

EXHIBIT 2

Sanitary Sewer Collection System Rehabilitation and Replacement

Guidance Specifications

CDPMT

March 21, 2017

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SECTION 01010
SUMMARY OF WORK

PART 1 – GENERAL

1.01 PURPOSE AND NEED

A. DeKalb County Department of Watershed Management's (DWM) Wastewater Collection and Transmission System (WCTS) includes an estimated 2,700 miles of sanitary sewer lines, and 70,000 manholes. Per the Consent Decree (CD) entered with the United States Environmental Protection Agency (USEPA), the County is implementing a program for continuous sewer assessment, maintenance and rehabilitation aimed at minimizing sanitary sewer overflows (SSOs). Sanitary sewer renewal, rehabilitation, and associated work activities completed under this Contract will serve to improve sanitary sewer system operation.

1.02 SCOPE OF WORK

A. The Work will include, but is not limited to, the following:

1. Light and heavy cleaning of gravity sewer mains.
2. Cleaning of sewer manholes.
3. Easement access route building and easement access clearing.
4. Bypass pumping.
5. CCTV Inspection.
6. Erosion Control.
7. Site Restoration resulting from providing access to assets, including but not limited to removing and/or replacing pavement, hardscape & landscaping features.
8. External and Internal Point Repairs.
9. Replace existing pipe using conventional open cut methods.
10. Replace existing pipe using pipe-bursting methods.
11. Rehabilitate existing pipe using Cured-in-Place Pipe Lining.
12. Open cut replacement of service laterals from mainline to edge of ROW or easement.
13. Cured-in-place rehabilitation of service laterals from mainline to edge of ROW or easement.
14. Install clean outs.
15. Foam treatment of sewer mains and/or service laterals.
16. Coordinate DWM's Community Outreach requirements to minimize impact to the citizens of DeKalb County.
17. Other work associated with the above items and all other aspects of the Contract Documents.

B. Perform all work in accordance with the Contract Documents.

1.03 PROJECT LOCATION

A. The Work is required at multiple locations within the WCTS as indicated in the technical exhibits and maps provided with the RFP.

1.04 WORK COORDINATION

A. The Contractor shall:

1. Coordinate the Work with third parties, (such as public utilities, other DeKalb County departments, and emergency service providers), in areas where such parties may have rights to underground property or facilities;
2. Request maps or other descriptive information as to the nature and locations of such underground facilities or property.
3. Coordinate the Work with owners of private and public property where access is required for the performance of the work.
 - a. Legal access will be acquired by the Contractor in accordance with the Contract Documents.

B. The Owner, through the Owner's Representative:

1. Will work with the Contractor to assign and schedule the work in a logical and efficient format.
 - a. All items in this contract shall be priced so each item can be assigned independently or combined with other items at the Owner's Representative's sole discretion.
 - b. No consideration of any claim or extra payment will be considered for:
 - 1) Extra payment arising from a decision to assign potential work items under this contract in any combination or in combination with another contract utilizing alternates by the Department of Watershed Management at the prices specified herein.

1.05 EXISTING SITE(S) CONDITIONS

A. The Contractor shall:

1. Make all necessary investigations to determine the existence and location of underground utilities that could impact the work.
2. Evaluate surface features that may impact the work.
3. Be held responsible for documenting, recording, maintaining and protecting existing utilities, structures, and personal property.
 - a. Damage to any existing utilities, structures, personal property will be repaired/replaced to equal or better condition by the Contractor at no additional cost to the project.

B. Nothing in these Contract Documents shall be construed as a guarantee existing utilities are either not located, or located as shown within the area of the work.

END OF SECTION

SECTION 01015
CONTROL OF WORK

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. This section includes:

1. The general use of the site including properties inside and outside of the right of way,
2. Work affecting existing utilities, roadways, streets, driveways, and traffic patterns.
3. Requirements for notification to adjacent landowners and occupants.

1.02 PERSONNEL – COOPERATION WITHIN THIS CONTRACT

A. The Contractor shall furnish:

1. Manpower knowledgeable and experienced with the type of work detailed in these Contract Documents to deliver a quality project.
2. Equipment in sufficient numbers, size and capacity that is efficient, capable and appropriate to produce Work that meets or exceeds the quality requirements of the Contract, and maintains a rate of progress insuring the completion of the work in a manner that complies with, and is within the time stipulated in the Contract Documents.

B. Program Manager/Owner's Representative:

1. May and at no additional cost to the Owner, order the Contractor to increase manpower or equipment if:
 - a. Rate of progress will not meet that required to complete the project per the Contract Documents.
 - b. Rate of progress is not in agreement with the accepted baseline schedule
 - c. Quality of performed work appears to be decreasing, or otherwise fails to meet the minimum standards required by the Contract
2. The Contractor shall immediately conform to such order and continue to do so until the Work is on schedule and meets the minimum standards required by the Contract.

3. Failure of the Program Manager to give such order shall in no way relieve the Contractor of his obligations meet the requirements of the Contract Documents.

C. All firms or persons authorized to perform any work under this Contract shall:

1. Cooperate with the General Contractor and his subcontractors or trades,
2. Assist in incorporating the work of other trades where necessary or required.
3. Comply with the requirements of all local state and federal agencies and other utility/facility Owners.

PART 2 – PRODUCTS

(Not Used)

PART 3 – EXECUTION

3.01 INSTALLATION

A. Private Land:

1. The Contractor shall not enter or occupy any private land outside of existing easements except,
 - a. By permission of the property owner
 - 1) Provide a copy of any written permission(s), agreements and releases between Contractor and Property Owner to Program Manager/Owner's Representative for files.
 - b. Owner per the Public Notification requirements listed in all applicable Specification Sections.
 - c. The Contractor shall precisely and thoroughly document the location, condition of all private property features just prior to any disturbance or access. This would include location of features, species of trees bushes, etc. and all other pertinent information. Any failure to do so may require the Contractor, at the Contractor's expense to complete all restoration requirements required by property owners regardless of their validity. In such occurrences, the contractor shall provide to the County, a written release from the property Owner.

B. Pipe Locations:

1. Pipelines shall be located substantially as indicated on the Drawings,

- a. Owner's Representative reserves the right to make modifications in locations and alignment to avoid interference with existing structures or utilities.
- b. Not all fittings required to complete connections or transitions are noted on the Drawings.
 - 1) Contractor is responsible for providing all required fittings and any associated restraint for completion of connections or transitions shown.

C. Open Excavations

- 1. All open excavations shall be adequately safeguarded by providing temporary barricades, caution signs, lights and other acceptable and effective means to prevent accidents to persons, and damage to property.
 - a. All work shall meet OSHA Standards
- 2. The Contractor shall, at his own expense, provide suitable and safe bridges and other crossings for accommodating travel by Owner's Representative, pedestrians and workmen. Bridges provided for access to private property during construction shall be removed when no longer required.
 - a. Required clean up and restoration will be equal to or better than original condition of site.
- 3. Maximum length of open trench is not to exceed:
 - a. 100 feet ahead of pipe laying and backfilling in paved areas
 - b. 200 feet ahead of pipe laying and backfilling in unimproved areas.
 - c. Shorter lengths of open trench may be required by surrounding conditions to minimize interference existing facilities, etc.
 - 1) This will be evaluated on a case-by-case basis.
- 4. Open excavation shall not restrict traffic or become a hazard.
 - a. Use construction procedures (such as limiting the length of open trench, prohibiting deposition of excavated material in the street, prohibiting the storage or stockpiling of materials in the street or on sidewalks)
- 5. Take precautions to prevent pedestrians/public from entering any construction zone.
 - a. Use all available measures to prevent injury including applying all applicable OSHA standards.
 - b. Night watchmen may be required where special hazards exist
 - c. Police protection provided for traffic while work is in progress.
 - d. The Contractor shall be fully responsible for damage or injuries

D. Maintenance of Traffic

1. Maintain vehicular and pedestrian traffic at all times:
 - a. Obtain and obey fully, street closure permission/permit from proper authority.
 - b. Conduct no construction operations in, and remain clear of the work area outside the hours allowed by the permit and Contract. The most stringent shall apply.
 - c. Temporary stockpiling excavated or stored material on street or pedestrian walkways without proper closure permit is not allowed.
 - d. Use available construction methods to mitigate any traffic hazards created.
 - 1) Provide temporary roadways, erect wheel guards or fences or other methods approved by the Program Manager/Owner's Representative.
2. Detours around construction or assessment activities will be subject to the approval of the Owner's Representative.
3. Where detours are permitted:
 - a. Provide all necessary barricades and signs as required to divert the flow of traffic.
 - b. Expedite construction operations and periods when traffic is being detoured.

E. Work Within GDOT Right-of-Way

1. All roadway restoration shall be done in accordance with the lawful requirements of the governing authorities within whose jurisdiction such pavement is located.
2. All highway utilities and traffic controls are to be maintained.
 - a. Work shall conform to the rules and regulations of the governing authorities, including the use of standard signs, barricades, and warning devices.
3. Conduct no construction operations in, and remain clear of the work area outside the hours allowed by the permit and Contract. The most stringent shall apply.
4. The Contractor shall furnish all such bonds or checks required by the governing authorities to ensure proper restoration of paved areas.

F. Care and Protection of Property

1. The Contractor shall be

- a. Responsible for the preservation of all public and private property affected by his operations.
 - b. Use every precaution necessary to prevent damage thereto.
 - c. Any direct or indirect damage to public or private property (through act, omission, neglect, misconduct in the execution of the work) shall be restored by the Contractor,
 - 1) At his expense,
 - 2) To a condition similar or equal to that existing before the damage was done.
2. Restore sidewalks disturbed by the Contractor's operations to a condition similar or equal to that existing before the damage was done using approved similar or comparable materials.
 - a. Curbing shall be restored to a condition similar to or equal to the original construction
 - 1) In accordance with the best modern practice and all related local, state and federal requirements.
3. Along the location of this work all fences, walks, bushes, trees, shrubbery, and other physical features shall be documented, protected and restored in a thoroughly workmanlike manner.
 - a. Fences and other features removed as a part of the work shall be replaced in the original location as soon as conditions permit. Temporary fences shall be provided and maintained as required by property owners at no additional cost to the Owner.
 - b. All grass areas beyond the limits of construction damaged by the Contractor shall be regraded and seeded.
 - 1) Seed mix will be as recommended by governing authority or property owner.
4. The documentation, protection, removal, and replacement of existing physical features along the line of work:
 - a. Shall be a part of the work under the Contract,
 - b. Costs in connection therewith shall be included in the unit and/or lump sum prices established under the items in the Contract Documents.

G. Protection and Relocation of Existing Structures and Utilities

1. The Contractor shall assume full responsibility for the protection of all buildings, structures, and utilities, public or private, including poles, signs, services to buildings, utilities in the street, such as pipes, water pipes, hydrants, sewers, drains, gas and electric and telephone cables.

- a. Carefully and fully support and protect all such structures and utilities from injury of any kind. Protect and restore damage to any cathodic protection components or locating devices including wires, tape, etc.
 - b. Damage resulting from the Contractor's operations shall be repaired by him at his expense, to the satisfaction of the property owner
- 2. If the Owner's Representative determines that permanent relocation of a utility is required, he may direct the Contractor, in writing, to perform the work.
 - a. Work so ordered will be paid for at the Contract unit prices, if applicable, or as extra work under the General Conditions.
 - b. If relocation of a privately owned utility is required, the Owner will notify the Utility to perform the work as expeditiously as possible.
 - 1) Contractor shall cooperate with the Owner and Utility,
 - 2) Have no claim for delay due to such relocation.
 - 3) Notify public utility companies in writing at least 48 hours (excluding Saturdays, Sundays, and legal holidays) before excavating in any public way.

H. Water For Construction Purposes: Refer to Section 01030 – Special Project Procedures, 3.01, Paragraph F.

I. Maintenance of Flow: Refer to Section 01520 – Sewer Flow Control.

3.02 CLEANUP

Refer to Section 01710 Clean up, and all other sections that require special clean up and disposal requirements. The most stringent shall apply.

END OF SECTION

SECTION 01016

CONTROL OF MATERIALS

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. This section includes the responsibilities of the Contractor regarding materials used on the project.

1.02 RELATED SECTIONS

- A. Section 01300 - Submittals

1.03 QUALIFICATIONS

- A. Only new materials and equipment shall be incorporated in the work.
 - 1. Materials and equipment furnished shall be subject to the inspection and approval of the Owner's Representative. Contractor shall be responsible for the close inspection, storage, maintenance and all protection of all materials and equipment delivered and used in the project
 - 2. No material shall be delivered to the job site without prior approval of the Owner's Representative.
 - 3. No materials or equipment shall be delivered to the project for which the manufacturer's published storage and handling instructions have not been provided
 - 4. Like items of products furnished and installed in the Work shall be end products of one manufacturer and of the same series or family of models.

- B. The materials and equipment used on the work shall correspond to the approved samples or other data.

- C. MANUFACTURER'S CERTIFICATE OF COMPLIANCE

When required by Owner's representative, a Manufacturer's Certificate of Compliance, shall be provided and signed by entity supplying the product, material, or service, and submitted prior to shipment of product or material or execution of the services.

- D. Engineer may permit use of certain materials or assemblies prior to sampling and testing if accompanied by accepted certification of compliance.

1.04 SUBMITTALS

- A. Within two (2) weeks of receiving the Notice-To-Proceed, the Contractor shall submit to the Owner's Representative a complete schedule of submittals and submittal log for review and approval. The Contractor shall submit either Action or Informational submittals on a timely basis as indicated in the schedule to not delay the Work. Such submittals shall be in sufficient detail to enable the Owner's Representative to identify the particular project and to form an opinion as to its conformity to the Specifications.
- B. The Contractor shall submit data and samples to permit consideration and approval before materials are necessary for incorporation in the work.
 - 1. Allow for a 10 working day review time for Owner/Owner's Representative.
 - 2. Any delay of approval resulting from the Contractor's failure to submit samples or data promptly or from required re-submittal shall not be used as a basis of a claim against the Owner.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Facilities and labor for handling storing, maintaining and inspecting all materials and equipment shall be furnished by the Contractor.
- B. At the Owner's Representative's request, either prior to beginning or during the progress of the work,
 - 1. The Contractor shall submit samples of materials for such special tests as may be necessary to demonstrate conformity to the specifications.
 - 2. Samples shall be furnished, stored, packed, and shipped as directed at the Contractor's expense.
 - 3. Except as otherwise noted, the Owner's Representative will make arrangements and pay for the tests.

PART 2 – PRODUCTS

(Not Used)

PART 3 – EXECUTION

(Not Used)

END OF SECTION

SECTION 01020

ALLOWANCES

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. This section includes administrative and procedural requirements governing allowances.

1.02 QUALIFICATIONS AND REQUIREMENTS

- A. Contingency allowance, if included in the Contract Documents, is for the sole use of the Owner for costs for additional related work.
- B. Selected materials, equipment, and installation can be included in Contract Documents by cash allowances.
 - 1. Allowances are established to defer selection or scope until more information is available.
 - 2. Other requirements will be issued by a Change Order.
- C. Allowances included in the Bid Tab are for:
 - 1. Miscellaneous modifications,
 - 2. Additional inspection and testing,
 - a. Inspection and testing allowances include the cost of engaging any third party inspection or testing agency
 - b. Costs for reporting results
 - c. Costs for actual inspections and tests
 - 3. Other unforeseen conditions.
- D. Procedures for submitting and handling Change Orders are included in General Conditions of these Contract Documents.
- E. The allowance does not include:
 - 1. Incidental labor required to assist the Owner.
 - 2. Costs for retesting on failure of previous tests and inspections, or failure of the Contractor to be ready
 - 3. Costs of services not required by Contract Documents.

F. Prior to final payment:

1. A Change Order will be issued, as recommended by the Owner
2. Change Order will reflect actual amounts due Contractor on account of Work covered by allowances,
3. Contract Price shall be correspondingly adjusted.

G. Any unused allowances will be returned to the Owner by deductive Change Order.

1.03 SCHEDULE OF ALLOWANCES

A. Contingency Allowance:

1. This item shall consist of miscellaneous work to be accomplished at the direction of the Owner including:
 - a. Items of work consistent with and related to the project not indicated in the Contract Documents,
 - b. Work under this item will be accomplished utilizing pay items indicated in the Bid Tab.
2. Work performed under this section:
 - a. Shall comply with the various sections of these specifications as appropriate to the specific items involved.
 - b. Work shall be further described, by the Owner, in written form and/ or supplemental exhibits.
 - c. No work will be allowed under this section without the prior written approval of the Owner.

B. Owner Directed Additional Work Cash Allowance:

1. Provides for related sewer rehabilitation work to be performed in conjunction with this project at the direction of the Owner.
 - a. All work performed under this section shall comply with these Contract Documents and appropriate industry standards.
 - b. Work covered under Cash Allowance:
 - 1) Provided to the Contractor in:
 - a) Owner's written form,
 - b) By modifications to the Contract Documents
 - c) By supplemental exhibits.
 - 2) No work will be allowed under this section without the prior written approval by the Owner.

C. Additional Noise Control, Traffic Control, Erosion Control, Public Relations, and Customer Service Cash Allowance:

1. Allowance provides for:
 - a. Special noise abatement equipment or Temporary structures for work in sensitive locations resulting in more stringent noise control requirements than those specified in these Specification
 - b. Any other specific rehabilitation activity specification.
 - c. Additional traffic control, erosion control, public relations or customer service work outside the original scope of bid items required to complete the work.
2. Owner's Representative will determine when special noise abatement equipment is necessary (e.g. overnight work, work near hospitals, etc.)
3. Owner's Representative will determine when additional traffic control, erosion control, public relations or customer service work outside the original scope of bid items is required to complete the work.

D. Owner Directed Site Restoration Cash Allowance

1. Provides for site restoration work on private or County property outside the scope of the bid items.
 - a. Site restoration shall only be performed where property has been damaged during the course of the work, not due to contractor negligence. Owner's Representative will determine when additional compensation is warranted.

1.04 SUBMITTALS

- A. Submit proposals for purchase of products or systems included in allowances, in the form of Change Orders.
- B. Submit invoices or delivery slips to indicate quantities of materials delivered for use in fulfillment of each allowance.
- C. Submit any additional information required by the Owner's Representative deemed necessary to document the use of allowance monies.
- D. At Project Closeout, the unused amounts remaining in the various allowances will be credited to the Owner by Change Order.

PART 2 – PRODUCTS

(Not Used)

PART 3 – EXECUTION

(Not Used)

END OF SECTION

SECTION 01030
SPECIAL PROJECT PROCEDURES

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. This section includes responsibilities and requirements of the Contractor specific to this project.

PART 2 – PRODUCTS

(Not Used)

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Provide labor, equipment and material including, but not limited to the following:
 - 1. Daily containment and removal of all sanitary debris, work debris and trash resulting from any work activities.
 - a. Disposal locations for sanitary debris and/or hazardous materials shall be legally certified to accept these materials. Disposal locations for any sanitary debris and/or hazardous materials shall be approved prior to disposal.
 - b. Manifests of hauling and disposal of such material shall be submitted to the Owner's Representative by the Contractor. Hauling and disposal costs will be borne by the Contractor.
 - 2. The following shall apply regarding Contract Documents:
 - a. The Contract Documents are complementary; what is required by one is as binding as if required by all.
 - b. Bring any discrepancies between the drawings and specifications to the attention of the Owner's Representative immediately.
 - c. Except as may be otherwise specifically stated in the Contract Documents, or as otherwise directed by the Owner's Representative, 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 the provisions of any standard, other specification, manual, code, or instruction (whether

or not specifically incorporated by reference in the Contract Documents).

- d. The Contractor shall assume that the most stringent shall apply
3. Coordinate with all trades the work by other utility Owners and jurisdictional agencies, as well as other Owner's work occurring at or near the project location.
 - a. Advise the Owner's Representative as to any discrepancies in the work of others that could affect the work in this project and cooperate with the direction provided.
4. Complete field engineering and layout required.
5. Protect work in progress and finished work until the project is completed and final acceptance is granted by the Owner.
 - a. Protect work by others when it affects work in this project or becomes part of this project.
6. Meetings:
 - a. Arrive on time
 - b. Bring:
 - 1) Authorized field representative(s)
 - 2) Authorized office representative(s)
 - 3) Each authorized, capable and responsible for committing to delivery, manpower and completion dates for their work.
7. Complete and submit to Owner's Representative:
 - a. Forms, schedules, narratives and reports (including technical data reports and forms) as required by these specifications or as directed in accordance with the project Documents.
 - 1) Failure to submit these in an acceptable and completed manner, and on time could result in a delay in payment.
8. Change Order work will be agreed upon in writing and signed by the Owner before the applicable work will begin.
9. To properly monitor and protect all materials and Owner assets from damage resulting from Contractor's work activities or weather.
 - a. Damaged materials or assets will be replaced at Contractor's cost.
 - b. Cost will be assessed by back charge or other means allowed by the Contract Documents.

10. Work Hours:
 - a. Work within defined work hours – typically 8:00 am to 5:00 pm Monday through Friday, except for defined holidays.
 - 1) Other hours may be directed by the Owner or Owner's Representative or may be negotiated with the Contractor.
 - 2) Work within a public Right-of-Way.
 - a) Comply with local jurisdiction and State DOT requirements for defined work hours and days.
 - 3) To perform all necessary overtime as ordered, to get their work back on schedule, if necessary.
 - a) If premium time is required by any other Contractor(s) to bring the project back to the original schedule, the cost of such premium time shall be borne solely by this Contractor. Contractor is subject to repayment of additional cost incurred by the Owner due to Owner's staff's overtime or premium time necessary to monitor the Contractor's efforts to bring the Work back on schedule or complete a task that requires work outside of normal work hours.
 - b) Such overtime shall be governed by the requirements and restrictions of the Contract Documents and any applicable jurisdictional permits, and shall not violate any noise ordinances or pose any danger or undue nuisance to the public.
11. Perform punch list work in a timely manner or be subject to Owner overhead costs. Punch list items, and completion of such items, will be created and completed as stipulated in this Specification.
 - a. Contractor shall first review the Work and develop a punch list. Contractor shall provide a copy to the Owner's Representative
 - b. Contractor shall complete the work on his punch list and provide the Owner's Representative with a signed off copy
 - c. Owner's Representative will review the Work and if determined to be reasonably complete will develop a punch list - If in the opinion of the Owner's Representative, the Work is determined not to be reasonably complete, the Contractor shall be advised to bring the Work closer to a point of completion that warrants a punch list by the Owner's Representative.
 - d. Contractor shall complete the items on the list provided by the Owner's Representative. At an agreed upon schedule the Owner's Representative and the Contractor shall review the progress and the completion of each punch list item.

- e. Owner overhead costs will be established and provided to the Contractor.
- f. Owner overhead costs will be assessed if punch list items are not completed on the agreed upon schedule and reoccurring inspections are required.
- g. Overhead cost will be based on total job related costs of the Owner and will be assessed against the retainage.

12. Provide certificates of insurance prior to mobilization to the job site.

13. Provide a current copy of the workman's compensation and liability insurance certificate prior to commencing work. Maintain insurance current and provide proof throughout project. Provide insurance coverage on all Contractor's equipment and tools against theft and damage.

- a. No claims will be registered against the Owner for loss or damage of same.
- b. The Contractor will not lien the project for payment of any claims on equipment loss or damage due to vandalism of any other form.

14. Workplace Safety:

- a. OSHA requirements to be the minimum safety level accepted.
- b. Safety requirements from Owner's Representative, supervising or Field personnel will be considered only if the instructions are stricter than those in OSHA requirements.
- c. The Contractor shall maintain all responsibility for initiating, maintaining, and supervising all safety precautions and programs in connection with the Work.

15. Contractor Vehicles:

- a. Personal vehicles shall not be parked at the specific work sites.
- b. All vehicles at the work site be the property of the Contractor and marked with an identifiable company sign.

16. Respond to all change notifications within 24 hours

- a. Provide the Owner's Representative with the complete and detailed change estimate cost data within 7 calendar days of notification.

17. Contractor shall provide fulltime onsite dedicated, qualified and suitable supervision of their work.

- a. Notify Owner's Representative of name, qualifications and contact information for person designated to perform onsite supervision
- b. Notify Owner's Representative of change of onsite supervisor immediately. No change shall be permitted without Owner's written permission.

- c. Person designated to perform onsite supervision shall have no other responsibilities.
- 18. Perform work in accordance with agreed upon Schedule:
 - a. Provide any necessary measures required to achieve and maintain this schedule at no additional cost to the Owner, Program Manager and Owner's Representative.

B. Overflows/Spills And Damage To Property And Utilities:

- 1. Schedule and perform the Work in a manner not causing or contributing to incidences of sanitary sewer overflows (SSOs) as defined in the latest Consent Decree.
- 2. If Contractor's activities cause or contribute to spills or SSOs
 - a. Immediately take appropriate action to contain and/or stop the overflow;
 - 1) Cleanup the spillage,
 - 2) Disinfect the area affected by the SSO or spill.
 - b. Simultaneously, notify the Owner's Dispatch Center, the Program Manager, and the Owner's Representative
 - 1) Provide information concerning location, cause, volume of the SSO,
 - 2) Assessment whether the spill entered a stream or storm drain.
 - c. The Contractor will be familiar with the details of spill response plan
 - 1) Detailed in the Sanitary Sewer Overflow Contingency and Emergency Response Plan (CERP) approved by Owner's Representative.
 - 2) Document can be found on Department of Watershed Management website under the Consent Decree Program or upon request to the Owner or Program Manager.
- 3. Indemnify and hold harmless the Owner, the Program Manager and the Owner's Representatives for any fines or third-party claims for personal or property damage arising out of an SSO or spill fully or partially the responsibility of the Contractor,
 - a. Including the legal, engineering, and administrative expenses of the Owner, Program Manager, and Owner's Representatives in defending such fines and claims.

4. Any damage to public or private property due to the work performed by the Contractor is the sole responsibility of the Contractor.
 - a. Damage to municipal or private utilities shall be repaired in a manner approved by the Owner/Program Manager at the Contractor's expense.
 - b. Damage to utilities or property belonging to other entities shall be repaired by the Contractor to the satisfaction of the utility/property owner at the Contractor's sole expense.
 - c. Equipment stuck or left in the sewer line/lateral shall be retrieved by the Contractor immediately at the sole expense of the Contractor. All necessary precautions to avoid a spill or SSO shall be employed immediately and maintained until safe service is provided.
 - d. Notify the Owner, Program Manager, and Owner' Representative prior to initiating retrieval.
 - e. Damage to the Contractor's equipment is the Contractor's sole responsibility.
 - f. Equipment stuck or left in the sewer line/lateral that causes a SSO or spill,
 - 1) Contractor is liable for the SSO or spill and all associated damages.
5. The Owner and/or the Program Manager reserves the right to make any repairs or retrieve any equipment and charge the Contractor accordingly.

C. Relocations

1. Relocate (including all associated work) structures, such as:
 - a. light poles,
 - b. signs,
 - c. sign poles,
 - d. fences,
 - e. piping,
 - f. conduits,
 - g. and drainsinterfering with the positioning and execution of the Work.
2. The cost associated with such relocations shall be included in the bid price as identified in the Bid Tab.
3. Effective and suitable temporary provisions necessary for public safety resulting from such relocations, shall be provided by the Contractor at no additional cost to the Owner.

D. Existing Underground Piping, Structures, And Utilities

1. Existing water, gas, telephone, electrical, cable or other utility lines may be existing and may not be indicated on the drawings.
 - a. Exercise extreme care before and during any excavation activity to locate, preserve, protect and flag these lines so as to avoid damage to the existing lines.
 - b. Should damage occur to an existing line, the Contractor shall repair or pay for repairs to the line to the satisfaction of the utility owner and at no cost to the Owner.
 - 1) If the Owner of the utility requires the use of his own forces to repair the damaged lines – Contractor shall pay for all repair costs.
2. Locations of existing underground piping and utilities shown on the Drawings:
 - a. Are shown without express or implied representation, assurance, or guarantee they are complete or correct.
 - b. Or that they represent a true picture of underground piping to be encountered.
 - c. Existing piping and utilities interfering with any assessment or construction shall be rerouted.
 - 1) Prior to rerouting notify the Owner's Representative of the location of the pipeline or utility
 - 2) Reroute or relocate the pipeline or utility as directed.
3. Carefully protect existing utilities that do not interfere with project work.
 - a. Existing utilities damaged in any way by the Contractor shall be restored or replaced by the Contractor at its expense as directed by the utility owner and the Owner's Representative.

E. HAZARDOUS LOCATIONS

The existing wet wells, manholes and related areas may be considered hazardous locations, since explosive concentrations of sewage gas may be present.

F. WATER FOR CONSTRUCTION PURPOSES

1. Water required for the work identified in the Contract:
 - a. May be furnished by the Owner if readily available connections are present
 - b. Only as approved by the Owner's Representative.

- c. Installed in each and every connection to the Owner's potable water supply,
 - 1) A backflow preventer and calibrated metering device meeting the requirements of the Owner shall be installed in each and every connection to the Owner's potable water supply

END OF SECTION

SECTION 01041
PROJECT COORDINATION

PART 1—GENERAL

1.01 SECTION INCLUDES

- A. The work under this Section includes the requirements of the Contractor to use standard methods suitable to the Owner, which produce results compliant and with which meet the intent of the Contract Documents.

1.02 RELATED SECTIONS

- A. This Section applies to the work of every division and every section of these Specifications.

1.03 QUALIFICATIONS AND REQUIREMENTS

- A. Management of the Project shall be through the use of standard methods suitable to the Owner, which produce results compliant and with which meet the intent of the Contract Documents.

1.04 RESPONSIBILITY FOR COORDINATION

- A. Carefully coordinate work with all other contractors and/or subcontractors to ensure proper and adequate interface of the work of other trades and subcontractors with the work of every section of these Specifications.
- B. The Contractor shall coordinate and schedule as necessary, operations with all utility companies in or adjacent to the area of Contractor's work. The Contractor shall require said utilities to identify in the field their property and provide drawings as necessary to locate them.
- C. The Contractor shall schedule the Contractor's Work so the Contractor does not interrupt the operation of any existing facility, including, but not limited to water mains, sewers, gas, telephone, power, cable or transit. In the event certain tie-ins or other operations make it absolutely necessary to interrupt the operation of existing facilities, the Owner of such utility or facility will be notified and such work will be done at a time and in a manner acceptable to the utility/facility Owner and project Owner/Program Manager.
- D. The Contractor shall coordinate with all property owners and governing authorities impacted by the execution of work activities to prevent access or service interruptions to critical public institutions such as hospitals, nursing homes, churches, schools, police and fire services, etc. and any other businesses deemed necessary for public welfare and safety. The Contractor shall notify the Owner's Representative in a timely manner of any related coordination efforts required prior

to commencing work activities possibly causing impacts. Failure to provide ample notification to the Owner's Representative will not justify claim for delays.

PART 2 PRODUCTS

(Not Used)

PART 3 – EXECUTION

3.01 PREPARATION

A. Inspection

1. Prior to performing any work under a section, the Contractor shall carefully investigate and confirm existing conditions that could affect the Work as well as inspect the installed work of other trades and verify all such work is complete to the point where the work under the section may properly commence.
2. The Contractor shall verify all materials, equipment and products to be installed under a section may be installed in strict accordance with the original design and pertinent reviewed shop drawings and the workers are qualified to install such items.

B. Discrepancies

1. In the event of discrepancy, immediately notify the Owner's Representative.
2. Do not proceed with construction in areas of discrepancy until all such discrepancies have been fully resolved.

3.02 REQUIREMENTS

- A. The Contractor shall coordinate the Work with the Owner's Representative so the construction will not restrain or hinder the operation of existing water or wastewater facilities. If, at any time, any portion of the water or wastewater facilities or system is scheduled to be out of service, the Contractor must obtain prior approval from the Owner's Representative as to the date, time, and length of time such facilities are out of service.
- B. Connections to the existing facilities, temporary service interruptions and/or alteration of existing facilities or systems will be made at times when the piping, asset, or facility involved is not in use, or at times when the piping, asset, or facility involved can be conveniently interrupted for the period needed to execute the work activity involved, as established by the Owner's Representative.
- C. After having coordinated the Work with the Owner's Representative, the Contractor shall notify the Owner's Representative of the time, time limits, and methods of each

connection or alteration, provide any other information required by the Owner's Representative, and have the approval of the Owner's Representative before any work is undertaken on the connections or alterations.

- D. Before any roadway or facilities are blocked off, the Owner's Representative's approval shall be obtained to coordinate operations for water and wastewater facilities and assets, and any signage, plating, bypass pumping, sinking of bypass conduits, ramping, stream crossings, or any other temporary accommodation work shall be implemented by the Contractor as directed by the Owner's Representative.

END OF SECTION

SECTION 01045

CUTTING AND PATCHING

PART 1 – GENERAL

1.01 SECTION INCLUDES

This section includes the Contractor's responsibility for all cutting, fitting, and patching, including excavation, backfill, surface restoration and all other aspects of the Work that involves any interface between existing and new conditions required to complete the work or to:

- A. Complete new Work
- B. Make several parts fit together properly.
- C. Uncover portions of the Work to provide for installation of ill-timed work.
- D. Remove and replace defective work.
- E. Remove and replace work not conforming to requirements of Contract Documents.
- F. Remove samples of installed work as specified for testing.

1.02 RELATED SECTIONS

- A. Section 01010 - Summary of Work
- B. Division 2 Specifications - Site Work

1.03 SUBMITTALS

- A. Submit, upon request, a written request/detailed description of proposed work to the Owner's Representative well in advance of executing any cutting or alteration affecting:
 - 1. Existing utilities/facilities of the Owner or other utility, facility or property owner or jurisdictional agency
 - 2. Structural or operational integrity or safety of any existing utility.
 - 3. Visual qualities of any sight exposed elements.
- B. Requests shall include:

1. Identification of the Project.
2. Description and location of the affected work, utility, facility or property
3. The reason for necessitating the cutting, alteration or excavation work proposed.
4. Effect on work of Owner or any other separate utility, facility or property owner or jurisdictional agency
5. Detailed description of proposed work including but not limited to:
 - a. Scope of cutting, patching, alteration, or excavation.
 - b. Trades/subcontractors who will execute the work.
 - c. Products proposed to be used including applicable data sheets.
 - d. Extent and method of refinishing to be done.
 - e. Plan to protect existing below and/or above grade structures, pipelines, etc.
 - f. Any other information required by the Owner's Representative.
6. Alternatives to cutting and patching.
7. Cost proposal, when applicable.
8. Written permission of any separate utility, facility or property owner or jurisdictional agency whose property will be affected.

C. Submit written notice to Owner's Representative designating the proposed date and the time the work will be uncovered.

PART 2 – PRODUCTS

2.01 MATERIALS

Comply with specifications, standards and manufacturer's published instructions for each specific product involved. Obtain approval on all materials and products to be incorporated into the Work

PART 3 – EXECUTION

3.01 PREPARATION

- A. Inspect and document existing conditions of all elements subject to damage or to movement during all aspects of the cutting, patching, alteration, or excavation Work.
- B. After uncovering work, inspect conditions affecting product installation or work performance.

- C. Report unsatisfactory or questionable conditions to Owner's Representative in writing. Do not proceed with work until Owner's Representative has approved further instructions.
- D. Provide all necessary and adequate devices and methods of temporary support and protection, as necessary, to assure structural and operational integrity or safety of any existing utility, facility or property affected by the Work. Obtain written approval of all proposed methods of protection and support from impacted Owners before impacting property or implementing action.
- E. All damage or injury caused by Contractor's work or failure to adequately protect the property of others shall be repaired and corrected to the satisfaction of the applicable Owner, at no additional cost to the County.
- F. Provide and maintain protection from the elements all utilities, facilities or property potentially exposed by cutting, patching, alteration, or excavation Work, and maintain excavations free from water.
- G. Inspect, monitor and document conditions of all utilities, facilities or property subject to damage or to movement during all aspects of the cutting, patching, alteration, or excavation Work.

3.02 INSTALLATION

- A. Execute cutting and demolition by methods preventing damage to other work and property, providing proper surfaces and joints to receive installation of repair.
- B. Execute excavating and backfilling by methods required by these Specifications, preventing settlement or damage to other work or property.
- C. Employ only qualified, approved Installers or Fabricators to perform cutting and patching.
- D. Execute fitting and adjusting products/materials to provide a finished installation complying with specified products, functions, tolerances, and finishes.
- E. Restore work cut or removed and install new products/materials to provide completed work in accordance with the requirements of the Contract Documents.
- F. Refinish to the extent necessary and as directed by the Owner's Representative, the new and existing surfaces as required to provide an even finish to match adjacent finishes, grades and surfaces. For continuous surfaces, refinish to nearest element interface, connection, intersection, surface or joint as directed.

END OF SECTION

SECTION 01056
GPS DATA COLLECTION

PART 1 – GENERAL

1.01 WORK FOR THIS SECTION

- A. The purpose of this work is to establish the position of asset points and new work in the sanitary sewer collection system using the Global Positioning System (GPS); establish the minimum quality of data; and, specify how the data will be delivered. The GPS position will be established for newly identified sanitary sewer system assets and corrected in the event of existing incorrectly mapped assets.
- B. GPS capture is required as described below.
 1. Horizontal position of all manholes and new work with an accuracy of ±one (1) meter. This applies to all manholes that are on Right-of-Way and all manholes off Right-of-Way.
 2. When GPS capture cannot be achieved on manholes and new work, due to canopy or building interferences, the position will be obtained by conventional survey methods tied to the stated reference system at the mapping grade accuracy listed above.

1.02 SUBMITTALS

- A. The Contractor shall provide to the Program Manager in writing the following information prior to the set deadline, or at the indicated frequency, whichever is applicable.

<u>Type of Submittal</u>	<u>Time/Frequency of Submittal</u>
Electronic Data related to New Assets	Weekly
Electronic Data and revisions related to Existing Assets	Weekly

1.03 RELATED SECTIONS

- A. The Work of the following Sections apply to the Work of this Section. Other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of the Work.

01510: Sanitary Sewer Main Television & Sonar Inspection (CCTV)

1.04 EXPERIENCED WORKERS

- A. Supervisor of the field crews shall have received proper training in this function and have a minimum of three years' experience in performing such work including safe working practices, etc.

- B. Crew Leaders/Field Supervisors obtaining GPS data shall have received proper training in this function and have a minimum of one year experience in performing such work including safe working practices, etc.
- C. The Contractor shall provide the Program Manager with written documentation indicating all Crew Leaders/Field Supervisors responsible for obtaining GPS data have received the proper training and where required the requisite experience.
- D. The Contractor shall provide a detailed account of satisfactory GPS experience during the last three years. Those references shall include contact, agency, telephone number and address.

1.05 REFERENCE COORDINATE SYSTEM

- A. The horizontal (X&Y) position of points will be referenced to the Georgia State Plane West NAD-83 coordinate system.

1.06 PROVIDED BY OWNER/PROGRAM MANAGER

- A. A map of each area of work will be provided by the Program Manager from the Owner's existing GIS map. The map will contain, when available, streets with names, aerial imagery, sewer manholes with asset IDs and sewer lines with existing GIS information available.

1.07 CALIBRATION

- A. Calibration shall be carried out in accordance with the GPS equipment manufacturer's instructions. Additional calibrations may be required during the course of the working day for large fluctuations of temperature and/or humidity, also in accordance with the manufacturer's instructions and tolerances.

1.08 INTERFERENCE

- A. Contractor must obtain a GPS position of sanitary point structures and new work regardless of the overhead conditions or other nearby obstructions interfering with satellite signals, at no additional cost. Coverage conditions will not allow all positions to be obtained by setting directly over the point to be obtained. Contractor may use rangefinders or conventional surveying methods to obtain the position of the point.

PART 2 – PRODUCTS

(NOT USED)

PART 3 – EXECUTION

3.01 GENERAL

- A. The Contractor shall furnish all labor, tools, materials, software and equipment necessary for capturing the position of all points specified.

3.02 PREPARATION

A. Mission Planning: Contractor shall plan the collection of GPS data, using the appropriate software, to optimize the accuracy and speed of data collection while minimizing the impact and interference on traffic and other activities.

3.03 DATA

A. The inventory database deliverable(s) for newly discovered assets, new work or existing mapped assets with incorrect existing position shall be submitted as an ESRI shapefile or geodatabase with each feature type represented in a different feature class (manholes, mains, etc.). Each attribute for manholes, and mains and new work are to be populated as provided in the attribute templates provided below. The data must be in the correct datum capable to be integrated into County's ESRI ArcGIS system which is the County's standard GIS software.

Manholes Attributes Template

ID	Northing	Easting	Depth	Size	Material

B. Asset IDs for manholes are to be provided by DWM via the guidance in this Specification Section. Asset IDs for newly identified assets found by the Contractor not in the existing mapped system inventory or new work installed by the Contractor, will be coordinated with the Owner and Program Manager and assigned and populated within the electronic GIS deliverable. Northing and easting coordinates shall be populated in system as notated in these Specifications. Manhole and new work depth shall be measured to the nearest 0.1 ft. Manhole and new work depth is to include extent from rim elevation directly above the outflow invert to bottom of outflow invert elevation. Size of manhole is the manhole diameter measured in inches. Manhole wall material (along with any apparent coating) shall be populated with numerical coding described as follows;

Text Code	Description
1	None
2	Precast
3	Brick
4	Block
5	Poured
6	Brick and Concrete
7	VCP
8	PVC
9	Stone and Mortar

Also, any asset ID information as indicated in the field and new work shall be recorded.

Sewer Mains Attributes Template

US_Manhole_ID	DS_Manhole_ID	US_MH_Depth	DS_MH_Depth	Diameter	Material

C. Asset IDs for assets are to be provided by DWM via the guidance in this Specification Section. Asset IDs for newly identified assets found by the Contractor not in the existing mapped system inventory or new work installed by the Contractor will be coordinated with the Owner and Program Manager and assigned and populated within the electronic GIS deliverable. Upstream and downstream manhole depths (US MH Depth & DS MH Depth) shall be measured to the nearest 0.1 ft and include the extent from rim elevation directly above the outflow invert to the outflow invert elevation. Main diameters shall be measured in inches and rounded to the nearest inch. Main material shall be populated with text coding described as follows;

Text Code	Description
VCP	Vitrified Clay Pipe
Truss	Truss
PVC	Polyvinyl Chloride Pipe
Concrete	Concrete Pipe
RCP	Reinforced Concrete Pipe
DIP	Ductile Iron Pipe
CIP	Cast Iron Pipe
CMP	Corrugated Metal Pipe
Tile	Tile
Brick	Brick

D. For assets with only incorrect coordinate location information but already located within the mapped inventory, only the corrected coordinates will be provided. Necessary data will be logged so that uncorrected positions can be post-processed and coordinated with DWM GIS division, at the discretion of the Owner and Program Manager, to obtain more accurate positions. New work shall be similarly located.

3.04 DELIVERABLES

- A. Map corrections to the printed map will be illustrated on the printed map with red markings and delivered at the completion of each week. Supplemental sketches will be provided, as necessary, to clearly depict the actual site conditions and new work.
- B. Coordinate and attribute data will be provided in GIS electronic format on a weekly basis as described in these Specifications or as directed by the Program Manager.

END OF SECTION

SECTION 01060

REGULATORY REQUIREMENTS

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Contractor's general responsibilities for adhering to all County, State, and Federal regulatory division's rules, regulations, and laws even when plans or specifications do not indicate permitting actions are required for the project.
- B. Permits and Responsibilities: The Contractor shall, without additional expense to the Owner, comply with any applicable Federal, State, County and municipal laws, codes and regulations, in connection with the execution of the Work.
- C. The Contractor shall take proper safety and health precautions to protect the Work, the workers, the public and the property of others.
- D. The Contractor shall also be responsible for all materials delivered and work performed until completion and acceptance of the Work, except for any completed unit of work previously accepted.
- E. Business Licenses: The Contractor shall provide the Owner, on the proper form, proof of being licensed to do business within DeKalb County; proof of proper business licenses shall also be provided by the Contractor for any and all subcontractors coming under the jurisdiction of this Contract.

1.02 ROADWAY PERMITTING

- A. The Contractor is responsible for obtaining road opening permits from the DeKalb County Department of Public Works Transportation Division at (770)492-5222, including providing any required restoration bonds.
 - 1. The Owner shall obtain all road opening permits required by the GDOT. The Contractor is not permitted to impact traffic on, or make any type of cuts on roadways requiring a permit from the GDOT until such time as the permit is provided and prominently displayed on-site.
 - 2. All documents necessary for said application must be provided by the Contractor to the Owner and Owner's Representative.
 - 3. Contractor shall strictly adhere to the requirements of such permits
- B. Traffic control shall be in accordance with the Manual on Uniform Traffic Control Devices (MUTCD), latest edition and the specific direction of the authority having jurisdiction.

1.03 EPD STREAM BUFFER PERMITS ACTIVITIES

- A. Buffers on state waters are valuable in protecting and conserving land and water resources, therefore buffers should be protected. The buffer variance process will apply to all projects legally eligible for variances and to all state waters having vegetation wrested from the channel by normal stream flow, provided adequate

erosion control measures are incorporated and all requirements in the project plans and specifications and are implemented. The following activities do not require application to or approval from the EPD.

1. Stream crossings for water lines or stream crossing for sewer lines occurring at an angle, as measured from the point of crossing, within 25 degrees of perpendicular to the stream and causing a width of disturbance of not more than 50 feet within the buffer; or
2. Where drainage structures must be constructed within the twenty-five (25) foot buffer area of any state water not classified as a trout stream; or
3. Where roadway drainage structures must be constructed within the twenty-five (25) foot buffer area of any state waters or the fifty (50) foot buffer of any trout stream.

1.04 ACOE PERMITS FOR MISCELLANEOUS ACTIVITIES

- A. Section 404 of the Clean Water Act requires all dredge and fill activities affecting the Nation's waters, including wetlands and other special aquatic sites to be permitted by a Nationwide Permit (NWP), Regional Permit, or Individual Permit, unless otherwise exempted.
- B. All Department of Army Corps of Engineers (ACOE) Permits shall be obtained by the Owner. The Contractor shall be responsible for complying with all required permits and shall perform restoration activities where temporary dewatering of areas is required.
- C. The ACOE has the authority to review project work within the Nation's water and to issue individual permits or approve the use of Nationwide and Regional Permits. The Environmental Protection Agency (EPA), Georgia Environmental Protection Division (EPD) and other natural resource agencies provide a key role in the review and establishing conditions of the permits.
- D. Work in jurisdictional waters, jurisdictional wetlands and bankstabilization activities shall not commence until all permits have been issued.
- E. Some NWPs require project proponents to notify Corps district engineers prior to commencing NWP activities. These notifications are called pre-construction notifications (PCNs), and they provide district engineers with opportunities to confirm whether or not the proposed activities qualify for NWP authorization. For most NWPs, the district engineer has to respond to a notification within 45 days of receipt of a complete PCN (see General Condition 31). If, after reviewing the PCN, the district engineer determines the proposed activity qualifies for NWP authorization, the district engineer issues an NWP verification letter to the project proponent. The NWP verification may contain special conditions ensuring the NWP activity results in minimal individual and cumulative effects on the aquatic environment and the Corps public interest review factors.
- F. The Contractor shall plan work accordingly.

1.05 QUALITY ASSURANCE

- A. Contractor shall perform all work under this Section in accordance with all pertinent Rules and regulations including, but not necessarily limited to, those stated herein and these Specifications, the more stringent provisions shall govern.
- B. The Contractor shall allow access to ACOE, EPA, EPD and other enforcing personnel should they wish to visit the work sites. This includes assisting with transportation as may be required along easements, if necessary.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Materials required to comply with these regulations shall include bank stabilization materials, materials for construction of temporary roads or crossings, sandbags and rebar for reconstruction of beaver dams, mats for temporary road access.
- B. Mats consist of wooden, rubber or metal structures capable of distributing the weight of heavy equipment to prevent soil displacement in wetland conditions.

