



SEWER LINING CONTRACT 2015

PROJECT NO. 2015-010

BID # 2258

***SET #* _____**

CITY OF CONCORD
ENGINEERING DEPARTMENT
850 WARREN C. COLEMAN BLVD, SOUTH
CONCORD, NORTH CAROLINA 28025
(PO BOX 308, CONCORD, NC, 28026)

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**INVITATION TO BID
SEWER LINING CONTRACT 2015**

Sealed Bids will be received by The City of Concord Engineering Division in Conference Room C, Alfred M. Brown Utilities Complex, 850 Highway 601 S., Concord, North Carolina, 28025, until 2:00 PM, local time, **Thursday March 19, 2015** for City's 2014 Sewer Lining Contract.

At said place and time, and promptly thereafter, all Bids that have been duly received will be publicly opened and read aloud.

The proposed Work is generally described as follows:

CURED IN PLACE PIPE LINING	
Pipe Diameter, Inches	Pipe Length, Linear Feet
8	17,473
10	1,730
12	5,129
Service re-connections	284
Protruding Taps	10

The work will require traffic control, re-connection of approximately 284 service lines, the removal of 10 protruding taps, and the rehabilitation of 53 manholes. These manholes are located on the same lines that are being lined under this contract. In addition, traffic control will be required in several of the heavy traffic area of the city. Contractor must submit a traffic control plan for approval by the city's transportation department prior to any lane closure or street closure. Traffic control must be in compliance with NCDOT requirements, including Work Zone Certification for workers within the work zone.

All Bids must be in accordance with the Bidding Documents on file with: The City of Concord (Engineering Department Office).

Please contact Donna Chandler, chandlp@concordnc.gov to register to bid. Registration for bidding requires the name of the company, physical address, email address, and telephone number.

Bidders must be properly licensed as required by Chapter 87 of the North Carolina General Statutes. All Subcontractors must also be licensed contractors in the State of North Carolina.

Bids will be received on a unit price basis.

5% Bid security must accompany each Bid.

The Successful Bidder will be required to furnish a Construction Performance Bond and a Construction Payment Bond as security for the faithful performance and the payment of all bills and obligations arising from the performance of the Contract. Contractor and all Subcontractors will be required to conform to the labor standards set forth in the Contract Documents.

Standard specifications for collection and distribution of Water and Sewer Authority of Cabarrus County (WSACC) shall be used on this project. Contractor shall obtain standard specifications from WSACC at <http://www.wsacc.org/>

Owner reserves the right to reject any or all Bids, including without limitation the rights to reject any or all nonconforming, non-responsive, unbalanced, or conditional Bids, and will award to lowest responsible Bidder taking into consideration quality, performance, and time specified in Bid Form for performance of Work. Owner also reserves the right to waive informalities.

By: Brian Hiatt, City Manager

INSTRUCTIONS TO BIDDERS

1. **DEFINED TERMS.** Terms used in these Instructions to Bidders shall have the following meanings assigned to them.

Contract Documents – Documents contained herein including contract specifications, project specifications , bid forms and construction contract.

Successful Bidder - The lowest, qualified, responsible, and responsive Bidder to whom Owner (on the basis of Owner's evaluation as herein provided) makes an award.

2. **COPIES OF BIDDING DOCUMENTS.** Bidding Documents, which include all front-end documents, may be obtained from Owner at address indicated on the Invitation to Bid.

Partial sets of Bidding Documents will not be issued in response to requests by subject matter.

Standard Specifications for Wastewater Collection and Water Distribution for Cabarrus County shall be used on this project. Contractor shall obtain standard specifications, current revision date is AUGUST 2006 from Water and Sewer Authority of Cabarrus County (WSACC).

Complete sets of Bidding Documents must be used in preparing Bids; neither Owner nor Engineer assumes any responsibility for errors or misrepresentations resulting from the use of incomplete sets of Bidding Documents.

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.

3. **QUALIFICATIONS OF BIDDERS.** To demonstrate qualifications to perform the Work, Bidder may be required to submit written evidence on financial data, previous experience, present commitments, and other such data as may be requested by Owner or Engineer. Each Bid must contain evidence of Bidder's qualification to do business in the state where the Project is located, or Bidder must agree to obtain such qualification prior to award of the Contract.

4. **EXAMINATION OF CONTRACT DOCUMENTS AND SITE.** It is the responsibility of each Bidder, before submitting a Bid, to (a) thoroughly examine the Contract Documents, (b) visit the sites to become familiar with local conditions that may affect cost, progress, performance, or furnishing of the Work, **please contact Mark Colangelo in Waste Water Resources at (704) 920-5339 to arrange a site visit**, (c) consider federal, state, and local laws and regulations that may affect cost, progress, performance, or furnishing of the Work, (d) study and carefully correlate Bidder's observations with the Contract Documents, and (e) notify Engineer of all conflicts, errors, or discrepancies discovered by Bidder in the Contract Documents.

4.01. **Underground Facilities.** Information and data reflected in the Contract Documents with respect to underground facilities at or contiguous to the site are based upon information and data furnished to Owner and Engineer by owners of such underground facilities or others, and Owner and Engineer disclaim responsibility for the accuracy or completeness thereof unless it is expressly provided otherwise in the Supplementary Conditions.

4.02. **Additional Information.** Before submitting a Bid, each Bidder will, at Bidder's own expense, make or obtain any additional examinations, investigations, explorations, tests, and studies and obtain any additional

information and data which pertain to the physical conditions (surface, subsurface, and underground facilities) at or contiguous to the site or otherwise which may affect cost, progress, performance, or furnishing of the Work and which Bidder deems necessary to determine its Bid for performing and furnishing the Work in accordance with the time, price, and other terms and conditions of the Contract Documents.

On request 24 hours in advance, Owner will provide each Bidder access to the site to conduct such explorations and tests as each 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. Arrangements for site visits shall be made by calling The Office of the Director of Engineering, City of Concord at (704) 920-5425.

4.03. Easements. The lands upon which the Work is to be performed, rights-of-way and easements for access thereto, and other lands designated for use by Contractor in performing the Work are identified in the Contract Documents. All additional lands and access thereto required for temporary construction facilities or storage of materials and equipment are to be provided by Contractor. Easements for permanent structures or permanent changes in existing structures are to be obtained and paid for by Owner unless otherwise specified in the Contract Documents.

4.04. Unit Price Contracts. Bidders must satisfy themselves of the accuracy of the estimated quantities in the bid schedule by examination of the site and a review of the drawings and the specifications, including the addenda. After bids have been submitted, the bidder shall not assert that there was a misunderstanding concerning the quantities of work or the nature of the work to be done.

4.05. Bidder's Representation. The submission of a Bid will constitute an incontrovertible representation by Bidder that Bidder has complied with every requirement concerning examination of the Contract Documents and the site, that without exception the Bid is premised upon performing and furnishing the Work required by the Contract Documents, and that the Contract Documents are sufficient in scope and detail to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.

5. **INTERPRETATIONS AND ADDENDA**. All questions about the meaning or intent of the Bidding Documents and the Contract Documents shall be submitted to Owner in writing. Interpretations or clarifications considered necessary by Owner 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 10 days prior to the date for opening of Bids may not be answered. Only answers issued by Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect.

6. **BID SECURITY**. Each Bid must be accompanied by bid security made payable without condition to Owner in an amount of 5 percent of the Bidder's maximum Bid and in the form of a certified or bank check or a bid bond issued by a surety meeting the requirements set forth in the Contract Specifications.

The bid security of the Successful Bidder will be retained until such Bidder has executed the Agreement, 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 Agreement and furnish the required contract security within the number of days set forth in the Bid Form, 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 7 days after the Effective Date of the Agreement or the day after the last day the Bids remain subject to acceptance as set forth in the Bid Form, whereupon bid security furnished by such Bidders will be returned. Bid security accompanying Bids which are deemed by Owner to be noncompetitive will be returned within 7 days after the bid opening.

7. **CONTRACT TIMES.** The numbers of calendar days within which, or the dates by which, the Work is to be substantially completed and also completed and ready for final payment (the Contract Times) are set forth in the Bid Form.

8. **LIQUIDATED DAMAGES.** Provisions for liquidated damages, if any, are set forth in Exhibit A.

9. **SUBSTITUTES OR "OR-EQUAL" ITEMS.** Where an item or material is specified by a proprietary name, it is done for the purpose of establishing a basis of quality and not for the purpose of limiting competition. The Engineer's intent is to consider alternative products that have the desired essential characteristics. The Engineer will consider any such products offered. Requests for acceptance of alternative products shall be made through Bidders bidding as prime Contractors. Acceptances for substitutions will not be granted directly to suppliers, distributors, or subcontractors. Pursuant to Section 133-3, General Statutes of North Carolina, the following procedures shall be used:

Bidders desiring to submit alternative product proposals for prior acceptance of the Engineers shall submit, in writing, such proposals ten days prior to bid date. Applications received after this time will not be reviewed. Each such request shall include the name of the material or equipment for which it is to be substituted and a complete description of the proposed substitute, including drawings, cuts, performance and test data, and other information necessary for an evaluation. A statement setting forth any changes in other materials, equipment, or other work that incorporation of the substitute would require should be included. The Engineer shall consider and either accept or reject all alternative product proposals submitted.

If, by the close of the fifth day prior to the deadline for receiving Bids, the Engineer has accepted any alternative product proposals, the Bidding Documents shall be modified to include the alternative products. The Engineer shall publish the modification in an Addendum at least 5 days prior to the deadline for receiving Bids. The Engineer's decision of acceptance or rejection of a proposed substitute shall be final.

10. **SUBCONTRACTORS, SUPPLIERS, AND OTHERS.** If the Supplementary Conditions require the identity of certain Subcontractors, Suppliers, and other persons and organizations (including those who are to furnish the principal items of material and equipment) 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 3 days after the bid opening submit to Owner the List of Subcontractors completed with all such Subcontractors, Suppliers, and other persons and organizations proposed for those portions of the Work for which such identification is required. The list shall be accompanied by an experience statement with pertinent information regarding similar projects and other evidence of qualification for each such Subcontractor, Supplier, person, or organization, if requested by Owner. If Owner or Engineer after due investigation has reasonable objection to any proposed Subcontractor, Supplier, or other person or organization, Owner may, before the Notice of Award is given, request the apparent Successful Bidder to submit an acceptable substitute without an increase in the Bid.

All Subcontractors shall be a licensed contractor in the State of North Carolina.

The City of Concord encourages Minority Business participation.

11. **BID FORM.** The Bid Form is bound in the Bidding Documents and shall not be removed therefrom. Bid Forms must be completed in ink.

Bids by corporations must be executed in the corporate name by the president or vice-president (or other corporate officer accompanied by evidence of authority to sign for the corporation). Bids by partnerships must be executed in the partnership name and signed by a partner. Bids by joint ventures shall be signed by each participant in the joint venture or by a representative of the joint venture accompanied by evidence of authority to sign for the joint venture.

The names of all persons signing shall be legibly printed below the signature. A Bid by a person who affixes to his signature the word "president", "secretary", "agent", or other designation without disclosing his principal may be held to be the Bid of the individual signing. When requested by Owner, evidence of the authority of the person signing shall be furnished.

All blanks in the Bid Form shall be filled. A bid price shall be indicated for each unit price item listed therein, or the words "No Bid", "No Charge", "No Change", or other appropriate phrase shall be entered.

The Bid shall contain an acknowledgment of receipt of all Addenda, the numbers and dates of which shall be filled in on the Bid Form.

No alterations in Bids, or in the printed forms therefor, by erasures, interpolations, or otherwise will be acceptable unless each such alteration is signed or initialed by the Bidder; if initialed, Owner may require the Bidder to identify any alteration so initialed.

11.01. Bid Pricing. The Bidder shall complete the schedule of unit prices included in the Bid Form and shall accept all fixed unit prices listed therein.

The total Bid will be determined as the sum of the products of the estimated quantity of each item and the unit price bid. The final Contract Price will be subject to adjustment according to final measured, used, or delivered quantities as provided in Division 1, and the unit prices in the Bid will apply to such final quantities.

11.02. Contingency. The Contingency is to be added to the bid price and is to be used for minor change order items. If the Contingency is to be used, a scope of work and price would be negotiated. The Contingency is for the sole use of Owner. A change order will be issued to delete any unauthorized portion of the Contingency.

12. **SUBMISSION OF BIDS**. Bids shall be submitted at the time and place indicated in the Invitation to Bid, or the modified time and place indicated by Addendum. Bids shall be enclosed in an opaque sealed envelope or wrapping, addressed to:

The City of Concord
W. Brian Hiatt, City Manager
c/o Sue B. Hyde, PE, Director of Engineering
P.O. Box 308, Concord, NC 28026 or
Alfred M. Brown Operations Center, 850 Warren C. Coleman Blvd.
Concord, North Carolina 28025-0308

Bids shall be marked with the name, license number, and address of the Bidder and shall be accompanied by the bid security and other required documents. If the Bid is sent through the mail or other delivery system, the sealed envelope shall be enclosed in a separate envelope with the notation "BID ENCLOSED" on the face of it.

Each Bid envelope shall be identified on the outside with the words "Bid for the 2015 Sewer Lining Contract."

Bidder shall assume full responsibility for timely delivery at the location designated for receipt of Bids. Bids received after the time and date for receipt of Bids will be returned unopened.

One copy of the bound documents containing the Bid Form must be submitted with the Bid.

Oral, telephone, facsimile, or telegraph Bids are invalid and will not receive consideration.

No Bidder may submit more than one Bid. Multiple Bids under different names will not be accepted from one firm or association.

A conditional or qualified bid will not be accepted.

13. **MODIFICATION AND WITHDRAWAL OF BIDS.** Bids 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 at any time prior to the opening of Bids.

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, that Bidder will be disqualified from further bidding on the Work to be provided under the Contract Documents.

14. **OPENING OF BIDS.** Bids will be publicly opened and read aloud. An abstract of the amounts of the Base Bids and major alternatives (if any) will be made available to Bidders after the opening of Bids.

The procedure for opening bids will follow the laws of North Carolina, and applicable regulations of various Licensing Boards.

15. **BIDS TO REMAIN SUBJECT TO ACCEPTANCE.** All Bids will remain subject to acceptance for the number of days set forth in the Bid Form, but Owner may, in its sole discretion, release any Bid and return the bid security prior to that date.

16. **AWARD OF CONTRACT.** Owner reserves the right to reject any or all Bids, including without limitation the rights to reject any or all nonconforming, nonresponsive, unbalanced, or conditional Bids, and will award to lowest responsible Bidder taking into consideration quality, performance, and time specified in Bid Form for performance of Work. Owner also reserves the right to waive informalities.

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

Owner may consider the qualifications and experience of Subcontractors, Suppliers, and other persons and organizations proposed for those portions of the Work for which the identity of Subcontractors, Suppliers, and other persons and organizations must be submitted as provided in the Supplementary Conditions. Owner also may consider the operating costs, maintenance requirements, performance data, and guarantees of major items of materials and equipment proposed for incorporation in the Work when such data is required for submission prior to the Notice of Award.

Owner may conduct such investigations as Owner deems necessary to assist in the evaluation of any Bid and to establish the responsibility, qualifications, and financial ability of Bidders, proposed Subcontractors, Suppliers, and other persons and organizations to perform and furnish the Work in accordance with the Contract Documents to Owner's satisfaction within the prescribed time.

If the Contract is to be awarded, it will be awarded to the lowest Bidder whose evaluation by Owner indicates to Owner that the award will be in the best interests of Owner.

If the Contract is to be awarded, Owner will give the Successful Bidder a Notice of Award within the number of days set forth in the Bid Form.

The evaluation of Suppliers' or manufacturers' data submitted with the Bid, or submitted upon request prior to the Notice of Award, will include consideration of the following:

Owner-required inventory of spare parts.

Building design changes which would be required to accommodate the proposed materials and equipment.

Installation requirements and related engineering, training, and operating costs.

Experience and performance record of the Supplier or the manufacturer.

Maintenance and frequency of inspections required to assure reliable performance of the equipment.

Suppliers' or manufacturers' service facilities and availability of qualified field service personnel.

Efficiency and related operating expense during the anticipated useful life of the equipment.

17. **CONTRACT SECURITY**. The Contract Specifications set forth Owner's requirements as to Performance and Payment Bonds. These Bonds shall be delivered to Owner with the executed Agreement.

18. **SIGNING OF AGREEMENT**. When Owner gives a Notice of Award to the Successful Bidder, it will be accompanied by four unsigned counterparts of the Agreement with all other written Contract Documents attached. Within the number of days set forth in the Bid Form, the Successful Bidder shall sign, leaving the dates blank, and deliver the required number of counterparts of the Agreement and attached documents to Owner with the required Bonds and power of attorney. Within 30 days thereafter, Owner shall execute all copies of the Agreement and other Contract Documents submitted by Contractor (Successful Bidder); shall insert the date of contract on the Agreement, Bonds, and power of attorney; and shall distribute signed copies as stipulated in the Agreement.

Should the Owner not execute the Contract within the period specified, the Successful Bidder may, by written notice, withdraw his signed Contract. Such notice or withdrawal shall be effective upon receipt of the notice by the Owner.

19. **SALES AND USE TAXES**. Provisions for sales and use taxes, if any, are set forth in the Contract Specifications.

20. **RETAINAGE**. Provisions concerning retainage are set forth in the Contract Specifications. The City shall keep a 10% retainage on the project. Once the project is 50% complete, the City has the option to keep the retainage at 10% or lower it to 5%.

21. **LAWS AND REGULATIONS.** Additional provisions, if any, concerning Laws and Regulations are set forth in the Contract Specifications.

21.01. **Collusive Bidding.** In accordance with Section 112(c) of Title 23 USC, and G.S. 75-5(b)(7) of the State of North Carolina, the Contractor (Bidder), by submission and execution of this bid, certifies that he has not entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of free competitive bidding in connection with his bid on this project.

STANDARD FORM CONSTRUCTION CONTRACT

This contract is made and entered into as of the ___ day of _____, 20___, by the City of CONCORD ("City") and _____ ("Contractor"), (x) a corporation, () a professional corporation, () a professional association, () a limited partnership, () a sole proprietorship, or () a general partnership; organized and existing under the laws of the State of _____.

Sec. 1. Background and Purpose.

Sec. 2. Services and Scope to be Performed. The Contractor shall provide _____ at the charges set forth either in this paragraph or in Exhibit "A". Additional Exhibits may be used to further define this Agreement when the Contractor and City so agree. Any additional exhibits shall be designated as exhibits to the Agreement with capitalized, sequential letters of the alphabet, shall be attached hereto and incorporated herein by reference as if the same were fully recited, and shall become terms of this Agreement upon execution by both parties. In this contract, "services" means the services that the Contractor is required to perform pursuant to this contract and all of the Contractor's duties to the City that arise out of this contract. Any amendments, corrections, or change orders by either party must be made in writing signed in the same manner as the original. (This form may be used for amendments and change orders.) The City reserves the right to refuse payment for any work outside that authorized herein or pursuant to a duly approved amendment or change order.

Sec. 3. Complete Work without Extra Cost. Unless otherwise provided, the Contractor shall obtain and provide, without additional cost to the City, all labor, materials, equipment, transportation, facilities, services, permits, and licenses necessary to perform the Work.

Sec. 4. Compensation. The City shall pay the Contractor for the Work as described in this paragraph below OR as described in Exhibit A attached. In the event of a conflict, the provisions of this paragraph shall control. Any additional expenses or charges shall only be paid after both the City and the Contractor agree to and execute a written change order. The City shall not be obligated to pay the Contractor any fees, payments, expenses or compensation other than those authorized in this contract or in a duly-approved change order.

Sec. 4a. Retainage. The City shall withhold no retainage on Contracts having a "total project cost" of less than \$100,000.00. The City may withhold retainage on contracts having a total project cost between \$100,000 and \$200,000. The City shall withhold retainage on contracts whose total project cost exceeds \$300,000. When withheld, retainage shall equal no more than five percent of each progress payment. When the project is fifty per cent complete, the City shall not retain anything from future project payments provided that (i) the surety concurs in writing, (ii) the Contractor continues to perform satisfactorily, (iii) any non-conforming work identified in writing by the architect, engineer(s) or City has been corrected by the Contractor and accepted by the architect, engineer(s) or City. However, if the City determines that the Contractor's performance is unsatisfactory, the City may withhold up to five percent retainage from each project payment. The City may withhold additional amounts above five percent for unsatisfactory job progress, defective construction not remedied, disputed work, third party claims filed against the owner or reasonable evidence that a third-party claim will be filed.

Definitions:

"Total Project Cost": Total value of the Contract and any approved change orders or amendments.

"Project Fifty Percent Complete": When the Contractor's gross project invoices (excluding the value of the materials stored off-site) equal or exceed fifty percent of the value of the contract, except that the value of materials stored on-site shall not exceed twenty percent of the Contractor's gross project invoices for the purpose of determining whether the project is fifty percent complete.

Sec. 5. Term. The Contractor shall commence work within _____ () days of the date of its receipt of written Notice to Proceed from the City. The date that is _____ () days from the date of the Contractor’s receipt of the Notice to Proceed shall be the “Commencement Date.” All work as set forth in the Scope of Services in Exhibit “A” shall be completed within _____ () calendar days of the Commencement Date. The date that is _____ () calendar days from the Commencement Date shall be the “Completion Date.” Time is of the essence with regard to this Project. If Contractor’s obligations are not completed by the Completion Date, the City reserves the right to nullify this Agreement, order the Contractor to immediately cease all work under this Agreement and vacate the premises, and to seek professional services equivalent to those outlined in Exhibit “A.” The Contractor shall be held accountable for all damages incurred by the City as a consequence of the missed Completion Date. The exercise of any of these rights by the City shall not be interpreted to prejudice any other rights the City may have in law or equity. This Contract shall not be automatically extended unless agreed to in writing by the City or as provided in Exhibit “A”.

Sec. 6. Contractor’s Billings to City. Payments will be made in accordance with the schedule found in this section below OR attached at Exhibit A. Contractor shall submit an original pay request (invoice) to the City Purchasing Agent by the first of each month in order to expedite payment. Upon receipt of the request the City Purchasing Agent shall verify the amounts and if correct forward the request to the Accounts Receivable Division of the Finance Dept. Final payment on the contract shall be made in 45 days, except in the case of retainage. Within 60 days after the submission of the final pay request, the City (with the written consent of the surety) shall release to the Contractor all retainage payments IF the City receives a certificate of substantial completion from the architect, engineer or designer-in-charge of the project OR the City receives beneficial occupancy and use of the project. In either case, the City may retain up to 2.5 times the estimated value of the work to be completed or corrected.

Sec. 7. Insurance. Contractor shall maintain and cause all sub-contractors to maintain insurance policies at all times with minimum limits as follows:

<u>Coverage</u>	<u>Minimum Limits</u>
Workers’ Compensation	\$100,000 each accident, \$100,000 bodily injury by disease each employee, \$500,000 bodily injury by disease policy limit
General Liability	\$1,000,000 per occurrence regardless of the contract size
Automobile Liability	\$1,000,000 per occurrence regardless of the contract size
Umbrella	<input type="checkbox"/> \$1,000,000 per occurrence if contract does not exceed 180 days and does not exceed \$500,000; otherwise,
	<input type="checkbox"/> \$2,000,000

Contractor shall provide a Certificate of Insurance to the City listing the City as an additional insured. Such Certificate shall be in a form acceptable to the City.

Sec. 8. Documentation Requirements:

A. Contractor shall provide the City with a **Certificate of Insurance** for review prior to the issuance of any contract or Purchase Order. All Certificates of Insurance will require written notice by the insurer or contractor’s agent in the event of cancellation, reduction or other modifications of coverage by the insurer. Such notice shall be not less than 30 days for nonrenewal by the insurer, not less than 10 days for cancellation due to nonpayment of the premium and as soon as possible for all other types of modifications. In addition to the notice requirement above, Contractor shall provide the City with written notice of cancellation, reduction, or other modification of coverage of insurance whether instigated by the insurer or by the Contractor immediately upon Contractor’s receipt of knowledge of such modifications. Upon failure of the Contractor to provide such notice, Contractor assumes sole responsibility for all losses incurred by the City for which insurance would have provided coverage. The insurance certificate shall

be for the insured period in which the initial contract period begins and shall be renewed by the contractor for each subsequent renewal period of the insurance for so long as the contract remains in effect.

The City shall be named as an **additional insured** on all policies except Workers' Compensation and it is required that coverage be placed with "A" rated insurance companies acceptable to the City. Statement should read, "City of Concord is added as an additional insured as evidenced by an endorsement attached to this certificate." Failure to maintain the required insurance in force may be cause for termination of this Agreement. In the event that the contractor fails to maintain and keep in force the insurance herein required, the City has the right to cancel and terminate the Agreement without notice.

B. All those doing business with the City must have a current **Privilege License** issued by the City of Concord if a privilege license is authorized by law.

C. Contractor shall provide a completed W-9 form to the City prior to execution by the City of this Agreement.

Sec. 9. Performance of Work by Contractor.

(a) The Contractor warrants that all work performed under this contract conforms to the contract requirements and is free of any defect in equipment, material, or design furnished, or workmanship performed by the Contractor or any subcontractor or supplier at any tier. This warranty shall continue for a period of 1 year from the date of issuance by the City of written final completion of the work.

(b) The Contractor shall remedy at the Contractor's expense any failure to conform, or any defect. In addition, the Contractor shall remedy at the Contractor's expense any damage to City - owned or controlled real or personal property, when that damage is the result of--

- (1) The Contractor's failure to conform to contract requirements; or
- (2) Any defect of equipment, material, workmanship, or design furnished.

(c) The Contractor shall restore any work damaged in fulfilling the terms and conditions of this clause. The Contractor's warranty with respect to work repaired or replaced will run for 1 year from the date of repair or replacement.

(d) The City shall notify the Contractor, in writing, within a reasonable time, not to exceed 30 days, after the discovery of any failure, defect, or damage.

(e) If the Contractor fails to remedy any failure, defect, or damage within a reasonable time, not to exceed 30 days unless otherwise agreed in writing and signed by the City Manager or his designee, after receipt of notice, the City shall have the right to replace repair, or otherwise remedy the failure, defect, or damage at the Contractor's expense.

(f) With respect to all warranties, express or implied, from subcontractors, manufacturers, or suppliers for work performed and materials furnished under this contract, the Contractor shall--

- (1) Obtain all warranties that would be given in normal commercial practice,
- (2) Require all warranties to be executed, in writing, for the benefit of the City, if directed to do so by the City; and
- (3) Enforce all warranties for the benefit of the City, if directed to do so by the City

(g) In the event the Contractor's warranty has expired, the City may bring suit at its expense to enforce a subcontractor's, manufacturer's, or supplier's warranty.

(h) Unless a defect is caused by the negligence of the Contractor or subcontractor or supplier at any tier, the Contractor shall not be liable for the repair of any defects of material or design furnished by the City nor for the repair of any damage that results from any defect in City-furnished material or design.

Sec. 10. Performance of Work by City. If the Contractor fails to perform the Work in accordance with the schedule referred to in Exhibit "A", the City may, in its discretion, perform or cause to be performed some or all of the Work, and doing so shall not waive any of the City's rights and remedies. Before doing so, the City shall give the Contractor reasonable notice of its intention. The Contractor shall reimburse the City for all costs incurred by the City in exercising its right to perform or cause to be performed some or all of the Work pursuant to this section.

Sec. 11. Attachments. Additional Exhibits may be used to further define this Agreement when the Contractor and City so agree. Any additional exhibits shall be designated as exhibits to the Agreement with capitalized, sequential letters of the alphabet, shall be attached hereto and incorporated herein by reference as if the same were fully recited, and shall become terms of this Agreement upon execution by both parties.

The following attachments are made a part of this contract and incorporated herein by reference:

- (a) Exhibit "A" – Scope of Services / Fee for Scope of Services.
- (b) Exhibit "B" – Contractor must execute the Affidavit attached as Exhibit B, attesting to compliance with state and federal laws related to E-Verify.
- (c) Exhibit "C" – Tax Form(s).
- (d) Exhibit "D" - Certificate of Insurance.

In case of conflict between an attachment and the text of this contract excluding the attachment, the text of this contract shall control. Any attachment that materially alters the standard terms contained herein must be reviewed by the City Attorney and approved by the City in writing.

Sec. 12. Notice. (a) All notices and other communications required or permitted by this contract shall be in writing and shall be given either by personal delivery, fax, or certified United States mail, return receipt requested, addressed as follows:

To the City:

Sue Hyde, Director of Engineering
City of Concord
P.O. Box 308
Concord, NC 28206
Fax Number: (704) 786-4521

To the Contractor:

VaLerie Kolczynski, Esq.
Interim City Attorney
PO Box 308
Concord, NC 28026
Fax Number: (704) 784-1791

(b) **Change of Address, Date Notice Deemed Given:** A change of address, fax number, or person to receive notice may be made by either party by notice given to the other party. Any notice or other communication under this contract shall be deemed given at the time of actual delivery, if it is personally delivered or sent by fax. If the notice or other communication is sent by US Mail, it shall be deemed given upon the third calendar day following the day on which such notice or other communication is deposited with the US Postal Service or upon actual delivery, whichever first occurs.

Sec. 13. Indemnification. To the maximum extent allowed by law, the Contractor shall defend, indemnify, and save harmless the City of Concord, its agents, officers, and employees, from and against all charges that arise in any manner from, in connection with, or out of this contract as a result of the acts or omissions of the Contractor or subcontractors or anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable except for damage or injury caused solely by the negligence of the City its agents, officers, or employees. In performing its duties under this section, the Contractor shall at its sole expense defend the City of Concord, its agents, officers, and employees with legal counsel reasonably acceptable to City. As used in this subsection – "Charges" means claims, judgments, costs, damages, losses, demands, liabilities, duties, obligations, fines, penalties, royalties,

settlements, expenses, interest, reasonable attorney's fees, and amounts for alleged violations of sedimentation pollution, erosion control, pollution, or other environmental laws, regulations, ordinances, rules, or orders. Nothing in this section shall affect any warranties in favor of the City that are otherwise provided in or arise out of this contract. This section is in addition to and shall be construed separately from any other indemnification provisions that may be in this contract. This section shall remain in force despite termination of this contract (whether by expiration of the term or otherwise) and termination of the services of the Contract under this contract.

Sec. 14. Corporate Status. If the Contractor is dissolved or suspended and the Contractor does not notify the City of such dissolution within three (3) business days from date of dissolution or suspension, and/or the corporate status is not reinstated within thirty (30) days, this contract, at the sole option of the City, shall be declared null and void or the Contractor shall execute a new contract showing the Contractor's correct legal entity.

Sec. 15. Miscellaneous.

(a) Choice of Law and Forum. This contract shall be deemed made in Cabarrus County, North Carolina. This contract shall be governed by and construed in accordance with the laws of North Carolina. The exclusive forum and venue for all actions arising out of this contract shall be the appropriate division of the North Carolina General Court of Justice, in Cabarrus County. Such actions shall neither be commenced in nor removed to federal court. This section shall not apply to subsequent actions to enforce a judgment entered in actions heard pursuant to this section.

(b) Waiver. No action or failure to act by the City shall constitute a waiver of any of its rights or remedies that arise out this contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed in writing.

(c) Performance of Government Functions. Nothing contained in this contract shall be deemed or construed so as to in any way estop, limit, or impair the City from exercising or performing any regulatory, policing, legislative, governmental, or other powers or functions.

(d) Severability. If any provision of this contract shall be unenforceable, the remainder of this contract shall be enforceable to the extent permitted by law.

(e) Assignment, Successors and Assigns. Without the City's written consent, the Contractor shall not assign (which includes to delegate) any of its rights (including the right to payment) or duties that arise out this contract. Unless the City otherwise agrees in writing, the Contractor and all assigns shall be subject to all of the City's defenses and shall be liable for all of the Contractor's duties that arise out of this contract and all of the City's claims that arise out of this contract. Without granting the Contractor the right to assign, it is agreed that the duties of the Contractor that arise out of this contract shall be binding upon it and its heirs, personal representatives, successors, and assigns.

(f) Compliance with Law. In performing all of the Work, the Contractor shall comply with all applicable law.

(g) City Policy. THE CITY OPPOSES DISCRIMINATION ON THE BASIS OF RACE AND SEX AND URGES ALL OF ITS CONTRACTORS TO PROVIDE A FAIR OPPORTUNITY FOR MINORITIES AND WOMEN TO PARTICIPATE IN THEIR WORK FORCE AND AS SUBCONTRACTORS AND VENDORS UNDER CITY CONTRACTS.

(h) EEO Provisions. During the performance of this Contract the Contractor agrees as follows: (1) The Contractor shall not discriminate against any employee or applicant for employment because of race, color, religion, sex, national origin, political affiliation or belief, age, or handicap. The Contractor shall take affirmative action to insure that applicants are employed and that employees are treated equally during employment, without regard to race, color, religion, sex, national origin, political affiliation or belief, age, or handicap. The Contractor shall post in conspicuous places available to employees and applicants for employment, notices setting forth these EEO provisions. (2) The Contractor in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, national origin, political affiliation or belief, age, or handicap.

(i) No Third Party Right Created. This contract is intended for the benefit of the City and the Contractor and not any other person.

(j) Principles of Interpretation. In this contract, unless the context requires otherwise the singular includes the plural and the plural the singular. The pronouns "it" and "its" include the masculine and feminine. Reference to statutes or regulations include all statutory or regulatory provisions consolidating, amending, or replacing the statute or regulation. References to contracts and agreements shall be deemed to include all amendments to them. The word "person" includes natural persons, firms, companies associations, partnerships, trusts, corporations, governmental agencies and units, and any other legal entities.

(k) Modifications, Entire Agreement. A modification of this contract is not valid unless signed by both parties and otherwise in accordance with requirements of law. Further, a modification is not enforceable against the

City unless the City Manager or other duly authorized official signs it for the City. This contract contains the entire agreement between the parties pertaining to the subject matter of this contract. With respect to that subject matter, there are no promises, agreements, conditions, inducements, warranties, or understandings, written or oral, expressed or implied, between the parties, other than as set forth or referenced in this contract.

(l) Corporate Seal. If a corporate seal is included by any party to this Contract, it is only for authentication purposes. This Contract is not signed under seal.

(The following section applies to construction contracts only if amount is over \$50,000)

Sec. 16. Bonding. Both performance and payment bonds for the full amount of this Contract are required to be attached. Instead of bonds, you may submit a letter from your banker or stockbroker stating that cash, certified checks or government securities in the amount of this Contract will be submitted. The performance bond shall have a value equal to 100% of this Contract. This bond shall be conditioned upon faithful performance of the contract in accordance with the plans, specifications and conditions of the contract. The performance bond shall be solely for the protection of the City. The payment bond shall be in an amount equal to 100% of the Contract, and conditioned upon the prompt payment for all labor or materials for which a contractor or subcontractor is liable. The payment bond shall be solely for the protection of the persons furnishing materials or performance labor for which a contractor or subcontractor is liable.

