).

Installation and operation of vacuum equipment and indicating devices shall be in accordance with manufacturer's recommendations.

After the testing equipment is in place, a measured vacuum of 10 inches of mercury (Hg) shall be established in the manhole. The time for the vacuum to drop to 9 inches of mercury shall be recorded.

Acceptance standards for leakage shall be established from the elapsed time for a negative pressure change from 10 inches to 9 inches of mercury[1]. See Table II, *Vacuum Test Table for Manholes*.

If the manhole/main fails the test, the Contractor shall locate the leakage, make the proper repairs, and the vacuum test shall be repeated until the manhole/main(s) passes the test. After the manholes have been backfilled

[1] 2.036 inches of Mercury = 1 psi

and the cover frame casting sealed in place, and prior to final acceptance of the project, any signs of leaks or weeping visible from the inside of the manhole shall be repaired and the manhole made watertight and tested. The extent and type of repairs that may be allowed shall be subject to the approval of the City. Leaks shall be repaired on the outside of the manhole unless approved otherwise by the City.

If a manhole joint mastic material is completely pulled out during the vacuum test, the manhole shall be disassembled and the mastic replaced.

12) **Televising of Sanitary Sewers**

TV Inspection: Upon completion of the mandrel test for deflection, the contractor shall request a final inspection by the City. The Contractor will TV the mainline using a TV inspection truck and all services inspected using a mini-cam. It is the responsibility of the contractor to flush all lines and manholes to ensure there is no sediment or debris in the lines at the time of inspection. The contractor and/or Engineer or their designated representative shall be present during the TV inspection. All inspections will be placed on a CD or flash drive. All debris should be removed.

Inspection Criteria:

a. The main lines and wyes will be checked for leaking joints, deformed pipe, cracked pipe, grade problems, excessive infiltration and overall appearance.

b. Services will be checked for leaks, cracks, broken, or missing pipe, deformed pipe, and grade. If defective pipe or conditions are discovered they shall be corrected at no cost to the City.

TV inspections are required following placement and compaction of backfill and completion of other required testing, but prior to placement of pavement. The City of Wilson will televise all sewer lines for conformance to the project drawings and specifications. A tape and log of the televising shall be prepared.

When the City Engineer or the Wastewater Collection ORC permits, contractors may TV their lines and deliver the tape or disk and log to the City for review. The television camera used for the inspection shall be one specifically designed and constructed for such inspection. Lighting for the camera shall be suitable to allow a clear picture of the entire periphery of the pipe. The camera shall be operative in 100% humidity conditions. The camera, television monitor, and other components of the video system shall be capable of producing picture quality to the satisfaction of the City; and if unsatisfactory, equipment shall be removed and no payment will be made for an unsatisfactory inspection.

The camera shall be moved through the line in either direction at a moderate rate, stopping when necessary to permit proper documentation of the sewer's condition. In no case will the television camera be pulled at a speed greater than 30 feet per minute. Manual winches, power winches, TV cable, and powered rewinds or other devices that do not obstruct the camera view or interfere with proper documentation of the sewer conditions

shall be used to move the camera through the sewer line. If, during the inspection operation, the television camera will not pass through the entire manhole section, the Contractor shall set up his equipment so that the inspection can be performed from the opposite manhole. If, again, the camera fails to pass through the entire manhole section, the inspection shall be considered complete and no additional inspection will be required.

The City will also televise sewer lines prior to the expiration of the one-year warranty. If a defective condition is found, it shall be presumed to be caused by defective workmanship or materials. The Contractor shall be notified and shall correct the work in a manner approved by the City.

13) **Force mains**

a. **Order of Operations**: Except for chlorination and tests for purity, the installation of sewer force mains shall be set forth on the plans and shall meet the requirements for water mains and as set forth in these specifications. Fill the system with water at a velocity of approximately 1 foot per second while necessary measures are taken to eliminate all air. Do not leave fill line connected to sewer line unless an RPZ backflow preventer is placed between the potable water supply and the line being filled.

b. **Pressure Tests & Leakage**: The Contractor shall test completed sections of line, including fittings, with water. This testing, however, does not relieve the Contractor of his responsibility to repair or replace any cracked or defective pipe. All work necessary to secure a tight line shall be performed by the Contractor. Testing shall be performed in the presence of the City's authorized representative and the Contractor. Cost for testing shall be incidental to line construction. Final acceptance from the City shall be contingent upon all pressure and leakage tests yielding satisfactory results.

Pressure Test: The newly laid piping or any valved section of piping shall, unless otherwise specified, be subjected for two hours to a leakage test. Raise the pressure by pump to 150 psi, 150% of design working pressure, or test pressure as shown on the drawings, whichever is greater. Measure the pressure at the low point on the system compensating for gauge elevation. Maintain this pressure (+ or – 5-psi) for 2 hours. If pressure cannot be maintained using reasonable pumping rate, determine cause, repair, and repeat the test until successful. The allowable leakage shall be no greater than allowances shown in Table 4A - Hydrostatic Testing Allowance, Section 5.2, of AWWA C600-10, *AWWA Standard for Installation of Ductile Iron Water Mains and Their Appurtenances and Table2 – Hydrostatic Test Makeup Water Allowances, Section 7.3 of AWWA C605-05 AWWA Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water*. A copy of these charts is located at the rear of the City of Wilson specification Section 02510 – *Water Distribution*. Contractor shall be responsible for all costs, labor, materials, and equipment to perform the testing. All visible leaks, broken or cracked pipe, valves, etc. shall be repaired.

i. Prerequisite conditions for testing shall be as follows:

- All pipe has been laid and the trench backfilled.
- Valves shall be properly located, operable and at correct elevation.
- All reaction anchors have had sufficient set of 3 days. High early strength concrete, 4500 psi or greater, may be used to reduce number of days.
- Lines shall be properly vented where entrapped air is a consideration.
- All construction activities on the project, that requires trenching or excavation within the limits of the line location, shall be completed prior to pressure testing of line.