PART 3 – EXECUTION

3.01 GENERAL

Provide all materials and promptly take actions necessary to achieve effective compliance with regulations in accordance with Section 404 of the Clean Water Act, the enforcing agency (ACOE), other enforcing personnel and these Specifications.

3.02 EPD STREAM BUFFER PERMIT CONDITIONS

Variance applications will be reviewed by the Director only where the applicant provides reasonable evidence of impacts to the buffer have been avoided or minimized to the fullest extent practicable and only in the following cases:

- A. The project involves the construction or repair of a structure which, by its nature, must be located within the buffer. Such structures include dams, public water supply intake structures, detention/retention ponds, waste water discharges, docks including access ways, boat launches including access ways, and stabilization of areas of public access to water; or
- B. The project will result in the restoration or enhancement to improve water quality and/or aquatic habitat quality; or
- C. Buffer intrusion is necessary to provide reasonable access to a property or properties; or
- D. The intrusion is for gravity-flow sewer lines that cannot reasonably be placed outside the buffer, and stream crossings and vegetative disturbance are minimized; or

- E. Crossing for utility lines, including but not limited to gas, liquid, power, telephone, and other pipelines, provided the number of crossings and the amount of vegetative disturbance are minimized; or
- F. Recreational foot trails and viewing areas, providing impacts to the buffer are minimal; or
- G. The project involves construction of one (1) single family home for residential use by the owner of the subject property and, at the time of adoption of this rule, there is no opportunity to develop the home under any reasonable design configuration unless a buffer variance is granted. Variances will be considered for such single family homes only if construction is initiated or local government approval is obtained prior to the effective date of this rule; or
- H. For non-trout waters, the proposed land disturbing activity within the buffer will require a permit from the United States Army Corps of Engineers under Section 404 of the Federal Water Pollution Control Act Amendment of 1972, 33 U.S.C. Section 1344, and the Corps of Engineers has approved a mitigation plan to be implemented as a condition of such a permit; or
- I. For non-trout waters, a plan is provided for buffer intrusion showing, even with the proposed land disturbing activity within the buffer, the completed project will result in maintained or improved water quality downstream of the project; or
- J. For non-trout waters, the project with a proposed land disturbing activity within the buffer is located in, or upstream and within ten linear miles of, a stream segment listed as impaired under Section 303(d) of the Federal Water Pollution Control Act Amendment of 1972, 33 U.S.C. Section 1313(d) and a plan is provided showing the completed project will result in maintained or improved water quality in such listed stream segment and the project has no adverse impact relative to the pollutants of concern in such stream segment; or
- K. For non-trout waters, the proposed land disturbing activity within the buffer is not eligible for a permit from the United States Army Corps of Engineers under Section 404 of the Federal Water Pollution Control Act Amendment of 1972, 33 U.S.C. Section 1344, includes required mitigation in accordance with current EPD "Stream Buffer Variance Mitigation Guidance" document, and involves:
 - 1. Piping, filling, or re-routing of non-jurisdictional Waters of the U.S.; or
 - 2. Stream buffer impacts due to new infrastructure projects adjacent to state waters (jurisdictional and non-jurisdictional Waters of the U.S.). This criterion shall not apply to maintenance and/or modification to existing infrastructure, which are covered under 391-3-7.05(2)(a).
 - 3. If the buffer impact will be temporary, the buffer variance request shall include the following information at a minimum:
 - a. A site map including locations of all state waters, wetlands, floodplain boundaries and other natural features, as determined by field survey.
 - b. A description of the shape, size, topography, slope, soils, vegetation and other physical characteristics of the property.
 - c. A dated and numbered detailed site plan showing the locations of all structures, impervious surfaces, and the boundaries of the area of

soil disturbance, both inside and outside of the buffer. The exact area of the buffer to be impacted shall be accurately and clearly indicated.

- d. A description of the project, with details of the buffer disturbance, including estimated length of time for the disturbance and justification for why the disturbance is necessary.
- e. A calculation of the total area and length of buffer disturbance.
- f. A letter from the issuing authority (if other than the Division and as applicable) stating it is aware of the project.
- g. An erosion, sedimentation and pollution control plan, where applicable.
- h. Proposed mitigation, if any, for the buffer disturbance and a restoration and re-vegetation plan, if applicable.
- i. Any other reasonable information related to the project the Division may deem necessary to effectively evaluate the variance request. Division shall determine if this information is needed within 20 business days of receipt.
- j. Application shall be on forms provided by the Division.

4. If the buffer impact will be permanent, the buffer variance request shall include all of the information in Sections (3)(a) thru (j) above, with the exception of (3)(h). A buffer variance request with permanent impact shall also include the following additional information:

- a. For non-trout waters, a copy of the permit application, supporting documentation, and proposed mitigation plan, if applicable, as submitted to the United States Army Corps of Engineers under Section 404 of the federal Water Pollution Control Act Amendment of 1972, 33 U.S.C. Section 1344, if applicable.
- b. A buffer mitigation plan addressing impacts to critical buffer functions, including water quality, floodplain, watershed and ecological functions based on an evaluation of existing buffer conditions and predicted post construction buffer conditions pursuant to Section (7)(c) herein.
- c. A plan for stormwater control once site stabilization is achieved, where applicable.
- d. For variance requests made under Sections (2)(i) and (2)(j), the application shall include the following water quality information:
 - 1) For variance requests under Section (2)(i), the application must include documentation indicating post-development conditions of the project will meet the four primary (water quality, downstream channel protection, overbank flood protection, and extreme flood protection) performance requirements in the Georgia Stormwater Management Manual or the equivalent.
 - 2) If the proposed variance is in, or within 10 linear miles of and upstream of, a stream segment listed as impaired under Section 303(d) of the federal Water Pollution Control Act Amendment of 1972, 33 U.S.C. Section 1313(d), the application must include predicted pollutant loading under pre- and post-development conditions as estimated by

models accepted by the Division. In addition, the applicant must document how the proposed project is in compliance with the TMDL implementation plan, if available, as required in Subsection 391-3-7-05(5)(i).

5. Upon receipt of a completed application in accordance with Sections 391-3-7-05(3) or 391-3-7-05(4), the Division shall consider the completed application and the following factors in determining whether to issue a variance:
 - a. The shape, size, topography, slope, soils, vegetation and other physical characteristics of the property; and
 - b. The locations of all state waters on the property as determined from field inspection; and
 - c. The location and extent of buffer intrusion; and
 - d. Whether reasonable alternative project designs, such as the use of retaining walls, are possible which do not require buffer intrusion or which require less buffer intrusion; and
 - e. Where the buffer impact is temporary, the buffer restoration plan is low or no maintenance, and the plan provides net gain in buffer value/function (i.e. water quality, floodplain, watershed, ecological perspectives), the application will be approved unless the Director declines the application based on the exceptional existing buffer value/function; and
 - f. Whether issuance of the variance is at least as protective of natural resources and the environment, and including wildlife habitat; and
 - g. The current condition of the existing buffer, to be determined by:
 - 1) The extent the existing buffer vegetation is disturbed;
 - 2) The hydrologic function of the buffer;
 - 3) Stream characteristics such as bank vegetative cover, bank stability, prior channel alteration, or sediment deposition; and
 - h. The extent the encroachment into the buffer may reasonably impair buffer functions. The value of mitigation activities conducted pursuant to this rule, particularly Subsections 391-3-7-05(7)(c) and 391-3-7-05(7)(d) herein, and shall take regional differences into consideration on-site or downstream, to be determined by development techniques or other measures contributing to the maintenance or improvement of water quality, including the use of low impact designs and integrated best management practices, and reduction in effective impervious surface area; and
 - i. The long-term water quality impacts of the proposed variance, as well as the construction impacts. For applications made under Subsections 391-3-7-05(2)(i) or 391-3-7-05(2)
 - j. The following criteria, reflecting regional differences in the state, shall be used by the Director to assist in determining whether the project seeking a variance will, when completed and with approved mitigation, result in maintained or improved water quality downstream of the project and minimal net impact to the buffer:
 - 1) Division will assume the existing water quality conditions are commensurate with an undeveloped forested watershed

unless the applicant provides documentation to the contrary. If the applicant chooses to provide baseline documentation, site and/or stream reach specific water quality, habitat, and/or biological data would be needed to document existing conditions. If additional data are needed to document existing conditions, the applicant may need to submit a monitoring plan and have it approved by the Division prior to collecting any monitoring data. Existing local data may be used, if available and of acceptable quality to the Division.

- 2) The results of the predicted pollutant loading under pre- and post-development conditions as estimated by models accepted by the Division indicate existing water quality conditions will be maintained or improved.
- 3) Projects for which a land disturbing activity is proposed within the buffer of a 303(d) listed stream, or upstream and within 10 linear miles of a 303(d) listed stream, the results of the model demonstrate the project has no adverse impact relative to the pollutants of concern in such stream segment.

k. Within 60 days of receipt of a complete buffer variance application, the Division will either provide written comments to the applicant or propose to issue a variance. When the Division proposes to issue a variance, it will send out a public advisory to all citizens and groups who request to receive the advisories. The applicant will then publish a notice in the legal organ of the local jurisdiction. The public advisory and public notice shall describe the proposed buffer modification, the location of the variance, where the public can go to review site plans, and where comments should be sent. The public shall have 30 days from the date of publication of the notice in the legal organ to comment on a variance proposal.

l. In all cases in which a buffer variance is issued, the following conditions shall apply:

- 1) The variance shall be the minimum reduction in buffer width necessary to provide relief. Streams shall not be piped if a buffer width reduction is sufficient to provide relief.
- 2) Disturbance of existing buffer vegetation shall be minimized.
- 3) Required mitigation shall offset the buffer encroachment and any loss of buffer functions. Where lost functions cannot be replaced, mitigation shall provide other buffer functions that are beneficial. Buffer functions include, but are not limited to:
 - a) temperature control (shading);
 - b) streambank stabilization;
 - c) trapping of sediments, if any;
 - d) removal of nutrients, heavy metals, pesticides and other pollutants;
 - e) aquatic habitat and food chain;
 - f) terrestrial habitat, food chain and migration corridor; and
 - g) buffering of flood flows.

4) Mitigation should be on-site when possible. Depending on site conditions, acceptable forms of mitigation may include but are not limited to:

- a) Restoration of the buffer to a naturally vegetated state;
- b) Bioengineering of channels to reduce bank erosion and improve habitat;
- c) Creation or restoration of wetlands;
- d) Stormwater management to better maintain the pre-development flow regime (with consideration given to downstream effects) that exceeds the requirements of applicable ordinances at the time of application;
- e) Reduction in pollution sources, such as on-site water quality treatment or improving the level of treatment of septic systems;
- f) Other forms of mitigation that protects or improves water quality and/or aquatic wildlife habitat;
- g) An increase in buffer width elsewhere on the property;
- h) Mitigation required under a Clean Water Act Section 404 or Nationwide permit issued by the U.S. Army Corps of Engineers;
- i) Those described in the most recent publication of the Georgia Stormwater Management Manual.

5) Forms of mitigation which are *not* acceptable include:

- a) Activities already required by the Georgia Erosion and Sedimentation Act, such as the minimal use of best management practices;
- b) Activities, already required by other federal, state and local laws, except as described in 391-3-7.05(7)(d) above. Corps of Engineers mitigation is acceptable.

6) The Division will not place a condition on a variance requiring a landowner to deed property or the development rights of property to the state or to any other entity. The landowner may voluntarily preserve property or the development rights of property as a mitigation option with the agreement of the Division.

- m. If a variance issued by the Director is acceptable to the issuing authority, the variance shall be included as a condition of permitting and therefore, becomes a part of the permit for the proposed land disturbing activity project. If a stream buffer variance is not acceptable to the issuing authority, the issuing authority may issue a land disturbing permit without allowing encroachment into the buffer.
- n. A general variance is provided for piping of trout streams with an average annual flow of 25 gpm or less.
- o. To obtain this general variance in Section 391-3-7.05(9) for encroaching on the buffer of a trout stream, the applicant must submit information to the issuing authority or EPD if there is no issuing authority demonstrating that the average annual flow in the

stream is 25 gpm or less. There are two acceptable methods for making this determination.

- 1) The USGS unit area runoff map may be used to determine the threshold acreage producing an average annual flow of 25 gpm or less.
- 2) The applicant may submit a hydrologic analysis certified by a Registered Professional Engineer or Geologist presenting information sufficient to estimate the average annual flow of each stream to be piped is 25 gpm or less with a high level of certainty.

p. Any stream piping performed in accordance with this general variance in Section 391-3-7.05(9) shall be subject to the following terms:

- 1) The total length of stream piped in any one property shall not exceed 200 feet.
- 2) Any project involving more than 200 ft of piping will require an individual variance for the entire project. The general variance may not be applied to a portion of a project; e.g., it is not permissible to pipe 200 ft of a stream under the general variance and seek an individual variance for an additional length of pipe.
- 3) The downstream end of the pipe shall terminate at least 25 ft. before the property boundary.
- 4) The applicant for a Land Disturbing Activity Permit shall notify the appropriate issuing authority of the precise location and extent of all streams piping as part of the land disturbing activity permit application. The issuing authority (if other than the Division) shall compile this information and convey it to the Division annually.
- 5) Where piping of a stream increases the velocity of stream flow at the downstream end of the pipe, appropriate controls shall be employed to reduce flow velocity to the predevelopment level. Plans for such controls must be submitted as part of the land disturbing activity permit.

3.03 ACOE PERMIT CONDITIONS

- A. General: NWP including, but not limited to, 3, 13, 14, and 33 apply to activities anticipated on this project. Each permit contains specific criteria that must be satisfied to be in compliance with the permit. In addition, 15 general permit conditions cover all Nationwide Permits. Both specific criteria and general permit conditions are applicable to this project.
- B. NWP 3 (Maintenance)
 1. Application: For all serviceable structures of fill requiring rehabilitation and/or replacement, including raising manholes.
 2. Permit Conditions: Use best management practices such as construction mats, proper erosion and sedimentation control and high-flotation tires on heavy equipment.
- C. NWP 13 (Bank Stabilization)

1. Application: For all rehabilitation/replacement activities along stream banks and other areas.
2. Permit Conditions:
 - a. No material is placed in excess of the minimum needed for erosion protection.
 - b. The bank stabilization activity is less than 500 feet in length without approval by the ACOE.
 - c. The activity will not exceed an average of 1 cubic yard per running foot placed along the bank below the plane of the ordinary high water mark or the high tide line.
 - d. No material is placed in any special aquatic site, including wetlands.
 - e. No material is of the type, or is placed in any location, or in any manner, so as to impair surface water flow into or out of any wetland area.
 - f. No material is placed in a manner to be eroded by normal or expected high flows.

L. NWP 14 (Road Crossings)

1. Application: For all rehabilitation/replacement activities requiring road crossings of wetlands and streams.
2. Permit Conditions
 - a. The width of fill is limited to the minimum necessary for the actual crossing.
 - b. The crossing is culverted, bridged, or otherwise designed to prevent the restriction of, and to withstand, expected high flows, and to prevent the restriction of low flows and the movement of aquatic organisms. The width of the fill is limited to the minimum necessary for the actual crossing.
 - c. The fill placed in the waters of the United States is limited to a filled area of no more than 1/3 acre. Furthermore, no more than a total of 200 linear feet of the fill for the roadway can occur in special aquatic sites, including wetlands.
 - d. The crossing, including all attendance features, both temporary and permanent, is part of a single and complete project for crossing a water of the United States.

M. NWP 33 (Temporary Construction, Access and Dewatering)

1. Application: For temporary dewatering and access road construction activities.
2. Permit Conditions
 - a. Temporary fill must be entirely removed to upland areas, or dredged material returned to its original location, following completion of the construction activity, and the affected areas must be returned to pre-construction conditions.
 - b. Cofferdams or other structures cannot be used to dewater wetlands or other aquatic sites so as to change their use.

- c. The permittee has notified the ACOE District Engineer prior to use of this permit. The notification must include a restoration plan.

3.04 RESTORATION

- A. All wetland areas, streams, creeks and other areas containing bodies of water shall be restored as specified below:
 - 1. Beaver Dam Removal and Replacement: The approved permitted activity may include breaching of a beaver dam at locations provided in the permit application. The location of the prescribed breach must not be changed without prior coordination with the Construction Manager or appointed liaison. Explosives are prohibited for beaver dam removal. If beaver dams are required to be breached, all beaver dams removed shall be restored as specified herein.
 - a. Restoration shall be done with sandbags filled ¾ full with materials from the site; preferably sandy soils.
 - b. Sandbags shall be placed in a staggered fashion to prevent a common seam from developing.
 - c. Number 4 steel reinforcement bar shall be used to fortify sandbag dams.
 - d. Reinforcement bar shall be driven a minimum of 2 feet below substrate and spaced per construction detail.
 - e. Bottom row of sandbags shall be embedded a minimum of 6 inches below ground surface, or until resting on compacted substrate, whichever is deeper.
 - f. Top elevation of sandbags should be determined by surveying the water elevation prior to removal of the dam.
 - g. All excavation and fill activities should be conducted by non-mechanical means. Bobcat-type tractors may be used to transfer construction supplies.
 - h. Dam shall be designed to allow flow over its middle section with the downstream channel lined with a row of sandbags.
 - i. Quality Assurance: After construction, the restored dam will be inspected by the Program Manager or an appointed liaison to ensuring the proper restoration techniques were employed. Afterwards, the beaver dam will be monitored for one growing season to ensure success. The Contractor will be responsible for reconstruction of any failed dam.
 - 2. Temporary Access Roads and Crossings
 - a. Must comply with any applicable permits.
 - b. Temporary construction roads may be constructed by earthen fill or crushed rock, or a combination of the two, for wetland or stream crossings.
 - c. Temporary construction roads for stream crossings must be constructed with materials able to withstand expected high flows.
 - d. Prior to placing fill within a wetland or stream, filter fabric should be placed beneath the fill area. The fabric will facilitate removal of the temporary fill materials.

- e. All materials placed in a wetland or stream must be removed to an upland area following construction.
- f. If culverts are required for a crossing, they must be designed to withstand and to prevent the restriction of expected high flows, and also to prevent the restriction of low flows and movement of aquatic organisms. Culverts must be removed and stream banks stabilized following the construction.

B. Existing stream banks and buffers surrounding bodies of water must be restored to at least existing conditions status with the exception of cleared easements and access for sanitary sewer asset inspection, operation and maintenance.

END OF SECTION

SECTION 01070

ABBREVIATIONS AND SYMBOLS

PART 1 – GENERAL

1.01 SECTION INCLUDES

This section includes a list, but may not be inclusive of all applicable abbreviations for technical societies, organizations, and bodies relevant to the work. Whenever reference is made to the furnishing of materials or testing thereof to conform to the standards of any technical society, organization, or body, it shall be construed to mean the latest standard, code, specification or tentative specification adopted and published at the time of advertisement for Bids whether listed below or not. Such standards are made a part hereof to the extent which is indicated or intended. Unless directed otherwise by the Owner's Representative, the most stringent shall apply.

1.02 DEFINITIONS AND ABBREVIATIONS

AA	Aluminum Association
AAMA.	Architectural Aluminum Manufacturer's Association
AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
ACOE	Army Corps of Engineers
ACPA	American Concrete Pipe Association
AEIC	Association of Edison Illuminating Companies
AFBMA	Anti-Friction Bearing Manufacturers Association
AGA.	American Gas Association
AGMA	American Gear Manufacturers Association
AIA	American Institute of Architects
AIEE	American Institute of Electrical Engineers
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AITC	American Institute of Timber Construction
ANSI	American National Standards Institute
AMCA	Air Moving and Conditioning Association

APA	American Plywood Association
APHA	American Public Health Association
API	American Petroleum Institute
APWA	American Public Works Association
ARC	Appalachian Regional Commission
AREA	American Railway Engineering Association
ASA	American Standards Association
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigeration, and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWPA	American Wood Preservers Association
AWS	American Welding Society
AWWA	American Water Works Association
CCTV.	Closed Circuit Television
CERP	Sanitary Sewer Overflow Contingency and Emergency Response Plan
CFR	Code of Federal Regulations
CIPP	Cured-In Place Pipe
CMAA	Crane Manufacturers Association of America
CRSI	Concrete Reinforcing Steel Institute
CSI	Construction Specifications Institute
CTI	Cooling Tower Institute
DIP	Ductile Iron Pipe
DIPRA	Ductile Iron Pipe Research Association
DEMA	Diesel Engine Manufacturers Association
EDA	Economic Development Administration

EIA	Electronic Industries Association
EPA.	Environmental Protection Agency
EPD	Environmental Protection Division
EIA	Electronic Industries Association
FCC	Federal Communications Commission
FmHA.	Farmers Home Administration
FRA	Federal Railroad Association
FS	Federal Specifications
GA-DOA	Georgia Department of Agriculture
GDOT	Georgia DOT
GIS	Geographic Information System
GSWCC	Georgia Soil and Water Conservation Commission
HEI	Heat Exchange Institute
ICRI	International Concrete Repair Institute
IEEE	Institute of Electronic and Electrical Engineers
IES	Illuminating Engineering Society
I/I	Infiltration and Inflow
IPBA	International Pipe Bursting Association
IPCEA	. Insulated Power Cable Engineers Association
IPC	Institute of Printed Circuits
ISA	Instrument Society of America
JSA	Job Safety Analysis
LACP	Lateral Assessment & Certification Program
MACP	Manhole Assessment and Certification Program
MARTA	Metropolitan Atlanta Rapid Transit Authority
MBMA	Metal Building Manufacturers Association

MMA	.Monorail Manufacturers Association
MSS	Manufacturers Standardization Society of the Valve and Fitting Industry
MSDS	Material Safety Data Sheet
MUTCD	Manual for Uniform Traffic Control Devices
NAAMM	National Association of Architectural Metal Manufacturers
NACE	National Association of Corrosion Engineers
NASSCO	National Association of Sewer Service Companies
NBFU	National Board of Fire Underwriters
NBS	National Bureau of Standards
NCPI	National Clay Pipe Institute
NEC	.National Electric Code
NEMA	National Electrical Manufacturers Association
NFPA.	National Fire Protection Association
NRMA.	National Ready-Mix Association
NWP	.Army Corps of Engineers Nationwide Permit
OSARP	Ongoing Sewer Assessment and Rehabilitation Program
OSHA	Occupational Safety and Health Administration
PACP	Pipeline Assessment Certification Program
PCA	Portland Cement Association
PCI	Prestressed Concrete Institute
PCN	Army Corps of Engineers Preconstruction Notification
PPE	.Personal Protective Equipment
PPI	Plastic Pipe Institute
PSARP	Priority Areas Sewer Assessment and Rehabilitation Program
PVC	Polyvinyl Chloride Pipe
RCRA	Resource Conservation and Recovery Act

SBC	Southern Building Code
SDS	Safety Data Sheet
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
SOP	Standard Operating Procedure
SSO	Sanitary Sewer Overflow
SSPC.	Steel Structures Painting Council
TCA	Tile Council of America
TEMA	.Tubular Exchangers Manufacturers Association
UBC	Uniform Building Code
UL	Underwriters Laboratories
USDC	United States Department of Commerce
USEPA	United States Environmental Protection Agency
WCTS	Wastewater Collection and Transmission System
WPCF	Water Pollution Control Federation

1.03 SYMBOLS

Symbols and material legends shall be as scheduled on the Contract Drawings.

END OF SECTION

SECTION 01200

PROJECT MEETINGS

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. General requirements for project meetings with the Program Manager and Owner's Representative including:
 - 1. Preconstruction Meeting
 - 2. Progress meetings,
 - 3. Pre-installation meetings,
 - 4. Inspection tours.
 - 5. All other meetings determined to be necessary by the Owner or Owner's Representative.

1.02 RELATED SECTIONS

- A. Section 01010: Summary of Work
- B. Section 01300: Submittals

1.03 PRECONSTRUCTION MEETING

- A. The Owner's Representative will schedule this meeting within 5 days of the issuance of the Notice to Proceed.
- B. The location of the meeting will be designated by the Owner's Representative.
- C. The following parties shall attend the meeting:
 - 1. Program Manager
 - 2. Owner/Owner's Representative
 - 3. Contractor's Superintendent and Responsible Representative
 - 4. Subcontractors as appropriate to the agenda
 - 5. Other agency representatives (EPD, EPA, DWM, etc.) as appropriate to the agenda
 - 6. Representatives of suppliers and manufacturers as appropriate to the agenda
 - 7. Others as requested by the Program Manager the Owner's Representative, or Contractor
- D. Suggested Agenda:
 - 1. Distribution and discussion of:
 - a. List of major subcontractors and suppliers.
 - b. Projected Project Schedules. (submittal schedule, preliminary progress schedule, payment schedule)

2. Critical work sequencing. (Contract start date and completion date)
3. Major equipment submittals, deliveries and priorities.
4. Project Coordination including:
 - a. Project constraints
 - b. Critical work areas
 - c. Traffic concerns
 - d. Pedestrian/traffic safe passage
 - e. Working hours
 - f. Non-working hours.
 - g. Designation of responsible personnel.
 - h. Contractor's responsibility for Contract compliance and quality control
 - i. Project field coordination
 - j. pre, and post construction, and progress photos and documentation
5. Procedures and processing of:
 - a. Field decisions.
 - b. Proposal requests.
 - c. Submittals.
 - d. WCD/Field Orders/ NCN/Change Orders.
 - e. Applications for Payment. Lien waivers
6. Adequacy of distribution of Contract Documents.
7. Procedures for maintaining Record Documents.
8. Temporary utilities and facilities/storage and staging facilities
9. Safety and first aid procedures and responsibilities.
10. Security Procedures/responsibilities
11. Insurance and bonds
12. Close out/Substantial and Final completion

1.04 PROGRESS MEETINGS

- A. Scheduling: Meetings shall be conducted at least every two (2) weeks throughout the construction or at other intervals directed by the Owner's Representative.
 1. Meeting frequency may be reduced at the request of the Owner's Representative.
- B. Location of the meetings: Capital Improvement Program (CIP) office or other location designated by the Owner's Representative.
- C. Progress meetings shall include (as a minimum)
 1. Owner and/or Owner's Representative(s), as appropriate
 2. Program/Construction Manager, as appropriate
 3. Resident Project Representative
 4. Contractor's Project Manager, Superintendent, and other representative(s) as appropriate
 5. Subcontractors and suppliers as appropriate to the agenda

6. Other governing agencies as appropriate for the work being completed
7. Others when appropriate
8. Subcontractors and suppliers as appropriate to the agenda

D. Suggested minimum agenda:

1. Review and approval of minutes of previous meeting
2. Actual vs. scheduled progress since previous meeting
3. Planned activities for the next two weeks
4. Problems with and revisions to schedule/narrative
5. Corrective measures and procedures to regain projected schedule
6. Contract and/or Record Document clarifications
7. Field observations, problems, and conflicts
8. Quality control
9. Actual and potential changes and their impacts
10. Review proposed changes for:
 - a. Effect on Schedule and on completion date.
 - b. Effect on other components of the Project.
11. Safety issues

E. Progress meetings will be held on a bi-weekly basis for at least the first 3 months.

1. Special meetings can be called by the Owner's Representative when warranted.
 - a. Need for a Special Meeting will be determined by the Owner's Representative.
 - b. Pre-installation meetings as determined necessary by the Owner's Representative

F. The Owner's Representative shall have the following specific responsibilities:

1. Distribute agenda for meetings
2. Distribute written notice of each meeting a minimum of seven days in advance of meeting date to all parties involved
3. Make physical arrangements for meetings
4. Record minutes to include significant proceedings, decisions and action items
5. Provide and record a sign-in sheet for all attendees
6. Reproduce and submit word-processed minutes

G. Representatives of contractors, subcontractors and suppliers attending the meetings shall be qualified and authorized to act on behalf of the entity each represents.

H. The Program Manager shall attend progress meetings to ascertain the work is expedited consistent with the Contract Documents and the project schedules.

1.05 PRE-INSTALLATION MEETINGS

- A. Scheduling: Schedule pre-installation meetings for installation of various aspects of the Work prior to the start of installation, as directed by the Owner's Representative, or as otherwise specified in this contract.
 - 1. Do not schedule pre-installation meetings until required submittals have been approved.
- B. Location: at DWM Engineering and Construction Management offices, Memorial Drive location.
- C. Meeting requirements:
 - 1. Conduct pre-installation meeting at project site.
 - a. Required attendance:
 - 1) Contractor's superintendent and foreman,
 - 2) Primary materials installer,
 - 3) Installer of each component of associated work,
 - 4) Representative(s) of materials manufacturer(s),
 - 5) Inspection and testing agency representative (if any),
 - 6) Installers of other work requiring coordination,
 - 7) Construction Manager,
 - 8) Owner's Representative.
 - b. Meeting purpose:
 - 1) Reviewing job mock-up (if any),
 - 2) Job conditions,
 - 3) Project requirements
 - 4) Procedures to be followed in performing work.
 - 2. Contractor shall conduct Site examination:
 - a. Examine existing areas and conditions of the Work site.
 - b. Report in writing any conditions detrimental to proper and timely completion of work.
 - c. Do not proceed with work until unsatisfactory conditions have been addressed.
 - d. Commencement of work shall constitute acceptance of substrate conditions.
 - 3. Manufacturer's authorized representative:
 - a. Shall inspect and confirm proper storage of job site materials, as directed by the Owner's Representative
 - b. Shall inspect and confirm in writing, the condition of previously improperly stored materials and the completion of any corrective action necessary and confirm warranty remains intact.
 - c. Establish scheduling of initial and final installation of products,

- d. Establish the method of preparing written progress reports to Contractor (with copy to Owner's Representative) of job conditions and installation.
4. Contractor shall:
 - a. Review manufacturer's product data publications and other published instructions for material installation compliance including shop drawings.
 - b. Ensure Shop drawings and submittals shall be reviewed and approved prior to pre-installation meetings.
 - c. Provide a set of approved shop drawings and submittals for meeting use.
5. Meeting Report: Prepared and submitted by the Owner's Representative.
 - a. Submit a draft to attendees for review/comment and a final including any comments received.
6. Pre-Installation meetings shall include, but not be exclusive of the following portions of the Work:
 - a. CCTV inspection work
 - b. Point Repair work
 - c. Pipe / Pipeline Systems
 - d. Manhole / Manhole Systems
 - e. Pipe Bursting
 - f. CIPP Projects
 - g. Jack & Boring
 - h. Manhole Rehab
 - i. Easement Clearing
 - j. Erosion Control Measures
 - k. All other as required by Owner's Representative

1.06 INSPECTION TOURS

- A. Formal inspection tours shall be made of the job progress for the Program Manager and any other officials as the occasion warrants and as scheduled by the Owner's Representative.
- B. If requested by the Owner's Representative, the Contractor shall be prepared to show and explain work completed and in progress throughout the Project to the inspection parties.

END OF SECTION

SECTION 01300

SUBMITTALS

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Provisions in this Section and the applicable General Requirements are mandatory procedures for preparing and submitting equipment data, shop drawings, product data, samples, procedures, schedules, certificates, or any other submittals to be prepared and submitted as required by the Contract Documents or as directed by the Owner's Representative.
- B. Submissions shall be in orderly sequence and timed to cause no delay in the Work.
- C. Delays occasioned by requirement of submissions of samples, shop drawings and product data not in accordance with Contract Documents are Contractor's responsibility, and will not be considered valid justification for extension of Contract Time.
- D. Project delays or delays in the purchasing of materials or equipment occasioned by the requirement for resubmission of shop drawings, product data, and samples initially rejected by the Owner's Representative, the Program Manager, and/or the Owner, are the Contractor's sole responsibility and will not be considered valid justification for time extensions.
- E. Keep at least one set of approved and reviewed shop drawings on the job site at all times.
- F. No portion of the Work requiring the submittal of shop drawings, product data, or samples shall commence until each such submittal has been reviewed by the Owner's Representative, and/or Program Manager, and/or Owner, and the action required on the returned submittal does not require a correction and resubmittal (i.e., "Reviewed" or "Revise and Resubmit" or similar notation); and further, each supplier/fabricator/manufacturer and installer shall have possession of such final reviewed submittal prior to commencing its portion of the Work commenced without compliance with the above will be subject to rejection, and immediate removal and replacement at no additional cost to the Owner.
- G. At the time of submission, the Contractor shall give the Owner's Representative specific written notice of any variations, or deviations in the submittals or samples from the requirements of the Contract Documents. This notice shall be both a written communication separate from the Shop Drawing's or Sample Submittal; and, in addition, by a specific notation made on each Shop Drawing or Sample submitted to Owner's Representative for review and approval. Each such variation or deviation shall be clearly and decisively delineated, in detail so they are obvious to the reviewer. Owner's Representative's review and approval of any variations or deviations shall not relieve Contractor from responsibility for any variation or deviation from the requirements of the Contract Documents unless Contractor has complied with the requirements of the Contract, and Owner's Representative has given written approval of each such variation or deviation by specific written notation

thereof incorporated in or accompanying the Shop Drawing or Sample. If the variations or deviations are deemed acceptable, suitable action may be taken for proper adjustment. Otherwise, the Contractor will not be relieved of the responsibility for executing the work in accordance with the Drawings and Specifications even though such shop drawings have been reviewed by the Owner's Representative. Additional costs associated with Owner's Representative's review and consideration of any variations or deviations may be recovered from the Contractor at the Owner's decision.

1.02 DEFINITIONS

- A. Samples: Physical examples prepared to illustrate materials, equipment or workmanship and to establish standards by which work will be judged as complying with contract requirements. Samples of trench materials submitted for acceptance testing shall be provided and will be used for comparison purposes of actual materials provided.
- B. Shop drawings: Drawings, diagrams, illustrations, schedules and performance charts, prepared to illustrate a portion of work in detail.
- C. Product data: Dated, printed literature of a product manufacturer which describes product and installation procedures.
- D. Submittals: General term including samples, shop drawings and product data, as applicable.
- E. Certificate of Conformance or Compliance: A document certified by a competent authority that the supplied good or service meets the required specifications. Also called certificate of compliance.
- F. Action Submittal: A submittal requiring Owner/Owner's Representative approval prior to commencing Work or ordering of applicable products and/or materials.
- G. Informational Submittal: A submittal submitted for informational purposes only.
- H. No Owner/Owner's representative approval is required. Submittal to be in conformance with the Contract Documents.

PART 2 – PRODUCTS

(Not Used)

PART 3 – EXECUTION

3.01 SUBMITTAL REQUIREMENTS

- A. Within two (2) weeks of receiving the Notice-To-Proceed, the Contractor shall submit to the Owner's Representative a complete schedule of submittals and submittal log for review and approval. The Contractor shall submit either Action or Informational submittals on a timely basis as indicated in the schedule to not delay the Work. Such submittals shall be in sufficient detail to enable the Owner's Representative to

identify the particular project and to form an opinion as to its conformity to the Specifications.

B. Submittals shall be digitally submitted in PDF format in color with all pages legible when reprinted on 8.5" x 11" paper unless otherwise specified herein.

C. Each submission must be accompanied by a consecutively numbered letter of transmittal, listing the contents of the submission and identifying each item by reference to Specification Section or Drawing number. The Submittal shall contain a Submittal Identification Number.

D. Submittals shall contain:

1. The date of submission and the dates of any previous submissions.
2. The Project title and the Owner's Project Number.
3. Contract identification.
4. The names of:
 - a. Contractor
 - b. Supplier
 - c. Manufacture
5. Identification of the submittal/product being submitted, with the Specification Section number. Clearly identify all attributes and properties of the submitted product that demonstrate compliance with the Contract Documents.
6. Field dimensions, clearly identified as such.
7. Relation to adjacent or critical features of the work or materials.
8. Applicable standards, such as, but not limited to ASTM or Federal Specification numbers.
9. Identification of variations or deviations from Contract Documents.
10. Identification of revisions on re-submittals.
11. An 8 inch by 3 inch blank space for Contractor and Construction Manager stamp.
12. Contractor's stamp shall be initialed or signed, certifying approval of the submittal, to the verification of products, field measurements and field construction criteria, and to the coordination of the information within the submittal with the requirements of the Work and of Contract Documents.

E. Catalog plates and other similar materials that cannot be conveniently labeled shall be bound in suitable covers bearing the identifying data.

F. Shop drawings shall be accompanied by all required certifications and other such supporting materials, and shall be submitted in such sequence or in such groups so all related items may be reviewed together. When shop drawings cannot be reviewed because the submission is not complete, or because related shop drawings or items have not been received, such shop drawings will be returned without action or will be held until the lacking materials are received. Any delay to the project resulting from the submission of incomplete shop drawing data shall be the responsibility of the Contractor and shall not constitute grounds for a project time extension.

- G. Other special requirements or required information may be listed in the Technical Specifications and/or given to the Contractor as deemed necessary by the Owner's Representative. The Contractor shall provide such information or meet such requirements at no additional cost to the Owner.

3.02 SAMPLE PREPARATION

- A. Provide six (2) copies of submittals to the Owner' Representative.
- B. Prepare samples in sizes, shapes and finishes in accord with provisions of individual specification sections.
- C. Samples furnished under this section are not to be confused with full-size, on-the-site "Mock-Ups" called for in some specification sections.
- D. Unless otherwise indicated, the number of samples submitted shall be the number required by contractor, plus two to be retained by Owner' Representative.
- E. The Contractor shall submit four samples, with tags and properly identified, for each item requiring samples.

3.03 SHOP DRAWING PREPARATION

- A. Shop drawing submittals shall comply with the following:
 1. Number sheets consecutively.
 2. Indicate working and erection dimensions and relationships to adjacent work.
 3. Show sectional views, where applicable.
 4. Indicate material, gauges, thicknesses, finishes, and characteristics compliance required by the Contract.
 5. Indicate anchoring and fastening details, including information for making connections to adjacent work.
- B. Form: Submit one (1) original drawing of full size to scale and two (2) copies. Digital submissions will be in AutoCAD 2000 format and PDF format including submittal forms and submit one (1) single PDF.
- C. Shop drawings shall be provided for any portion of the Work that would necessitate the need for such detailed plans as may be required for the material/product review or prosecution of the work, whether or not included in the Drawings. All necessary shop drawings shall be furnished by and through the Contractor. They shall include layout, plan and profile, shop details, erection plans, and bending diagrams for reinforcing steel, etc. Review by the Owner's Representative must be obtained before any work involving these plans may be performed. Plans for other aspects of the work may also be required, and such cases shall be subject to review by the Owner's Representative.

3.04 PRODUCT DATA PREPARATION

- A. Include product manufacturer's dated, printed material with product description, storage and handling instructions and installation instructions indicated. Data not

related to project shall be deleted. Storage and handling instructions shall be approved and on site before materials are shipped.

3.05 CONTRACTOR'S REVIEW

- A. Review all submittals before forwarding to the Owner's Representative and stamp to indicate conformance with requirements of the Contract Documents.
- B. Determine verify and indicate clearly, field measurements and construction, materials, catalog numbers and similar data. Coordinate each submittal with requirements of work and Contract Documents.
- C. Where work is indicated "By Others", Contractor shall indicate subcontractor responsibility for providing and coordinating such work.
- D. Contractor agrees the submittals processed by the Owner's Representative are not Change Orders, the purpose of submittals by Contractor is to demonstrate the Contractor understands design concept, he demonstrates his understanding by indicating materials he intends to furnish and install, and by detailing fabrication, assembly and installation methods he intends to use.
- E. Contractor represents by submitting samples, shop drawings and product data he has complied with provisions specified above. Submissions made without Contractor's approval indicated thereon, or clearly indicative that the Contractor failed to review the submission will be returned without being reviewed for compliance with this requirement.
- F. Date each submittal and indicate name of Project, Owner's Representative, Contractor and Subcontractor, as applicable, description or name of equipment, material or product and location where material or product is to be used.
- G. Accompany submittal with transmittal letter containing project name, Contractor's name, number of submittals, titles and other pertinent data. Transmittal shall, as required in these Specifications, outline variations or deviations, if any, in submittals from requirements of Contract Documents.

3.06 OWNER'S REPRESENTATIVE'S REVIEW

- A. Owner's Representative will review submittals within 10 working days.
- B. Owner's Representative's review is only to determine general conformance with design concept of project and with information in Contract Documents. Owner's Representative's determination regarding an individual item shall not extend to the entire assembly in which the item functions.
- C. Owner's Representative's review of submittals shall not relieve Contractor of responsibility for any variation or deviation from requirements of Contract Documents unless Contractor has informed Owner's Representative, in writing, of such variation or deviation at time of submission and Owner's Representative has given written acknowledgment of the specific deviation. Owner's Representative's review shall in no way relieve Contractor from responsibility for errors or omissions in submittals.

- D. Owner's Representative will return submittals to Contractor marked with appropriate comment as defined below:
 - 1. "No Exceptions Taken" indicates the submittal has been reviewed for conformance with design and no exceptions are taken. Proceed with the work.
 - 2. "Revise and Resubmit" indicates the annotations are to be confirmed in a resubmittal of the affected submittal. However, subject to prior arrangement with the Owner's Representative, the Contractor may proceed with the work as annotated during the interim required for resubmittal.
 - 3. "Rejected" indicates submission to be revised and resubmitted for further review prior to proceeding with the work.
 - 4. "Furnish as Corrected" indicates Contractor is to move forward with minor corrections as indicated. A resubmittal to the Owner's Representative is not required before purchasing and/or proceeding. A final submittal with corrections will be submitted to the Owner's Representative upon completion.
- E. Owner's Representative will return one (1) full size scanned copy of reviewed submittal in PDF format for printing and distribution by Contractor.

3.07 RESUBMISSION

- A. Make corrections and changes indicated for unacceptable submissions and resubmit in same manner as specified above. Resubmission for review shall be made by Contractor within 10 working days of documented receipt of returned submittals.
- B. In resubmission transmittal, direct specific attention to revisions other than corrections requested by the Owner's Representative on previous submissions, if any.
- C. Shop drawings and product data:
 - 1. Revise initial drawings or data, and resubmit as specified for the initial submittal.
 - 2. Indicate any changes made other than those requested by the Owner's Representative
- D. Samples:
 - 1. Submit new samples as required for initial submittal.

3.08 DISTRIBUTION

- A. Contractor is responsible for obtaining and distributing copies of submittals to the Subcontractors and material suppliers after as well as before final approval. Prints of reviewed shop drawings shall be made from transparencies carrying the Owner's Representative's appropriate stamp.
- B. Contractor shall maintain a file of processed submittals for the duration of the project, including a complete set in the field or field office.

- C. Distribute shop drawings and product data reviewed by the Owner's Representative to:
 - 1. Job Site file
 - 2. Subcontractors
 - 3. Supplier or Manufacturer
 - 4. As requested by Owner

END OF SECTION

SECTION 01310

SCHEDULING OF WORK

PART 1 - GENERAL SECTION

1.01 SECTION INCLUDES

- A. Describing the scheduling and progress reporting requirements of the Contract. The primary objectives of the requirements of this Section are:
 1. To insure adequate planning and execution of the Work by the Contractor;
 2. To assist the Program Manager and Owner's Representative in evaluating the progress of the Work;
 3. To provide for optimum coordination by Contractor of its subcontractors, and of its Work with the work or services provided by the Owner or any separate contractors; and
 4. To permit the timely prediction or detection of events or occurrences affecting the timely prosecution of the Work.
- B. Nothing in this Section shall be construed to usurp the Contractor's authority, responsibility, and obligation to plan and schedule the Work as Contractor deems, subject to all other requirements of the Contract Documents.

1.02 DEFINITIONS

- A. Critical Path Method (CPM): A planning and scheduling technique involving the charting of all events and operations to be encountered in completing a given process, rendered in a form permitting determination of the relative significance of each event and establishing the optimum sequence and duration of operations.
- B. Schedule of Record: The Schedule of Record will be the Official Project Schedule for this Contract. All updates and/or revisions relating to coordinating the Work, scheduling the Work, monitoring the Work, reviewing the progress payment requests, evaluating time extension requests, and all other objectives shall be made to this Schedule. No other Schedule will be recognized for this Contract.
- C. Total Float: Total float or slack time associated with one chain of activities is defined as the amount of time between earliest start date and latest start date or between earliest finish date and latest finish date for such activities, as calculated as part of the accepted Schedule Submittal.

1.03 GENERAL SCHEDULING REQUIREMENTS

- A. The Work of this Contract shall be planned, scheduled, executed, and reported using the critical path method (CPM). The Contractor shall use either Microsoft Project 2013 Professional version or later (MPP file) or Oracle Primavera P6 Version 8: Professional Project Management (MPX file) software program to develop and maintain its Schedule Submittal:
- B. The Preliminary Schedule Submittal, as defined herein, shall represent the Contractor's commitment and intended plan for the Work in compliance with the

Contract completion date and interim milestone dates specified or as directed by the Owner's Representative. The Preliminary Schedule Submittal shall take into account all foreseeable activities to be accomplished by any separate contractors or the Owner, and interface dates with utility companies, the Owner's operations, and others. The Preliminary Schedule Submittal shall anticipate all necessary manpower and resources to complete the Work within the dates set forth or as directed and agreed to.

- C. A Preliminary Schedule Submittal found unacceptable by the Program Manager or Owner's Representative shall be revised by the Contractor and resubmitted within five (5) working days.
- D. Once reviewed and accepted by the Owner's Representative, the Preliminary Schedule Submittal will become the Baseline Schedule. A copy of the Baseline Schedule should immediately be made and labeled as the Schedule of Record. The purpose of the Schedule of Record is to capture actual and current status each update period, and it can be compared against the Baseline Schedule as needed.

- E. The Contractor is responsible for determining the sequence of activities, the time estimates of the detailed design activities and the means, methods, techniques and procedures to be employed. The Schedule of Record shall represent the Contractor's best judgment of how it will execute the Work in compliance with the Contract requirements. The Contractor shall ensure the Schedule of Record is current and accurate and is properly and timely monitored, updated and revised as Project conditions and the Contract Documents require.

1.04 SCHEDULE SUBMITTAL

- A. Within ten (10) work days after the Notice to Proceed, the Contractor shall submit the Preliminary Schedule Submittal according to the requirements established herein. The Schedule of Record and accompanying reports, statused through the period agreed upon by the Owner's Representative will be presented twenty-four (24) hours ahead of at each construction meeting, to give the Owner's Representative time to review to review it and formulate initial comments.
- B. The Schedule of Record shall include, but not be limited to, the following information:
 1. Project name
 2. Distinct, logical and identifiable subdivisions of Work (at a minimum this would separate Design, Procurement and Construction Phases).
 3. Activities for all aspects of the Work, with durations not exceeding ten (10) work days for all activities for which the Contractor will perform actual design work. Submittals and other similar activities may exceed ten (10) work days if approved by the Owner's Representative.
 4. All start dates, milestones, total float and completion dates.
 5. Responsibility for each activity.
 6. Cost loaded values for each activity for which payment is required. The cost breakdown shall have a direct correlation to the Schedule of Values to be used as the basis for Applications for Payment.
 7. Labor resources

8. Confirm the Work is to be performed on single shift and 5 day per work week basis. This period is further defined as Monday through Friday from 8:00am-5:00pm in specification Section 01030.
9. Shall consider all foreseeable factors or risks affecting, or may affect, performance of the Work including: historical and predicted weather conditions, applicable laws, regulations or collective bargaining agreements pertaining to labor, transportation, traffic, air quality, noise, and any other applicable regulatory requirements.
10. A tabular report listing all predecessor and successor activities for each activity.
11. A legible time scaled network diagram.
12. A listing of the project calendar, indicating the anticipated days of work performance and non-work (Contractor holidays) that extends through end of contract period.
13. Contractor shall submit three (3) 11" x 17" colored copies and one (1) electronic copy of all Construction Schedules. Contractor shall submit three (3) copies of all bar charts, reports and/or other required data.
14. A digital submittal, in a form and format acceptable to the Owner's Representative, is a requirement of the Schedule Submittal. This electronic media should include a copy of all bar charts, schedule reports and narrative in pdf format and the Schedule of Record statused through the current period in MPP or MPX format.