Sec. 17. Dispute Resolution. It is understood and agreed that NCGS 143-128(f1-g) requires that disputes arising under an agreement for the erection, construction, alteration or repair of a building be subject to a dispute resolution process specified by the City. The amount in controversy shall be at least \$15,000.00 before this dispute resolution procedure may be used. In compliance with this statutory provision, the City specifies this Section as the dispute resolution process to be used on this Project. It is further understood and agreed that this dispute resolution process is based on non-binding mediation and will only be effective to the extent that the Parties to any mediated dispute participate in the mediation in good faith. It is also understood and agreed that the City is under no obligation under any circumstance to secure or enforce the participation of any other Party in the mediation of any dispute subject to this Section and NCGS 143-128(f1-g).

This Section 17 does not apply to:

- (a) The purchase and erection of prefabricated or relocatable buildings or portions of such buildings, except that portion of the work that must be performed at the construction site; or**
- (b) The erection, construction alteration or repair of a building when the cost of such building is \$300,000 or less.**

17.1 Any dispute arising between or among the Parties listed in Section 17.3 that arises from an agreement to construct the Project, including without limitation a breach of such agreement, shall be subject to non-binding mediation administered by the American Arbitration Association under its Construction Industry Mediation Rules (“Rules”), except as otherwise expressly set forth in this Section. To the extent any provision of the Rules is inconsistent with the provisions of this Section, the provisions of this Section shall control. The mediation provided in this Section shall be used pursuant to this Agreement and NCGS 143-128(F1-g) and is in lieu of any dispute resolution process adopted by the North Carolina State Building Commission, which process shall not apply to this Project.

17.2 For purposes of this Section the following definitions shall apply:

- a. *Agreement to construct the Project* means an agreement to construct the Project that is subject to the requirements of NCGS 143-128 and does not include any agreement related to the Project that is not subject to said statute.
- b. *Construct or construction* refers to and includes the erection, construction, alteration or repair of the Project.
- c. *Party or Parties* refers to the parties listed in Section 16.4.
- d. *Project* means the building to be erected, constructed, altered or repaired pursuant to this

Agreement.

17.3 The City and any Party contracting with the City or with any first-tier or lower-tier subcontractor for the construction of the Project agree to participate in good faith in any mediation of a dispute subject to this Section and NCGS 143-128(f1-g), including without limitation the following Parties (if any): architect(s), engineer(s), surveyor(s), construction manager, construction manager at risk, prime contractor(s), surety(ies), subcontractor(s), and supplier(s).

17.4 In order to facilitate compliance with NCGS 143-128(f1-g), the Contractor and all other Parties shall include this Section in every agreement to which it (any of them) is a Party for the construction of the Project without variation or exception. Failure to do so will constitute a breach of this Agreement, and the Contractor or other Party failing to include this Section in any agreement required by this Section shall indemnify and hold harmless the remaining Parties from and against any and all claims, including without limitation reasonable attorney fees and other costs of litigation, arising in any manner from such breach. Notwithstanding the foregoing provisions of this Section, it is expressly understood and agreed that the Parties are intended to be and shall be third-party beneficiaries of the provisions of this Section and can enforce the provisions hereof.

17.5 The following disputes are not subject to mediation: (i) a dispute seeking a non-monetary recovery; and (ii) a dispute seeking a monetary recovery of \$15,000 or less.

17.6 A dispute seeking the extension of any time limit set forth in an agreement to construct the Project shall be subject to mediation pursuant to this Section and NCGS 143-128(f1-g), but only if the damages which would be suffered by the Party seeking the extension would exceed \$15,000 if the disputed extension is denied. To the extent that liquidated damages are set forth in such agreement as the measurement of damages for failure by such Party to meet such time limit, such liquidated damages shall be the exclusive standard for determining the amount of damages associated with such dispute.

17.7 For purposes of this Section, a dispute is limited to the recovery of monetary damages from the same transaction or occurrence against a single Party or two or more Parties alleged to be liable jointly, severally or in the alternative. Two or more disputes may not be consolidated or otherwise combined without the consent of all Parties to such disputes.

17.8 In addition to such matters as are required by the Rules, a request for mediation shall include the amount of the monetary relief requested.

17.9 Prior to requesting mediation, a Party must form a good faith belief that it is entitled under applicable law to recover the monetary amount to be included in the request from one or more of the remaining Parties. Such belief must be based on a reasonable and prudent investigation into the dispute that is the subject of the request. The request for mediation must be based on such investigation and may not include any amount or the name of any remaining Party, unless supported by such investigation and good faith belief by the Party requesting the mediation.

17.10 If a Party breaches any provision of Section 17.9, it shall indemnify and hold harmless all other Parties from any costs, including reasonable attorney fees and other costs of litigation, and damages incurred by such other Parties that arise from such breach.

17.11 All expenses incurred by a Party to a dispute in preparing and presenting any claim or defense at the mediation shall be paid by the Party. Such expenses include without limitation preparation and production of witnesses and exhibits and attorney fees. All other expenses of the mediation, including filing fees and required traveling and other expenses of the mediator, shall be borne as follows: one half by the Party requesting the mediation, with the remaining parties paying equal shares of the remaining expenses and costs; provided that, if the City is named as a party to the mediation, the City shall pay at least one-third of the mediation expenses and costs divided among the Parties. If more than one Party to a dispute requests a mediation, the mediation expenses and costs to be divided among the Parties shall be borne equally by the Parties to the dispute; provided that, if the City is named as a Party to the mediation, the City shall pay at least one-third of the mediation expenses and costs divided among the Parties.

17.12 The mediation shall be held at a location agreeable to the mediator and all of the Parties; provided that, if no agreement can be reached, the mediation will be held at such location in Cabarrus County as the mediator shall determine.

17.13 The provisions of this Section are subject to any other provision of this Agreement concerning the submission, documentation and/or proof of any claim or dispute. Such other provisions shall apply in full force and shall be satisfied as a condition precedent to mediation pursuant to this Section.

17.14 The Parties understand and agree that mediation in accordance with this Section shall be a condition precedent to institution of any legal or equitable proceeding seeking monetary recovery based on any dispute that is subject to mediation pursuant to this Section.

Sec. 18. Breach. In the event of a violation of any material term of this Agreement, the non-violating party may terminate the Agreement upon written notice. Such notice shall state the violation with specificity and shall give ten (10) days to cure the violation. The cure period shall be measured as ten (10) days from the date of receipt of notice by the violating party, or, if the date is not known, then thirteen (13) days from the date the notice is placed in the United States Post. If the violation remains uncorrected at the end of the cure period, the Agreement shall be terminated without any further action by the non-violating party. Any remaining disputes shall be subject to the dispute resolution procedure set forth above, if applicable.

IN WITNESS WHEREOF, the City of Concord and the Contractor have caused this contract to be executed by their respective duly authorized agents or officers.

CITY OF CONCORD:

(Typed or Printed Legal Name of Contractor)

By: _____
City Manager

By: _____
Signature of President/Vice President/Manager/Partner

Date: _____

Printed Name: _____

Title: _____

ATTEST BY:

Date: _____

City Clerk

ATTEST:

BY: _____
Signature of Vice President, Secretary, or other officer

Printed Name: _____

Title _____

APPROVED AS TO FORM:

Attorney for the City of Concord

SEAL

APPROVAL BY CITY FINANCE OFFICER

This instrument has been pre-audited in the manner required by the Local Government Budget and Fiscal Control Act.

Signature

EXHIBIT A
BID FORM,
LIST OF LINES & MANHOLES

EXHIBIT A

BID FORM

PROJECT IDENTIFICATION: **Sewer Lining Contract 2015**

Contract 2015-010

THIS BID IS SUBMITTED TO:

W. Brian Hiatt, City Manager
c/o Sue B. Hyde, PE Director of Engineering
City of Concord
850 Warren C. Coleman Blvd.
Concord, North Carolina 28025
(PO Box 308, Concord, NC, 28026-0308)

1. The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an agreement with Owner in the form included in the Contract Documents to perform and furnish all Work as specified or indicated in the Contract Documents within the specified time and for the amount indicated in this Bid and in accordance with the other terms and conditions of the Contract Documents.

2. Bidder accepts all of the terms and conditions of the Invitation to Bid and the Instructions to Bidders, including without limitation those dealing with the disposition of bid security. This Bid will remain subject to acceptance for 60 days after the day of bid opening. Bidder will sign and submit the Agreement with the Bonds and other documents required by the Bidding Documents within 10 days after the date of Owner's Notice of Award.

3. In submitting this Bid, Bidder represents that:

a. Bidder has examined copies of all the Bidding Documents and of the following Addenda (receipt of all which is hereby acknowledged):

No. _____ Dated _____

b. Bidder has visited the site and become familiar with and satisfied itself as to the general, local, and site conditions that may affect cost, progress, performance, and furnishing of the Work.

EXHIBIT A

- c. Bidder is familiar with and has satisfied itself as to all Federal, state, and local Laws and Regulations that may affect cost, progress, performance, and furnishing of the Work.
 - d. Bidder has obtained and carefully studied (or assumes responsibility for having done so) all such additional or supplementary examinations, investigations, explorations, tests, studies, and data concerning conditions (surface, subsurface, and underground facilities) at or contiguous to the site or otherwise which may affect cost, progress, performance, or furnishing of the Work or which relate to any aspect of the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder and safety precautions and programs incident thereto. Bidder does not consider that any additional examinations, investigations, explorations, tests, studies, or data are necessary for the determination of this Bid for performance and furnishing of the Work in accordance with the time, price, and other terms and conditions of the Contract Documents.
 - e. Bidder is aware of the general nature of Work to be performed by Owner and others at the site that relates to Work for which this Bid is submitted as indicated in the Contract Documents.
 - f. Bidder has correlated the information known to Bidder, 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.
 - g. Bidder has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Contract Documents and the written resolution thereof by Engineer is acceptable to Bidder, and the Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performing and furnishing the Work for which this Bid is submitted.
 - h. This Bid is genuine and not made in the interest of or on behalf of any undisclosed person, firm, or corporation 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 person, firm, or corporation to refrain from bidding; and Bidder has not sought by collusion to obtain for itself any advantage over any other Bidder or over Owner.
4. Bidder will complete the Work for the following unit prices. Quantities indicated are estimated and not guaranteed; they are solely for comparing Bids and establishing the initial Contract Price. Final payment will be based on actual quantities.

EXHIBIT A

**UNIT PRICE SCHEDULE
Contract 2015-010**

Item No.	Item Description	Quantity	Unit Price (\$)	Item Total (\$)
1	8 Inch Lining	17,473 LF		
2	10 Inch Lining	1,730 LF		
3	12 Inch Lining	5,129 LF		
4	Removing protruding taps	10 ea.		
5	Re-connection of Service lines	284 ea.		
6	Manhole Rehab	321 VF		
7	Traffic Control. Lump Sum.	1 L.S.		
8	BASE BID :			
9	10% CONTINGENCY:			
10	TOTAL BID:			

* Item 6 Manhole restoration shall be in accordance Section 2.2 Cementitious Manhole Restoration of NASSCO Specifications for "Manhole Rehabilitation -Guideline Specifications" December 2013.

5. The following lines will require a traffic control plan and may require night work:

- All lines on Union Street
- All lines on Spring Street
- All Lines on Corban Ave.
- All lines on Wilshire Ave.

Depending on the set up required at any of the lines, additional traffic control may be necessary in addition to the streets listed above. It is the responsibility of the contractor to provide all necessary signs and personnel for traffic control.

6. Bidder agrees that the Work will be complete within **120 days** of the date of the Notice to Proceed. Liquidated damages are set at \$200.00 per day past the completion date set forth in the construction contract.

7. Communications concerning this Bid shall be sent to Bidder at the following address:

NAME: _____

ADDRESS: _____

EXHIBIT A

P.O. BOX: _____

CITY: _____ STATE: _____

ZIP CODE: _____

7. The terms used in this Bid, which are defined in the General Conditions included as part of the Contract Documents, have the meanings assigned to them in the General Conditions.

SIGNATURE OF BIDDER

Contractor's License Number _____

License Expiration Date _____

If an Individual

By _____ (signature of individual)

Doing business as _____

Business address _____

Phone No. _____

Date _____, 20_____

ATTEST _____ TITLE _____

If a Partnership

By _____
(Firm name)

By _____ (signature of individual)

Business address _____

Phone No. _____

Date _____, 20_____

ATTEST _____ TITLE _____

EXHIBIT A

If a Corporation

By _____
(Corporation name)

By _____
(signature of authorized person) (title)

Business address _____

Phone No. _____

Date _____, 20_____

ATTEST _____ TITLE _____

(Seal)

IF A JOINT VENTURE (Other party must sign below.)

Contractor's License Number _____

License Expiration Date _____

If an Individual

By _____
(Signature of individual)

Doing business as _____

Business address _____

Phone No. _____

Date _____, 20_____

ATTEST _____ TITLE _____

If a Partnership

By _____
(Firm)

EXHIBIT A

(Signature of general partner)

Business address _____

Phone No. _____

Date _____, 20____

ATTEST _____ TITLE _____

If a Corporation

By _____
(Corporation name)

By _____
(Signature of authorized person) (Title)

Business address _____

Phone No. _____

Date _____, 20____

ATTEST _____ TITLE _____

(Seal)

PERFORMANCE BOND

Date of Execution of this Bond _____

Name and Address of
Principal (Contractor) _____

Name and Address
of Surety _____

Name and Address of

EXHIBIT A

Contracting Body

Amount of Bond

Contract

That certain contract by and between the Principal and the Contracting Body above named dated _____ for _____

KNOW ALL MEN BY THESE PRESENTS, that we, the PRINCIPAL and SURETY above named, are held and firmly bound unto the above-named Contracting Body, hereinafter called the Contracting Body, in the penal sum of the amount stated above for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the Principal entered into a certain contract with the Contracting Body, identified as shown above and hereto attached;

NOW THEREFORE, if the Principal shall well and truly perform and fulfill all the undertakings, covenants, terms, conditions, and agreements of said contract during the original term of said contract and any extensions thereof that may be granted by the Contracting Body, with or without notice to the Surety, and during the life of any guaranty required under the contract, and shall also well and truly perform and fulfill all the undertakings, covenants, terms, conditions, and agreements of any and all duly authorized modifications of the contract that may hereafter be made, notice of which modifications to the Surety being hereby waived, then, this obligation to be void; otherwise, to remain in full force and virtue.

EXHIBIT A

PERFORMANCE BOND: (Continued)

THIS PERFORMANCE BOND is made and given pursuant to the requirements and provisions of Section 129 of Chapter 143 of the General Statutes of North Carolina and pursuant to Article 3 of Chapter 44-A of the General Statutes of North Carolina, and each and every provision set forth and contained in Section 129 of Chapter 143 and in Article 3 of Chapter 44-A of the General Statutes of North Carolina is incorporated herein, made a part hereof, and deemed to be conclusively written into this Bond.

IN WITNESS WHEREOF, the above-bounden parties have executed this instrument under their several seals as of the date indicated above, the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned and representative, pursuant to authority of its governing body.

WITNESS:

Principal (Name of individual and trade name,
partnership, corporation, or joint venture)

(Proprietorship or Partnership)
Printed Name _____

BY _____ (SEAL)
Printed Name _____

TITLE _____
(Owner, Partner, Office held in
corporation, joint venture)

ATTEST:(Corporation)

(Corporate Seal of Principal)

BY _____
Printed Name _____

TITLE _____
(Corporation Secretary or
Assistant Secretary Only)

Surety (Name of Surety Company)

WITNESS:

BY _____
Printed Name _____

TITLE _____

(Corporate Seal of Surety)

Attorney in Fact

COUNTERSIGNED:

(Address of Attorney in Fact)

N.C. Licensed Resident Agent

EXHIBIT A - LIST OF LINES

FACILITYID	LOCATION	Size(In.)	Length (Ft.)	MATERIAL	Taps	COMMENTS
102.1110-102.1115	Supercenter Dr	8	299	DI	0	
102.1115-102.3111	Supercenter Dr	8	391	DI	0	
102.3111-102.3115	Supercenter Dr	8	397	DI	0	
102.3115-102.3117	Supercenter Dr	8	265	DI	0	
102.3117-102.3118	Supercenter Dr	8	271	DI	0	
102.3118-102.3119	Supercenter Dr	8	128	DI	0	
130.4125-130.4134	530 Goldmoore Dr NE	8	406	CL	1	
211.4106-211.4114	Union St N	8	190	CL	1	211.4114 flush tank 6' 8"
211.4114-211.4118	Union St N	8	183	CL	4	
211.4118-211.4121	Union St N	8	179	CL	2	
211.4121-212.3116	Union St N	8	406	CL	9	
211.4129-211.4123	Spring St	8	296	CL	9	
211.4135-211.4129	Spring St	8	195	CL	6	
211.4135-211.4143	Spring St	8	225	CL	4	211.4135 flush tank 6' deep
211.4143-211.4148	Spring St	8	178	CL	4	
211.4148-212.3137	Spring St	8	227	CL	4	
212.1139-212.1138	Corban Ave	8	139	CL	2	
212.1140-212.1141	Corban Ave	8	294	CL	5	
212.1141-212.1143	Corban Ave	8	252	CL	8	
212.1142-212.1140	Corban Ave	8	337	CL	2	
212.1143-212.1144	Corban Ave	8	156	CL	2	
212.1144-212.1139	Corban Ave	8	522	CL	7	
212.3116-212.3123	Union St N	8	245	CL	5	
212.3123-212.3126	Union St N	8	140	CL	4	
212.3126-212.3130	Union St N	8	186	CL	3	
212.3130-212.3133	Union St N	8	94	CL	2	
212.3133-212.3140	Union St N	8	134	CL	3	
212.3137-212.3141	Spring St	8	185	CL	0	
212.3141-212.3130	Chestnut	8	397	CL	3	lamphole 43 ft from DS manhole
212.3143-212.3154	Spring St	8	308	CL	8	Tap Cut @ 38'
212.3153-212.3156	265-269 Union St. S	8	100	CL	3	
212.3154-212.3159	Spring St	8	132	CL	4	
212.3156-212.3161	269 Union St S-Hillcrest Ave SE	8	222	CL	5	
212.3159-212.3164	Spring St	8	277	CL	5	
212.3161-212.3167	Hillcrest Ave SE- 305 Union St S	8	187	CL	7	Tap Cut @ 137'
212.3164-238.1103	Spring St	8	491	CL	6	
212.3167-212.3171	305-321 Union St S	8	213	CL	4	
212.3171-238.1105	321-349 Union St	8	349	CL	7	Tap Cut @321
237.2111-237.2112	179 Fern Ave SW-Georgia St. SW	8	148	CL	3	Tap Cut @ 26'
238.1105-238.1110	Tribune Ave SW (Union to Spring)	8	427	CL	6	
238.1106-238.1103	Spring St.	8	155	CL	4	
238.1111-238.1105	377-349 Union St S	8	291	CL	6	
238.1114-238.1122	391-401 Union St S	8	263	CL	5	flush tank. Needs mh@238.1114
238.1119-238.1110	373 Spring St SW - Tribune Ave SW	8	356	CL	6	
238.1122-238.1126	401-429 Union St S	8	176	CL	3	
238.1126-238.1129	429 Union St S-Blume Ave SE	8	147	CL	2	
238.1128-238.1119	411-373 Spring St SW	8	338	CL	12	
238.1129-238.1138	Blume Ave SW-467 Union St S	8	371	CL	6	1" gas line in main
238.1133-238.1137	415 Spring St SW-Blume Ave SW	8	302	CL	9	flush tank. Needs mh @ 238.1133
238.1137-238.1177	Blume Ave SW-458 Spring St SW	8	332	CL	7	Tap Cut @139'
238.1138-238.1145	467-479 Union St S	8	194	CL	4	tap cut @ 48'
238.1145-238.2116	479-493 Union St S	8	153	CL	2	
238.1152-238.1155	Spring St SW (between Myrtle's)	8	64	CL	0	
238.1155-238.1162	St SW (between Myrtle Ave and Oakla	8	257	CL	5	
238.1162-238.1165	Oakland Ave SW-513 Spring St SW	8	182	CL	7	
238.1167-238.1165	527-513 Spring St SW	8	252	CL	3	

FACILITYID	LOCATION	Size(In.)	Length (Ft.)	MATERIAL	Taps	COMMENTS
238.1177-238.1152	458 Spring St SW-Myrtle Ave SW	8	58	CL	1	
238.2116-238.2117	493 Union St S-Oakland Ave SE	8	185	CL	2	
238.2117-238.2119	Oakland Ave SE-513 Union St S	8	75	CL	3	
238.2119-238.2129	513-547 Union St S	8	388	CL	8	tap cut @ 322
238.2128-238.2132	Union St S-21 Wilshire Ave SW (propst	8	266	CL	0	Ductile scaled up bad
238.2130-238.2128	McAllister Ave SE-555 Union St S	8	80	CL	0	
238.2137-238.2157	576 Union St S-McAllister Ave SE	8	252	CL	3	
238.3145-238.3144	Wilshire Ave SW	8	451	CL	0	
238.3146-238.3145	Wilshire Ave SW	8	483	CL	1	
238.3148-238.3147	Wilshire Ave SW	8	352	CL	5	
238.4103-238.2137	599-576 Union St S	8	334	CL	4	
238.4110-238.4103	Patton Ct SE-599 Union St S	8	332	CL	4	
238.4113-238.4110	633-Patton Ct SE	8	38	CL	0	
238.4117-238.4113	645-633 Union St S	8	112	CL	0	missing manhole
No #-238.1128	Spring St.	8	62	CL	2	Needs manhole
		Total 8 inch	17,473			
211.2167-211.2171	Market St.	10	233	CL	6	
211.2176-211.2171	Market St.	10	177	CL	4	
211.4102-211.2176	Market St.	10	190	CL	1	
238.3131-238.3133	hind 202 morgan Pl SW-Sedgefield St S	10	197	CL	1	
238.3133-238.3137	Sedgefield St SW-Bright Wood Ct SW	10	145	CL	0	
262.1103-261.2101	Journey St SW	10	306	CL	0	
262.1110-262.1103	Journey St SW	10	391	CL	0	
No #-262.1103	Journey St SW	10	91	CL	0	Needs manhole
		Total 10 inch	1,730			
157.1136-157.3100	Beechwood Ave NW	12	263	CL	0	
238.1165-238.1179	513 Spring St S-76 Wilshire Ave SW	12	549	CL	7	
238.1179-238.3149	76-88 Wilshire Ave SW	12	133	CL	0	
238.3100-238.3103	105-141 Wilshire Ave SW (propst side)	12	369	CL	0	
238.3103-238.3110	141-165 Wilshire (propst side)	12	451	CL	0	
238.3110-238.3114	165 Wilshire Ave SW	12	402	CL	0	
238.3114-238.3144	Wilshire Ave SW	12	42	CL	0	
238.3139-261.2101	Wilshire Ave SW	12	170	CL	0	
238.3140-238.3139	Wilshire Ave SW	12	134	CL	0	
238.3141-238.3140	Wilshire Ave SW	12	368	CL	1	
238.3142-238.3141	Wilshire Ave SW	12	395	CL	0	
238.3143-238.3142	Wilshire Ave SW	12	227	CL	0	
238.3144-238.3143	Wilshire Ave SW	12	320	CL	0	
238.3149-238.3150	88-108 Wilshire Ave SW (propst side)	12	199	CL	0	
238.3150-238.3100	108 Wilshire Ave SW (propst side)	12	156	CL	0	
261.2101-261.2131	Wilshire Ave SW	12	65	CL	0	
261.2104-261.2106	Wilshire Ave SW	12	142	CL	0	
261.2106-261.2130	Wilshire Ave SW	12	123	CL	0	
261.2131-261.2104	Wilshire Ave SW	12	200	CL	0	
157.1134-157.1136	Beechwood Ave NW	12	330	CL	2	
157.1139-157.1134	Concord Pkwy N (Hospital)	12	92	CL	0	casing under road
		Total 12 inch	5,129		284	
		Grand Total	24,332			

EXHIBIT A- LIST OF MANHOLES

<u>MH ID</u>	<u>Near Address</u>	<u>Manhole Diameter (feet)</u>	<u>Manhole Depth (feet)</u>	<u>Manhole Depth (inches)</u>	<u>Manhole Material</u>	<u>Reconstruct Invert</u>
130.4125	Goldmoor Dr NE	4	6	8	Brick	No
212.3153	Union St S.	4	6	3	Brick	No
212.3156	Union St S.	4	6		Brick	No
212.3161	Union St S.	4	7	7	Brick	No
212.3167	Union St S.	4	7	3	Brick	No
212.3171	Union St S.	4	7		Brick	No
237.2111	Fern Ave. S	4	4		Brick	No
238.1105	Union St S.	4	6		Brick	No
238.1107	Spring St S.	4	3		Brick	No
238.1111	Union St S.	4	6		Brick	No
238.1122	Union St S.	4	6		Brick	No
238.1126	Union St S.	4	5		Brick	No
238.1128	Spring St S.	4	4		Brick	No
238.1129	Union St S.	4	4		Brick	No
238.1137	Spring St S.	4	7	6	Brick	No
238.1138	Union St S.	4	4		Brick	No
238.1145	Union St S.	4	4	4	Brick	No
238.1152	Spring St S.	4	6		Brick	No
238.1155	Spring St S.	4	7	5	Brick	No
238.1162	Spring St S.	4	8		Brick	No
238.1177	Spring St S.	4	6	2	Brick	No
238.2116	Union St S.	4	5	3	Brick	No
238.2128	Union St S.	4	12	5	Brick	No
238.2137	Union St S.	4	11		Brick	No
238.3133	Sedgefield St SW	4	12		Brick	No
238.3137	Sedgefield St SW	4	8		Brick	No
238.4103	Union St S.	4	9		Brick	No
238.4110	Union St S.	4	5	7	Brick	No
238.4113	Union St S.	4	5		Brick	No
238.4117	Union St S.	4	6		Brick	No
238.4120	Union St S.	4	6		Brick	No
262.1108	Brightwood	4	7		Brick	No
238.1106	Spring St S.	4	4	6	Brick	No
212.3164	Spring St S.	4	5		Brick	No
212.3154	Spring St S.	4	5	9	Brick	No
212.3143	Spring St S.	4	2		Brick	No
211.4148	Spring St S.	4	4	7	Brick	No
211.4135	Spring St S.	4	6		Brick	No
212.3137	Spring St S.	4	3		Brick	No
212.3141	Spring St S.	4	3		Brick	No
212.3130	Union St S.	4	9		Brick	No
212.3133	Union St S.	4	6		Brick	No

EXHIBIT A- LIST OF MANHOLES

<u>MH ID</u>	<u>Near Address</u>	<u>Manhole Diameter (feet)</u>	<u>Manhole Depth (feet)</u>	<u>Manhole Depth (inches)</u>	<u>Manhole Material</u>	<u>Reconstruct Invert</u>
212.3126	Union St S.	4	4	6	Brick	No
211.4121	Union St S.	4	7	6	Brick	No
211.4106	Union St S.	4	6	8	Brick	No
211.4114	Union St S.	4	6	9	Brick	No
211.4129	Spring St S.	4	7		Brick	No
212.3116	Union St S.	5	6	5	Brick	No
212.1140	Corban Ave S	4	5	4	Brick	No
212.1141	Corban Ave S	4	6		Brick	No
212.1143	Corban Ave S	4	5		Brick	No
212.1144	Corban Ave S	4	3		Brick	No
212.1139	Corban Ave S	4	4	4	Brick	No

Total Number of Manholes=	53	311	117
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Total Vertical Feet=	320.75	Feet
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EXHIBIT B
E-VERIFY

EXHIBIT "B"

STATE OF NORTH CAROLINA

AFFIDAVIT

COUNTY OF CABARRUS

I, _____ (the individual signing below), being duly authorized by and on behalf of
_____ (the legal name of the entity entering the contract, "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). Employer attests that Employer is in compliance with the requirements of the federal and state laws relevant to E-verify.
3. Employer is a person, business entity, or other organization that transacts business in the State of North Carolina. Employer employs 25 or more employees in this State. (mark Yes or No)
a. YES _____, or b. NO _____.
4. Employer attests that all subcontractors employed by it as part of this contract comply with the requirements of E-Verify, and Employer will ensure compliance with E-Verify by any subcontractors subsequently hired by Employer as part of any contract with the City of Concord.
5. Employer shall have a continuing duty to inform the City of Concord of any changes to this sworn information.

This ___ day of _____, 20__.

Signature of Affiant
Print or Type Name: _____

State of North Carolina County of Cabarrus

Signed and sworn to (or affirmed) before me, this the _____
day of _____, 20__.

My Commission Expires:

Notary Public

|||
(Affix Official/Notarial Seal)

EXHIBIT C
TAX FORM(S)

EXHIBIT D

CERTIFICATE OF INSURANCE

EXHIBIT E

GENERAL CONDITIONS

EXHIBIT E

GENERAL CONDITIONS

ARTICLE 1.0 – DEFINITIONS

1.1 Defined Terms:

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

- 1.1.1 **Acceptance** - By the OWNER of the Work as being fully complete in accordance with the Contract Documents subject to waiver of claims.
- 1.1.2 **Addenda** - Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the Contract Documents.
- 1.1.3 **Agreement** - The written instrument which is evidence of the agreement between OWNER and CONTRACTOR covering the work.
- 1.1.4 **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.
- 1.1.5 **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 States Occupational Safety and Health Administration.
- 1.1.6 **Bid** - The offer or proposal of a bidder submitted on the prescribed form setting forth the prices for the Work to be performed.
- 1.1.7 **Bidder** – The one who submits a Bid directly to Owner, as distinct from a sub-bidder who submits a bid directly to a Bidder.
- 1.1.8 **Bidding Documents** - The Bidding Requirements and the proposed Contract Documents (including all Addenda issued prior to receipt of Bids).
- 1.1.9 **Bidding Requirements** - The Advertisement or Invitation to Bid, Instructions to Bidders, Bid security form, if any, and the Bid form with any supplements
- 1.1.10 **Bonds** - Performance and payment bonds and other instruments of security.
- 1.1.11 **Change Order** - A document recommended by ENGINEER which is signed by CONTRACTOR and OWNER and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, issued on or after the Effective Date of the Agreement.
- 1.1.12 **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.
- 1.1.13 **Contract** – Executed agreement between the OWNER and the successful bidder, covering the performance of the WORK and the compensation therefore. The Contract supersedes prior negotiations, representations, or agreements, whether written or oral.
- 1.1.14 **Contract Documents** – The definition of the Contract Documents shall be as set forth in the Agreement. Approved Shop Drawings and the reports and drawings of subsurface and physical conditions are not 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.
- 1.1.15 **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 11.3 in the case of Unit Price Work).

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- 1.1.16 **Contract Times** - The number of days or the dates stated in the Agreement to complete the Work so that it is ready for final payment as evidenced by ENGINEER's written recommendation of final payment.
- 1.1.17 **CONTRACTOR** - The individual or entity with whom OWNER has entered into the Agreement.
- 1.1.18 **Cost of the Work** - See paragraph 11.1.1 for definition.
- 1.1.19 **Drawings** - That part of the Contract Documents prepared 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.
- 1.1.20 **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.
- 1.1.21 **ENGINEER** – Director of Engineering, City of Concord.
- 1.1.22 **ENGINEER's Consultant** – An individual or entity having a contract with ENGINEER to furnish services as ENGINEER, independent professional associate or consultant with respect to the Project.
- 1.1.23 **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.
- 1.1.24 **General Requirements** - Sections of Division 1 of the Specifications. The General Requirements pertain to all sections of the Specifications.
- 1.1.25 **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.
- 1.1.26 **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.
- 1.1.27 **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.
- 1.1.28 **Liens** - Charges, security interests, or encumbrances upon Project funds, real property, or personal property.
- 1.1.29 **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.
- 1.1.30 **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.
- 1.1.31 **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.
- 1.1.32 **OWNER** – City of Concord, North Carolina.
- 1.1.33 **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.
- 1.1.34 **PCB's** – Polychlorinated biphenyls
- 1.1.35 **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

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and crude oils.

- 1.1.36 **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.
- 1.1.37 **Project Manual** - The bound documentary information prepared for bidding and construction 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.
- 1.1.38 **Radioactive Material** - Source, special nuclear, or byproduct material as defined by the atomic Energy Act of 1954 (42 USC Section 2011 et seq.) as amended from time to time.
- 1.1.39 **Resident Project Representative** - The authorized representative of ENGINEER who may be assigned to the Site or any part thereof.
- 1.1.40 **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.
- 1.1.41 **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.
- 1.1.42 **Site** - Lands or areas indicated in the Contract Documents as being furnished by OWNER upon which the Work is to be performed, including right-of-way and easements for access thereto, and such other lands furnished by OWNER which are designated for the use of CONTRACTOR. .
- 1.1.43 **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.
- 1.1.44 **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.
- 1.1.45 **Substantial Completion** - The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of ENGINEER, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms "substantially complete" and "substantially completed" as applied to all or part of the Work refer to Substantial Completion thereof.
- 1.1.46 **Supplementary Condition** - That part of the Contract Documents which amends or supplements these General Conditions.
- 1.1.47 **Supplier** - A manufacturer, fabricator, supplier, distributor, material man, 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.
- 1.1.48 **Underground Facilities** - All underground pipeline, 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 of other control systems.
- 1.1.49 **Unit Price Work** - Work to be paid for on the basis of unit prices.
- 1.1.50 **Work** - The entire completed 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.

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- 1.1.51 **Work Change Directive** - A written statement to CONTRACTOR issued on or after the Effective Date of the Agreement and signed by OWNER and recommended by ENGINEER ordering an addition, deletion, or revision in the Work, or responding to differing or unforeseen subsurface or physical conditions under which the Work is to be performed or to emergencies. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the change ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order following negotiations by the parties as to its effect, if any, on the Contract Price or Contract Times.
- 1.1.51 **Written Amendment** - A written statement modifying the Contract Documents, signed by OWNER and CONTRACTOR on or after the Effective Date of the Agreement and normally dealing with the non-engineering or non-technical rather than strictly construction-related aspects of the Contract Documents.
- 1.1.53 **Resident Observer** - Shall have the same definition as "Resident Project Representative" when referred to in these documents or during the duration of the Project.
- 1.1.54 **Written Notice** - The "Notice" as used herein shall mean and include all written notices, demands, instruction, claims, approvals, and disapprovals required to obtain compliance with Contract requirements. Written notice shall be deemed to have been duly served 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 to an authorized representative of such individual, firm or corporation, or if delivered at or sent by registered mail to the last business address known to him who gives the notice. Unless otherwise stated in writing, any notice to or demand upon the OWNER under this Contract shall be delivered to the OWNER through the ENGINEER.

1.2 Terminology

1.2.4 Intent of Certain Terms or Adjectives

1.2.1.1 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 section 9.9 or any other provision of the Contract Documents.

1.2.2 Day

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from 1.2.2.1 The work "day" shall constitute a calendar day or 24 hours measured
midnight to the next midnight.

1.2.3 Defective

1.2.3.1 The word "defective", when modifying the work "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 14.4 or 14.5).