3.10 PUMP STATIONS AND FORCE MAINS

3.10.1 GENERAL:

A. **Self Priming Pumps**: Pumps shall be self-priming pumps with electro-mechanical controls. Pumps shall be designed for continuous duty pumping raw, unscreened wastewater. Pumps shall be capable of handling a 3-inch solid and any trash or stringy material that can pass through a 4-inch hose unless mechanical means of solids reduction is installed at the pump. Pumps shall be made non-clog by passing solids, trash, and stringy material through a non-clog or vortex-type impeller. Impellers shall have blades that are generally forward rounded or otherwise configured to avoid catching solids, trash, and stringy material.

Sewage pump selection should allow for up sizing or downsizing of impellers as dictated by sewage flows.

B. **Station Layout**: See **Standard Detail 734.02** for typical pump station site layout. Also, see **Standard Details 732.03, 732.04, 732.05, 732.06,** and **732.08** for additional information pertaining to typical installation requirements. The City of Wilson approved and permitted plans shall govern construction with regard to layout provided the minimum requirements of this section have been included, as applicable, or otherwise excepted by the City Engineer.

C. **Backup Pump/Generator**: All stations shall include a backup generator. See paragraph 3.10.3 Auxiliary Generator for specific requirements and specifications for each option.

3.10.2 MINIMUM FEATURES REQUIRED IN PUMP STATION

Lift stations shall include but are not necessarily limited to the following minimum equipment, controls, features and elements:

Lift Station Checklist

☐	1.	Inspection and Testing: Wetwell same as manhole. See paragraph 3.9.1.F.11 Manhole Vacuum Testing for manhole testing requirements.
☐	2.	Underground service preferred. When overhead service is necessary, provide a service head. Meter base, service connection, disconnect, and area light with photo cell are required.
☐	3.	Audible and visual high water alarm and alarm silence. High water alarm circuitry. Provide dual high water alarm bubbler system.
☐	4.	Provide mercury float switch type control system for high level alarm backup to SCADA and to local alarm.
☐	5.	As an alternate, a SCADA System required by Water Resources or the City Engineer and reviewed for compatibility with the City of Wilson system.
☐	6.	Primary level control shall be a bubbler system with hand-off-automatic (H-O-A) switches and an automatic alternator.
☐	7.	Automatic air release valves, as applicable.
☐	8.	Independent high water alarm circuitry.
☐	9.	3-phase power with 3-phase voltage monitor, if applicable. Indication of 3-phase power fail.
☐	10.	Suction and discharge gauges
☐	11.	Elapsed time indicators
☐	12.	High pump temperature protection
☐	13.	Pump run lights
☐	14.	Motor overload resetter
☐	15.	TLVSS Surge suppressor
☐	16.	Duplex service receptacles on GFCI installed external to the NEMA 4X enclosure
☐	17.	Surge relief valve and return piping to wetwell
☐	18.	Dual power supply auto switchover, etc.
☐	19.	Freezeless Yard Hydrant. See paragraph 2.2.17, paragraph 3.10.4, **Standard Detail 739.01**.
☐	20.	Service to hydrant with meter and RPZ backflow preventer in an insulated enclosure with locking access and heater (if applicable)
☐	21.	Cold-weather ballast fluorescent lighting and heater(s).
☐	22.	Provide condensate heater on thermostat inside pump control panel.
☐	23.	All control panels must be minimum NEMA 4X weatherproofed, constructed of stainless steel, and have weatherproof identifying labels attached with stainless steel screws.
☐	24.	Buildings designed to house pumps shall be equipped with thermostatically controlled ventilation (fan and louver) with no-spark fan (see Water and Sewer Design, paragraph 4.1.6). Building to be designed to 100 mph wind speed or meet current building specs (see Water and Sewer Design, paragraph 4.1.1.C).
☐	25.	Unless uninterruptable power supply is available, the lift station is to include back-up alarm system that operates off a 12-volt battery connection in the event of power failure. The battery system is to include a trickle charger to ensure battery integrity.
☐	26.	Control Panel Dead Front: Panels on the primary pump station and generator shall comply with NFPA 70E. The following elements, when applicable for the type system under consideration, at a minimum, shall be accessible and located in front of the dead front panel and/or barriers

		installed to make the following accessible without being exposed to live conductors: Control/programming keyboards, all hand operated switches, H-O-A switches, disconnects, pump run lights and run time gauges, alarm silence, duplex receptacles, motor overload resetter, gauges (such as ammeter, temperature, fuel level indicator), indication of 3-phase power fail, handles, GFCI switch (on/off), circuit breakers, area light, autodialer, etc.
☐	27.	Provide a permanent weatherproof sign stating the pump station identifier, 24-hour emergency number and instructions to call in case of emergency.
☐	28.	Screened vent for wetwell.
☐	29.	Emergency pump connection with 90-degree elbow, gate valve, and quick connect with gap.
☐	30.	Backup Systems: A backup generator shall be provided.
☐	31.	Provide programmable auto-exercise cycle for generator
☐	32.	Station Start-up assistance and certification: Station start-up and certification shall include an operational/witness/drawdown test
☐	33.	Provide 2,000 gallon emergency overflow tank for stations up to 1,000 gpm and 3,000 gallon emergency overflow tank for flows 1,001 to 2,000 gpm.