C. Activities and milestones to appear on the Schedule Submittal shall include, but not be limited to, Work Progress Meetings, Submittals, Pre installation meetings, Owner/Owner's Representative Reviews impacting the Work, preconstruction documentation, Site work and restoration, demolition, excavation, pipe laying, other pipe installation related activities, structure installation, paving, major material fabrication and delivery, shop drawings submittals, progress meetings, equipment delivery and installation, coordination requirements, inspections, dates of Substantial and Final Completion, testing and instruction, and any other activities required by the Owner's Representative. In lieu of including submittals in the Schedule of Record, a separate Submittal Schedule may be prepared and maintained. For each major material submittal, a string of four (4) activities should be incorporated to reflect: preparation of the submittal, review by Owner's Representative (based on ten (10) work days), procurement and delivery. The delivery of said material is to occur prior to its scheduled installation.

D. The Owner's Representative shall have the right to require the Contractor to modify any portion of the Contractor's Schedule of Record or Recovery Schedule, as herein required, (including cost loading) with the Contractor bearing the expense thereof, which the Owner's Representative reasonably determines to be:

1. Impractical or unreasonable;
2. Based upon erroneous assumptions, calculations, or estimates;
3. Not in compliance with other provisions of the Contract Documents;
4. required to insure proper coordination by the Contractor of the Work of its subcontractors and with the work or services being provided by any separate contractors;
5. Necessary to avoid undue interference with the Owner's operations

6. Necessary to ensure completion of the Work by the milestone and completion dates set forth in the Contract Documents;
7. Required for the Contractor to comply with the requirements of this Section or any other requirements of the Contract Documents; or
8. Not in accordance with the Contractor's actual operations.

1.05 UPDATING OF DESIGN SCHEDULE/PROGRESS REPORTS

- A. The Owner's Representative shall review the Contractor's report of actual progress at each Progress Meeting. At a minimum, this report should be submitted 24 hours in advance of the Progress Meeting to allow the Owner's Representative to review it and formulate initial comments. Prepared by the Contractor, the progress reports shall set forth up-to-date and accurate progress. Said reports shall be prepared by the Contractor in consultation with all principal subcontractors.
- B. The Schedule Report of the Contractor shall show the activities, or portions of activities, completed during the reporting period, the actual start and finish dates for these activities, remaining duration and estimated completion dates for both activities currently in progress and those expected to begin within the next two weeks. This shall be provided in both hard copy and electronic format.
- C. At the Progress Meeting a total review of the Project will take place including but not limited to, the following:
 1. Current update of the Schedule of Record
 2. Anticipated detailed design activities for the subsequent report period plus a two week look ahead.
 3. Critical items pending
 4. Contractor requested changes to the Schedule of Record accompanied by a detailed narrative.
- D. The Contractor shall submit a detailed narrative with the progress report including, but not be limited to, a narrative describing actual Work accomplished during the reporting period, a description of problem areas, current and anticipated delaying factors and their impact, explanations of corrective actions taken or planned, any proposed newly planned activities or changes in sequence, and proposed logic for a Recovery Schedule as further described herein.
- E. No invoice for payment shall be submitted and no payment whatsoever will be made to the Contractor until the Schedule of Record, and narrative reports as defined herein, are updated and provided, in both hard copy and electronic format, to the Owner's Representative for review and approval.

1.06 SCHEDULE REVISIONS

- A. Should the Contractor desire to or be otherwise required under the Contract Documents to make modifications or changes in its method of operation, its sequence of Work or the duration of the activities in the Schedule of Record, it shall do so in accordance with the requirements of this Paragraph and the Contract Documents. The approved Schedule of Record may only be revised by written approval of the Program Manager and/or Owner's Representative as provided herein.

- B. The Contractor shall submit requests for revisions to the Schedule of Record to the Program Manager and/or Owner's Representative using the Schedule Revision Form provided by the Owner's Representative. The Contractor shall identify revisions and descriptions of logic for rescheduling work and substantiate the milestone and completion dates will be met as listed in the Contract Documents. Proposed revisions acceptable to the Owner's Representative and Program Manager will be approved in writing and incorporated into the Schedule of Record.
- C. Requests for revision will be accompanied by evidence acceptable to the Owner's Representative stating the Contractor's subcontractors agree with the proposed revisions.
- D. If there are separate contractors on the Project, the approval of the separate contractors shall be obtained to make the proposed schedule revisions. If accepted by the Owner's Representative and Program Manager, the revisions shall be binding upon the Contractor and all separate contractors on the Project.
- E. The impact of all change orders to this Contract shall be included in the project schedule. When Work is associated with a Change Order, incorporate adjustments to the schedule. The adjustments shall be resource-loaded with material unit quantities and the corresponding cost accounts, resources account codes, activity description, accepted costs and time adjustments. The activity ID number shall identify the number of the Change Order.

1.07 RECOVERY SCHEDULE

- A. Should the updated Schedule of Record, at any time during the Contractor's performance, show, in the sole opinion of the Owner's Representative, the Contractor is behind schedule for any milestone or completion date for any location or category of work, the Contractor, at the request of the Owner's Representative, shall prepare a Schedule Revision for the purpose of displaying recovery. The revision shall identify how the Contractor intends to reschedule its Work in order to regain compliance with the Schedule of Record within fourteen (14) calendar days, and shall be provided to the Owner's Representative in both hard copy and electronic format.
- B. Within ten (10) work days, the Contractor shall prepare and submit to the Owner's Representative, in both hard copy and electronic format, a Recovery Schedule, incorporating the best available information from subcontractors and others permitting a return to the Schedule of Record at the earliest possible time. The Contractor shall prepare a Recovery Schedule to the same level of detail as the Schedule of Record. The Recovery Schedule shall be prepared in coordination with other separate contractors on the Project.
- C. Within two (2) work days after submission of the Recovery Schedule to the Owner's Representative, the Contractor shall participate in a conference with the Owner's Representative to review and evaluate the Recovery Schedule. Within two (2) work days of the conference, the Contractor shall submit the revisions necessitated by the review for the Owner's Representative's review and acceptance. The Contractor shall use the accepted Recovery Schedule as its plan for returning to the Schedule of Record.

D. The Contractor shall confer continuously with the Owner's Representative to assess the effectiveness of the Recovery Schedule. As a result of these conferences, the Owner's Representative will direct the Contractor as follows:

1. If the Owner's Representative determines the Contractor continues behind schedule, the Owner's Representative will direct the Contractor to prepare a Schedule Revision and comply with all the requirements of a Schedule Revision as stated herein and the other requirements of the Contract Documents; provided, however, nothing herein shall limit in any way the rights and remedies of the Owner and Owner's Representative as provided elsewhere in the Contract Documents; or
2. If the Owner's Representative determines the Contractor has successfully complied with provisions of the Recovery Schedule, the Owner's Representative will direct the Contractor to return to the use of the approved Schedule of Record.

1.08 TOTAL FLOAT TIME

- A. Total float or slack time shown on the currently approved Schedule of Record is not for exclusive use or benefit of either the Program Manager or the Contractor and is available for use by either of them according to whichever first needs the benefit of the total float to facilitate the effective use of available resources and to minimize the impact of Project problems, delays, impact, acceleration or changes in the Work arising during performance. The Contractor specifically agrees total float time may be used by the Program Manager in conjunction with their review activities or to resolve Project problems. The Contractor agrees there will be no basis for any modification of the milestone or completion dates or an extension of the Contract Time, or a claim for additional compensation as a result of any Project problem, delay, impact, acceleration, or change order only resulting in the loss of available total float on the currently approved Schedule of Record.
- B. Total float time shown on the Schedule of Record shall not be used arbitrarily by the Contractor in a manner, in the opinion of the Owner's Representative, unnecessarily delays separate contractors from proceeding with their work in a way detrimental to the interests of the Owner.

END OF SECTION

SECTION 01320
PROGRESS REPORTS, VIDEOS AND PHOTOGRAPHS

PART 1 – GENERAL

1.01 SECTION INCLUDES

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

1.02 RELATED SECTIONS

- A. Section 01300: Submittals
- B. Section 01310: Scheduling of Work
- C. Section 01420: Inspection of Work

1.03 SUBMITTALS

- A. Reports
 - 1. The Contractor's Superintendent shall prepare and submit Daily Reports throughout the project, from Notice to Proceed to Final Acceptance. Daily Reports shall be kept in an orderly manner at the site, available for inspection or review when requested by the Program Manager and the Owner's Representative. Copies of Daily Reports shall be accumulated and submitted to the Owner's Representative on a weekly basis, on a regular day and time established by the Owner's Representative. Failure to submit Daily Reports or to comply with the format requirements below is cause for the Owner's Representative to retain additional monies due the Contractor from the monthly Application(s) for Payment until such time as the reports have been brought up to date by the Contractor. The value for such retainage shall be determined by the Owner's Representative.
 - 2. Each Daily Report shall include the following information at a minimum:
 - a. Manpower by subcontractor, trade, and skill level
 - b. Weather and temperatures (AM and PM)
 - c. List of visitors to the jobsite
 - d. Specific work performed with locations
 - e. Digital Pictures of the work performed, with descriptions of each picture
 - f. Situations or circumstances which could delay the Work or give cause for a time extension or additional cost
 - g. Instructions requested (and of whom)

- h. Materials received
- i. Major equipment arrival/departure
- j. Total days accrued under the terms of the Contract Documents
- k. Accidents and incidents
- l. Safety issues
- m. Meetings
- n. A copy of a delivery receipt of all deliveries, to the project on that day, of equipment and/or materials
- o. A copy of all field reports from testing companies
- p. Other significant events at the jobsite or items of information as directed by the Owner's Representative

3. The Contractor shall take the necessary action required to specifically alert the Owner's Representative to potential items impacting the progress of the Work. Such items shall be clearly highlighted in the report.
4. All Contractor's Daily Reports shall be typed and submitted for approval to the Owner's Representative in electronic/PDF format.

B. Videos

1. Prior to the beginning of any work, the Contractor shall take a pre-construction video of the work area to record existing conditions. Video shall show all conditions potentially subject to disagreement. These conditions shall be shown in sufficient detail to provide a basis for decisions. The Owner's Representative shall be notified of the day and time of when the video is to be made and given an opportunity to be present during the making of the video. Video shall be submitted in DVD format, in triplicate, with a log of the items recorded within 10 calendar days of the Notice to Proceed. No request for payments will be processed until the pre-construction video has been submitted and approved by the Owner's Representative. 2 copies each. Required for close-out. Failure to capture sufficient and irrefutable detail necessary to defend against a claim will render the Contractor responsible for correcting any such claim at his own expense.
2. Following completion of the work, another recording shall be made showing the same area and features as in the pre-construction video. The Owner's Representative shall be notified of the day and time of when the video is to be made and given an opportunity to be present during the making of the video. Post-Construction video shall be made prior to final acceptance and before submitting a request for final payment. Video shall be submitted in DVD format, in triplicate, with a log of the items tapped, with the final payment application. 2 copies each. Required for close-out.
3. At the conclusion of the Project, the Contractor shall have all videos generated for the project consolidated and copied onto a DVD and prepare a Table of Contents for the Disk. A copy of the DVD and Table of Contents for the DVD shall be transmitted, in triplicate, to the Owner's Representative with the request for final payment. 2 copies each. Required for close-out.

C. Photographs

1. Accompanying each work order and prior to the beginning of any work, the Contractor shall take project photographs of the work area to record existing

conditions. The Pre-Construction photos shall show all conditions potentially subject to disagreement. These conditions shall be shown in sufficient detail to provide a basis for decisions. The Pre-Construction photographs shall be submitted to the Owner's Representative within 15 calendar days after the date of the Notice to Proceed. No request for payments will be processed until two (2) copies of Pre-Construction photos have been submitted and approved by the Owner's Representative. Required for closeout. Failure to capture sufficient and irrefutable detail necessary to defend against a claim will render the Contractor responsible for correcting any such claim at his own expense.

2. Post-Construction photographs shall be provided prior to final acceptance and completion of each work order. Following completion of the work, another photograph shall be made showing the same area and features as in the Pre-Construction photographs. 2 copies each. Required for close-out.
3. As the work progresses, the Contractor shall provide record photographs of all major components of the construction. The photographs shall be taken as frequently as necessary to provide an appropriate record of the work. The photographs shall be representative of the primary work being claimed for during the period under consideration.
4. All photographs (Pre-construction, Post-construction, Progress, etc.) shall be submitted with pertinent information provided at the bottom front left corner of each photograph (with an adhesive label), including: project name, Contractor's name, description of subject, orientation, and date and time of exposure. Digital copies of all photos are to be submitted electronically in JPEG format.

END OF SECTION

SECTION 01410

TESTING LABORATORY SERVICES

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. This Section includes testing the Owner's Representative may require, beyond the testing required of the manufacturer, to determine if materials provided for the Project meet the requirements of these Specifications.
- B. This work also includes all testing required by the Owner's Representative to verify work performed by the Contractor is in accordance with the requirements of these Specifications (i.e., concrete strength and slump testing, existing soils conditions, soil compaction, etc.).
- C. This work does not include materials testing required in various sections of these Specifications to be performed by the manufacturer at their facilities before shipment to the job site (i.e., testing of pipe), or testing and inspection required by referenced standards or codes including welding inspection by an AWS certified CWI, prior to during and after welding.
- D. The testing laboratory or laboratories will be a 3rd party testing facility selected by the Contractor subject to approval by the Owner.

1.02 QUALIFICATIONS AND REQUIREMENTS

- A. Cooperation with the Owner's Representative and Contractor shall be required.
- B. Provide qualified personnel promptly on notice.
- C. Contractor to provide preliminary schedule for testing and timely updates as the Work progresses.
 - 1. Establishing Schedule
 - a. The Contractor shall, by advance discussion with the Owner's Representative and the testing laboratory, determine the time required for the laboratory to perform its tests and to issue each of its findings, and make all arrangements for the testing laboratory to be on-site to provide the required testing. The location and frequency of tests may be dictated at any time by the Owner's Representative at its discretion.
 - b. Provide all required time within the construction schedule.
 - 2. When changes in the construction schedule are necessary during construction, coordinate all such schedule changes with the Owner's representative and the testing laboratory, as required.
 - 3. When the testing laboratory is ready to test according to the determined schedule, or when timely request for such services have been made, but is prevented from testing or taking specimens due to incompleteness of the Work, or any other failure of the Contractor to be ready, all extra costs for

testing attributable to the delay will be back-charged to the Contractor and shall not be borne by the Owner, including but not limited to travel charges incurred, technician time, etc.) Costs associated with retesting failed Work will be at the Contractor's expense.

- D. Perform specified inspections, sampling and testing of materials.
 - 1. Comply with specified standards, ASTM, other recognized authorities, and as specified. The most stringent shall apply.
 - 2. Ascertain compliance with requirements of the Contract Documents.
- E. Promptly notify the Owner's Representative and Contractor of the results including any irregularity or deficiency of work observed during performance of services.
- F. Promptly submit three copies (two copies to the Owner's Representative and one copy to the Contractor) of report of inspections and tests in addition to those additional copies required by the Contractor with the following information included:
 - 1. Date issued.
 - 2. Project title and number.
 - 3. Testing laboratory name and address.
 - 4. Name and signature of inspector.
 - 5. Date of inspection or sampling.
 - 6. Record of temperature and weather.
 - 7. Date of test.
 - 8. Identification of product, Specification section or applicable codes standards or authorities
 - 9. Location of Project.
 - 10. Type of inspection or test.
 - 11. Results of test.
 - a. Observations regarding compliance with the Contract Documents.
- G. Perform additional services as required.
- H. The laboratory is not authorized to release, revoke, alter or enlarge on requirements of the Contract Documents, or approve or accept any portion of the Work.
 - 1. Testing shall be in accordance with all pertinent codes, standards, authorities and regulations and with procedures and requirements of the American Society for Testing and Materials (ASTM)

1.03 DELIVERY, STORAGE & HANDLING

Promptly process and distribute all required copies of test reports and related instructions to insure all necessary retesting or replacement of materials with the least possible delay in the progress of the Work. Handle and store all test specimens in accordance with the requirements of the contract documents and all applicable standards. The most stringent shall apply.

1.04 RESPONSIBILITIES OF THE CONTRACTOR

- A. Cooperate with laboratory personnel, provide access to Work and/or manufacturer's facilities.
- B. Provide the laboratory with representative samples, in required quantities, of materials to be tested in a timely manner that allows for required testing and analysis. Failure to do so will not constitute cause for a claim.
- C. Furnish copies of mill test reports.
- D. Furnish required labor and facilities to:
 - 1. Provide safe access to Work to be tested.
 - 2. Assist in obtaining and handling samples at the site.
 - 3. Facilitate inspections and tests.
 - 4. Build or furnish a cure box for concrete cylinders or other samples as required by the laboratory.
 - 5. Coordinate observation and testing of coatings and linings in accordance with manufacturer's published application requirements and cure times.
- E. Laboratory Tests: Where such inspection and testing are to be conducted by an independent laboratory agency, the sample(s) shall be selected by such laboratory or agency, or the Owner's Representative, and shipped to the laboratory by the Contractor at Contractor's expense. Contractor shall make arrangements and provide all necessary assistance in obtaining the samples.
- F. Copies of all correspondence between the Contractor and testing agencies shall be submitted through the Owner's Representative. The test lab may provide test reports and related instructions directly to the Contractor provided the Owner's Representative is copied.
- G. Inspections and tests required by codes or ordinances or by a plan approval authority, and made by a legally constituted authority, shall be the responsibility of, and shall be paid for by the Contractor, unless otherwise provided in the Contract Documents. The Owner's Representative shall approve the Contractor's testing agency.
- H. Inspection or testing performed exclusively for the Contractor's convenience shall be the sole responsibility of the Contractor. In the event of a discrepancy, the final results shall be determined by the Owner's Representative and shall be based on the findings of the Owner's test lab.
- I. Unless otherwise provided in the Contract Documents, all specimens and samples for test will be taken by the testing laboratory or the Owner's Representative. If specified, the Contractor shall deliver to laboratory, in a timely manner and at designated location, adequate samples of proposed materials requiring testing. Specimens provided by the Contractor are assumed to represent the materials that will be provided to the project. Changes in the materials provided are the responsibility of the Contractor and all retests shall be at the Contractor's expense.

- J. The Contractor shall cooperate with laboratory personnel, and provide access to the Work and to Manufacturer's facilities.
- K. The Contractor shall be responsible for properly transporting all samples, except those taken by testing laboratory personnel, to the testing laboratory.
- L. The Contractor shall provide incidental labor and facilities to allow safe and adequate access to Work to be tested, to obtain and properly handle samples at the Site or at source of products to be tested, and to facilitate tests and inspections, storage and curing of test samples.
- M. The Contractor shall notify Owner's Representative and laboratory where testing is to be performed 48 hours prior to expected time for operations requiring inspection and testing services.
- N. The Contractor shall safe guard all specimens until removed from the site by the test lab.
- O. The Contractor shall be responsible for all cost associated with other means or methods of testing deemed necessary due to damaged specimens while in the responsible care of the Contractor

PART 2 – PRODUCTS

(Not Used)

PART 3 – EXECUTION

(Not Used)

END OF SECTION

SECTION 01420

INSPECTION OF WORK

PART 1 – GENERAL

1.01 SECTION INCLUDES

This section includes guidelines for the inspection of contract work.

1.02 QUALIFICATIONS AND REQUIREMENTS

- A. The Owner's Representative shall have the right of access to and inspection of the work at all times. Materials, equipment, and products shall be subject to the Owner's Representative's review as specified herein. Safe access must be provided to the Owner's Representative, with the understanding that no Work which cannot be safely accessed will not be paid for until safe access is provided for full and complete review of the Work.
- B. The Owner's Representative is responsible for general surveillance of the work on behalf of the Program Manager. The Owner's Representative is not responsible for construction means, methods, sequences, or procedures or for safety precautions and programs in connection with the work. The Owner's Representative is not responsible for supervision of the work and shall not give instruction to the Contractor's personnel as to methods of executing the work. The Owner's Representative is not responsible for the Contractor's failure to carry out the work in accordance with the Contract Documents.
- C. Any government representative or other individual identified by the Program Manager shall have safe access to the work wherever it is in preparation or progress. The Contractor shall provide proper facilities for such access and inspection.

1.03 RESPONSIBILITY OF THE CONTRACTOR

- A. The Contractor is responsible for all materials, equipment, methods, and procedures in execution of the work.
- B. The Contractor shall correct, to the satisfaction of the Owner's Representative, any work or material found to be defective or of deficient quality. Such corrections shall be made by the Contractor at no additional expense to the Owner.

1.04 RIGHT OF ENTRY

Representatives of DeKalb County, the Environmental Protection Division of the Georgia Department of Natural Resources, and the U.S. Environmental Protection Agency and others, as may be identified by the Program Manager, shall have safe and suitable access to the work whenever it is in preparation or progress. The Contractor shall provide proper facilities for such access and inspection.

END OF SECTION

SECTION 01510

SANITARY SEWER MAIN TELEVISION AND SONAR INSPECTION (CCTV)

PART 1 – GENERAL

1.01 SECTION INCLUDES

This section includes guidelines and requirements for CCTV Inspection. CCTV inspection identifies structural defects, maintenance concerns, and actual and potential sources of I/I in mainline sewers, service laterals, and manholes. CCTV inspection will also be used to verify installed assessment, cleaning, rehabilitation and/or replacement work as required.

1.02 REFERENCES

- A. Codes, Specifications, and Standards - NASSCO – National Association of Sewer Service Companies – Pipeline Assessment Certification Program (PACP) Reference Manual, Version 7.0 or latest version.
- B. Manual for Uniform Traffic Control Devices (MUTCD) standards
- C. Attachment A – PACP Standard Exchange Database Anticipated Inspection Header Form Attribute Guidance Table (CCTV) (Reference NASSCO PACP Reference Manual, Version 7.0 for related information.

1.03 RELATED SECTIONS

- A. Section 01056 – GPS Data Collection
- B. Section 01320 - Progress Reports & Videos
- C. Section 01520 – Sewer Flow Control
- D. Section 02607 - Manhole Height Adjustment
- E. Section 02956 – Sanitary Sewer Cleaning

1.04 DEFINITIONS

- A. Television Inspection: Operation necessary to complete a true-color audio-visual inspection verifying existing internal pipe conditions including pipe materials, pipe grade, connections, cracks, leaking joints, seepage and roots. Contractor shall furnish all labor, materials, equipment, tools, and other incidental services for CCTV.
- B. Sonar Inspection: Operation necessary to complete an inspection verifying existing internal pipe conditions including amount of debris in the bottom. Sonar inspection will supplement, not replace, CCTV. Contractor shall furnish all labor, materials, equipment, tools, and other incidental services for sonar inspection. Sonar inspection of a particular pipe will only be conducted when approved in writing by the Owner or Program Manager.

- C. **MPEG:** MPEG (pronounced M-peg), which stands for Moving Pictures Experts Group, is the nickname given to a family of International Standards used for coding audio-visual information in a digital compressed format. For the purposes of this specification, MPEG shall be defined as an ISO-MPEG Level 4 standard (MPEG- 4) digital audio-visual coding having a minimum resolution of 500 lines. All video files shall be named using .mpg or .wmv as the file extension.
- D. **External Hard Drive:** For the purposes of this specification, an external hard drive is a peripheral auxiliary device connected to the computer via a high-speed interface cable. The interface cable allows the external hard drive to communicate with the computer so the data may be passed back and forth. The Contractor will deliver all inspection standard exchange databases, digital reports and media to the Owner/Program Manager on an external hard drive compatible with the Owner and Program Manager's equipment and software and will provide adequate storage to contain all deliverables as outlined in the Specifications.
- E. **Sonar/TISCIT:** Operation necessary to complete a simultaneous CCTV and sonar inspection verifying existing internal conditions. Both the CCTV and sonar will be displayed together on the audio visual documentation. Contractor shall furnish all labor, materials, equipment, tools, and other incidental services for the sonar/TISCIT inspection.
- F. **Buried Manhole:** A manhole where the manhole cover (lid) is not visible at ground surface. Buried manholes usually require removing the material (excluding light dirt and plant material) covering the manhole lid and raising the manhole frame and cover (lid). All buried manholes on the sanitary systems shall be reported for raising following their location discovery by the Contractor (Reference Specification Section 02607). Subsequently, the raised manholes shall be inspected.

1.05 SUBMITTALS

- A. Submittals are to be in color PDF format for printed documents as well as other required formats when applicable for digital transfers.
- B. Submit one example video on external hard drive of previous sewer inspection work that shows operational and structural defects in sewers, complete with audio commentary and inspection log(s).
 - 1. Videos and inspection logs will be reviewed by Program Manager to determine if quality of CCTV image is acceptable, if defects were properly identified, picture clarity, advancement speeds and lighting are acceptable and documented according to industry standards and the Program Manager's requirements.
 - 2. Modify equipment and/or inspection procedures to achieve report material of acceptable quality.
 - 3. Do not commence Work prior to approval of report material quality by the Program Manager. Upon acceptance, report material shall serve as standard for remaining Work.
- C. Records reports shall include a separate report for each pipe segment showing inspection setup data, each defect and locations of laterals, and other coded information. Also, each report shall include photographs of moderate and severe

defects. Each report shall also note the labeling number of the corresponding video recording of that pipe segment. The video record of the pipe inspections shall be provided digitally on an approved mass storage device. These records shall include all video information and narrations. The video files shall have a unique name referenced in the PACP inspection database. The file name shall include manhole ID numbers for upstream and then downstream manholes as the start of the file name. It is preferred the direction of the inspection and inspection date be included as well.

- D. Camera specification sheet
- E. Sonar survey equipment specification sheet
- F. References: Contact names and telephone numbers
- G. List of staff and equipment to be used on this Project
- H. Supervisor and field crew leader's contact information including name and mobile telephone numbers
- I. Confined space entry certification indicating staff to be used on this project have been properly trained should confined space entry be required
- J. Training and inspection plan a minimum of 7 days prior to the first inspection
- K. Public notification door hanger based on Program Manager's provided example
- L. Inspection (See Documentation Section for additional information)
 - 1. Initial first day's inspections within 24 hours after first day's work is completed.
- M. Include the following with each weekly submittal:
 - 1. Inspection media (videos and photographs)
 - 2. Quality controlled Inspection database (PACP Standard Exchange Access Database)
 - 3. Inspection reports (PDF – Digital format)
- N. Traffic control plan
- O. Quality control plan

1.06 EXPERIENCE

- A. Supervisor of the field crews performing these functions shall have the proper training and up-to-date NASSCO PACP certification in these types of equipment and monitoring functions and have a minimum of five (5) years' experience in performing such assignments including safe work practices, etc.
- B. Field crew leaders performing these functions shall have the proper training and up-to-date NASSCO PACP certification in these types of equipment and monitoring

functions and have a minimum of two (2) years' experience in performing such assignments including safe working practices, etc.

- C. The Contractor shall provide the Owner with written documentation (certification) indicating the supervisor, field crew leader and all crewmembers responsible for these assignments have the proper training and the requisite experience.
- D. No crew members shall enter confined spaces without the necessary certified training and permit.
- E. The required experience shall be documented in the Contractor's Invitation to Bid submittal.
- F. A PACP certified technician or supervisor shall control operation of television equipment and encoding of inspection. Should Contractor utilize any personnel to actually document the inspection results not PACP certified, those inspections shall be refused and re-survey shall be completely at the Contractor's sole expense.

1.07 RESPONSIBILITY FOR OVERFLOWS/SPILLS AND DAMAGE TO PROPERTY AND UTILITY

- A. Reference Specification Section 01030 – Special Project Procedures, Para B.

PART 2 – PRODUCTS

2.01 CCTV/SONAR PERFORMANCE

- A. The Contractor shall furnish the following, but not limited to: the mobile television/sonar inspection studio, television camera, sonar, audio-visual digital encoding equipment/software, and other necessary equipment, materials, power, labor, and technicians as needed to perform the television inspection.
- B. The surveying/inspecting equipment will be capable of surveying/inspecting a length of sewer up to at least one-thousand five-hundred (1,500) feet when entry onto the sewer may be obtained at each end and up to one-hundred (100) feet by rodding or up to seven-hundred and fifty (750) feet where a self-propelled unit is used, where entry is possible at one (1) end only. This equipment will be maintained in full working order.
- C. Each survey/inspection unit will contain a means of transporting the CCTV camera and/or sonar equipment in a stable condition through the sewer under survey and/or inspection. Such equipment will ensure the maintained location of the CCTV camera or sonar equipment when used independently on or near to the central axis of a circular shaped sewer when required in the prime position.
- D. Where the CCTV camera and/or sonar head are towed by winch and bond through the sewer, all winches will be stable with either lockable or ratcheted drums. All bonds will be steel or of an equally non-elastic material to ensure the smooth and steady progress of the CCTV camera and/or sonar equipment. All winches will be inherently stable under loaded conditions. The bonds shall be oriented in such a manner as to enable unhindered extension or retraction through the line. All effort shall be made to prevent damage to the pipe during the television/sonar inspection. In the case where damage is caused by the Contractor, for any reason, such as would

be caused by incorrect deployment of bonds or retrieval of lodged equipment, the cost of repair or remedy shall be borne solely by the Contractor and repaired immediately after notification to the Owner's Representative within 24 hours.

- E. Each unit will carry sufficient numbers of guides and rollers such that, when surveying or inspecting, all bonds are supported away from pipe and manhole structures and all CCTV/sonar cables and/or lines used to measure the CCTV camera's/sonar head location within the sewer are maintained in a taut manner and set at right angles where possible, to run through or over the measuring equipment.
- F. Each unit will carry a range of flow control plugs or diaphragms for use in controlling the flow during the survey/inspection. A minimum of one (1) item of each size of plug or diaphragm ranging from the required diameters will be carried. See Sewer Flow Control Specification 01520 for additional details and requirements.
- G. Each survey/inspection unit will have on-call equipment available to carry out the flushing, rodding, and jetting of sewers for "Light Cleaning" See the definition of "Light Cleaning" in Sanitary Sewer Cleaning Specification 02956 for details.
- H. Television/Sonar Inspection: The Contractor shall inspect pipelines with pan and tilt conventional television imagery and/or sonar as indicated in the contract documents so as to record all relevant features and defects of the pipeline under inspection. Inspection of pipelines shall be carried out utilizing the Owner approved formats only.
- I. External Hard Drive (Videos):
 - 1. Audio portion of videos shall be sufficiently free from electrical interference and background noise to provide complete intelligibility of oral report.
 - 2. Store in upright position with temperature range of 45 to 80 degrees F (7 to 27 degrees C).
 - 3. Identify each hard drive with labels showing Owner's name, Contractor's name, the inspection period, and project area or sewer segments on the hard drive.
- J. Hard Drive Titling:

Each segment shown on the external hard drive should have its own video titled with the beginning and end point of the pipe segment.

K. CCTV Camera/Sonar Head Prime Position:

The CCTV camera/sonar head will be positioned to reduce the risk of picture distortion. In circular sewers the CCTV camera lens and/or sonar head will be positioned centrally (i.e. in prime position) within the sewer. In non-circular sewers, picture orientation will be taken at mid-height, unless otherwise agreed, and centered horizontally. In all instances the camera lens/sonar head will be positioned looking along the axis of the sewer when in prime position. A positioning tolerance of $\pm 10\%$ of the vertical sewer dimension will be allowed when the camera is in prime position.

L. CCTV Camera/Sonar Head Speed:

The speed of the CCTV camera in the sewer will be limited to six (6) inches per second or 30

ft/min for surveys. Similar or slightly higher speed may be used on a case-by-case basis. Stop for a minimum of five (5) seconds at every lateral, defect, or adversity. The speed of scanning sonar will be limited to four (4) inches per second.

M. CCTV Color Camera:

The television camera used for the pipe line inspection shall be one specifically designed for hazardous and corrosive environments and constructed for pipeline inspection. Lighting for the camera shall be suitable to allow a clear picture of the entire periphery of the pipe. The camera shall adhere to the following requirements:

1. Waterproof and shall be operative in 100% humidity conditions with lens fogging and any conditions that may be encountered in the inspection environment.
2. Self-leveling, color pan and tilt camera(s) to facilitate the survey and inspection of all laterals, including defects such as hydrogen sulfide corrosion in the soffit of sewers and benching or walls of manholes over and above the standard defects that require reporting.
3. A three-hundred sixty (360) degrees rotational scan indicating general condition must be implemented at every fifty (50) feet interval (min.) along sewers, and at manholes and any salient, specified, defect features.
4. The tilt arc must not be less than two-hundred seventy (270) degrees with adjustable supports designed for operation in connection with pipe inspection with a viewing angle of not less than 65 degrees.
5. The view seen by the television camera shall be transmitted to a monitor of not less than 11 inches in size.
6. The travel speed of the television inspection camera (through the pipe) shall be uniform and shall not exceed the maximum speed herein specified.
7. The camera, television monitor, and other components of the video system shall be capable of producing picture quality to the satisfaction of the Program Manager; and if unsatisfactory, equipment shall be removed and no payment will be made for an unsatisfactory inspection.
8. The adjustment of focus and iris will allow optimum picture quality to be achieved and will be remotely operated.
9. The adjustment of focus and iris will provide a minimum focal range from six (6) inches in front of the camera's lens to infinity.
10. The distance along the sewer in focus from the initial point of observation will be a minimum of twice the vertical height of the sewer.
11. The illumination must be mounted on and turned in the direction of the camera such as to allow an even distribution of the light around the sewer perimeter without the loss of contrast picture, flare out, or shadowing, light sensitivity to be greater than 1.5 lux minimum, minimize reflective glare, remote variable intensity control, provide a clear in-focus picture of entire inside periphery of pipe and the ability to achieve proper balance of tint and brightness.

N. Color CCTV/Sonar:

All CCTV and/or sonar work will use color CCTV/sonar reproduction.

O. CCTV Side Scanning Camera:

The Owner's Representative will consider high resolution digital CCTC side scanning cameras if proposed by the Contractor. The Program Manager may not accept the side scanning camera use for this project if the contractor cannot provide supporting documents showing previous successful application.

P. Sonar Survey Requirements:

1. Sonar assessment will provide for a continuous output on external hard drive format of all sewers surveyed, supported by complete defect code sheets. Additionally, silt levels will be assessed as a percentage depth of sewers at twenty-five (25) foot intervals for each pipeline surveyed.
2. Where combined CCTV and sonar imagery is used the output will display combined CCTV and sonar images of the sewer being surveyed. The sonar image will be superimposed on the real CCTV image as a combined operation.

Q. The survey/inspection vehicle for general public streets or assessable locations will comprise two (2) distinct separate areas. One (1) of these, designated as the viewing area, will be insulated against noise and extremes in temperature, include the provision for air conditioning, and will be provided with means of controlling external and internal sources of light in a manner capable of ensuring that the monitor screen display is in accordance with the requirements of this specification. Seating/and or space accommodations will be available to enable additional workers to clearly view the on-site monitor, which will display the survey/inspection as it proceeds.

R. The working area will be reserved for equipment, both operational and stored, and no equipment utilized within the sewer will be allowed to be stored in the viewing area.

S. The vehicle will be suitable for carrying the survey team and laborers and the equipment necessary to safely perform the work.

T. Off road inspection equipment/easement machine proposed by the Contractor shall be reviewed and approved by the Program Manager before the Contractor utilizes said equipment.

PART 3 – EXECUTION

3.01 GENERAL

A. The following guidelines concerning the use of CCTV and sonar will be followed:

1. Generally, CCTV alone will be used for internal condition assessment where the depth of flow is less than twenty-five (25%) percent of overall sewer diameter at the start of the survey. A case-by-case determination will be made whether to use CCTV where the depth of flow is more than twenty-five (25%) percent level but no greater than forty (40%) percent of overall sewer diameter at any time throughout the length.
2. Generally, CCTV combined with sonar will be used for internal condition assessment where depth of flow of sewage varies from twenty-five (25%) percent to seventy-five (75%) percent of overall sewer diameter for sewers

greater than or equal to eighteen (18) inches in diameter. Where the sewer is less than eighteen (18) inches in diameter and depth of flow of sewage exceeds twenty-five (25%) percent but is less than seventy-five (75%) percent of overall sewer diameter one of the following actions may be taken based on the Contractor and Program Manager's agreement: (a) continue using CCTV (where depth of flow is only marginally greater than twenty-five (25%) percent of overall diameter) or (b) use sonar (by damming or plugging the sewer so that the depth of flow exceeds seventy-five (75%) percent of overall diameter) or (c) use plugging and/or bypassing to reduce flow to 25% or less.

3. Generally, sonar alone will be used where depth of flow in the sewer exceeds seventy-five (75%) percent of overall diameter and the level of the flow will be artificially increased, without the risk of flooding, to ensure that the pipe is completely surcharged.

B. Confined Space Entry: Crews shall minimize the physical entry into manholes. Manhole entry shall be performed in accordance with Federal, State, Local and any other regulations for confined space entry. Only trained crews and staff may perform confined space entry after obtaining an entry permit. Staff must use safety required equipment, including harnesses, ventilation equipment, etc.

C. The Contractor shall make map verifications and record and deliver GIS map corrections as necessary (Refer to Section 01056).

D. Traffic Control: The work area shall be protected at all times with an adequate number of cones, barricades, flags, certified flaggers, and other measures necessary to meet the Manual for Uniform Traffic Control Devices (MUTCD) standards and to properly and safely protect both vehicular and pedestrian traffic. Flagmen shall work to secure all affected streets. Further requirement for traffic control may be imposed by the specific agency having jurisdiction. All traffic control measures shall comply with the requirements of MUTCD, Part 6 – Temporary Traffic Control, Latest Edition as published by USDOT/FHWA.

E. Site Security: Wear all required safety equipment, such as safety vests, hardhats, safety glasses, and steel toe boots. Follow all applicable state and local traffic safety procedures. Alert the closest fire department/Emergency Medical Services (EMS) as to the location of the day's work and to stand by for emergencies.

F. Scheduling Time: Crews shall begin inspections after 8:00 am and terminate inspections no later than 5:00 pm each day unless otherwise directed by the Program Manager in order to address localized special requirements. Authorization should be obtained if work is to be performed outside of the designated hours. Work should be performed by the Contractor in time frames complying with the County's noise ordinance.

G. Permits for Rights of Ways & Contract Utility Licensing: The Contractor shall obtain work permits for all work to be performed in State and/or County Right of Ways. The Contractor shall also plan for all other insurances, traffic control measures, and other terms of the permit in advance. The Contractor shall also obtain all necessary and applicable licensing.

H. Sequence of Work:

1. Perform Work in the following sequence:
 - a. Clean sewer lines and manholes in accordance with "Light Cleaning" requirements of Section 02956, Sanitary Sewer Cleaning.
 - b. Contractor shall remove debris in accordance with guidance in Section 02956, Sanitary Sewer Cleaning.
 - c. After cleaning, the manhole sections shall be visually inspected by means of CCTV. The inspection then will be done one linear section at a time and the flow in the section being inspected will be suitably controlled as specified (see Sewer Flow Control Specification Section 01520). All CCTV inspections shall be performed in accordance with PACP standards including the specific date and time of inspection.
- I. Inspection equipment shall utilize software capable of providing complete survey reports, inspection standard exchange database, and linked media files; equipped with modules necessary for NASSCO Pipeline Assessment and Certification Program inspection.
- J. If television/sonar inspection of an entire manhole to manhole sewer segment cannot be successfully performed from one manhole, a reverse setup shall be performed to obtain a complete inspection. A reverse setup shall be considered incidental to and included in the segment's unit price bid for CCTV inspection. If upstream (reverse) setup, is required, establish new inspection run separate from downstream (normal) setup so two inspection records exist in the software, one with the normal setup and one with the reverse setup.
- K. Televised pipe segment inspection is represented by one manhole-to-manhole pipe segment or other structural access-to-access point; not multiple manhole-to-manhole segments.
- L. Show continuous footage reading and other required information on inspections image. Place on screen where it is clearly visible (if black font, do not place on dark background, if white font, do not place on light background).
- M. Viewing shall be in direction of flow, except while camera is being used in a reverse setup. Inspection shall proceed from upstream to downstream, unless prohibited by obstruction.
- N. Keep camera lens clean and clear. If material or debris obscures image or causes reduced visibility, clean or replace lens prior to proceeding with recording operation.
- O. Camera lens shall remain above visible water level and may submerge only while passing through clearly identifiable line sags or vertical misalignments. If flow exceeds 25 percent of diameter and the camera lens becomes obscured, pause inspection until flow subsides. If necessary, reschedule CCTV operation. Surcharging and flooding of camera lens is not an excusable condition if it has been artificially created upstream, i.e., placement of flow plugs or freshwater flushing in pipe.
- P. Pan the camera to record the inside of each lateral or connecting pipe and the connection of lateral or connecting pipe to sewer pipeline.
- Q. Recordings shall clearly show all defects and observations, and their severity in addition to obvious features, i.e., laterals and joints.

- R. Immediately report to Program Manager any obstructions restricting flow and causing inspection to be interrupted. Assure the obstruction is documented in the inspection with the appropriate defect code. Document condition with still photographs, and begin a reverse inspection setup or inspections of other pipelines to the satisfaction of the Program Manager.
- S. Televise pipe segments from manhole to manhole on same video in continuous run.
 - 1. Video shall clearly show camera starting and ending at manhole, unless defects do not allow it.
 - 2. Do not perform partial televising on one video and then complete run on another video.
 - 3. If line is partially televised, due to excusable condition, i.e., collapsed line, televised length shall be viewed by the Program Manager.
 - 4. If a portion of the Contractor's inspection is unacceptable to the Owner or Program Manager, the entire pipe segment shall be deemed unacceptable and the Contractor shall re-televise the entire pipe segment at the Contractor's sole expense.
- T. The Program Manager may, on occasion, accept a physical inspection not adhering to minimum standards if adverse conditions are encountered and re-inspection is not advised.

3.02 CCTV/SONAR INSPECTION

- A. Data Transfer: Upon completion of CCTV inspection, transfer inspection data to an external hard drive (HD) of sufficient capacity and compatibility with Owner's and Program Manager's equipment and available programs; include code required for proper playback of video file.
- B. Labeling: Provide printed label on outside of HD that indicates the following:
 - 1. Name of owner
 - 2. Project title
 - 3. Date of submittal
 - 4. Inspection company
 - 5. Deliverable number
 - 6. Project assignment area (provided by Program Manager)
- C. Media:
 - 1. Video:
 - a. Inspections completed, with a unique filename per manhole to manhole pipe segment inspection.
 - b. Continuous digital video recordings of the inspection view as it appears on the television monitor shall be taken. The recording shall also be used as a permanent record of defects.
 - c. The recording shall be MPEG-4. Separate MPEG-4 files shall be created for each pipe. In case of a reverse setup, such inspection shall be stored in a separate inspection record and MPEG file. MPEG

files shall be written to External Hard Drive media for delivery to the Program Manager.

d. MPEG files shall be named according to the following file specification:

TV_[PIPEID]_[Direction]_[MMDDYYYY]_[Incremental Number].mpg

e. The incremental number shall be used if multiple inspections are performed for the same line, such as a reverse inspection setup.

f. The Owner, at its sole discretion, reserves the right to refuse any MPEG, on the basis of poor image quality, excessive bit rates, inconsistent frame rates or any other characteristics that may affect usability by the Owner.

g. The digital video encoding shall include video information that can be reproduced with a video image equal or very close to the quality of the original picture on the television monitor. The replay of the recorded video information shall be free of electrical interference and shall produce a clear, stable image.

2. Audio:

- a. Embedded in video file
- b. Operator will include description of inspection setup, including related information from log form and unusual conditions.
- c. Operation changes (for example, remove roots and restart inspection at footage prior to root removal)
- d. Verbal description and location of each defect
- e. Verbal description and location of each service connection

D. Still Photographs:

1. Provide color digital photographs showing inspection image whenever observation or defect has a moderate or major severity; looking into a lateral or connection pipe; or unless otherwise instructed by the Owner or Program Manager;
2. Each with a unique filename matching the asset ID with a random number;
3. Encoded in .JPEG format;
4. Minimum 1024 x 768 resolution; and
5. Provide label on front of photograph with structure identification number, footage (if not visible on photograph), and defect code (if applicable).

E. Database:

1. Include all inspections in a single consolidated PACP Version 6 or newer Access Standard Exchange database. Creating a database per inspection is not acceptable. Each submittal standard exchange database shall be cumulative containing all prior inspections as well as inspections conducted during interim period since previous submittal.
2. Provide PACP standard exchange database of collected data including anticipated inspection header field attribute information as shown in Attachment A:

3. File Type: MS Access, .MDB, .ACCDB
4. Database Format: PACP Version 6 or newer. NASSCO PACP data will be exported into Standard PACP Standard Exchange database.
5. List inspection media names in corresponding asset/inspection/defect information field within database.

F. Linear Measurement:

1. The CCTV/sonar monitor display will incorporate an automatically updated record in feet and tenths of a foot of the footage of the camera or center point of the transducer, whichever unit is being metered, from the cable calibration point, the pipe diameter (physical measurement by Contractor), and verified pipe material. The relative positions of the two (2) center points will also be noted.
2. The Contractor shall use a suitable metering devise enabling the cable length to be accurately measured; this shall be accurate to 0.20 feet. The Contractor shall use the footage readings to identify location of defects to the nearest 0.10 feet. Measurement shall be zeroed after each segment inspected. The Contractor shall calibrate the footage meter on a regular basis and demonstrate that the tolerance is being achieved by tape measurement between manholes on the surface. This taped measurement must be included on a quality control form which will be completed and submitted by the Contractor depicting the level of accuracy achieved.

G. Data Display, Recording and Start of Survey/Inspection:

1. At the start of each sewer length being surveyed or inspected and each reverse set-up, the length of pipeline from zero (0) footage, the entrance to the pipe, up to the cable calibration point will be recorded and reported in order to obtain a full record of the sewer length. Only one (1) survey will be indicated in the final report. All reverse set-ups, blind manholes, and buried manholes will be logged on a separate log. Video digits will be recorded so every recorded feature has a correct tape elapsed time stamp. Each log will make reference to a start and finish manhole unless abandonment took place because of blockage.
2. The footage reading entered on to the data display at the cable calibration point must allow for the distance from the start of the survey/inspection to the cable calibration point such that the footage at the start of the survey is zero (0).
3. In the case of surveying through a manhole where a new header sheet and file must be created, the footage will be set at zero (0) with the camera focused on the outgoing pipe entrance.
4. At the start of each manhole length a data generator will electronically generate and clearly display on the viewing monitor and subsequently on the video recording a record of data in alpha-numeric form containing the following minimum information:
 - a. Automatic update of the camera's footage position in the sewer line from adjusted zero (0)
 - b. Sewer dimensions
 - c. Manhole/pipeline asset ID number

- d. Date of survey
- e. Road name/location
- f. Direction of survey
- g. Time of start of survey
- h. Sewer use (SS - Sanitary Sewer)
- i. Material of construction of the pipe
- j. The size and position of the data display will be such as not to interfere with the main subject of the picture.