1.2.4 Furnish, Install, Perform, Provide

1.2.4.1 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.

1.2.4.2 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.

1.2.4.3 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.

1.2.4.4 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.

1.2.5 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 2.0 – PRELIMINARY MATTERS

2.1 Delivery of Bonds

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

2.2 Copies of Documents

2.2.1 The CONTRACTOR will be furnished without charge up to **five** sets of specifications and full size drawings. Additional sets of drawings and specifications requested by the CONTRACTOR will be furnished at the cost of reproduction, plus handling.

2.3 Commencement of Contract Times: Notice to Proceed

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- 2.3.1 The Contract Time will commence to run on the day indicated in the Notice to Proceed.
- 2.4 Starting the Work
 - 2.4.1 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.
- 2.5 Before Starting Construction
 - 2.5.1 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.
 - 2.5.2 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:
 - 2.5.2.1 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;
 - 2.5.2.2 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
 - 2.5.2.3 a preliminary schedule of values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.
 - 2.5.3 Evidence of Insurance: The CONTRACTOR shall submit three copies of his insurance certificate with submittal of his executed Contract Documents. The CONTRACTOR may use the "Accord Form" for the Certificate of Insurance, but the form shall be modified to state that the described insurance policies shall not be canceled without 30 days prior written notice to the OWNER and the ENGINEER by registered mail. CONTRACTOR shall review "Accord Form" before forwarding to the ENGINEER.
- 2.6 Pre-Construction Conference
 - 2.6.1. Before any Work at the Site is started, a conference attended by CONTRACTOR, ENGINEER, and others as appropriate will be held to establish a working

EXHIBIT E

understanding among the parties as to the Work and to discuss the schedules referred to in paragraph 2.5.2, procedures for handling Shop Drawings and other submittals, processing Applications for Payment, and maintaining required records.

2.7 Initial Acceptance of Schedules

2.7.1 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 2.5.2. 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.

2.7.1.1. 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 therefore.

2.7.1.2 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.

2.7.1.3 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.

2.8 Award

2.8.1 The award of the Contract, if it is awarded, will be to the lowest responsive, responsible Bidder whose qualifications indicate the award will be in the best interest of the OWNER and whose Bid complies with all the prescribed requirements. Notice of Award will not be given until the OWNER has concluded such investigations as he deems necessary to establish the responsibility, qualifications, and financial ability of the Bidders to do the Work in accordance with the Contract Documents to the satisfaction of the OWNER within the time prescribed. The OWNER reserves the right to reject the Bid of any Bidder who does not pass such investigation to the OWNER'S satisfaction. In analyzing Bids, the OWNER may take into consideration alternates and unit prices, if requested by the Bid forms. If the Contract is awarded, the OWNER will give the successful Bidder a Notice of Award within 90 days after the opening of Bids.

ARTICLE 3.0 - CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE

3.1 Intent

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

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- 3.1.2 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.
 - 3.1.3 Clarifications and interpretations of the Contract Documents shall be issued by ENGINEER as provided in Article 9.0.
- 3.2 Reference Standards
- 3.2.1 Standards, Specifications, and Codes.
 - 3.2.1.1. Reference to standards, specifications, manuals, or codes of any technical society, organization, or association, whether such reference be specific or by implication, shall mean the standard, specification, manual, or code 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.
 - 3.2.1.2 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.
- 3.3 Reporting and Resolving Discrepancies
- 3.3.1 Reporting Discrepancies
 - 3.3.1.1 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 6.16.1) until an amendment or supplement to the Contract Documents has been issued by one of the methods indicated in paragraph 3.4; 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 know thereof.
 - 3.3.2 Resolving Discrepancies

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- 3.3.2.1 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:
 - 3.3.2.1.1 the provisions of any standard, specification, manual, code, or instruction (whether or not specifically incorporated by reference in the Contract Documents)

3.4 Amending and Supplementing Contract Documents

- 3.4.1 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.
- 3.4.2 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.

3.5 Reuse of Documents

- 3.5.1 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 in 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 thereof 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 4.0 - AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; REFERENCE POINTS

4.1 Availability of Lands

- 4.1.1 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 therefore as provided in paragraph 10.5.
- 4.1.2 CONTRACTOR shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and

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equipment.

4.2 Subsurface and Physical Conditions

- 4.2.1 Any testing, reports or drawings which are available or have been relied upon for this project are identified or included in the Special Provisions.
- 4.2.2 Limited Reliance by CONTRACTOR on Technical Data Authorized: CONTRACTOR may rely upon the general accuracy of the technical data. 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:
 - 4.2.2.1 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
 - 4.2.2.2 other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or
 - 4.2.2.3 any CONTRACTOR interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinion, or information.

4.3 Differing Subsurface or Physical Conditions

- 4.3.1 Notice: If CONTRACTOR believes that any subsurface or physical condition at or contiguous to the Site that is uncovered or revealed either:
 - 4.3.1.1 is of such a nature as to establish that any "technical data" on which CONTRACTOR is entitled to rely as provided in paragraph 4.2 is materially inaccurate; or
 - 4.3.1.2 is of such a nature as to require a change in the Contract Documents; or
 - 4.3.1.3 differs materially from that shown or indicated in the Contract Documents; or
 - 4.3.1.4 is of an unusual nature, and differs materially from condition 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 6.16.1), 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.

- 4.3.2 ENGINEER's Review: After receipt of written notice as required by paragraph 4.3.1, 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.

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4.3.3 Possible Price and Times Adjustments

- 4.3.3.1 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:
- 4.3.3.1.1 such condition must meet anyone or more of the categories described in paragraph 4.3.1; and
 - 4.3.3.1.2 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 9.8 and 11.3.
- 4.3.3.2 CONTRACTOR shall not be entitled to any adjustment in the Contract Price or Contract Times if:
- 4.3.3.2.1 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
 - 4.3.3.2.2 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
 - 4.3.3.2.3 CONTRACTOR failed to give the written notice within the time and as required by paragraph 4.3.1.
- 4.3.3.3 If OWNER and CONTRACTOR are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, a Claim may be made therefore as provided in paragraph 10.5. 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.

4.4 Underground Facilities

- 4.4.1 Shown or Indicated: The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or contiguous to the Site is based on information and data furnished to OWNER or ENGINEER by the OWNERS of such Underground Facilities, including OWNER, or by others.
- 4.4.1.1 OWNER and ENGINEER shall not be responsible for the accuracy or completeness of any such information or data; and
 - 4.4.1.2 the cost of all of the following will be included in the Contract Price, and CONTRACTOR shall have full responsibility for:
 - 4.4.1.2.1 reviewing and checking all such information and data.
 - 4.4.1.2.2 locating all Underground Facilities shown or indicated in the Contract Documents.

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- 4.4.1.2.3 coordination of the Work with the OWNERS of such Underground Facilities, including OWNER, during construction and
- 4.4.1.2.4 the safety and protection of all such Underground Facilities and repairing any damage thereto resulting from the Work.

4.4.2 Not Shown or Indicated

- 4.4.2.1 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 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 6.16.1), identify the OWNER of such Underground Facility and give written notice to that OWNER and to OWNER and ENGINEER. ENGINEER will promptly review the Underground Facility and determine the extent, if any, to which a change is required in the Contract Documents to reflect and document the consequences of the existence or location of the Underground Facility. During such time, CONTRACTOR shall be responsible for the safety and protection of such Underground Facility.
- 4.4.2.2 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 Contract 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 therefore as provided in paragraph 10.5.

4.5 Reference Points

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

4.6 Hazardous Environmental Condition at Site

- 4.6.1 Reports and Drawings: Reference is made to these General 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.
- 4.6.2 Limited Reliance by CONTRACTOR on Technical Data Authorized: CONTRACTOR

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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. 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:

- 4.6.2.1 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
- 4.6.2.2 other data, interpretations, opinions and information contained in such reports or
 - shown or indicated in such drawings; or
- 4.6.2.3 any CONTRACTOR interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions, or information.
- 4.6.3 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 the 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.
- 4.6.4 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.
- 4.6.5 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 therefore as provided in paragraph 10.5.
- 4.6.6 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 therefore as provided in paragraph 10.5. OWNER may have such deleted portion of the Work performed by Owner's own forces or others in accordance

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with Article 7.0.

4.6.7 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 of 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 4.6.6 shall obligate CONTRACTOR to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

4.6.7.1 The provisions of paragraphs 4.2, 4.3, and 4.4 are not intended to apply to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 5.0 – BONDS AND INSURANCE

5.1 Performance and Payment Bonds

5.1.1 Concurrent with execution of the Agreement and within ten days of the Notice of Award, the successful CONTRACTOR shall procure, execute, and deliver to the OWNER and maintain, at his own cost and expense, the following bonds, in the forms attached, of a surety company approved by the state in which the Work is being performed as a Surety:

5.1.1.1 Performance Bond - in an amount not less than 100% of the total amount payable to the CONTRACTOR by the terms of the Contract as security for the faithful performance of the Work. Bond must be valid until one year after the date of issuance of the Certificate of Substantial Completion.

5.1.1.2 Payment Bond - in an amount not less than 100% of the total amount payable to the CONTRACTOR by the terms of the Contract as security for the payment of all persons performing labor and furnishing material in connection with the Work. Bond must be valid until one year after the date of issuance of the Certificate of Substantial Completion.

5.1.2 All Bonds signed by an agent must be accompanied by a certified copy of the authority to act. Bonds 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 Audit Staff, Bureau of Government Financial Operations, U.S. Treasury Department.

5.1.3 If the Surety on any Bond furnished by the CONTRACTOR is declared bankrupt or becomes insolvent or its right to do business in the state in which the Work is being performed is revoked, the CONTRACTOR shall, within ten days thereafter, substitute another Bond or Surety, both of which shall be acceptable to the OWNER.

5.2 Insurance Requirements

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- 5.2.1 Wherever in this Article the terms "The Insured" and "OWNER" occur with respect to coverage in a policy, it shall mean the OWNER and its agent and agencies, all municipalities where Work is being performed under the Contract, the ENGINEER, and any other parties specifically designated herein, who shall be named as insured in each policy issued. The insurance policies required herein shall not contain any Third Party Beneficiary Exclusion.

The CONTRACTOR shall not commence Work under the Contract until he has obtained all insurance required under this Article and such insurance has been approved by the OWNER, nor shall the CONTRACTOR allow any Subcontractor to commence Work on his subcontract until all similar insurance required of the Subcontractor has been so obtained and approved.

Provision of some types of insurance by a Subcontractor may be waived, at the option of the OWNER, where it is deemed that adequate coverage is provided by the CONTRACTOR's insurance. Subcontractors must, in all cases, provide Workers' Compensation and Employer's Liability Insurance and Automobile Liability Insurance.

One copy of each such insurance policy and certificates indicating each type of coverage mentioned, and the correlation between the insurance furnished and that required, shall be filed with each of The Insured.

All policies relating to this Contract shall be so written that each of The Insured shall be notified by the carrier of cancellation or change at least 30 days prior to the effective date of such cancellation or change. Renewal certificates covering the renewal of all policies expiring during the life of the Contract shall be filed with each of The Insured not less than 30 days before the expiration of such policies.

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

- a. claims under workers' compensation, disability benefits, and other similar employee benefit acts;
- b. claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees;

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- c. claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees;
- d. claims for damages insured by personal injury liability coverage which are sustained: (1) by any person as a result of an offense directly or indirectly related to the employment of such person by Contractor, or (2) by any other person for any other reason;
- e. 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 there from; and
- f. 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.

5.3 General Insurance Requirements

5.3.1 The insurance required to be purchased and maintained by Contractor shall

- a. include at least the specific coverages and be written for not less than the limits of liability specified herein or required by Laws or Regulations, whichever is greater;
- b. include completed operations insurance;
- c. include contractual liability insurance covering Contractor's indemnity obligations under Paragraphs 6.12, 6.16, and 6.31 through 6.33 of the General Conditions;
- d. 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 Engineer;
- e. remain in effect at least until final payment and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work;
- f. with respect to completed operations insurance, and any other insurance coverage written on a claims-made basis, remain in effect for at least 2 years after final payment (and Contractor shall furnish Owner and Engineer

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evidence satisfactory to Owner of continuation of such insurance at final payment and one year thereafter);

- g. contain a cross liability or severability of interest clause or endorsement. Insurance covering the specified additional insured shall be primary insurance, and all other insurance carried by the additional insured shall be excess insurance; and
- h. with respect to workers' compensation and employers' liability, comprehensive automobile liability, commercial general liability, and umbrella liability insurance, Contractor shall require its insurance carriers to waive all rights of subrogation against Owner, Engineer, and their respective officers, directors, partners, employees, and agents.

5.3.2 Workers' Compensation and Employers' Liability Insurance. This insurance shall protect Contractor against all claims under applicable state workers' compensation laws. Contractor shall also be protected against claims for injury, disease, or death of employees which, for any reason, may not fall within the provisions of a workers' compensation law. This policy shall include an "all states" or "other states" endorsement.

The liability limits shall be not less than:

Workers' compensation	Statutory
Employers' liability	\$1,000,000 each occurrence

5.3.3 Comprehensive Automobile Liability Insurance. This insurance shall be occurrence type written in comprehensive form and shall protect Contractor, and Owner, and Engineer as additional insured, against all claims for injuries to members of the public and damage to property of others arising from the use of motor vehicles, either on or off the project site whether they are owned, non-owned, or hired.

The liability limits shall be not less than:

Bodily injury and property damage	\$1,000,000 combined single limit for each occurrence
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5.3.4 Commercial General Liability Insurance. This insurance shall be occurrence type written in comprehensive form and shall protect Contractor, and Owner, and Engineer as additional insured, against claims arising from injuries, sickness, disease, or death of any person or damage to property arising out of performance of the Work. The policy shall also include personal injury liability coverage, contractual liability coverage, completed operations and products

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liability coverage, and coverage for blasting, explosion, collapse of buildings, and damage to underground property.

The liability limits shall be not less than:

Bodily injury and property damage	\$1,000,000 combined single limit for each occurrence \$1,000,000 general aggregate
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- 5.3.5 Umbrella Liability Insurance. This insurance shall protect Contractor, and Owner, and Engineer as additional insured, against claims in excess of the limits provided under workers' compensation and employers' liability, comprehensive automobile liability, and commercial general liability policies. The umbrella policy shall follow the form of the primary insurance, including the application of the primary limits.

The liability limits shall be not less than:

Bodily injury and property damage	\$4,000,000 combined single limit for each occurrence \$4,000,000 general aggregate
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- 5.3.6 Owner's Protective Liability Insurance. This insurance shall be issued in the name of Owner and shall protect and defend Owner against claims arising as a result of the operations of Contractor or Contractor's Subcontractors.

The liability limits shall be not less than:

Bodily injury and property damage	\$1,000,000 combined single limit for each occurrence \$1,000,000 general aggregate
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- 5.3.7 Property Insurance. Contractor shall purchase and maintain property insurance coverage for the Work at the site in the amount of the full replacement cost thereof. This insurance shall:

- a. include the interests of Owner, Contractor, Subcontractors, Engineer, and Engineer's Consultants, each of whom is deemed to have an insurable interest and shall be listed as a named insured;
- b. be written on a Builder's Risk "all-risk" or open peril or special causes of loss policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, false-work, Work in transit including ocean transit, and Work in storage at the project site or at another location acceptable to Owner, and shall insure against at least the following perils: fire, lightning, extended coverage, theft, vandalism and malicious mischief, earthquake, collapse, debris removal, demolition occasioned by enforcement

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of Laws and Regulations, water damage, and damage caused by frost and freezing;

- c. cover, in an amount not less than \$100,000, the Owner-furnished equipment and materials to be erected or installed by Contractor;
- d. include expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects); and
- e. 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 insured.

If Owner requests in writing that other special insurance be included in the property insurance provided by Contractor, Contractor shall, if possible, include such insurance, and the cost thereof will be charged to Owner by appropriate Change Order or Written Amendment. Prior to commencement of the Work at the site, Contractor shall in writing advise Owner whether or not such other special insurance has been procured by Contractor.

- 5.3.8 Pollution Liability Insurance. This insurance shall be occurrence type written in comprehensive form and shall protect Contractor, and Owner, and Engineer as additional insured, against claims for bodily injury, property damage and/or remediation costs stemming from pollution incidents. The liability limits shall be not less than \$5,000,000 general aggregate.

5.4 Other Insurance Requirements

- 5.4.1 If any of the property and casualty insurance requirements are not complied with at their renewal dates, payments to the CONTRACTOR will be withheld until these requirements have been met, or at the option of the OWNER, the OWNER may pay the renewal premiums and withhold such payments from any monies due to the CONTRACTOR.
- 5.4.2 In the event that claims in excess of the insured amounts provided herein are filed by reason of any operations under the Contract, the amount of excess of such claims, or any portion thereof, may be withheld from payment due or to become due the CONTRACTOR until such time as the CONTRACTOR shall furnish such additional security covering such claims as may be determined by the OWNER.
- 5.4.3 All policies and certificates of insurance of the CONTRACTOR shall contain the following clauses:
 - 5.4.3.1 insurers shall have no right of recovery or subrogation against the OWNER and its agents and agencies and the ENGINEER, it being the intention of the parties that the insurance policies so effected shall

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protect both parties and be primary coverage for any and all losses covered by the above-described insurance.

- 5.4.3.2 the clause "other insurance provisions" in a policy in which the OWNER and its agents and agencies and the ENGINEER is named as an insured, shall not apply to these parties.
- 5.4.3.3 the insurance companies issuing the policy or policies shall have no recourse against the OWNER and its agents and agencies and the ENGINEER, for the payment of any premiums or for assessments under any form of policy.
- 5.4.3.4 any and all deductibles in the above-described insurance policies shall be assumed by and be for the amount of, and at the sole risk of the CONTRACTOR.
- 5.4.3.5 OWNER will be included as an additional insured on all liability policies for claims arising out of the work to be performed by the named insured. Sub-contractors must meet the same requirements as the CONTRACTOR.

ARTICLE 6.0 - CONTRACTOR'S RESPONSIBILITIES

6.1 Supervision and Superintendence

- 6.1.1 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 complete Work complies accurately with the Contract Documents.
- 6.1.2 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.

6.2 Labor; Working Hours

- 6.2.1 CONTRACTOR shall provide competent, suitably qualified personnel to survey, layout, and construct the Work as required by the Contract Documents. CONTRACTOR shall at all times maintain good discipline and order at the Site.
- 6.2.2 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.

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6.3 Services, Materials, and Equipment

- 6.3.1 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.
- 6.3.2 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.

6.4 Progress Schedule

- 6.4.1 CONTRACTOR shall adhere to the progress schedule established in accordance with paragraph 2.7 as it may be adjusted from time to time as provided below.
- 6.4.1.1 CONTRACTOR shall submit to ENGINEER for acceptance (to the extent indicated in paragraph 2.7) 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.
- 6.4.1.2 Proposed adjustments in the progress schedule that will change the Contract Times (or Milestones) shall be submitted in accordance with the requirements of Article 12.0. Such adjustments may only be made by a Change Order or Written Amendment in accordance with Article 12.0.

6.5 Substitutes and "Or-Equals"

- 6.5.1 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 equipment or material or equipment of other Suppliers may be submitted to ENGINEER for review under the circumstances described below.
- 6.5.1.1 "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

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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 6.5.1.1, a proposed item of material or equipment will be considered functionally equal to an item so named if:

- 6.5.1.1.1 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;
- 6.5.1.1.2 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.

6.5.1.2 Substitute Items

- 6.5.1.2.1. 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 6.5.1.1, it will be considered a proposed substitute item.
- 6.5.1.2.2 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. Such information on items of material or equipment will not be accepted by ENGINEER from anyone other than CONTRACTOR.
- 6.5.1.2.3 The procedure for review by ENGINEER will be as set forth in paragraph 6.5.1.2.4, as supplemented in the General Requirements and as ENGINEER may decide is appropriate under the circumstances.
- 6.5.1.2.4 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 a 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

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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.

- 6.5.2 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 6.5.1.2.
 - 6.5.3 ENGINEER's Evaluation: ENGINEER will be allowed a reasonable time within which to evaluate each proposal or submittal made pursuant to paragraphs 6.5.1 and 6.5.2. 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.
 - 6.5.4 Special Guarantee: OWNER may require CONTRACTOR to furnish at CONTRACTOR's expense a special performance guarantee or other surety with respect to any substitute.
 - 6.5.5 CONTRACTOR's Expense: CONTRACTOR shall provide all data in support of any proposed substitute for "or-equal" at CONTRACTOR's expense.
- 6.6 Concerning Subcontractors, Suppliers, and Others
- 6.6.1 CONTRACTOR shall not employ any Subcontractor, Supplier, or other individual or entity, 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.
 - 6.6.2 Within ten days after Notice of Award has been issued, the CONTRACTOR shall furnish to the ENGINEER a list of subcontractors, suppliers, or other persons or organizations who will participate in the Work or furnish principal items of materials and equipment to be utilized in the Work. The list shall include the subcontractors, suppliers, or other persons or organizations indicated on the Bid Form. Within ten days after receipt of the list but prior to the Effective Date of the Agreement, the ENGINEER shall notify the CONTRACTOR in writing if the ENGINEER (or OWNER) has reasonable objection to any subcontractor, suppliers, or other person or organization on the list. Failure by the ENGINEER to object to anyone on the list within the specified time shall constitute acceptance of the subcontractor, supplier, or other person or organization. Acceptance of a subcontractor, supplier, other person or organization named shall not constitute a waiver of the requirements of the contract specifications or the right of the OWNER or ENGINEER to reject defective work. If the ENGINEER (or OWNER) has a reasonable objection as described above, the CONTRACTOR may either (1) submit an acceptable substitute without an increase in his Bid price, or (2)

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withdraw his Bid without forfeiting his Bid security.

- 6.6.3 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. OWNER or ENGINEER may furnish to any such Subcontractor, Supplier, or other individual or entity to the extent practicable, information about amounts paid to CONTRACTOR on account of Work performed for CONTRACTOR by a particular Subcontractor, Supplier, or other individual or entity.
 - 6.6.4 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.
 - 6.6.5 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.
 - 6.6.6 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.
 - 6.6.7 All Work performed for CONTRACTOR by a Subcontractor shall be pursuant to an appropriate agreement between the CONTRACTOR and Subcontractor. The Subcontractor shall not commence Work until the CONTRACTOR has obtained all insurance as required by Article 5.0, inclusive.
 - 6.6.8 The CONTRACTOR shall not subcontract more than 50 percent of the Contract price without prior written approval of the OWNER.
- 6.7 Patent Fees and Royalties
- 6.7.1 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

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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.

6.8 Permits

6.8.1 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 connection to the Work.

6.9 Laws and Regulations

6.9.1 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.

6.9.2 If CONTRACTOR observes that the Specifications or Drawings are at variance with any Laws or Regulations, he shall give ENGINEER prompt written notice thereof. If CONTRACTOR performs any Work knowing it to be contrary to such Laws or Regulations, and without such notice to ENGINEER, he shall bear all costs arising there from. The CONTRACTOR shall, at all times, observe and comply with and shall cause all his agents and employees and all his Subcontractors to observe and comply with all such existing Laws or Regulations, and shall protect and indemnify the OWNER and the ENGINEER and the municipalities in which Work is being performed, and their officers and agents against any claim or liability arising from or based on the violation of any such Law or Regulation, whether by himself or his employees or any of his Subcontractors.

6.9.3 Changes in Laws or Regulations not adopted or in effect 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 therefore as provided in paragraph 10.5.

6.10 Taxes

6.10.1 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. A

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listing of sales tax paid for the period shall be submitted with each Progress Payment

6.11 Use of Site and Other Areas

6.11.1 Limitation on Use of Site and Other Areas

6.11.1.1 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 the owner or occupant thereof, or of any adjacent land or areas resulting from the performance of the Work.

6.11.1.2 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.

6.11.1.3 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 ENGINEER's, 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.

6.11.2 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.

6.11.3 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 material and shall restore to original condition all property not designated for alteration by the Contract Documents.

6.11.4 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

6.12.1 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

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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. CONTRACTOR is advised that failure to furnish the ENGINEER with accurate and detailed record drawings shall be reason for withholding final payment.

6.13 Safety and Protection

6.13.1 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:

- 6.13.1.1 all persons on the Site or who may be affected by the Work;
- 6.13.1.2 all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and
- 6.13.1.3 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.

6.13.2 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 6.13.1.2 or 6.13.1.3 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 14.7.2 that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).

6.14 Safety Representative

6.14.1 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.

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6.15 Hazard Communication Programs

6.15.1 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

6.16.1 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

6.17.1 CONTRACTOR shall submit Shop Drawings to ENGINEER for review and approval in accordance with the acceptable schedule of Shop Drawings and Sample submittals. CONTRACTOR shall submit four copies of all shop drawings plus the number required for use by the ENGINEER. 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 6.17.5.

6.17.2 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 6.17.5. CONTRACTOR shall submit three samples plus the number required to be returned to the CONTRACTOR for each sample required.

6.17.3 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 2.7, 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

6.17.4 Submittal Procedures

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

6.17.4.1.1 all field measurements, quantities, dimensions, specified performance criteria, installation requirements, materials, catalog numbers, and similar information with respect

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- thereto;
- 6.17.4.1.2 all materials with respect to intended use, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work;
 - 6.17.4.1.3 all information relative to means, methods, techniques, sequences, and procedures of construction and safety precautions and programs incident thereto; and
 - 6.17.4.1.4 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;
 - 6.17.4.1.5 each Shop Drawing submitted to the ENGINEER must be accompanied by a transmittal which references the applicable section(s) of the specifications. In addition, each Shop Drawing shall be numbered in the order of submittal sequence. All submittals called for in the specifications shall be submitted in the number of copies as indicated in the Contract Documents.
- 6.17.4.2 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.
- 6.17.4.3 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.

6.17.5 ENGINEER's Review

- 6.17.5.1 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.
- 6.17.5.2 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.
- 6.17.5.3 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 6.17.4.3 and ENGINEER, has given written approval of each such

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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 6.17.4.1.

6.17.6 Resubmittal Procedures

6.17.6.1 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 revision other than the corrections called for by ENGINEER on previous submittals.

6.18 Continuing the Work

6.18.1 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 15.4 or as OWNER and CONTRACTOR may otherwise agree in writing.

6.19 CONTRACTOR's General Warranty and Guarantee

6.19.1 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:

- 6.19.1.1 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
- 6.19.1.2 normal wear and tear under normal usage.

6.19.2 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:

- 6.19.2.1 observations by ENGINEER;
- 6.19.2.2 recommendation by ENGINEER or payment by OWNER of any progress or final payment;
- 6.19.2.3 the issuance of a certificate of Substantial Completion by ENGINEER or any payment related thereto by OWNER;
- 6.19.2.4 use or occupancy of the Work or any part thereof by OWNER;
- 6.19.2.5 any acceptance by OWNER or any failure to do so;
- 6.19.2.6 any review and approval of a Shop Drawing or Sample submittal or the issuance of a notice of acceptability by ENGINEER;
- 6.19.2.7 any inspection, test, or approval by others; or
- 6.19.2.8 any correction of defective Work by OWNER.

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6.20 Indemnification

6.20.1 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 ENGINEER's, architects, attorneys, and other professionals and all court of 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:

6.20.1.1 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 there from; and

6.20.1.2 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.

6.20.2 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 6.20.1 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.

6.20.3 Nothing in the Contract Documents shall create or give to third parties any claim or right of action against the CONTRACTOR, the OWNER or the ENGINEER beyond such as may legally exist irrespective of the Contract.

6.21 Operation and Maintenance Manuals

6.21.1 CONTRACTOR shall submit two copies of Operation and Maintenance Manuals for all equipment for review. Upon receipt of approval, six complete sets must be provided. No equipment may be placed into service until the approved manuals are received by the ENGINEER. Instruction manuals shall list all of the equipment specified in this and other sections of the Specifications and shall include equipment serial numbers, design data, operating instructions, maintenance instructions, lubrication instructions, piping, wiring and control diagrams, assembly drawings showing location of parts, part numbers and spare parts list.

ARTICLE 7.0 - OTHER WORK

7.1 Related Work at Site

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- 7.1.1 OWNER may perform other work related to the Project at the Site by OWNER's employees, or let other direct contracts therefore, or have other work performance by utility owner. If such other work is not noted in the Contract Documents, then:
- 7.1.1.1 written notice thereof will be given to CONTRACTOR prior to starting any such other work; and
 - 7.1.1.2 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 therefore as provided in paragraph 10.5.
- 7.1.2 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 responsibility 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.
- 7.1.3 If the proper execution or results of any part of CONTRACTOR's Work depends upon work performed by others under this Article 7.0, 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.

7.2 Coordination

- 7.2.1 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:
- 7.2.1.1 the individual or entity who will have authority and responsibility for coordination of the activities between the various CONTRACTORS will be identified;
 - 7.2.1.2 the specific matters to be covered by such authority and responsibility will be itemized; and
 - 7.2.1.3 the extent of such authority and responsibilities will be provided.
- 7.2.2 OWNER shall have sole authority and responsibility for such coordination.

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ARTICLE 8.0 - OWNER'S RESPONSIBILITIES

8.1 Communications to CONTRACTOR

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

8.2 Replacement of ENGINEER

8.2.1 In case of termination 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.

8.3 Furnish Data

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

8.4 Pay Promptly When Due

8.4.1 OWNER shall make payments to CONTRACTOR promptly when they are due as provided in paragraphs 14.2.3. and 14.7.3.

8.5 Lands and Easements; Reports and Tests

8.5.1 OWNER's duties in respect of providing lands and easements and providing engineering surveys to establish reference points are set forth in paragraphs 4.1 and 4.5. Paragraph 4.2 refers to OWNER 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.

8.6 Insurance

8.6.1 OWNER's responsibilities, if any, in respect to purchasing and maintaining liability and property insurance are set forth in Article 5.0.

8.7 Change Orders

8.7.1 OWNER is obligated to execute Change Orders as indicated in paragraph 10.3.

8.8 Inspections, Tests, and Approvals

8.8.1 OWNER's responsibility in respect to certain inspections, tests, and approvals is set forth in paragraph 13.3.2.

8.9 Limitations on OWNER's Responsibilities

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- 8.9.1 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
 - 8.10.1 OWNER's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in paragraph 4.6.
- 8.11 Evidence of Financial Arrangements
 - 8.11.1 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 thereof will be as set forth in these General Conditions.

ARTICLE 9.0 - ENGINEER'S STATUS DURING CONSTRUCTION

- 9.1 OWNER's Representative
 - 9.1.1 ENGINEER will be OWNER's representative during the construction period and his instructions shall be carried into effect promptly and efficiently.
- 9.2 Project Representative
 - 9.2.1 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 section 9.9.
- 9.3 Clarifications and Interpretations
 - 9.3.1 The ENGINEER will furnish a Resident Project Representative (and assistants) to assist the ENGINEER in observing the performance of the Work. The Resident Project Representative will serve as the ENGINEER's liaison with the CONTRACTOR, working principally through the CONTRACTOR's superintendent to assist him in understanding the intent of the Contract Documents.
 - 9.3.2 The Resident Project Representative shall conduct on-site observations of the Work in progress to confirm that the Work is proceeding in accordance with the Contract Documents. He will verify that tests, equipment and systems start-ups and operating and maintenance instructions are conducted as required by the Contract Documents. He will have the authority to disapprove or reject defective Work in accordance with Article 13.0.

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9.3.3 Except upon written instruction of the ENGINEER, the Resident Project Representative:

- 9.3.3.1 Shall not authorize any deviation from the Contract Documents or approve any substitute materials or equipment.
- 9.3.3.2 Shall not exceed limitation of ENGINEER's authority as set forth in the Contract Documents.
- 9.3.3.3 Shall not undertake any of the responsibilities of CONTRACTOR, Subcontractors, or CONTRACTOR's superintendent, or expedite the Work.
- 9.3.3.4 Shall not advise on or issue directions relative to any aspect of the means, methods, techniques, sequences or procedures of construction unless such is specifically called for in the Contract.
- 9.3.3.5 shall not advise on or issue directions as to safety precautions and programs in connection with the Work.

9.4 Authorized Variations in Work

9.4.1 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 therefore as provided in paragraph 10.5.

9.5 Rejecting Defective Work

9.5.1 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 Works provided in paragraph 13.4, whether or not the Work is fabricated, installed, or completed.

9.6 Shop Drawings, Change Orders and Payments

- 9.6.1 In connection with ENGINEER's authority as to Shop Drawings and Samples, see paragraph 6.17.
- 9.6.2 In connection with ENGINEER's authority as to Change Orders, see Articles 10.0, 11.0, and 12.0.
- 9.6.3 In connection with ENGINEER's authorities to Applications for Payment, see Article 14.0.

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9.7 Determinations for Unit Price Work

- 9.7.1 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 10.5.

9.8 Decisions on Requirements of Contract Documents and Acceptability of Work

- 9.8.1 ENGINEER will be the initial interpreter of the requirements of the Contract Documents and judge of the acceptability of the Work there under. 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 to ENGINEER in writing, in accordance with the provisions of paragraph 10.5, with a request for a formal decision.
- 9.8.2 The rendering of a decision by ENGINEER pursuant to this paragraph 9.8 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 14.7) 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.

9.9 Limitations on ENGINEER's Authority and Responsibilities

- 9.9.1 Neither ENGINEER's authority or responsibility under this Article 9.0 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.
- 9.9.2 ENGINEER will not supervise, direct, contract, 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.
- 9.9.3 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.

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- 9.9.4 ENGINEER's review of the final Application for Payment and accompanying documentation and all maintenance and operating instruction, schedules, guarantees, Bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by paragraph 14.7.1 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
- 9.9.5 The limitations upon authority and responsibility set forth in this section 9.9 shall also apply to ENGINEER's Consultants, Resident Project Representative, and assistants.

ARTICLE 10.0 – CHANGES IN THE WORK; CLAIMS

10.1 Authorized Changes in the Work

- 10.1.1 Without invalidating the Agreement and without notice to any surety, OWNER may, 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).
- 10.1.2 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 therefore as provided in paragraph 10.5.

10.2 Unauthorized Change in the Work

- 10.2.1 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 3.4, except in the case of an emergency as provided in paragraph 6.16 or in the case of uncovering Work as provided in paragraph 13.4.2.

10.3 Execution of Change Orders

- 10.3.1 OWNER and CONTRACTOR shall execute appropriate Change Orders recommended by ENGINEER (or Written Amendments) covering:
- 10.3.1.1 changes in the Work which are: (i) ordered by OWNER pursuant to paragraph 10.1.1, (ii) required because of acceptance of defective Work under paragraph 13.8.1 or OWNER's correction of defective Work under paragraph 13.9, or (iii) agreed to by the parties;
- 10.3.1.2 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

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10.3.1.3 changes in the Contract Price or Contract Times which embody the substance of any written decision rendered by ENGINEER pursuant to paragraph 10.5; 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 6.18.1.

10.4 Notification to Surety

10.4.1 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.