3.10.3 BACKUP GENERATOR OPTION

Provide auxiliary natural gas, LP gas, or diesel fired automatically activated stand-by power generator source with automatic reset, placed on site. Generator must be duel fuel. The engine set and generator shall be from the same manufacturer. Pump manufacturer to provide power demand/ratings to Contractor before ordering pump and the power demand appropriately marked on the pump shop drawings. Generator shall have the capacity sufficient to sequentially start and run all pumps in the pump station. The Contractor shall provide a complete engine driven generator set. The generator set shall consist of four-cycle, radiator-cooled, engine direct connected to an alternating current generator, a unit-mounted control panel, all mounted on a common sub-base. The control panel shall be complete with engine controls and instruments, safety controls and panel lights and include, but not necessarily limited to, the following:

A. The generation unit shall be capable of powering the pump motors starting current, electrical systems, instrumentation/controls and alarm systems, and other auxiliary equipment as may be necessary to provide for the safe and effective operation of the pump station. The generation unit shall have the appropriate power rating to start and continuously operate under all connected loads plus 10%.
B. The generation unit shall be provided with special sequencing controls to delay lead and lag pump starts unless the generating unit has the capacity to start all pumps simultaneously while the auxiliary equipment is operating.
C. The generation unit shall be capable of shutting down and activating the audible and visual alarms and telemetry if a damaging operating condition develops.
D. The generation unit shall be protected from damage when restoration of power supply occurs.

E. The generator shall be equipped with an automatic transfer switch to start generator and transfer load to emergency in case of utility under voltage, over voltage, power loss, phase reversal, or phase loss. Response time on transfer switch, due to loss of utility power, needs to be adjustable by owner.
F. The control panel shall be complete with run-stop-remote switch; remote start-stop terminals; cranking limit; battery charge rate ammeter, oil pressure gauge, temperature gauge; low oil pressure shutdown; high engine temperature shutdown; over speed shutdown; AC voltmeter; voltage adjustment; frequency meter; and running time meter. Switches and gauges shall be located in front of the dead front and/or barriers to make them accessible without being exposed to live conductors and shall comply with NFPA 70E.
G. Circuit breakers shall be provided with a built in control panel.
H. Provide manufacturer's recommended anti-freeze, engine heaters, and suitable trickle battery charger. All accessories shall be engine-mounted and within the weatherproof sound attenuated housing.
I. The manufacturer of the unit shall completely assemble and test the unit before shipment. He shall be one who is regularly engaged in the production of such equipment, and who has spare parts and service facilities.
J. The controls must indicate engine run, common engine fail, transfer switch position, low fuel level, and fuel tank leak for remote telemetry purposes. Lights and gauges must be located in front of the dead front and/or barriers to make them accessible without being exposed to live conductors and shall comply with NFPA 70E.
K. The automatic transfer switches must have a disconnect on the utility service main side.
L. The generator shall comply with the following minimum requirements:
    1. Engine: Four-cycle, 4 cylinder, radiator cooled, at 1800 RPM. Starting shall be from batteries, with capability to start the unit at 32 degrees temperature.
    2. Generator: Rating shall be continuous standby service at 0.8 power factor, at 1800 RPM.
    3. Voltage: Three-phase. KW rating to match facility needs plus 10%.
    4. Engine shall be equipped with an isochronous governor.
    5. Frequency regulation shall be less than 3-cycles from no-load to full load.
M. All accessories needed for the proper installation of the system shall be furnished. Included should be batteries, battery cables, exhaust piping, mufflers, and vibration mounting. Batteries should be lead acid.
N. The generator set shall be enclosed with a factory-installed weather-protective housing (sound abating enclosure to 68db @ 23 ft.) Housing shall provide easy access to the engine-generator and instrument panel. Muffler to be designed so exhaust is not blown or sucked across the set by cooling air.
O. Included with the generator shall be a complete fuel system consisting of a fuel tank, fuel gauge, fuel lines, fuel pumps (if applicable), valves and any and all other items incidental to a first-quality installation.
P. Diesel Option: Provide integral sub-base double-walled diesel tank. The tank is to be UL approved closed-top dike type. The tank shall also be fitted with a leak sensor device. The tank must have a capacity to run the generator for a minimum of 24 hours at 100% load.
    Tank shall consist of the fuel tank separate and contained within the frame. No generator weight is to be supported by the tank. Provide a drain plug at one end of the rupture basin. Provide vibration isolators between generator set and tank assembly. Provide fuel low-level alarm remote mounted.