5. Once the survey of the pipeline is under way, the following minimum information will be continually displayed:

- a. Automatic update of the camera's footage position in the sewer line from adjusted zero (0).
- b. Manhole or pipe asset ID number.
- c. Defect/observation code(s) (temporarily display when encountered)
- d. Date and time

6. Before camera enters the pipe, inspection shall provide video of the manhole. Video recording shall begin by facing pipe segment to be televised and then pan/tilt/zoom as necessary to point camera up toward the manhole opening.

H. Coding: Defect Coding, as well as material, shape, and lining coding, and conventions used will comply with PACP formats and will be compatible with the Owner's GIS.

3.03 MAN ENTRY SURVEY

- A. Photographic Camera Position - General Illustration of Sewer Interior:
 - 1. The hand-held photographic camera or CCTV camera will be positioned to reduce the risk of picture distortion. In circular sewers the camera lens will be positioned centrally looking along the axis of the sewer. In non-circular sewers picture orientation will be taken at mid-height, unless otherwise agreed, and centered horizontally.
 - 2. The hand held photographic camera or CCTV camera will be positioned so the long side of the photograph or CD-ROM frame is horizontal.
- B. Photographic Camera Position - Lateral/Specific Defect: A means of accurately locating the photographic or camera's footage and any recorded lateral or defect, along the sewer will be provided, to an accuracy of $\pm 1\%$ or six (6) inches, whichever is greater.
- C. Photographic Quality: The in-sewer photographic camera or hand held CCTV system and suitable illumination will be capable of providing an accurate, uniform and clear record of the sewer's internal condition.

3.04 DELIVERABLES

- A. Digital PACP Standard Exchange database shall be submitted on external hard drive in duplicate to the Program Manager. The database must contain all the data required by this specification.

- B. Final Television/Sonar Inspection Reports shall be submitted to the Program Manager in PDF on the same external hard drive referenced above. Corresponding MPEG videos and photos shall also be submitted to the Program Manager as outlined by this specification.

3.05 PUBLIC NOTIFICATION – CCTV INSPECTION

- A. Public notification is critical and compliance with the public notification criteria is a prerequisite for CCTV inspection, especially when conducting inspections on sewers in easements passing through private property. Notification must be provided to all property occupiers/owners likely to be affected including residential, commercial and institutional (schools, hospitals, nursing homes, etc.). At a minimum, the following steps shall be taken:
 1. The Contractor shall print and distribute pre-approved advance notice door hangers 72 hours before conducting CCTV inspection. The Contractor shall distribute the door hangers to the property owners (residential, commercial and institutional) in the affected area(s).
 2. The advance notice door hangers shall be customized by Public Outreach to suit this project and will be provided to the Contractor for printing prior to project commencement. If CCTV inspection is delayed, the Contractor must re-distribute door hangers.
 3. The Contractor is responsible for distributing pre-approved “Right-of-Entry” (ROE) forms and securing signatures from affected property owners on the ROE forms prior to conducting CCTV inspection.
- B. The Contractor shall keep a daily log of the distribution of the door hangers. This shall be maintained and submitted to the Owner and/or Program Manager upon request.
- C. The Contractor shall alert the appropriate Owner and Program Manager personnel of their work locations on a daily basis.
- D. Contractor will provide and place “Right-of-Way” signs in prominent locations where CCTV is planned 24-hours in advance of commencing the inspection. Signs will be a minimum of 24 inches wide by 18 inches high with letters a minimum of 2 inches high. Signs will be supported a minimum of 12 inches above grade by integral metal frames. Wording on the signs shall be similar to the following:

CCTV INSPECTION WILL BE CONDUCTED ON “date” and “time.” Contact “person” with “company” at “phone number” for additional information.

3.06 QUALITY ASSURANCE/QUALITY CONTROL

- A. Data Quality Control Procedure:
 1. The Contractor shall perform a Quality Control (QC) check of the televised inspection documentation using the QC database provided by the Program Manager.
 2. The Contractor shall correct any data conflict, missing data, or other questionable entry identified by the conflict, missing data, or other

questionable entry identified by the QC reports prior to submitting the CCTV inspection data to the Program Manager.

- B. The Contractor shall establish and perform a QA/QC analysis addressing all video and data recorded before the data is submitted to the Owner/Program Manager. The Program Manager will periodically request the Contractor to review the QC results with the Program Manager.
- C. The data submissions shall undergo the same random review checks for Quality when submitted to the Owner/Program Manager. Should accuracy or qualitative levels fall below those deemed acceptable to the Program Manager, the data submittal will be refused and no payment will be released. Contractor will be required to correct or re-do inspections until the Program Manager is satisfied with the work.

3.07 DOCUMENTATION

- A. The Contractor shall complete work on each asset as described herein. Refer to the Measurement and Payment Section (Section 01025) for documentation required with each pay request.
- B. Measurement Units: All dimensions will be in feet and inches. Sewer measurement will be to the nearest inch.
- C. CCTV and Man-Entry Photographs: Photographs will be taken of all laterals or connecting pipes and moderate or severe pipeline defects. Where a defect is continuous or repeated the photographs will be taken at the beginning of the defect and at not less than ten (10) foot intervals thereafter.
- D. The Contractor shall complete weekly and end of work television/inspection reports as described herein. These reports shall be per the format and defect codes of NASSCO's Pipeline Assessment and Certification Program (PACP). Prior to beginning work, the Contractor shall submit a digital sample of the television inspection report to the Program Manager for approval.

END OF SECTION

Attachment A - PACP Standard Exchange Database Anticipated Inspection Header Form
Attribute Guidance Table (CCTV)

SECTION 01520

SEWER FLOW CONTROL

PART 1 – GENERAL

1.01 SECTION INCLUDES

The purpose of this section is to define the various methods of wastewater flow control including plugging/blocking and bypass/diversion pumping. Wastewater flow control shall maintain an efficient and uninterrupted level of service to the sewer system while performing investigative or construction operations.

1.02 RELATED SECTIONS

- A. Section 01300 – Submittals
- B. Section 01510 – Sanitary Sewer Main Television and Sonar Inspection
- C. Section 02800 – Gravity Sewer Rehabilitation
- D. Section 02500 – Lining Cured-In-Place-Pipe (CIPP)
- E. Section 02501 – Lining with Ultra Violet Fiberglass Cured-in-Place Pipe
- F. Section 02520 – Internal Point Repairs with CIPP
- G. Section 02535 – Gravity Flow Sanitary Sewers
- H. Section 02956 – Sanitary Sewer Cleaning
- I. Section 02958 – Pipe Rehabilitation by Pipe Bursting Method

1.03 REFERENCES

- A. ASTM D1238 - Standard Test Method for Melt Flow Rates of Thermoplastics by Extrusion Plastometer
- B. ASTM D1248 - Standard Specification for Polyethylene Plastics Extrusion Materials for Wire and Cable
- C. ASTM D1505 - Standard Test Method for Density of Plastics by the Density-Gradient Technique
- D. ASTM D1693 - Standard Test Method for Environmental Stress-Cracking of Ethylene Plastics
- E. ASTM D2122 - Standard Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings
- F. ASTM D2657 - Standard Practice for Heat Fusion Joining of Polyolefin Pipe and Fittings

- G. ASTM D2837 - Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials or Pressure Design Basis for Thermoplastic Pipe Products

1.04 QUALIFICATIONS

- A. Qualification documentation will be submitted as a part of all Requests for Proposals and Prequalification.
- B. The Contractor must meet all of the following criteria to be considered qualified to propose and/or bid on the subject contract:
 1. The Contractor, or their subcontractor, must document they, not their parent company, related company, or the experience of an individual/s, have been in this line of business a minimum of five (5) years.
 2. The Contractor, or their subcontractor, must document they, not their parent company, related company, or the experience of an individual/s, have performed gravity sewer bypass/diversion pumping for the sizes of sewer mains and flows expected under this contract in the past two (2) years. This documentation shall include locations, references (including names and phone numbers), pipe sizes, pump sizes and pumping rates. This documentation must include a minimum of three (3) different projects and must cover the range of sizes of sewer mains and flows expected under this contract.

1.05 SUBMITTALS

- A. Prior to any bypass/diversion pumping activity the Contractor shall submit the complete and detailed bypass pumping plan to the Owner's Representative's for review and approval as required of Section 01300, Submittals.
- B. The bypass system shall meet the requirements of all codes and regulatory agencies having jurisdiction. The Contractor may submit a general bypass/diversion pumping plan to be used when bypassing sewer mains smaller than 12-inch diameter. Once the Contractor has received written approval from the Owner's Representative for the smaller than 12-inch sewer main plan, the Contractor may use the plan without re-submittal. The contractor is completely responsible for the design, installation and operation of an effective bypass system. The Owner's Representative's review is for general conformance only and does not relieve the Contractor of any responsibility.
- C. For bypass plans associated with 12-inch or larger sewer mains, a Georgia certified Professional Engineer must sign and seal the bypass/diversion plan.
- D. The bypass/diversion pumping plan submittal, regardless of pipe size, shall have sufficient detail to show the following at a minimum:
 1. Lowest overflow point upstream of the bypass/diversion.
 2. Pump stations upstream of the bypass/diversion.
 3. Staging area for pumps.
 4. Sewer plugging method and types of plugs.

5. Number, size, material, location and method of installation of suction piping and required protection against any potential for vortexing
6. Number, size, material, location and method of installation of discharge piping.
7. Bypass pump sizes, capacity, number of each size to be onsite and the power requirements, including standby equipment that must also be on site.
8. System curve design calculations detailing the static lift, friction losses, velocity losses and flow velocities.
9. Pump curves with the system curves plotted showing the pump operation range and confirming the pump size, horsepower and impeller required.
10. Standby power generator size and location, if utilized.
11. Noise control and abatement measures.
12. Downstream discharge plan including pipe routing plan and profile views.
13. Sections showing suction and discharge pipe depth, embedment, joint restraints, thrust blocking and backfilling.
14. Method of protecting discharge manholes or structures from erosion and damage.
15. Location and position, in detail, where pipes cross roadways and driveways.
16. Traffic Control Plan, if applicable.
17. The plan should take into account the potential for wet weather with flow calculations adjusted accordingly.
18. Identification Personnel committed solely to monitoring the bypass system including but not limited to bypass pumps, discharge lines, related pump stations, manhole levels, etc. This monitoring shall be conducted continuously until the bypass system is no longer needed.

E. The Contractor will provide an emergency response plan for each bypass/diversion pumping. The plan shall address at a minimum, protocol for Owner contact, emergency 24-hour contact names and numbers including responsible contractor personnel and vendor emergency numbers, containment and clean up procedures, backup equipment and materials that will be on site, monitoring responsibility and all other information required by the Owner's Representative. The plan will be followed in the event of failure of the bypass/diversion pumping system.

F. The Contractor must identify all pump stations and the lowest overflow point upstream of the plugging/block and/or bypass/diversion pumping. The Contractor may be required, at no additional cost to the Owner, to station personnel at upstream pump stations and overflow points.

G. The Contractor shall notify the Owner's Representative a minimum of 48 hours prior to commencing any plugging/block and/or bypass/diversion pumping.

H. The Contractor shall complete a daily written record (diary) detailing the work carried out and any small items of Work incidental to the Work. The Contractor shall include in his daily record and reference to the following:

1. Delays: Dense traffic, lack of information, sickness, labor or equipment shortage, etc.
2. Weather: Conditions (e.g., rain, sunny, windy, etc.).

3. Equipment: On site including size, model, number (e.g., specialty cleaning, bypass equipment, etc.).
4. Submittals: To the Owner's Representative's.
5. Personnel: On site by name, trade, hours on site (e.g., all labor, specialty services, etc.).
6. Accident: Report (e.g., all injuries, vehicles, etc.).
7. Incident: Report (e.g., damage to property, property Owner's complaint, etc.).
8. Major defects encountered: including collapsed pipe, if any, cave-ins, sink holes, etc.
9. Visitors: On site.
10. Disposals: Type and quantity of debris (including liquids).
11. Daily Work: Work attempted and work accomplished.

1.06 EXPERIENCE

- A. Experience documentation will be submitted as a part of all Requests for Proposals and Prequalification. The Contractor shall provide the Owner's Representative with written documentation acknowledging the supervisor and field crew leaders responsible for this work have received the proper training, are certified, and have the requisite experience. This documentation will include dates of hands-on experience, employer, description of duties/experience, 24-hour contact name and phone number along with pumping vendor contacts, experience and a written commitment to 24-hour emergency service. Documentation on any person shall not be longer than one (1) page.
- B. Supervisor of the field crews must be properly trained in this function and have a minimum of three (3) years' experience in performing successful gravity sewer bypass/diversion pumping, to include safe working practices for the types of equipment and operation of the equipment used for this contract.
- C. Field crew leaders must be properly trained in the function and have a minimum of two (2) years hands-on experience in performing successful bypass/diversion pumping, to include safe working practices for the types of equipment and operation of the equipment used for this contract.
- D. No crewmembers shall enter confined spaces without the necessary certified training.

1.07 PERSONNEL

- A. The Supervisor must visit the project site daily, checking on their personnel and subcontractors, meeting with the field crew leaders, as well as checking on the status and progress of the project.
- B. A field crew leader must be with their crew when their crew is working. Each field crew leader can only have one crew. Each crew must have its own field crew leader; this includes when the requirements call for 24-hour monitoring.

1.08 RESPONSIBILITY FOR SANITARY SEWER OVERFLOWS AND DAMAGE TO PROPERTY AND UTILITY

- A. Reference Specification Section 01030 – Special Project Procedures

1.09 SAFETY

- A. All work shall be performed in accordance with OSHA standards and State and Federal safety regulations.
- B. No person shall enter a confined space without the documented requisite training, certification, and entry permit.

PART 2 – PRODUCTS

2.01 PIPE FOR FLOW DIVERSION

- A. Ductile Iron Pipe: Ductile iron pipe, as specified in DeKalb County Design Standard for Ductile Iron Sanitary Sewer Pipe and Fittings, is acceptable for use for flow diversion during construction.
- B. High Density Polyethylene Pipe (HDPE) is permitted for flow diversion. Polyethylene material shall comply with the requirements for Type III polyethylene, C-5 and P-34 as tabulated in ASTM D-1248 and has the Plastic Pipe Institute recommended designation PE3406. The material shall also have an average specific base resin density of between 0.94 g/cc and 0.955 g/cc (ASTM D-1505). Pipe made from these resins must have a long-term strength (50 years) rating of 1,250 psi or more per hydrostatic design basis categories of ASTM D-2837. The polyethylene resin shall contain antioxidants and be stabilized against ultraviolet degradation to provide protection during processing and subsequent weather exposure. The polyethylene resin shall have an environmental stress crack resistance condition C, as shown in ASTM D-1693, to be greater than 500 hours, 20% failure. All pipes shall be made from virgin quality material. No rework compound, except when obtained from the manufacturer's own production of the same formulation shall be used. The polyethylene resin shall have an average melt flow index, condition E as shown in ASTM D-1238, not in excess of 0.25 g/10 mm. Pipe shall be homogeneous throughout, and free of visible cracks, holes, foreign material, blisters, or other deleterious faults. Diameters and wall thickness shall be measured in accordance with ASTM D-2122. Pipe joining will be done by thermal butt fusion method in accordance with ASTM D-2657.
- C. Polyvinylchloride (PVC) pipe is permitted for flow diversion. PVC pipe shall be rigid and securely coupled with a minimum number of connections. Glued PVC is not allowed.
- D. Lay flat hose is permitted for use with 2" and 3" gas powered portable pumps, and must be in like new condition free of damage, leaks or other unacceptable conditions. Use of lay flat hoses across roadways is prohibited.
- E. Irrigation type piping is not allowed.

- F. No more than two (2) pump discharge hoses will be allowed at any given time. The length of these hoses shall be limited at the direction of the Owner's Representative or as indicated in the approved by-pass pumping plan. The Contractor, at a minimum, shall design all piping, joints and accessories to withstand twice the maximum operating pressure or 100 psi whichever is greater.
- G. If required, the Contractor must provide air relief (air relief valves, etc.) on bypass/diversion pumping discharge piping to insure proper operation.
- H. All pumps used shall be fully automatic self-priming units and do not require the use of foot-valves or vacuum pumps in the priming system. The pumps may be electric, gas, or diesel powered, provided they meet all specified sound level requirements. If electric pumps are used, the combined generator/pump system shall meet the specified sound level requirements. All pumps used shall be constructed to allow dry running for long periods of time to accommodate the cyclical nature of effluent flows.
- I. Maintain sufficient equipment, materials and personnel on site to monitor the system and ensure continuous and successful operation of bypass and dewatering systems.
 - 1. Keep standby pumps on site, fueled and operational at all times.
 - 2. Maintain sufficient number of valves, tees, elbows, connections, tools, sewer plugs, piping, and all other necessary parts or system hardware on-site to ensure immediate repair or modification of any part of system as necessary.
- J. Unless specified otherwise in these Specifications or approved by the Owner's Representative, all pumps (and generators if used) shall be fully sound attenuated and shall produce a noise level of sixty-five (65) dB or less at a distance of twenty-three (23) feet.
- K. The Contractor shall provide the necessary stop/start controls for each pump.

PART 3 – EXECUTION

3.01 GENERAL STANDARDS AND REQUIREMENTS

- A. Prior to commencing each bypass/diversion pumping activity the Contractor must receive written approval from the Owner's Representative.
- B. Ensure all levels of sewage flow are continuously monitored and effectively handled.
- C. The back-up pump, appropriate piping, fuel, lubrication and spare parts shall be incorporated into the bypass/diversion pumping arrangement at the site, ready for use in case of a breakdown.
- D. At no cost to the Owner, the Contractor will carry out a "trial run" of the bypass/diversion arrangement on all sewers greater than 12-inches. This trial run must be conducted before the Owner's Representative will accept the arrangement. The "trial run" shall demonstrate the incorporation of all standby equipment to handle flows when the main pump set is switched off. The "trial run" shall be performed using *clean* water. Additionally, the Contractor shall perform leakage and pressure tests of the bypass pumping discharge piping using *clean* water prior to the actual operation. The pressure and leakage test shall be conducted at one-and-a-half

times the maximum pressure the system will experience based on the approved Bypass Pumping Plan for a period of two hours.

- E. All materials used for bypass/diversion pumping shall be pre-approved by the Owner's Representative prior to commencing pumping activities. Materials later determined to be unacceptable shall be replaced with acceptable materials at no additional cost to the Owner.
- F. When wastewater flows at the upstream manhole of the sewer main being televised are above the maximum allowable requirements for television inspection, or do not allow the proper sewer or manhole repair, the flows shall be reduced to the levels required by one of the following methods: plugging/blocking or bypass/diversion pumping of the flows, as approved by the Owner's Representative.
- G. In some applications, the wastewater flow may be plugged/blocked and contained within the capacity of the collection system. This shall only be done when it has been determined by the Contractor and approved by the Owner's Representative the system can accommodate the surcharging without any adverse impact to the system or customers.
- H. When a sanitary sewer is being rehabilitated or replaced, the Contractor shall provide notification to all Property Owner's forty-eight (48) hours in advance of planned downtime for public and private service laterals connected to or served by the sewer main being rehabilitated or replaced. Downtime for all private or public service laterals is not to exceed six (6) hours.
- I. During construction, flows in sections of the existing sewer being rehabilitated by removal and replacement shall be accommodated by plugging/blocking or bypass/diversion pumping.
- J. The plan must keep the wastewater flowing without discharge or spills into any storm sewers, adjacent creeks or on to the ground. No bypassing to ground surface, receiving waters, storm drains, or bypassing resulting in groundwater contamination or potential health hazards shall be permitted. The Contractor will seek and obtain inspection and testing approval of each section of newly laid sewer before removing the flow diversion from service and placing the newly installed or rehabilitated section into service.
- K. In sections of the existing sewer being rehabilitated by laying a new line parallel to the existing sewer, the existing sewer may be used to accommodate the existing flow, and no bypass/diversion pumping will be necessary if the existing sewer is not damaged or otherwise unsuitable for effective use or its use restricted by the Contractor's operations.
- L. All pipe materials utilized in wastewater flow control shall be in like new condition, and free of defects, and leaks. The Contractor, at no cost to the Owner, shall replace any defective material. Upon completion of the job, wastewater flow control materials shall be removed from the site.
- M. Before any wastewater flow control equipment is installed, the Contractor shall de-silt the segment of sewer to be bypassed while it is still under flow. Subsequent jetting

and final cleaning before inspection or repair shall be undertaken while the segment of sewer is bypassed.

- N. The Contractor is responsible for locating any existing utilities in the area the Contractor selects to locate the bypass pipelines. The Contractor shall locate his bypass pipelines to minimize any disturbances to existing utilities and shall obtain approval of the pipeline locations from the Owner's Representative. All costs associated with relocating utilities and obtaining all approvals shall be paid by the Contractor.
- O. During all wastewater flow control operations, the Contractor shall protect manholes and all local sewer lines from damage inflicted by any equipment. The Contractor shall be responsible for all physical damage to mainlines, manholes, and all local sewer lines caused by human or mechanical failure.
- P. The Contractor shall complete all wastewater flow control activities with the minimum sound level compatible with the herein specified noise levels for temporary pumping systems.

3.02 DEPTH OF FLOW

- A. In performing television inspection (without sonar), joint testing, and/or sealing and other sewer rehabilitation work, the Contractor shall control the depth of flow in the sewer within the following guidelines:

Maximum Pipe Flow Depth

Television Inspection		Joint Testing and Sealing	
Pipe Size	% Pipe Dia.	Pipe Size	% Pipe Dia.
6"-12"	25	6"-12"	20
15"-24"	25	15"-24"	25
27" or larger	25	27" or larger	30

- B. When sewer line flows, as measured in the first manhole upstream of the sewer segment being inspected or rehabilitated, exceed the maximum depth listed above or inspection of the complete pipe periphery is necessary for effective testing, sealing, or line work, the Contractor shall implement wastewater flow control methods. The implementation of the flow control method shall be reviewed and approved by the Owner's Representative.

3.03 PLUGGING AND BLOCKING

- A. The Contractor shall insert a sewer line plug into the line at a manhole upstream from the section being inspected or repaired. The plug shall be so designed so all or any portion of the flow can be released. Plugs should be secured to manhole to prevent movement downstream. Flows shall be shut off or reduced and continuously monitored to within the maximum flow limits specified. Wastewater flow shall be restored to normal following completion of work.

- B. No Plumbers plugs will be allowed.

3.04 BYPASS/DIVERSION PUMPING

- A. When bypass/diversion pumping is required, a pump size shall be determined by the Contractor. The Contractor shall supply the necessary pumps, conduits, and other equipment to effectively divert the flow of wastewater around the sewer section where the work is to be performed. The bypass system shall have sufficient capacity to handle existing flows plus additional flow potentially occurring during periods of rainstorms as indicated from the flow monitoring program. The Contractor shall be responsible for furnishing the necessary labor and supervision to set up, monitor and operate the pumping and bypassing system. A "setup" consists of the necessary pumps, conduits, and other equipment required to divert the flow of wastewater from the start to finish of work performed.
- B. Wastewater shall be pumped directly into the nearest available downstream manhole, provided the existing sewer has the capacity to transport the flow. The Contractor shall request the Owner's Representative to determine the capacity of the downstream existing system. The Contractor shall request this determination a minimum of fourteen (14) calendar days prior to the planned bypass/diversion pumping.
- C. The Contractor shall be responsible for monitoring and keeping the pumps running continuously 24 hours a day, if required, until the bypass operation is no longer required. The Contractor shall have standby pumps on site along with all necessary supporting materials, accessories, fuel and personnel at all times.
- D. Bypass pumping systems shall have sufficient capacity to pump peak flows in the pipes being bypassed (flows in the existing interceptor sewers can increase dramatically during periods of wet weather). The Contractor shall provide all pipeline plugs, pumps of adequate size to handle wet weather peak flows, and temporary discharge piping to ensure the total flow of the interceptor sewer is safely diverted around the section to be repaired. Wastewater flow control system will be required to be operated and monitored twenty-four (24) hours per day.
- E. Maintenance personnel capable of starting, stopping, refueling, and maintaining the pumps and equipment during the bypass/diversion pumping operation shall continuously monitor pumps and equipment. If pumping is required on a 24-hour basis, engines shall be equipped in a manner to keep noise within limits specified herein.

3.05 FLOW CONTROL PRECAUTIONS

- A. Where the wastewater flow is plugged/blocked, the Contractor shall be responsible for taking all necessary precautions to protect public health. The sewer lines shall also be protected from damage. The following shall apply:
 1. No wastewater shall be allowed to back up into any homes or buildings.
 2. No wastewater shall overflow any manholes, cleanouts, or any other outlet.
 3. Customers upstream of the flow control area shall be able to use all their water and sewer utilities without interruption.

4. If any of the above occur or are expected to occur, the Contractor shall provide bypass pumping or flow diversion to alleviate all of the conditions and perform response as stipulated per the Consent Decree. Additionally, the Contractor shall continuously monitor and observe the conditions upstream of the plug and be prepared to immediately start bypass/diversion pumping, if needed.
- B. Any sump pumps, bypass pumps, trash pumps, or any other type of pump, pulling wastewater or any type of material out of the manhole or sewer, shall discharge the material into another manhole, or appropriate sealed vehicle or container approved by the Owner's Representative. Under no circumstances shall this material be discharged, stored, or deposited on the ground, swale, road, or open environment.
- C. The removal of excavated materials that contain, or are contaminated by sewage, including but not limited to spoil materials, pipe, debris, portions of manholes etc. shall be discharged into appropriate sealed vehicles or containers and not placed on the ground, swale, road, or open environment.
- D. The Contractor shall take appropriate steps to ensure all pumps and piping carrying raw wastewater are protected from traffic. Traffic control shall be performed in accordance with the requirements of the governing agency.
- E. Prior to any wastewater flow control operations, the Contractor will identify the pump station/s and lowest overflow point upstream of the planned plugging/blocking or bypass/diversion. During operations the Contractor will continuously monitor the pump stations and lowest points to ensure overflow does not occur.
- F. In the event, during any form of "Sewer Flow Control," raw wastewater is spilled, discharged, leaked, or otherwise deposited in the open environment, the Contractor shall immediately stop overflow and shall immediately report overflows to the Owner's emergency dispatch center and the Owner's Representative. The Contractor shall be responsible for any containment and cleanup of liquids and solids and stabilization of the area affected. This work shall be performed at the Contractor's expense with no additional cost to the Owner. The Contractor shall also be responsible for notifying the Owner's Representative and complying with any and all regulatory requirements for cleaning up the spill at no additional cost to the Owner. The Contractor shall be responsible for any fines assessed by regulatory agencies including the Georgia Environmental Protection Division (EPD).
- G. During wastewater flow control operations, the Contractor shall take proper precautions to prevent damage to existing sanitary sewer facilities, flooding, or damage to public or private property.
- H. The Contractor shall be responsible for, and make repairs, replacements or rebuilds, as directed by the Owner's Representative, to any portion of the sewer system damaged during any plugging or bypass/diversion pumping operation. All such repairs, replacements, and rebuilding shall be paid for by the Contractor.
- I. The Contractor shall be responsible for, and make such provisions, as are necessary, for handling all flows in existing sewers, connections, and manholes by pipes, flumes, or by other approved methods at all times, when his operations would, in anyway, interfere with normal functioning of those facilities.

- J. The Contractor shall be responsible for the removal of any debris and sedimentation in the existing sewers, laterals, and manholes, etc., attributable to his work under this Contract. The Contractor is responsible for the proper disposal of these items. The debris and liquids are to be disposed of properly in accordance with all applicable laws. The local municipality can furnish a letter to the landfill stating the contractor is authorized to dispose of the non-hazardous materials. Debris and liquids type and quantities are to be tracked in the daily Contractor diary. Hauling and disposal costs will be borne by the Contractor.
- K. It is the Contractor's responsibility to notify in writing any Property Owner and/or resident having a sewer service connection on the sewer being rehabilitated or replaced. The Contractor shall notify Property Owners 48 hours prior to commencing sewer rehabilitation or replacement. The Contractor shall be solely responsible for any damage caused by property service connection backups caused by the sewer rehabilitation operations.

3.06 CLEAN UP

- A. Keep premises free from accumulations of waste materials, rubbish, and other debris resulting from the Work.
- B. Restore to original condition portions of site not designated for alterations by Contract Documents.
- C. When by-pass pumping operations are complete, drain piping into sanitary sewer prior to disassembly.

END OF SECTION

SECTION 01540

SECURITY AND SAFETY

PART 1 – GENERAL

1.01 SECTION INCLUDES

This section includes procedures and guidelines for ensuring the safety and security of Owner's job sites and Department of Watershed Management (DWM) facilities. The Contractor shall obtain the latest official copies of these requirements from the Owner's Representative.

1.02 RELATED SECTIONS

This Section applies to the work of every division and every section of these Specifications.

1.03 REFERENCES

- A. Occupational Safety and Health Standards issued by the Secretary of Labor pursuant to the Williams-Steiger Occupational Safety and Health Act of 1970 and as amended.
- B. American National Standards Institute (ANSI Z117.1-20030) for New Construction – Confined Space.
- C. Manual of Uniform Traffic Control Devices for Streets and Highways 2009 Edition and as amended.

1.04 DEFINITIONS

- A. Owner's Representative: The Owner's representative authorized to make decisions regarding the contract.
- B. Project Safety Coordinator: a representative on behalf of the Contractor who is responsible for the safety of the Contractor's and Program Manager's employees, the Owner's personnel and all other personnel at the site of the work caused by their operations.
- C. Competent Person: A person who is able to identify existing and predictable hazards in the workplace as unsanitary, hazardous, or dangerous to employees, and who has the authority to take prompt corrective measures to eliminate them.

1.05 SUBMITTALS

- A. The Contractor shall provide the Program Manager and Owner's Representative with a list of 24-hour emergency phone numbers and names including the chain of command.
- B. The Contractor shall maintain a current Employee Log of employees performing work on-site, as well as a Visitor Log, with both available to the County upon request. This log shall be immediately available to the Program Manager and Owner's Representative upon request and submitted as necessary throughout the course of

the project. An example of the Employee Log and Visitor's Log can be found in Attachment A and Attachment B.

- C. Prior to the performance of any work, the Contractor will prepare and submit a Safety/Health and Security Plan to include, but is not limited to, the following minimum requirements:
 - 1. Basic pre-employment background checks for criminal convictions, veracity of previous employment and education statements, driving record and financial responsibility as applicable to the position.
 - 2. Security Education and Awareness training applicable to the job.
 - 3. Standard operating procedures (SOPs) for safeguarding County equipment, supplies and property.
 - 4. Certification requested under the SAFETY Act, Homeland Security Act of 2002, if applicable. Provide date and result as requested.
 - 5. Established process for identification of employees and emergency notification procedures.
 - 6. If applicable, procedures for obtaining entry permits and badges. Procedures for returning badges upon termination of employment.
 - 7. Anti-terrorism training provided to employees including the state of national alert with appropriate procedures.
 - 8. Emergency evacuation procedures including accounting for employees at a safe haven.
 - 9. Procedures for reporting post contract criminal convictions and traffic accidents to the Contract Officer or DWM project manager.
 - 10. SOPs for protecting employees when performing required duties off-site including training for reporting accidents, calling for immediate assistance, job reporting procedures and personal duress codes or alarms.
 - 11. Contact information for the person(s) responsible for implementation and enforcement of Safety/Health and Security rules and regulations for this contract.
 - 12. Safe work procedures for the activities within the Contractor's scope of work.
 - 13. New employee orientation program which addresses job and site specific rules, regulations and hazards.
 - 14. The Contractor's Drug Free Work Place Policy including substance abuse prevention and testing program.
 - 15. Provisions to protect all of the Contractor's employees, other persons and organizations that may be affected by the work from injury, damage or loss.
 - 16. Demonstrated compliance with Safety Audit Evaluations, Safety Inspections, current Federal/OSHA Safety/Health and Security Plan, facility safety program (when applicable), and locally accepted safety codes, regulations and practices.
 - 17. A site-specific emergency and evacuation plan.
 - 18. Hazard Communication/Right to Know Program
 - 19. Security procedures for the Contractors work, tools, and equipment.
 - 20. Capability of providing the Program Manager with documentation to show compliance with their plan, plus accidents and investigation reports.

21. Fire Prevention Measures
22. Safety in Wastewater Works, to include training employees on the biological, chemical, and atmospheric hazards associated with working in sewer systems, Common hazards include hydrogen sulfide, low oxygen, methane gas, and biologicals
23. Confined Space Sewer System Entry, including "Permit Required"
24. Measures to comply with all State and County regulations relative to closing or restricting the use of public streets, roads, or highways. Traffic control procedures, devices and the use of flaggers shall meet all requirements of the applicable current rules and regulations for traffic control.
25. Any other contract specific requirements.

D. Provide a Job Safety Analysis (JSA) for the scope of work, prior to the start of work.

E. The Contractor shall provide the Owner Representative with all safety reports, training records, competent person list, and accident reports prepared in compliance with Federal/OSHA and the Project Safety/Health and Security Plan as requested.

1.06 DELIVERY, STORAGE AND HANDLING

The Contractor is solely responsible for the security of any offices or any temporary staging areas utilized by the Contractor. The Contractor is also responsible for the security and protection of his personnel, materials, tools, vehicles and equipment on-site at all of the various work locations throughout the county.

1.07 PERSONNEL

- A. All personnel working on a DWM project site must wear a visible County-issued ID badge authorizing the person to be on the project site. All personnel must obtain and display an identification badge, issued by DWM's Safety Representative before reporting to work on any CIP project site. Attachment A describes the badging procedures required to obtain badge.
- B. The Contractor shall have a Project Safety Coordinator who shall be identified on the employee log to be submitted.
- C. The Project Safety Coordinator shall ensure compliance with all applicable health and safety requirements of all governing legislation.
 1. The Project Safety Coordinator should have OSHA 30-Hour training as a minimum.
 2. The Project Safety Coordinator should have the authority to resolve safety-related issues on the jobsite.
 3. The Project Safety Coordinator should make regular site inspections as commensurate with the size and scope of the Project.
- D. Contractor shall have a "Competent Person" on-site at all times when excavation, scaffolding, and confined space and open trench operations are being performed.
- E. Contractor shall have at least one currently certified person in First Aid and CPR on-site at all times.

- F. Contractor shall provide suitable first aid provisions and medical supplies necessary to administer emergency first aid treatment. The Contractor shall have standing arrangements for the removal and hospital treatment of an injured person. All first aid facilities and emergency ambulance service shall be made available by the Contractor to the Owner and the Program Manager's personnel.
- G. Should the Contractor dismiss employees who have been given access to the DWM facilities while the contract is in force, the Contractor will advise the DWM Security Office.
- H. The Owner may request the Contractor to immediately remove from the premises and/or dismiss any employee found unfit to perform duties due to one or more of the following reasons:
 - 1. Neglect of duty, absenteeism, security or safety problems and sleeping on the job.
 - 2. Disorderly conduct, use of abusive or offensive language, quarreling, intimidation by words, actions or fighting.
 - 3. Theft, vandalism, immoral conduct or any other criminal action.
 - 4. Selling, consuming, possessing, or being under the influence of intoxicants, alcohol or illegal substances, which produce similar effects while on duty.
 - 5. Involved in a vehicle accident while on the Owner's property or driving the Owner's equipment. No employee, Contractor, or Subcontractor will be extended privileges to drive the Owner's equipment on the Owner's property if driving privileges have been withdrawn by the person's State of residence.
- I. All employees will be required to sign in and out on a designated logsheet.
- J. All employees shall be required to wear at all times in an observable location, above the waist, on outer clothing, an appropriate photo I.D. badge to be furnished by the Contractor and approved by the Owner.
- K. No one under age sixteen is permitted at work sites after normal working hours. Contractor's employees are allowed on work sites only during the specified hours and only when working on this contract. No Contractor employee will be allowed on sites when not specifically working on this Contract's predetermined times and dates.
- L. All employees and agents of the Contractor must read the Project Site Rules statement and sign a log acknowledging understanding of project site rules provided in Attachment D. A sample log is attached to this Section as Attachment B and Attachment C.
- M. The Contractor is solely responsible for the security and protection of their personnel.

1.08 RESPONSIBILITY

- A. Contractor must cooperate with Owner on all security matters and must promptly comply with any project security arrangements established by the Owner's Representative or Program Manager.

- B. It is the Contractor's obligations to comply with all applicable governmental requirements and regulations and to undertake necessary actions to establish and maintain secure conditions at any jobsite.
- C. The Contractor and his subcontractors are wholly responsible for the security of their employees, work areas, and for all their material, equipment and tools at all times.
- D. The Contractor shall comply with the site security program at all times on Owner's facilities.
- E. The Contractor shall maintain the security program throughout the Contract duration.
- F. The Contractor shall restrict entry of unauthorized personnel and employees and vehicles onto the Project site.
- G. The Contractor shall only allow entry to authorized persons with proper Owner-approved identification. All Contractor and Subcontractor employees will be required to have personnel working at these facilities photographed for an Owner-provided identification (ID) badge before they start work.
- H. The Contractor will be held responsible for all damage to the work and any negligence resulting in injuries due to his failure of erecting and maintaining adequate barricades, signs, fences, lights and safety provisions as required. Whenever evidence is found of such damage, the Contractor shall immediately remove the damaged portion and replace it at the Contractor's expense.
- I. The Contractor's responsibility for the maintenance of barricades, signs, fences and lights, and safety provisions as required, shall not cease until the Owner's Representative has accepted, in writing, the Project.
- J. The Contractor shall not allow cameras on-site or photographs to be taken, except those required to perform the Work in accordance with the Contract Documents or otherwise approved by Owner's Representative.
- K. It is not the Owner's Representative's responsibility to verify the Contractor's safety plan for the adequacy and compliance of the plan.
- L. The Contractor shall be fully responsible for the safety and health of the employees, its subcontractors, and lower tier contractors during the performance of its work.
- M. The Contractor shall be responsible for the safety of the Contractor's and Program Manager's employees, the Owner's personnel, and all other personnel at the work site caused by their operations.
- N. It is the responsibility of the Contractor to ensure all articles of possible personal or monetary value found by the Contractor's employees are turned into the Owner's Representative.
- O. The Contractor shall be responsible for maintaining satisfactory standards of employees' competency, conduct, courtesy, appearance, honesty and integrity, and shall be responsible for taking such disciplinary action with respect to any employee, as may be necessary.

P. The Contractor is solely responsible for the security of any offices or any temporary staging areas utilized by the Contractor. The Contractor is also responsible for the security of his materials, tools, vehicles and equipment on-site at all of the various work locations throughout the county.

1.09 SAFETY

The Owner's Representative has the right to refuse access to the site or request a person or vehicle be removed from the site if found violating any of the safety, security, or conduct rules as outlined.

PART 2 – PRODUCTS

(Not Used)

PART 3 – EXECUTION

3.01 PREPARATION

- A. All Contractors/Subcontractors will be required to have personnel working at these facilities photographed for identification (ID) badges before they start work.
- B. The Contractor shall require all employees performing activities on site to sign the "Employee Acknowledgment of Project Site Rules Log" included at the end of this Section in Attachment D. All employees, subcontractor employees and lower tier contractor employees will attend a new employee orientation session. Signature of the Employee Log by the employee certifies the orientation training has been received.
- C. Review of the Contractor's Safety Plan by the Owner's Representative shall not impose any duty or responsibility upon the Owner for the Contractor's performance of the work in a safe manner.

3.02 INSTALLATION

The Contractor shall furnish and erect such barricades, fences, lights, and safety provisions for the protection of persons or property and of the work as necessary.

END OF SECTION

Attachment A – Badging

DeKalb County Badging Procedures

Every person working on a new DeKalb County Watershed Management, CIP construction site must wear a County issued ID badge authorizing the person to be on the project site. This new standard applies to all contractors and subcontractors. All workers must obtain and display an identification badge issued by the County's Safety Representative before reporting to work on any new CIP project. DeKalb County has contracted with Resurgens Risk Management to be the safety representative. The ID badge will play a key role in Watershed Management's security efforts on project sites. Therefore, individuals should wear the assigned badge at all times.

Prior to Badging:

- All contractor and subcontractor employees are required to attend safety training before receiving a badge
- Minimum duration is 2 hours
- The **contractor is responsible** for conducting the training
- The training should cover general construction safety and **specific** hazards employees will encounter on the County project site.
- Employees should have adequate knowledge of all company safety rules and applicable OSHA standards
- Contractor's training should include the specific safety concerns and hazards employees may encounter at the Watershed Management project site
- Personal instruction, safety videos, and on-line training are permissible
- Upon completion, employees should have a basic knowledge of safety, know the company's views about safety, know safety concerns specific to Watershed Management's construction projects, and know what PPE to use on the jobsite.
- Suggested safety topics are included on page 3
- Before training commences, contractor must provide the County the safety training outline. If training is to be received on-line, please include training web site.

Badging:

- Once employees have completed the two-hour training, provide documentation to the County's Safety representative.
- Sign-in sheets must show a printed name, signed name, and date of training.
- E-mail to alfranco@dekalbcountyga.gov
- After receipt of the sign-in sheet, the Safety representative will register the employee in the badging system, then, the employee is eligible to receive the badge.
- Field verification will be done randomly to ensure employees were trained.
- Only those employees registered in the badging system are eligible to receive a badge.
- Badging will take place at the Watershed Management, CIP Division, 1641 Roadhaven Drive, Stone Mtn., 30083

Badging will be conducted on prescribed days and/or by appointment

Badges are valid until the expiration date shown on the badge. If a worker changes companies or projects, the badge must be surrendered and a new badge will be issued if needed. If applicable, the new employer will provide the employee certification that the safety training is completed. After verification by the Safety representative, the badging database will be updated and a new badge issued. All workers shall display the badge on the outer layer garment of clothing between the belt and shoulder. All persons working on a CIP project must wear badges in a manner which is easily displayed. If a badge is lost or stolen, workers will be required to pay a \$20 replacement fee. CASH ONLY- No change will be provided.

Safety Topics Suggestions:

Company Safety Policy/Rules

Basic Safety

Personal Protective Equipment

Fall Protection

Trenching & Excavation

Traffic Control/Traffic Safety

Aerial Lifts

Ladder Safety

Relevant OSHA Standards

Housekeeping

Confined Space

Hazardous Materials

Globally Harmonized Hazard Communication Standard (GHS)

Hand & Power tools

Scaffolding

Attachment B – Employee Log

By signing this log, I acknowledge I have read, understand and agree to abide by the project rules outlined above and all local, state, federal and/or any other applicable contract obligations. I further acknowledge I have been informed by a representative of the company as to the site specific hazards, any hazardous substances I may be exposed to while on the site and the site/company emergency action procedures.

EMPLOYEES (PRINT)	SIGNATURE	Company Name	Date
Signature of Company Representative		Date Signed	

Attachment C -Visitors Log

By the signing of this log I acknowledge I have read, understand and agree to abide by the project rules outlined above. This is not for a vehicle access permit.

VISITOR'S NAME (PRINT)	SIGNATURE	Company Name	Date	IN	OUT

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Attachment D – Project Site Rules

By Signing this Employee Log, I acknowledge I understand and agree to abide by the project rules outlined below. I further acknowledge I have been briefed on specific hazards, hazardous substances that are onsite and the site emergency action procedure.

PROHIBITED ACTIVITIES:

1. Unauthorized removal or theft of Owner property.
2. Violation of safety or security rules or procedures.
3. Possession of firearms or lethal weapons on jobsite
4. Acts of sabotage
5. Destruction or defacing OWNER property
6. Failure to use sanitary facilities
7. Failure to report accidents or job related injuries
8. Being under the apparent influence of drugs, alcohol or other intoxicants or in possession of drugs, alcohol or other intoxicants on the property
9. Wearing shorts or tennis shoes on jobsite
10. Failure to wear a hardhat/safety glasses as required by law.
11. Gambling at any time on project
12. Fighting, threatening behavior, or engaging in horseplay on the project
13. Smoking in unauthorized areas on the project
14. Open fire cooking or making unauthorized fires on project property
15. Selling items or raffles without authorization
16. Use of unauthorized cameras on the project
17. Use of radio or television in the construction area
18. Failure to park personal vehicle in authorized parking area
19. Failure to wear designated identification (Site Specific)
20. Failure to use designated gates
21. Use or storage of unauthorized chemicals or substances on site.

I have read, understand and agree to abide by the PROJECT SITE RULES. Furthermore, I understand failure to abide by these rules is grounds for being denied access to the project site. I have received a personal copy for my use and reference.

Signature

Date

SECTION 01600

MATERIAL AND EQUIPMENT

PART 1 – GENERAL

1.01 SECTION INCLUDES

This section includes requirements of material and equipment incorporated into the work including, but not limited to:

1. Contractor to conform to applicable specifications and standards.
2. Materials and equipment are to comply with size, make, type and quality specified, or as specifically approved in writing by the Owner.
3. Manufactured and Fabricated Products:
 - a. Design, fabricate and assemble in accord with the best engineering and shop practices.
 - b. Manufacturer like parts of duplicate units to standard size and gages, to be interchangeable.
 - c. Two or more items of the same kind shall be identical, by the same manufacturer.
 - d. Products shall be suitable for service conditions.
 - e. Equipment capacities, sizes and dimensions shown or specified shall be adhered to unless variations are specifically approved in writing.
4. Contractor is not to use material or equipment for any purpose other than what it is designed or is specified for.

1.02 RELATED SECTIONS

- A. General Conditions of the Agreement
- B. Section 01010: Summary of Work.
- C. Section 01300: Submittals.

1.03 DELIVERY, STORAGE AND HANDLING

- A. Arrange deliveries of Products in accord with construction schedules; coordinate to avoid conflict with work and conditions at the site.
 1. Deliver Products in undamaged condition, in manufacturer's original containers or packaging, with identifying labels intact and legible.

2. Immediately upon delivery, inspect shipments to assure compliance with requirements of Contract Documents and approved submittals and the Products are properly protected and undamaged.

B. Provide equipment and personnel to handle Products by methods to prevent soiling or damage to Products or packaging.

C. Store Products in accord with manufacturer's published instructions, with seals and labels intact and legible.

1. Store Products subject to damage by the elements in weathertight enclosures.
2. Maintain temperature and humidity within the ranges required by manufacturer's instructions.

D. Exterior Storage:

1. Store fabricated products above the ground, on blocking or skid, to prevent soiling or staining. Cover products subject to deterioration with impervious sheet coverings while providing adequate ventilation to avoid condensation.
2. Store loose granular materials in a well-drained area on solid surfaces to prevent mixing with foreign matter or other stored materials

E. Arrange storage in a manner to provide easy access for inspection. Make periodic inspections of stored products to assure the Products are maintained under specified conditions and free from damage or deterioration.

F. Protection After Installation: Provide substantial coverings and all other necessary provisions required to protect installed Products from damage from traffic and subsequent construction operations. Remove when no longer needed.

1.04 SUBMITTALS

A. The Bidder shall submit a separate substitution request for each product, supported with complete data, with drawings and samples as appropriate, including (as applicable) and in conformance with Specification 01300, Submittals, and the General Requirements.

1.05 RESPONSIBILITY FOR ADHERING TO MANUFACTURER'S INSTRUCTIONS

A. When Contract Documents requires that the storage, monitoring and protection of materials or the installation of work shall comply with manufacturer's printed instructions, obtain and distribute copies of such instructions to parties involved in the installation, including two copies to Owner's Representative. All such

instructions shall be provided prior to arrival of material or equipment and shall be a part of the submittal.

1. Maintain one set of complete instructions at the job site during installation and until completion.
2. Keep digital copies available for distribution in PDF format.