10.5 Claims and Disputes

10.5.1 Notice: Written notice stating the general nature of each Claim, dispute, or other matter shall be delivered by the claimant to ENGINEER 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 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 12.1.2. A Claim for an adjustment in Contract Time shall be prepared in accordance with the provisions of paragraph 12.2.2. 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).

10.5.2 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:

10.5.2.1 an appeal from ENGINEER's decision is taken within the time limits and in accordance with the dispute resolution procedures set forth in Article 16.0; or

10.5.2.2 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

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applicable Laws and Regulations.

10.5.3 If ENGINEER does not render a formal decision in writing within the time stated in paragraph 10.5.2, 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.

10.5.4 No Claim for an adjustment in Contract Price or Contract Times (or Milestones) will be valid if not submitted in accordance with this paragraph 10.5.

ARTICLE 11.0 - COST OF THE WORK; UNIT PRICE WORK

11.1 Cost of the Work

11.1.1 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 the 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 11.1.2.

11.1.1.1 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, worker' 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.

11.1.1.2 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.

11.1.1.3 Payments made by CONTRACTOR to Subcontractors for Work performed by Subcontractors and all subcontracts shall be subject to the provisions of the Contract Documents.

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- 11.1.1.4 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.
- 11.1.1.5 Supplemental costs including the following:
 - 11.1.1.5.1 the proportion of necessary transportation, travel, and subsistence expenses of CONTRACTORS's employees incurred in discharge of duties connected with the Work.
 - 11.1.1.5.2 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 OWNER, 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 the CONTRACTOR.
 - 11.1.1.5.3 rentals of all construction equipment and machinery, whether rented from CONTRACTOR or others, shall be negotiated between the ENGINEER and the CONTRACTOR. These rates shall include all fuel, lubricants, insurance, etc. Equipment rental charges shall not exceed the prorated monthly rental rates listed in the current edition of the "Compilation of Rental Rates for Construction Equipment," as published by the Associated Equipment Distributors. Charges per hour shall be determined by dividing the monthly rates by 176. The rental of any such equipment and machinery shall close when the use thereof is no longer necessary for the Work.
 - 11.1.1.5.4 sales, consumer, use, and other similar taxes related to the Work, and for which CONTRACTOR is liable, imposed by Laws and Regulations.
 - 11.1.1.5.5 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.
 - 11.1.1.5.6 losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance of otherwise, sustained by CONTRACTOR in connection with the performance of the Work (except losses and damages with the deductible amounts of property insurance established in accordance with paragraph 5.6.4), provided such losses and damages have resulted from causes other than the negligence of CONTRACTOR, and 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.
 - 11.1.1.5.7 the cost of utilities, fuel, and sanitary facilities at the Site.
 - 11.1.1.5.8 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.
 - 11.1.1.5.9 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

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changes in the Work or caused by the event giving rise to the Claim.

11.1.1.5.10 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.

11.1.2 Costs Excluded: The term Cost of the Work shall not include any of the following items:

- 11.1.2.1 Payroll costs and other compensation of CONTRACTOR's officers, executives, principals (of partnerships and sole proprietorships), general managers, engineers, architects, estimators, attorney, auditors, accountants, purchasing and contracting agents, expeditors, timekeepers, clerks, and other personnel employed 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 11.1.1.1 or specifically covered by paragraph 11.1.1.4, all of which are to be considered administrative costs covered by the CONTRACTOR's fee.
- 11.1.2.2 Expenses of CONTRACTOR's principal and branch offices other than CONTRACTOR's office at the Site.
- 11.1.2.3 Any part of CONTRACTOR's capital expenses, including interest on CONTRACTOR's capital employed for the Work and charges against CONTRACTOR for delinquent payments.
- 11.1.2.4 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.
- 11.1.2.5 Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in paragraph 11.1.1 and 11.1.2.

11.1.3 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 12.1.3.

11.1.4 Documentation: Whenever the Cost of the Work for any purpose is to be determined pursuant to paragraphs 11.1.1 and 11.1.2, 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.

11.3 Unit Price Work

11.3.1 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

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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 9.8.

- 11.3.2 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.
- 11.3.3 OWNER or CONTRACTOR may make a Claim for an adjustment in the Contract Price in accordance with paragraph 10.5 if:
 - 11.3.3.1 the quantity of any item of Unit Price Work performed by CONTRACTOR differs materially and significantly from the estimated quantity of such item indicated in the Agreement; and
 - 11.3.3.2 there is no corresponding adjustment with respect any other item of Work; and
 - 11.3.3.3 if 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 12.0 - CHANGE OF CONTRACT PRICE; CHANGE OF CONTRACT TIMES

12.1 Change of Contract Price

- 12.1.1 The Contract Price may only be changed by a Changed 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 provisions of paragraph 10.5.
- 12.1.2 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:
 - 12.1.2.1 where the Work involved is covered by unit prices contained in the Contract Documents, by application of such unit price to the quantities of the items involved (subject to the provisions of paragraph 11.2); or
 - 12.1.2.2 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 12.1.3.2); or
 - 12.1.2.3 where the Work involved is not covered by unit price contained in the Contract Documents and agreement to a lump sum is not reached under paragraph 12.1.2.2, on the basis of the Cost of the Work (determined as provided in paragraph 11.1) plus a CONTRACTOR's fee for overhead and profit (determined a provided in paragraph 12.1.3).
- 12.1.3 CONTRACTOR's Fee; The CONTRACTOR's fee for overhead and profit shall be determined as follows:
 - 12.1.3.1 a mutually acceptable fixed fee; or

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- 12.1.3.2 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:
- the 12.1.3.2.1 for costs incurred under paragraphs 11.1.1.1 and 11.1.1.2, CONTRACTOR's fee shall be 15 percent;
- 12.1.3.2.2 for costs incurred under paragraph 11.1.1.3, the CONTRACTOR's fee shall be five percent;
- 12.1.3.2.3 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 12.1.3.2. 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 11.1.1.1 and a11.1.1.2 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;
- 12.1.3.2.4 no fee shall be payable on the basis of costs itemized under paragraphs 11.1.1.4, 11.1.1.5, and 11.1.2;
- 12.1.3.2.5 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
- 12.1.3.2.6 when both additions and credit 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 12.1.3.2.1 through 12.1.3.2.5, inclusive.

12.2 Change of Contract Times

- 12.2.1 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 10.5.
- 12.2.2 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 12.0.

12.3 Delays Beyond CONTRACTOR's Control

- 12.3.1 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 therefore as provided in paragraph 12.2.1. 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 CONTRACTOR's performing work as contemplated by Article 7.0, fires, floods, epidemics, abnormal weather conditions, or acts of God.

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12.4 Delays Within CONTRACTOR's Control

12.4.1 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.

12.5 Delays Beyond OWNER's and CONTRACTORS's Control

12.5.1 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.

12.6 Delay Damages

12.6.1 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:

12.6.1.1 delays caused by or within the control of CONTRACTOR; or

12.6.1.2 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 OWNER's or other CONTRACTOR's performing other work as contemplated by Article 7.0.

12.6.2 Nothing in this paragraph 12.6 bars a change in Contract Price pursuant to this Article 12.0 to compensate CONTRACTOR due to delay, interference, or disruption directly attributable to actions or inactions of OWNER or anyone for whom OWNER is responsible.

12.7 Abnormal Weather Conditions

12.7.1 Abnormal Weather Conditions for rain shall be derived from the most recent 20-year (minimum) average for the nearest NOAA weather reporting station. The mean number of days of precipitation per month of 0.10 inch or more shall establish the mean number of weather days for the period.

12.8 Liquidated Damages

12.8.1 The required completion time for the Project is as set forth in the Agreement. The CONTRACTOR is advised that the Contract times stated in the Bid Form are of the essence of the Contract. For each and every day in excess of each Contract time stated in the Bid Form that the CONTRACTOR fails to complete the Work indicated, the CONTRACTOR shall pay to the OWNER the sum stated in the Bid Form as liquidated damages. The said amounts are fixed and agreed upon by and between the CONTRACTOR and the OWNER as an estimate of the actual damages which would be incurred by the OWNER.

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ARTICLE 13.0 - TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

13.1 Notice of Defects

13.1.1 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 13.0.

13.2 Access to Work

13.2.1 OWNER, ENGINEER, ENGINEER's Consultants, other representative and personnel of OWNER, independent testing laboratories, and governmental agencies with jurisdictional interest 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.

13.3 Tests and Inspections

13.3.1 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.

13.3.2 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:

13.3.2.1 for inspections, tests, or approvals covered by paragraphs 13.3.3 and 13.3.4 below;

13.3.2.2 that costs incurred in connection with tests or inspections conducted pursuant to paragraph 13.4.2 shall be paid as provided in said paragraph 13.4.2; and

13.3.2.3 as otherwise specifically provided in the Contract Documents.

13.3.3 If the Contract Documents, laws, ordinances, rules, regulations or orders of any public authority having jurisdiction require any Work to be specifically inspected, tested, or approved by some public body, CONTRACTOR shall assume full responsibility therefore, pay all costs in connection therewith and furnish ENGINEER the required certificates of inspection, testing or approval.

13.3.4 The OWNER reserves the right to independently perform at its own expense, laboratory tests on random samples of material or performance tests on equipment delivered to the site. These tests, if made, will be conducted in accordance with the appropriate referenced standards or specification requirements. The entire shipment represented by a given sample, samples or price of equipment may be rejected on the basis of the failure of samples or pieces of equipment to meet specified test requirements. All rejected materials or equipment shall be removed from the site, whether stored or installed in the Work, and the required replacement shall be made, all at no additional cost to

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the OWNER.

13.3.5 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.

13.3.6 Uncovering Work as provided in paragraph 13.3.5 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.

13.4 Uncovering Work

13.4.1 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.

13.4.2 If ENGINEER considers it necessary or advisable that covered Work be observed by ENGINEER or inspected or tested by other, 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 therefore as provided in paragraph 10.5. 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 therefore as provided in paragraph 10.05.

13.5 OWNER May Stop the Work

13.5.1 If the Work is defective, or CONTRACTOR fails to supply sufficient skilled workmen or suitable materials or equipment, or fails to furnish or perform the Work in such a way that the completed Work will conform to the Contract Documents, or if the Work interferes with the operation of the existing facility, the OWNER may order CONTRACTOR to stop, by a written order any Work, or any portion thereof, until the cause for such order has been eliminated.

13.6 Correction or Removal of Defective Work

13.6.1 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

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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).

13.7 Correction Period

13.7.1 If within one year after the date of Substantial Completion or such longer period of time as may be prescribed by Laws or Regulations or by the terms of any applicable special guarantee required by the Contract Documents or by any specific provision of the Contract Documents, 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 6.11.1 is found to be defective, CONTRACTOR shall promptly, without cost to OWNER and in accordance with OWNER's written instruction: (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 there from. 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.

13.7.2 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.

13.7.3 Where defective Work (and damage to other Work resulting there from) has been corrected or removed and replaced under this paragraph 13.7, 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

13.7.4 CONTRACTOR's obligations under this paragraph 13.7 are in addition to any other obligation or warranty. The provisions of this paragraph 13.7 shall not be construed as a substitute for or a waiver of the provisions of any applicable statute of limitation or repose.

13.8 Acceptance of Defective Work

13.8.1 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

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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 therefore as provided in paragraph 10.5. If the acceptance occurs after such recommendation, an appropriate amount will be paid by CONTRACTOR to OWNER.

13.9 OWNER May Correct Defective Work

- 13.9.1 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 13.6.1, 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.
- 13.9.2 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, incorporate in the Work all materials and equipment stored 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 CONTRACTOR's, and ENGINEER and ENGINEER's Consultants access to the Site to enable OWNER to exercise the rights and remedies under this paragraph.
- 13.9.3 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 13.9 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 therefore as provided in paragraph 10.5. 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.
- 13.9.4 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 13.9.

ARTICLE 14.0 - PAYMENTS TO CONTRACTOR AND COMPLETION

14.1 Schedule of Values

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- 14.1.1 The schedule of values established as provided in paragraph 2.5.2 will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to ENGINEER. Progress payments on account of Unit Price Work will be based on the number of units completed.
- 14.1.2 With the above submittal, the CONTRACTOR shall submit for the ENGINEER's approval, a complete breakdown of all lump sum items in the Proposal. This breakdown, modified where directed by the ENGINEER, will be used as a basis for preparing partial estimates and establishing progress payments.
- 14.1.3 A lump sum payment equal to three percent of the total bid price (to include all bonds, insurance, move-on expenses, etc.) will be allowed for 'mobilization' as a progress payment line item. Up to half of the cost for mobilization will be considered in the initial payment request provided that cost documentation suitable to the ENGINEER is furnished by the CONTRACTOR. Any outstanding balance of mobilization line item will be payable when the Project Work is ten percent complete as indicated by the approved progress payments.

14.2 Progress Payments

14.2.1 Applications for Payments

14.2.1.1 The effective ending date of all applications for Progress Payments shall be the 25th day of each month unless mutually agreed upon otherwise. All applications for Progress Payments will be computer-generated based on the Schedule of Values as provided in paragraph 14.1, and submitted in triplicate. The application will be generated each period by the CONTRACTOR.

14.2.1.2 Prior to final preparation of each Progress Payment, the CONTRACTOR and Resident Project Representative shall mutually measure and agree upon the quality of Work completed each period.

14.2.1.3 Partial payment for materials or equipment properly stored on-site will be made on the basis of the invoice cost of the materials or equipment provided a detailed list of the materials for which partial payment is requested and supporting copies of the invoices is attached to each Application for Progress Payment. As the work progresses, the value of materials not entered into construction will be reduced as materials or equipment are installed. At the completion of the Work, the value of stored materials not entered into construction must be zero.

14.2.1.4 The following paragraphs (i & ii) are for construction projects in North Carolina only:

14.2.1.4.1 Sales and Use Tax: With each application for Progress Payment,

CONTRACTOR must furnish a certified and notarized statement setting forth the cost of the property purchased from each vendor and the amount of sales and/or use tax paid thereon. The statement shall show both the N.C. Sales Tax and the County Tax paid and shall list any payments made directly to the North Carolina Department of Revenue. Tax statements and certification shall be submitted on the forms provided in the Contract Documents. In the event the CONTRACTOR makes several

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purchases from the same vendor, such certified statement must indicate the invoice numbers, the inclusive dates of the invoices, the total amount of the invoices, and the sales and use taxes paid thereon. Such statement must include the cost of any tangible personal property withdrawn from the CONTRACTOR's warehouse stock and the amount of sales or use tax paid thereon by the CONTRACTOR. Similar certified statements by his subcontractors must be obtained by the prime CONTRACTOR and furnished with the Application for Progress Payment. If no tax has been paid during the pay request period, "NONE" shall be entered on the tax form.

- 14.2.1.4.2 Use tax may be due on construction equipment brought into North Carolina for use in the performance of contracts (NCGS §105-164.4 and 105-164.6). CONTRACTORS are also liable for payment of applicable privilege licenses (NCGS §105-54) and for payment of applicable franchise, corporate income and withholding taxes (NCGS §105-122, 105-123, 105-134, and 105-163.2).
- 14.2.1.5 Retainage: Retainage shall be as set forth in the Standard Contract Form or otherwise in the Contract Documents and shall be in compliance with the requirements of Laws and Regulations.

14.2.2 Review of Applications:

- 14.2.2.1 ENGINEER will, within 10 days after receipt of each Application for Payment, either indicate in writing his approval of payment or return the Application to CONTRACTOR indicating in writing his reasons for refusing to approve payment. In the latter case, CONTRACTOR may make the necessary correction and resubmit the Application. Within 30 days of receiving the submittal of an approvable Application for Payment, the OWNER will make partial payment to the CONTRACTOR on the basis of a duly certified approved estimate of the Work performed during the preceding period by the CONTRACTOR.
- 14.2.2.2 ENGINEER's recommendation of any payment requested in an Application for Payment will be based on ENGINEER's observations on the Site of the executed Work 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:
 - 14.2.2.2.1 the Work has progressed to the point indicated;
 - 14.2.2.2.2 the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, to the results of any subsequent tests called for in the Contract Documents, to a final determination of quantities and classifications for Unit Price Work under paragraph 9.8, and to any other qualifications stated in the recommendation); and
 - 14.2.2.2.3 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. 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 have been exhaustive, extended to every

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- 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;
- 14.2.2.2.4 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;
- 14.2.2.2.5 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 referred to in paragraph 14.2.2.2. ENGINEER may also refuse to recommend any such payment because of subsequently discovered evidence or 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:
- 14.2.2.2.5.1 the Work is defective, or completed Work has been damaged, requiring correction or replacement;
 - 14.2.2.2.5.2 the Contract Price has been reduced by Written Amendment or Change Orders;
 - 14.2.2.2.5.3 OWNER has been required to correct defective Work or complete Work in accordance with paragraph 13.9; or
 - 14.2.2.2.5.4 ENGINEER has actual knowledge of the occurrence of any of the events enumerated in paragraph 15.2.1.

14.2.3 Payment Becomes Due

- 14.2.3.1 Thirty days after presentation of the Application for Payment to OWNER with ENGINEER's recommendation, the amount recommended will (subject to the provisions of paragraph 14.2.4) become due, and when due will be paid by OWNER to CONTRACTOR

14.2.4 Reduction in Payment

- 14.2.4.1 OWNER may refuse to make payment of the full amount recommended by ENGINEER because:
- 14.2.4.1.1 claims have been made against OWNER on account of CONTRACTOR's performance or furnishing of the Work;
 - 14.2.4.1.2 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

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discharge of such Liens;

14.2.4.1.3 There are other items entitling OWNER to a set-off against the amount recommended; or

14.2.4.1.4 OWNER has actual knowledge of the occurrence of any of the events enumerated in paragraphs 14.2.2.5.1 through 14.2.2.5.3 or paragraph 15.2.1.

14.2.4.2 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.

14.2.4.3 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 14.2.3.1.

14.3 CONTRACTOR's Warranty of Title

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

14.4 Substantial Completion:

14.4.1 CONTRACTOR may, in writing to OWNER and ENGINEER, certify that the entire Project is substantially complete and request that ENGINEER issue a certificate of Substantial Completion. Within a reasonable time thereafter, OWNER, CONTRACTOR and ENGINEER shall make an inspection of the Project to determine the status of completion. If ENGINEER and OWNER do not consider the Project substantially complete, ENGINEER will prepare and deliver to OWNER a tentative certificate of Substantial Completion and the responsibilities between OWNER and CONTRACTOR for maintenance, heat and utilities. There shall be attached to the certificate a tentative list of items to be completed or corrected before Substantial Completion, and the certificate shall fix the time within which such items shall be completed or corrected, said time to be within Contract Time.

14.4.2 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.

14.5 Partial Utilization:

14.5.1 Prior to Substantial Completion of the Project, OWNER may request CONTRACTOR in writing to permit him to use a specified part of the Project which he believes he may use without significant interference with construction of the other parts of the Project. If CONTRACTOR agrees, he will certify to OWNER and ENGINEER that said part of the Project is substantially complete and request the ENGINEER to issue a certificate of Substantial completion for that part of the Project. Within a reasonable time thereafter, OWNER, CONTRACTOR, and ENGINEER shall make an inspection of that part of the Project to determine its status of completion. If ENGINEER and OWNER do not consider that it is

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substantially complete, ENGINEER will notify CONTRACTOR in writing giving his reasons therefore. If ENGINEER and OWNER consider that part of the Project to be substantially complete, ENGINEER will execute and deliver to OWNER and CONTRACTOR a certificate to that effect, fixing the date of Substantial Completion as to that part of the Project, attaching thereto a tentative list of items to be completed or corrected before Substantial Completion of the entire Project and fixing the responsibility between OWNER and CONTRACTOR for maintenance, heat, and utilities as to that part of the Project. OWNER shall have the right to exclude CONTRACTOR from any part of the Project which ENGINEER has so certified to be substantially complete, but OWNER shall allow CONTRACTOR reasonable access to complete items on the tentative list.

14.5.2 The CONTRACTOR is specifically advised that payment in full for sections so completed and used by the OWNER will NOT be made until the entire Project has been completed. Partial payments for Work completed and the retainage will be handled on the basis of the ENTIRE Contract Amount as here specified. The CONTRACTOR shall account for this in his Bid and under no circumstances will occupancy and use of completed sections of the Work by the OWNER be considered as grounds for reducing the retainage withheld from the CONTRACTOR's partial payments, or for an increase in the Contract Price.

14.6 Final Inspection

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

14.7 Final Payment

14.7.1 Application for Payment

14.7.1.1 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.

14.7.1.2 The final Application for Payment shall be accompanied (except as previously delivered) by: (i) all documentation called for in the Contract Documents; (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.

14.7.1.3 In lieu of the releases or waivers of Liens specified in paragraph 14.7.1.2 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,

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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.

14.7.2 Review of Application and Acceptance

14.7.2.1 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 14.9. 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.

14.7.3 Payment Becomes Due

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

14.8 Final Completion Delayed

14.8.1 If, through no fault of CONTRACTOR, final completion of the Work is significantly delayed, and if ENGINEER so confirms, OWNER shall, upon receipt of CONTRACTOR's 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 5.1, the written consent of the surety to the payment of the balance due for that portion of the Work fully complete 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.

ARTICLE 15.0 - SUSPENSION OF WORK AND TERMINATION

15.1 OWNER May Suspend Work

15.1.1 At any time and without cause, OWNER may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by notice in writing to

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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 therefore as provided in paragraph 10.5.

15.2 OWNER May Terminate for Cause

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

15.2.1.1 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 2.7 as adjusted from time to time pursuant to paragraph 6.4);

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

15.2.1.3 CONTRACTOR's disregard of the authority of ENGINEER; or

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

15.2.2 If one or more of the events identified in paragraph 15.2.1 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, 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.

15.3 OWNER May Terminate For Convenience

15.3.1 Upon seven days written notice to CONTRACTOR, 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):

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15.3.1.1 for completed and acceptable Work executed in accordance with the contract Documents prior to the effective date of termination.

15.3.2 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.

15.4 CONTRACTOR May Stop Work or Terminate

15.4.1 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 15.3. In lieu of terminating the Contract and without prejudice to any other right 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 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 15.4 are not intended to preclude CONTRACTOR from making a Claim under paragraph 10.5 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.

15.5 Assignment of Contract

15.5.1 CONTRACTOR shall not assign, transfer, convey or otherwise dispose of the Contract, or of his legal right, title, or interest in or to the same or to any part thereof, without the prior written consent of the OWNER. CONTRACTOR shall not assign by power of attorney or otherwise any monies due him and payable under this Contract without the prior written consent of the OWNER. Such consent, if given, will in no way relieve the CONTRACTOR from any of the obligations of this Contract. OWNER shall not be bound to abide by or observe the requirements of any such assignment.

ARTICLE 16.0 - DISPUTE RESOLUTION

16.1 Methods and Procedures

16.1.1 Dispute resolution methods and procedures, if any, shall be as set forth in these General Conditions, in the Standard Form Contract, or otherwise in the Contract Documents. If no method and procedure has been set forth, and subject to the provisions of paragraph 9.9 and 10.5, 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.

EXHIBIT F

SPECIFICATION FOR CURED-IN-PLACE-PIPE
(CIPP)



PERFORMANCE SPECIFICATION GUIDELINE

FOR THE
INSTALLATION OF

CURED-IN-PLACE PIPE (CIPP)

June, 2011

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Disclaimer

These specifications were prepared by NASSCO and peer reviewed by industry professionals. These specifications are not specific to any one product and should be considered a guideline only. Conditions for use may require additions, deletions or amendments to these guidelines so as to conform to project specific site conditions. NASSCO assumes no liability as to content, use and application of these guidelines.

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PART 1 - GENERAL

- A. These PSG's include the minimum requirements for the rehabilitation of sanitary sewer pipelines by the installation of Cured-In-Place Pipe (CIPP) within the existing, deteriorated pipe as shown on the plans included as part of these contract documents.
- B. The rehabilitation of pipelines shall be done by the installation of a resin-impregnated flexible tube which, when cured, shall be continuous and tight-fitting throughout the entire length of the original pipe. The CIPP shall extend the full length of the original pipe and provide a structurally sound, joint-less and water-tight new pipe within a pipe. The Contractor is responsible for proper, accurate and complete installation of the CIPP using the system selected by the Contractor.
- C. Neither the CIPP system, nor its installation, shall cause adverse effects to any of the Owner's processes or facilities. The use of the product shall not result in the formation or production of any detrimental compounds or by-products at the wastewater treatment plant. The Contractor shall notify the Owner and identify any by-products produced as a result of the installation operations, test and monitor the levels, and comply with any and all local waste discharge requirements. The Contractor shall cleanup, restore existing surface conditions and structures, and repair any of the CIPP system determined to be defective. The Contractor shall conduct installation operations and schedule cleanup in a manner to cause the least possible obstruction and inconvenience to traffic, pedestrians, businesses, and property owners or tenants.
- D. The prices submitted by the Contractor, shall include all costs of permits, labor, equipment and materials for the various bid items necessary for furnishing and installing, complete in place, CIPP in accordance with these specifications. All items of work not specifically mentioned herein which are required, by the contractor, to make the product perform as intended and deliver the final product as specified herein shall be included in the respective lump sum and unit prices bid.

1.1 DESCRIPTION OF WORK AND PRODUCT DELIVERY

- A. These PSG's cover all work necessary to furnish and install, the (CIPP). The Contractor shall provide all materials, labor, equipment, and services necessary for traffic control, bypass pumping and/or diversion of sewage flows, cleaning and television inspection of sewers to be lined, liner installation, reconnection of service connections, all quality controls, provide samples for performance of required material tests, final television inspection, testing of lined pipe system and warranty work, all as specified herein.

- B. The product furnished shall be a complete CIPP system including all materials, applicable equipment and installation procedures. The CIPP system manufacturer may submit, a minimum of 14 calendar days in advance of the bid date, required information to the Owner to obtain pre-approval status. Those CIPP systems that have been pre-approved will not be required to furnish information as required in the submittal section of these specifications unless specifically requested to do so by the Owner or if any of the CIPP system components have changed from those pre-approved by the Owner. All other CIPP systems or multi-component products will be required to meet the submittal requirements as contained herein.
- C. The CIPP shall be continuous and joint-less from manhole to manhole or access point to access point and shall be free of all defects that will affect the long term life and operation of the pipe.
- D. The CIPP shall fit sufficiently tight within the existing pipe so as to not leak at the manholes, at the service connections or through the wall of the installed pipe. If leakage occurs at the manholes or the service connections the Contractor shall seal these areas to stop all leakage using a material compatible with the CIPP as directed by the Owner at the price bid therefore in the Proposal. If leakage occurs through the wall of the pipe the liner shall be repaired or removed as recommended by the CIPP manufacturer. Final approval of the liner installation will be based on a leak tight pipe.
- E. The CIPP shall be designed for a life of 50 years or greater.
- F. The CIPP may be designed to resist external groundwater pressures only or as a fully structural stand alone pipe-within-a-pipe. If the design is for groundwater, only the design groundwater level is required for external loads. If specified in the contract documents the installed CIPP shall be a structurally designed pipe within a pipe, meet or exceed all contract specified physical properties, fitting tightly within the existing pipe all within the tolerances specified. The installed CIPP shall withstand all applicable surcharge loads (soil overburden, live loads, etc.) and external hydrostatic (groundwater) pressure, if present, for each specific installation location.
- G. The installed CIPP shall have a long term (50 year) corrosion resistance to the typical chemicals found in domestic sewage.
- H. All existing and confirmed active service connections and any other service laterals to be reinstated as directed by the Owner shall be re-opened robotically or by hand in the case of man-entry size piping, to their original shape and to 90% of their original capacity. All over-cut service connections will be properly repaired to meet the requirements of these specifications.

- I. All materials furnished, as part of this contract shall be marked with detailed product information, stored in a manner specified by the manufacturer and tested to the requirement of this contract.
- J. Testing and warranty inspections shall be executed by the Owner. Any defects found shall be repaired or replaced by the Contractor.
- K. The Contractor shall furnish all samples for product testing at the request of the Owner. The Owner shall take possession of the samples for testing and shall maintain the chain of custody, deliver the samples to an approved laboratory and pay for all material and product testing performed under this contract.

1.2 REFERENCES

- A. The following documents form a part of this specification to the extent stated herein and shall be the latest editions thereof. Where differences exist between codes and standards, the requirements of these specifications shall apply. All references to codes and standards shall be to the latest revised version.

ASTM - F1216 Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube

ASTM - F1743 Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Pull in and inflate and Curing of a Resin-Impregnated Tube

ASTM - D543 Standard and Practice for Evaluating the Resistance of Plastics to Chemical Reagents

ASTM - D638 Standard Test Method for Tensile Properties of Plastics

ASTM - D790 Standard Test Methods for Flexural Properties of Un-reinforced and Reinforced Plastics and Electrical Insulating Materials

ASTM - D792 Standard Test Methods for Density and Specific Gravity of Plastics by displacement.

ASTM - F2019-03 Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Pulled in Place Installation of Glass Reinforced Plastic (GRP) Cured-in-Place Thermosetting Resin Pipe (CIPP)

ASTM - D2122-98(2004) Standard Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings

ASTM F2561 - 06 Standard Practice for Rehabilitation of a Sewer Service Lateral and Its Connection to the Main Using a One Piece Main and Lateral Cured-in-Place Liner

ASTM - D2990 Standard Test Methods for Tensile, Compressive, and Flexural Creep and Creep-Rupture of Plastics

ASTM - D3567-97(2002) Standard Practice for Determining Dimensions of Fiberglass (Glass-Fiber-Reinforced Thermosetting Resin) Pipe and Fittings

ASTM - D3681 Standard Test Method for Chemical Resistance of "Fiberglass (Glass Fiber Reinforced Thermosetting Resin) Pipe in a Deflected Condition

ASTM - D5813 Standard Specification for Cured-in Place Thermosetting Resin Sewer Pipe

1.3 PERFORMANCE WORK STATEMENT (PWS) SUBMITTAL

- A. The Contractor shall submit, to the Owner, a Performance Work Statement (PWS) at the pre-construction meeting, which clearly defines the CIPP product delivery in conformance with the requirements of these contract documents. Unless otherwise directed by the Owner, the PWS shall at a minimum contain the following:
- B. Clearly indicate that the CIPP will conform to the project requirements as outlined in the Description of Work and as delineated in these specifications.
- C. Where the scope of work is specifically delineated in the contract documents, a detailed installation plan describing all preparation work, cleaning operations, pre-CCTV inspections, by-pass pumping, traffic control, installation procedure, method of curing, service reconnection, quality control, testing to be performed, final CCTV inspection, warranties furnished and all else necessary and appropriate for a complete CIPP liner installation. A detailed installation schedule shall be prepared, submitted and conform to the requirements of this contract.
- D. Contractor's description of the proposed CIPP lining technology, including a detailed plan for identifying all active service connections maintaining service, during mainline installation, to each home connected to the section of pipe being lined, including temporary service if required by the contract.
- E. A description of the CIPP materials to be furnished for the project. Materials shall be fully detailed in the submittals and conform to these specifications and/or shall conform to the pre-approved product submission.
- F. A statement of the Contractors experience. The Contractor shall have a minimum of three (3) years of continuous experience installing CIPP liners in pipe of a similar size, length and configuration as contained in this contract. A minimum of 150,000 linear feet of shop wet-out liner installation is required and minimum of 6 onsite wet-out installations are required as specifically applicable to this contract. The lead personnel including the superintendent, the foreman and the lead crew personnel for the CCTV inspection, resin wet-out, the CIPP liner installation, liner curing and the robotic service reconnections each must have a minimum of three (3) years of total experience with the CIPP technology proposed for this contract and must have demonstrated competency and experience to perform the scope of work contained in this contract. The name and experience of each lead individual performing work on this contract shall be submitted with the PWS. Personnel replaced by the contractor, on this contract, shall have similar, verifiable experience as the personnel originally submitted for the project.

- G. Engineering design calculations, in accordance with the Appendix of ASTM F-1216, for each length of liner to be installed including the thickness of each proposed CIPP. It will be acceptable for the Contractor to submit a design for the most severe line condition and apply that design to all of the line sections. These calculations shall be performed and certified by a, qualified, Professional Engineer. All calculations shall include data that conforms to the requirements of these specifications or has been pre-approved by the Owner.
- H. Proposed manufacturers technology data shall be submitted for all CIPP products and all associated technologies to be furnished.
- I. Submittals shall include information on the cured-in-place pipe intended for installation and all tools and equipment required for a complete installation. The PWS shall identify which tools and equipment will be redundant on the job site in the event of equipment breakdown. All equipment, to be furnished for the project, including proposed back-up equipment, shall be clearly described. The Contractor shall outline the mitigation procedure to be implemented in the event of key equipment failure during the installation process.
- J. A detailed description of the Contractor's proposed procedures for removal of any existing blockages in the pipeline that may be encountered during the cleaning process.
- K. A detailed public notification plan shall be prepared and submitted including detailed staged notification to residences affected by the CIPP installation.
- L. An odor control plan shall be submitted, by the contractor, that will ensure that project specific odors will be minimized at the project site and surrounding area.
- M. Compensation for all work required for the submittal of the PWS shall be included in the various pipelining items contained in the Proposal.

1.4 PRODUCT SUBMITTALS

- A. Fabric Tube – including the manufacturer and description of product components.
- B. Flexible membrane (coating) material – including recommended repair (patching) procedure if applicable.
- C. Raw Resin Data - including the manufacturer and description of product components.

- D. Manufacturers' shipping, storage and handling recommendations for all components of the CIPP System.
- E. All MSDS sheets for all materials to be furnished for the project.
- F. Tube wet-out & cure method including:
- G. A complete description of the proposed wet-out procedure for the proposed technology.
- H. The Manufacturer's recommended cure method - for each diameter and thickness of CIPP liner to be installed. The PWS shall contain a detailed curing procedure detailing the curing medium and the method of application.
- I. Compensation for all work required for the submittal of product data shall be included in the Lump Sum price contained in the Proposal for Mobilization.

1.5 SAFETY

- A. The Contractor shall conform to all work safety requirements of pertinent regulatory agencies, and shall secure the site for the working conditions in compliance with the same. The Contractor shall erect such signs and other devices as are necessary for the safety of the work site.
- B. The Contractor shall perform all of the Work in accordance with applicable OSHA standards. Emphasis shall be placed upon the requirements for entering confined spaces and with the equipment being utilized for pipe renewal.
- C. The Contractor shall submit a proposed Safety Plan to the Owner, prior to beginning any work, identifying all competent persons. The plan shall include a description of a daily safety program for the job site and all emergency procedures to be implemented in the event of a safety incident. All work shall be conducted in accordance with the Contractor's submitted Safety Plan.
- D. Compensation for all work required for the submittal of the Safety Plan shall be included in the various pipelining items contained in the Proposal.

1.6 QUALITY CONTROL PLAN (QCP)

- A. A detailed quality control plan (QCP) shall be submitted to the Owner that fully represents and conforms to the requirements of these specifications. At a minimum the QCP shall include the following:
- B. A detailed discussion of the proposed quality controls to be performed by the Contractor.