Q. LP Option: The tank must have a capacity to run the generator for a minimum of 24 hours at 100% load.
R. Provide manufacturer's recommended anti-freeze and engine block heater with thermostatic controls to maintain engine coolant at proper temperature to fulfill start-up requirements, adjustable if possible. Provide suitable trickle battery charger. All accessories shall be engine-mounted and within the weatherproof sound attenuated housing.
S. Provide annunciator panels with visual and audible alarms to monitor and warn of emergency operation conditions affecting line and generator power sources.
T. Provide stainless steel super critical grade type exhaust silencer mounted inside of the generator enclosure for corrosion protection.
U. Provide amp meter, voltmeter, and frequency meters with phase switches. Meter gauges shall be located in front of the dead front and/or barriers to make them accessible without being exposed to live conductors and shall comply with NFPA 70E.
V. Provide fuses or circuit breakers for battery charger and engine.
W. Provide an automatic battery charger, static type, magnetic amplifier control with DC voltmeter, DC ammeter and potentiometer for voltage adjustment. The charger is to be completely automatic and rated for the type of battery use. The charging rate is to be determined by the state of the battery and reducing to milliamp current on fully charged battery. The charger shall be 120 V., single-phase, 60 cycle, AC input with 6-amp maximum output.
X. Operation and Maintenance instructions: The Contractor shall provide a minimum of four continuous hours of operation and maintenance instructions for the Owner's personnel.
Y. The City must be furnished with one complete set of air, oil and fuel filters.
Z. Provide 5-year warranty from manufacturer of Generator and Engine.
AA. Provide three bound (3-ring binder) sets of Operation and Maintenance Manual with parts list for all components relative to lift station generator.

3.10.4 MISCELLANEOUS REQUIREMENTS

A. **Pump Certification**: Manufacturer's representative shall be present at pump start-up. See paragraph G, *Pump Station Operational/Witness Test/Start-up* requirements, below.

B. **Wetwell Coating**: Wetwell interiors shall be coated with a two component elastomeric, hydrophobic, corrosion resistant polyurea coating where the primer can be applied to damp or dry surfaces. Primer coat film thickness shall be 1.5 to 3 mils. The top coat film range shall be from 8 to 12 mils. Shore hardness D shall be minimum 75. Coating shall equal or exceed Duramer K-2002 by Innovative Polymer Solutions, LLC. Contractor to follow all applicable safety measures for handling and application as recommended by the Manufacturer of the coating. Comply with applicable confined space safety requirements.

C. **Setting Non-Freeze Yard Hydrants**

1. Contractor to provide elbow and transition fittings for connection to water service. Yard hydrants to be set with the hose nozzle a minimum of 18 inches above finished grade. Bury depth to be minimum 24 inches. Elbow is to rest on a 4" x 24" x 24" concrete pad.

2. Place 1 cubic foot of #57 stone around valve with stone placed a minimum of 4 inches above the drain hole. Prior to backfilling stone, place a layer of non-woven separation fabric over stone. Backfill and compact.

3. Once the hydrant has been set, construct a 4" x 24" x 24" concrete pad around hydrant.

4. See **Standard Detail 739.01**.

D. **Force mains**: Force mains shall be constructed in accordance with the plans and in accordance with the requirements applicable to water main construction. Pipe joints shall be push on, mechanical joint type, or as indicated on the approved drawings for the type pipe required. 3-inch and larger fittings shall be mechanical joint with appropriate restraint.

E. **Manuals/Parts**: The City must be furnished with three bound copies (3-ring binder) of the Operation and Maintenance and Parts Manuals with parts list for the pumps/motors and/or station, pump controls, the generator unit, and the automatic transfer switch as well as all other components relative to lift station generator. Also, provide a spare impeller, key, nut, washer, and mechanical seal for each pump.

F. **Safety Placards**: Provide safety placards as required for structure (e.g. confined access entry) and equipment as required by OSHA shall be posted and readily visible.

G. **Pump Station Operation/Witness Test/Start-up:**

1) **Witnessed Testing**: Witness testing shall be performed in the presence of the City's authorized representative and the results of the testing maintained as part of the construction record documentation. Witnessed testing shall include start-up assistance by a qualified factory representative and certification. Prior to acceptance by the City, an operational test of all pumps, drive, 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.

After construction debris and foreign material has been removed from the wetwell, the Contractor shall supply an adequate amount of clear water volume to operate station through several pumping cycles. Observe and record operation of pumps, suction (if applicable) 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.

2) **Drawdown test**: The Contractor shall conduct a drawdown test to confirm that the pump is operating at or near the required design operating point and to determine the actual pumping rate of each pump. This test shall be conducted in the presence of the City's authorized representative, the Contractor and a representative of the pump manufacturer. The rate shall be determined by subtracting the starting static surface elevation of the water in the wetwell from

the "off" elevation and multiplying the difference by the volume per vertical foot of wetwell. That number shall then be divided by the number of minutes of pump run time to affect the drop measured. This test shall be performed for each pump and the rates recorded for each pump and included as part of the record in the certified pump test.

3) **Manufacturers Start-up Services**: The manufacture's representative shall be present at pump start up. Co-ordinate station start-up with manufacturer's technical representative. The representative or factory service technician shall inspect the completed installation. He shall calibrate and adjust instrumentation, correct or supervise correction of defects or malfunctions, and instruct operating personnel in proper operation and maintenance procedures.

3.11 PIPE DESIGN LIFE

In addition to the above noted specifications, the Contractor shall secure and the manufacturer shall furnish and warrant that sanitary sewer pipe is designed for a 50-year life.

3.12 CLEANUP AND RESTORATION OF SITE

After the backfill is completed, the contractor shall dispose of all surplus material, dirt and rubbish from the site, and shall keep the site free of mud and dust to the satisfaction of the City. The Contractor may be required to flush or sprinkle the street to prevent dust nuisance. It is important that clean up and restoration of the site follows the work closely. The Contractor shall dispose of surplus material and clean the street at the end of each day for the portion of work completed that day unless additional cleaning is required. After all work is completed, the Contractor shall remove all tools and other equipment, leaving the site free, clean, and in good condition.