B. Handle, install, connect, clean, condition, protect and adjust products in strict accord with such instructions and in conformance with specified requirements.

1. Should job conditions or specified requirements conflict with manufacturer's instructions, consult with Owner's Representative for further instructions immediately.
2. Do not proceed with work without clear instructions from the Owner's Representative.

C. Perform work in accord with manufacturer's published instructions. Do not omit any preparatory step or installation procedure unless specifically modified or exempted by Contract Documents.

PART 2 – PRODUCTS

2.01 PRODUCT OPTIONS

A. Products List:

Within 10 working days submit to Owner's Representative a complete list of major products proposed to be used, with the name of the manufacturer and the installing subcontractor. This list shall be submitted with the complete schedule of submittals and submittal log as stipulated in the Specifications.

B. Contractor's Options:

1. For Products specified only by reference standard, select any product meeting the standard.
2. For Products specified by naming several products or manufacturers, select any one of the products or manufacturers named complying with the specifications.
3. For Products specified by naming one or more Products or manufacturers and "or equal", Contractor must submit a request for substitutions for any Product or manufacturer not specifically named.
4. For Products specifically identified herein by a manufacturer's name, model, or catalog number and the words "or equal" or "or approved equal" do not

follow the manufacturer's name, only such items may be used in the Base Bid, except as hereinafter provided:

- a. Products of the Contractor's choice may be offered as substitutions to such specified products in accordance with the General Requirements.
- b. Substitute products must be accompanied by full descriptive and technical data for products proposed.
- c. The Contractor must first confirm that the substitute product is of comparable character to the specified item. Unless otherwise specified within this division, the Owner's Representative will not approve or disapprove any substitute products before the bids are opened.
- d. Any impacts or changes to other trades as a result of the use of substitute products will be the responsibility of the Contractor submitting these products. The Bidder shall include in his bid all additional construction and re-design costs associated with that substitute product including but not limited to mechanical, electrical, plumbing, fire protection, civil, architectural, structural, and instrumentation changes.
- e. In the event the Owner's Representative does not allow the product for use as a substitute, then the product item as specified shall be furnished for the amount indicated in the Base Bid.
- f. It is the Contractor's responsibility to show all work in design parameters to prove product substitution is equal or superior than specified.

2.02 PRODUCT SUBSTITUTIONS

- A. General:
 1. Allowance of substitute products does not constitute a waiver of the specifications.
 2. Substitute products may be deemed equal provided the "equal" product is the same or better than the product specified in function, performance, reliability, quality, and general configuration.
 3. Determination of "equal" in reference to the project design requirements will be made solely by the Owner's Representative.
 4. No substitute equipment will be considered unless, in the opinion of the Owner's Representative, it conforms to the Contract Drawings and Specifications in all respects, except for make, manufacturer and minor details.

5. Should the Bidder propose substitute products, he shall notify the Owner's Representative in writing, after the award of the contract and prior to initiating construction, of all dimensional, mechanical, electrical, instrumentation, and structural changes and/or requirements for the substitute product, including relationships between the substitute product and other products or facilities and shall reimburse the Owner's Representative through the Owner for any associated redesign and/or construction drawings or specifications modifications.
6. Reimbursement for the Engineer's redesign work and any other costs resulting from consideration of substitutions shall be at the Contractor's expense.

B. Contractor's Representations:

A request for a substitution represents the Contractor:

1. Has investigated the proposed Product and determined it is equal to or superior in all respects to that specified.
2. Will provide the same warranties or bonds for the substitution as for the Product specified.
3. Will coordinate the installation of an accepted substitution into the work, and make such other changes, as may be required, to make the work complete in all respects.
4. Waives all claims for additional cost, under his responsibility, which may subsequently become apparent.

C. Owner's Representative will review requests for substitutions with reasonable promptness, and notify Contractor, in writing, of the decision to accept or reject the requested substitution.

PART 3 – EXECUTION

(Not Used)

END OF SECTION

SECTION 01700

PROJECT CLOSEOUT

PART 1 – GENERAL

1.01 SECTION INCLUDES

Comply with requirements for administrative procedures stated in this Section and as required of the Contract Documents in closing out the Work. Minimal closeout procedures are summarized in this Section.

1.02 RELATED SECTIONS

- A. General Requirements
- B. Section 01720: Record Documents

1.03 QUALIFICATIONS AND REQUIREMENTS

- A. Contract requirements shall be met when construction and related activities have successfully produced, in order, completion of these three closeout stages:
 1. Substantial Completion
 2. Final Completion
 3. Final Payment
- B. The Contractor shall provide all written notices and supporting documentation as described below when requesting Substantial Completion and Final Completion, respectively. Partial submittals of the required documents shall not represent a valid request, and the Owner's Representative shall not be liable for any delays in the Substantial and Final Completion dates arising there from.

1.04 SUBMITTALS

- A. The Contractor shall provide to the Owner's Representative the following documents, in PDF and hard copy, in the quantity of one original and two copies unless otherwise noted.
- B. All submittals for approval shall have already been made and reconciled prior to Substantial Completion.
- C. Submittals under this Paragraph would be for a final submittal should revisions or additional copies are required of previously submitted documentation.
 1. Evidence of Compliance with all requirements of governing authorities to include Certificates of Inspection.
 2. Assessment record documents (reports, final data, etc.), as required of the Contract Documents.

3. Subcontractor List: A complete listing of all subcontractors and their suppliers, indicating business addresses, telephone numbers, contact names, and items supplied by each.
4. Manufacturer List: A listing of manufacturers of major materials, equipment and systems installed in the Work, and local contact addresses and phone numbers.
5. Warranties: All warranties transferred to the County. Special Guarantees and service agreements
6. Payment of Debts and Claims and Consent of Surety: The Contractor shall submit adequate evidence the Contractor has paid all obligations to date arising out of the Contract. Contractor shall also submit written consent of its Surety to final payment.
7. Release of Claims and Liens: The Contractor and each subcontractor shall also submit a certified Release of Claims and Liens, indicating the releases for waivers submitted are complete to the best of its knowledge and information upon receipt of final payment. Example form attached.
8. Certificate of Insurance for Products and Complete Operations.
9. No partial submittals of the above items are to be made to the Owner's Representative. All items of each category are to be collected by the Contractor and delivered at one time to the Owner's Representative, together with a letter of transmittal listing all items. Where items are to be delivered to the Owner's Representative, the Contractor shall include a copy of the transmittal letter listing all enclosures, signed by the respective representative acknowledging receipt.
10. Record Drawings
11. Consent of Surety to Final Payment: As required in General Conditions.
12. Releases from Agreements
13. Final Application for Payment
14. Extra Materials/Spare Parts: As required by individual Specification sections.

1.05 REINSPECTION FEES

When the Owner's Representative performs re-inspections due to failure of the work to comply with the claims of status of completion made by the Contractor:

1. Owner will compensate Owner's Representative for such additional services.
2. Owner will deduct the amount of such compensation from the Final Payment to the Contractor.

1.06 FINAL ADJUSTMENT OF ACCOUNTS

- A. Submit a final statement of accounting to the Owner's Representative.
- B. Statement shall reflect all adjustments to the Contract Price:
 1. The original Contract Price.
 2. Additions and deductions resulting from:
 - a. Previous Change Orders.

- b. Allowances.
- c. Unit Prices.
- d. Deductions for uncorrected work.
- e. Penalties and Bonuses.
- f. Deductions for liquidated damages.
- g. Deductions for re-inspection payments.
- h. Other adjustments.

3. Total Contract Price as adjusted.
4. Previous payments.
5. Sum remaining due.

C. Owner's Representative will prepare final Change Order reflecting approved adjustments to the Contract Price not previously made by Change Orders.

1.07 APPLICATION FOR PAYMENT

Contractor shall submit the final Application for Payment in accordance with procedures and requirements stated in the Conditions of the Contract.

PART 2 – PRODUCTS

(Not Used)

PART 3 – EXECUTION

3.01 SUBSTANTIAL COMPLETION

- A. A. Reference the Definitions, regarding Substantial Completion in the Agreement.
- B. B. When the Work is substantially complete, the Contractor shall submit to the Owner's Representative:
 1. A written notice the Work or a designated and acceptable portion thereof, is substantially complete.
 2. An original Certificate of Occupancy for the Project (as applicable).
 3. A list of items to be completed or corrected (hereinafter referred to as a "Punch List").
 4. All executed work orders signed and accepted by the Owner's Representative.
 5. Project closeout documents, warranties, and certificates for review and approval.
- C. Within 10 working days of such notice, the Contractor and Owner's Representative will make an inspection to determine the status of completion.
- D. The Punch List submitted by the Contractor will be reviewed and tracked for completion by the Owner's Representative. Once complete, the Owner's Representative shall provide a punch list for any remaining items for the Contractor to

complete. The Owner's Representative may withhold the issuance of the Certificate of Substantial Completion until corrections required by the Owner's Representative are made or all parties are satisfied they will be made.

- E. Should the Owner's Representative determine the Work is not substantially complete:
 - 1. The Owner's Representative will promptly notify the Contractor in writing, giving the reasons therefore.
 - 2. The Contractor shall remedy the deficiencies in the Work, and then send a second written notice of Substantial Completion to the Owner's Representative.
- F. When the Owner's Representative concurs the Work is substantially complete, the Owner's Representative will:
 - 1. Prepare a Certificate of Substantial Completion accompanied by the Contractor's Punch List of items to be completed or corrected, as verified and amended by the Owner's Representative. (Note: Contract responsibilities are not altered by inclusion or omission of required Work for the Punch List.)
 - 2. Sign the Certificate of Substantial Completion and submit it to the Owner and the Contractor for their written acceptance of the responsibilities assigned to them in the Certificate.

3.02 FINAL COMPLETION

- A. Reference the Definitions, regarding Final Completion in the Agreement.
- B. To attain Final Completion, the Contractor shall complete the activities pertaining to the Certificate of Substantial Completion and complete work on all Punch List items. Only then shall a written request to the Owner's Representative for final inspection be submitted.
- C. When the Work is complete, the Contractor shall submit to the Program Manager written certification, signed jointly by the Owner's Representative, indicating:
 - 1. The Contract Documents have been complied with in their entirety.
 - 2. The Work has been inspected for compliance with Contract Documents.
 - 3. The Work has been completed in accordance with Contract Documents.
 - 4. The Work is completed and ready for final inspection.
- D. The Contractor and Owner's Representative will make an inspection to verify the status of completion with reasonable promptness after receipt of such certification.
- E. Should the Owner's Representative determine the Work is incomplete or defective:
 - 1. The Owner's Representative will promptly notify the Contractor in writing, listing the incomplete or defective Work.
 - 2. The Contractor shall take immediate steps to remedy the stated deficiencies, and send a second written certification to the Owner stating the Work is complete.

- F. When the Owner's Representative finds the Work is acceptable under the Contract Documents, the Contractor will be requested to make a final closeout submittal.

END OF SECTION

**UNCONDITIONAL WAIVER AND RELEASE
UPON FINAL PAYMENT**

STATE OF GEORGIA

DEKALB COUNTY

The undersigned mechanic and/or material man has been employed by _____ (name of contractor) to furnish _____ (describe materials and/or labor) for the construction of improvements known as _____ (title of the project or building) which is located in the City of _____, City of _____, and is owned by _____ (name of owner) and more particularly described as follows:

**(DESCRIBE THE PROPERTY UPON WHICH THE IMPROVEMENTS WERE
MADE BY USING EITHER A METES AND BOUNDS DESCRIPTION, THE
LAND LOT DISTRICT, BLOCK AND LOT NUMBER, OR STREET ADDRESS
OF THE PROJECT.)**

Upon the receipt of the sum of \$_____, the mechanic and/or material man waives and releases any and all liens or claims of liens or any right against any labor and/or material bond it has upon the foregoing described property.

Given under hand and seal this _____ day of _____, 20 ____.

_____ (Seal)

(Witness)

SECTION 01710

CLEAN-UP

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. This section includes policies and procedures preventing the accumulation of waste materials on the site and the clean-up of waste materials throughout the duration and upon the completion of work.
- B. This section includes miscellaneous work related to quality control including, but not limited to, protecting active utilities and general procedures for utility crossings. The Contractor shall also reference the General Requirements related to protection of existing utilities.
- C. This section includes operations not specified in detail as separate items, but can be sufficiently described as to the kind and extent of work involved. Furnish all labor, materials, equipment and incidentals to complete the work under this Section.

1.02 RELATED SECTIONS

- A. Section 02110: Access Route & Easement Access Clearing
- B. Section 02276: Site Restoration and Erosion Control

1.03 QUALIFICATIONS AND REQUIREMENTS

- A. Contractor shall keep the project site free from accumulated waste materials and rubbish at all times during the Work. At completion of the Work, the Contractor shall remove all waste materials and rubbish from and about the Project, as well as his tools, equipment, machinery, and surplus/stockpiled materials, except those specifically required by the Contract Documents to be salvaged or left for the Owner's use.
- B. If Contractor fails to keep project clean on a daily basis or as directed, or to clean up prior to Date of Substantial Completion, the Program Manager may do so, and the cost will be charged to the Contractor.
- C. Attention is directed to the State Soil Erosion and Sediment Control laws, ordinances and requirements, as well as Georgia's NPDES Permit No. GAR 100001, 100002, or 100003, as applicable, and as detailed in the drawings, or addressed in other sections.

- D. Reference Section 01030 as related to Sewage waste disposal, handling, and spill prevention, containment and mitigation.

1.04 SAFETY

- A. Store volatile or sanitary waste as required by State and Federal requirements, and remove from project site daily to an approved facility.
 - 1. Allow no volatile wastes to accumulate on project site.
 - 2. Provide adequate ventilation during use of volatile substances.
- B. Do not burn or bury waste materials and/or rubbish on project site.
- C. Do not dispose of any volatile wastes such as, but not limited to, mineral spirits, oil, or paint thinner, in storm or sanitary drains, on pavements, in gutters, or on the project site.
- D. Do not dispose any waste or cleaning materials containing materials harmful to plant growth on the project site. Immediately clean up materials accidentally spilled.

PART 2 – PRODUCTS

(Not Used)

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Clean-up during construction
 - 1. Execute cleaning procedures to insure the streets, easements, rights of way, work areas, project site and adjacent properties are maintained free from debris, dust, and rubbish unauthorized stockpiled or stored materials.
 - 2. Wet down materials subject to blowing. Do not throw waste materials from heights.
 - 3. Provide covered, on-site containers for waste collection. Place all waste materials and rubbish in containers in an expeditious manner to prevent accumulation. Remove waste from project site when containers become full or daily if so directed.
 - 4. Legally dispose all waste materials, rubbish, volatile materials and cleaning materials off project site.

5. Maintain project in a "broom-clean" state until Date of Substantial Completion. Protect surfaces from contamination during all operations.
6. Do not allow debris contributing to the survival or spread of rodents, roaches or other pests to accumulate.
 - a. Remove debris containing food scraps on a daily basis.
 - b. Should pests inhabit project, Contractor shall be responsible for securing services of a pest exterminator at no additional cost to the Owner.

B. Protection and clean-up of roads

1. Spillovers on roads from trucks entering or leaving the site shall be immediately cleaned up and monitored on a continuing basis so pavements and adjacent sidewalks and property will not be littered with earth, stones, mud or any other debris resulting from assessment and construction related operations.
2. Accumulations of earth, sand, gravel and mud shall be removed from vehicle wheels and vehicle underbodies and ledges before entry upon public roads.

C. Stripping

In areas so designated, topsoil shall be stockpiled. The topsoil shall be protected until it is placed as specified. Any topsoil remaining after all work is in place shall be used on-site in designated areas.

D. Bench marks

Carefully protect and maintain all benchmarks, monuments, and other reference points. If disturbed, replace at no additional cost to the Owner, as directed by the Owner's Representative.

E. Incidental work

Do all incidental work not otherwise specified, but obviously and reasonably necessary or directed, for the proper completion of the contract as specified at no additional cost to the Owner.

3.02 ACTIVE UTILITIES

- A. Active utilities traversing the site shall be adequately protected and preserved in operating condition. Repair damage to all such utilities due to work under this Contract, to the satisfaction of the authority having jurisdiction over the utility at no additional cost to the Owner. If damaged, tracer wires and marking materials shall be restored, repaired or replaced as necessary, to the satisfaction of the authority having jurisdiction over a utility.

- B. Disconnect or arrange for the disconnection protection and reconnection of any utility service in accordance with regulations of the governing utility concerned and interfering with the work.
- C. Crossing Utilities: This item shall include any extra work required in crossing culverts, water courses, or drains, including all sheeting and bracing, extra excavation and backfill, or any other work required for the crossing, whether or not shown on the drawings. In no case shall there be less than 0.3 feet between any two pipe lines and structures. Special requirements from the authority having jurisdiction over a utility for such things as maintenance clearance or clearance related to cathodic protection shall be complied with. Refer to DeKalb County Department of Watershed Management Design Standards.
- D. Relocating Existing Gas Lines:

Notify the proper utility authority involved when relocating gas lines is required. Coordinate all work and required permits by the utility so construction progress will not be hampered. Failure to do so will not justify an increase in time or money.

3.03 FINAL CLEAN-UP

- A. All general and specific cleaning shall be performed prior to Contractor's request for the project or portion thereof be inspected for Substantial Completion.
- B. Clean disturbed areas of project site of debris.
 - 1. Broom clean paved surfaces, driveways and sidewalks.
 - 2. Rake clean all landscaped surfaces
 - 3. Remove oil and similar deleterious substances.

END OF SECTION

SECTION 01720

RECORD DOCUMENTS

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. This section includes, but is not limited to, the compiling, maintaining, recording and submitting of project record documents as herein specified.
- B. Record Documents include, but are not limited to:
 - 1. Drawings,
 - 2. Photographs of buried conditions and changes
 - 3. Sketches
 - 4. Specifications
 - 5. Test records
 - 6. Printed and digital PDF map marked-ups illustrating changes to the map.
 - 7. Contract changes including field orders, change orders, RFI's etc.

1.02 RELATED SECTIONS

- A. Section 01700: Project Closeout

1.03 QUALIFICATIONS AND REQUIREMENTS

- A. Unless noted otherwise, Record Drawings shall provide dimensions, distances and material type.
- B. Unless noted otherwise, Record Drawings shall provide elevations to the nearest 0.01 for all pertinent items constructed by Contractor.
- C. The Contractor shall maintain on the project site, throughout the Contract Time, an up-to-date set of Record Drawings. The Record Drawings are subject to review each month by the Program Manager, and shall be made available on demand.
- D. Upon completion of the project, the Program Manager shall correct the original bid/contract plans and specifications, to include the Record Drawings and corrected specifications provided by the Contractor at the completion of the work. Change Orders, Addenda, Field Orders, negotiated changes, substitutions, final products list, etc. shall document the project as finally constructed. The corrections may be made by “clouding” and referencing other material on additional drawing sheets or specification pages. Failure to provide a complete and compliant set of Record Drawings at project close out will be cause for withholding Final Payment, regardless of the Program Manager’s periodic reviews
- E. All drawings shall be conspicuously identified as “Record Documents” (per 3.1.A) in the lower right corner of all sheets. Specifications may be identified on the cover and via the “Footer” on each page.

1.04

SUBMITTALS

- A. At contract closeout, and prior to requesting final payment, deliver Record Documents to the Owner's Representative for the Owner. Allow for sufficient time for review.
- B. Accompany Submittal with transmittal letter, in duplicate, containing:
 - 1. Date
 - 2. Project title and number
 - 3. Contractor's name and address
 - 4. Title and number of each record document
 - 5. Signature of Contractor or Contractor's authorized representative
- C. The digital media (CD or DVD) label is to include the project's County ID Number, project name and location, the Owning Agency's name, the Designer's name, the Contractor's name and the format of files (.pdf or .dwg or acceptable CAD format). All file names on the digital media should correlate with actual sheet numbers of the drawings. Both the sleeve and the disk are to be labeled.
- D. Contractor shall add to the digital PDF(s) all changes to the map or drawing based upon actual field conditions. Contractor shall submit marked up map(s) or drawing(s) showing the position of unmapped and incorrectly positioned or added manhole(s) and/or pipelines discovered or installed during the investigation or construction. Map(s) or drawing(s) shall be marked up in red and delivered to the Owner's Representative on the completion of each project. Additionally, supplemental sketches also marked up in red ink, shall be provided as necessary, to clearly depict the actual site conditions. Contractor shall also show all point repairs, access roads and raised manholes. A legend shall be added to the title block indicating the symbology, color coding (should be required to be as follows: red-additions, green-deletions, blue-notes) and descriptions. The date, the words "Record Drawing" and company name shall also be added to the title block.
- E. Record Drawings Plan Submittal
 - 1. The following Datum shall be used:
 - a. Vertical: NAVD 88
 - b. Horizontal: NAD 83 (modified to ground). Conversion factor shall be provided to convert back to State Plane (grid)
 - 2. There are 2 STEPS to follow in order to complete the Record Drawings:
 - a. Step 1 – Draft Plan Submittal and Review
 - 1) Upon completion of the work at each location receiving rehabilitation and/or replacement, the marked set of construction plans (Contractor redlines) and a copy of the certified Field Survey Notes obtained from the surveyor's record collection points shall be furnished to the Project Engineer. The Contractor shall prepare a draft version of the Record Drawings for Owner's Representative's review.

- 2) The following items shall be included as part of the Submittal:
 - a) Certified Field Survey Notes – if in electronic format, points shall clearly identify the feature being referenced
 - b) Contractor redlines
 - c) Draft Surveyed Record Drawings submitted for review including the following:
 - (1) Every sheet shall be stamped “Surveyed Record Drawing”.
 - (2) Engineer Certification – every sheet shall be attested to and sealed by a Georgia Registered Engineer (signature required only on final submittal).
 - (3) Surveyor Certification – this shall be provided, as a minimum, on the cover sheet (signature required only on final submittal).
 - (4) Surveyed Northings and Eastings (N/Es) shall be updated and noted – update N/Es by striking through original N/Es and adding actual N/Es.
 - (5) CAD files shall reflect the actual physical location of the updated N/Es by moving valves, manholes, etc. to their new locations.
 - (6) Pipe inverts, pipe lengths, pipe slopes, pipe fittings, etc. (including hydraulic calculations on the plans) shall be updated by striking through original data and adding actual data.
 - (7) Plans shall indicate whether rims were surveyed prior to, or after final lift of paving.
 - (8) The following construction information shall be added to the Cover Sheet:
 - (a) Date Installed:
 - (b) Contractor:
 - (c) Owner Field Representative:
 - (d) Owner/Developer:
 - (e) Project Engineer:
 - (f) Soils Engineer:
 - (g) Surveyor:

b. Step 2 – Final Plan Submittal

- 1) Following Owner’s Representative’s review of the last draft submittal, the Contractor will then prepare the final submittal package based on Owner’s Representative’s review comments and submit to Owner.
- 2) The final submittal package shall include the following items:
 - a) Two bound, signed, half-sized print sets (11" x 17")

- b) A disc containing both electronic file (latest version of AutoCAD) and .pdf files
- c) Electronic drawings shall include appropriate line types/styles per Owner's CAD Standards.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Storage:
 - 1. Store documents and samples in the Contractor's field office, apart from documents used for construction.
 - 2. Provide files and racks for storage of documents.
- B. Maintenance:
 - 1. Maintain documents in a clean, dry, legible condition and in good order.
 - 2. Maintain at the site for the Owner's Representative, one copy of all record documents.
- C. C. Make documents and samples available at all times for inspection by Owner's Representative.
- D. D. Failure to maintain the Record Documents in a satisfactory manner will be cause for withholding of a certificate for payment.

PART 2 – PRODUCTS

(Not Used)

PART 3 - EXECUTION

3.01 RECORDING

- A. Label each document "RECORD DOCUMENTS" in neat, large printed letters.
- B. Recording:
 - 1. Record information concurrently with construction progress.
 - 2. Do not conceal any work until required information is recorded.

3.02 RECORD DRAWINGS

- A. Surveyed Record Drawings of the project shall be submitted for review and approval as a condition for project Acceptance, and subsequently a condition of releasing the project for Final Completion.
- B. Record Drawings shall be reproducible, shall have a title block indicating the drawings are "RECORD DOCUMENTS" the name of the company preparing the Record Drawings, and the date the Record Drawings were prepared.
- C. One full set of specifications and drawings shall be saved in Adobe Acrobat (.pdf) format both scanned and original plot from AutoCAD to allow for clarity in viewing, and one full set on a separate CD or DVD saved in a (.dwg) format such as AutoCAD

or a similar system no newer than the current operating version of the Owner's capabilities. The digital media disk shall be labeled with the project's County ID number, project name and location, the Owning Agency's name, the Designer's name and the format of files included in CD. *Note: One paper copy of the Record drawings and specifications with Designers and Surveyors seals shall be provided for the Owner's use and archiving.

D. Legibly mark drawings to record actual construction, including:

1. All Construction:
 - a. Changes of dimension and detail
 - b. Changes made by Requests for Information (RFI), field order, clarification memorandums or by change order
 - c. Details not on original Drawings
 - d. Exact direction and location of existing and new utilities where field location varies from GIS drawing or other information provided by the Owner for the project.
2. Site Improvements, Including Underground Utilities:
 - a. Horizontal and vertical locations of all exposed and underground utilities and appurtenances, both new facilities constructed and those utilities encountered, referenced (by triangulation) to permanent surface improvements.
 - b. Location and dimensions of roadways and parking areas, providing dimensions to back of curb when present.
 - c. The locations shall be referenced to at least two easily identifiable, permanent landmarks (e.g., power poles, valve markers, etc.) or benchmarks.
 - d. The Record Drawings shall include the horizontal angle and distance between manhole covers.
3. Structures:
 - a. Depths and locations of various elements of foundation in relation to finish first floor datum or top of wall.
 - b. Location and elevation of internal and buried utilities and appurtenances concealed in the construction, referenced to visible and accessible features of the structure.

3.03 SPECIFICATIONS

A. Legibly mark each section to record:

1. Manufacturer, trade name, catalog number, and supplier of each product and item of equipment actually installed.
2. Changes made by RFI, field order, clarification memorandums, or by change order.

END OF SECTION

SECTION 02010

SUBSURFACE CONDITIONS

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. This section includes general guidelines for the treatment of subsurface conditions, including, but not limited to, the excavation and handling of all subsurface materials and conditions included in the contract work.
- B. It is understood and agreed the Contractor has made or will make a thorough investigation of the surface and subsurface conditions of the site and any special construction problems potentially arising from nearby watercourses and floodplains, particularly in areas where construction activities may encounter water bearing sands, soils, and gravels or limestone solution channels.

1.02 RELATED SECTIONS AND DOCUMENTS

- A. General Requirements of the Agreement and Division 1 Specification Sections apply to this Section.
- B. Division 2: Site Work

PART 2 – PRODUCTS

(Not Used)

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Excavation to required subgrade elevations is unclassified and no classification of excavated materials will be made. Excavation work shall include the removal and subsequent handling of all materials excavated or otherwise removed in performance of the contract work, regardless of the type, character, composition, obstructions encountered, or condition thereof.
- B. The Contractor shall be responsible for providing all services, labor, equipment, and materials necessary or convenient for completing the work within the time specified in these Contract Documents.
- C. The Contractor shall perform all excavations of every description, and of whatever substances encountered, to the dimensions and levels shown on the Drawings and/or as required to complete the Work as specified.
- D. The Contractor shall satisfy himself as to rock and other materials potentially encountered in excavation, and make proper allowances for all contingencies in his lump sum or unit price bid. Neither the Owner's Representative nor the Program Manager will be responsible for subsurface conditions found.

END OF SECTION

SECTION 02110
ACCESS ROUTE & EASEMENT ACCESS CLEARING

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. This section includes, but is not limited to, removing and disposing trees, stumps, roots, brush, structures, abandoned utilities, trash, debris, and all other materials found on or near the surface of the ground in the project area and, understood by generally accepted engineering practice, not to be suitable for construction of the type contemplated from the work site. Precautionary measures to prevent damage to existing features to remain are considered part of the work.
- B. The Owner's Representative will designate all trees, shrubs, plants, and other things to remain. Trees, shrubs, plants adjacent to clearing areas shall have protection fence installed prior to the beginning of clearing. Paint required for cut or scarred surface of trees or shrubs selected for retention shall be an asphaltum base paint prepared especially for tree surgery and approved by the Owner's Representative.
- C. Sewer Easement Clearing Operations shall be coordinated with temporary and permanent erosion and sedimentation control procedures.

1.02 RELATED SECTIONS

- A. Section 01015 – Control of Work
- B. Section 02276 – Site Restoration and Erosion Control
- C. Section 02485 – Sodding
- D. Section 02486 - Seeding
- E. Section 02542 – Silt Fence

1.03 DEFINITIONS

- A. Light Clearing: This area requires "bush hog" equipment for tree and shrub removal.
- B. Medium Clearing: This area requires "bush hog" and "chipper" equipment for tree and shrub removal (up to 4 caliper inches).
- C. Heavy Clearing: This area requires "timbering" equipment for tree and shrub material.

1.04 QUALIFICATIONS AND REQUIREMENTS

- A. The Contractor shall comply with all applicable codes, ordinances, rules, regulations, and laws of local, municipal, State or Federal authorities having jurisdiction over the work. All required permits shall be obtained for construction operations by the Contractor and submitted to Owner's Representative for verification.

- B. All persons involved in land disturbance work shall be trained and certified in accordance with the requirements of the Georgia Erosion and Sedimentation Act.
- C. Contractor shall provide the services of qualified personnel for measuring tree caliper and defining species of plantings to be removed and replaced.
- D. Open burning will not be permitted.

1.05 SUBMITTALS

- A. Prior to beginning easement clearing, the Contractor shall submit to the Owner's Representative a map in addition to all other required pre-clearing documentation showing the location of all easements to be cleared. The Contractor shall label each easement as requiring light clearing, medium clearing or heavy clearing.
- B. The Contractor shall submit to the Owner's Representative a schedule for clearing the easements.
- C. The easement clearing map and schedule must be submitted to the Owner's Representative ten (10) working days prior to beginning easement clearing.
- D. The easement clearing map and schedule must be approved by the Owner's Representative before the Contractor can begin work.
- E. Copies of all permits required for clearing operations shall be provided to the Owner's Representative prior to beginning work.
- F. Certificate of confirmation by the Contractor that all equipment will comply with all local state and federal noise, emission and environmental requirements and that any piece of equipment found not in compliance will be immediately shut down and removed from the site.
- G. Plan for approved fuel storage areas, if applicable.

PART 2 – PRODUCTS

2.01 EQUIPMENT

The Contractor shall furnish equipment with operators of the type normally used in clearing and grubbing operations including, but not limited to tractors, trucks, loaders, stump grinders, and root rakes.

PART 3 – EXECUTION

3.01 INSTALLATION AND EXECUTION

- A. Clearing and grubbing activities will be conducted at the minimum level necessary to provide access to a construction activity location.
- B. Use of explosives for clearing is not permitted.

- C. Clear and grub the permanent easement, but not to exceed limits of easements on each side of the pipeline, before initiating other items of work. Remove all approved trees, growth, debris, stumps and other objectionable matter, except as directed by the Owner's Representative.
- D. Materials to be cleared, grubbed and removed from the project area include, but are not limited to, the following: trees, stumps, roots, brush, trash, organic matter, paving, miscellaneous structures, debris, and abandoned utilities.
- E. Grubbing shall consist of completely removing roots, stumps, trash, and other debris from all graded areas so the topsoil is free of roots and debris. Topsoil is to be left sufficiently clean so further picking and raking will not be required. Grubbing shall only be performed at the specific direction of the Owner's Representative.
- F. All stumps, roots, foundations and planking embedded in the ground shall be removed and disposed of in a proper manner. Piling and butts of utility poles shall be removed to a minimum depth of two feet below the limits of excavation for structures, trenches and roadways or two feet below finished grade, whichever is lower. Stumps and roots shall be grubbed and removed to a depth not less than 2 feet below grade.
- G. Prior to clearing landscaping features, but not necessarily limited to, specimen trees, fences, cultivated trees, cultivated shrubbery, property corners, man-made improvements, subdivision and other signs, shall be noted on the easement clearing maps and shall be reviewed with the Owner's Representative. The Owner's Representative will determine the landscape features to remain undisturbed. The Contractor shall take extreme care in moving landscape features and shall re-establish these features as directed by the Owner's Representative. The contractor shall also photographically document these features prior to disturbance or clearing. This documentation shall be sufficient in detail to confirm the condition and location of all features.
- H. Surface rocks and boulders shall be grubbed from the soil and removed from the site, if not suitable and needed as rip rap.
- I. Where tree limbs interfere with utility wires, or where the trees to be felled are in close proximity to utility wires, the tree shall be taken down in sections to eliminate the possibility of damage to the utility.
- J. Any work pertaining to the security or location of utility poles shall comply with the requirements of the appropriate utility. All activities shall be coordinated with the utility owner.
- K. Fences adjoining any excavation or embankment, in the Contractor's opinion, damaged or buried, shall be carefully removed, stored and replaced. Any fencing, in the Owner's Representative's opinion, significantly damaged shall be replaced with new fence material of equal or better quality at the Contractor's expense.
- L. All holes or cavities resulting from the removal of stumps, poles, foundations, piling etc., extending below the subgrade elevation of the proposed work shall be filled with crushed rock or other suitable material, compacted to the same density as surrounding material.

- M. The Contractor shall exercise special precautions for the protection and preservation of trees, cultivated shrubs, sod, fences, etc. situated within limits of the construction area, but not directly within excavation and/or fill limits. The Contractor shall be held liable for any damage his operations have inflicted on such property.
- N. The Contractor shall be responsible for all damages to existing improvements outside the permanent easement resulting from Contractor's operations.
- O. Burying of residual materials and debris will not be allowed.

3.02 CONSTRUCTION ACCESS ROUTE ON EASEMENT

- A. When directed by the Owner's Representative, a construction access route shall be built on the sewer easement for the purpose of accessing manholes and performing all other necessary work within the easement.
- B. Construction access exit/entrance shall be cut not less than twenty (20) feet wide and fifty (50) long, minimum, and six (6) inches deep below existing grade. Filter fabric shall be placed at the bottom of the cut, and stone shall be placed on top of the fabric, filling the six-inch depth along the road.
- C. Construction roads, when required, shall be cut fourteen (14) feet wide and as long as required, and six (6) inches deep below existing grade. Geotextile fabric shall be placed at the bottom of the cut, and stone shall be placed on top of the fabric, filling the six-inch depth along the road.
- D. Provide and install the geotextile fabric and stone as indicated in the Manual for Erosion and Sediment Control in Georgia.
- E. The Contractor is required to maintain the exit/entrance and roadway to include periodic top dressing of gravel to maintain a 6-inch depth. Remove all spilled materials and debris from graveled surfaces and public/private roads.

3.03 CLEAN-UP

- A. The debris resulting from the clearing and grubbing operation shall be hauled to a disposal site approved by the County and in accordance with all requirements of Federal, State, County and municipal regulations. No debris of any kind shall be deposited in any stream or body of water, or in any street or alley. No debris shall be deposited upon any private property, except with written consent of the property owner. In no case shall any material or debris be left on the worksite, shoved onto abutting private properties, or buried on the worksite.
- B. Open burning will not be permitted.

END OF SECTION

SECTION 02205

DEWATERING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Protection of Resources.
- B. Excavation/Trench Dewatering.
- C. Stream and Surface Water Diversion.
- D. Disposal of Water Removed from Excavations and Trenches.

1.02 REFERENCES

- A. Occupational Safety and Health Administration (OSHA) Regulations.

1.03 SCOPE

- A. This section specifies the control, handling, and disposal of groundwater and surface water during construction.
 - 1. Including installation, operation, and removal of all facilities required to maintain open excavations and trenches in a dewatered condition to permit unrestricted construction operations.
- B. Contractor is responsible for the stability of all temporary and permanent slopes, grades, trenches, foundations, materials, and structures during the course of the Work.
 - 1. Repair and replace all slopes, grades, foundations, materials, and structures damaged by water, both surface and subsurface, to the lines, grades, and conditions existing prior to the damage,
 - 2. Complete work at no additional cost to the Owner.
- C. The Contractor shall construct all permanent work in areas free from water.
 - 1. Design, construct, and maintain all ground water monitoring systems, pumping systems, dikes, levees, cofferdams, and diversion and drainage channels as necessary to maintain construction areas free from water.
 - 2. Protect the areas occupied by permanent work from water damage.
 - 3. Remove temporary work after it has served its purpose.

1.04 DEFINITIONS

- A. Dewatering includes lowering the water table and intercepting seepage otherwise emerging from slopes or bottoms of excavations and disposing of removed water.
- B. The intent of dewatering is to:

1. Increase stability of excavated slopes;
2. Prevent dislocation of material from slopes or bottoms of excavations;
3. Reduce lateral loads on sheeting and bracing;
4. Improve excavating and hauling characteristics of excavated material;
5. Prevent failure or heaving of the bottom of excavations; and
6. Provide suitable conditions for placement and compaction of backfill materials.

C. Diversion of surface drainage includes:

1. Use of temporary drainage ditches and dikes and installation of temporary culverts and sump pumps with discharge lines, as required, to protect the Work from any source of surface water.

1.05 JOB CONDITIONS

A. Permits:

1. Obtain all necessary permits from the jurisdictional agencies
2. Submit a Notice of Intent to the Georgia Environmental Protection Division by certified return receipt mail at least forty-eight (48) hours prior to conducting any land disturbance activities.

B. Responsibilities: Contractor shall:

1. Select and install a system to control water as specified in this section. Piezometers shall be installed to gauge water levels as needed.
2. Comply with the requirements of the jurisdictional agencies.
3. Take measures to prevent damage to properties, buildings or structures, sewers and other utility installations, pavements, sidewalks, and the Work.
4. Not overload or obstruct existing facilities.
5. Modify the installed dewatering system
 - a. If while in operation it causes (or threatens to cause) damage to existing buildings, structures, utilities, facilities, other adjoining property or adjacent water wells.
6. Monitor the quality of the discharge from the dewatering system.
 - a. If soil particles are being removed by the system, install and maintain settling basins as required to control particle removal.
7. Install and monitor control points on adjacent buildings, structures, utilities, facilities, or other adjoining properties.
 - a. Address any movements detected caused by the Work.
8. Repair damage, disruption, or interference resulting directly or indirectly from dewatering operations at no additional cost to the Owner.
9. Submit plans and details for the protection of the Work, where applicable, to the Owner's Representative for approval.
 - a. These plans shall include (but are not limited to) details of bulkheads, pumping facilities, dikes, and drainage.

1.06 PERFORMANCE REQUIREMENTS

- A. Provide a dewatering system to produce the following results:
 - 1. Effectively reduce the hydrostatic pressure affecting excavations and actually lower the groundwater table as required.
 - 2. Develop a substantially dry and stable subgrade for subsequent construction operations.
 - 3. Preclude damage to adjacent properties, buildings, structures, utilities, installed facilities, and other work. Contractor is responsible for determining necessary locations of monitoring points.
 - 4. Prevent the loss of fines, seepage, boils, quick condition, or softening of the foundation strata.
 - 5. Maintain stability of sides and bottom of excavations.
- B. Prevent seepage water, surface water, and water from any other source from entering the excavation.
 - 1. Dewatering the excavations and trenches of surface, seepage or rainwater may include placement of drainage materials, such as crushed stone and filter fabric, together with sump pumping. However, the excavation shall not be used as a conduit for groundwater.
- C. Provide ditches, berms, pumps, and other methods necessary to divert and drain surface water from excavations and other Work areas.
- D. Locate groundwater and surface water control and dewatering systems so as not to interfere with utilities, construction operations, adjacent properties, or adjacent water wells.
- E. Assume sole responsibility for the dewatering system:
 - 1. For any loss or damage resulting from partial or complete failure of protective measures Settlement, or resultant damage caused by the dewatering operations.

1.07 SUBMITTALS

- A. The Contractor shall submit a dewatering plan to the Owner's Representative prior to commencing Work.
 - 1. Dewatering plan shall be submitted for each site, where required, and include the following descriptions for each of the proposed sites:
 - a. arrangement,
 - b. location,
 - c. depth,
 - d. capacities of system components,
 - e. installation details,
 - f. groundwater monitoring system and readings (monitoring of points to continue a minimum of 30 days after completion of dewatering)
 - g. settlement monitoring points and readings

2. Operation and maintenance procedures will include:
 - a. Design calculations (if any).
 - b. Standby equipment and power supply.
 - c. Location and size of berms, dikes, settling basins, sumps, and discharge items.
 - d. Pollution control facilities.
 - e. Discharge locations.
 - f. Surface water control and drainage installations.
 - g. Proposed methods and locations for disposing of removed water.
 - h. Copies of all permits required to collect and discharge water removed from construction areas.
 - i. Positive means of monitoring groundwater elevation
 - j. methods for monitoring fines in discharge water
3. Submit Well Permits (if required)
4. Working drawings and supporting documents shall be revised and resubmitted to the Owner's Representative if the dewatering system is modified during installation or during operation.

PART 2 - PRODUCTS

Not Applicable

PART 3 - EXECUTION

3.01 PROTECTION OF RESOURCES

- A. Construction operations shall be planned and conducted to prevent an adverse impact on streams, lakes, and reservoirs with sediment or other harmful material used in the construction of the project.
- B. Comply with all regulations of the Environmental Protection Agency (EPA), the Georgia Department of Natural Resources, Environmental Protection Division (EPD), and the Georgia Department of Transportation (GDOT).

3.02 EXCAVATIONS/TRENCH DEWATERING

- A. Provide, operate, and maintain dewatering systems of sufficient size and capacity to permit excavation and subsequent construction in dry.
 1. Lower, monitor and maintain groundwater level a minimum of 2 feet below the lowest point of excavation continuously until excavation is completely backfilled.
 2. Continuously maintain excavations free of water, regardless of source, until backfilled to final grade.
- B. Groundwater Table:
 1. Lowering groundwater table 2 feet below excavation depth:

- a. If determined necessary to effectively lower the groundwater as required, dewatering systems shall include wells or well points, and other equipment and appurtenances installed outside limits of excavations and sufficiently below lowest point of excavation, so as to maintain the specified groundwater elevation.
- C. Design and Operate Dewatering Systems:
 - 1. To prevent loss of fines as water is removed.
 - 2. To avoid inducing settlement or damage to existing facilities, completed Work, or adjacent property.
 - 3. To relieve artesian pressures and resultant uplift or softening of the excavation bottom.
- D. Provide on-site, ready and sufficient redundancy in each system to keep excavation free of water in event of component failure.
- E. Provide 100 percent emergency power backup with automatic startup and switchover in event of electrical power failure.
- F. Provide supplemental ditches and sumps only as necessary to collect water from local seeps. Do not use ditches and sumps as primary means of dewatering.
- G. Excavated area shall be limited to the capability of the equipment or system to properly dewater the area.
 - 1. If, in the opinion of the Owner's Representative, the Contractor has failed to obtain an absolutely dry trench bottom by insufficient or ineffective use of methods of trench dewatering, the contractor shall cease all excavation work and immediately obtain the services of a licensed dewatering professional.
- H. Provide and maintain ditches of adequate size to collect surface water and seepage entering the excavations
 - 1. Divert collected water into a sump to be drained or pumped into drainage channels and settling basins prior to discharge to storm sewers.
 - 2. Obtain prior approval from Owner's Representative and jurisdictional agency concerned.
 - 3. Install all drainage ditches, sumps, and pumps to:
 - a. Control excessive seepage on excavated slopes,
 - b. Drain isolated zones with perched water tables
 - c. Drain impervious surfaces at final excavation elevation.
- I. Dewatering operations shall preserve final lines and grades, and not disturb or displace adjacent soil.
- J. Accomplish dewatering far enough in advance of excavation to ensure the groundwater is already lowered prior to completing the final excavation to finish subgrade.

- K. All destabilized subgrade conditions caused by improper dewatering operations shall be undercut and backfilled with suitable backfill material at no additional cost to the Owner.
- L. Prior to discharging water from a dewatering system into a storm sewer, the contractor shall provide an effective proven means of collecting all fines and silt before they enter the storm sewer. Failure to do so will result in the contractor's responsibility for:
 - 1. Making arrangements with the jurisdictional agency for corrective action
 - 2. Clean the affected storm sewer and appurtenances.
 - 3. Complete all necessary action related to correcting the restriction or blockage at no additional cost to the Owner.
- M. The Contractor shall backfill and restore all temporary drainage ditches, sumps, and settling basins, when no longer required, at no additional cost to the Owner
 - 1. Backfill with granular material, concrete, or other material as approved by the Owner's Representative.

3.03 STREAM AND SURFACE WATER DIVERSION

- A. The Contractor shall use all necessary means, such as ditches, berms, dikes, sand bags, hay bales, or other methods, to prevent surface water from entering excavations. Effectiveness of the means selected will be subject to the discretion of the Owner's Representative.
- B. Perform surface water diversions in a manner preventing the accumulation of water around structures or any other locations within the site of the Work, where it may be detrimental.
 - 1. Intercept and divert surface drainage away from the excavations, by the use of dikes, curb walls, ditches, pipes, sumps, or other means.
 - 2. Design surface drainage systems to prevent erosion, on or off the site, or cause unwanted flow of water.
 - 3. Remove the temporary surface drainage system when no longer required.
 - 4. Remove debris and restore the site or sites to original condition.
 - 5. Dispose of removed debris at a legally licensed facility.
- C. If stream diversion or relocation around the site of the Work is required, the Contractor shall comply with all jurisdictional requirements and return the stream to its original location and contours.
 - 1. Slopes in stream relocations shall be seeded above the waterline.

3.04 DISPOSAL OF WATER REMOVED FROM EXCAVATIONS AND TRENCHES

- A. The Contractor shall dispose of collected water from the Work per the regulations established by the EPA, EPD, and in a manner approved by the Owner's Representative.
 - 1. Disposal method utilized shall not damage or interfere with the normal drainage from the Work site.

2. Protect any portion of the Work completed or in progress, surfaces of streets, and private property from damage.
- B. All gutters, drains, culverts, storm sewers, and inlets around the Work shall be kept clean and open for normal surface drainage.
- C. The Contractor shall not direct water across or over pavement except by methods approved by the Owner's Representative.
 1. Water shall not be drained into Work under construction.
- D. Water removed from excavations and discharged into streams shall be conducted in accordance with regulations established by the EPA and the EPD.
 1. Filter collected water through an approved and effective means of filtration after pumping.

END OF SECTION

SECTION 02224
PIPE BORING AND JACKING

PART 1 – GENERAL

1.01 SCOPE

- A. The work covered by this Section includes furnishing all labor, materials and equipment required to bore and jack casings or construct tunneled crossings and to properly complete pipeline construction as described herein and/or shown on the Drawings.
- B. General: Supply all materials and perform all work in accordance with applicable American Society for Testing and Materials (ASTM), American Water Works Association (AWWA), American National Standards Institute (ANSI) or other recognized standards. Latest revisions of all standards are applicable.
- C. If requested by the County, submit evidence that manufacturer has consistently produced products of satisfactory quality and performance over a period of at least two years.