- C. Defined responsibilities, of the Contractor's personnel, for assuring that all quality requirements, for this contract, are met. These shall be assigned, by the Contractor, to specific personnel.
- D. Proposed procedures for quality control, product sampling and testing shall be defined and submitted as part of the plan.
- E. Proposed methods for product performance controls, including method of and frequency of product sampling and testing both in raw material form and cured product form.
- F. A scheduled performance and product test result reviews between the Contractor and the Owner at a regularly scheduled job meeting.
- G. Inspection forms and guidelines for quality control inspections shall be prepared in accordance with the standards specified in this contract and submitted with the QCP.
- H. Two (2) days of inspector training, by the CIPP system manufacture, for the Owners inspectors shall be provided. This training shall be prior to liner installation, include both technical and field training and include all key aspects of visual inspection and sampling procedures for testing requirements. On smaller projects having an estimated duration of less than two (2) weeks of lining work, the system manufacturer shall furnish a check list containing key elements of the CIPP installation criteria that is important for the Owners inspector to ensure that quality control and testing requirements are performed in accordance with the contract documents.
- I. Compensation for all work required for the submittal of the QCP shall be included in the various pipelining items contained in the Proposal. Compensation for inspector training shall be included in the price bid therefore in the Proposal.

1.7 CIPP REPAIR/REPLACEMENT

- A. Occasionally installations will result in the need to repair or replace a defective CIPP. The Contractor shall outline specific repair or replacement procedures for potential defects that may occur in the installed CIPP. Repair/replacement procedures shall be as recommended by the CIPP system manufacturer and shall be submitted as part of the PWS.
- B. Defects in the installed CIPP that will not affect the operation and long term life of the product shall be identified and defined.

- C. Repairable defects that may occur in the installed CIPP shall be specifically defined by the Contractor based on manufacturer's recommendations, including a detailed step-by-step repair procedure, resulting in a finished product meeting the requirements of these contract specifications.
- D. Un-repairable defects that may occur to the CIPP shall be clearly defined by the Contractor based on the manufacturer's recommendations, including a recommended procedure for the removal and replacement of the CIPP.

1.8 AS-BUILT DRAWINGS

- A. As-Built drawings, pre & post inspection videotapes and/or CD's shall be submitted to the Owner, by the Contractor within 2 weeks of final acceptance of said work or as specified by the Owner. As-Built drawings will include the identification of the work completed by the Contractor and shall be prepared on one set of Contract Drawings provided to the Contractor at the onset of the project.
- B. As-Built drawings shall be kept on the project site at all times, shall include all necessary information as outlined in the PWS or as agreed to by the Owner and the Contractor at the start of the Contract and shall be updated as the work is being completed, and shall be clearly legible.
- C. Compensation for all work required for the submittal and approval of As-Built Drawings shall be included in the various pipelining items contained in the Proposal.

1.9 WARRRRANTY

- A. The materials used for the project shall be certified by the manufacturer for the specified purpose. The Contractor shall warrant the liner material and installation for a period of one (1) year. During the Contractor warranty period, any defect which may materially affect the integrity, strength, function and/or operation of the pipe, shall be repaired at the Contractor's expense in accordance with procedures included in Section 1.7 CIPP Repair/Replacement and as recommended by the manufacturer.
- B. On any work completed by the contractor that is defective and/or has been repaired, the contractor shall warrant this work for (1) year in addition to the warrantee required by the contract.,
- C. After a pipe section has been lined and for a period of time up to one (1) year following completion of the project, the Owner may inspect all or portions of the lined system. The specific locations will be selected at random by the Owner and will include all sizes of CIPP from this project. If it is found that any of the CIPP has developed abnormalities since the time of "Post Construction Television Inspection,"

the abnormalities shall be repaired and/or replaced as defined in Section 1.7 CIPP Repair/Replacement and as recommended by the manufacturer. If, after inspection of a portion of the lined system under the contract, problems are found, the Owner may televise all the CIPP installed on the contract. All verified defects shall be repaired and/or replaced by the Contractor and shall be performed in accordance with Section 1.7 CIPP Repair/Replacement and per the original specifications, all at no additional cost to the Owner.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. The CIPP System must meet the chemical resistance requirements of these contract documents.
- B. All materials, shipped to the project site, shall be accompanied by test reports certifying that the material conforms to the ASTM standards listed herein. Materials shall be shipped, stored, and handled in a manner consistent with written recommendations of the CIPP system manufacturer to avoid damage. Damage includes, but is not limited to, gouging, abrasion, flattening, cutting, puncturing, or ultra-violet (UV) degradation. On site storage locations, shall be approved by the Owner. All damaged materials shall be promptly removed from the project site at the Contractor's expense and disposed of in accordance with all current applicable agency regulations.

2.2 FABRIC TUBE

- A. The fabric tube shall consist of one or more layers of absorbent non-woven felt fabric, felt/fiberglass or fiberglass and meet the requirements of ASTM F 1216, ASTM F 1743, ASTM D 5813 & ASTM F2019. The fabric tube shall be capable of absorbing and carrying resins, constructed to withstand installation pressures and curing temperatures and have sufficient strength to bridge missing pipe segments, and stretch to fit irregular pipe sections. The contractor shall submit certified information from the felt manufacturer on the nominal void volume in the felt fabric that will be filled with resin.
- B. The wet-out fabric tube shall have a uniform thickness and excess resin distribution that when compressed at installation pressures will meet or exceed the design thickness after cure.
- C. The fabric tube shall be manufactured to a size and length that when installed will tightly fit the internal circumference, meeting applicable ASTM standards or better, of the original pipe. Allowance shall be made for circumferential stretching during installation. The tube shall be properly sized to the diameter of the existing pipe and

the length to be rehabilitated and be able to stretch to fit irregular pipe sections and negotiate bends. The Contractor shall determine the minimum tube length necessary to effectively span the designated run between manholes. The Contractor shall verify the lengths in the field prior to ordering and prior to impregnation of the tube with resin, to ensure that the tube will have sufficient length to extend the entire length of the run. The Contractor shall also measure the inside diameter of the existing pipelines in the field prior to ordering liner so that the liner can be installed in a tight-fitted condition.

- D. The outside and/or inside layer of the fabric tube (before inversion/pull-in, as applicable) shall be coated with an impermeable, flexible membrane that will contain the resin and facilitate, if applicable, vacuum impregnation and monitoring of the resin saturation during the resin impregnation (wetout) procedure.
- E. No material shall be included in the fabric tube that may cause de-lamination in the cured CIPP. No dry or unsaturated layers shall be acceptable upon visual inspection as evident by color contrast between the tube fabric and the activated resin containing a colorant.
- F. The wall color of the interior pipe surface of CIPP after installation shall be a light reflective color so that a clear detailed examination with closed circuit television inspection equipment may be made. The hue of the color shall be dark enough to distinguish a contrast between the fully resin saturated felt fabric and dry or resin lean areas.
- G. Seams in the fabric tube, if applicable, shall meet the requirements of ASTM D5813.
- H. The outside of the fabric tube shall be marked every 5 feet with the name of the manufacturer or CIPP system, manufacturing lot and production footage.
- I. The minimum length of the fabric tube shall be that deemed necessary by the installer to effectively span the distance from the starting manhole to the terminating manhole or access point, plus that amount required to run-in and run-out for the installation process.
- J. The nominal fabric tube wall thickness shall be constructed, as a minimum, to the nearest 0.5 mm increment, rounded up from the design thickness for that section of installed CIPP. Wall thickness transitions, in 0.5 mm increments or greater as appropriate, may be fabricated into the fabric tube between installation entrance and exit access points. The quantity of resin used in the impregnation shall be sufficient to fill all of the felt voids for the nominal felt thickness.

2.3 RESIN

- A. The resin shall be a corrosion resistant polyester or vinyl ester resin and catalyst system or epoxy and hardener system that, when properly cured within the tube composite, meets the requirements of ASTM F1216, ASTM F1743 or F2019, the physical properties herein, and those, which are to be utilized in the design of the CIPP for this project. The resin shall produce CIPP which will comply with or exceed the structural and chemical resistance requirements of this specification.
- B. The resin to tube ratio, by volume, shall be furnished as recommended by the manufacturer.

2.4 STRUCTURAL REQUIREMENTS

- A. The physical properties and characteristics of the finished liner will vary considerably, depending on the types and mixing proportions of the materials used, and the degree of cure executed. It shall be the responsibility of the Contractor to control these variables and to provide a CIPP system which meets or exceeds the minimum properties specified herein:
- B. The CIPP shall be designed as per ASTM F1216 Appendixes. The CIPP design shall assume no bonding to the original pipe wall.
- C. The design engineer shall set the long term (50 year extrapolated) Creep Retention Factor at 50% of the initial design flexural modulus as determined by ASTM D-790 test method. This value shall be used unless the Contractor submits long term test data (ASTM D2990) to substantiate a higher retention factor.
- D. The cured pipe material (CIPP) shall, at a minimum, meet or exceed the structural properties, as listed below.

2.5 MINIMUM PHYSICAL PROPERTIES

Property	Test Method	Cured Composite Per ASTM F1216	Cured Composite Per Design
Flexural Modulus of Elasticity (Short Term) (Felt Tubes) Felt/Fiberglass, Fiberglass as recommended by the Manufacturer	ASTM D-790	250,000 psi	Contractor Value
Flexural Strength (Short Term) (Felt Tubes) Felt/Fiberglass, Fiberglass as recommended by the Manufacturer	ASTM D-790	4,500 psi	Contractor Value

- A. The required structural CIPP wall thickness shall be based, as a minimum, on the physical properties of the cured composite and per the design of the Professional Engineer (see section 1.3.F) and in accordance with the Design Equations contained in the appendix of the ASTM standards, and the following design parameters:

Design Safety Factor	2.0 (1.5 for pipes 36" or larger)
Creep Retention Factor	50%
Ovality	2% or as measured by field inspection
Constrained Soil Modulus	Per AASHTO LRFD Section 12 and AWWA Manual M45
Groundwater Depth	As specified or indicated on the Plans
Soil Depth (above the crown)	As specified or indicated on the Plans
Live Load	Highway, railroad or airport as applicable
Soil Load (assumed)	120 lb/cu. Ft.
Minimum Service Life	50 years

- B. The Contractor shall submit, prior to installation of the lining materials, certification of compliance with these specifications and/or the requirements of the pre-approved CIPP system. Certified material test results shall be included that confirm that all materials conform to these specification and/or the pre-approved system. Materials not complying with these requirements will be rejected.
- C. The design soil modulus may be adjusted based on data determined from detailed project soil testing results as provided by the Owner in the contract documents.

PART 3 - INSTALLATION

3.1 CONSTRUCTION REQUIREMENTS

- A. Preparation, cleaning, inspection, sewage by-passing and public notification. The Contractor shall clean the interior of the existing host pipe prior to installation of the CIPP liner. All debris and obstructions, that will effect the installation and the final CIPP product delivery to the Owner, shall be removed and disposed of.
- B. The CIPP liner shall be constructed of materials and methods, that when installed, shall provide a jointless and continuous structurally sound CIPP able to withstand all imposed static, and dynamic loads on a long-term basis.
- C. The Contractor may, under the direction of the Owner, utilize any of the existing manholes in the project area as installation access points. If a street must be closed to traffic because of the location of the sewer, the Contractor shall furnish a detailed traffic control plan and all labor and equipment necessary. The plan shall be in conformance with the requirements of the local agency having jurisdiction over traffic control.

- D. Cleaning of Pipe Lines - The Contractor shall remove all internal debris from the pipe line that will interfere with the installation and the final product delivery of the CIPP as required in these specifications. Solid debris and deposits shall be removed from the system and disposed of properly by the Contractor. Moving material from manhole section to manhole section shall not be allowed. As applicable the contractor shall either plug or install a flow bypass pumping system to properly clean the pipe lines. Precaution shall be taken, by the Contractor in the use of cleaning equipment to avoid damage to the existing pipe. The repair of any damage, caused by the cleaning equipment, shall be the responsibility of the Contractor. The Owner will designate a site for the disposal of all debris removed, from the Owner's sewer system, as a direct result of the cleaning operation. Unless otherwise specified by the Owner, the Contractor shall dispose of all debris at no charge. Should any dumping fees apply, the Contractor shall be compensated at the respective unit price bid in the Proposal for cleaning.
- E. By-passing Existing Sewage Flows - The Contractor shall provide for the flow of existing mainline and service connection effluent around the section or sections of pipe designated for CIPP installation. With most small diameter pipelines, particularly on terminal sewers, plugging will be adequate but must be monitored on a regular basis to prevent backup of sewage into adjacent homes. Service connection effluent may be plugged only after proper notification to the affected residence and may not remain plugged overnight. Installation of the liner shall not begin until the Contractor has installed the required plugs or a sewage by-pass system and all pumping facilities have been installed and tested under full operating conditions including the bypass of mainline and side sewer flows. Once the lining process has begun, existing sewage flows shall be maintained, until the resin/felt tube composite is fully cured, cooled down, full televised and the CIPP ends finished. The Contractor shall coordinate sewer bypass and flow interruptions with the Owner at least 14 days in advance and with the property owners and businesses at least 1 business day in advance. The pump and bypass lines shall be of adequate capacity and size to handle peak flows. The Contractor shall submit a detail of the bypass plan and design to the Owner before proceeding with any CIPP installation. Compensation for by-pass pumping and all associated plans and approvals shall be at the price bid therefore in the Proposal.
- F. Contractor shall perform post-cleaning video inspections of the pipelines. Only PACP certified personnel trained in locating breaks, obstacles and service connections by closed circuit television shall perform the inspection. The Contractor shall provide the Owner a copy of the pre-cleaning and post-cleaning video and suitable log, and/or in digital format for review prior to installation of the CIPP and for later reference by the Owner.
- G. Line Obstructions - It shall be the responsibility of the Contractor to clear the line of obstructions that will interfere with the installation and long-term performance of the

CIPP. If pre-installation inspection reveals an obstruction, misalignment, broken or collapsed section or sag that was not identified as part of the original scope of work and will prohibit proper installation of the CIPP, the Contractor may be directed by the Owner to correct the problem(s) prior to lining by utilizing open cut repair methods. The Contractor shall be compensated for this work under a contingency pay item designated for open cut point repairs. Removal of any previously unknown obstructions shall be considered as a changed condition. The cost of removal of obstructions that appeared on pre-bid video documentation and made available to the Contractor, prior to the bid opening, shall be compensated for on a unit price basis in accordance with the contract documents.

- H. The Contractor shall be responsible for confirming the locations of all branch service connections prior to installing and curing the CIPP. If required in the contract documents, each connection will be dye tested to determine whether or not the connection is live or abandoned. The cost for dye testing of existing service connections shall be compensated at the unit price bid in the Proposal for Dye Testing of Existing Service Connections. In the event the status of a service connection cannot be adequately defined, the Owner will make the final decision, prior to installation and curing of the liner, as to the status. Typically only service connections deemed "active" shall be reopened by the Contractor.
- I. The Contractor shall be allowed use water from an owner-approved fire hydrant in the project vicinity. Use of an approved double check backflow assembly shall be required. Contractor shall provide his own approved assembly. Contractor shall pay current market price for all water usage.

3.2 INSTALLATION OF LINER

- A. The CIPP Liner shall be installed and cured in the host pipe per the manufacturer's specifications as described and submitted in the PWS.
- B. CIPP installation shall be in accordance with the applicable ASTM standards with the following modification:
- C. The wet-out tube shall be positioned in the pipeline using the method specified by the manufacturer. Care should be exercised not to damage the tube as a result of installation. The tube should be pulled-in or inverted through an existing manhole or approved access point and fully extend to the next designated manhole or termination point.
- D. Prior to installation and as recommended by the manufacturer remote temperature gauges or sensors shall be placed inside the host pipe to monitor the temperatures during the cure cycle. Liner and/or host pipe interface temperature shall be monitored and logged during curing of the liner.

- E. To monitor the temperature of the liner wall and to verify correct curing and where specified by the contract documents, temperature sensors can be placed between the host pipe and the liner in the bottom of the host pipe (invert) throughout its length to monitor the temperature on the outside of the liner during the curing process. The temperature sensors can be placed at intervals as recommended by the sensor manufacturer. Additional sensors can be placed where significant heat sinks are likely or anticipated. The sensors, if installed, should be monitored by a computer using a tamper proof data base that is capable of recording temperatures at the interface of the liner and the host pipe.
- F. Curing shall be accomplished by utilizing the appropriate medium in accordance with the manufacturer's recommended cure schedule. The curing source or in and output temperatures shall be monitored and logged during the cure cycles if applicable. The manufacturer's recommended cure method & schedule shall be used for each line segment installed, and the liner wall thickness and the existing ground conditions with regard to temperature, moisture level, and thermal conductivity of soil, per ASTM as applicable, shall be taken into account by the Contractor.
- G. For heat cured liners, if any temperature sensor or multiple sensors do not reach the temperature as specified by the manufacturer to achieve proper curing or cooling, the installer can make necessary adjustments to comply with the manufacturer's recommendations. The system computer should have an output report that specifically identifies each installed sensor station in the length of pipe, indicates the maximum temperature achieved and the sustained temperature time. Each sensor should record both the maximum temperature and the minimum cool down temperature and comply with the manufacturers recommendations. For UV Cured Liners, all light train sensor readings, recorded by the tamper proof computer, shall provide output documenting the cure along the entire length of the installed liner. The cure procedure shall be in accordance with the manufacturers recommendation as included in the PWS submission by the contractor.

3.3 COOL DOWN

- A. The Contractor shall cool the CIPP in accordance with the approved CIPP manufacturer's recommendations as described and outlined in the PWS.
- B. Temperatures and curing data shall be monitored and recorded, by the Contractor, throughout the installation process to ensure that each phase of the process is achieved as approved in accordance with the CIPP System manufacturer's recommendations.

3.4 FINISH

- A. The installed CIPP shall be continuous over the entire length of a sewer line section and be free from visual defects such as foreign inclusions, dry spots, pinholes, major wrinkles and de-lamination. The CIPP shall be impervious and free of any leakage from the pipe to the surrounding ground or from the ground to inside the lined pipe.
- B. Any defect, which will or could affect the structural integrity or strength of the linings, shall be repaired at the Contractor's expense, in accordance with the procedures submitted under Section 1.7 CIPP Repair/Replacement.
- C. The beginning and end of the CIPP shall be sealed to the existing host pipe. The sealing material shall be compatible with the pipe end and shall provide a watertight seal.
- D. If any of the service connections leak water between the host pipe and the installed liner, the connection mainline interface shall be sealed to provide a water tight connection.
- E. If the wall of the CIPP leaks, it shall be repaired or removed and replaced with a watertight pipe as recommended by the manufacture of the CIPP system.
- F. Compensation shall be at the actual length of cured-in-place pipe installed. The length shall be measured from center of manhole to center of manhole. The unit price per linear foot installed shall include all materials, labor, equipment and supplies necessary for the complete CIPP liner installation. Compensation for service connection sealing and pipe sealing at the manhole/wall interface, shall be at the unit price bid therefore in the Proposal.

3.5 MANHOLE CONNECTIONS AND RECONNECTIONS OF EXISTING SERVICES

- A. A seal, consisting of a resin mixture or hydrophilic seal compatible with the installed CIPP shall be applied at manhole/wall interface in accordance with the CIPP System manufacturer's recommendations.
- B. Existing services shall be internally or externally reconnected unless indicated otherwise in the contract documents
- C. Reconections of existing services shall be made after the CIPP has been installed, fully cured, and cooled down. It is the CONTRACTOR'S responsibility to make sure that all active service connections are reconnected.

- D. External reconnections are to be made with a tee fitting in accordance with CIPP System manufacturer's recommendations. Saddle connections shall be seated and sealed to the new CIPP using grout or resin compatible with the CIPP.
- E. A CCTV camera and remote cutting tool shall be used for internal reconnections. The machined opening shall be at least 90 percent of the service connection opening and the bottom of both openings must match. The opening shall not be more than 100 percent of the service connection opening. The edges of the opening shall not have pipe fragments or liner fragments, which may obstruct flow or snag debris. In all cases the invert of the sewer connection shall be cut flush with the invert entering the mainline.
- F. In the event that service reinstatements result in openings that are greater than 100 percent of the service connection opening, the Contractor shall install a CIPP type repair, sufficiently in size to completely cover the over-cut service connection. No additional compensation will be paid for the repair of over-cut service connections.
- G. Coupons of pipe material resulting from service tap cutting shall be collected at the next manhole downstream of the pipe rehabilitation operation prior to leaving the site. Coupons may not be allowed to pass through the system.
- H. Compensation shall be at the actual number of services re-connected using either internal or external means as contained in the Proposal. The unit price bid per service line re-connected shall include all materials, labor, equipment and supplies necessary to complete the work as required in these specifications.

3.6 TESTING OF INSTALLED CIPP

- A. The physical properties of the installed CIPP shall be verified through field sampling and laboratory testing. All materials for testing shall be furnished by the Contractor to the Owner for testing. All materials testing shall be performed at the Owner's expense, by an independent third party laboratory selected by the Owner as recommended by the CIPP manufacturer. All tests shall be in accordance with applicable ASTM test methods to confirm compliance with the requirements specified in these contract documents.
- B. The Contractor shall provide samples for testing to the Owner from the actual installed CIPP liner. Samples shall be provided, at a minimum from one location per 1000 linear feet of CIPP installed or as required by the Owner. The sample shall be cut from a section of cured CIPP that has been inverted or pulled through a like diameter pipe which has been held in place by a suitable heat sink, such as sandbags. All curing, cutting and identification of samples will be witnessed by the Owner and transmitted by the Owner to the testing laboratory. On pipelines greater than 18 inches in diameter the Owner may at its discretion, require plate samples

cured with the CIPP or designate a location in the newly installed CIPP where the Contractor shall take a sample. The Opening produced from the sample shall be repaired in accordance with manufacturers recommended procedures.

- C. The laboratory results shall identify the test sample location as referenced to the nearest manhole and station. Final payment for the project shall be withheld pending receipt and approval of the test results. If properties tested do not meet the minimum physical and thickness requirements, the CIPP shall be repaired or replaced by the Contractor unless the actual physical properties and the thickness of the sample tested meet the design requirements as required in the contract.
- D. Chemical resistance - The CIPP system installed shall meet the chemical resistance requirements of ASTM D5813. CIPP samples tested shall be of fabric tube and the specific resin proposed for actual construction. It is required that CIPP samples without plastic coating meet these chemical testing requirements. A certification may be submitted, by the contractor, from the manufacturer, verifying that the chemical resistance of the CIPP meets the contract requirements.
- E. Hydraulic Capacity - Overall, the hydraulic capacity shall be maintained as large as possible. The installed CIPP shall at a minimum be equal to the full flow capacity of the original pipe before rehabilitation. In those cases where full capacity cannot be achieved after liner installation, the Contractor shall submit a request to waive this requirement, together with the reasons for the waiver request. Calculated capacities may be derived using a commonly accepted roughness coefficient for the existing pipe material taking into consideration its age and condition.
- F. The installed CIPP thickness shall be measured for each line section installed. If the CIPP thickness does not meet that specified in the contract and submitted as the approved design by the Contractor then the liner shall be repaired or removed unless the tested physical properties and the thickness of the sample tested meet the design requirements as required in the contract. The liner thickness shall have tolerance of minus 5% plus 10%. In man-entry size piping the Contractor shall remove a minimum of one sample or one sample every line section of installed CIPP, not meeting the specified design thickness, to be used to check the liner thickness. The samples shall be taken by core drilling 2-inch diameter test plugs at random locations selected by the Owner. As an alternative the Contractor may use industry proven, non-destructive methods for confirming the thickness of the installed CIPP.
- G. All costs, to the Contractor, associated with providing cured CIPP samples for testing shall be included in the Lump Sum price bid for Mobilization. Payment for all testing by a laboratory will be paid for, by the Owner, directly to the laboratory under the lump sum reserve for testing item force bid in the Bid Proposal.

3.7 FINAL ACCEPTANCE

- A. All CIPP sample testing and repairs to the installed CIPP as applicable, shall be completed, before final acceptance, meeting the requirements of these specifications and documented in written form.
- B. The Contractor shall perform a detailed closed-circuit television inspection in accordance with ASTM standards, in the presence of the Owner after installation of the CIPP liner and reconnection of the side sewers. A radial view (pan and tilt) TV camera shall be used. The finished liner shall be continuous over the entire length of the installation and shall be free of significant visual defects, damage, deflection, holes, leaks and other defects. Unedited digital documentation of the inspection shall be provided to the Owner within ten (10) working days of the liner installation. The data shall note the inspection date, location of all reconnected side sewers, debris, as well as any other defects in the liner, including, but not limited to, gouges, cracks, bumps, or bulges. If post installation inspection documentation is not submitted within Ten (10) working days of the liner installation, the Owner may at its discretion suspend any further installation of CIPP until the post-installation documentation is submitted. As a result of this suspension, no additional working days will be added to the contract, nor will any adjustment be made for increase in cost. Immediately prior to conducting the closed circuit television inspection, the Contractor shall thoroughly clean the newly installed liner removing all debris and build-up that may have accumulated, at no additional cost to the Owner.
- C. Bypass pumping or plugging from the upstream manhole shall be utilized to minimize sewage from entering the line during the inspection. In the case of bellies in the line, the pipe shall be cleared of any standing water to provide continuous visibility during the inspection.
- D. Where leakage is observed through the wall of the pipe, the contractor shall institute additional testing including but not limited to air testing, localized testing and any other testing that will verify that the leakage rate of the installed CIPP does not exceed acceptable tolerances specified in the contract.

3.8 TYPICAL BID ITEMS

- A. Mobilization – Lump Sum - Includes all PWS info, submittals, safety plan, as-built drawings, testing samples, mobilization/demobilization of labor, equipment and materials to the project site. Generally limited to 5% of the total amount bid for the project.
- B. Pre-Lining CCTV Inspection – Per linear foot - Includes pre-cleaning and post cleaning CCTV for Owner review. Does not include CCTV inspection just prior to

CIPP installation. All inspections will be performed by PACP trained and certified personnel.

- C. Dye Testing of Service Connections – Per each -Includes dye testing and documentation of existing service connection on each pipe length to be lined.
- D. Point Repairs – Per each or by Lump Sum Contingency- Includes excavation and restoration of a section or sections of pipe that are beyond rehabilitation using a CIPP. Note: Point repair items shall be categorized by pipe size, a minimum length of excavation and depth category of excavation to be paid for in the Proposal. If point repairs are not identified in the contract documents payment shall be on a contingency basis.
- E. Standard Pipe cleaning – Per linear foot for each pipe size category – including all labor, equipment, materials and cost of material disposal.
- F. Heavy Pipe Cleaning – Per linear foot for each pipe category – including all labor, equipment, materials and cost of material disposal.
- G. Inspector training – Lump Sum – includes all labor equipment and materials required to train the Owner's inspectors on the technology to be installed for a period of two days.
- H. Liner Installation – Per linear foot for each pipe size category - Includes all labor, equipment and materials required for the complete installation of a CIPP.
- I. Traffic Control –Lump Sum – Includes all labor, equipment and material required to implement a traffic control plan for the entire project and shall include all costs associated sub-contracted traffic control specialists.
- J. Sewage By-pass – Lump Sum – Includes all labor, equipment and materials required, to implement a sewage by-pass plan for the entire project, including the cost of all sub-contracted sewage by-pass specialists.
- K. Service Reconnections – Per each – Includes reconnecting existing live sewer service connections to the installed CIPP. Owner shall review and verify those connections that are not live and will be left unopened.
- L. Service connection sealing – Per each – Includes sealing the interface between the installed CIPP and the host pipe at the location of the service connection.
- M. Manhole/Wall Interface Sealing – Per each – Includes sealing the interface between the installed CIPP and the manhole wall

- N. Post Construction CCTV Inspection - Per linear foot - Includes post lining CCTV for submission to the Owner. All inspections will be performed by PACP trained and certified personnel.

- O. Reserve for Testing – Lump Sum Reserve – For Owners use to include testing, required as directed by the Owner, under this contract by an independent laboratory. (The amount will be set by the Owner in the Bid Proposal)

****END OF SECTION****

EXHIBIT G
SPECIFICATIONS
FOR
MANHOLE REHABILITATION



PERFORMANCE SPECIFICATION GUIDELINE

FOR

MANHOLE REHABILITATION

December, 2013

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Disclaimer

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GENERAL DISCUSSION OF PRODUCTS AND TECHNOLOGIES

- A. The rehabilitation of manholes can be complicated and the selection of the correct product or technology can, at times, be confusing. There are many methods available for the rehabilitation of manholes. Each method must be evaluated to determine its applicability to provide the correct solution for the best available price. The following steps can be taken to develop the best approach towards rehabilitation and what family of products best meet specific project requirements.
1. Thoroughly evaluate the condition of the manhole to be rehabilitated using the Manhole Assessment Certification Program (MACP) as developed by NASSCO for providing a uniform coding for the defects typically found in a manhole structure.
 2. Define the type of defects as structural defects, operational & maintenance defects, construction features and other.
 3. Based on the defined defects classify each manhole into the general rehabilitation technology or technologies to be considered. Technologies can be classified into general rehabilitation needs including grouting, cementitious reconstruction, polymer coatings/linings, cured-in-place lining, panel liners, mechanical seals and bench and channel inserts.
 4. Select the correct solution based on the problems identified.
 5. What are the problems being addressed?
 6. Does the selected technology provide the desired long-term solution to the problem?
 7. Does the selected technology go beyond solving the immediate need and if so, is there a reasonable cost for the added benefit?
 8. Does the selected technology ensure compatibility of all materials being used to complete the repair?
 9. Is the selected technology Contractor friendly? Is it relatively well suited for the project site conditions?
 10. Select products and/or technologies that have viable, proven installation techniques.
 11. Can the Contractor capabilities and experience be quantifiable during the bid process?
 12. Can the qualifications of the personnel, working for the Contractor and applying the product be verified?
- B. There are many products technologies and variations available. Only generic categories of technologies are included in these sample specifications. Technology and product applicability, to each project, should be verified by contacting the manufacturer of each product, and discussing the proposed application to verify product compatibilities. Supporting documentation and third party testing should always be reviewed prior to selection. In some cases multiple technologies will be required to totally rehabilitate the manhole structure. Products and Technologies are

generally referred to herein as Rehabilitation Component Systems (SYSTEM's) and include the following:

1. Chemical Grouting – Generally used when the existing manhole is structurally sound but has leakage or I&I problems. Grout types and longevity in different soil conditions must be verified through the grout manufacturer.
2. Cementitious Manhole Restoration – Cementitious materials can be Portland Cement, Microsilica enhanced, Calcium Aluminate, or Geopolymer based. The Geopolymer, Calcium Aluminates and Microsilica cements typically have a higher resistance to corrosion and typically attain high structural strength after curing which facilitates top-coating in a relatively short period of time. Standard Portland cements typically require a 28 day cure before top coating. Cementitious materials can be trowelled, sprayed, spun cast or poured in place. This type of technology is generally used for structural reconstruction, elimination of I&I and prevention against low levels of corrosion. In some cases, cementitious materials are used as a base coating to level or smooth out the existing structure surface before applying a polymer top coat.
3. Polymers (Epoxy, Polyurethane, Polyurea Coatings) – Generally used for corrosion protection and to eliminate I&I. Epoxies and urethanes can have structural benefit when applied sufficiently thick. When applying multiple components to rehabilitate a manhole it is extremely important that all components are compatible with each other and each is properly cured and prepared before the application of the next product. Application of polymers on new manhole and concrete structures requires specific attention to off-gassing of the concrete causing unwanted pin-holing in the material during and immediately after application. As a general rule, cured concrete will off-gas air when the structure temperature is rising and will inhale when the concrete temperature drops. New or green concrete typically off-gasses almost continually and often requires penetrating primers to densify the surface prior to coating application. The Manufacturer of each system should be contacted to determine what the effect off-gassing has on the product and the best procedures for the application of polymers directly onto new concrete structures. The Contractor should be experienced in coating both new and old concrete structures.
4. Cured-In-Place Liners – Generally used for structural reconstruction of a manhole, I&I removal and corrosion protection. The process includes the installation of a specifically designed fabric liner, saturated with a thermosetting resin, that is heat cured under pressure and molded tightly to fit the inside shape of the existing manhole.
5. Panel Liners – Generally non-structural liners used for corrosion protection and elimination of I&I. Usually installed in the form of panels, thermally welded at the seams and mechanically anchored or glued to the manhole wall using a special adhesive.
6. Chimney Seals – Used for defects in the adjustable portion of the manhole. Seals can be used as a stand-alone product or in conjunction with a cementitious or polymer product. Seals can be applied both internally and

externally to the manhole structure and can be comprised of polymer applied, cured-in-place or rubber mechanical composition.

7. Barrel Joint Seals – Includes joints between pre-cast manhole sections where leaking joints are contributing groundwater infiltration and no structural deficiencies are present.
8. Bench and Channel Inserts - Prefomed corrosion resistant inserts installed in the bench and channel of the manhole.
9. Dish Inserts – Manhole opening cover. Prevents water from entering through the manhole cover holes.

References:

NASSCO Manhole Assessment Certification Program (MACP) - A certification program administered by NASSCO to train manhole inspection personnel on the standard coding of defects found in the manhole structure.

PART 1 - GENERAL

- A. These Specifications include the minimum requirements for the rehabilitation of manholes as shown on the plans included as part of these [contract documents].
- B. The rehabilitation of manholes shall be accomplished by the application or installation of rehabilitation components either individually or together. These may include grouts, protective coatings, a variety of linings, inserts, seals and mechanical devices that, when installed, shall protect the manhole structure, seal it from I & I, rebuild it structurally (if needed) and provide chemical resistance for the length of time specified. Several manhole components such as frames, covers and steps will typically be replaced rather than rehabilitated. The Contractor is responsible for the accurate and complete installation, and warranty of each manhole Rehabilitation Component System (SYSTEM) specified by the Owner.
- C. The manhole SYSTEM's installed shall cause no adverse effects to any of the Owner's processes or facilities either during or after application. The use of the product, by the Contractor, shall not result in the formation or production of any detrimental compounds or by-products at the wastewater treatment plant. The Contractor shall notify the Owner and identify any by-products produced as a result of the installation operations, test and monitor the levels, and comply with any and all local waste discharge requirements. The Contractor shall cleanup, restore existing surface conditions and structures, and repair any of the manhole SYSTEM's installed and determined to be defective. The Contractor shall conduct installation operations and schedule cleanup in a manner to cause the least possible obstruction and inconvenience to traffic, pedestrians, businesses, and property owners or tenants.
- D. The prices submitted by the Contractor, shall include all costs of permits, labor, equipment and materials for the various bid items necessary for furnishing and

applying, complete in place, manhole SYSTEM's, in accordance with these specifications. All items of work not specifically mentioned herein which are required to make the product perform as intended and deliver the final product as specified herein shall be included in the respective lump sum and unit prices bid in the Proposal. These Specifications include the minimum requirements for the rehabilitation of manholes defined herein and as shown on the plans included as part of these contract documents.