TABLE II
VACUUM TEST TABLE FOR MANHOLES
BASED ON ASTM C1244

MINIMUM TEST TIMES FOR VARIOUS manhole DIAMETERS FOR PRESSURE DROP FROM 10 INCHES TO 9 INCHES HG.

	DIAMETER (FEET)				
Depth (FT)	4	4.5	5	5.5	6
	TIME (SECONDS)				
6	15				
8	20	23	26	29	33
10	25	29	33	36	41
12	30	35	39	43	49
14	35	41	46	51	57
16	40	46	52	58	67
18	45	52	59	65	73
20	50	53	65	72	81
22	55	64	72	79	89
24	59	64	78	87	97
26	64	75	85	94	105
28	69	81	91	101	113
30	74	87	98	108	121

END OF SECTION 02530

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02920 – SEEDING, SODDING AND GROUNDCOVER

(Last Revised ~~4/20/12~~, 9/18/19) R2

SELECTED LINKS TO SECTIONS WITHIN THIS SPECIFICATION

Part 1 – General	Fertilizer, Product Spec	Seeding
Part 2 – Products	Lime, Product Spec	Sodding
Part 3 – Execution	Maintenance	Topsoil, Product Spec

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions apply to this specification.

B. Section 00825 – Product Substitutions

C. Section 00950 – Measurement and Payment

D. Section 02200 – Earthwork

E. Section 02275 – Trenching, Backfilling, & Compaction of Utilities

F. Section 02510 – Water Distribution

G. Section 02530 – Sanitary Sewer

H. Section 02630 – Storm Drainage

I. City of Wilson List of Approved Manufacturers and Products

J. NCDEQ Division of Energy, Mineral, and Land Resources, Land Quality Section's Erosion and Sedimentation Control Planning and Design Manual, latest revision.

1.2 SUMMARY

A. This section includes preparation of surfaces and application for seeding and sodding of areas proposed to be stabilized and landscaped in utility easements, on sites, along roadways and other applicable areas disturbed by construction.

B. This specification covers seeding, sodding and groundcover but excludes trees, shrubs, plants, edgings, planters and irrigation.

1.3 DEFINITIONS

A. **GENERAL**: For the purposes of this specification, the following definitions refer to landscaping items that come under the authority of the City of Wilson as specified within this section and other sections of this manual.

1) **Finish Grade**: In terms of landscaping, the surface that has been established, graded, raked, and prepared to receive groundcover, fertilizer, seed, and mulch; the finished surface of planting soil.

2) **Groundcover**: The material placed on a prepared surface and used to stabilize the soil from erosion.

3) **Sod**: An existing established matt of grass that has been removed from one area by a mechanical harvester and transferred to a prepared subgrade at another location; used to render a finished appearance and/or provide immediate resistance to erosion.

4) **Subgrade**: Surface or elevation remaining after completing the excavation before placement of topsoil.

5) **Topsoil**: A native, imported, or modified soil which is primarily organic in nature, free of rocks, clumps of clayey soils and otherwise friable in texture.

1.4 SUBMITTALS

A. Submit product data and shop drawings for the following:

1) **Seed certification**: All seed shall be labeled to show it meets North Carolina Seed Law requirements. All seed must have been tested within 6 months of planting.

2) A seed bag tag shall be submitted with final payment request from each type or mixture of seed used.

3) Topsoil analysis, if requested by City Engineer. Soil testing shall state percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity; deleterious material; pH; and mineral and plant-nutrient content of topsoil. Report is to state suitability of topsoil for lawn growth and recommend quantities of nitrogen, phosphorus, potash nutrients and soil amendments to be added to produce satisfactory topsoil.

1.5 QUALITY ASSURANCE

A. Materials and operations shall comply with the latest revision of all applicable Codes and Standards.

1.6 NCDEQ NCG01

1.7 QUALITY STANDARDS

A. Materials and operations shall comply with the latest revision of the Codes and Standards listed below:

American National Standards Institute

ANSI Z60.1 American Standard for Nursery Stock

American Society for Testing and Materials

ASTM C602 Specification for Agricultural Liming Materials

ASTM D5268 Specification for Topsoil Used for Landscaping purposes

1.8 STANDARD ABBREVIATIONS

AASHTO American Association of State Highway Transportation Officials.

ANLA American Nursery & Landscaping Association

ANSI American National Standards Institute

ASTM American Society for Testing and Materials

FS Federal Specifications

MSDS Material Safety Data Sheets

NCDOT North Carolina Department of Transportation

NCSPA North Carolina Sod Producers Association

USDA United States Department of Agriculture

1.9 PRODUCT DELIVERY, STORAGE AND HANDLING

A. **Handling/Storage**:

1) See Part 3 - EXECUTION of these specifications for handling of sod materials during placement.

2) Observe Nursery's directions for delivery and storage of seed and sod materials.

3) Store and protect fertilizer and lime until item is applied.

1.10 PROJECT CONDITIONS

A. The Contractor is responsible for obtaining all applicable permits (encroachment, grading, etc.), making application, and paying permit fees.

B. Seed mixture shall be chosen to ensure the development of plants during the season of planting, and to ensure future growth and permanence.

C. Protect structures, utilities, sidewalks, pavements, and other facilities, along with lawns and existing exterior plants from damage caused by planting operations.

D. **Temporary Seeding**: Denuded areas to be graded during the construction phases that are not to be brought to final grade shall receive temporary seeding and mulching. Temporary seeding shall also be used to stabilize finished grade areas if the time of year is outside the specified permanent seeding periods. All disturbed areas are to be stabilized with either temporary or permanent vegetation in accordance with Table 2920.1, Stabilization Timeframes, below.