1.02 SUBMITTALS

- D. Submittals shall be made in accordance with the requirements of the General Requirements of the Contract Documents and Section 01300 Submittals. In addition, the following specific information shall be provided:
- E. Method Submittals: As directed by the County the Contractor shall provide for the County's approval, a detailed plan for the methods proposed for the construction of the casing or tunnel. These plans shall address the following:
 1. Groundwater Control: The Contractor shall control the groundwater throughout the construction of the casing in accordance with these Specifications. The groundwater shall be controlled by dewatering (well points, sumps, or deep wells), grouting, freezing or other method approved by the County. The Contractor shall prepare a written, detailed plan for controlling groundwater, citing similar installation conditions and results. This plan shall be submitted to the County prior to any construction for the casing.
 2. Face Protection: The face of the excavation shall be protected from the collapse of the soil into the casing or tunnel.
 3. Casing Design: Design of the bore pit and required bearing to resist jacking forces are the responsibility of the Contractor. The excavation method selected shall be compatible with expected ground conditions. The lengths of the casing shown on the Drawings are the minimum lengths required. The length of the casing may be extended for the convenience of the Contractor, at no additional cost with the approval of the County. Due to restrictive right-of-way and construction easements, boring and jacking casing lengths less than the nominal length may be necessary.
 4. Bore and Jack Method:

- a. With County approval the Contractor has the option to select the bore and jack method, including groundwater control, except as restricted herein.
 - b. Submit working drawings, written procedure, and calculations describing in detail the proposed bore and jack method and entire operation. This shall include, but not be limited to, groundwater control, ground stabilization if proposed, excavation procedures, control of casing alignment and grade, support of face, detection of surface movement, cathodic protection, insulated spacers, procedure for installing pipes, and anchors and placement of an approved fill material between pipe and casing. If, in opinion of the Contractor, modifications to the methods are required during construction, working drawings shall be submitted for County approval delineating such modifications, including reasons for the modifications at no cost to the County.
- 5. Tunneling Method.
- 6. Welding procedures and qualifications as required by the American Welding Society, AWS D1.1. The Contractor shall also submit qualification documents to include CWI and written reports and test results on all inspections and tests.
- 7. Welding shall be continuous, complete joint penetration (CJP) butt joint welds as required for rigid and watertight connections. Conform to AWS D1.1 and AWWA C206 approved welding procedures and referenced welding codes. In case of conflict AWS D1.1 shall govern. Rejectable weld defects shall be repaired or redone and retested until sound weld base metal has been deposited in accordance with appropriate welding codes. All welds (100 percent inspected) shall be VT inspected by Contractor's CWI and marked to indicate acceptance or rejection. Inspect 50 percent of all butt joint welds with full circumference RT conducted and evaluated by approved NDT personnel in accordance with Recommended Practice No. SNT-TC-1A Level II. Welds tested shall be selected by the Owner's representative. If in the opinion of the Owner's representative, inspections indicate inadequate quality of welds, percentage of welds tested shall be increased. VT to be performed in accordance with AWS D1.1 paragraph 6.9 Statically Loaded Nontubular Connections. RT shall be performed on CJP welds in accordance with AWS D1.1, paragraph 6.12.1. Submit all test results and RT films to Owner's representative.
- 8. The Contractor shall provide the services of an AWS certified CWI for all field welding. The CWI's qualifications shall be submitted for approval prior to the start of the work. The CWI shall be on site and perform all required duties prior to, during and after welding, and shall provide reports to the Owner for all inspections performed.

F. Material Submittals: The Contractor shall provide for the County's approval, shop drawings, proposed construction drawings and other pertinent specifications and product data as follows:

- 1. Shop drawings for casing pipe and tunnel liner plate showing sizes and connection details.
- 2. Design mixes for concrete and grout.
- 3. Casing Spacers.
- 4. Material placement methods.

G. Experience Submittals

1. Boring and jacking casings and tunnel construction is deemed to be specialty contractor work. If the Contractor elects to perform the work, the Contractor shall provide written and verifiable evidence of experience as required by the General Requirements of the Contract Documents. A minimum of five continuous years of experience in steel casing and tunnel construction is required of the contractor proposed to do the work. Evidence of this experience shall be provided with the shop drawings for approval by the County.

H. Monitoring Submittals: The Contractor shall provide a settlement monitoring plan.

1.03 STORAGE AND PROTECTION

- A. All materials shall be stored and protected in accordance with the manufacturer's published recommendations and as approved by the County.

PART 2 – PRODUCTS

2.01 MATERIALS AND CONSTRUCTION

A. Casing

1. The casing shall be new unused pipe made from steel plate having minimum yield strength of 35,000 psi. The steel plate shall also meet the chemical requirements of ASTM A 36. Pipe shall conform to the latest revisions of ASTM A134 or ASTM A139.
2. Unless otherwise directed by the County the outside of the casing pipe shall be coated with coal tar epoxy having a minimum dry film thickness of 16 mils. The direction of permitting agencies shall be followed upon approval of the Owner's Representative. Surface preparation shall be SSPC-SP-10. Epoxy shall have a minimum solids content of 65 percent by volume and shall be air or airless spray applied, minimum drying time shall be seven days. Brushing shall be permitted in small areas only. All coating and recoating shall be done in strict accordance with the manufacturer's recommendations. Epoxy shall be Tnemec, Kop-Coat, Valspar or approved equal and submitted for approval by the County.
3. Minimum casing thicknesses are shown on the Drawings. Actual thicknesses shall be determined by the casing installer, based on an evaluation of the required forces to be exerted on the casing when jacking and all calculations shall be submitted for review by the Owner's Representative. Any buckling of the casing due to jacking forces shall be repaired at no additional cost to the County.
4. Minimum diameters of casing are shown on the Drawings. Larger casings, with the County's approval, may be provided at no additional cost to the County, for whatever reasons the Contractor may decide, whether due to casing size availability, line and grade tolerances, soil conditions, etc. All cost associated with necessary modifications to ensure proper fit of spacers or any increase in the fill material shall be at the Contractor's expense.

B. Liner Plate

1. Liner plates shall be of the thickness shown on the Drawings. The liner plates shall be either the 4-flange type or the 2-flange lap-joint type. Bolts and nuts used with the 2-flange plates shall be a minimum of 5/8 inch in diameter and shall conform to the latest revision of ASTM A 307 for plate thickness less than 0.209 inch, and ASTM A 449 for plate thickness equal to or greater than 0.209 inch. Bolts and nuts used with 4-flange plates shall be not less than 1/2 inch in diameter for plate thicknesses to and including 0.179 inch and not less than 5/8 inch in diameter for plates of greater thickness. The bolts and nuts shall be quick acting coarse thread and shall conform to ASTM A 307, Grade A. Each ring shall have 2-inch diameter half couplings and plugs for grouting, located as shown on the detailed drawings. Liner plates, bolts and calculations shall be submitted to the Owner's Representative for review.

C. Casing Spacers: Casing spacers shall meet one of the following requirements:

1. Casing spacers shall be flanged, bolt-on style with a two-section stainless steel shell lined with a PVC liner, minimum 0.09-inch thick also having a hardness of 85-90 durometer. Runners shall be attached to stainless steel risers which shall be properly welded to the shell. The height of the runners and risers shall be manufactured such that the pipe does not float within the casing. Casing spacers shall be Cascade Waterworks Manufacturing Company, Advanced Products & Systems, Inc., or approved equal.

Casing spacers shall be a two-section, flanged, bolt on style constructed of heat fused PVC coated steel, minimum 14-gauge band and 10 gauge risers, with 2-inch wide fiberglass reinforced polyester insula duty PVC inner liner, minimum 0.09-inch thick, having a hardness of 85-90 durometer, and all stainless steel hardware shall be Pipeline Seal and Insulator, Ltd., or approved equal.

2. Casing spacers shall be designed for the general configuration shown in the Plans, including provisions for other conduits to be installed with the carrier pipe.

D. Carrier Pipe: All joints of pipe in casing shall be restrained. Carrier Pipe to be supplied in accordance with County Design Standards. Field welding of ductile iron pipe is prohibited.

E. Surface Settlement Markers: Surface settlement markers within pavement areas shall be P.K. nails. Surface settlement markers within non-paved areas shall be wooden hubs. Contractor may substitute alternate methods for County approval.

2.02 EQUIPMENT

A. Casings

1. A cutting head shall be attached to a continuous auger mounted inside the casing pipe.
2. On casing pipe for pipelines over 60 feet in length, the installation equipment shall include a steering head and a grade indicator.
3. The steering head shall be controlled manually from the bore pit. The grade indicator shall consist of a water level attached to the casing, which would indicate the elevation of the front end of the casing or some other means for grade indication approved by the County.

B. Tunnels

1. Tunnel Boring Machine (TBM)
 - a. The TBM's design shall be submitted for approval by the County. The TBM shall be minimally equipped with disc cutters of diameter 19 inches or greater designed for operation at thrusts of up to 70 kips per cutter.
 - b. The TBM shall afford adequate protection against loss of ground and permit ground support adjacent to the tunnel face, as required by ground conditions.
 - c. The TBM shall be equipped with a dust control system which includes a water spray system, dust shield and dust scrubber system.
 - d. The method used to advance the TBM shall ensure its correct alignment at all times, without binding or imposing excessive loads on the primary tunnel supports or upon the surrounding ground.
 - e. The TBM shall be equipped with a roll indicator and laser target system, which allows the operator to observe the machine's alignment and orientation (predictor system) from the control station.
 - f. The TBM shall be grounded in accordance with the latest requirements of the National Electrical Code and equipped with ground fault protection.
2. Other Tunneling Equipment
 - a. Power machinery and tools within the tunnel shall be operated by either electricity, compressed air, diesel with approved scrubber or other approved power. Electrical tools and equipment shall be grounded in accordance with the latest standards of the National Electric Code.
 - b. All electrical equipment and power receptacles shall have appropriate ground fault protection.
 - c. Provide temporary electrical lights to properly and safely illuminate all parts of the shafts and tunnel including special illumination at the working face. Lighting circuits shall be thoroughly insulated and separated from the power circuits, and lights shall be enclosed in wire cages. Secure electrical permits required for successful completion of this work.

PART 3 – EXECUTION

3.01 GENERAL

- A. Interpretation of soil investigation reports and data, investigating the site and determination of the site soil conditions prior to bidding is the sole responsibility of the Contractor. Rock and/or water, unstable soils due to any reason, if encountered, shall not entitle the Contractor to additional compensation. With approval from the County the Contractor may perform additional soil investigation at no cost to the County.
- B. When water is encountered, provide and maintain a dewatering system of sufficient capacity to remove water on a 24-hour basis keeping excavations free of water until the backfill operation is in progress and above the groundwater level. Dewatering shall in such a manner that removal of soil particles is held to a minimum. Dewatering shall comply with the approved Temporary and Permanent Erosion and Sediment Control Plan and these Specifications.
- C. Methods of dewatering shall be at the option and responsibility of the Contractor but must be effective and meet the required results of these Specifications. Maintain close observation to monitor and detect settlement or displacement of surface facilities due to dewatering. Should settlement or displacement be detected, notify the County immediately and take such action as necessary to maintain safe conditions and prevent damage.
- D. Casing and tunnel construction shall be performed so as not to interfere with, interrupt or endanger roadway surface and activity thereon, and minimize subsidence of the surface, structures, and utilities above and in the vicinity of the work. Support the ground continuously in a manner that will prevent loss of ground and keep the perimeters and face of the casing, passages and shafts stable. The Contractor shall be responsible for all settlement resulting from operations and shall repair and restore all damaged property to its original or better condition and is responsible for all associated damages at no cost to the County.

3.02 SAFETY

- A. Provide all necessary bulkheads and shields to ensure complete safety to all traffic, persons and property at all times during the work. Perform the work in such a manner as to not permanently damage the rail or roadbed or interfere with normal traffic over it in those areas immediately adjacent and outside the active project work area.
- B. Perform all activities in accordance with the Occupational Safety and Health Act of 1970 (PL-596), as amended, applicable regulations of the Federal Government, OSHA 29CFR 1926 and applicable criteria of ANSI A10.16-81, "Safety Requirements for Construction of Tunnel Shafts and Caissons".

3.03 SURFACE SETTLEMENT MONITORING

- A. Provide surface settlement markers, located as proposed by the Contractor and placed as approved by the County. At a minimum, the Contractor shall place settlement markers outside of pavement area, along the centerline of the casing or tunnel at 20 foot intervals. Markers shall also be placed at each shoulder of the

roadway, at each edge of pavement, at the centerline of the pavement and at 10 and 25 feet offset in each direction from the centerline of the casing. Tie settlement markers to bench marks and indices sufficiently removed as not to be affected by the Contractor's operations.

- B. An independent Professional Land Surveyor (PLS) provided by the Contractor shall make observations of surface settlement markers, placed as required herein, at intervals acceptable to the County. In the event settlement or heave on any marker exceeds 1-inch, the Contractor shall immediately cease work and using a method submitted and approved by the County, take immediate action to restore surface elevations to those existing prior to start of Contractor's operations.
- C. The PLS shall take readings and permanently record surface elevations prior to start of dewatering operations and/or shaft excavation. The following schedule shall be used for obtaining and recording elevation readings: all settlement markers, once a week; all settlement markers within 50 feet of the casing or tunnel heading, at the beginning of each day; more frequently at the County's direction if settlement is identified. Make all elevation measurements to the nearest 0.01 foot. The PLS shall continue monitoring through the warranty period.
- D. The Contractor shall cooperate fully with jurisdictional personnel. Any settlement shall be corrected by and at the expense of the Contractor.
- E. Promptly report any settlement and horizontal movement immediately to the County and take immediate remedial action at no cost to the County.

3.04 BORING AND JACKING

- A. Shaft or Pit
 - 1. Conduct boring and jacking operations from a shaft or pit excavated at one end of the section to be bored. Where conditions and accessibility are suitable, place the shaft on the downstream end of the bore.

The shaft or pit shall be rectangular and excavated to a width and length required for ample working space. If necessary, sheet and shore the shaft or pit properly on all sides. Shaft or pit sheeting shall be timber or steel piling of ample strength to safely withstand all structural loadings of whatever nature due to site and soil conditions. Keep preparations dry during all operations. Perform shaft or pit dewatering operations as necessary in accordance with these Specifications.
 - 2. The bottom of the shaft or pit shall be firm and unyielding to form an adequate foundation upon which to work. In the event the shaft or pit bottom is not stable, excavate to such additional depth as required and place a gravel sub-base or a concrete sub-base to create the support necessary to perform the required boring and jacking operation at no extra cost to the County.
- B. Jacking Rails and Frame
 - 1. Set jacking rails to proper line and grade within the shaft or pit. Secure rails in place to prevent settlement or movement during operations. The jacking rails shall cradle and hold the casing pipe on true line and grade during the progress of installing the casing.
 - 2. Place backing between the heels of jacking rails and the rear of the shaft.

The backing shall be adequate to withstand all jacking forces and loads.

3. The jacking frame shall be of adequate design for the magnitude of the job. Apply thrust to the end of the pipe in such a manner to impart a uniformly balanced load to the pipe barrel without damaging the joint ends of the pipe.

C. Boring and jacking of casing pipes shall be accomplished by the dry auger boring method without jetting, sluicing or wet boring.

B. Auger the hole and jack the casing through the soil simultaneously.

C. Bored installations shall have a bored-hole diameter essentially the same as the outside diameter of the casing pipe to be installed.

D. Execute boring ahead of the casing pipe with extreme care, commensurate with the rate of casing pipe penetration. Boring may proceed slightly in advance of the penetrating pipe and shall be made in such a manner to prevent any voids in the earth around the outside perimeter of the pipe. Make all investigations and determine if the soil conditions are such as to require the use of a shield. The Contractor shall remove any obstacles such as buried stumps and other debris encountered during casing installation at no additional cost to Owner.

E. As the casing is installed, check the horizontal and vertical alignment frequently. Make corrections prior to continuing operation.

F. Any casing pipe damaged in jacking operations shall be repaired, if approved by the County, or removed and replaced at Contractor's own expense.

G. Lengths of casing pipe, as long as practical, shall be used except as restricted otherwise. Joints between sections shall be completely welded in accordance with AWS recommended procedures. Prior to welding the joints, the Contractor shall ensure that both ends of the casing sections being welded are square.

H. The Contractor shall submit a contingency plan to the County for approval which will allow the use of a casing lubricant, such as bentonite, in the event excessive frictional forces jeopardize the successful completion of the casing installation.

I. Once the jacking procedure has begun, it should be continued without stopping until completed, subject to weather and conditions beyond the control of the Contractor.

J. Care shall be taken to ensure that casing pipe installed by boring and jacking method will be at the proper alignment and grade.

K. The Contractor shall maintain and operate pumps and other necessary drainage system equipment to keep work dewatered at all times.

L. Adequate sheeting, shoring and bracing for embankments, operating pits and other appurtenances shall be placed and maintained to ensure that work proceeds safely and expeditiously. Upon completion of the required work, sheeting, shoring and bracing shall be left in place, cut off or removed, as directed by the County.

M. Refer to Section 02324, Trenching and Trench Backfilling, and Section 02205, Dewatering for additional information related to trench excavation, all classes and types of excavation, the removal of rock, muck and debris, and the excavation of all working pits and backfill.

3.05 TUNNELS

- A. Shaft Excavation
 - 1. Excavate in such a manner that overbreak is held to a minimum. In soil and mixed face conditions, install primary support in continuous and close contact with the excavated surface to control water inflow and prevent ground loss, so that adjacent structures are not affected by ground movements. Excavation in soil shall not be advanced ahead of the previously installed primary support any more than is necessary for the installation of the succeeding section of primary support.
 - 2. Whenever shaft sinking is suspended, stabilize the excavated surfaces and keep any dewatering system operating. The Contractor shall have qualified personnel periodically check conditions that might threaten the excavation stability.
 - 3. Remove excavated soil and rock from the site and dispose of properly complying with all applicable local, state, and federal requirements regarding materials, methods of work, and disposal of excess and waste materials. All required inspections, permits, and fees are the contractor's responsibility and at no cost to the County.
 - 4. Remove sheeting used for shoring from the shaft and off the job site. The removal of sheeting, shoring and bracing shall be done in such a manner as not to endanger or damage either new or existing structures, private or public properties and also to avoid cave-ins or sliding in the banks.
- B. Tunnel Excavation
 - 1. Excavate in such a manner that overbreak is held to a minimum.
 - 2. Where water inflows in the tunnel face are large and increasing, the County may instruct the Contractor to drill probe holes, relief holes and ground treatment holes in the tunnel face, and to carry out consolidation grouting before proceeding at no additional cost to the County.
 - 3. Whenever tunneling is suspended, complete installation of the primary support for that excavation cycle. Have qualified personnel periodically check conditions that might threaten tunnel stability.
 - 4. Remove excavated rock from the excavation of the TBM erection, transit and reception chambers and dispose of properly at a location secured by the Contractor.
- C. The liner plates shall be installed progressively as excavation proceeds. Excavation shall not continue more than 24 inches past the end of the liner plate already in place. At this time an additional section of liner shall be installed before excavation shall continue. Grout shall be placed under pressure in the annular void as the excavation proceeds. Grout should be continuously placed as close to the heading as possible, using grout stops if necessary. Grout shall be injected in the lower holes first, moving upward as the back space is filled. Threaded plugs shall be installed after filling each grout hole. The Contractor shall submit to the County, for approval, a submittal for grout material, grouting plan and schedule based on liner plate completion in time intervals and distances.

3.06 VENTILATION AND AIR QUALITY

- A. Provide, operate and maintain for the duration of casing project a ventilation system

to meet safety and OSHA requirements.

3.07 ROCK EXCAVATION IN CASING

- A. In the event that rock is encountered during the installation of the casing pipe which, in the opinion of the County, cannot be removed through the casing, the County may authorize the Contractor to complete the crossing with a tunnel.
- B. With the County's approval the Contractor may continue to install the casing and remove the rock through the casing at no additional cost to the County.

3.08 INSTALLATION OF PIPE

- A. After construction of the casing or tunnel is complete, and has been accepted by the County, install the pipeline in accordance with the Drawings and Specifications.
- B. Check the alignment and grade of the casing and submit a plan to the County for approval to set the pipe at proper alignment, grade and elevation, without any sags, high spots, misalignments or end-of-casing issues.
- C. The carrier pipe shall be held in the casing pipe by the use of casing spacers. The casing spacers shall be designed by the Contractor such that the carrier pipe can be installed in the casing. For tunnels, the carrier pipe will be held in place with a steel strap per the details.
- D. With County approval and as directed by the County close the ends of the casing or tunnel with 12-inch thick masonry seal.

3.09 SHEETING REMOVAL

- A. Remove sheeting used for shoring from the shaft and off the job site. The removal of sheeting, shoring and bracing shall be done in such a manner as not to endanger or damage either new or existing structures, private or public properties and also to avoid cave-ins or sliding in the banks.

END OF SECTION

SECTION 02271

GABIONS

PART 1 – GENERAL

1.01 SECTION INCLUDES

The section includes general requirements for providing wire mesh gabion baskets and all appurtenant work, including furnishing and placing all fill rock, compacting embankment or other fill material, placing geotextile filter material, as well as excavating, and disposing excess or waste material, in accordance with the Contract Documents.

1.02 RELATED SECTIONS

- A. Section 01300: Submittals
- B. Section 02276: Site Restoration and Erosion Control

1.03 REFERENCED SPECIFICATIONS, CODES, AND STANDARDS

- A. ASTM A 313 Standard Specification for Stainless Steel Spring Wire.
- B. ASTM A 641 Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
- C. ASTM A 764 Standard Specification for Steel Wire, Carbon, Drawn Galvanized and Galvanized at Size for Mechanical Springs.
- D. ASTM A 975 Standard Specification for Double-Twisted Hexagonal Mesh Gabions and Revet Mattresses.

1.04 SUBMITTALS

- A. Manufacturer's data, recommendations, and instructions for installation.
- B. Contractor shall submit a letter certifying the rock from its selected rock source meets the requirements of this specification and, if requested, shall coordinate inspection of the rock source by the Owner's Representative.
- C. Complete layout and installation details for gabion installations

PART 2 – PRODUCTS

2.01 GENERAL

- A. Standard galvanized gabions should typically be used unless corrosion/abrasion or aesthetic concerns warrant the use of PVC coating. PVC coated gabions will only be used when directed by the Owner's Representative.
- B. Materials used in the manufacture and assembly of gabions shall comply with all requirements of ASTM A 975 for Style 1, standard galvanized or Style 3, PVC coated galvanized gabions, except as modified herein.
- C. Gabions shall be fabricated so the sides, ends, lid and diaphragms can be assembled at the construction site into rectangular baskets of the sizes as required.
- D. Gabions shall be of single unit construction, manufactured with all components mechanically connected at the production facility; the base, lid, ends, and sides shall be woven into a single unit so the strength of the unit shall meet the requirements of paragraph 2.2 D or 2.3 D below.
- E. Where the length of the gabion exceeds one and one-half its horizontal width, the gabion shall be divided by diaphragms, of the same mesh and gage as the body of the gabions, into cells so the length does not exceed the horizontal width. The gabion shall be furnished with the necessary diaphragms secured in proper position on the base so no additional tying is required at this juncture.
- F. Wire mesh used for gabion manufacture shall be non-raveling. This is defined as the ability to resist pulling apart at any of the twists or connections forming the mesh when a single wire strand in a section of mesh is cut.

2.02 GALVANIZED STEEL WIRE MESH GABIONS

- A. Gabion basket units shall be of non-raveling construction and fabricated from a double twisted hexagonal mesh of hot dipped galvanized steel wire. The mesh opening shall be hexagonal in shape and uniform in size measuring not more than 3-1/4 inches by 4-1/2 inches.
- B. Mesh wire, lacing wire, and stiffener wire used in the construction of gabions shall meet the minimum requirements shown below:

Property	Governing Standard	Minimum Requirement
Tensile Strength	ASTM A 641, Soft Temper	54,000 to 70,000 psi – Mesh and Selvedge Wire 54,000 to 75,000 psi – Lacing and Stiffener Wire
Zinc Coating	ASTM A 641, Class 3	0.90 oz/sq.ft. – Selvedge Wire

Property	Governing Standard	Minimum Requirement
		0.85 oz/sq.ft. – Mesh Wire 0.70 oz/sq.ft. – Lacing and Stiffener Wire
Diameter – Mesh Wire	ASTM A 975, Style 1	0.120 in.
Diameter – Lacing and Stiffener Wire	ASTM A 975, Style 1	0.087 in.
Diameter – Selvedge Wire	ASTM A 975, Style 1	0.150 in.

C. Fasteners used in the construction of gabions shall meet the minimum requirements shown below:

Property	Governing Standard	Minimum Requirement
Tensile Strength	ASTM A 764, Coating Class 3, Coating Finish 1, Coating Type B, Tensile Class II	230,000 to 273,000 psi
Zinc Coating	ASTM A 764, Coating Class 3, Coating Finish 1, Coating Type B, Tensile Class II	0.80 oz/sq.ft.
Diameter	ASTM A 975, Style 1	0.118 in.

D. The minimum strength requirements of the wire mesh and connections shall comply with ASTM A 975 as listed below:

Test Description	Minimum Requirement
Parallel to twist	3500 lbf/ft
Perpendicular to twist	1800 lbf/ft
Connection to selvedges	1400 lbf/ft
Panel to panel connection	1400 lbf/ft
Punch test	6000 lbf

E. Gabions shall be manufactured by Maccaferri, Terra Aqua, or approved equal.

2.03 PVC COATED GALVANIZED STEEL WIRE MESH GABIONS

A. Gabion basket units shall be of non-raveling construction and fabricated from a double twisted hexagonal mesh of hot dipped galvanized steel wire. The mesh opening shall be hexagonal in shape and uniform in size measuring not more than 3-1/4 inches by 4-1/2 inches.

B. Mesh wire, lacing wire, and stiffener wire used in the construction of gabions shall meet the minimum requirements shown below:

Property	Governing Standard	Minimum Requirement
Tensile Strength	ASTM A 641, Soft Temper	54,000 to 70,000 psi – Mesh and Selvedge Wire 54,000 to 75,000 psi – Lacing and Stiffener Wire
Zinc Coating	ASTM A 641, Class 3	0.85 oz/sq.ft. – Selvedge Wire 0.80 oz/sq.ft. – Mesh Wire 0.70 oz/sq.ft. – Lacing and Stiffener Wire
Diameter – Mesh Wire	ASTM A 975, Style 3	0.106 in.
Diameter – Lacing and Stiffener Wire	ASTM A 975, Style 3	0.087 in.
Diameter – Selvedge Wire	ASTM A 975, Style 3	0.134 in.

C. Fasteners used in the construction of gabions shall be made from stainless steel and shall meet the minimum requirements shown below:

Property	Governing Standard	Minimum Requirement
Tensile Strength	ASTM A 313, Type 302	222,000 to 253,000 psi
Diameter	ASTM A 975, Style 3	0.118 in.

D. The minimum strength requirements of the wire mesh and connections shall comply with ASTM A 975 as listed below:

Test Description	Minimum Requirement
Parallel to twist	2900 lbf/ft
Perpendicular to twist	1400 lbf/ft
Connection to selvedges	1200 lbf/ft
Panel to panel connection	1200 lbf/ft
Punch test	5300 lbf

E. The minimum requirements of the PVC for coating shall comply with ASTM A 975 as listed below:

Test Description	Minimum Requirement
Specific Gravity	1.30 – 1.35
Tensile Strength	2985 psi
Modulus of Elasticity	2700 psi
Hardness	Shore "D" between 50 and 60
Brittleness Temperature	>= 15 degrees-F
Resistance to Abrasion	< 12 percent
Salt Spray Exposure	No effect after 3000 hours of exposure

Test Description	Minimum Requirement
Ultraviolet Light Exposure	No effect after 3000 hours of exposure
Evaluation after Salt Spray and Ultraviolet Tests Above	Specific Gravity, Tensile Strength, Hardness, and Resistance to Abrasion Tests shall not change by more than 6, 25, 10 and 10-percent respectively, from their initial values.
Coating Thickness	0.02 in. - Nominal 0.015 in. – Minimum
Appearance after Gabion Fabrication	No visible cracks, breaks, or bubbles and no discernable variation in color.

F. Gabions shall be manufactured by Maccaferri, Terra Aqua, or approved equal.

2.04 ROCK FILL MATERIALS

- A. Rock fill shall consist of durable, angular field or quarry stone meeting the following criteria: sound, hard, and free from seams, cracks, or other structural defects, weighing at least 156-pounds per cubic foot or more. Flat, slabby, or shaley pieces will not be acceptable. Stones shall be resistant to weathering and to water action and free from overburden, spoil, and organic material. The minimum dimension of any rock or stone shall be 4 inches and the maximum dimension shall not be greater than 8 inches. The rocks or stones shall be graded and placed in size so as to produce a reasonably dense mass.
- B. Rock fill shall be hauled from a pit or site approved by the Owner's Representative. On site quality control shall be through visual inspection. Rock not meeting the requirements of this specification may be rejected by the Owner's Representative.

2.05 GEOTEXTILE FABRIC

- A. Geotextile fabric shall meet the requirements of GA DOT Section 881.06 for nonwoven fabrics, having physical properties as follows:
 - 1. Puncture Resistance (ASTM D 4833) 30 lbs.
 - 2. Grab Tensile Strength (ASTM D 4632) 65 lbs.
 - 3. Grab Elongation (ASTM D 4632) 40%
 - 4. Flow Rate (GDT: 87) 50 – 350 gal/min/ft²
- B. Fabric shall be Mirafi 140N or approved equal.

PART 3 – EXECUTION

3.01 FOUNDATION PREPARATION

- A. The foundation areas for the gabions shall be excavated to the slopes, lines and grades shown and shall be smooth and firm, free of brush, trees, stumps, and other objectionable material.
- B. The Contractor shall remove and exclude all stormwater, groundwater and creek or stream water from the excavation. Sump pumps and sand bags, or other means, shall be used to remove and exclude water and continuously maintain water level below the bottom of the excavation. Water shall be removed and excluded until backfilling is complete and all field soils testing has been completed. Any water removed from the excavation shall not be discharged into any surface drainage system, stream or other water body unless such discharge meets water quality standards. Removed water may be disposed on-site by land application using sprinklers in an area designated by the Owner's Representative or by discharge into an approved treatment system.
- C. Foundation fill materials, procedures, and testing shall be as indicated on the Drawings and in accordance with the applicable requirements of the Section 02324, Trenching and Trench Backfilling. Foundation fill materials shall be compacted to 95 percent of maximum density unless otherwise indicated.
- D. Geotextile fabric shall be placed where indicated and oriented and secured as recommended by the manufacturer. Use a minimum of 1-foot overlap for each joint. Use a wider overlap if recommended by the geotextile manufacturer and secure per manufacturer's instructions

3.02 ASSEMBLY AND INSTALLATION OF GABIONS

- A. Gabions shall be assembled and installed in accordance with the manufacturer's recommendations. Empty gabion units shall be assembled individually and placed on the prepared surface to the lines and grades shown. The sides, ends, and diaphragms shall be erected to insure the correct position of all creases and the tops of all sides are uniform.
- B. All adjoining gabion units shall be connected by tie wire lacing along the perimeter of their contact surfaces in order to obtain a monolithic structure. Lacing adjoining basket units shall be accomplished by continuous stitching with alternating single and double loops, with a half-hitch on each double loop, spaced at intervals of not more than 6 inches. All lacing wire terminals shall be securely fastened.
- C. Fasteners may be used in lieu of tie wire lacing and shall be installed so the strength requirements of paragraph 2.2 D are met, and with a spacing interval of not more than 6 inches for all connections, including internal diaphragm to basket connections. Fasteners used for assembly of gabion units shall only be attached when the basket units are empty.

D. After adjoining empty basket units are set to the desired lines and grades and common sides with adjacent units thoroughly laced, they shall be placed in tension and stretched to remove any kinks from the mesh and to form a uniform alignment. Stretching empty basket units shall be accomplished to prevent any possible unraveling.

3.03 PLACING ROCK FILL

A. Proceed with the rock filling operations by carefully placing material by hand or machine to avoid damaging the wire coating, assuring a minimum of voids between the stones, and maintaining the alignment throughout the filling process. Undue bulging of the mesh shall be avoided. To minimize localized deformation, the basket units in any row are to be filled in stages consisting of maximum 12-inch courses, and at no time shall any cell be filled to a depth exceeding one foot more than the adjoining cell. The last layer of stone shall over-fill each basket by 1-in. to 2-in. to compensate for future rock settlement. The maximum height the stone may be dropped into the basket units shall be 3-feet. Adjust placement of stone by hand to ensure maximum stone density.

B. Along all exposed faces, the outer layer of stone shall be carefully placed and arranged by hand to insure a neat and compact appearance. All stones used on exposed faces shall have no dimension smaller than the mesh opening size.

C. Each partitioned section of the gabion shall be filled and leveled at the 1/3 point for 3-ft high gabions or the 1/2 point for 1.5-ft high gabions and shall be cross tied through the middle with connecting wire from end to end and side to side. Connecting wires shall be looped around one mesh opening at each basket face and the wire terminals shall be securely twisted to prevent their loosening.

D. Lids shall be stretched tight over the stone fill using crowbars or lid closing tools, until the lid meets the perimeter edges of the front and end panels. The lid shall then be tightly laced with tie wire along all edges, ends, and internal cell diaphragms by continuous stitching with alternating single and double loops, with a half-hitch on each double loop, spaced at intervals of not more than 6 inches. Special attention shall be given to assure all projections or wire ends are turned into the baskets. The Contractor shall have the option of securing the lids by using fasteners spaced at intervals of not more than 6 inches along all edge, end, and internal cell diaphragm connections provided the strength requirements of paragraph 2. 2 D are met.

E. After filling and securing the gabion lids, any space remaining between the stream bank and the gabion baskets shall be filled with a graded gravel clean and free from organic matter and meeting the following criteria:

1. It shall be crushed rock or gravel, durable and free from slaking or decomposition under the action of alternate wetting or drying. The material shall be uniformly graded and shall conform to the following gradation (GA DOT Section 800.01, No. 467 modified):

Size	Percentage Passing
2-inch	100
1 1/2 inch	95-100
3/4 inch	35-70
3/8 inch	10-30
No. 4 Sieve	0-10

2. The backfilled gravel material shall be compacted with hand or mechanical tampers to a minimum of 80-percent of maximum density. The compaction must be performed so as to not displace the gabion baskets.

3.04 PROTECTION OF THE WORK

The construction sequence shall be planned and carried out so no tracked, wheeled vehicles, or any heavy equipment will travel over or on a completed gabion.

END OF SECTION

SECTION 02273

RIPRAP

PART 1 – GENERAL

1.01 SECTION INCLUDES

The section includes general requirements for providing stone riprap slope protection, including associated earthwork and geotextile filter material, complete and in place, in accordance with the Contract Documents.

1.02 RELATED SECTIONS

- A. Section 01300: Submittals
- B. Section 02276: Site Restoration and Erosion Control

1.03 REFERENCED SPECIFICATIONS, CODES, AND STANDARDS

- A. Georgia Department of Transportation (GA DOT), Standard Specifications
- B. Construction of Roads and Bridges, 1993 Edition
- C. ASTM C 88, Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
- D. ASTM C 535, Standard Test Method for Resistance to Degradation of Large Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
- E. AASHTO T 85, Standard Method of Test for Specific Gravity and
- F. Absorption of Coarse Aggregate
- G. AASHTO T 210, Method of Test for Aggregate Durability Index.
- H. AASHTO T 134, Optimum Moisture Content

1.04 SUBMITTALS

- A. Shop Drawings: Description and location of proposed sources of riprap bedding and riprap.
- B. Testing certificates from a qualified testing agency shall be submitted prior to acceptance of the rock source to verify the gradation, abrasion resistance, and bulk density. Contractor shall, if requested, coordinate inspection of the rock source by the Owner's Representative.
- C. Trip tickets showing source, type, and weight of each load of material delivered to the Site.

PART 2 – PRODUCTS

2.01 STONES FOR RIPRAP

- A. All Stone for riprap shall be sound, durable pieces of quarried stone weighing 156-pounds per cubic foot or more. The stone shall be angular and random in shape; rounded boulders or cobbles shall not be used. Flat, slabby, or shaley pieces will not be acceptable. Stones shall be resistant to weathering and to water action and free from overburden, spoil, and organic material and shall meet the gradation requirements below.
- B. Riprap shall conform to the size types as follows: Equivalent to GA DOT specification Section 805 for "Plain Riprap"
- C. The durability index and percent absorption shall be determined by AASHTO T 210 and AASHTO T 85, respectively. The minimum apparent specific gravity of the stones shall be 2.5 as determined by AASHTO T 85.
- D. Stones shall have less than 10 percent loss of weight after five cycles, when tested per ASTM C 88.
- E. Stones shall have a wear not greater than 40 percent, when tested per ASTM C 535.
- F. Control of gradation shall be by visual inspection. The Contractor shall furnish a sample of the proposed gradation of at least 5 tons or 10 percent of the total riprap weight, whichever is less. If approved, the sample may be incorporated into the finished riprap at a location where it can be used as a frequent reference for judging the gradation of the remainder of riprap. Any difference of opinion between the Owner's Representative and the Contractor shall be resolved by checking the gradation of two random truckloads of stones. Arranging for and the costs of mechanical equipment, a sorting site, and labor needed in checking gradation shall be the Contractor's responsibility.
- G. The acceptability of the stones will be determined by the Owner's Representative prior to final placement.

2.02 GEOTEXTILE FABRIC FILTER

- A. Geotextile fabric shall meet the requirements of GA DOT Section 881.06 for woven fabrics, having physical properties as follows:
 - 1. Tensile Strength- any direction (ASTM D 4634) 200 1bs
 - 2. Bursting Strength (ASTM D 3786) 500 psi
 - 3. Elongation Before Breaking (ASTM D 4634) 10-35%
 - 4. Percent Open Area (GOT: 88) 4.0-6.0%
- B. Fabric shall be Mirafi Filterweave 403 or approved equal.

PART 3 – EXECUTION

3.01 SURFACE PREPARATION

- A. Surfaces to receive filter materials and riprap, including the toe trench and slope, shall be brought to the line and grade indicated and shall be smooth and firm, free of brush, trees, stumps, and other objectionable material. Where filling of depressions is required or a filled bank is constructed, the new material shall be compacted with hand or mechanical tampers to a minimum of 85-percent of maximum density.
- B. The Contractor shall remove and exclude all stormwater, groundwater and creek or stream water from the excavation. Sump pumps and sand bags or portable dams, diversions, or other approved means, shall be used to remove and exclude water and continuously maintain water level below the bottom of the excavation. Water shall be removed and excluded until both geotextile filter material and riprap have been placed. Any water removed from the excavation shall not be discharged into any drainage system, surface stream or other water body unless such discharge meets water quality standards. Removed water may be disposed on-site by land application using sprinklers in an area designated by the Engineer or by discharge into an approved treatment system.
- C. Cleared and excavated materials shall be hauled off site to an appropriate disposal location arranged by the Contractor and at its sole expense unless otherwise indicated or specified.
- D. Riprap installed at the toe of a stream bank below the elevation of the water in a stream to prevent scour from undermining the riprap shall be backfilled and covered with native soil to the original grade. The backfilled native soil shall be compacted with hand or mechanical tampers and riprap placed per GDOT Section 603.

3.02 PLACEMENT OF GEOTEXTILE FABRIC

- A. The fabric shall be placed with the long dimension running up the slope, with the upstream strip overlapping the downstream strip. Use a minimum of 2-foot overlap for each overlap. Use a wider overlap if recommended by the geotextile manufacturer and secure per manufacturer's instructions.
- B. The fabric shall be placed loosely with sufficient folded or gathered material to prevent stretching and tearing during riprap placement.
- C. The fabric shall be anchored into place using securing pins with type and spacing as recommended by the manufacturer. In addition, the fabric shall be secured at the toe and crest of the slope using anchor trenches at least 2-feet deep. If a stream bank extends sufficiently above a stream so the riprap would not be installed to the top of the bank, then the fabric shall be anchored in a 2-foot deep trench up-slope from the top of the minimum free-board of 0.5 feet above the flow resulting from a 50-year, 24-hour storm runoff event.

3.03 STONE RIPRAP

- A. Placing riprap shall begin at the toe and proceed up the slope. The stones shall be placed, or dumped from a height of not more than three feet and placed with equipment or by hand. Sufficient hand work shall be performed to produce a neat and uniform surface.
- B. Dumped riprap shall be used only where there is an existing road access to the top and/or bottom of the stream bank. Riprap shall be dumped into place, beginning at the toe and proceeding up the slope, and may be . spread using suitable equipment. Care must be taken to prevent damage to the underlying filter material. Sufficient hand work shall be performed to produce a neat and uniform surface.

END OF SECTION

SECTION 02276

SITE RESTORATION AND EROSION CONTROL

PART 1 - GENERAL REQUIREMENTS

1.01 SECTION INCLUDES

- A. The work specified in this Section consists of providing, monitoring, maintaining and removing temporary erosion and sedimentation controls and restoring site conditions as necessary.
- B. Temporary erosion controls include, but are not limited to, Best Management Practices (BMP's) such as: grassing, mulching, netting, and watering, and reseeding on-site surfaces and spoil and borrow area surfaces and providing interceptor ditches at ends of berms and at those locations ensuring the erosion during construction will be either eliminated or maintained within acceptable limits as established by the Owner's Representative, Local Issuing Authority and State.
- C. Temporary sedimentation controls include, but are not limited to, BMP's such as: silt fencing, silt dams, temporary sediment traps, temporary inlet sediment traps, barriers, rock filter dams, temporary creek crossings, diversion ditches, tree protection fencing, and appurtenances at the foot of sloped surfaces ensuring the sedimentation pollution will be either eliminated or maintained.
- D. Site restoration includes, but not limited to, protecting, preserving, and reestablishing specimen trees, fences, cultivated trees and shrubbery, and man-made improvements within and surrounding the project area.

1.02 RELATED SECTIONS

- A. Section 01015: Control of Work
- B. Section 02110: Access Route and Easement Access Clearing
- C. Section 02271: Gabions
- D. Section 02273: Riprap
- E. Section 02485: Sodding
- F. Section 02486: Seeding

G. Section 02542: Silt Fence

1.03 REFERENCES

- A. Clean Water Act
- B. Georgia Building Code
- C. Any Soil Erosion and Sediment Control Ordinances in force by the local Government.
- D. State of Georgia, Department of Transportation, Standard Specifications.
- E. Manual for Erosion and Sediment Control in Georgia, latest edition.
- F. Georgia Erosion and Sedimentation Control Act
- G. Georgia Water Quality Control Act

1.04 QUALIFICATIONS AND REQUIREMENTS

- A. Provide effective temporary erosion and sediment control measures during construction or until final controls become effective.
- B. Erosion, Sedimentation and Pollution Control shall be performed in accordance with Georgia's NPDES Permit No. GAR 100001, 100002, or 100003, as applicable, and as detailed in the drawings.

1.05 SUBMITTALS

- A. Furnish manufacturer's data for all items confirming compliance with specifications
- B. Furnish qualifications of all personnel involved in Work related to providing, monitoring, maintaining and removing temporary erosion and sedimentation controls

PART 2 - PRODUCTS

2.01 EROSION CONTROL

- A. Mulch
- B. Temporary grass seed

- C. Permanent grass seed
- D. Sod
- E. Dust control
- F. Slope stabilization blankets
- G. Flocculants and coagulants
- H. Tackifiers
- I. Stream bank stabilization products
- J. Slope stabilization products:
 - 1. Rolled Erosion Control Products (RECPs): A natural fiber blanket with single or double photodegradable or biodegradable nets.
 - a. Blankets shall be non-toxic to vegetation, seed, or wildlife. At a minimum, the plastic or biodegradable netting shall be stitched to the fibrous matrix to maximize strength and provide for ease of handling.
 - b. Products shall be determined to be non-toxic in accordance with EPA-821-R-02-012.
 - 2. Hydraulic Erosion Control Products (HECPs): shall utilize straw, cotton, wood or other natural based fibers held together by a soil binding agent working to stabilize soil particles. Paper mulch should not be used for erosion control.
 - a. HECPs shall be prepackaged from the manufacturer. Field mixing of performance enhancing additives will not be allowed. Fibrous components should be all natural or biodegradable.
 - b. Products shall be determined to be non-toxic in accordance with EPA-821-R-02-012.

2.02 SEDIMENTATION CONTROL

- A. Bales - clean, seed free cereal hay type.
- B. Netting - fabricated of material acceptable to the Owner.
- C. Filter stone - No. 57 - crushed stone.
- D. Filter media sock, silt fencing (Type NS or Type S).

- E. Tree save fencing.

PART 3 - EXECUTION

3.01 GENERAL

- A. All erosion control measures are to be installed per the requirement listed in the construction documents as well as defined with Georgia's Manual for Erosion and Sediment Control, latest edition.
- B. No payment will be made for any portion of the Project when temporary erosion and sedimentation controls are not properly installed and maintained in compliance with the Georgia Manual for Erosion and Sedimentation Control, latest edition.

3.02 VEGETATIVE MEASURES

- A. Erosion control should be addressed in the planning stages of all proposed land-disturbing activities. Erosion control techniques shall be installed, monitored and maintained on all areas exposed, including areas that will be paved or built upon in the future. Various types of vegetative practices are to be used as required for erosion control. The time-line for the implementation of various vegetative practices is as follows:
- B. Mulch, temporary vegetation, or permanent (perennial) vegetation shall be completed on all exposed areas within 14 days after disturbance. Failure to do so will justify Owner to immediately have work done at the Contractor's expense.
- C. Ds1 - Disturbed Area Stabilization (With Mulching Only): Mulching can be used as a singular erosion control method on areas at rough grade. Mulch can be an option for up to six months provided the mulch is applied at the appropriate depth (depending on type of mulch used), anchored, and has a continuous 90% cover or greater of the soil surface. Maintenance shall be required to maintain appropriate depth, anchorage, and 90% cover. If an area will remain undisturbed for greater than six months, permanent (perennial) vegetation shall be used.
- D. Ds2 - Disturbed Area Stabilization (With Temporary Seeding): Temporary vegetation may be employed instead of mulch if the area will remain undisturbed for less than six months.
- E. Ds3 - Disturbed Area Stabilization (With Permanent Vegetation): Permanent (perennial) vegetation or sod shall be used immediately on areas at final grade. Permanent (perennial) vegetation shall be used on rough graded areas to remain undisturbed for six months or greater.