1.1 DESCRIPTION OF WORK AND PRODUCT DELIVERY

- A. These Specifications cover all work necessary to furnish and install, a variety of protective manhole SYSTEM's. The Contractor shall deliver a finished product(s) including all materials, labor, equipment, and services necessary for traffic control, bypass pumping and/or diversion of sewage flows, cleaning equipment, product installation, all quality controls and samples for performance of required material tests, final inspection and warranty work, all as specified in these contract documents and at the quantities of each component contained in the Bid Proposal.
- B. The SYSTEM's furnished shall be complete integrated and compatible systems including all materials, manufacturer's recommended equipment and manufacturer's installation procedures. The SYSTEM manufacturer may submit to the Owner, a minimum of 14 calendar days in advance of a bid date, all required product information to obtain pre-approval SYSTEM status. Those SYSTEM's that have been pre-approved will not need to be re-submitted as required in the submittal section of these specifications unless any of the system components have changed from those pre-approved by the Owner. All other component products will be required to meet the submittal requirements as contained herein.
- C. The SYSTEM's installed shall be free of all defects that will affect the design and service life and operation of the manhole.
- D. The SYSTEM installed shall eliminate water leakage into the manhole and prevent water or vapors to leak out of the manhole through pin-holes or other defects. If leakage occurs either in or out of the manhole the Contractor shall seal these areas to stop all leakage using a material compatible with the SYSTEM applied and as specified by the manufacturer. If leakage occurs through any SYSTEM applied to the manhole, the SYSTEM shall be repaired or removed as recommended by the manufacturer. All repair materials shall have the same estimated life expectancy than the SYSTEM installed. Final approval of the SYSTEM installation will be based on meeting the acceptance test requirements for each SYSTEM applied/installed.
- E. The SYSTEM (applied to the intended structure) shall be designed against corrosion and typical chemicals found in domestic sewage, unless otherwise specified in the

detailed section of the contract documents. The manufacturer of the SYSTEM shall provide testing data that supports their SYSTEM's design and service life.

- F. SYSTEM'S may be designed to rehabilitate the existing manhole against corrosion, I&I structural build-back, or a combination of the three. In certain cases the preparation, certification and submission of design calculations by a registered professional engineer is required for manhole replacement and rehabilitation technologies. All design must be supported by third party testing and documentation for the exact product that is being submitted.
 - 1. A manhole is specified to be structurally replaced, being able to sustain all earth, hydrostatic and dynamic loading without support by the existing structure. Certification and submission of design calculations by a registered professional engineer is required
 - 2. A manhole is specified to be structurally rebuilt, with build-back materials, or rehabilitated to sustain hydrostatic loading by groundwater. Certification and submission of design calculations by a registered professional engineer is required
 - 3. A manhole is specified to receive a corrosion protective coating sufficiently thick to totally protect the existing host structure from further corrosion, deterioration and water vapor transmission. Certification and submission of design calculations by a registered engineer may be required
 - 4. A manhole is specified to receive a coating to renew mortar or other deteriorated components of a manhole but has no specified longevity or corrosion resistance requirement. The manufacture's third party testing will be acceptable for application suitability.
 - 5. A manhole is specified to receive patch repair materials for portions of the manhole. The manufacture's third party testing will be acceptable for application suitability.
- G. All manhole steps shall be removed prior to a coating or lining application.
- H. Flow from existing active service connections entering the manhole shall be maintained or bypassed if the flow will affect proper SYSTEM application/installation.
- I. All component materials furnished, as part of this contract shall be marked with detailed product information, stored in a manner specified by the manufacturer and tested to the requirements of this contract.
- J. Testing shall be executed by the owner or by the contractor in the presence of the owner. Warranty inspections shall be executed by the Owner or its representative. Any defects found shall be repaired or replaced by the Contractor.
- K. The Contractor shall furnish all samples for product testing as required in the contract documents. The Owner shall take possession of the samples for testing

and shall maintain a chain of custody, deliver the samples and pay an approved laboratory for all material and product testing performed under this contract.

- L. Compensation for all work required for providing test samples shall be included in the various SYSTEM items contained in the Bid Proposal.

1.2 SCOPE OF WORK INCLUDED

- A. A detailed description of each SYSTEM included in the contract, complete with estimated quantities.

1.3 PERFORMANCE WORK STATEMENT (PWS) SUBMITTAL

- A. The Contractor shall submit, to the Owner, a Performance Work Statement (PWS) at the pre-construction meeting, which clearly defines the proposed manhole SYSTEM delivery in conformance with the requirements of these contract documents. Unless directed otherwise by the Owner, the PWS shall at a minimum contain the following:
 - B. Clearly indicate that the SYSTEM will conform to the project requirements as outlined in the Description of Work, Scope of Work Included and as further delineated in these contract documents.
 - C. Certify at the time of the bid, that the designated manholes, included in the contract documents, were visited, inspected and evaluated by the Contractor or Contractor's Representative, prior to submitting a bid.
 - D. Where the scope of work is specifically delineated in the contract documents, a detailed installation plan describing all preparation work, cleaning operations, pre-inspections, sewage flow maintenance, traffic control, installation procedure, method of curing, quality control, testing to be performed, final inspection, warranties furnished and all else necessary and appropriate for a complete SYSTEM application/installation, shall be submitted.
 - E. A detailed installation schedule shall be prepared, submitted and conform to the requirements of these contract documents.
 - F. The manufacturer's description of the SYSTEM materials are to be furnished for the project. Material descriptions shall be sufficiently detailed in the submittals to verify conformance to these specifications and/or shall conform to the pre-approved SYSTEM submission.
 - G. The Contractor's experience for each type of rehabilitation component shall be as more specifically delineated in the detailed specifications. The name and experience of each lead individual performing work on this contract, for each component, shall be submitted with the PWS. If personnel are substituted after submittal of the PWS,

the name and experience of the individual shall be submitted to the Owner for approval before starting any work.

- H. Engineering design calculations may be requested for verification of structural design submittals. These calculations shall be in accordance with the applicable ASTM or industry standard for each structural design component/system to be installed. These calculations shall be performed and certified by a registered Engineer.
- I. Information on the SYSTEM and all tools and equipment required for a complete application/installation, shall be submitted. The PWS shall identify which tools and equipment will be redundant on the job site in the event of equipment breakdown. The Contractor shall outline the mitigation procedure to be implemented in the event of key equipment failure during the installation process.
- J. A detailed description of the Contractor's proposed procedures for cleaning and preparing the manhole structure, prior to applying/installing the SYSTEM shall be submitted as part of the PWS. The Contractor will describe in detail what substrate testing will be performed by the contractor to verify acceptability of the SYSTEM material to be applied.
- K. Compensation for all work required for the SYSTEM submittal of the PWS shall be included in the Mobilization Item contained in the Bid Proposal.

1.4 SUBMITTALS

- A. Product data submittals required for all rehabilitation SYSTEM's proposed for installation under this contract shall include:
 - 1. SYSTEM material type and manufacturer to be used including: catalog data sheets, ASTM references, material composition, manufacturers recommended specifications, component physical properties and chemical resistance. (PWS)
 - 2. Manufacturer's detailed description of the recommended procedures for handling and storing materials including a proposed method for monitoring temperatures of the storage location, if applicable to the specific SYSTEM material. (PWS)
 - 3. Manufacturers detailed description of the recommended material installation/application process including mixing, additives, set time, cure time (return to service) and all equipment required for quality product delivery. (PWS)
 - 4. Technical data sheet describing each rehabilitation component to be applied/installed, stating the expected longevity of the component in a wastewater environment. Data shall be based on independent third party tests. (PWS)
 - 5. Manufacturer's detailed description of all required field testing processes and procedures. (PWS)

6. Copies of independent testing performed on the rehabilitation component, indicating that the product meets the requirements as specified in these contract documents and the manufacturers design. (PWS)
7. Technical data sheet and project specific data for manhole repair materials to be used in conjunction with each rehabilitation component(s) including application cure time and surface preparation procedures. (PWS)
8. Certification that backup installation equipment is available on the job site or can be delivered to the job site by the morning of the next business day. (PWS)
9. Shipping information including: (Jobsite)
 - a. Shipped item, including manufacturer, stock and lot number
 - b. Date shipped including origination and delivery locations
 - c. Shipping method and carrier
 - d. All shipping, storage and safety requirements including MSDS documents.
 - e. Date delivered to project site including name and signature of receiver
10. By-Pass Pumping Plan if applicable to the SYSTEM's being installed. (PWS)
11. Traffic Control plan, if applicable for the SYSTEM's being installed.
12. Certified statement, from the manufacturer, that the contractor/installer is an approved installer of the SYSTEM with certificates of completed training for each crew member involved in each rehabilitation component. This requirement shall comply with the specific SYSTEM requirements specified in the contract documents. (PWS)
13. For each manhole rehabilitation, a complete and accurate record of all SYSTEM's installed/applied shall be prepared by the Contractor. The record shall include identifying manhole number, location, quantities of rehabilitation components installed.
14. Submittal of all quality assurance documentation and test reports for SYSTEM's installed. (After Rehabilitation Completion)
15. Compensation for all work required for product submittals and the submittal of a By-Pass Pumping Plan and a Traffic Control Plan shall be included in the Mobilization Item contained in the Bid Proposal.
16. Refer to section 1.1.F for design requirements.

1.5 QUALITY CONTROL PLAN (QCP)

- A. A detailed quality assurance plan (QCP) shall be submitted to the Owner that fully represents and conforms to the quality control requirements of these specifications. At a minimum the QCP shall include the following:
 - B. A detailed description of the proposed quality controls to be performed by the Contractor.
 - C. Defined responsibilities, of each of the Contractor's personnel, for assuring that all quality control requirements, for this contract, are met. These shall be assigned, by the Contractor, to his specific personnel.

- D. Proposed procedures for quality control, product sampling and testing shall be defined.
- E. Proposed methods for product performance controls, including method of and frequency of product sampling and testing both in raw material form and cured product form as applicable.
- F. A scheduled performance and product test result reviews between the Contractor and the Owner at a scheduled job meeting.
- G. Inspection forms and guidelines for quality control inspections shall be prepared in accordance with the standards specified in this contract and submitted with the QCP.
- H. Inspector training, by a qualified trainer, for the Owner's inspectors shall be provided as further defined in Section 1.9. This training shall be prior to SYSTEM installation, include both technical and field training and include all key aspects of visual inspection and sampling procedures for testing requirements. On smaller projects having an estimated duration of less than two (2) weeks of rehabilitation work, the system manufacturer shall furnish a check list containing key elements of the SYSTEM criteria, represented in the QCP, for the Owner's representative to ensure that quality control and testing requirements are performed in accordance with the contract documents.
- I. Proposed methods and procedures for SYSTEM repair or replacement, (as defined in Section 1.6) in the event of product defects or total failure.

1.6 SYSTEM REPAIR/REPLACEMENT

- A. Due to mechanical damage or defects in application, SYSTEM's will occasionally need to be repaired or replace a portion of the installed product. The Manufacturer shall outline specific repair or replacement procedures for potential issues that may occur during the application of the SYSTEM. Repair/replacement procedures shall be as recommended by the SYSTEM Manufacturer and shall be submitted as part of the PWS.
- B. Issues, that may not affect the operation and long term life of the product, shall be identified and defined by the Manufacturer.
- C. Repairable issues that may occur in the SYSTEM shall be specifically based on Manufacturer's recommendations, including a detailed step-by-step repair procedure, resulting in a finished product meeting the estimated life cycle of the component and requirements of these contract specifications.

- D. Un-repairable issues that may occur in the SYSTEM shall be clearly defined based on the Manufacturer's recommendations. The Contractor together with the manufacturer shall define the best recommended procedure for the total removal and replacement of the SYSTEM.
- E. The Contractor shall receive no additional compensation for the repair or replacement of SYSTEM's deemed non-conforming to the requirements of these contract documents and unacceptable by the Owner.

1.7 REFERENCES

- A. ASTM and other applicable standard documents, that are listed in the detailed specifications, are made a part of these specifications by reference to the extent stated herein and shall be the latest edition thereof. Where there are differences between codes, standards and these specifications, these specifications shall govern.

1.8 DELIVERY, STORAGE AND HANDLING

- A. Rehabilitation component materials are to be kept dry, protected from weather and stored under cover and in accordance with manufacturer's recommendations.
- B. Polymer and Cementitious protective coating materials are to be stored at temperatures as recommended by the manufacturer and handled according to their material safety data sheets. Do not store near flame, heat or strong oxidants.

1.9 INSPECTOR TRAINING

- A. The Contractor shall provide training by a manufacturer's approved trainer for the Owner's representatives/inspectors on the specific product being installed.
- B. The inspector training shall include sufficient amount of classroom time to instruct the inspector's on the basic concepts of the technology and what aspects are important to review and inspect in the field while the SYSTEM is being installed by the Contractor. The inspector training shall also include a sufficient amount of time to instruct the inspectors on what needs to be inspected in the field, what needs to be inspected for each SYSTEM and what documentation is needed to verify that the SYSTEM has been installed in accordance with the contract documents.
- C. Compensation for inspector training shall be at the number of days specified and the unit price Bid in the Proposal.

1.10 SAFETY

- A. The Contractor shall conform to all work safety requirements of pertinent regulatory agencies, and shall secure the site for working conditions in compliance with the same. The Contractor shall erect such signs and other devices as are necessary for the safety of the work site.
- B. The Contractor shall perform all of the Work in accordance with applicable OSHA safety standards. Emphasis shall be placed upon the requirements for entering confined spaces and with the equipment being utilized for manhole rehabilitation components. Confined space, defined as any space having one or more of the following characteristics:
 - 1. Limited openings for entry and exit.
 - 2. Unfavorable natural ventilation.
 - 3. Not designed for continuous worker occupancy.
- C. The Contractor shall have on the job site at all times at a minimum the following safety equipment:
 - 1. Gas monitor capable of testing and detecting for combustible gas, oxygen deficiency and hydrogen sulfide.
 - 2. Confined space access and retrieval winch system.
 - 3. Ventilating fans with large diameter ventilating hose.
 - 4. Supplied air respirator, MSHA/NIOSH approved type.
 - 5. Safety harness and life lines.
 - 6. Other equipment as may be required for a specific project
 - 7. All equipment to be available for use, in sufficient quantity, by the Contractor, Engineer and Owner for the duration of the project.
- D. All entries into or work within confined spaces shall be conducted in accordance with the U.S. Department of Health and Human Services/National Institute for Occupational Safety and Health [DHHS (NIOSH)] Publication No. 87-113, A Guide to Safety in Confined Spaces.
- E. The Contractor shall submit a proposed Safety Plan to the Owner, as part of the PWS and prior to beginning any work, identifying all competent persons, equipment and operating procedures. The plan shall include a description of a daily safety program and daily safety meeting for the job site and all emergency procedures to be implemented in the event of a safety incident. All work shall be conducted in accordance with the Contractor's submitted Safety Plan.
- F. Compensation for all work required for the submittal of the Safety Plan shall be included in the Lump Sum item for Mobilization contained in the Bid Proposal.

1.11 WARRANTY

- A. The materials used for the project shall be certified by the manufacturer for the specified purpose. The manufacturer shall warrant the SYSTEM to be free from defects in raw materials for one (1) year after installation or from the date of acceptance by the Owner, whichever is later. The Contractor shall warrant the installation of the rehabilitation component for a period of one (1) year. During the one (1) year warranty period if the rehabilitation component, fails, delaminates, peels or shows any defect, which may materially affect the integrity, strength, function and/or operation of the manhole structure, it shall be immediately repaired at the Contractor's expense in accordance with procedures included in Section 1.6 Rehabilitation Component Repair/Replacement.
- B. After a manhole has been renewed and for a period of time up to one (1) year following completion and final acceptance of the project, the Owner may inspect all or portions of the renewed manholes. The specific locations will be selected at random by the Owner and will include all types of structures from this project.
- C. If any of the rehabilitation components have developed defects since the time of "Quality Assurance And Testing," the defects shall be repaired and/or the component shall be replaced as defined in Section 1.6 Rehabilitation Component System (SYSTEM) Repair/Replacement. Owner may inspect all manholes where SYSTEM's have been applied/installed under this contract.
- D. All verified defects shall be repaired and/or replaced by the Contractor and shall be performed in accordance with Section 1.6 Rehabilitation Component System Repair/Replacement and per the original specifications, all at no additional cost to the Owner.

1.12 WARRANTY INSPECTIONS

- A. Visual inspection to determine integrity of SYSTEM materials and water-tightness will be conducted within 3 months before the expiration of the guarantee period.
- B. If possible, inspection should be performed in the spring during high groundwater and frequent rainfall events.
- C. The Owner shall perform, at its own cost, warranty inspections with its own personnel or personnel independent of the installation contractor.
- D. Ten (10) percent of manholes rehabilitated shall be inspected, at locations randomly selected, by the Owner.
 - 1. No infiltration or inflow shall be visible in the renewed manhole.

2. If any SYSTEM fails the warranty inspection, the Owner shall inspect all SYSTEM's installed in the contract, together with Contractor.

1.13 MEASUREMENT AND PAYMENT

- A. Measurements for each item furnished and installed to the satisfaction of the Owner shall be at the units of measure contained in the Bid Proposal. Manhole coatings and linings will be measured over the entire installed length. Coating and/or lining of the channel shall be at the Lump Sum price per each bid therefore in the Proposal.
- B. Payment for each SYSTEM furnished and installed, in accordance with the contract documents and to the satisfaction of the Owner, will be at the unit or lump sum prices bid therefore in the Bid Proposal.

PART 2 - REHABILITATION COMPONENT SYSTEM PRODUCTS

- A. The SYSTEM'S defined herein include those identified as commercially accepted methods for manhole rehabilitation. Methods or products not defined herein must be pre-approved by the Owner before use on this project under these specifications.

2.1 CHEMICAL GROUTS

A. REFERENCES

ASTM F2414-03 Standard Practice for Sealing Sewer Manholes Using Chemical Grouting

B. CHEMICALGROUT TYPES

1. The Contractor shall specifically define the type of chemical grout that will be furnished for the project. Depending on the specific application either Acrylic or Acrylate Based Grout or Urethane Based Grout shall be furnished. The type of grout to be used shall be in accordance with the manufacturer's recommendation for the specific application area of the project.
2. Contractor shall deliver materials to job site in undamaged, unopened containers bearing manufacturer's original labels. Materials used as chemical grout shall be transported, stored, mixed and applied in manner prescribed by the manufacturer of the specified materials, as detailed in published data provided by manufacturer.

C. MATERIALS

1. Contractor shall provide a chemical sealant solution containing principal chemical sealant constituent, initiator (trigger) and catalyst specifically recommended for the purpose of sealing leaks in manholes. Chemical sealant constituent, initiator (trigger) and catalyst shall be compatible when mixed. Solution shall have ability

to tolerate dilution and react in moving water. After final reaction, it shall be a stiff, impermeable, yet flexible gel. The grout proportions shall be such that dilute aqueous solutions, when properly catalyzed will form stiff gels. Materials provided shall gel in a predetermined time period when exposed to normal groundwater pH ranges, and be capable of formula adjustments to compensate for changing conditions. Final reaction shall produce a continuous, irreversible, impermeable stiff Gel and shall not be rigid or brittle.

2. The grout shall exhibit the following properties:
 - a. Controllable reaction times and shrinkage through the use of chemicals supplied by the same manufacturer. The minimum set time shall be established so that adequate grout travel is achieved.
 - b. Resistance to chemicals, to most organic solvents, mild acids and alkali.
 - c. The grout shall be non-toxic in its cured form.
 - d. Sealing material shall not become rigid or brittle when subjected to a dry environment. The material shall be able to withstand freeze/thaw and moving load conditions as verified by third party testing.
3. The Contractor shall identify the type of grout and additives used on the contract and furnish references of successful use in similar applications. The Contractor shall select the choice of materials based on chemical and physical properties and expected performance for the requirements of the contract documents.
4. Grout conditions may be adjusted for catalyzing the reaction, inhibiting the reaction, lowering the freezing temperature the grout solution, adding fillers, providing strength or for inhibiting root growth according to the instructions of the grout manufacturer and in the specified quantities as recommended by the grout manufacturer.

D. MIXING & HANDLING

1. Mixing and handling of chemical grout, which may be toxic under certain conditions, shall be done in such a manner as to minimize any hazard to personnel and shall be in accordance with the manufacturer's recommendations. It is the responsibility of the Contractor to provide appropriate protective measures to ensure that chemicals are handled only by trained and authorized personnel. All equipment used to install the grout shall be as recommended by the manufacturer and only personnel thoroughly familiar with all aspects of the grouting material and meeting the qualification requirements specified herein, shall perform the actual grouting operation.

2.2 CEMENTITIOUS MANHOLE RESTORATION

A. REFERENCES

ASTM F2551 Standard Practice for Installing a Protective Cementitious Liner System in Sanitary Sewer Manholes

ASTM C150 Standard Specification for Portland Cement Type I

ASTM C33-86 Standard Specification for Concrete Aggregates

ASTM C78 Standard Test Method for Flexural Strength of Concrete; Using Simple Beam with Third Point Loading

ASTM C109/C109M-05 Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens)

ASTM C157/C157M-06 Standard Test Method for Length Change of Hardened Hydraulic-Cement Mortar and Concrete

ASTM C267 Test Methods for Chemical Resistance of Mortars, Grouts and Monolithic Surfacing and Polymer Concretes

ASTM C293-02 Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Center-Point Loading)

ASTM C309 Specification for Liquid Membrane-Forming Compounds for Curing Concrete

ASTM C321-00(2005) Standard Test Method for Bond Strength of Chemical-Resistant Mortars

ASTM C348-02 Standard Test Method for Flexural Strength of Hydraulic-Cement Mortars

ASTM C494-86 Standard Specification for Chemical Admixtures for Concrete

ASTM C496/C496M-04e1 Standard Test Method for Splitting Tensile Strength of Cylindrical Concrete Specimens

ASTM C666/C666M-03 Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing

ASTM C882-05 Standard Test Method for Bond Strength of Epoxy-Resin Systems Used With Concrete by Slant Shear

B. GENERAL

1. The Contractor shall provide a cementitious restoration material designed for structural build-back, I&I abatement, corrosion resistance, and repairing inverts to design requirements. All materials applied to a structure shall be compatible, as specified by the manufacturer.

C. MANHOLE REPAIR MATERIALS

1. Infiltration Control – Cementitious Material
 - a. All fast setting materials furnished shall be designed specifically for leak control, to be applied in dry powder form, with no prior mixing of water, directly to active leaks under hydrostatic pressure in manholes or related structures, in accordance with the manufacturer's recommendations.
2. Infiltration Control - Oakum Water Plugs

- a. Rapid setting, oil free oakum and hydrophilic grout to seal active water leaks prior to applying other SYSTEM's
 - b. Oil-free oakum meeting Federal Specification HH-P-117
 - c. Two-part urethane resin.
3. Invert Repair and Patching
 - a. All material furnished, by the Contractor, shall be designed to fill large voids in manhole walls and to repair or reconstruct inverts where no hydrostatic pressure exists. Material shall consist of rapid setting cements, mono-crystalline quartz aggregates, and various accelerating agents. Material shall not contain chlorides or metallic particles and shall be applied in accordance with the manufacturer's recommendations.
 - b. Repair and Patching Materials shall have its bond strength tested to substrate failure according to ASTM C952 and be compatible with all other material components applied to the manhole.
 4. Grouting mix:
 - a. For stopping severe infiltration, the Contractor shall provide a polymer solution that reacts freely with water to form a strong film, gel, or foam of polyurethane. See specification section 2.1 Grouts.
 5. Cementitious Coating Restoration Materials for manhole walls, channels, corbels, chimneys and benches. The Contractor shall install cementitious restoration materials that shall be specifically designed for the rehabilitation of manholes and other related wastewater structures. Liner materials shall be cement based, poly-fiber reinforced, shrinkage compensated, and enhanced with chemical admixtures and siliceous aggregates. Liner materials shall be mixed with water per manufacturer's written specifications and applied using equipment specifically designed for, troweling, low-pressure spray or centrifugal spin casting application. All cementitious liners shall be troweled to densify and smooth out the surfaces.
 6. Refer to section 1.1.F for design requirements.

2.3 CAST-IN-PLACE CONCRETE RESTORATION

A. GENERAL

1. This method includes a formed in place seamless concrete manhole within the existing manhole extending from the manhole bench to the frame, utilizing an internal forming system for forming a new and structurally independent wall within the existing structure conforming generally to the existing inside and shape of the manhole.
2. The new interior wall shall have a cross-sectional dimension of sufficient thickness to be structurally independent and allow for the maximum new finished inside diameter. It shall be constructed of high strength ready mix concrete and specifically designed to be applicable for municipal and industrial sewer collection systems.

B. REFERENCES

ASTM C-39 Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens

ASTM C-94 Standard Test Method for Ready-Mix Concrete

ASTM C-143 Standard Test Method for Slump of Hydraulic Cement Concrete

C. MATERIALS

1. Concrete - The concrete shall be Type I&II Portland cement concrete with 5/8 inch minus coarse aggregate with fiber reinforcement and plasticizers. Other formulations and filler materials may be selected to meet specific needs as recommended by the manufacturer.

D. FORMWORK

1. Segmented forms in cylindrical and conical sections
2. Provide adequate annular space for concrete.
3. Finished manhole opening shall not be less than 20 inches
4. The liner shall be sealed at the existing bench and pipe openings to form a long term water-tight connection.
5. Removable from within new cast concrete manhole wall.

E. PLASTIC INTERIOR WALL SURFACE

1. Provide PVC or Polyethylene liner on new manhole interior wall surface.
 - a. Refer to section 1.1.F for design requirements.
 - b. Ribbed or studded for embedment into the concrete liner.
 - c. Fit securely to exterior of concrete forms.
 - d. Heat fuse or extrusion weld seams

2.4 POLYMER SYSTEMS

A. REFERENCES

ASTM D543 - Resistance of Plastics to Chemical Reagents.

ASTM D638 - Tensile Properties of Plastics.

ASTM D695 - Compressive Properties of Rigid Plastics.

ASTM D790 - Flexural Properties of Unreinforced and Reinforced Plastics.

ASTM D2240 - Standard Test Method for Rubber Property—Durometer Hardness

ASTM D4060 - Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abrader

ASTM D4414 - Standard Practice for Measurement of Wet Film Thickness of Organic Coatings by Notched Gages

ASTM D7234 - Pull-off Strength of Coatings Using a Portable Adhesion Tester.

SSPC SP-13/NACE No. 6 – Surface Preparation of Concrete

NACE SP0188 - For performing holiday detection

CIGMAT - Evaluation of Liner System for Wastewater Concrete and Clay Brick Facilities

ASTM G210 - Severe Wastewater Analysis Test

B. EXISTING SUBSTRATE PREPARATION

1. Standard Portland cement or new concrete (not quick setting high strength cement) must cure a minimum of 28 days prior to application of the coating product(s).
2. Remove existing coatings prior to application of the SYSTEM which may affect the performance and adhesion of the SYSTEM.
3. Thoroughly clean, removing all laitance and prepare existing products to effect a mechanical bond with the SYSTEM.
4. Manufacturer shall recommend specific methods for surface preparation.

C. REPAIR AND RESURFACING PRODUCTS

1. Repair products shall be used to fill voids, bug holes, and/or smooth transitions between components prior to the installation of the SYSTEM. Repair materials must be properly cured and must be compatible with the SYSTEM and shall be used and applied in accordance with the manufacturer's recommended requirements.
2. Resurfacing products shall be used to fill large voids, lost mortar in masonry structures, smooth deteriorated surfaces and to rebuild severely deteriorated structures.
3. The following products may be accepted and approved as compatible repair and resurfacing products for use within the specifications:
 - a. 100% solids, solvent-free polymer grout specifically formulated for epoxy polymer top coating compatibility.
 - b. Factory blended, rapid setting, high early strength, fiber reinforced, non-shrink repair mortar that can be trowelled or pneumatically spray applied maybe approved if specifically formulated to be suitable for polymer top coating with the specified polymer product. The length of resurfacing material cure required before polymer top-coating, shall be as recommended by the manufacturer.
 - c. All repair and resurfacing materials should be properly cured and prepared for surface top-coat application.

D. COATING PRODUCTS

1. Refer to section 1.1.F for design requirements.

E. SYSTEM APPLICATION

1. Polymer System manufacturer shall provide System application procedures and requirements.
2. Manufacturer recommended and approved application equipment.
3. Hard to reach areas, primer application and touch-up may be performed using hand tools.

2.5 CURED-IN-PLACE MANHOLE LINERS

A. REFERENCES

- ASTM D-638-03 Standard Test Method for Tensile Properties of Plastics
- ASTM D695-02a Standard Test Method for Compressive Properties of Rigid Plastics
- ASTM D790-07 Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
- ASTM D2344/D2344M-00(2006) Standard Test Method for Short-Beam Strength of Polymer Matrix Composite Materials and Their Laminates
- ASTM: D-3039 ASTM D3039/D3039M-00(2006) Standard Test Method for Tensile Properties of Polymer Matrix Composite Materials

B. PRE-MADE LINERS

1. Pre-Made liners can be custom fabricated and can accommodate a variety of manhole shapes and sizes.
2. The liner is designed and fabricated for each specific manhole and must be installed in that manhole.

C. TUBE LINERS

1. The tube liner system includes a constant diameter tube design that is stretched to fit a range of manhole sizes and lengths.
2. The tube typically consists of stretchable resin absorbing textile material

D. MATERIALS

1. Manhole interior walls and benches shall be patched with compatible patching/plugging compounds as specified elsewhere herein. Manhole interior surfaces shall have all defects such as leaks, holes, mortar joints, bug holes, etc. patched with compatible cementitious patching/plugging compounds as specified elsewhere herein.
2. Channel reconstruction cement shall be as specified elsewhere herein.
3. As a minimum the manhole liner systems shall be composed of a multiple layered composite consisting of felt, an impervious membrane, and fiberglass as required.
4. The fibrous layer will be impregnated with a polymer resin. Add fiberglass and resin, for additional liner thickness.
5. Refer to section 1.1.F for design requirements.

2.6 COMPOSITE LINER

(Fiberglass Reinforced Epoxy Composite)

- A. The protective liner shall be a multi layered composite comprised of layers of epoxy and fiberglass/carbon fiber cloth, hand crafted, constructed in place and cured at ambient temperature.

- B. Manhole interior surfaces shall have all defects such as leaks, holes, mortar joints, bug holes, etc. patched with cementitious patching/plugging compounds as specified elsewhere herein.
- C. Manhole invert channels shall be reconstructed with cements as required and specified elsewhere herein.
- D. Manhole corbel and joints shall be surface prepped and resurfaced to an even and nearly smooth profile with cements as required and specified elsewhere herein.

2.7 CONCRETE PROTECTIVE LINERS

A. REFERENCES

- ASTM C579 - Compressive Strength of Chemically Setting Silicate and of Shotcrete
- ASTM C109/C109M-05 Standard Test Method for Compressive Strength of Hydraulic Cement Mortars(Using 2-in. or [50-mm] Cube Specimens)
- ASTM C307 - Standard Test Method for Tensile Strength of Chemical-Resistant Mortar, Grouts, and Monolithic Surfacing
- ASTM D412-06a Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension
- ASTM D638 - Standard Test Method for Tensile Properties of Plastics
- ASTM D792 - Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement
- ASTM D4833-00e1 Standard Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products
- ASTM D4787 Standard Practice for Continuity Verification of Liquid or Sheet Linings Applied to Concrete Substrates
- ACI 506.2-77 - Specifications for Materials, Proportioning, and Application Silica Chemical Resistant Mortars.

B. HIGH DENSITY POLYETHYLENE (HDPE)

1. Protective liners shall be integrally extruded complete with anchoring studs. The minimum thickness of liner sheet with anchoring studs and the joint overlaps shall be recommended by the manufacturer. All joints shall be sealed using thermal welding as recommended by the manufacturer.
2. HDPE Material Properties. Manufacturer shall submit design for minimum density, elongation, and abrasion resistance.
 - a. Minimum annular space clearance when filling with flow-able concrete or grout shall be as required by manufacturer.
 - b. Anchor bolt penetration of concrete in manhole wall shall be to manufacturer specifications.
 - c. Countersink screws to mount liner to profiles
3. Manufacturer shall submit Cement and Grout material requirements to fill annular space between the liner and the manhole wall.

C. POLYVINYL CHLORIDE (PVC) PROTECTIVE SHEET LINERS

1. The minimum liner thickness shall be determined by the manufacturer.
2. All joints and seams to be thermally sealed as recommended by the manufacturer.
3. Manufacturer Refer to section 1.1.F for design requirements.
4. Apply primer and two part mastic to seal liner to manhole wall.

2.8 FRP MANHOLE INSERTS

A. REFERENCES

ASTM D3753-05e1 Standard Specification for Glass-Fiber Reinforced Polyester Manholes and Wet Wells

B. WALL CLEANING

1. Wall Cleaning as recommended by manufacturer

C. BENCH-FORMING AND REPAIR MATERIALS

1. Concrete shall be Type V, in accordance with the manufacturers recommendations.
2. Leak repair material as recommended by the manufacturer

D. FRP INSERT MATERIAL

1. Inserts shall comply with ASTM D3753 and the following:
 - a. Inserts shall be single piece barrel and [concentric] [eccentric] reducer construction without seams, joints, or sections, comprised of chopped strand and continuous fiber glass reinforcement within isophthalic polyester resin containing finely-graded sand. Materials shall be resistant to corrosive attack from sanitary sewage and sewer gases including sulfuric acid and shall satisfy the 100,000 hour criterion in ASTM D 3753.
 - b. Interior and exterior surfaces shall be relatively smooth and be free of sharp projections and protruding glass fibers. No blisters or de-laminations shall be visible.
 - c. Inserts shall be sized to fit inside existing manholes and allow grade rings and frame between the top and finish grade. Wall thickness shall provide for an AASHTO H-20 load rating and wall stiffness of 36psi minimum.
2. Sealants
 - a. A sealant, as recommended by the manufacturer shall be inserted between the FRP reducer and frame
 - b. Sealant between FRP insert and the surfaces of the manhole base shall be a quick-setting grout as recommended by the manufacturer.
3. Grout
 - a. Grout shall meet the specifications as required by the manufacturer.

2.9 MANHOLE CHIMNEY SEALS

A. REFERENCES

ASTM C923-07 Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals
ASTM D412-06a Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers -Tension
ASTM D638-03 Standard Test Method for Tensile Properties of Plastics
ASTM D395-03 Standard Test Methods for Rubber Property - Compression Set
ASTM - D790 Standard Test Methods for Flexural Properties of Un-reinforced and Reinforced Plastics and Electrical Insulating Materials
ASTM D695-02a Standard Test Method for Compressive Properties of Rigid Plastics
ASTM D2240-05 Standard Test Method for Rubber Property - Durometer Hardness
ASTM D-638-03 Standard Test Method for Tensile Properties of Plastics
ASTM D790-07 Standard Test Methods for Flexural Properties of Un-reinforced and Reinforced Plastics and Electrical Insulating Materials
ASTM D2344/D2344M-00(2006) Standard Test Method for Short-Beam Strength of Polymer Matrix Composite Materials and Their Laminates
ASTM: D-3039 ASTM D3039/D3039M-00(2006) Standard Test Method for Tensile Properties of Polymer Matrix Composite Materials

B. GENERAL

1. Manhole frame sealing includes the sealing of the frame joint area and the chimney above the cone of the manhole with either a manufactured or applied internal flexible seal.
2. The seal shall be designed to prevent leakage of water into the manhole.