E. **Environmental - Wetlands**: Before crossing or entering into any jurisdictional wetlands, Contractor shall verify whether or not a wetlands permit has been obtained for the encroachment and whether special restrictions have been imposed. Care shall be taken not to disrupt drainage, alter, or destroy non-permitted wetlands unless a permit has been obtained. Restore areas noted on the project drawings, the contract documents, and/or in the permit. All encroachments shall be subject to US COE and NCDENR Division of Water Quality approval and permitting conditions.

F. **Safety**: The Contractor shall keep the surface in a safe and satisfactory condition during the progress of the work.

G. After seeding and mulching, care shall be taken to prevent future runoff destruction of seeded areas.

1.11 SERVICE INTERRUPTION

Contact the City of Wilson to coordinate interruption of service, operation of valves, line cut-ins, or placement of a tapping sleeve and valve. If interruption is necessary, the interruption shall be arranged to occur at such a time to cause the least disruption and minimize loss of service. At the direction of City Engineer, temporary service may be required to be provided. Provide a minimum of 72 hours notice of the proposed utility interruption or necessary operation of valves.

1.12 LOCATING SERVICES

Contact ***"NC One Call"*** 811 before digging.

811
Know what's **below.**
Call before you dig.

1.13 COORDINATION

A. Coordinate placement of groundcover with other Contractors and with the City Engineer.

B. Proceed with planting only when existing and forecasted weather conditions permit.

C. Protect undisturbed lawns, shrubs and trees and promptly repair damages caused by seeding, sodding, and groundcover operation.

1.14 WARRANTY

Warranty period for groundcover: 12 months from date of substantial completion if not designated as temporary cover.

PART 2 – PRODUCTS

2.1 MISCELLANEOUS

2.1.1 TOPSOIL

A. **Topsoil**: Comply with ASTM D 5268, *Standard Specification for Topsoil Used for Landscaping Purposes,* pH range of 5.5 to 7, a minimum of 4% organic material content; free of stones 1 inch or larger in any dimension and other extraneous materials harmful to plant growth.

1) On-site Topsoil Source: Reuse surface soil stockpiled on-site. Verify suitability of stockpiled surface soil to produce topsoil. Clean surface soil of roots, plants, sod, stones, clay lumps, and other extraneous materials harmful to plant growth. Provide erosion control measures to prevent erosion, and off-site deposition of topsoil.

a. Contractor may supplement on-site source with imported or manufactured topsoil when quantities are insufficient. Obtain topsoil from naturally well-drained sites where topsoil occurs at least 4 inches in depth. Do not obtain from swamps or marshes.

2) Off-site Topsoil Source: Obtain topsoil from naturally well-drained sites where topsoil occurs at least 4 inches in depth. Do not obtain from swamps or marshes.

2.1.2 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 formaldehyde, phosphorous, and potassium in the composition as shown on **Standard Detail 350.01**.

B. **Slow-Release Fertilizer**: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the composition as shown on **Standard Detail 350.01**.

2.1.3 LIME

A. **Lime**: ASTM C602, *Standard Specification for Agricultural Liming Materials*, agricultural limestone containing a minimum 80 percent calcium carbonate equivalent, Class O, with a minimum 95 percent passing through No. 8 sieve and a minimum 55 percent passing through No. 60 sieve.

If ordered by the City Engineer, a pelted form of limestone with a water-soluble binder may be required to speed breakdown of limestone.

PART 3 – EXECUTION

3.1 CONSTRUCTION OF SUBGRADE

A. **EXCAVATION, GRADING AND SUBGRADE PREPARATION FOR SEEDING/SODDING**: Excavation, grading and subgrade preparation for seeding and/or sodding shall be in strict compliance with Division 02200, *Earthwork* and Division 02275, *Trenching, Backfilling, and Compaction of Utlities*, and this specification section, as applicable. The subgrade upon which this work is to be placed shall be smoothly shaped and compacted to a firm, even surface conforming to the elevation and cross-sections shown on the plans, the standard

drawings, or as directed by the City Engineer. All soft, frozen, and unsuitable material shall be removed and replaced with approved material.

B. **FINE GRADING (Trimming)**: Fine grading shall be the responsibility of the Contractor to ensure that the finished grade conforms to the proposed finished grades as shown on the plans and the applicable standard details.

3.2 SEEDING, SODDING, AND GROUNDCOVER

3.2.1 GENERAL

Seeding and groundcover includes seedbed preparation, liming, fertilizing, seeding, and mulching of all disturbed areas. Areas inside or outside the limits of construction that are disturbed by the Contractor's operation and activity shall be seeded and mulched.

A. Unless called for otherwise on the Erosion and Sedimentation Control Plan, in areas where natural sod or vegetation has been disturbed, the area shall be fertilized, limed, seeded, and mulched in accordance with **Standard Detail 350.01**.

If a utility line is installed through a landscaped lawn, the seeding shall be modified to restore ground cover comparable to the existing lawn.

B. Seeding shall be carried out as soon as practical after the construction in any one area, and shall be maintained against erosion through the completion of the project. Seeding shall be accomplished as work progresses.

The Contractor shall be responsible for proper care of the seeded area during the period that vegetation is being established. In the event of an erosive rain before an adequate stand of vegetation has been established, damaged areas shall be repaired, fertilized, seeded, and mulched at the Contractor's expense.

C. Seeding on rights of way of NCDOT maintained roads shall be in accordance with NCDOT specifications and the requirements of the approved encroachment permit.