- F. Ds4 - Disturbed Area Stabilization (With Sodding): May be used in place of Ds3.
- G. Stabilization of an area is accomplished when 70% of the surface area is covered in a uniform, vegetative cover (permanent or temporary) or anchored mulch of the appropriate thickness with 90% coverage. "Final stabilization" means all soil disturbing activities at the site have been completed, and for unpaved areas and areas not covered by permanent structures and areas located outside the waste disposal limits of a landfill cell certified by EPD for waste disposal, 100% of the soil surface is uniformly covered in permanent vegetation with a density of 70% or greater, or landscaped according to the Plan (uniformly covered with landscaping materials in planned landscaped areas), or equivalent permanent stabilization measures.
- H. Permanent (perennial) vegetation shall consist of: planted trees, shrubs, perennial vines; a crop of perennial vegetation appropriate for the time of year and region; or a crop of annual vegetation and a seeding of target crop perennials appropriate for the region, such that within the growing season a 70% coverage by perennial vegetation shall be achieved.
 - 1. For linear construction projects on land used for agricultural or silvicultural purposes, final stabilization may be accomplished by stabilizing the disturbed land for its agricultural or silvicultural use.
 - 2. For the purposes of this specification, permanent vegetation is used synonymously with perennial vegetation. Perennial vegetation is plant material that lives continuously from year to year although it may have a dormant season when the leaves and possibly the stems "die back" to the ground. No vegetative planting can technically be considered permanent. Annual vegetation is plant material lives for only one growing season. This type of vegetation is typically used for temporary establishment due to its quick germination. Some perennial vegetation can be used for temporary stabilization.
- I. Slope Stabilization
 - 1. It is the intention of this specification to allow interchangeable use of RECPs and HECPs for erosion protection on slopes. The Contractor should select the type of erosion control product best fitting the need of the particular site.
 - a. Installation and stapling of RECPs and application rates for the HECPs shall conform to manufacturer's guidelines for application.
 - b. Products shall have a maximum C-factor (ASTM D6459) for the following slope grade:

Slope (H:V)	C-Factor (max.)
3:1 or greater	0.080

2. RECPs will be categorized as follows:
 - a. Short term (functional longevity 12 mos.)
 - 1) Photodegradable: Straw blankets with a top and bottom side photo degradable net. The maximum size of the mesh shall be openings of $\frac{1}{2}$ " X $\frac{1}{2}$ ". The blanket should be sewn together on 1.5" centers with degradable thread. Minimum thickness should be 0.35" and minimum density should be 0.5 lbs per square yard.
 - 2) Biodegradable: Straw blanket with a top and bottom side biodegradable jute net. The top side net shall consist of machine direction strands that are twisted together and then interwoven with cross direction strands (leno weave). The bottom net may be leno weave or otherwise to meet requirements. The approximate size of the mesh shall be openings of 0.5" X 1.0". The blanket should be sewn together on 1.5" centers with degradable thread. Minimum thickness should be 0.25" and minimum density should be 0.5 lbs per square yard.
 - b. Extended term (functional longevity 24 mos.)
 - 1) Photodegradable: Blankets that consist of 70% straw and 30% coconut with a top and bottom side photodegradable net. The top net should have ultraviolet additives to delay breakdown. The maximum size of the mesh shall be openings of 0.65" X 0.65". The blanket should be sewn together on 1.5" centers with degradable thread. Minimum thickness should be 0.35" and minimum density should be 0.6 lbs per square yard.
 - 2) Biodegradable: Blankets that consist of 70% straw and 30% coconut with a top and bottom side biodegradable jute net. The top side net shall consist of machine direction strands that are twisted together and then interwoven with cross direction strands (leno weave). The bottom net may be leno weave or otherwise to meet requirements. The approximate size of the mesh shall be openings of 0.5" X 1.0". The blanket should be sewn together on 1.5" centers with degradable thread. Minimum thickness should be 0.25" and minimum density should be 0.65 lbs per square yard.
 - c. Long-term (functional longevity 36 mos.)
 - 1) Photodegradable: Blankets that consist of 100% coconut with a top and bottom side photodegradable net. Each net should have ultraviolet additives to delay breakdown. The maximum size of the mesh shall be openings of 0.65" X 0.65". The blanket should be sewn together on 1.5" centers with

degradable thread. Minimum thickness should be 0.3" and minimum density should be 0.5 lbs per square yard.

- 2) Biodegradable: Blankets that consist of 100% coconut with a top and bottom side biodegradable jute net. The top side net shall consist of machine direction strands that are twisted together and then interwoven with cross direction strands (leno weave). The bottom net may be leno weave or otherwise to meet requirements. The approximate size of the mesh shall be openings of 0.5" X 1.0". The blanket should be sewn together on 1.5" centers with degradable thread. Minimum thickness should be 0.25" and minimum density should be 0.5 lbs per square yard.
3. Site Preparation: After the site has been shaped and graded to the approved design, prepare a friable seedbed relatively free from clods and rocks more than one inch (1") in diameter, and any foreign material preventing contact of the soil stabilization mat with the soil surface. Surface must be smooth to ensure proper contact of blankets or matting to the soil surface. If necessary, redirect any runoff from the ditch or slope during installation.
4. Maintenance: All erosion control blankets and matting should be inspected periodically following installation, particularly after rainstorms to check for erosion and undermining. Any dislocation or failure should be repaired immediately. If washouts or breakage occurs, reinstall the material after repairing damage to the slope or ditch. Continue to monitor and maintain these areas until they become permanently stabilized.

3.03 SEDIMENTATION CONTROL

- A. Install and maintain silt fencing, silt dams, traps, barriers and all other appurtenances as shown on the approved descriptions and working drawings. Hay bales, silt fencing, filter socks, and other BMP's which deteriorate and filter stone which is dislodged shall be replaced when needed. Refer to Specification 02542 – Silt Fencing for general silt fencing requirements.
- B. Install and maintain temporary stream crossings as indicated in the Manual for Erosion and Sediment Control in Georgia, and as modified in these specifications, the more stringent shall apply.
- C. Install and maintain riprap for all erosion and sediment control methodologies as indicated in the Manual for Erosion and Sediment Control in Georgia and as specified or modified in the Contract Documents the more stringent shall apply. Refer to Specification Section 02273 – Riprap for general riprap requirements.

3.04 SITE RESTORATION

- A. Prior to clearing landscaping features, but not necessarily limited to, specimen trees, fences, cultivated trees, cultivated shrubbery, property corners, man-made improvements, subdivision and other signs, shall be noted and shall be reviewed with the Owner's Representative. The Owner's Representative will determine the landscape features to remain undisturbed. The Contractor shall take extreme care in moving landscape features and shall re-establish these features as directed by the Owner's Representative.
- B. Species of plantings to be replaced shall be verified by a landscape expert. The size of the planting replacement must be equal to the size of the planting removed.
- C. Fences adjoining any excavation or embankment, in the Contractor's opinion, damaged or buried, shall be carefully removed, stored and replaced. Any fencing, in the Owner's Representative opinion, significantly damaged shall be replaced with new fence material of equal or better quality at the Contractor's expense.
- D. The Contractor shall exercise special precautions for protecting and preserving trees, cultivated shrubs, sod, fences, etc. situated within limits of the project area. The Contractor shall be held liable for any damage his operations have inflicted on such property.
- E. The Contractor shall be responsible for all damages to existing improvements outside the project area resulting from Contractor's operations.

3.05 ACCEPTANCE

- A. Should any of the temporary erosion and sediment control measures employed fail to produce results complying with the requirements of the State, immediately take whatever steps are necessary to correct the deficiency within the limits defined in the NPDES permit or Georgia's Manual for Erosion and Sediment Control.
- B. For a product or practice to be approved as slope stabilization, the product or practice must have a documented C-factor of 0.080.

3.06 DOCUMENTATION

- A. Contractor shall monitor, report and retain records as required by the GA NPDES Permit No. GAR 100001, 100002, or 100003, as applicable. Attached to the end of this section are the minimal, but not limited to, reports which should be performed and maintained. The following are the attached reports:
 1. Daily Inspection Report

2. Daily Rainfall Monitoring Report
3. Weekly Inspection Report
4. Stormwater Monitoring Data
5. Monthly Inspection Report
6. Inspection Summary Report for violations and corrective actions.
7. Erosion and Sedimentation Control Inspection Report

END OF SECTION

Daily Inspection Report

Inspection performed by certified personnel each day construction activity occurs on-site

Project Information	
Date:	Project Name:
Project Location:	
Inspection Observations	
Rainfall within past 24 hours (inches):	Is rainfall greater than 0.5"? Inspection Required <input type="checkbox"/>
Inspection Observations	
Petroleum Product Storage Areas: Are all of the temporary and permanent controls contained in Plan in place? <input type="checkbox"/> Yes <input type="checkbox"/> If no, describe the location(s) of deficiencies and corrective actions that must be taken.	
Vehicle Entrances and Exits: Is there tracking of sediment from locations where vehicles enter and leave the project? If yes, describe the location(s) and the corrective actions that must be taken.	
Other Observations	
Is an Erosion, Sedimentation and Pollution Control Plan revision required? <input type="checkbox"/> Yes <input type="checkbox"/> No Date of revision:	
Corrective Actions and Date:	

Signature of Certified Personnel

Printed Name of Certified Personnel

Daily Rainfall Log

Project Name: _____

Project Location: _____

Month: _____ Year: _____

Type of Device Used to Measure Rainfall: _____

Device Location: _____

Daily Rainfall Monitoring Data

Weekly Inspection Report

Inspection performed by certified personnel at least once every seven calendar days and within 24 hours of the end of a storm that is 0.5 inches or greater

Project Information	
Date:	Project Name:
Project Location:	
Name of Inspector:	
Inspection Event	
Regular weekly inspection:	<input type="checkbox"/>
Inspection within 24 hours of 0.5" storm event	<input type="checkbox"/>
Inspection Observations	
Disturbed areas that have not undergone final stabilization:	
Are all of the temporary and permanent controls contained in Plan in place and properly maintained? <input type="checkbox"/> Yes <input type="checkbox"/> No	
If no, describe the location(s) of deficiencies and corrective actions that must be taken.	
Corrective Action Taken and Date:	
Material storage areas exposed to precipitation:	
Are all of the temporary and permanent controls contained in Plan in place and properly maintained? <input type="checkbox"/> Yes <input type="checkbox"/> No	
If no, describe the location(s) of deficiencies and corrective actions that must be taken.	
Corrective Action Taken and Date:	

Discharge locations or points.

Are erosion control measures preventing impacts to receiving waters? Yes No

If no, describe observations:

Structural control measures:

Are all of the temporary and permanent controls contained in Plan in place and properly maintained?

Yes No

If no, describe the location(s) of deficiencies and corrective actions that must be taken.

Other observations:

Is an Erosion, Sedimentation and

Pollution Control Plan revision required?

Yes No

Date of revision:

Signature of Certified Personnel

Printed Name of Certified Personnel

Month: _____ Year: _____
Submit to EPD by 15th of Following Month

Project Location: _____

Project Location: _____

Storm Water Monitoring Data

To be used within 24-hours of a qualifying rainfall event of 0.5-inches or more.

I certify that all sampling and analysis was conducted as per the

(Signature of Certified Personnel)

Monthly Inspection Report

Inspection performed by certified personnel at least once per month

Project Information	
Date:	Project Name:
Project Location:	
Inspection Observations	
Rainfall within past 24 hours (inches):	Is rainfall greater than 0.5"? Inspection Required <input type="checkbox"/>
Inspection Observations	
Areas that have undergone final stabilization: Are all permanent stabilization controls contained in Plan in place? <input type="checkbox"/> Yes <input type="checkbox"/> No If no, describe the location(s) of deficiencies and corrective actions that must be taken.	
Other observations: Are pollutants entering the drainage system or receiving waters? <input type="checkbox"/> Yes <input type="checkbox"/> No If yes, describe the location(s) and the corrective actions that must be taken.	
Are all erosion and sediment control measures operating properly? <input type="checkbox"/> Yes <input type="checkbox"/> No If no, describe the location(s) and the corrective actions that must be taken.	
Other Observations	
Is an Erosion, Sedimentation and Pollution Control Plan revision required? <input type="checkbox"/> Yes <input type="checkbox"/> No Date of revision:	
Corrective Actions and Date:	

Inspection Summary

Site: _____ LDA No. _____

Site Inspection Report

Erosion and Sedimentation Inspection Report

Maintain Reports on-site

Site:	Date:	Time:
Inspector:	Accompanied By:	
Stage of Construction:		
Site:		
Observation:		
Recommendations:		
Contractor's Corrective Action (and Date):		
Site:		
Observation:		
Recommendations:		
Contractor's Corrective Action (and Date):		

SECTION 02324
TRENCHING AND TRENCH BACKFILLING

PART 1 – GENERAL

1.01 SCOPE

- A. The work under this section consists of furnishing all labor, equipment, and materials and performing all operations in connection with the trench excavation and backfill required to install the pipelines.
 - 1. Excavation includes:
 - a. Removing any trees, stumps, brush, debris, or other obstacles remaining after the site preparation operations, obstructing the Work.
 - b. Excavating and removing all earth, rock, or other materials to install the pipe and appurtenances in conformance with the lines and grades shown on the Plans and as specified. Excavation is unclassified.
 - B. Backfill shall include refilling and compacting the fill in the trenches and excavations up to the surrounding ground surface or road grade at crossing.
 - C. Pipe Trenches are divided into four (4) specific areas:
 - 1. Foundation: Material at the bottom of the excavated trench prior to any backfill.
 - a. Where the existing foundation is unsuitable for the installation of backfill, over-excavation is required to install trench stabilization material (for example: rock or other stiffer material) to bring the bottom back to the elevation of the original trench.
 - 2. Bedding: The area above the trench bottom (or foundation) and below the bottom of the barrel (invert) of the pipe.
 - 3. Pipe Zone Backfill: The area from the bedding material to 12 inches above the outside diameter of the pipe crown (top-of-pipe).
 - a. Care required to be sure that backfill is shoveled into the “haunch” of the pipe zone as the backfill is placed and compacted.
 - 4. Final Backfill: The area from the top of the pipe zone up to subgrade for roadways or ground surface.
 - D. The choice of pipe installation method, means, techniques, and equipment rests with the Contractor.
 - E. Unless otherwise directed by the Owner, all trench and backfill requirements of the Authority Having Jurisdiction shall be followed when work is performed within their rights of way.

1.02 RELATED SECTIONS

- A. Section 02010: Subsurface Conditions
- B. Section 02205: Dewatering
- C. Section 02535: Gravity Flow Sanitary Sewers

- D. Section 03300: Cast-in-Place Concrete
- F. Section 01041: Project Coordination

1.03 REFERENCES

- A. DeKalb County Department of Watershed Management Potable Water Main, Gravity Sanitary Sewer, and Sanitary Sewer and Force Main Design Standards, Latest Edition and Version.
- B. ASTM C33 - Concrete Aggregates.
- C. ASTM C136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
- D. ASTM D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).
- E. ASTM D1556 - Standard Test Method for Density of Soil in Place by the Sand-Cone Method.
- G. ASTM D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2700 kN-m/m³)).
- H. ASTM D2922 - Standard Test Method for Density of Soil and Soil Aggregate in Place by Nuclear Methods (Shallow Depth).
- I. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

1.04 QUALITY ASSURANCE

- A. Density: All references to "maximum dry density" shall mean the maximum dry density as defined by ASTM D1557 unless otherwise dictated by a permitting agency and approved by the Owner's Representative.
 - 1. Cohesion less, free draining soils "maximum dry density" shall mean the maximum index density as determined by ASTM D4253.
 - 2. Density for foundation, bedding, pipe zone and final backfilling in-place shall meet the requirements of ASTM D1556, and ASTM D2922.
- B. Sources and Evaluation Testing: Material testing certifying conformance with these Specifications shall be performed by an independent testing laboratory.

1.05 SAFETY

- A. Perform all trench excavating and backfilling activities in accordance with the Occupational Safety and Health Act of 1970 (PL 91-596), as amended.
 - 1. Particularly to the Safety and Health Regulations Part 1926, Subpart P "Excavation, Trenching & Shoring" as described in OSHA publication 2226 or latest version.

1.06 TESTING

- A. Testing shall be performed by an approved independent commercial testing laboratory. The Owner's Representative shall dictate the number of locations of testing. The Contractor shall coordinate testing. Minimum number of required tests are specified in section 3.19 of this specification section.
 - 3. Tests and analysis of fill and borrow material: in accordance with the requirements of ASTM D1557.
 - 4. Compaction testing: in accordance with the requirements of ASTM D1556 or ASTM D2292.
- B. If tests indicate Work does not meet specified requirements, the Contractor shall remove Work, replace, and retest at no cost to the Owner.
- C. Samples of native material intended for use as fill shall be provided by the contractor in time to allow for the Owner's independent commercial testing laboratory to conduct all necessary testing in time to support installation. Failure to provide timely, suitable, acceptable or representative samples will not justify any claim by the contractor.

1.07 SUBMITTALS

- A. Detailed work plan for trenching and trench backfilling with complete written description identifying:
 - 1. Details of the proposed method of construction
 - 2. Sequence of operations for construction relative to trenching and trench backfilling.
 - 3. Descriptions, with supporting illustrations, shall be sufficiently detailed to demonstrate to the Owner's Representative the procedures meet the requirements of these Specifications.
- B. Dewatering plan in accordance with the requirements of Section 02205 – Dewatering.
- C. Flowable Fill: Certified mix design and test results; include material types and weight per cubic yard for each component of mix.
- D. Backfill material sources and product quality information.
- E. Shoring plan stamped by a licensed structural engineer licensed in the state of the project where required by OSHA Standards.
- F. As-Built Drawings:
 - 1. The Contractor shall record locations of utilities, as installed, referenced to survey benchmarks.
 - 2. Include location of utilities encountered or rerouted.
 - a. Provide horizontal dimension, elevations, inverts, and gradients.
 - b. Use either GPS technology or conventional survey to locate utilities.

- c. Accuracy of locations reported: within +6 inches or -6 inches of actual field locations.

1.08 JOB CONDITIONS

- A. Potholing:
 - 1. Confirm in the field the location of all existing parallel and/or crossing utilities that could affect installation of new conveyance facilities.
 - 2. Conduct potholing using non-destructive means such as high pressure air or water – vacuum excavation.
 - 3. Include potholing in provided bid price for trenching.
- B. Protect existing utilities that are to remain in service throughout construction (see Section 01041)
 - 1. Incorrectly located utilities – those found greater than 5 feet horizontally from the locations shown on the drawings or obtained by the utility locate operator.
 - a. Immediately consult the utility owner for directions.
 - b. Cooperate with utility companies in keeping respective services and facilities in operation.
 - 2. Repair damaged utilities to the satisfaction of the utility owner or have repair completed by the utility owner
 - a. No additional charge to the contract will be allowed for damaged utilities.
- C. The Contractor shall not interrupt existing utilities serving any facilities, during occupied hours, except when permitted in writing by the Owner and then only after acceptable temporary, utility services have been provided.
- D. The Contractor shall provide a minimum of forty-eight (48) hours' notice to the Owner/Owner's Representative and utility owner, and receive written notice to proceed before interrupting any utility.
- E. The Contractor shall coordinate with utility companies for shut-off of services if lines are active.
 - 1. No separate payment shall be made.
- F. Notify the Owner's Representative immediately of unexpected subsurface conditions.
 - 1. Discontinue work in affected areas until notification to resume work.
- G. The Contractor shall protect the bottom of the trench and soil adjacent to and beneath trench from frost.

PART 2 – PRODUCTS

2.01 TRENCH FOUNDATION MATERIALS

- A. Crushed stone shall be utilized for over excavated trench foundation (trench stabilization material).

1. Meeting the requirements of the Georgia Department of Transportation Specifications Construction of Transportation Systems 800.2.01, Group I (limestone, marble, or dolomite) or Group II (quartzite, granite, or gneiss). Stone size shall be between No. 57 and No. 4, inclusive.

2.02 BEDDING

- A. Bedding materials shall be crushed stone as specified below.
- B. Crushed stone utilized for bedding shall meet the requirements of the Georgia Department of Transportation Specifications Construction of Transportation Systems 800.2.01, Group I (limestone, marble, or dolomite) or Group II (quartzite, granite, or gneiss). Stone size shall be between No. 57 and No. 4, inclusive.
- C. Filter Fabric - Non-Woven Type
 1. Filter fabric associated with bedding shall be a UV stabilized, continuous filament, needle-punched, polypropylene, nonwoven geotextile.
 2. The fabric shall have an Equivalent Opening size (EOS) and Apparent Opening Size (AOS) of one-hundred and twenty (120) to seventy (70). The fabric shall also conform to the minimum property values listed in the following table:
 3. Filter fabric:
 - a. TenCate Mirafi® S1000,
 - b. Propex GeoTex® 1071
 - c. or approved equal.

2.03 PIPE ZONE BACKFILL

- A. Pipe Zone backfill:
 1. Crushed stone as specified for bedding as per 2.01 of this specification.
 2. Select material (specified in 2.05 (below)
 3. Earth material meeting the requirements of this section.
 - a. Earth materials:
 - 1) Suitable materials selected from materials excavated from the trench.
 - 2) Clean and free of rock larger than two (2) inches at its largest dimension, organics, cinders, stumps, limbs, frozen earth or mud, man-made wastes, and other unsuitable materials.
 - 3) Saturated material (higher water content than allowed for compaction) must be dried to where it is capable of meeting the specified compaction requirements.
 - 4) When necessary, materials shall be moistened to facilitate compaction by tamping.
 - 5) Excavated materials not suitable for use as pipe zone backfill shall be removed from the work site and legally disposed of at no additional cost to the Owner

2.04 FINAL BACKFILL

Final backfill material shall be No. 89 stone in all road cuts and under surface paved areas. Final backfill in non-paved areas shall be select backfill as specified in this specification,

2.05 SELECT BACKFILL

Select backfill shall be imported granular materials meeting the requirements as specified for bedding, pipe zone backfill, or final backfill materials, including compaction requirements.

2.06 CONCRETE

- A. Concrete shall be used as shown on the plans.
- B. Mix: ASTM C94/C94M, Option A.
 1. Cement: ASTM C150/C150M, Type I or Type II.
 2. Coarse Aggregate Size: $\frac{3}{4}$ inch(es).
 3. Design for Minimum Compressive Strength at 28 Days: 3,000 psi.

2.07 FLOWABLE FILL (CONTROLLED DENSITY FILL, CDF)

- A. Flowable fill, where required for trench backfill, shall meet the requirements of the Georgia Department of Transportation Standard Specifications Construction of Transportation Systems.
- B. Select and proportion ingredients to obtain compressive strength of 100 psi at 28 At 28 days in accordance with ASTM D4832.
- C. Materials:
 1. Cement: ASTM C150/C150M, Type I per GDOT Section 600.
 2. Aggregate: ASTM C33/C33M, Size 7.
 3. Fly Ash (Pozzolan): Class F fly ash in accordance with ASTM C618, except as modified herein:
 - a. ASTM C618, Table 1, Loss on Ignition: Unless permitted otherwise, maximum 3 percent.
 - b. Test in accordance with ASTM C1012/C1012M to verify sulfate resistance is acceptable.
 4. Water: Clean, potable, containing less than 500 ppm of chlorides.

2.08 GRANULAR MATERIAL

Granular material, where required for trench backfill, shall be sand, river sand, crushed stone or aggregate, pond screenings, crusher run, recycled concrete, or other angular material. Granular material shall meet graduation requirements for Size No. 57 or finer.

2.09 COMPACTION EQUIPMENT

Compaction equipment shall be of suitable type and adequate to obtain the compaction specified. Compaction equipment shall be operated in strict accordance with the

manufacturer's instructions and recommendations and shall be maintained in such condition to deliver the manufacturer's rated compaction effort.

PART 3 – EXECUTION

3.01 PREPARATION OF PIPELINE EASEMENT

- A. Clear the easement prior to the start of trenching to the extent necessary to install the work per 02110
 1. Topsoil and grass shall be stripped a minimum of six (6) inches over the trench excavation site and stockpiled separately for replacement, if suitable, over the finished grading areas.
 2. Cut trees and brush and remove all stumps, and haul to a disposal site
 3. Do not permit excavated materials to cover brush or trees to remain prior to disposal.
- B. Do not remove existing trees or tree limbs over two (2) inches in diameter, whether on public or private property, unless they are within ten (10) feet of the pipe centerline, without approval of the Owner's Representative.

3.02 DISPOSAL OF CLEARED MATERIAL

- A. Dispose of all trees, stumps, brush, roots, limbs, and other waste materials from the clearing operation.
 1. Disposal operations shall meet all the requirements of Federal, State, County and municipal regulations regarding health, safety, and public welfare.
 2. All cleared material shall be disposed of off the site of the Work in an approved location at the Contractor's expense.

3.03 OBSTRUCTIONS

- A. Obstructions which may be removed and do not require replacement.
 1. Remove obstructions within the trench area or adjacent thereto such as tree roots, stumps, abandoned piling, concrete structures, logs, and debris of all types interfering with construction per Section 02010
 2. Owner's Representative may, if requested, make changes in the trench alignment to avoid major obstructions, if such alignment changes can be made within the easement or right-of-way without adversely affecting the intended function of the facility.
 3. All changes shall be made following the requirements in GR-5 in the General Requirements section of these documents.
- B. The Contractor shall dispose of obstructions removed from the excavation in accordance with the requirements of these documents.

3.04 TRENCH EXCAVATION

- A. Excavated to the lines and grades shown on the plans

- C. Centerline of the trenches shall match centerline of the pipes
- D. Excavated to the dimensions allowing worker access for proper joining of pipe, proper haunching, pipe zone and backfill placement and compaction and protective shoring.
- E. Trench shall be maintained vertical from bottom of excavation to 12 INCHES above the top of the pipe

3.05 TRENCH WIDTH

- A. Minimum Width of Trenches: per DeKalb County Department of Watershed Management Potable Water Main, Gravity Sanitary Sewer, and Sanitary Sewer and Force Main Design Standards, Latest Edition and Version.
- B. Maximum Trench Width: Do not exceed minimum widths indicated unless:
 - 1. Otherwise shown or specified,
 - 2. No additional compensation for excavation and backfilling will be made beyond the minimum widths specified above
 - 3. Directed by the Owner or their Representative
- C. Where rock is encountered in trenches, the Contractor shall excavate to remove boulders and stones to provide a minimum of six (6) inches clearance between the rock and any part of the pipe or manhole.

3.06 EXCAVATED MATERIALS

- 1. Excavated materials shall not be placed in rights-of-way unless the material will be used as backfill within forty-eight (48) hours of excavation.
 - a. Excavated materials not used as backfill shall be immediately disposed of away from the site of the Work.
- 2. Excavated material shall be placed sufficiently back from the edge of the excavation to:
 - a. Prevent caving the trench wall,
 - b. Permit safe access along the trench,
 - c. Not cause any drainage problems.
- 3. Excavated material shall be placed so as not to damage existing landscape features or man-made improvements.

3.07 SHORING, SHEETING, AND BRACING OF TRENCHES

- A. The Contractor shall sheet and brace the trench as required by OSHA Standards and any other Federal, State, and local laws and regulations.

1. Shoring, sheeting, and bracing shall be designed by a Professional Engineer registered in the state of the project location.
2. Protect adjacent structures, property, workers, and the public.
3. Maintain installed shoring in place until the pipe has been placed and backfilled to the top of the pipe zone.
4. Shoring shall be removed during the completion of final backfill in a manner not to damage the pipe or permit voids in the backfill. The Contractor ensure the removal of shoring does not impact the compaction of the pipe zone material or cause voids across all backfill zones, including the pipe bedding and backfill zone.
5. Sheeting, bracing, and shoring shall be performed in accordance with OSHA requirements for the protection of workers, the public and facilities under conditions such as (but not limited to):
 - a. When sloping trench walls do not adequately protect persons within the trench from slides or cave-ins.
 - b. In caving ground.
 - c. In wet, saturated, flowing, or otherwise unstable materials
 - d. Where trenches and other excavations are within ten (10) feet from existing buildings and structures
 - e. where necessary to prevent damage to adjoining buildings, structures, roadways, pavement, utilities, trees, or private properties, which are required to remain
6. Where necessary to maintain the top of the trench within the available construction easement or right-of-way.

B. Timber: Timber for shoring, sheeting, or bracing shall be sound and free of large or loose knots and in good, serviceable condition. Size and spacing shall be in accordance with:

1. OSHA regulations.
2. Engineer designed shoring system as required

C. Steel Sheeting and Sheet Piling: Steel sheet piling shall be the continuous interlock type.

1. The weight, depth, and section modulus of the sheet piling shall be sufficient to restrain the loads of earth pressure and surcharge from existing foundations and live loads.
2. Procedure for installing and bracing shall be so scheduled and coordinated with removing the earth so the ground under existing structures shall be protected against lateral movement at all times.
3. The Contractor shall provide closure and sealing between sheet piling and existing facilities.

D. Trench Shield: A trench shield or trench box may be used to support the trench walls.

1. The use of a trench shield does not necessarily preclude the additional use of bracing and sheeting.

2. When trench shields are used, care must be taken to avoid disturbing the alignment and grade of the pipe or disrupting bedding and pipe zone backfill as the shield is moved.
3. When the bottom of the trench shield extends below the top of the pipe, the trench shield shall be raised in six (6) inch increments with specified backfilling occurring simultaneously.
4. At no time shall the trench shield be "dragged" with the bottom of the shield extending below the top of the pipe.

E. Remove bracing and sheeting in units when backfill reaches the point necessary to protect the pipe and adjacent property.

1. Leave sheeting in place when, in the opinion of the Owner's Representative, it cannot be safely removed or is within three (3) feet of an existing structure, utility, or pipeline.
2. Cut off any sheeting left in place at top of pipe zone or 3 feet below the surface, whichever is less. Accurately document the horizontal and vertical location of remaining shoring on the record drawings.

F. Sheet piling within three (3) feet of an existing structure or pipeline shall remain in place, unless otherwise directed by the Owner's Representative.

G. Contractor shall have a competent person on site at all times during all phases of trench excavation, pipe and manhole installation and trench backfill.

3.08 DEWATERING EXCAVATIONS

A. Dewatering shall be performed in accordance with the requirements of Section 02205 - Dewatering.

3.09 TRENCH FOUNDATION AND STABILIZATION

A. The bottom of the trench shall provide a foundation to support the pipe and its specified bedding. The trench bottom shall be graded to support the pipe and bedding uniformly throughout its length and width.

B. Over Excavation of Trench Foundation: If the trench bottom is spongy, does not provide firm, stable footing, or material at the bottom of the trench will not adequately support the pipe:

1. Trench foundation will be determined to be unsuitable,
2. Owner's Representative shall order trench stabilization by over excavating the trench bottom and fill with crushed stone.
3. Material as dictated in Part 2

C. Where replacing the unsuitable material with crushed stone does not provide an adequate trench foundation:

1. Trench bottom shall be excavated to a depth of at least two (2) feet below the specified trench bottom.

2. Place filter fabric in the bottom of the trench and support the fabric along the trench walls until the trench stabilization, bedding, pipe zone backfill and pipe have been placed at the proper grade.
3. Overlap ends of the filter fabric above the pipe zone.

D. Where trench stabilization is provided, the trench stabilizing material shall be compacted to at least ninety (95) percent of the maximum dry density, unless specified otherwise.

3.010 BEDDING

- A. Prior to placing bedding material, the trench bottom shall be stable, free of any water, loose rocks, boulders, or large dirt clods. Bedding shall be provided and placed as specified below.
- B. At a minimum, bedding material shall:
 1. Be no less than 6-inch thick below bottom of pipe.
 2. Be compacted in lifts no greater than 6-inch and graded and shaped to provide uniform support along the bottom of the pipe
 4. Be placed to maintain the pipe at the proper elevation.
 5. Be placed to bring the pipe to the grade and dimensions needed to match the proposed pipe profile.
 - a. Bring to grade and line by tamping the bedding material or by removing the excess amount of the bedding material under the pipe.
 - b. Wedging or blocking up pipe shall not be permitted.
 - c. Do not apply pressure to the top of the pipe to lower the pipe to the proper elevation or grade.
 - d. Each pipe section shall have a uniform bearing on the bedding for the length of the pipe, except immediately at the joint. Bridging is not permitted.
 6. Extend the full width of the trench bottom.
- C. At each joint, the Contractor shall excavate bell holes of ample depth and width to permit the joint to be assembled properly and to relieve the pipe bell of any load.
- D. Following proper pipe placement:
 1. Add initial pipe zone material equally to each side of the pipe.
 - a. Material shall be shovel sliced, tamped, vigorously chinked, or otherwise consolidated to provide uniform support for the pipe barrel.
 - b. Completely fill voids under the pipe, including the bell hole.
- E. Gravity Sewers and Accessories: Bedding Requirements – As specified in this specification.
- F. Manholes:
 1. Excavate to a minimum of twelve (12) inches below the planned elevation of the base of the manhole.

2. Place and compact crushed stone bedding material to the required grade before constructing the manhole.

G. Excessive Width and Depth:

1. Gravity Sewers:
 - a. If trench is excavated to excess width, the Contractor shall provide the bedding class with the next higher bedding factor.
 - b. Unless specified by the Owner or their Representative any trench that is excavated to an excessive depth, shall have crushed stone provided and placed to the proper elevation or grade.

H. Compaction: Bedding under the pipe, manholes, and accessories shall be compacted to a minimum of ninety (95) percent of the maximum dry density, unless specified otherwise in these Specifications. The most stringent shall apply.

3.011 PIPE ZONE BACKFILL

- A. Place pipe zone backfill material carefully around the pipe in uniform layers to a depth of at least twelve (12) inches above the pipe crown.
 1. Layer depths
 - a. Maximum of six (6) inches for pipe eighteen (18) inches in diameter and smaller
 - b. Maximum of twelve (12) inches for pipe larger than eighteen (18) inches in diameter.
- B. Place backfill on both sides of the pipe simultaneously to prevent side pressures.
- C. Compact each layer thoroughly with suitable hand tools or tamping equipment.
 1. Protect pipe during compaction operations.
- D. Compact to a minimum ninety (95) percent of the maximum dry density, unless otherwise specified. The most stringent shall apply.
- E. Provide select materials as specified herein if excavated earthen material as not suitable for backfill.

3.012 CONCRETE ENCASEMENT FOR PIPELINES

- A. As identified on the plans or where directed by the Owner's Representative.
 1. Excavate the trench to provide a minimum of twelve (12) inches clearance from the barrel of the pipe on all sides.
 2. Lay the pipe to line and grade on solid blocks or other supports accepted by the Owner's Representative.
 3. Do not install bedding or pipe zone backfill.
 4. Place concrete to the full width of the trench and to a height of not less than twelve (12) inches above the pipe barrel. Protect and monitor pipe for floating or movement during concrete placement. Do not use any ferrous metal rods or materials to stabilize pipe.

5. Do not backfill the trench for a period of at least twenty-four (24) hours after concrete is placed, and provide all necessary excavation protection from unauthorized entry

3.013 FINAL BACKFILL

- A. The Contractor shall backfill carefully to restore the ground surface to its original condition.
- B. Except as specified otherwise, the top six (6) inches shall be topsoil obtained as specified in this section. The most stringent shall apply.
- C. Excavated material shall be used as backfill - Provide select backfill material conforming to the requirements of this section.
- D. Place final backfill material in uniform layers, compacting each layer thoroughly as follows:
 1. In six (6) inch layers, if using light power tamping equipment, such as a "jumping jack"
 2. In twelve (12) inch layers, if using heavy tamping equipment, such as hammer with tamping feet
- E. Settlement: If the trench settles, re-fill, compact, and grade the surface to conform to the adjacent surfaces.
- F. Final backfill shall be compacted to a minimum ninety (95) percent of the maximum dry density, unless specified otherwise. The most stringent shall apply

3.014 ADDITIONAL MATERIAL

Where final grades above the pre-construction grades are required to maintain minimum cover, additional fill material shall be placed as directed by the Owner's Representative.

1. The Contractor shall utilize excess material excavated from the trench, if the material is suitable.
2. If excess excavated materials are not suitable, or if the quantity available is not sufficient, the Contractor shall provide additional suitable fill material.

3.015 BACKFILL WITHIN RIGHTS-OF-WAY

The Contractor shall compact per the requirements found as stipulated on the Standard Trench Detail.

3.016 BACKFILL WITHIN GEORGIA DOT RIGHTS-OF-WAY

- I. Backfill within the Georgia DOT rights-of-way shall meet the requirements as required by GDOT Specification.

3.017 FLOWABLE FILL

- A. As identified on the plans or where required by the Owner's Representative:
- B. Excavate trench to provide a minimum of six (6) inches clearance on either side of the pipe barrel.
- C. Lay the pipe to line and grade on solid blocks or other supports accepted by the Owner's Representative.
- D. Place flowable fill to the full width and depth of the trench.
 1. Protect from freezing for a period of thirty-six (36) hours after placement.
 2. Minimum temperature of flowable fill at point of delivery shall be fifty (50) degrees F.
 3. Provide steel plates over flowable fill in road locations, and all other necessary excavation protection from unauthorized entry in non-road areas.

3.018 COMPACTED GRANULAR MATERIAL

- A. Where compacted granular material is required as pipe zone and final backfill material, it shall be placed after bedding material specified elsewhere has been placed.
- B. Compact granular material to a minimum of ninety-five (95) percent of the maximum dry density.

3.019 TESTING AND INSPECTION

- A. The soils testing laboratory is responsible for the following:
 1. Compaction tests in accordance with the requirements of this section.
 2. Field density tests for minimum of:
 - a. Each two (2) feet of lift,
 - b. One (1) test site between each pair of manholes,
 - c. Every one-hundred (100) feet within road rights-of-way,
 - d. More frequently if ordered by the Owner's Representative.
 3. Owner's Representative will direct where density tests will be performed along the site of the Work.
 4. Inspecting and testing stripped areas, subgrades, and proposed fill materials.
- B. The Contractor's duties relative to testing shall include the following:
 1. Timely Notification of laboratory of conditions requiring testing.
 2. Coordinating with laboratory and Owner's Representative for field testing.
 3. Paying costs for additional testing performed beyond the scope required and for re-testing where initial tests reveal non-conformance with specified requirements.
 4. Providing access, excavation, and labor assistance as necessary for laboratory personnel to conduct tests.

- C. Inspection:
 - 1. Earthwork operations, acceptability of excavated materials for bedding or backfill, and placing and compaction of bedding and backfill is subject to inspection by the Owner's Representative.
- D. The Contractor shall comply with applicable codes, ordinances, rules, regulations, and laws of local, state, and federal authorities having jurisdiction.

3.020 DISPOSAL OF EXCESS EXCAVATED MATERIAL

- A. Legally dispose of excess excavated material in accordance with the requirements of local, state, and federal laws and regulations.
- B. Make arrangements for the disposal and bear all costs of disposal.

END OF SECTION

SECTION 02485 SODDING

PART 1 – GENERAL

1.01 SCOPE

- A. This section includes the Contractor's responsibility to furnish all labor, materials, equipment, and incidentals necessary to place sod and maintain all sodded areas disturbed by the Contractor's operations.
- B. Work includes all soil preparation, soil additives, and the storage, transportation, placing, and maintenance of sod at all locations as required or as directed by the Owner's Representative.
- C. See GSWCC Ds3 and Ds4 Requirements for Regulatory Compliance

1.02 RELATED SECTIONS

Section 02276: Site Restoration and Erosion Control

1.03 SUBMITTALS

- A. Product labels/data sheets.
- B. Certification of sod; include source and harvest date of sod, and sod seed mix.
- C. Proof of Georgia Live Plant license

1.04 DELIVERY, STORAGE, AND PROTECTION

- A. Sod:
 - 1. Do not harvest if sod is excessively dry or wet to the extent survival may be adversely affected.
 - 2. Harvest and deliver sod only after laying bed is prepared for sodding.
 - 3. Roll or stack to prevent yellowing.
 - 4. Deliver and lay within 64 hours of harvesting.
 - 5. Keep moist and covered to protect from drying from time of harvesting until laid.

1.05 WEATHER RESTRICTIONS

Perform Work under favorable weather and soil moisture conditions as determined by accepted local practice.

1.06 GUARANTEE

- A. Establish an acceptable growth of the specified sod on all areas as directed by the Owner's Representative.

- B. An area is considered acceptable if each piece of sod is alive and healthy and generally free from weeds, insects, and disease, producing a complete cover of living grass.
- C. The Contractor is responsible for monitoring, watering, weeding, and mowing, the sod during the maintenance period.

1.07 MAINTENANCE SERVICE

- A. Begin maintenance immediately after each area is planted and continue for a period of 60 days after all planting under this section is completed, or an acceptable stand of grass is established
- B. Perform maintenance operations during maintenance period to include:
 - 1. Monitoring for drying, displacement, damage
 - 2. Watering: First 2 weeks water daily, (factoring in impact of rainfall), thereafter keep surface moist
 - 3. Washouts: Repair by filling with topsoil, liming, fertilizing, and resodding.
 - 4. Mowing: Mow to 2 inches after grass height reaches 3 inches, and mow to maintain grass height from exceeding 3-1/2 inches.
 - 5. Resod unsatisfactory areas, or portions thereof, immediately at the end of the maintenance period if an acceptable stand has not been produced.

PART 2 – PRODUCTS

2.01 SOD

- A. New sod consisting of live, dense, well rooted growth; well suited for the intended purpose and soil conditions; completely free of noxious weeds and grasses (crab grass, quack grass, Johnson grass, Canada thistle); and containing less than 5 plants of objectionable weeds per 100 square feet.
- B. Provide sod machine cut to pad thickness of 3/4" (+1/4"), excluding top growth and thatch. Provide only sod capable of vigorous growth and development when planted (viable, not dormant).
- C. Provide sod of uniform pad sizes with maximum 5% deviation in either length or width. Broken pads or pads with uneven ends will not be acceptable. Sod pads incapable of supporting their own weight when suspended vertically with a firm grasp on upper 10% of pad will be rejected
- D. Obtain all sod from an approved nursery with a Georgia Live Plant license.
- E. Replacement sod will match existing lawn grass type.

2.02 FERTILIZER

Commercially manufactured, Grade 10-10-10; furnished in standard containers clearly marked with the name, weight, and guaranteed analysis of the contents and ensuring proper protection in transportation and handling; and in compliance with all local, state, and federal

fertilizer laws.

2.03 AGRICULTURAL LIMESTONE

Containing a minimum of 85 percent calcium carbonate and magnesium carbonate combined, 85 percent of which passes a No. 10 mesh sieve.

PART 3 – EXECUTION

3.01 PREPARATION

- A. Place sod as soon as practical after its removal from point of origin. Keep it moist while displaced.
- B. Scarify each area to be sodded a minimum of 2 inches and remove stones larger than 3/4 inch in any dimension.
- C. Before beginning sodding operations in any area, complete placing the topsoil and final grading, and have the area approved by the Owner's Representative.

3.02 APPLICATION

- A. Set sod between April 1 and October 31 and when the soil is in a workable condition. If weather is acceptable to the Owner's Representative, the dates may be extended beyond those stated.
- B. Do not set sod out of season unless soil conditions are favorable and written permission is obtained from the Owner's Representative.
- C. During times when sodding cannot be conducted, erosion control and silt fences shall be placed and maintained. If property owner and the Project Manager agree, seeding may be substituted for sodding.
- D. Apply fertilizer and agricultural limestone uniformly over the sod bed at the suggested rates shown below. The actual application rates shall be determined by the applicator and guaranteed by the applicator to produce an acceptable and healthy stand of grass. Immediately prior to placing sod, water the sod bed until it is saturated to a depth of 1 inch, and keep it moist until the sod is placed.
 1. Fertilizer: 15 pounds per 1,000 square feet of 10-10-10.
 2. Agricultural Limestone: 40 pounds per 1,000 square feet.
- E. Lay sod to form a solid mass with tightly fitted joints. Butt ends and sides of sod strips; to not overlap. Stagger strips to offset joints in adjacent courses. Work from boards to avoid damage to subgrade or sod. Tamp or roll lightly to ensure contact with subgrade. Work sifted soil into minor cracks between pieces of sod; remove excess to avoid smothering of adjacent grass. Lay sod on slopes with short dimension running up and down.
- F. Saturate sod with fine water spray within 2 hours of planting.
- G. Two weeks after the sod is installed, top dress and thoroughly water it. Top dressing shall consist of the following:

1. 1/2 to 1 Pound: 38 percent urea formaldehyde per 1,000 square feet.
2. 20 Pounds: 6-12-12 per 1,000 square feet.

H. Reconditioning Existing Lawns:

1. Recondition existing lawn areas damaged by Contractor's operations including storage of materials and equipment and movement of vehicles. Also recondition existing lawn areas where minor re-grading is required.
2. Provide fertilizer, sod and soil amendments as specified for new lawns and as required to provide a satisfactorily reconditioned lawn. Provide new topsoil as required to fill low spots and meet new finish grades.
3. Cultivate bare and compacted areas thoroughly to provide a satisfactory, planting bed.
4. Remove diseased and unsatisfactory lawn areas; do not bury into soil. Remove topsoil containing foreign materials resulting from Contractor's operations including oil drippings, stone, gravel and other loose materials.
5. Water newly planted areas and keep moist until acceptable grass stand is established.

3.03 MAINTENANCE

- A. Begin maintenance immediately after sodding and continue until final acceptance of the Contract per Paragraph 1.7 above.
- B. Maintain lawns by watering, fertilizing, weeding, mowing, trimming, and other operations, such as rolling, re-grading and replanting, as required to establish an acceptable lawn, smooth and free of stones, weeds, and eroded or bare areas.

3.04 INSPECTION

- A. The Owner's Representative shall inspect the sod within 30 days after installation and determine if it is acceptable.
- B. The Owner's Representative will again review the sod for acceptance 30 and 60 days after installation. This acceptance by the Owner is for the purposes of payment only.

3.05 PROTECTION

No equipment, material storage, construction traffic, etc., will be permitted on newly sodded areas. Contractor responsible for providing effective protection. Contractor to repair all damage.

3.06 CLEANING

Dispose of all surplus material in compliance with all applicable laws and regulations and in accordance with contract requirements.

END OF SECTION

SECTION 02486

SEEDING

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. This section includes the Contractor's responsibility to furnish all labor, materials, equipment and incidentals necessary and place seed and maintain all seeded areas as specified herein including all areas disturbed by the Contractor's operations.
- B. GSWCC Ds3 and Ds4 Requirements for Regulatory Compliance

1.02 RELATED SECTIONS

- A. Section 02276: Site Restoration and Erosion Control

1.03 SUBMITTALS

- A. Product labels/data sheets
- B. Seed: Certification of seed analysis, germination rate, and inoculation:
 - 1. Provide fresh, clean, new-crop seed complying with tolerance for purity and germination established by Official Seed Analysts of North America.
 - 2. Certify each lot of seed has been tested by a testing laboratory certified in seed testing, within 6 months of date of delivery, Include with certification:
 - a. Name and address of laboratory
 - b. Date of test
 - c. Lot number for each seed specified
 - d. Test Results:
 - 1) name,
 - 2) percentages of purity and of germination, and
 - 3) weed content for each kind of seed furnished
 - 3. Mixtures: Proportions of each kind of seed

1.04 GUARANTEE

- A. Secure an acceptable growth of grass in all areas designated for seeding If the planting is less than 50 percent successful, rework the ground, refertilize, reseed, and remulch the entire area.
- B. The Contractor is responsible for monitoring, watering, weeding, and mowing, the grass stand during the maintenance period.

1.05 MAINTENANCE

- A. Begin maintenance immediately after each area is planted and continue until final acceptance of the Contract or an acceptable stand of grass is established and accepted.
- B. Maintenance is necessary to help establish a good healthy uniform growth over the entire seeded area. Maintenance to be performed includes the following:
 - 1. Watering: First 2 weeks every day, (factoring in impact of rainfall), thereafter keep surface moist.
 - 2. Washouts: Re-grade and re-seed at the Contractor's expense until acceptable stand is established.
 - 3. Mulch: Replace wherever and whenever washed or blown away
 - 4. Mowing:
 - a. Mow to 2 inches after grass height reaches 3 inches, and mow to maintain grass height from exceeding 3-1/2 inches.
 - 5. Rake clippings and leaves, and appurtenances until the project is completed or an acceptable stand of grass is established and accepted.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Products and applications to match Contract application period and meet manufacturers recommendations, or as recommended by soil sample analysis.
- B. Fertilizer shall be a complete commercial fertilizer. It shall be delivered to the site in the original unopened containers each showing the manufacturer's guaranteed analysis of the contents and ensuring proper protection in transportation and handling, and in compliance with all local, State, and Federal fertilizer laws. Store fertilizer, so when used, it shall be dry and free flowing.
- C. Lime shall be ground limestone containing not less than 85 percent calcium and magnesium carbonates.
- D. Seed shall be from the same or previous year's crop; each variety of seed shall have a percentage of germination not less than 90, a percentage purity of not less than 85, and shall have not more than one percent weed content.
- E. The mixture for lawn areas shall consist of seed proportioned by weight as indicated on the drawings and shall match existing species unless directed otherwise by Owner's Representative.
- F. Grass seeding shall match the existing adjacent grass of previously landscaped areas unless directed otherwise by the Owner's Representative.