C. MECHANICAL FRAME SEAL MATERIAL

1. The flexible sleeve portion of the seal shall be extruded or molded from a high quality rubber compound, which conforms to the resilient material properties prescribed in ASTM C 923 Table 1.
2. The sleeve shall have an unexpanded vertical height sufficient to seal the entire grade adjustment area and be corrugated or pleated to allow for vertical and horizontal movement.
3. The upper and lower sections of the sleeve that compress against the frame casting, and manhole chimney or cone shall have an expansion band recess capable of restraining the band during expansion and after installation.
4. Any extension used in conjunction with the sleeve to increase chimney coverage shall be manufactured of the same material in conformance with ASTM C923, Table 1 and be designed with an extension flap which fits into or behind the expansion band recess allowing for joining the components with an expansion band.
5. The expansion bands used for compressing the sleeve and extensions against the manhole shall be fabricated stainless steel, conforming to the applicable

section 4.2 of ASTM C 923. The manufacturers mechanism used to expand the bands shall have the capacity to develop sufficient pressure to create a watertight seal. The bands shall be permanently held in the expanded position with a positive locking mechanism that conforms to the applicable section 4.2 of ASTM C 923.

6. The installed internal seal or its appurtenances shall not extend far enough into the manhole opening to prevent or unduly restrict manhole entry. If the seal is constructed of another flexible material, it shall have both tensile and tear strength equal to or greater than that of the natural or synthetic rubber when tested in accordance with the applicable ASTM procedures.
7. Physical Properties
 - a. Extruded or molded from a high grade rubber compound as per ASTM C923.
8. The installed seal shall remain flexible, to allow for repeated vertical movements of the frame due to frost lift, ground movement, or other causes and/or repeated horizontal movement of the frame due to thermal movement of pavement or other causes.

D. POLYMER CHIMNEY SEAL

1. Polymer manhole chimney seals shall be designed to prevent leakage of water into the manhole through the frame joint area and the area above the manhole cone including all extensions to the chimney area. Extensions shall include but are not limited to lifting rings, brick and/or block material that may have been used to achieve grade.
2. The polymer chimney seal material shall be corrosion resistant.
3. Mil thickness shall be determined by the manufacturer. Refer to section 1.1.F for design requirements.
4. The polymer chimney seal may require a primer resin applied to the entire surface before application. The sealing system shall line the interior of the adjustment area from the cone/top of the manhole and onto the inside of the casting. If the manhole has been relined prior to the seal installation the seal shall cover a minimum of 6 vertical inches to cover casting cone interface.

E. CURED-IN-PLACE CHIMNEY SEAL

1. The liner shall be continuous in length and consist of one or more layers of a stretchable absorbent textile material and resin. The liner is designed to prevent I&I, withstand hydrostatic pressures, bridge missing mortar or brick segments, withstand multiple freeze/thaw cycles, and conform to the contours of the existing structure. The saturated liner shall have uniform thickness and have excess resin distribution that when compressed at installation pressures will meet or exceed the design thickness after cure.
2. The exposed layer of the stretchable liner shall be coated with an impermeable, translucent, flexible membrane. The liner shall be marked correlating to the address or manhole identification number, and date of installation.

3. The liner shall be a one-piece assembly sewn in the shape of a tube at a predetermined length to seal the casting and to overlap onto the cone/corbel. The sewn seams shall be sealed using a tape compatible with the liner coating. The liner wall thickness shall be uniform throughout. The liner will be capable of conforming to offset bricks and grade rings, missing mortar gaps, and disfigured and deteriorated chimneys.
4. The resin system shall be a corrosion resistant silicate resin containing 100% solids and no VOC's. The resin system contained within the stretchable liner, when properly cured, shall form a tenacious mechanical bond with properly prepared surfaces and withstands multiple freeze/thaw cycles without cracking
5. Refer to section 1.1.F for design requirements.

F. COMPOSITE CHIMNEY SEAL

1. The protective liner shall be a multi layered composite comprised of layers of epoxy and fiberglass cloth, hand crafted, constructed in place and cured at ambient temperature to mitigate curing stresses. The liner, when cured, shall prevent I & I by withstanding hydrostatic pressure as well as conforming to the shape and bonding tightly to the chimney substrate.
2. The chimney interior surfaces shall have all defects such as leaks, holes, mortar joints, bug holes, etc. patched with compatible patching/plugging compounds as specified elsewhere herein for use in manholes and compatible with the epoxy contained in the fiberglass or carbon fiber cloth.
3. The chimney seal shall, when cured, create a monolithic liner which ties the casting and the length of the chimney together with the first 3 inches of the corbel.

2.10 REPLACE MANHOLE FRAME AND COVER

A. REFERENCE

ASTM A48/A48M-03 Standard Specification for Gray Iron Castings Class 35B
 AASHTO Standard Specifications for Highways and Bridges

B. CONDITION

1. The manhole casting shall be free from sand or blow holes and other defects. The machine bearing surfaces of the frame and cover shall have even bearing

2.11 MANHOLE ADJUSTMENT MATERIALS

A. REFERENCE

ASTM D4976-06 Standard Specification for Polyethylene Plastics Molding and Extrusion Materials
 AASHTO Standard Specifications for Highways and Bridges

B. MATERIALS

1. Manhole frame adjustments shall be HDPE, PVC, EPP, rubber, brick, block, cement or poured concrete as shown in detail on the contract documents.
2. Measurement shall be by vertical linear inch of adjustment materials provided and/or installed.
3. Payment shall be at the price per vertical linear inch or as a lump sum as stated in the bid documents.

2.12 MANHOLE STEPS

A. REFERENCES

ASTM C478-07 Standard Specification for Pre-cast Reinforced Concrete Manhole Sections

ASTM A615/A615M-07 Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement

AASHTO M199

B. MATERIAL

1. Reinforcing bar manhole steps shall conform to the minimum requirements of ASTM C478, Para, 11. The reinforcing bar shall be grade 60, deformed 1/2inch reinforcing bar conforming to the requirements of ASTM A615

PART 3 - EXECUTION

A. GENERAL

1. Maintain all flow in the manhole throughout duration of project.
2. Provide 48 hour notice to the Owner prior to start of work for Inspector to review and document materials and equipment to be used, for Quality Assurance and testing requirements.

B. CONTRACTOR EXPERIENCE

1. Current documentation, from the SYSTEM product manufacturer, certifying that the Contractor's training, the Contractor's personnel and equipment comply completely with their product Quality Assurance requirements.
2. For a manhole coating or lining product to be considered for this project, a minimum of 1000 vertical feet of documented manhole rehabilitation must have been completed by the Contractor in the previous three (3) year period.
3. For all SYSTEM products, to be considered for this project, a minimum of a three (3) year successful installation history must be documented.
4. In all cases a minimum of five (5) recent verifiable references of the Contractor's work is required, indicating the successful application of the SYSTEM products of the same material type as specified herein or to be furnished by the Contractor and applied in a similar project environment as included in these contract specifications.

C. MANHOLE PREPARATION

1. Bypass Pump sewage, in the manhole, as required
2. Clean interior surfaces of manhole of debris, dirt, oil, grease, remains of old coating materials, and any other extraneous materials.
3. Pressure wash manhole walls to remove loose mortar, concrete and debris. Pressure washing levels, used for cleaning, shall be as recommended by the manufacturer.
4. Repair irregularities in manhole using materials, compatible with proposed resurfacing material, as recommended by the manufacturer.
5. Repair leakage in manhole using materials, compatible with proposed resurfacing material, specified in these contract specifications.
6. Trim and grout incoming laterals and pipes as required and/or specified.
7. Remove debris from manhole and incoming sewer connections.
 - a. Handle cleaning water to prevent water and residue from causing damage.
 - b. Do not discharge debris downstream through the sanitary sewer system.
 - c. Filter solids-laden water through a de-silting device.
 - d. Properly dispose of debris and residue from cleaning and other construction operations in a manner satisfactory to Owner and authority having jurisdiction over area where work site is located.

3.1 CHEMICAL GROUT

A. GENERAL

1. Grouting should only be performed on a structurally sound manhole unless the grout is used to prevent water from entering the manhole during application of a lining or coating system. All structural repairs, adjustments to the frame and cover and installation of grade rings shall be completed prior to beginning the grouting operation. Normal grouting operations shall be performed at the temperatures as recommended by the manufacturer.

B. CHEMICAL GROUTING APPLICATION

1. Grouting applications may include sealing a manhole from infiltration/Inflow prior to application of a coating or lining or other structural rehabilitation component or using the grout for sealing the entire manhole structure. If the entire manhole is to be sealed, grouting shall include corbel, wall, pipe seals, bench and invert as recommended by the manufacturer of the grouting material.

C. DRILLING AND GROUT INJECTION

1. Drilling grout injection holes in the manhole in strategic locations to re-direct flow coming through cracks and other defects in the wall, or to seal the entire exterior surface of the manhole, shall be in accordance with the recommendations of the grout manufacturer.

2. Grout shall be injected through the drilled holes using the recommended probe and applying pressures that will effectively inject the grout but, not cause damage to the manhole structure or the surrounding area.
3. Grout typically, shall be injected through the lowest holes first, working the grout higher until the manhole is externally sealed with grout. Additional holes may be required to verify that the grout has encompassed the entire outside of the manhole.
4. The injection holes shall be cleaned and patched as recommended by the manufacture.

D. TESTING AND ACCEPTANCE

1. Visual inspection – all leakage into the manhole must be eliminated.

3.2 CEMENTITIOUS RESTORATION

A. GENERAL

1. Before starting any patch work or liner application install a perforated device, catch bucket, or other straining device to prevent construction debris from entering down-stream pipes.
2. Provide all materials, labor, equipment, etc. required to perform the work as recommended by the manufacturer and as required by the contract documents.
3. Inspect each manhole to determine methods of stopping leaks and applying patch repairs.
4. Promptly inform Owner of errors or discrepancies between the contract documents and the field conditions found, in order that changed conditions can be evaluated and revised directives issued in a timely manner.
5. Install all products in accordance with manufacturer's instructions regarding surface preparation, product application and curing.
6. Confirm that all material to be used, for the rehabilitation of the manhole are compatible with each other. Do not use any materials that have not been verified for compatibility.

B. SEALING ACTIVE LEAKS

1. The work consists of hand applying a dry quick-setting cementitious mix designed to instantly stop running water or seepage in all types of concrete and masonry structures. The applicator shall apply material in accordance with manufacturer's recommendations in accordance with the following minimum specifications.
 - a. The area to be repaired must be clean and free of all debris per the guidelines set forth elsewhere in these specifications.
 - b. Once cleaned, prepare crack or hole by chipping out loose material to a minimum depth recommended.

- c. As recommended by the manufacturer, place a generous amount of the dry quick-setting cementitious material to the active leak, with a smooth fast motion, maintaining external pressure for 30 seconds, repeat until leak is stopped.
- d. Proper application should not require any special mixing of product or special curing requirements after application.
- e. Use of Oil-free Oakum Water Plugs.
 - 1) Saturate oakum with resin following approved submittals.
 - 2) Use additives as required.
 - 3) Place and cure following manufacturer's recommendations.

C. INVERT REPAIR

- 1. The work consists of hand mixing and applying a rapid setting, high early strength, non-shrink patching material to fill all large voids and repair manhole channels prior to spray lining of the manhole. For invert repairs, flow must be temporarily restricted by inflatable or mechanical plugs prior to cleaning.
 - a. The area to be repaired must be cleaned and free of all debris per the guidelines set forth in Section A, 1 Manhole Cleaning and Preparation.
 - b. Mix water shall be clean potable water and require no additives or admixtures for use with cementitious patching materials.
 - c. Cementitious material shall be mixed in a mortar tub or 5 gallon pail with water per manufacturer's specifications. Material should be mixed in small quantities, to avoid setting prior to placement in voids or channels.
 - d. Once mixed to proper consistency, the materials shall be applied to the invert or void areas by hand or trowel. In invert applications, care should be taken to not apply excessive material in the channel, which could restrict flow. Once applied, materials should be smoothed either by hand or trowel in order to facilitate flow.
 - e. Flows in channels shall be re-established when material has cured enough to withstand the flow as determined by the manufacturer.

D. APPLICATION OF CEMENTITIOUS MANHOLE LINER

- 1. The work consists of troweling, spray applying and/or centrifugally spin-casting a cementitious based liner to the inside of the existing manhole. The necessary equipment and application methods to apply the cementitious based liner materials shall be only as recommended and approved by the material manufacturer.
- 2. Material shall be mixed with water in accordance with manufacturer's specifications. Once mixed to proper consistency, the materials shall be pumped via a rotor-stator style progressive cavity pump through a material plaster hose for delivery to the appropriate and / or selected application device. The equipment shall be as recommended by the manufacturer, matched for the material being applied.

3. If a chimney seal is required in conjunction with the lining technology, the Contractor should contact the chimney seal manufacturer to determine the proper preparation required for effectively installing the chimney seal after the coating has been applied and cured.

E. SPRAY APPLICATION OF THE CEMENTITIOUS MATERIAL.

1. All material shall be applied and finished, by the Contractor, using equipment specified by the manufacturer.
 - a. Material hose shall be coupled to a low-velocity spray application nozzle. Pumping of the material shall commence and the mortar shall be atomized by the introduction of air at the nozzle, creating a low-velocity spray pattern for material application.
 - b. Spraying shall be performed by starting at the manhole invert and progressing up the wall to the corbel and chimney areas.
 - c. Material shall be applied to a specified uniform minimum thickness as required by the manufacturer and as necessary for proper curing and application. Material shall be applied to the bench area in such a manner as to provide for proper drainage.
 - d. Material shall be troweled smooth to compact material into voids. A brush or broom finish may be applied when a top coating is desired.

F. SPIN CASTING APPLICATION OF THE CEMENTITIOUS MATERIAL

1. All material shall be applied and finished by the Contractor using equipment specified by the manufacturer.
 - a. Material hose shall be coupled to a high speed rotating applicator device. The rotating casting applicator shall then be positioned within the center of the manhole at either the top of the manhole chimney or the lowest point elevation corresponding to the junction of the manhole bench and walls.
 - b. The high speed rotating applicator shall then be initialized and pumping of the material shall commence. As the mortar begins to be centrifugally cast evenly around the interior of the manhole, the rotating applicator head shall be raised and / or lowered at a controlled retrieval speed conducive to providing a uniform material thickness on the manhole walls.
 - c. Controlled multiple passes are then made until the specified minimum finished thickness is attained. If the procedure is interrupted for any reason, simply stop the retrieval of the applicator head until flows are recommenced.
 - d. Material thickness may be verified at any point with a depth gauge and shall be no less than a uniform 1/2-inch. If additional material is required at any level, the rotating applicator head shall be placed at that level and application shall recommence until that area is thickened.
 - e. Material shall be applied only when manhole is in a saturated surface dry (SSD) state, with no visible water dripping or running over the manhole walls.

- f. The low-velocity spray nozzle and the centrifugal spin casting head may be used in conjunction to facilitate uniform application of the mortar material to irregularities in the contour of the manhole walls and bench areas.
- g. Troweling of materials shall begin immediately following the spray application. Initial troweling shall be in an upward motion, to compress the material into voids and solidify manhole wall. A brush or broom finish may be applied if top coating is desired.
- h. Curing will take place once the manhole cover has been replaced. It is important that the manhole cover is replaced no more than 10-20 minutes after troweling is complete to avoid moisture loss in the material due to sunlight and winds.
- i. Material shall not be applied during freezing weather conditions. Material shall not be placed when the ambient temperature is 37 degrees Fahrenheit and falling or when the temperature is anticipated to fall below 32 degrees Fahrenheit during 24 hours.

G. TESTING AND ACCEPTANCE

- 1. Visual inspection – verify no infiltration, cracks, or loose material.
- 2. Vacuum Testing, as required in the contract documents
- 3. Cementitious Material Physical Property Testing

3.3 CAST-IN-PLACE CONCRETE LINER

A. PREPARATION

- 1. The Contractor shall employ adequate cleaning to remove loose material and debris from the manhole. Existing steps which might interfere with the erection of the forms shall be removed. Precautions shall be taken to prevent foreign material from entering the active lines. Infiltration which may adversely affect placement of the concrete shall be eliminated or reduced to an acceptable level.
- 2. If a chimney seal is required in conjunction with the lining technology, the Contractor should contact the chimney seal manufacturer to determine the proper preparation required for effectively installing the chimney seal after the liner has been installed and cured.

B. EQUIPMENT

- 1. Segmented, stackable steel forms shall be bolted together in cylindrical and conical sections with either eccentric or concentric cones or flat top ceilings and conform generally to the interior shape of the existing manhole.

C. INSTALLATION PROCEDURE

- 1. Pipe extensions shall be placed through the new concrete wall at the base and at higher points of entry, such as drop inlets, to maintain flows during the procedure.

2. The form shall be sized and erected to conform to the existing interior dimensions and shape. The space between the forms and the existing wall shall be of a sufficient thickness, as specified. The finished opening shall have a minimum diameter of 20 inches.
3. The form shall be positioned, sealed and finished at the manhole base to ensure concrete does not enter the sewer.
4. The concrete shall be carefully placed from the bottom up in such a manner as to prevent segregation of the cement and aggregate. The concrete shall be consolidated to fill all pockets, seams and cracks within the existing wall.
5. When the concrete has sufficiently cured to preclude slump or damage, the form shall be disassembled and removed.
6. The bench shall receive an overlay of concrete as proposed by the Contractor at a minimum thickness as specified.
7. Prior to installation of the new concrete wall, a water stop shall be placed around the circumference of the bench where it meets the vertical wall and around all pipe penetrations to form a water stop.

D. FINISH

1. The resultant concrete interior wall shall be smooth and free of honeycomb and areas of segregated aggregate.

E. CLEANUP

1. Upon completion, the Contractor shall clean up the work site and properly dispose of any excess material or debris.

F. SAFETY

1. The assembled internal manhole forms shall be bolted together to prevent shifting and shall have sufficient stiffness and strength to prevent collapse. All work shall be performed in strict accordance with the city and OSHA safety standards for confined space entry procedures.

G. TESTING AND ACCEPTANCE

1. Visual Inspection
2. Vacuum Testing, as specified in the contract documents
3. Material Physical Property Testing during and after installation

3.4 POLYMER LINERS

A. GENERAL

1. Contractor shall comply with local, state and federal regulatory and other applicable agencies with regard to environment, health and safety during work.
2. New Portland cement concrete structures shall have cured a minimum of 28 days since manufacture prior to commencing coating installation or as recommended by the manufacturer.

3. Any active flows shall be dammed, plugged or diverted as required to ensure all liquids are maintained below or away from the surfaces to be coated.
4. Temperature of the surface to be coated should be maintained between 40 deg F and 120 deg F or as recommended manufacturer.
5. Specified surfaces should be shielded to avoid exposure of direct sunlight or other intense heat source. Where varying surface temperatures do exist, coating application shall be scheduled when the temperature is falling and not rising or as recommended by the manufacturer.
6. Prior to commencing surface preparation, Contractor shall inspect all surfaces specified to receive the coating and notify Owner, in writing, of any noticeable disparity in the site, structure or surfaces which may interfere with the work, use of materials or procedures as specified herein.

B. SURFACE PREPARATION

1. Oils, grease, incompatible existing coatings, waxes, form release, curing compounds, efflorescence, sealers, salts, or other contaminants which may affect the performance and adhesion of the coating to the substrate shall be entirely removed.
2. Concrete and/or mortar damaged by corrosion, chemical attack or other means of degradation shall be removed so that only sound substrate remains.
3. Choice of surface preparation method(s) should be based upon the condition of the structure and concrete or masonry surface, potential contaminants present, access to perform work, and required cleanliness and profile of the prepared surface to receive the specified polymer coating product, as recommended by the manufacturer.
4. Surface preparation methods or combination of methods that may be used include high pressure water cleaning, high pressure water jetting, abrasive blasting, shot blasting, grinding, scarifying, detergent water cleaning, hot water blasting and others as described in NACE No. 6/SSPC SP-13. Whichever method(s) are used, they shall be performed in a manner that provides a uniform, sound clean neutralized surface with sufficient profile to promote an acceptable bond with the specified polymer coating.
5. Infiltration shall be stopped by using a material which is compatible with the repair products and is suitable for top-coating with the epoxy coating product. The manufacturer shall verify the product compatibility, in writing, to the Owner.
6. Manhole Chimney Joint and Casting: The area between the manhole and the manhole ring and the manhole casting shall be a termination point of the specified epoxy coating product.

C. APPLICATION OF REPAIR AND RESURFACING PRODUCTS

1. Areas where reinforcing bars have been exposed shall be repaired in accordance with the manufacturer's recommendations.
2. Areas where rebar has been exposed and is corroded shall be first prepared as required elsewhere in these specifications. The exposed rebar shall then be

abrasive blasted and coated with the polymer coating product specified as recommended by the manufacturer.

3. Repair products shall be used to fill voids, bugholes, and other surface defects which may affect the performance or adhesion of the epoxy coating product.
4. Resurfacing products shall be used to repair, smooth or rebuild surfaces with rough profiles to provide a concrete or masonry substrate suitable for the polymer coating product to be applied. These products shall be installed to minimum thickness as recommended within the manufacturer's published guidelines. Should structural rebuild be necessary, these products shall be installed to a thickness as specified in the contract documents. Structural rebuild should be specified in advance of bid whenever feasible, and paid for at a separate unit price in the Bid Proposal.
 - a. Repair and resurfacing products shall be handled, mixed, installed and cured in accordance with manufacturer recommendations.
 - b. All repaired or resurfaced surfaces shall be inspected for cleanliness and suitability to receive the coating product(s). Additional surface preparation may be required prior to coating application.
5. If a chimney seal is required in conjunction with the lining technology, the Contractor should contact the chimney seal manufacturer to determine the proper preparation required for effectively installing the chimney seal after the coating has been applied and cured.

D. APPLICATION OF POLYMER COATING PRODUCT

1. Application procedures shall conform to the recommendations of the epoxy coating product manufacturer, including environmental controls, product handling, mixing, application equipment and methods.
2. Spray equipment shall be specifically designed to accurately ratio, apply the polymer coating product, shall be in proper working order and shall be as recommended by the product manufacturer.
3. Contractors qualified in accordance with these specifications shall perform all aspects of polymer coating product installation.
4. Prepared surfaces shall be coated by spray application of the coating product(s) described herein to a minimum as recommended by the manufacturer to meet the requirements of these contract documents.

NOTE: Coating thickness recommendations are available through the polymer coating product manufacturer based upon project assessment. Contact the manufacturer of the polymer coating for project specific recommendations.

5. Subsequent top coating or additional coats of the polymer coating product shall occur within the product's recoat time. Additional surface preparation procedures will be required if this recoat time is exceeded. The polymer manufacturer's recoat time for the specific application, based on temperature and project conditions, shall be strictly followed by the applicator.

6. The polymer coating product shall mechanically bond with adjoining construction materials throughout the manhole structure to effectively seal and protect concrete or masonry substrates from infiltration and attack by corrosive elements. Procedures and materials necessary to effect this bond shall be as recommended by the polymer coating product manufacturer. No hollow spots will be accepted.
7. Contractor must submit manufacturers recommended method for terminating a coating or lining in a manhole
8. If required sewage flow shall be stopped, bypassed or diverted for application of the polymer coating product to the invert and interface with pipe materials.

E. TESTING AND ACCEPTANCE

1. Visual Inspection - Installed liner system shall be completely free of pinholes and hollow spots/voids and other defects that will reduce the life expectancy of the applied system.
2. Film thickness Measurements – (either wet or dry) Liner thickness shall be the minimum value as specified in the contract documents.
3. Holiday Detection Test (Spark Testing), to identify pinholes, thin material and any defects that will affect the life of the installed system.
4. Adhesion Testing – To verify that the system has consistently mechanically bonded to the host structure.
5. Dye Testing – For non-bonded systems to verify no leakage from an annular space
6. Vacuum Testing as specified in the contract documents

3.5 CURED-IN-PLACE MANHOLE LINERS (CIPM)

A. MAINTAINING WASTEWATER FLOWS

1. The Contractor shall be fully responsible for maintaining the normal sewage flow through the manhole where the specified rehabilitation work demands such flow control. The Contractor shall plan his work in order to maintain flows and to not interrupt sewer service. This may include night work. The cost of any night work required will be included in the contract price of the applicable item. The Contractor shall not perform work to manholes until plans for bypass pumping or flow restriction have been submitted to the Owner and accepted. No plugging of existing Utility System Gravity Mains will be made without submitting a plan to the Owner for review.
2. Unlined flow channel. Install a bridge or flow through tube and cut the liner bottom near the flow line in the channel to expose the flow channel and give access to the pipes. Plug the pipes entering the manhole through the wall and trim the pipe opening to restore flow.
3. Lined flow channel. Plug the pipes entering the manhole and line the flow channel to the edge of the pipe. Trim all pipe openings and restore the flow.

B. PRE-INSPECTION

1. Prior to beginning work, the manhole shall be visually inspected and any areas of apparent structural damage that will affect the installation of the liner shall be reported to the Owner for proceeding with the work.
2. All manhole steps shall be removed before the CIPM liner is installed.

C. INFILTRATION CONTROL

1. The stopping of active hydrostatic infiltration shall be accomplished by using a quick set cementitious material compatible to the liner material being installed or using compatible expansion type grouts

D. CHANNEL RECONSTRUCTION

1. Specifications should include a separate line item for Channel Rebuild which is sometimes required.
2. Remove all loose grout and rubble of existing channel. Rebuild channel by shaping and repairing slope of shelves or benches. Work shall include alignment of inflow and out flow ports in such manner to prevent the deposition of solids at the transition point(s). All inverts shall follow the grades of the pipe entering the manhole. Changes in direction of the sewer and entering branch or branches shall have a true curve of as large a radius as the size of the manhole will permit. Channels shall be shaped to allow entrance of maintenance equipment into pipes including buckets, TV camera, etc.
3. Channels shall only be lined where indicated on the plans "lined channels".

E. CIPM PREMADE LINER INSTALLATION

1. The Contractor shall furnish all materials, equipment, tools, and labor as required for the rehabilitation of the manholes specified, including the installation of the CIPM liner.
2. The installation of the selected liner system shall be in strict accordance with the manufacturer's instructions. This shall include the preparation, installation, inflation, curing, and finishing, required for the complete installation of the CIPM liner. Custom fabricate liner to individual manhole dimensions.
3. Line bench area with material placed in the bottom of the manhole and extending a minimum of 6 inches up the manhole wall,
4. Saturate liner with resin, place into manhole, pressurize with air or water and cure with hot water, steam or hot air following manufacturer's recommendations
5. When finished, liner forms a monolithic structure from the manhole frame to the bench.
6. All safety rules and regulations applicable laws and insurance requirements shall be observed, by the Contractor, in storing, handling, use and application of the liner materials, resins and any solvents.

F. CIPM TUBE LINER INSTALLATION

1. The manhole is prepared by pressure washing, sand blasting, and filling large voids.
2. The manhole depth is measured and the technicians cut the liner from a bulk roll to match the depth of the manhole.
3. Resin is mixed and introduced into the liner under a controlled vacuum impregnation process.
4. The liner tube has the ability to stretch and accommodate barrel sections while adapting to an eccentric or concentric corbel section of a manhole.
5. The tube liner is inverted through the center of the retaining ring until the liner is fully turned inside out and positioned within the manhole
6. CIPM Tube Liner is fully inverted
7. The inflation device is inserted within the manhole tube liner.
8. Pressure is applied causing the one-size liner to conform to the manhole.
9. The tube liner is cured at ambient temperatures typically within two hours from mixing or accelerated with steam and can be installed during cold winter months as well as warm summer months.
10. The inflation device is removed and the CIPM tube liner is trimmed at the top of the manhole casting flush with the casting lid seat.

G. TESTING AND ACCEPTANCE

1. Visual Inspection. Liner should be free of severe wrinkles, areas deficient of resin, delamination of the fabric layers, infiltration, large hollow areas behind the liner and any other defects that will affect the life expectancy of the CIPM
2. Spark test to identify pin-holes and defects
3. Adhesion test to verify bonding to the host structure if specified
4. Core sample to verify thickness
5. Vacuum Testing as specified in the contract documents
6. Dye Testing – For non-bonded systems to verify no leakage from an annular space

3.6 COMPOSITE LINER

(Fiberglass/Carbon Fiber Reinforced epoxy composite)

1. The protective composite liner shall be hand crafted in place to follow the shape and contour of the manhole. A layer of epoxy, shall be placed and firmly troweled to force the epoxy into and even out any and all imperfections of the final prepped surface and ensure 100% bonding with no gaps or voids. A fiberglass fabric coated with a chemical binder shall be applied and incorporated into the epoxy (encapsulated) by application of another layer of epoxy.
2. Refer to section 1.1.F for design requirements.

A. TESTING AND ACCEPTANCE

1. Visual Inspection. Liner should be free of severe wrinkles, areas deficient of resin, delamination of the fabric layers, infiltration, large hollow areas behind the

liner and any other defects that will affect the life expectancy of the Composite Liner.

2. Spark test to identify pin-holes and defects
3. Adhesion test to verify bonding to the host structure if specified
4. Core sample to verify thickness
5. Vacuum Testing as specified in the contract documents
6. Dye Testing – For non-bonded systems to verify no leakage from an annular space

3.7 PROTECTIVE PANEL LINERS

A. HIGH DENSITY POLYETHYLENE (HDPE)

1. All manhole steps shall be removed prior to installing the protective liner.
2. A bonding agent compatible with grout or concrete shall be applied to manhole wall before placing liner sheets.
3. Adequate annular space between liner sheet and manhole wall shall be provided to allow placement of concrete or grout.
4. The liner sheet supports shall be secured to the manhole walls.
5. The liner sheets shall be inserted into the manhole and supported as per the manufacturer's recommendations.
6. Secure the liner sheets to the installed supports.
7. Form liner sheet seams in accordance with the manufacturers recommendations.
8. Place the concrete or grout, as recommended by the manufacturer, with no wrinkling of liner. Vibrate, as required, to prevent voids.
9. After the concrete or grout has cured, remove the internal forms or supports and finish all seams as recommended by the manufacturer.

B. POLYVINYL CHLORIDE (PVC) PROTECTIVE SHEET LINERS

1. Apply mastic primer to manhole wall and cure following manufacturers recommendations.
2. Apply mastic to primed manhole wall.
3. Apply liner to mastic.
4. Embed anchoring extensions in mastic.
5. Wrinkling of liner not permitted.
6. Finish liner seams following manufacturer's recommendations

C. TESTING AND ACCEPTANCE

1. Visual Inspection – To verify that there are no loose panels, peeling, bubbles, or other areas that may hinder the performance of the liner.
2. Weld inspection – Performed by using a putty knife to verify weld is solid.
3. Liner thickness shall be the minimum value as specified herein.
4. Spark test – To verify liners are pinhole free and welds are sealed.
5. Adhesion Test – To verify bonding.
6. Vacuum Testing, as specified in the contract documents

7. Dye Testing – For non-bonded systems to verify no leakage from an annular space.

3.8 PRECAST INSERTS

A. DIVERSION PUMPING

1. Install and operate sewage diversion pumping equipment to maintain sewage flows without backup, overflow, or spillage.

B. CLEANING AND SURFACE PREPARATION

1. Remove dirt, grease, and debris from floor and interior walls of manhole using high pressure water and cleaners and cleaning methods as recommended by the manufacturer.
2. Deteriorated invert and bench surfaces shall be abrasive blasted to profile the surface. Compressed air shall be supplied from compressors fitted with oil/moisture separators. Surfaces shall be cleaned of dust and grit particles by dry air blast cleaning, vacuum cleaning, or wiping with a tack cloth. Used abrasives shall be collected and removed without allowing any to enter the sewage flows in the manhole.

C. REPAIRS

1. Active leaks, if present, shall be sealed by application of leak repair material in accordance with the manufacturer's instructions.
2. Repair and reshape manhole inverts and benches. Inverts shall be U-shaped and have a minimum depth of 1/2 pipe diameter. Benches shall have smooth surfaces without defects that allow debris to accumulate.

D. PRECAST INSERT INSTALLATION

1. Remove pavement if present. Excavate around the manhole as necessary to prevent soil and debris from falling into manhole while frame and grade rings are removed. Set aside frame and cover for reuse in rehabilitated manhole.
2. Cut the insert or chip the concrete benches so that the insert will be evenly supported when lowered into place. Accurately locate incoming and outgoing sewer lines and cut the insert for a close fit within 1 inch to both. Seal the cut edges with resin as recommended by the manufacturer.
3. Lower the insert into a 4-inch deep layer of quick-setting grout mixture, making sure that the sewer lines and insert openings align.
4. Place a 6-inch deep layer of quick-setting grout at the bottom of the annular space between the insert and the wall.
5. Seal the sewer openings with Oakum soaked in sealing gel.
6. Fill the remaining annular space with grout. Consolidate the grout without damage to the insert.
7. Install the grade rings, frame, and cover, sealing the surfaces between the reducer, the grade rings, and the frame.

8. Replace pavement if any was removed

E. PROTECTIVE COATING, CHIMNEY BENCH AND INVERT

1. All oil and grease shall be removed from the chimney surface by detergent cleaning with solvent, vapor, alkali, emulsion, or steam.
2. Follow detergent cleaning with abrasive blast cleaning to remove laitance and deteriorated concrete and to roughen the surface to manufacturer specifications.
3. All surfaces shall be clean and dry before applying the protective coating.
4. Apply a quick set grout to the chimney, bench and invert and seal the bottom edge of the insert. Apply two (2) coats of filler/sealer with a squeegee as necessary and as recommended by the manufacturer, to achieve a smooth void free surface. Apply additional coats of filler/sealer to achieve a total applied thickness as recommended by the manufacturer.