D. **Stockpile Area**: The Contractor is responsible for securing a material lay down and stockpile storage area. As such, the Contractor is responsible for the necessary erosion control measures, including but not necessarily limited to, a construction entrance, silt fence, protection of streams/buffers, clean up and restoration of site to the satisfaction of the City and the NCDENR, Department of Water Quality, Land Quality Section. Stockpile and/or waste areas must be maintained within the limits of the areas protected by the proposed measures and otherwise temporarily seeded if to be left stockpiled over 30 days.

E. **Stabilization Time Frames**:

Table 2920.1 Stabilization Timeframes[a]		
Site Area Description	**Stabilization**	**Timeframe Exceptions**
Perimeter dikes, swales, Ditches, and perimeter slopes	7 days	None
High Quality Water (HQW) Zones	7 days	None
Slopes steeper than 3:1	7 days	If slopes are 10 feet or less in length and are not steeper than 2:1, 14 days are allowed
Slopes 3:1 to 4:1	14 days	-7 days for slopes greater than 50 feet in length and with slopes steeper than 4:1 -7 days for perimeter dikes, swales, ditches, perimeter slopes and HQW Zones
Areas with slopes flatter than 4:1	14 days	-7 days for perimeter dikes, swales, ditches, perimeter slopes and HQW Zones

[a]Effective April 1, 2019. Source: NCDEQ/Division of Energy, Minerals, and Land Resources; Land Quality

Note: After the permanent cessation of construction activities, any areas with temporary ground stabilization shall be converted to permanent ground stabilization as soon as practicable but in no case longer than 90 calendar days after the last land disturbing activity. Temporary ground stabilization shall be maintained in a manner to render the surface stable against accelerated erosion until permanent ground stabilization is achieved.

3.2.2 SODDING/SEEDING

A. GENERAL

The goal of sodding/seeding, where specified, is to return the disturbed area to its original vegetative condition, and to return the area to an aesthetically pleasing environment. Thus, all sodding/seeding shall meet the following requirements:

In most instances the areas requiring sod restoration versus seed restoration should be readily determinable by the Contractor based on preconstruction conditions. In general, where streets have roadside ditches, the area from the edge of pavement to the centerline of the ditch will be reseeded or sodded, depending on the existing condition of the grass. Installation in areas where there are no roadside ditches and traffic does not generally frequent, and has an existing good thick uniform stand of grass, shall be resodded.

Any questionable areas shall be restored in the manner (sodded or seeded) determined on site by the City Engineer.

Vegetative restoration (sodding or seeding) shall be done as the work progresses. Areas to be protected by a vegetative cover include, but are not limited to, any areas disturbed during construction that are not otherwise

stabilized by gravel, concrete, or asphaltic paving, or other impervious built-upon surface.

Any area disturbed without owner authorization will be restored by the Contractor at his own expense. In all cases the Contractor will guarantee a stand of grass over the entire area.

The work to be done to acquire the necessary vegetative cover shall include but is not specifically restricted to appropriate tilling of the area, the application of fertilizer and lime for areas to be seeded, placement of sod, or sowing of seed and placing of a straw mulch to hold the seed and soil in place until germination and growth occur.

After bringing the area to be sodded or seeded to proper grade, the entire area shall be tilled to a minimum depth of 4 inches by discing, harrowing, or other approved means. Following tilling, all large debris and stones shall be removed to the satisfaction of the City Engineer and the surface leveled.

3.2.3 MAINTENANCE OF SEEDED/SODDED AREAS:

Contractor shall provide a suitable backflow prevention devise for filling of water tank trucks or trailers (see **Standard Detail 519.01**). Contractor shall water sodded/seeded areas as necessary for providing for growth of sod/seed.

The Contractor shall provide general care for the restored areas as soon as the sod has been laid (or seeded and mulched), and such care shall continue until final inspection and acceptance of the work. All restored areas shall be protected against traffic or other use by warning signs or barricades approved by the City.

The Contractor shall mow the sodded and/or seeded areas with approved mowing equipment, depending upon climatic and growth conditions and the need for mowing specific areas. In the event that weeds or other undesirable vegetation are permitted to grow to such an extent that, either cut or uncut, they threaten to smother the species, they shall be mowed and the clippings raked and removed from the area. When the surface has been damaged during the period covered by this contract, the affected areas shall be repaired to re-establish the grade and the condition of the soil, as directed by the City Engineer, and shall then be sodded, or seeded, as specified.

3.2.4 SODDING

All existing ornamental grass stands (commercial or private lawns) may be carefully taken up, protected and replaced to their original condition or the Contractor may elect to install new sod of the same grass type. Sod furnished by the Contractor shall have a good cover of living or growing grass. This shall be interpreted to include grass that is seasonally dormant during the cold or dry seasons and capable of renewing growth after the dormant period. All sod shall be obtained from areas where the soil is reasonably fertile and contains a high percentage of loamy topsoil. Sod shall be cut or stripped from living, thickly matted turf relatively free of weeds or other undesirable foreign plants, large stones, roots, or other materials, which might be detrimental to the development of the sod or to future maintenance. At least 70% of the plants in the cut sod

shall be composed of the existing lawn species, and any vegetation more than 6 inches in height, shall be mowed to a height of 3 inches or less before sod is lifted. Sod, including the soil containing the roots and the plant growth showing above, shall be cut uniformly to a thickness not less than 2 inches.