F. TESTING AND ACCEPTANCE

1. Visual Inspection – Inserts shall be inspected for workmanship and no leakage.
2. Vacuum Testing, as specified in the contract documents

3.9 MANHOLE CHIMNEY SEALS

A. MECHANICAL FRAME SEAL

1. The contact surfaces for the sleeve and/or extensions shall be reasonably clean and smooth, circular and free from excessive voids or defects. If the masonry surface is rough or irregular and will not provide an effective sealing surface, it shall be smoothed with a single component non-shrink quick set repair mortar designed for vertical and overhead use. Realign manhole frame and cover if offset is greater than Three (3) inches between the frame and top of the manhole structure.
2. After any surface preparation is completed and the rubber sleeve has been placed in the proper position, the lower band is positioned in the band recess and expanded as required to provide a water tight seal. If an extension or extensions are being used, place the extension in the proper position, insert the band into the lower band recess and expand as required to provide a watertight seal.
3. Extension flap shall be placed into or behind the expansion band recess to allow for the compression of both the extension flap and sleeve against the manhole surface by the expansion band. Continue by placing the upper band or bands in the recess, insuring the seal is properly placed on the manhole cone, chimney and frame and expand as required to provide an effective seal.
4. Installation procedures shall be in accordance with the manufacturer's recommended instructions.
5. TESTING AND ACCEPTANCE
 - a. Visual Inspection
 - b. Leakage test - Following the expansion of the lower band a quality assurance test shall be performed to insure effective sealing by pulling the upper section

of the seal or extension inward to create a recess behind the seal where water can be poured. Pour the water behind the seal and observe the lower sealing area for any visible leaks. The sealing shall be considered effective if no water leaks from behind the seal at the lower sealing area.

B. POLYMER CHIMNEY SEAL

1. All loose and protruding mortar and brick that would interfere with the polymer chimney seal's performance shall be removed. Any lips for gravel pan supports shall be cut off flush with the manhole casting. All loose material or excessive voids shall be repaired using patching cement, as recommended by the manufacturer. The Contractor shall obtain from the polymer chimney seal manufacture, in writing, the material compatibility and the recommended time required for the patching cement to properly cure prior to installing the polymer chimney seal.
2. Preparation of the chimney surface and casting may include using high pressure water, sandblasting, wire brushing, or other methods as described by the manufacturer, to ensure a clean surface. Active leaks (infiltration) shall be sealed by a method as recommended by the polymer chimney seal manufacturer prior to installing the chimney seal. After water or sandblasting, pressure wash the entire area remove any loose sand that may have been deposited. The substrate surface must be free of sand, loose debris, latencies, dust, oil, grease or chemical contamination. A blower may be required to completely dry the substrate surface or as recommended by manufacturer.
3. The polymer chimney seal shall require the proper mixing of several components, is recommended by the manufacture. If a primer is required, ensure that all surfaces are clean and dry before applying. After proper curing of the primer, the polymer chimney seal may be applied evenly by brush over the entire chimney area, including the frame joint area and the area above the manhole cone including all extensions to the chimney area.
4. Installation procedures shall be in accordance with the manufacturer's recommended instructions.
5. TESTING AND ACCEPTANCE
 - a. Visual Inspection - Final liner system shall be completely free of pinholes or voids
 - b. Holiday Detection Test
 - c. Adhesion Testing

C. CURED-IN-PLACE (CIPM) CHIMNEY LINER

1. The installation shall include a coated non-woven textile liner of a length specific to each manhole and a silicate based thermo-set resin. The liner is vacuum impregnated (saturated) on-site with the thermo-set resin. The saturated liner is then lowered into the manhole and is temporarily held in position. The installation device is then lowered and properly positioned inside of the liner. The bladder on the installation device is then pressurized so that the liner is pressed against the

existing structure. Once the resin-saturated liner is cured, the installation device is removed. The liner is then trimmed flush with the manhole cover seat.

2. All surfaces to be lined must be stringently pressure washed as recommended by the manufacturer. Other alternatives to clean the structure may be used along with pressure washing such as abrasive blasting. The existing casting shall be cleaned using a grinder or by sand blasting. Large voids and missing bricks shall be filled with hydraulic cement to provide an area that liner can press up against. Smaller voids and missing mortar may go un-patched, since these areas will be filled with excess resin. Steps that are located in the area to be lined shall be removed.
3. The liner shall be vacuum impregnated (saturated) on-site under controlled conditions. The resin shall be pre-measured at the manufacturing plant prior to shipment. The volume of resin used shall be sufficient to fill all voids in the liner material at nominal thickness and diameter. No dry or unsaturated areas in the liner shall be acceptable upon visual inspection.
4. Installation Device – The liner is placed with the saturated resin side facing the substrate to allow for resin migration. Once the liner is placed in the manhole and rested on the spacing rings, then the installation device is inserted inside the liner. The spacing rings located on top of the manhole allow the installation device to rest at the correct depth. Once the installation device inserted, the bladder is pressurized. The installation device stays in place and pressurized until the liner is cured.
5. Curing – The liner is cured at ambient temperatures as it is pressed firmly against the structure. The curing time must take into consideration the resin system, ground conditions (temperature and moisture level), and weather conditions. Typically, one hour is needed to cure the liner. A curing log shall be document the cure time, pressure, resin usage, and other pertinent information.
6. Trimming – Once cured, the installation device is removed and the liner is trimmed at the manhole cover seat.
7. The finished cured-in-place manhole chimney liner shall be continuous from the manhole cover seat to the overlap onto the cone/corbel section. The liner shall provide a smooth surface that conforms to the existing structure. The liner shall be free of dry spots and de-laminations. The finished product must provide an air and watertight corrosion resistant liner protecting the manhole chimney.
8. TESTING AND ACCEPTANCE
 - a. Visual Inspection to insure bonding, resin saturation, complete cure and a smooth surface free from cracks or hollow spots.
 - b. The liner shall be subjected to several freeze/thaw cycles either in the field or simulated in a freezer with no cracking or bond breakage. This test or equivalent test shall be as recommended by the manufacturer and the test results recorded in writing by the Owner representative.
 - c. Adhesion Testing
 - d. Dye Testing – For non-bonded systems to verify no leakage from an annular space

D. COMPOSITE CURED IN PLACE CHIMNEY SEAL

1. The protective composite liner shall be hand crafted in place to follow the shape and contour of the manhole. A layer of epoxy, shall be placed and firmly troweled to force the epoxy into and even out any and all imperfections of the final prepped surface and ensure 100% bonding with no gaps or voids. A fiberglass fabric coated with a chemical binder shall be applied and incorporated into the epoxy (encapsulated) by application of another layer of epoxy.
2. Refer to section 1.1.F for design requirements. Greater thickness can be accomplished by either increasing the thickness of the epoxy layers or by using additional fiberglass layers.
3. TESTING & INSPECTION
 - a. Visual Inspection to insure bonding, resin saturation, complete cure and a smooth surface free from cracks or hollow spots.
 - b. The liner shall be subjected to several freeze/thaw cycles either in the field or simulated in a freezer with no cracking or bond breakage. This test or equivalent test shall be as recommended by the manufacturer and the test results recorded in writing by the Owner representative.
 - c. Adhesion testing
 - d. CIP Material Property Tests
 - e. Dye Testing – For non-bonded systems to verify no leakage from an annular space

3.10 REPLACE FRAME AND COVER

- A. The manhole frame and cover shall be manufactured and installed to the dimensions shown on the contract documents.
- B. Measurement shall be by each manhole frame and cover removed and replaced.
- C. Payment shall be at the unit price each Bid in the Proposal.
 1. Payment includes removal of existing frame and cover, replacing frame and cover, and disposal of old frame and cover as required.

3.11 MANHOLE ADJUSTMENT MATERIALS

- A. ADJUSTMENT MATERIAL INSTALLATION
 1. The contractor shall furnish all materials, equipment, tools and labor required for the adjustment of rings and covers to grade.
 2. The ring and cover to be adjusted shall be located and clearly marked.
 3. The existing road or ground surface shall be cut all around the ring & cover, either by triangular, square or round cut (being careful to not create stress fracture points in the corners by over-cutting) to an adequate depth that will allow

the desired adjustments to be accomplished. If the cut is not deep enough, the increase in depth may be accomplished with the use of various digging investments.

4. All of the road or ground inside of the cut shall be removed to allow safe working conditions during the adjustment and restoration to the proper height or level.
5. The ring shall be positioned, either by suspension or by placement on the correct amount of adjustment rings, If the positioning is accomplished by suspension, the required retainer shall be installed properly.
6. Once the ring is properly positioned and secured, the open area shall be filled and properly compacted with the materials prescribed in the bid documents and finished off in a manner to meet the requirements of the specs.
7. If the area has been filled (in whole or in part) with poured concrete and/or asphalt, it shall be adequately protected by control devices for a period of time that will allow the fill to properly cure before allowing traffic to resume.

3.12 MANHOLE STEPS

- A. Manhole steps shall be driven into pre-cast or drilled holes. Steps shall be installed no more than 16 inches apart vertically on the interior of the manhole wall at a point 4" below the base flange of the manhole casting.
- B. Measurement shall be for each manhole step provided
- C. Payment shall be at the price per each Bid in the Proposal.
 1. Payment includes the removal and replacement of manhole steps per each Bid in the Proposal.

3.13 QUALITY ASSURANCE AND TESTING

A. GENERAL

1. The Contractor shall test the installed SYSTEM's as specified by these contract documents. 10% of the installed SYSTEM's shall be tested using a testing procedure as further delineated below. If more than 5% of the tested SYSTEM's fail the test than an additional 10% of the manholes are selected for further testing. This process continues until the SYSTEM's tested meet the requirements of these contract documents, to the satisfaction of the Owner.

B. CHAIN OF CUSTODY

1. The Contractor shall perform all testing in the presence of the Owner's representative. The Owner's representative shall receive test samples from the Contractor and transmit samples to a third party testing laboratory. The Owner's representative will maintain the chain of custody of all samples that are

transmitted and tested to verify SYSTEM compliance with these contract documents.

C. TEST REQUIREMENTS

1. Visual Inspection
 - a. All manholes shall be visually inspected. Any leakage into the manhole in areas where SYSTEM's were installed by the Contractor shall be identified.
 - b. The Contractor shall provide samples for testing to the Owner from the actual installed SYSTEM. Samples shall be provided, at a minimum from one location per every ten (10) SYSTEM's installed.
2. Cementitious Material Property Testing
 - a. Where specified one 2 X 2 inch sample cube shall be taken for every 50 bags of material used. Samples shall be sprayed from nozzle, identified in the presence of the Owner's representative and sent, by the Owner's representative, to an independent test laboratory for compression strength testing as described in ASTM C-109.
3. Vacuum Testing
 - a. Where specified if the entire manhole including invert and pipe penetrations is rehabilitated to as new condition then a Vacuum Test may be performed according ASTM F1244. If vacuum test fails then the contractor shall spray entire manhole with a soap solution and retest to determine where air is entering the manhole. Inspector shall determine if failure was due to improper rehabilitation or poor pipe condition or improperly seated plugs. If inspector determines that the failure is due to improper rehabilitation then the Contractor shall repair manhole according to manufacturer recommendations and retest until a successful vacuum test is achieved. If inspector determines that the failure was due to poor condition of the pipes, or annular space between the pipe and its liner, or the inability to seat the plugs properly and that there are no visible defects in the applied product then it will be determined that the manhole has passed.
4. Film thickness Measurements
 - a. Where applicable and specified during application a wet film thickness gauge, meeting ASTM D4414 - Standard Practice for Measurement of Wet Film Thickness of Organic Coatings by Notched Gages, shall be used. Measurements shall be taken, in the presence of the Owner's representative, documented and attested to by Contractor for submission to Owner.
5. Holiday Detection Test
 - a. Where specified Holiday Detection shall be performed for all coating systems installed in corrosive environments.
 - b. After the epoxy coating product have set in accordance with manufacturer instructions, all surfaces shall be inspected for holidays with high-voltage holiday detection equipment. Reference NACE RPO 188-99 for performing holiday detection.

- c. All detected holidays shall be marked and repaired by abrading the coating surface with grit disk paper or other hand tooling method. After abrading and cleaning, additional coating can be hand applied to the repair area.
 - d. All touch-up/repair procedures shall follow the coating manufacturer's recommendations.
 - e. Documentation on areas tested, results and repairs made shall be provided to the Owner, in writing, by Contractor.
6. Adhesion Testing
- a. Where specified a minimum of 10% of the manholes coated shall be tested For adhesion/bond of the coating to the substrate. Testing shall be conducted in accordance with ASTM D4541, ASTM D7234, or NACE SP018. Owner's representative shall select the manholes to be tested.
 - b. A minimum of three (3) - 50 mm dollies shall be affixed to the coated surface at the cone area, mid section and at the bottom of the structure or in areas suspect from non-destructive evaluation and testing The adhesive used to attach the dollies to the coating shall be rapid setting with tensile strengths in excess of the coating product and permitted to cure in accordance with manufacturer recommendations. The coating and dollies shall be adequately prepared to receive the adhesive.
 - c. Failure of the dolly adhesive shall be deemed a non-test and require retesting. Prior to performing the pull test, the coating shall be scored to the substrate by mechanical means without disturbing the dolly or bond within the test area.
 - d. Two of the three adhesion pulls shall exceed 300 psi or concrete failure with more than 50% of the subsurface adhered to the coating.
 - e. Should a structure fail to achieve two successful pulls as described above, additional testing shall be performed at the discretion of the Owner. Any areas detected to have inadequate bond strength shall be evaluated by the Owner.
 - f. Further bond tests may be performed in that area to determine the extent of potentially deficient bonded area and repairs shall be made by Contractor.
7. All testing shall conform to these contract specifications and the submitted PWS.

3.14 SAMPLE BID ITEMS

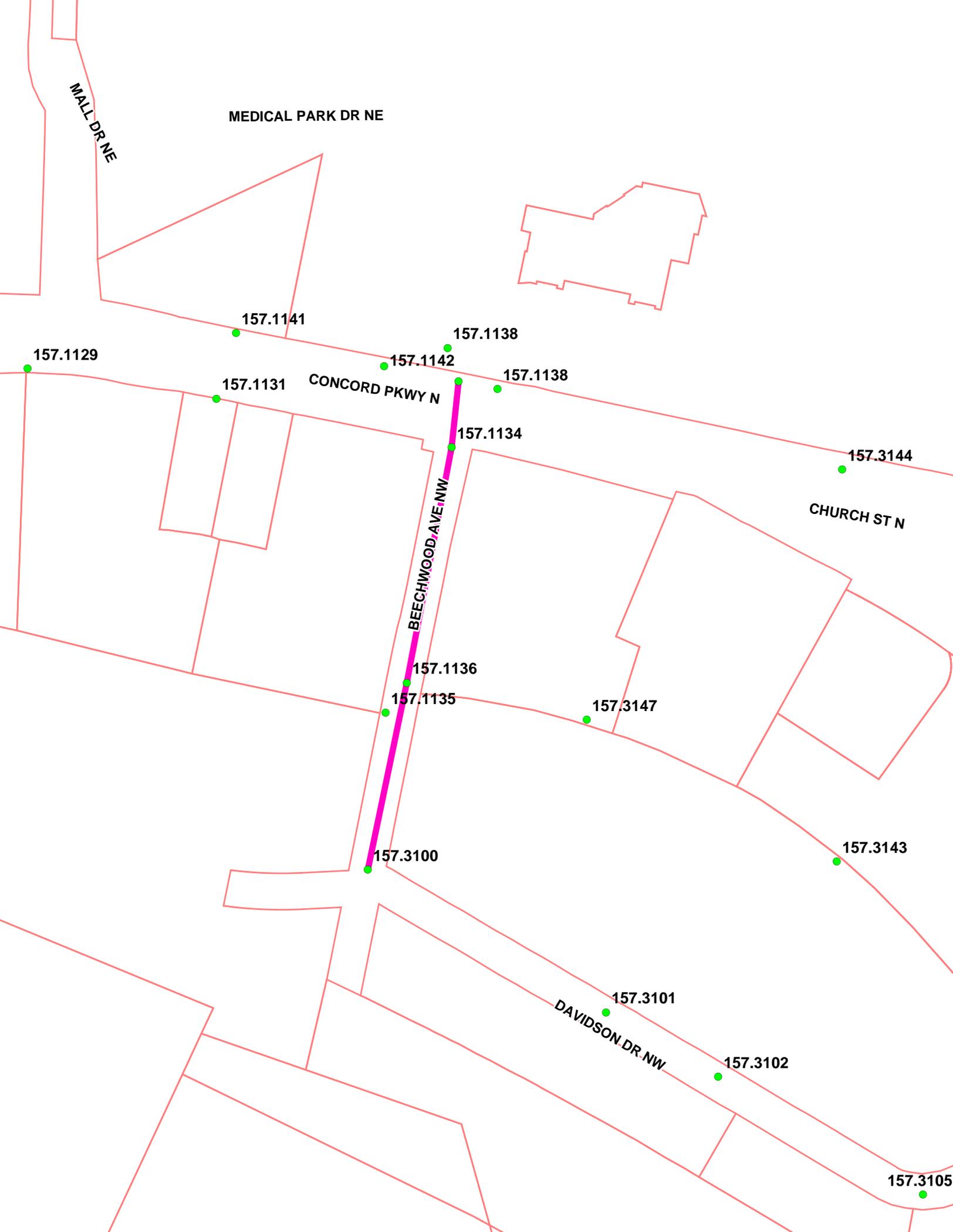
- A. Mobilization – Lump Sum – Includes all PWS info, submittals, safety plan, as built drawings, test samples and mobilization/demobilization of labor, equipment and materials to the project site.
- B. SYSTEM (One for each SYSTEM Specified)– Lump Sum – per each vertical foot including all labor, materials and equipment required by the Contractor to furnish a leak proof manhole to the Owner, complete.

- C. SYSTEM Inspector Training (One for each SYSTEM Specified) – price per day – includes the cost of all labor, equipment and materials required to train the Owner’s inspectors on the SYSTEM technology, at the Owner’s project location.
- D. Replace Manhole Frame and Cover – Lump Sum – per each manhole including all labor, materials and equipment required by the Contractor to remove and dispose of the existing manhole frame and cover and furnish and install a new manhole frame and cover to the Owner, complete.
- E. Manhole Adjustment Materials – per vertical inch – includes all labor, equipment and materials required, by the Contractor, to adjust each manhole as required by the Owner, complete.
 - 1. Bench Rebuild – Some manholes may require structural construction of a bench to promote proper flow. Merely lining the existing flat bench is not consistent with good rehabilitation practice
- F. Manhole Steps – per each – includes all labor, equipment and materials required, by the Contractor, to install each manhole step as required by the Owner, complete

****END OF SECTION****

EXHIBIT H

MAPS



MALL DR NE

MEDICAL PARK DR NE

157.1129

157.1141

157.1131

CONCORD PKWY N

157.1142

157.1138

157.1138

157.1134

157.3144

CHURCH ST N

BEECHWOOD AVE NW

157.1136

157.1135

157.3147

157.3100

157.3143

157.3101

DAVIDSON DR NW

157.3102

157.3105



212.1129

CAMILLA PL SE

212.1138

ROSEHAVEN CT SE

212.1139

212.1131

212.1134

RIVERBIRCH DR SE

212.1196

212.1125

212.1197

212.1135

212.1149

212.1126

WILKINSON CT SE

212.1144

212.1143

HAHN PL SE

212.1127

212.1141

212.1128

HOPKINS ST SE

212.1148

212.1150

212.1140

CORBAN AVE SE

212.3102

HUDSON ST SE

VIRGINIA ST SE

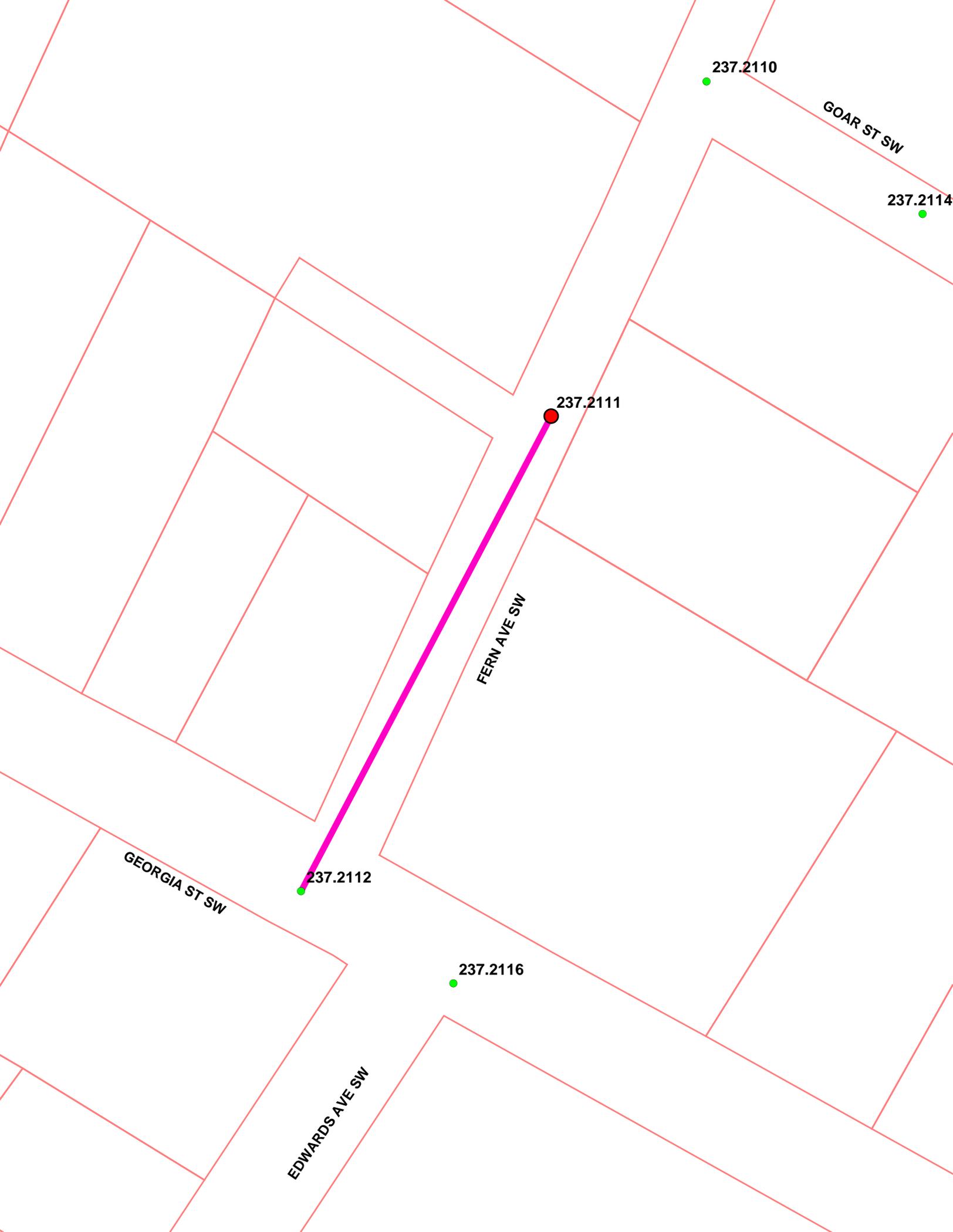
212.3103

212.3197

SHINN ST SE

212.1142

212.3196



237.2110

GOAR ST SW

237.2114

237.2111

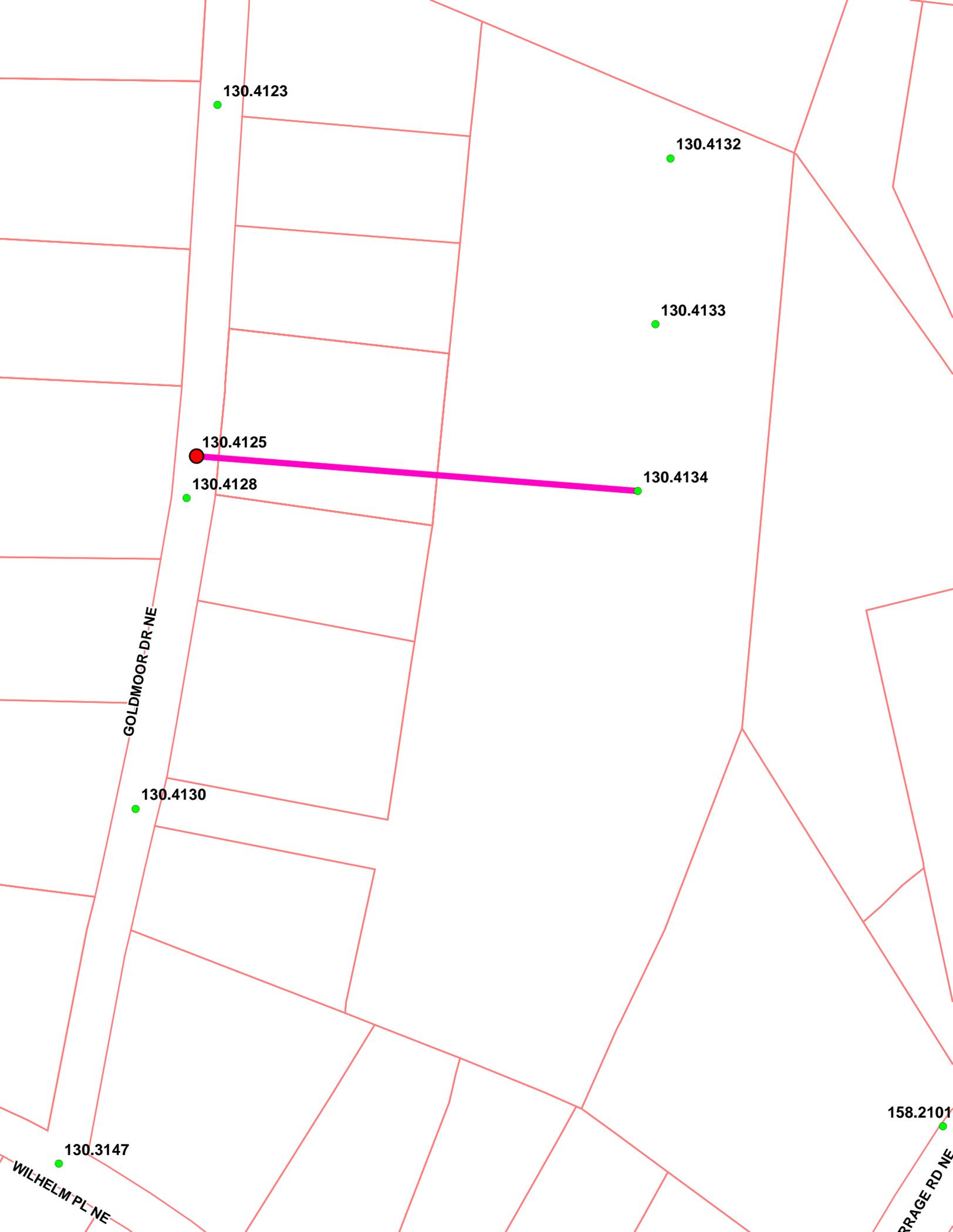
FERN AVE SW

237.2112

GEORGIA ST SW

237.2116

EDWARDS AVE SW



130.4123

130.4132

130.4133

130.4125

130.4134

130.4128

GOLDMOOR DR NE

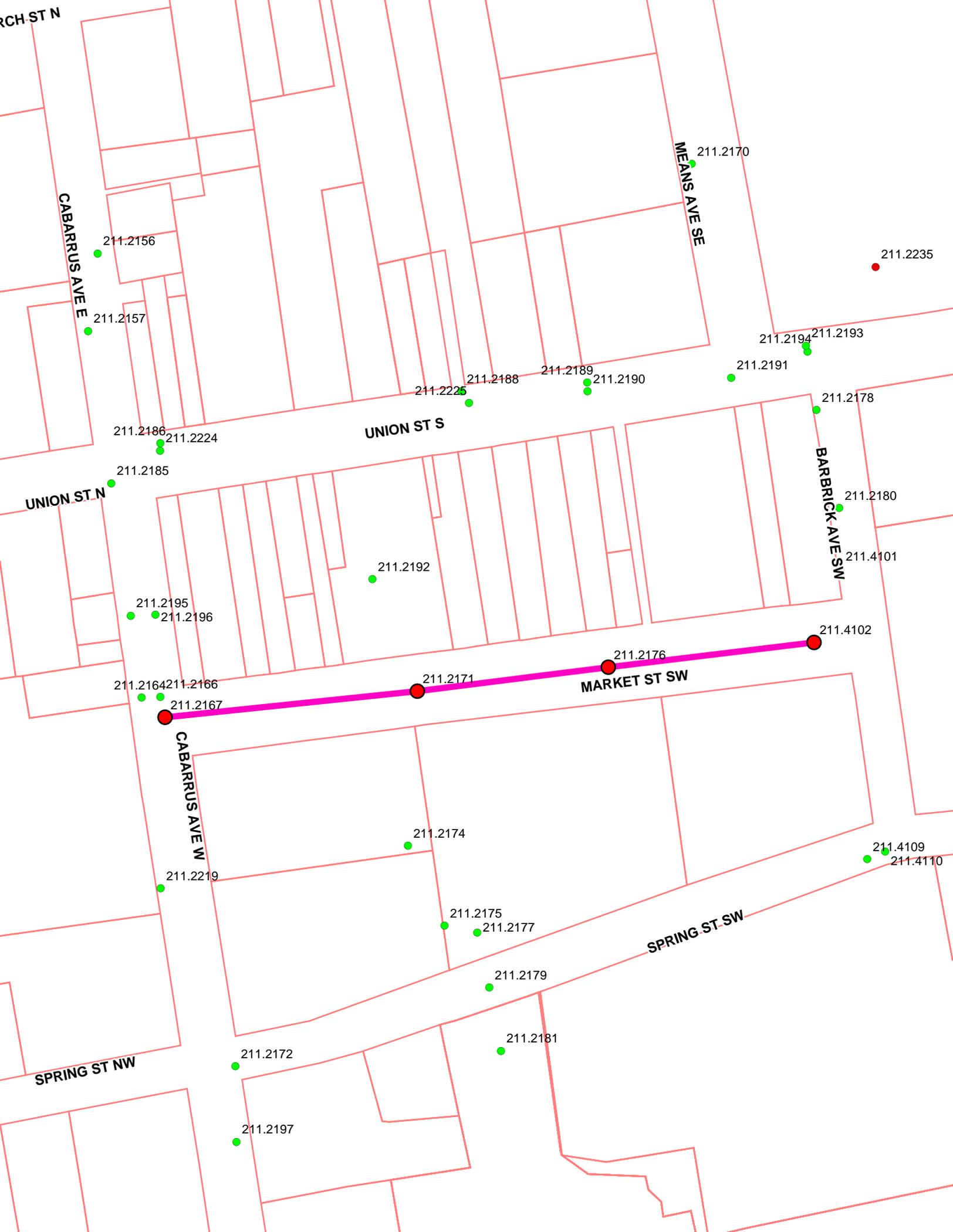
130.4130

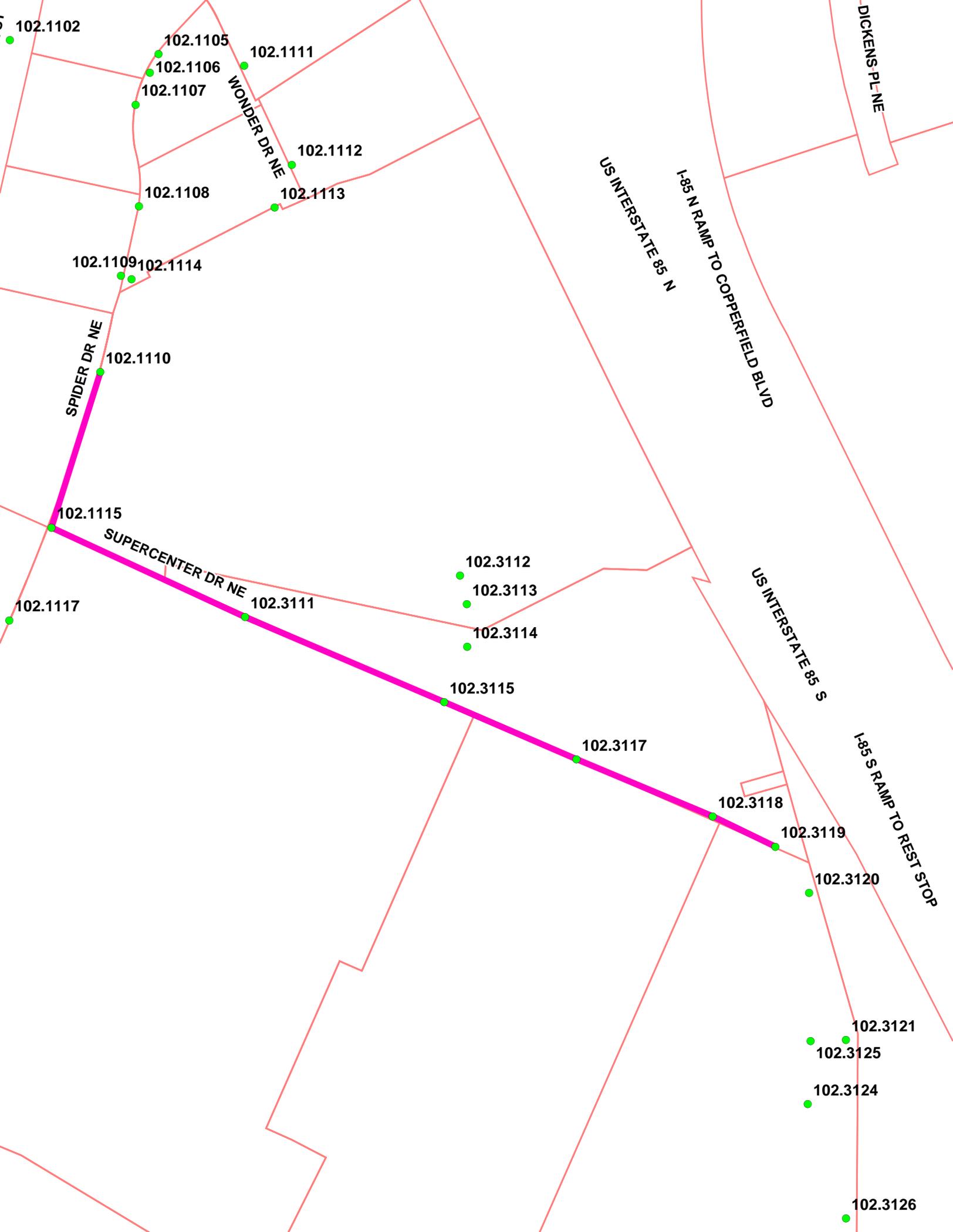
130.3147

158.2101

WILHELM PL NE

RRAGE RD NE











ANDY AVE SW

238.1162 238.1165

SPRING ST SW

238.1167

238.1169

238.4102

238.4108

238.4111

238.4115

238.4122

238.4190

238.4127

238.3148

238.4121

238.4128

238.4139

238.4141

238.1179

238.3101

238.3102

238.4135

RESDEN ST SW

238.3149

238.3105

238.3108

MARSHDALE AVE SW

238.3150

238.3100

238.3104

238.3106

238.3115

238.3147

238.3107

238.3118

238.3119

238.3146

238.3111

238.3113

SYLVAN ST SW

238.3103

238.3112

238.3116

238.3122

WILSHIRE AVE SW

238.3145

238.3110

238.3112

238.3120

238.3124

HILLSIDE AVE SW

238.3117

238.3144

238.3114

238.3121

238.3128

238.3130

SEDGEFIELD ST SW

238.3125

238.3123

238.3143

238.3153

238.3142