After inspection and approval of the source of sod by the City Engineer, the sod shall be cut with approved sod cutters to such a thickness that after it has been compacted, it shall have a uniform thickness of not less than 2 inches. Sod sections or strips shall be cut in uniform widths, not less than 10 inches, and in lengths of not less than 18 inches, but of such length as may be readily lifted without breaking, tearing, or loss of soil. Where strips are required, the sod must be rolled without damage with the grass folded inside. The Contractor may be required to mow high grass before cutting sod.

The sod shall be transplanted within 24 hours from the time it is stripped, unless circumstances beyond the Contractor's control make storing necessary. In such cases, sod shall be stored in an unrolled condition, irrigated, and protected from exposure to air drafts and sun and shall be kept from freezing. Sod shall be cut and moved only when the soil moisture conditions are such that favorable results can be expected. Where the soil is too dry, permission to cut sod may be granted only after it has been watered sufficiently to moisten the soil to the depth the sod is to be cut.

Sodding shall be performed only during the seasons when satisfactory results can be expected. Frozen sod shall not be used and sod shall not be placed upon frozen soil. Sod may be transplanted during periods of drought with the approval of the City Engineer, provided the sod bed is watered to moisten the soil to a depth of at least 4 inches immediately prior to laying the sod.

The sod shall be moist and shall be placed on a moist earth bed. Pitchforks shall not be used to handle sod, and dumping from vehicles shall not be permitted. The sod shall be carefully placed by hand, edge to edge and with staggered joints, in rows at right angles to the slopes, commencing at the base of the area to be sodded and working upward. The sod shall immediately be pressed firmly into contact with the sod bed by tamping or rolling with approved equipment to provide a true and even surface, and ensure knitting without displacement of the sod or deformation of the surfaces of sodded areas. Where the sod may be displaced during sodding operations, the workmen when replacing it shall work from ladders or treated planks to prevent further displacement. Screened soil of good quality shall be used to fill all cracks between sod sections. The quantity of the fill soil shall not cause smothering of the grass. Where the grades are such that the flow of water will be from paved surfaces across sodded areas, the surface of the soil in the sod after compaction shall be set approximately 1 inch below the pavement edge. Where the flow will be over the sodded areas and onto the paved surfaced around manholes and inlets, the surface of the soil in the sod after compaction shall be placed flush with pavement edges.

Adequate water and watering equipment must be on hand before sodding begins, and sod shall be kept moist until it has become established and its continued growth assured. Contractor shall water sodded areas a minimum of 1 inch of water, twice per week until re-established and once per week thereafter

until work is accepted. In all cases, watering shall be done in a manner, which will avoid erosion from the application of excessive quantities and will avoid damage to the finished surface.

3.2.5 SEEDING

Following surface preparation as described in paragraph 3.1A, *Excavation, Grading and Subgrade Preparation for Seeding/Sodding*, above, unless no soil test results are available, areas to be seeded shall be given an initial application of agricultural lime at a rate of at least 4,000 pounds per acre as well as fertilize and phosphate as shown on **Standard Detail 350.01**, all of which shall be thoroughly mixed with the soil. Dense or compacted soil areas and cut grade soil areas shall be ripped at greater than 6 inches of depth with a spring toothed ripper or similar equipment after finish grade but before tillage. Severely compacted surfaces shall be ripped to at least 12-inches of depth. No compaction soils shall be covered with soil fill until ripped. Finish grades on slopes shall be roughened parallel to contours to maximize surface storage and minimize runoff.

Upon completion of ground and soil preparation work, a grass seed mixture applied in accordance with **Standard Detail 350.01** shall be sown. When permitted to be placed, Bermuda grass seed shall be in an unhulled condition from September 1 to April 1 and be in a hulled condition at all other times. Centipede grass seed is permitted to be planted from April 1 through July 15. Target pH at 5.5 for centipede grass. Substitutions for "Rebel" fescue will be considered acceptable only if the substituted fescue variety has no ratings less than "5" as determined by the USDA 1983 Tall Fescue Trails or more recent USDA trail data. No rye grass or other ground cover species shall be included in the seeding mixture. This shall be followed by placing a suitable cover of clean straw or approved equivalent mulch at the rate specified in **Standard Detail 350.01**. If straw is used as a temporary cover only, these rates shall be doubled or tripled depending upon average slope conditions.

All straw shall be stabilized by the application of an asphalt emulsion or other approved binding materials. Alternative methods such as hydro-seeding or hydro-mulching may be considered on an individual basis.

A stand of grass shall be considered acceptable when area cover is at least 95%. The Contractor shall overseed, and otherwise maintain the grassed areas until the stand of grass has reached a uniform height of 3 to 4 inches and a state of uniform species maturity. The Contractor shall then top-dress the stand of grass with a minimum of 300 pounds per acre of 12-4-8 (4-1-2 or 3-1-2 ratio) fertilizer (or equivalent). Supply at least 1 lb. of nitrogen. Annual weed grasses and grain weeds shall not be considered part of the area cover, and seeding stands shall not be considered acceptable until the stand reaches a state of uniform post-seeding maturity for the specified species.

If straw mulching results in competing stands of grain, maintenance shall include mowing of the grain weed stand to a height of 4 inches prior to reaching a height of 10 inches. Grain weed stands shall not be considered part of the minimum 95% area cover. Unacceptable grass stands shall be overseeded, after aeration

by spiker, at half the original rate, as many times as necessary to establish an acceptable stand.

3.3 CLEANUP

A. Disposal: Remove surplus soil and waste material, unsuitable soil, trash, and debris and legally dispose of off-site.

END OF DIVISION 02920

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