PART 3 – EXECUTION

3.01 PREPARATION

- A. Soil samples to be obtained and processed at the Contractor's expense to determine lime requirements.
- B. Agricultural lime is suggested at the rate of one to two tons per acre unless soil tests indicate otherwise. Graded areas require lime application. Agricultural lime shall be within the specifications of the Georgia Department of Agriculture. The actual application rate shall be determined by the applicator and guaranteed by the applicator to produce an acceptable and healthy stand of grass.
- C. Fertilizer shall be applied at the rate as shown per the drawings or at minimum follow the guidelines within the Georgia Manual for Erosion and Sediment Control latest edition. The actual application rate shall be determined by the applicator and guaranteed by the applicator to produce an acceptable and healthy stand of grass.

3.02 INSTALLATION

- A. Grading and shaping will be required to promote positive drainage. Vertical banks shall be sloped to enable plant establishment. Concentrations of water will cause excessive soil erosion and shall be diverted to a safe outlet. Diversions and other treatment practices shall conform to the appropriate standards and specifications.
- B. The subgrade of all areas to be seeded shall be raked and all rubbish, sticks, roots and stones shall be removed.
- C. Lime shall be spread evenly over surface and thoroughly incorporated as required.
- D. Fertilizer shall be uniformly spread and immediately mixed with the upper 2 inches of the soil.
- E. Seeding
 - 1. Hydraulic Seeding: Mix the seed (inoculated if needed), fertilizer, and wood cellulose or wood pulp fiber mulch with water and apply in a slurry uniformly over the area to be treated. Apply within one hour after the mixture is made.
 - 2. Conventional Seeding: Seeding will be done on a freshly prepared and firmed seedbed. For broadcast planting, use a culti-packer-seeder, drill, rotary seeder, other mechanical seeder, or hand seeding to distribute the seed uniformly over the area to be treated. Cover the seed lightly with 1/8 to 1/4 inch of soil for small seed and 1/2 to 1 inch for large seed when using a cultipacker or other suitable equipment.
- F. Mulching: Mulching is required for all permanent vegetation applications. Mulch applied to seeded areas shall achieve 75% to 100% soil cover.

END OF SECTION

SECTION 02500
LINING WITH CURED-IN-PLACE PIPE (CIPP)

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. The rehabilitation of a full length of an existing sewer main, from manhole to manhole, and partial/segmental/point repairs by the trenchless method known as Cured-In-Place Pipe (CIPP) lining.
 - 1. CIPP consists of:
 - a. Installing a resin-impregnated flexible tube, either inverted or pulled into the existing sewer main,
 - b. Expanding the tube to fit tightly against the interior diameter of the main it was installed in by the use of water or air pressure.
 - c. Curing/hardening the resin by elevating the temperature of the fluid (water/air) used for the inflation to a sufficient level for the initiators in the resin to effect a reaction.
 - d. The resultant shall be a hard, impermeable pipe within a pipe.
 - 2. Partial/segmental/point repair CIPP shall include lining a limited section of pipe of no less than three (3) linear feet in length or longer

1.02 SCOPE

- A. Provide all material, labor, and equipment to rehabilitate the existing sanitary sewer as described herein and shown on the plans.
- B. The CIPP process shall provide for the structural and hydraulic renewal of the existing sewer.
 - 1. The CIPP liner shall be smooth, hard, strong and chemically inert.
 - 2. The interior surface shall closely follow the contours of the host pipe.
- C. When completed:
 - 1. Re-establish access at manholes
 - a. Seal at each manhole shall be watertight.
 - 2. New CIPP liner shall extend from manhole to manhole
 - 3. Re-establish service connections to the sewer with a water tight seal that eliminates infiltration.

1.03 REFERENCES

- A. ASTM
 - 1. D543 – Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents
 - 2. D638 - Standard Test Method for Tensile Properties of Plastics.

- 3. D790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
- 4. D1598 - Standard Test Method for Time-to-Failure of Plastic Pipe Under Constant Internal Pressure.
- 5. D2122 - Standard Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings.
- 6. D2990 - Standard Test Methods for Tensile, Compressive, and Flexural Creep and Creep-Rupture of Plastics.
- 7. D2412 - Standard Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading.
- 8. D2837 - Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials or Pressure Design Basis for Thermoplastic Pipe Products.
- 9. D5813 - Standard Specification for Cured-In-Place Thermosetting Resin Sewer Piping Systems.
- 10. F1216 - Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube.
- 11. F1743 - Standard Practice for Rehabilitation of Existing Pipelines and Conduits by Pulled-in-Place Installation of Cured-in-Place Thermosetting Resin Pipe.
- 12. F2019- 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.
- 13. F2599 – Standard Practice for the Sectional Repair of Damaged Pipe by Means of an Inverted Cured-In-Place Liner

- B. National Association of Sewer Service Companies (NASSCO): Guideline for the use and handling of styrenated resins in cured-in-place-pipe, September, 2008
- C. Potable Water Main, Gravity Sanitary Sewer, and Sanitary Sewer and Force Main Design Standards, DeKalb County Department of Watershed Management.

1.04 QUALIFICATIONS

- A. Full Length Liners:
 - 1. Product manufacturer shall have:
 - a. Minimum 10 years' experience in CIPP manufacturing including:
 - 1) Manufacture of a minimum of 100,000 linear feet of CIPP
 - 2) Provided qualifications for 10 projects for CIPP with pipe diameters of similar size or greater to those found on the contract drawings
 - 3) Personal experience of the manufacturing manager with other manufacturing companies may be substituted in lieu of the current company experience
 - a) Substitution requires approval of Owner's Representative.

- 4) Certify that their product is designed for a minimum 50-year design life.
2. Installing Contractor shall have:
 - a. Minimum of 10 years' experience in sewer rehabilitation including:
 - 1) Minimum 50,000 linear feet of sewer rehabilitation
 - a) In pipe diameter of similar size to those found on the contract drawings or greater utilizing CIPP trenchless technology.
 - 2) Personal experience of the Contractor's construction manager with other construction companies may be substituted in lieu of the current company experience
 - a) Substitution requires approval of Owner's Representative.
 - 3) Contractor's Installing Personnel (foreman, crews, etc.) must have:
 - a) Minimum 3 years active experience in commercial installation of CIPP liner
 - b) Key personnel shall each have completed minimum 100,000 linear feet and 300 line sections of CIPP in gravity sewers.
 - c) Certified training on installing manufacturer's product approved by the manufacturer.
 - b. Demonstrate they have a manufacturer approved quality assurance program to standardize the materials, manufacture, wet out and installation of the specific CIPP product in place.
 - c. Contractor shall demonstrate experience for selected method of curing in a mock up before actual lining of pipe (if required)

B. Partial/Segmental/Point Repairs:

1. Proposed system (material, methods, workmanship) shall have been proven through previous successful installations.
 - a. Only systems intended to have 50-year design life will be accepted.
2. Product Requirements:
 - a. Minimum of 500 Point Repairs using the same system shall have been successfully installed.
 - 1) In place for a minimum period of 5 years.
 - b. The Manufacturer (Licensor) shall have completed enough testing to document the material and the method(s) of installation proposed will produce the desired long-term performance.
3. Installer Requirements:
 - a. Minimum three (3) years active experience in the commercial installation of the product bid.
 - b. Installer's key personnel shall each have:

- 1) Minimum three hundred (300) successful point repair installations within pipes in the range of eight (8) to thirty-six (36) inch diameter.
- 2) The Installer shall demonstrate they have a quality assurance program in place.

1.05 SUBMITTALS

A. Action Submittals (submit for review and approval):

1. Comprehensive Construction Sequencing Plan including:
 - a. Work Site Plan including:
 - 1) Proposed access routes
 - 2) Set up locations for lining installation
 - 3) Wet out area (if required) including:
 - a) Typical insertion and curing schedule/plan
 - (1) Submit wet out, insertion and curing plan for each and every lining proposed
 - (a) Submit minimum 48 hours (2 working days) prior to each installation
 - b. Site Health and Safety Plan
 - c. Required Construction Permits
 - d. Sewer Flow Control Plan in accordance with Section 01520 including:
 - 1) Spill Containment Plan
 - 2) Emergency contingent plan
 - e. Work schedule
 2. Erosion Control Plan in accordance with Section 02276 Site Restoration and Erosion Control.
 3. Traffic Control Plan in accordance with MUTCD and GDOT requirements (where applicable).
 4. Analysis of design criteria and calculations for CIPP thickness per ASTM F1216 full deteriorated condition.
 - a. Submit complete data and design calculations for each lining
 - b. Include installation method statement for each lining including:
 - 1) Repair details for potential sewer defects in conjunction with manholes, joints, laterals and infiltration.
 - 2) Quality Control/Quality Assurances
 - c. Calculations shall be prepared and stamped by a Professional Engineer in the State of Georgia.
 - 1) Approval of the calculations shall not relieve the Contractor of any contractual obligations.
 5. Curing temperature monitoring system shop drawings
 6. Shop Drawings for hydrophilic end seals and pre-liners to be used and method of installation.
 7. Proposed testing procedure including:
 - a. Number, location and sampling methods

8. Proposed testing laboratory with qualifications, experience history and references.
9. Pre-installation CCTV inspection DVD.
10. Qualification requirements for the Contractor, Installer and personnel (See Item 1.04 Qualifications, this specification)

B. Informational Submittals:

1. Manufacturer's technical literature and certificate demonstrating the materials to be used meet the referenced standards and the requirements of these specifications.
2. Proposed equipment and procedures for accomplishing the cured-in-place pipe lining work.
3. Manufacturer's printed installation instructions including:
 - a. Installation method statement including:
 - 1) Details concerning curing methods,
 - 2) Inversion pressures necessary for proper installation,
 - 3) Minimum pressure required to hold tube tight against existing host pipe,
 - 4) Maximum allowable pressure that will not damage tube,
 - 5) Type of insertion,
 - 6) Defect repair:
 - a) Methods of repairing in conjunction with manholes,
 - b) Joints,
 - c) Laterals,
 - d) Active infiltration,
 - e) Quality control/quality assurance plan,
 - f) Repair material test results.
 4. Product data and Manufacturer's installation procedures for resin and catalyst system including but not limited to specifications, characteristics, properties, and itemized exceptions and deviations to Specification.
 5. Certified test reports on physical properties and chemical resistance of proposed resin
 6. Material Safety Data Sheets for all resins, and other additives such as accelerants, colorants, and lubricants utilized in the pipe liner/lining process.
 7. Manufacturer's Certificate of Compliance that resin material is appropriate for intended application and in conformance with specifications
 8. Certified test reports on physical properties and chemical resistance of proposed resin
 9. Annular space sealant
 10. Service connection fittings

C. Project Submittals

1. The Contractor shall submit the following information during the project for the use of CIPP at a particular location:

- a. Field measurements.
- b. Design wall thickness calculations,
 - 1) signed and sealed by a professional engineer registered in the state of Georgia and proficient in the design of CIPP systems
 - 2) Manufacturer certification of material to values used in calculations.
- 2. "Wet-out" Plan: for each proposed lining section,
 - a. method for "wet-out" or flexible tube
 - b. specific insertion and curing schedule
- 3. Contractor's procedures and materials for installing the liner and renewing sewer services including time and duration of sewer service unavailability.
- 4. Sampling procedures and locations for obtaining representative samples of the finished liner.

D. The Contractor shall submit a daily written record as specified in Section 01320 Progress Reports & Videos

- 1. The Owner's Representative shall certify receipt of the daily record (in email format) noting any items and adding any observations with reference to claims for payment to the Contractor.
- 2. The Owner's Representative may request a weekly submission in the form of progress report.
 - a. Owner's Representative shall provide the Contractor a written request for a weekly progress report.

E. Record drawings, including the identification of the work completed by the Contractor, and the post-installation CCTV shall be submitted within 2 weeks after the project is completed.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Packaging, handling and shipping shall be done in accordance with the manufacturer's instructions.
 - 1. The Contractor shall be responsible for the delivery, storage, and handling of materials and products.
 - a. keep products safe from damage
 - b. Promptly remove damaged products from the Work site at the Contractor's expense.
 - c. Replace damaged products with undamaged products acceptable to the Manufacturer and Owner's Representative.
 - d. Dispose of in accordance with current applicable regulations.
 - 2. No materials or products shall be shipped to the Site of the Work without the agreement of the Owner's Representative.
- B. Resin to be shipped directly to wet-out facility from resin manufacturer unless otherwise approved by the Owner's Representative.

- C. Store water or steam cured resin-impregnated tubes in refrigerated truck trailers at a temperature below 45 degrees F to prevent premature curing
- D. No cuts, tears, or abrasions shall occur to liner tube during handling.
- E. Materials shall be accompanied by test reports certifying that the material conforms to the ASTM standards listed herein.
- F. The liner wet-out report must be provided for liner material and resin type.
 - 1. The ratio of resin and fabric must be provided by the manufacturer.

1.07 SAFETY

- A. Perform work in accordance with OSHA standards and State and Federal safety regulations.
- B. No confined space entry will be permitted without the development and implementation of a confined space entry plan
 - 1. Plan shall be in accordance with OSHA standards
 - 2. Personnel involved shall have current training certificates
 - 3. Entry permit is required prior to entry.

PART 2 – PRODUCTS

2.01 GENERAL

- A. Liner pipe shall be cured-in-place pipe (CIPP) similar or equal to the following:
 - 1. Insituform, St., Louis, MO.
 - 2. Layne Inliner, The Woodlands, TX.
 - 3. IPR, The Woodlands, TX.
 - 4. Other proposed liner products must be preapproved by the Owner's Representative.
- B. Owner or Owner's Representative shall be entitled to witness the pipe manufacture.

2.02 MATERIALS

- A. Flexible Liner Tube:
 - 1. Consist of layers of flexible nonwoven and absorbent polyesterfelt:
 - a. Designed in accordance with ASTM F1216, Appendix X.1.2.2 (Fully Deteriorated Gravity Pipe Condition).
 - b. CIPP design shall assume no bonding to the original pipe wall.
 - c. Fabricated from materials which when cured will be chemically resistant to reagents as defined in ASTM D543.
 - 2. Manufacturer must have performed long-term testing for flexural creep of the CIP material installed by Subcontractors.

- a. Such testing results are to be used to determine the long-term, time dependent flexural modulus that will be used in product design.
 - 1) This constitutes a performance test of the tube and resin and general installation and curing workmanship.
- b. A percentage of the instantaneous flexural modulus value will be used in design calculations for external buckling.
 - 1) The percentage or the long-term creep retention value utilized, will be verified by this testing.
 - 2) Retention values exceeding 50 percent of the short term test results will not be allowed.
- c. Materials used shall be of a quality equal to, or better than, the materials used in the long-term test with respect to the initial flexural modulus used in the CIPP design.

3. Layers of cured CIPP shall be uniformly bonded.

- a. Layers that separate cleanly using a probe or point of a knife blade are not acceptable.
- b. Probe or knife blade moving cleanly between layers is not acceptable.
- c. Occurrence of (a) or (b) above will require new samples to be obtained from the installed pipe.
- d. Reoccurrence may cause rejection of the Work.
- e. Overlapped layers of felt in longitudinal seams that cause lumps in the final product are not acceptable.

4. Capable of stretching to fit irregular pipe sections.

5. Fabricated and sized for each section to ensure snug and firm fit inside existing sewer

- a. Produce required thickness after resin is cured.
- b. After installation there shall be no wrinkles or permanent fins formed.

6. Inside layer of tube shall be coated with an impermeable material compatible with resin and felt.

7. Maximum Stretching Allowance: In accordance with ASTM F1216.

8. Fabricate in lengths such that liner occupies length of pipeline between launch and reception manholes.

9. Where several layers of felt are required, inner layer shall be stitched to form a tube.

- a. Each successive layer shall be individually wrapped around previous one and stitched together.
- b. Outer layer of felt shall have an installation tube pre-bonded to it, or a sheet of this material shall be wrapped around completed felt tube.
- c. Where a pre-bonded material is used, bond a covering strip over seam to form airtight joint.

B. Preliner:

1. Polypropylene compatible with resin system used for the CIPP:

- a. Shall not adversely affect adhesive properties of resin used in mainline or lateral liners.

- b. May be used (if required) to eliminate/control infiltration during CIPP installation.
- C. Interior Pipe Wall Color: Shall not be a dark or non-reflective nature that could inhibit proper closed circuit television (CCTV) inspection.
- D. Prior to design and manufacture of the liner,
 - 1. Obtain all the information needed for to be provided for design including:
 - a. condition of the host pipe,
 - b. Host pipe:
 - 1) Diameter,
 - 2) Ovality,
 - 3) Deflection,
 - 4) Length
 - 5) Bury conditions,
 - 6) Soil type,
 - 7) Soil loading factor
 - 8) Hydrostatic load,
- E. Design liner thickness using the following criteria:
 - 1. Design Life: 50 Years
 - 2. Pipe Diameters: Per Contract Drawings
 - 3. Ovality: 2%
 - 4. Pipe Condition: Fully deteriorated
 - 5. External Water: Ground surface if not specified on the Contract Drawings
 - 6. Flexural Strength: 4,500 psi
 - 7. Short Term Flexural Modulus: 250,000 psi
 - 8. Reduction Factor: 50%
 - 9. Long Term Flexural Modules: 125,000 psi
 - 10. k Enhancement Factor: 7.
 - 11. Soil Modules: 1,000 psi
 - 12. Soil Density: 125 pcf
 - 13. Highway Live Load: AASHTO H-25
 - 14. Safety Factor: 2 minimum
 - 15. Minimum Thickness:
 - a. Pipe 10-inches and Smaller: 6 millimeters
 - b. Pipe Larger than 10-inches: 7.5 millimeters
 - c. If calculations require thicker wall, round to next higher multiple of 0.5 millimeters.
 - 16. Poisson's Ratio: 0.3
 - 17. Minimum length Partial/Segmental/Point Repair liners to be 8 feet

- a. Repair shall effectively span the distance from the adjacent pipe joint plus one (1) foot unless otherwise directed by the Owner's Representative,
- b. Calculated lengths longer than 8 feet will govern.
- 18. Liner shall be watertight
- 19. Produce cured tube resistant to shrinkage, not corrode or oxidize, and resistant to abrasion from solids, grit, and sand in wastewater.

2.03 RESIN

- A. Resin:
 - 1. Corrosion-resistant polyester, vinyl ester or epoxy system including all required catalysts, initiators or hardeners.
 - a. When cured within the tube create a composite that satisfies the requirements of ASTM F1216 and ASTM F1743.
 - b. The physical properties specified herein and those which are to be utilized in the design of the CIPP for this Project.
 - 2. Shall produce a CIPP that will comply with the structural and chemical resistance requirements of this Specification.
 - a. Styrenated resins are allowed. General purpose, unsaturated, polyester, epoxy, isophthalic neopentyl glycol, or thermosetting vinyl ester resin, catalyst system, initiators, or hardeners that provide specified cured physical strengths and properties, and
 - 3. Compatible with reconstruction inversion process.
 - 4. Resin used for a partial/segmental/point repair:
 - a. Epoxy resin providing the specified cured physical strengths and properties.
 - b. Compatible with reconstruction inversion process
 - c. Unless otherwise directed by the Owner's Representative.
 - 5. Resistant to municipal wastewater environment including:
 - a. Immersion in raw septic sewage at temperatures up to 75 degrees F.
 - 6. Curing:
 - a. Designed to cure properly within selected curing method.
 - b. Initiation Temperature: 180 degrees F, maximum.
 - 7. Resistant to ultra-violet light (sunlight) prior to installation.
 - 8. Only neat resins are acceptable.
 - a. PET resins, resin filters, resin additives, and resin enhancement agents are prohibited.
 - b. Old resins and reworked resins are prohibited,
 - 1) Regardless of whether or not they are mixed with new resin.
 - 9. Chemical resistance of resin system shall have been tested by resin manufacturer in accordance with ASTM D543.
 - a. Exposure to chemical solutions listed below at temperatures of up to 75 degrees F shall be conducted for a minimum period of 1 month
 - 1) Resulting in a loss of not more than 20 percent of initial structural properties.

- b. Minimum Chemical Solution Concentration, ASTM F1216:
 - 1) Tap Water, pH 6 to 9: 100 percent.
 - 2) Nitric Acid: 5 percent.
 - 3) Phosphoric Acid: 10 percent.
 - 4) Sulfuric Acid: 10 percent.
 - 5) Gasoline: 100 percent.
 - 6) Vegetable Oil: 100 percent.
 - 7) Detergent or Soap: 0.1 percent.
 - c. CIPP samples for testing shall be of tube and resin system similar to that proposed for actual construction.
 - 1) CIPP samples with and without plastic coating shall meet these chemical testing requirements.
- 10. CIPP Field Samples:
 - a. Submit test results from field installations of the same resin system and tub materials as proposed for the actual installation.
 - b. Test results must verify that CIPP physical properties specified have been achieved in previous field applications.

B. Catalyst:

- 1. Primary: 1 percent maximum of resin by volume.
- 2. Secondary: 1/2 percent maximum of resin by volume.

C. Hydrophilic End Seals

- 1. Hydrotite, Greenstreak, Inc.
- 2. Ultra Seal, Adeka Corporation.
- 3. Insignia, LMK Technologies

2.04 SOURCE QUALITY CONTROL

- A. At time of manufacture, each lot of liner shall be inspected and certified to be free of defects.
- B. Mark inside of tube in at least one location per setup.
 - 1. Mark shall include manufacturer of liner, at regular intervals, not to exceed 5 feet, along full length.

PART 3 – EXECUTION

3.01 PREPARATION

- A. The following installation procedures shall be adhered to unless otherwise approved by the Owner's Representative.
 - 1. Carry out all operations in accordance with Federal, State, and local safety laws, regulations, standards, policies, and procedures including those promulgated by OSHA and those recommended by the manufacturer.

- a. Particular attention is drawn to those safety requirements involving entering confined spaces (follow OSHA requirements) and steam curing.
 - 1) Curing with pressurized steam creates additional safety concerns including:
 - a) High temperatures,
 - b) Quick burn times,
 - c) Potential blow offs,
 - d) Others.
 - 2) take additional precautions to secure the work area
 - a) Insure the safety of everyone in or around the curing apparatus.
 - 3) Before utilizing this curing method:
 - a) Submit a written copy of the Contractor's standard operating and safety procedures for this methodology to the Owner's Representative.
 - b) Submittal to go to the Owner's Representative
 - c) Address all safety concerns in the submittal
 - d) Identify how/where OSHA requirements are addressed in the submitted procedures.
- 2. The Contractor shall bypass wastewater around the sewer segment or sewer segments designated for lining as specified in Section 01520 -Sewer Flow Control.
 - a. Bypass system shall include accommodating flow from mainlines and service laterals as required
 - b. Service connection effluent (laterals) may be plugged only after proper notification to the affected properties.
 - c. The Contractor is responsible for any overflows that occur due to his operations.
 - 1) Damage/cleanup shall be completed by the Contractor at no additional expense to the project.
- 3. Do not install liner if ground water temperatures and/or ambient temperatures are excessive for the manufacturer's recommended installation procedures.

B. Where practicable, liners may be installed in continuous runs through manholes where there are two or more continuous sewer segments, especially to connect several short segments with a continuous lining.

- 1. Furnish a detailed traffic control plan and all labor and equipment necessary if required to complete installation.
- 2. No separate payment will be made for traffic control. It is an incidental part for CIPP installation.

3.02 PRE-INSTALLATION PROCEDURES

- A. Locate and designate all existing manholes and new manhole access points as necessary for the Work.

1. Provide water from hydrants for cleaning, installation and other process related work items requiring water.
 - a. Comply with all connection and use requirements for water.
 - b. Use clean water for inversion and curing.
 - c. Water procurement shall be in accordance with purveyor's requirements.
2. Locate and mark all existing utilities in areas where excavation is to be performed prior to beginning any excavation.

B. Complete the following activities:

1. Before Work commences:
 - a. Required pre-installation submittals shall be approved by Owner's Representative, including:
 - 1) Traffic management plan/measures,
 - 2) Safe pedestrian passage,
 - 3) Provision of vehicular access to property,
 - 4) Bypass/diversion pumping,
 - 5) Emergency measures/contingent plans.
 - b. Submit an Installation Access Plan including:
 - 1) Access manhole location(s)
 - 2) Site plan sketch showing dimensions of access within work limits and utilities
 - 3) Approximate installation rate (ft/day)
 - 4) Appropriate excavation/backfill/resurfacing procedures including permits according to Georgia Dept. of Transportation and governing agency standards.
2. Pre-insertion Cleaning:
 - a. Clean sewer pipe before pre-insertion television inspection.
 - 1) Immediately before installation of the lining complete a high pressure flush and vacuum in sewer sections to be rehabilitated and repaired including pertinent manholes.
 - 2) Remove any root, grease buildup and any other obstruction that may interfere with the lining operation.
 - b. Debris removed from sewer during cleaning shall be transported in watertight containers and disposed of in accordance with local, State, and Federal Regulations.
3. Pre-insertion CCTV Inspection:
 - a. In accordance with Section 01510 Sanitary Sewer Main Television and Sonar Inspection (CCTV)
 - b. Inspect sewer pipe before insertion of resin impregnated tube to ensure pipe is clean and existing pipe conditions are acceptable for lining.
 - 1) Any notable condition that could affect the lining operation will be removed/repaired prior to initiating the lining.

- c. Line Obstructions: If pre-insertion CCTV inspection reveals obstruction in existing pipe that cannot be removed by sewer cleaning equipment, with approval of Owner's Representative, perform point repair using flexible coupling.
- 4. Ensure proper sequence of work occurs between mainline and lateral lining activities.
- 5. Confirm accurate location and serviceability of existing lateral or service connection (tap). Serviceability shall be confirmed by flowing water, dye testing, or visually with CCTV inspection.
 - a. Dye Testing: Where sewer line segments may contain abandoned services, Contractor may be directed by Program Manager to perform dye testing to determine if services are live and require reinstatement.
 - b. When service connections protrude into existing pipe more than 1/2 inch, as measured from inside pipe wall, remove protruding portion of service connection to within 1/2 inch of inside pipe wall.

3.03 INSTALLATION

- A. Verify diameters and lengths in field before manufacturing and cutting liner to length
- B. Install in accordance with ASTM F1216, Section 7 or ASTM F1743, Section 6.
 - 1. Active infiltration must be removed prior to insertion of the liner.
- C. Resin Impregnation (Wet-Out):
 - 1. Quantity of resin used for tube impregnation shall be sufficient to fill the volume of air voids in the tube with additional allowances for:
 - a. Polymerization shrinkage
 - b. Loss of resin during installation through cracks and irregularities in the original pipe wall.
 - 2. Tube shall be vacuum impregnated with resin (wet-out) under controlled conditions.
 - a. Designate vacuum-impregnated location prior to CIPP installation
 - b. If requested, allow Owner's Representative to inspect materials and procedures used to vacuum impregnate tube.
 - c. The point of vacuum shall be no further than 25 feet from the point of initial resin introduction.
 - 1) After vacuum in the tube is established, a vacuum point shall be no further than 75 feet from the leading edge of the resin.
 - 2) The leading edge of the resin slug shall be as near to perpendicular to the longitudinal axis of the tube as possible.
 - d. If Contractor uses an alternative method of resin impregnation, method shall produce the equivalent results of a rollersystem.
 - 1) Proposed alternative shall be documented to Owner's Representative's and Program Manager's satisfaction that saturation of CIPP is sufficient.

- e. Handle resin impregnated tube to retard or prevent settling until it is ready for insertion.
3. Use roller system to uniformly distribute resin throughout tube.
4. Complete wet-out process control sheet for every lining completed. Control sheet shall provide the following information:
 - a. Liner manufacturer
 - b. Liner diameter
 - c. Number of layers
 - d. Resin manufacturer
 - e. Resin amount
 - f. Resin type
 - g. Batch number
 - h. Catalyst and accelerator name/type
 - i. Hardener name/type
 - j. Percent of filler, if any
 - k. Mixing ratios
 - l. Vacuum pressure of impregnation process
 - m. Wet-out start time and date

D. Insertion

1. Dewater existing host pipe for CIPP installation as required.
2. Insert wet-out tube through existing manhole or approved access point by means of an inversion process and application of hydrostatic head sufficient to extend tube to next designated manhole or termination point.
 - a. Alternately, tube may be pulled into place and expanded with inflation bladder.
 - 1) Insertion method shall not result in abrasion or scuffing of the tube.
3. Once installation has begun, maintain pressure between minimum and maximum pressures until installation has been completed.
 - a. Pressure shall be sufficient to hold tube tight against host sewer pipe.
4. Place temperature gauges between tube and host pipe's invert position to monitor temperature during cure cycle.
5. CIPP shall be continuous over entire length from manhole to manhole.
6. Complete installation process control sheet for every lining completed. Control sheet shall provide the following information:
 - a. Liner length.
 - b. Hydrostatic head at point of inversion.
 - c. Hydrostatic head at termination point.
 - d. Time inversion process started.
 - e. Time cutting ends started.
 - f. Time cutting laterals started.
 - g. Number of laterals cut.

E. Inflation Bladder Removal: For pulled-in-place installation techniques where inflation bladder is designed not to bond to CIPP, remove bladder material from CIPP

F. Curing:

1. Complete curing process control sheet for every lining completed.
2. Control sheets shall provide (as outlined in ASTM F1216):
 - a. Include manufacturer recommended temperatures and time for the different steps of curing process;
 - b. Initial cure,
 - 1) Initial cure may be considered completed when exposed portions of flexible tube pipe take a hard set and temperature is adequate
 - c. Post cure,
 - d. Cooling
3. After installation, apply steam, or hot water as recommended by liner manufacturer.
 - a. Steam:
 - 1) Provide safety system specifically structured for use of steam.
 - 2) Thermoset Resin: Designed to cure properly when using steam.
 - 3) CIPP Tube Thermoplastic Coating:
 - a) Formulated from material designed specifically to withstand high temperature curing process utilizing steam.
 - b) Polypropylene/polyethylene blend or equal.
 - 4) Equipment:
 - a) Heat source shall be capable of delivering steam throughout section and uniformly raising steam temperature above temperature required to affect cure of resin.
 - b) Install temperature gauges in the following areas:
 - (1) Incoming steam supply.
 - (a) Outgoing steam supply.
 - (2) Between impregnated tube and pipe invert at lining termination point.
 - 5) Steam Temperature: 230 degrees F, minimum.
 - 6) Minimum Interface Temperature between Liner and Tube: 120 degrees F.
 - 7) Pressure Required to Keep Tube Inflated: Per manufacturer's instructions.
 - 8) Time: Per manufacturer's instructions.
 - 9) Cool Down:

- a) Send air through steam cured CIPP liner until liner cools down to 120 degrees F interface temperature.
 - b) Once 120 degrees F has been reached, water may be introduced to finish cooling line down to 90 degrees F.
 - c) During release of water, prevent vacuum that could damage newly installed CIPP.
- b. Hot Water:
 - 1) Provide safety system specifically structured for use of hot water.
 - 2) Thermoset Resin: Designed to cure properly when using hot water.
 - 3) CIPP Tube Thermoplastic Coating:
 - a) Formulated from material designed specifically to withstand high temperature curing process utilizing hot water.
 - b) Polypropylene/polyethylene blend or equal.
- 4) Equipment:
 - a) Heat source shall be capable of delivering hot water throughout section and uniformly raising water temperature above temperature required to affect cure of resin.
 - b) Install temperature gauges in the following areas:
 - (1) Incoming water supply.
 - (2) Outgoing water supply.
 - (3) Between impregnated tube and pipe invert at lining termination point.
- 5) Minimum Interface Temperature between Liner and Tube: 120 degrees F.
- 6) Time: 3 hours, minimum.
- 7) Cool Down:
 - a) Introduce cool water into CIPP to replace water being drained from small hole made in downstream end.
 - b) Cool liner to temperature below 90 degrees F before relieving hydrostatic head.
 - c) During release of water, prevent vacuum that could damage newly installed CIPP.

G. Manholes

1. CIPP terminating in manhole shall be cut in shape and manner approved by Owner's Representative.
2. Seal pipe opening and fill in annular space using products specified in Part 2 – Products – Hydrophilic End Seals
 - a. CIPP connections at manhole opening shall be watertight seal.
 - b. Install seal per manufacturer's instructions.

- a. Recheck seal repair after 48 hours. If seal does not hold, continue to repair until there are no leaks.
- b. Channels: When CIPP is installed continuous through manhole, create channel per Owner's Representative's instructions.
 - 1) Do not break or shear pipe.

H. Inverts:

- 1. Finish manhole inverts to provide smooth transition between connections.
- 2. Use CIPP liner material, an approved epoxy, or similar material to form smooth transition to eliminate sharp edges of CIPP, within host pipe, and in manholes at concrete bench and channel invert.
- 3. Invert rehabilitation shall be compatible with manhole rehabilitation activities.

I. Partial/Segmental/Point Repair CIPP Liners

- 1. Install partial CIPP liner in accordance with ASTM F2599 and same requirements for full liner.
- 2. Dimensions of liner shall be fabricated to size, that when installed, will neatly fit circumference of existing pipe.
- 3. Tube shall be vacuum impregnated with thermo-set resin.
 - a. Remove air in tube by vacuum allowing resin to thoroughly impregnate tube.
 - b. Retain a resin-impregnated sample of each installation to provide verification of curing process taking place in host pipe.
 - 1) Hang sample in entry manhole to simulate ambient conditions of host pipe.
- 4. Insert saturated tube and inversion bladder into carrying device and pull into host pipe.
 - a. Pull shall be completed when end of launching device is aligned with beginning of section to be repaired.
 - b. Protect resin and tube during pull to ensure no resin is lost by contact with manhole walls or pipe.
 - 1) Resin that provides structural seal shall not contact pipe until positioned at point of repair.
 - c. Alternative methods of liner insertion and pressurization may be used for products and processes approved by the Georgia Department of Natural Resources and the Owner's Representative,
 - 1) When the final cured-in-place product meets the intent of ASTM F1216.
 - 2) Installation shall be in accordance with the manufacturer's recommendations and available for verification by the Owner's Representative.
- 5. Installer shall be capable of viewing the beginning of liner contacting host pipe;
 - a. Verify exact placement of liner.
 - b. No measuring from a CCTV counter or estimating will be allowed.

6. Extract tube from carry device by controlled air or water pressure.
 - a. Hold tube in place against wall of host pipe by pressure until cure is complete
7. The CIPP point repair shall be an ambient cure system
 - a. Cure period shall be of a duration recommended by the resin manufacturer.
8. The finished pipe shall be continuous over the length of the internal point repair,
 - a. Overlap point repairs if necessary,
 - b. Be as free as commercially practicable from visual defects such as foreign inclusions, wrinkles, dry spots, pinholes, and delamination.
 - c. It shall also meet the leakage test requirements.
9. Alternate curing mediums may be used, including, but not limited to steam and ambient cure.
 - a. End product must meet or exceed the requirements of this section.
 - b. Alternate curing mediums and alternate installation methodologies must be submitted for approval to the Owner's Representative prior to the bid opening date as specified in the bid documents.
 - c. Notification of approval (or rejection) shall be made prior to bid opening.
 - d. When alternate curing mediums and/or alternate installation methodologies are approved for use,
 - 1) Follow all of the manufacturer's recommendations for installation and curing,
 - 2) No exceptions shall be permitted.
10. Should the Owner's Representative require a sample from the partial/segmental/point repair once sampling piece is cured and inflation bladder is deflated,
 - a. Remove bladder and launching device from host pipe.
 - b. Remove materials used in installation other than CIPP liner from host pipe.
 - c. Recover sample piece and label with upstream and downstream manhole numbers and footage from downstream manhole.

J. Service Lateral Re-Instatement:

1. Reconnect service connections using CCTV and a robotic cutter device to field locate laterals, reinstate, and determine number of service connections.
 - a. Service interruptions shall not exceed 8 hours.
 - b. Existing sewer service laterals will be internally reinstated to 100% of their pre-CIPP flow diameter.
 - c. The finished opening shall be smooth with no ragged edges and shall prevent clogging or blockages.
2. Do not reconnect services from abandoned or vacant lots,
 - a. unless otherwise directed by the Owner's Representative

3. Show distance from nearest downstream manhole to reconnected service on record drawings
4. Recover coupons at downstream manhole and remove.
5. When a remote cutting device is used and a cleanout is available, then a mini-camera down the service may also be used to assist the operator in cutting or trimming.
6. All service lateral reinstatements will be wire brushed to eliminate burrs and snags.

3.04 POST INSTALLATION

- A. CIPP installation shall be free from visual defects such as foreign inclusions, dry spots, keel, boat hull, pinholes, wrinkles, and other deformities.
 1. Defects and deformities may, at discretion of the Owner's Representative, be cause for rejection of entire liner.
 - a. Correct failed CIPP and defective CIPP from post installation television inspection or test reports for structural values or thickness as determined by the Owner's Representative.
 - b. Method of repair,
 - c. May require field or workshop demonstration,
 - d. Requires approval by the Owner's Representative prior to commencement of Work
 2. Remove and replace pipe identified with defects or deformities at the Contractor's expense.
- B. Both ends of the cured Liner shall be cut smoothly 2" from the inlet and outlet points in the manhole,
 1. Sealed with an epoxy or resin mixture compatible with the Liner/resin system,
 2. Providing a watertight seal.
 3. Sealing material and installation method shall be submitted and approved by the Owner's Representative prior to start of construction.
 4. Hydraulic cements and quick-set cement products are not acceptable.
- C. Where liners of any type are installed in two or more continuous manhole to manhole segments,
 1. Liner invert through the intermediate manholes shall be left intact.
 2. Final finishing of the installation in intermediate manholes shall require removal of the top of the exposed liner
 3. Neatly trimming of the liner edge where it touches the lip of the manhole bench.
- D. Portions of any piece of liner material removed during installation shall be available for inspection and retention by the Owner's Representative.
- E. All manhole drop connections shall be reviewed on an individual basis.

1. Reinstate openings for all drop assemblies after relining mainline sewer.
2. Outside drop assemblies shall be lined with a cured-in-place liner compatible with the mainline liner, for the full length of the drop assembly and bend.
3. Drop assemblies inside manholes are not required to be relined, unless directed by the Owner's Representative.

3.05 SAMPLE TESTING

- A. The Contractor shall have an independent testing laboratory analyze finished liner samples taken from manhole cutoffs, service coupons, etc.
 1. A minimum of two (2) 12-inch long samples shall be taken from the first segment installed, or as directed by the Owner's Representative.
 2. A minimum of two (2) 12-inch long samples shall be taken for each 2,500 LF of liner material installed
 - a. For each manufacturing lot if less than 2,500 LF liner installed,
 - b. As directed by the Owner's Representative.
 3. A minimum of six (6) 12-inch long samples per project shall be taken for each type of liner furnished,
 - a. Or as directed by the Owner's Representative.
 4. Physical samples removed for testing shall be individually labeled and logged to record the following:
 - a. Owner's Project number and title
 - b. Sample number
 - c. Segment number of line as noted on plans
 - d. Date and time of sample
 - e. Name of Contractor
 - f. Location and by whom tested
 - g. Results of test
 - h. Street name and address
 5. Send one sample from the first segment installed, one sample from each 2,500 LF installed to test in accordance with applicable ASTM standards for:
 - a. Tensile Properties,
 - b. Flexural Modulus,
 - c. Flexural Strength,
 - d. Wall thickness shall be conducted, a minimum of three samples per project will be tested.
 - e. If tests do not meet the minimum values:
 - 1) Additional samples originally not sent for testing may be required to be tested, as directed by the Owner's Representative.
 - 2) Contractor bears all costs associated with additional testing.

Property	ASTM Test Method	Minimum Value
Flexural Strength	D790	4,500 psi
Flexural Modulus	D790	250,000 psi
Tensile Strength	D638	3000 psi
Thickness	D5813	Contract requirement

6. Resin Sampling:
 - a. Wet-out facility resin mixing equipment shall have a valve downstream of the mixing function and immediately upstream of application of mixed resin of tube where resin samples may be drawn
 - b. Batch mix facilities, if any, shall provide sampling of mixed batch
 - c. Submitted "wet-out" schedule cannot be modified without 24-hour notice to Program Manager
 - d. Resin samples shall be drawn at times determined by Owner's Representative.
7. Field thickness testing:
 - a. Perform prior to conducting laboratory tests.
 - b. Take a wall thickness measurement in accordance with ASTM D2122
 - c. Make a minimum of four measurements, evenly spaced, on each test specimen.
 - 1) Calculate average thickness using measured values.
 - d. Average thickness shall be equal or greater than required design thickness.
 - e. Failure of thickness test shall be grounds for rejection for CIPP liner.
8. If properties test do not meet the minimum physical and thickness requirements, the CIPP shall be repaired or replaced at the Contractor's expense.
9. All curing, cutting, and identification of samples will be witnessed by the Owner's Representative.

3.06 TELEVISION INSPECTION

- A. Perform television survey in accordance with the requirements of Section 01510 – Sanitary Sewer Main Television and Sonar Inspection (CCTV).
 1. CCTV shall be performed
 - a. Prior to installation of the CIPP but after pre-lining cleaning.
 - b. After installation of CIPP line and the reconnection of all active sewer laterals.
- B. Conduct finished inspections continuous over entire length of sewer between manholes within 48 hours of installation
 2. Liner shall be free from visual defects, damage, and deflection.
 - a. No visible infiltration through the liner, at the joints, at the service

connections or at the manholes

3. Base acceptance of liner on videotaped CCTV inspection and that defects described in 1, above, do not exist.
 - a. Corrections of defects or failures identified in post-installation CCTV shall be repaired at no cost to Owner
 - b. Method of repair shall be approved by Owner's Representative prior to completion of work.

3.07 TESTING

- A. Full Length CIPP testing shall be in accordance with Section 02650 – Testing for Acceptance of Sanitary Sewers.
- B. Partial/Segmental/Point Repair CIPP testing shall be in accordance with Section 3.06 Television Inspection of this specification.

3.08 ACCEPTANCE

- A. Laboratory Testing: one sample shall be sent to an independent laboratory and tested.
 1. Preparation and testing standards shall be performed in accordance with the approved submittals.
 2. Failure of any test can be grounds for rejection of the CIPP liner.
 3. At the direction of the Owner's Representative a second sample shall be tested.
- B. Destructive Testing: Where test results of samples from the 12-inch long pipe section are lower than required values, at the direction of the Owner's Representative, Contractor shall cut samples from liner along length of pipe.
 1. The size and shape of the samples shall be determined by the Owner's Representative.
 2. The Contractor shall repair the CIPP liner and host pipe at no additional cost to the Owner.
 3. Failure of test shall be grounds for rejection for the CIPP liner.
- C. Resin Sampling: Owner's Representative drawing the samples will arrive unannounced and shall be afforded immediate access to the equipment.
 1. Resin sample shall be sent to the independent laboratory and tested.
 2. Testing standards shall be performed in accordance with approved submittals.
 3. Failure of any test can be grounds for rejection for the CIPP liner.
- D. Low-pressure air testing or hydrostatic exfiltration test: acceptance based on successful completion of this test as specified herein.
- E. The Contractor shall submit to the Owner's Representative, for acceptance and approval,
 1. two (2) copies of unedited post-installation CD/DVDs

- 2. Associated certified test reports for each sewer main segment within 10 working days of the Liner installation.
- 3. No more than one sewer main segment shall be included on a post-installation Inspection CD/DVD or curing report.
- F. It is the intent of these specifications the completed liner, with all appurtenances to be essentially equivalent in final quality and appearance to new sewer pipe installation.
 - 1. The conditions of the existing host pipe will be taken into consideration.
- G. Where, in the opinion of the Owner's Representative, a defect in the CIPP liner requires removing a section of the CIPP liner, the Contractor shall make all repairs as directed by the Owner's Representative and shall install a segmental liner, compatible with the CIPP liner, to accomplish a continuous finished liner.
 - 1. No separate measurement and payment will be made for such defect repair or for the post-repair segmental liner.

3.09 PRIVATE SERVICE LINE SHUTDOWN

- A. Notify Owner's Representative at least 1 week prior to shutdown
- B. When it is necessary to shut down a private sewer service line notify building occupants regarding service lateral disconnection by placing a door hanger approved by the Owner's Representative.
 - 1. Place door hangers 48 hours prior to shut down.
- C. When service lateral will be disconnected from main for more than 8 hours, lateral shall be positively drained or pumped down.
 - 1. Monitor status of flow and storage
 - 2. Pump lateral more frequently where flows exceed storage capacity of lateral or Contractor provided temporary storage
- D. If service lateral cannot be positively drained or pumped down or disconnection of service is anticipated being 8 hours or longer,
 - 1. Contractor shall provide temporary living accommodations for resident at no additional cost to Owner or resident.
 - 2. Temporary living accommodations shall be approved by Program Manager and coordinated through resident and Owner's Customer Support Representative
 - 3. Alternatively, Contractor may supply a temporary bypass pumping system to keep the lateral operational.
- E. Notify building occupants when work is complete and uninterrupted service restored
- F. Commercial sewer services shall be maintained at all times while the business is open.

1. No sewage from the services or main line shall be discharged on the ground or in waterways.
2. Holding pits or tanks are not allowed unless permitted by Federal, State, and local authorities having jurisdiction.

3.10 CLEANUP

- A. After the CIPP liner installation work has been completed and all testing acceptable, the Contractor shall clean up the work area.
 1. All excess material and debris not incorporated into the permanent installation shall be disposed of by the Contractor.
 - a. The debris and liquids are to be disposed of properly in accordance with all applicable laws.
 - b. The local municipality can furnish a letter to the landfill stating the Contractor is authorized to dispose of the non-hazardous materials.
 - c. Debris and liquids type and quantities are to be tracked in the daily contractor diary.
 - d. Hauling and disposal costs will be borne by the Contractor.
 2. The work area shall be left in a condition equal to or better than prior condition.
 - a. Disturbed grassed areas shall be seeded or sod placed as directed by the Owner's Representative at no additional cost to the Owner.
 - b. The work site restoration work shall be completed in accordance with the requirements of Section 02480 – Site Restoration and Erosion Control.

3.11 DOCUMENTATION

- A. The Contractor shall complete work on each asset as assigned via the Owner's Computerized Work Order Management system.
 1. Upon start of work, the Contractor shall receive work orders as assigned by the Owner's Representative.
 2. The Contractor shall maintain and synchronize the status of each rehabilitation work order issued.

3.12 WARRANTY

- A. Material Warranty: A written guarantee of 2 years shall be provided by manufacturer against breakdown of material effectiveness or structural repair elements
- B. Workmanship Warranty: The Contractor shall guarantee his work for a warranty period of two (2) years from the date of final acceptance against any leakage, cracking, loss of bond, or other discontinuity is identified.
- C. Warrantee Inspection: A warranty inspection shall be conducted in the 23rd month following final acceptance of the Work.
 1. Contractor and liner manufacturer representative shall participate in inspection.

2. Deficiencies related to material and workmanship shall be repaired by contractor to the satisfaction of the Program Manager and at no additional cost.
3. If repairs are made, then the Contractor shall warrant the work for one (1) year in addition to the original warranty period required by the Contract.

END OF SECTION

SECTION 02501
LINING WITH ULTRA-VIOLET LIGHT FIBERGLASS CURED-IN-PLACE PIPE

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Work under this section shall include rehabilitating a full length of an existing sewer main, from manhole to manhole, by the trenchless method known as ultra violet cured-in-place-pipe (UV-CIPP) in accordance with these Specifications. CIPP consists of installing a resin-impregnated fiberglass material tube (Liner) that when cured extends the full length of the original pipe and shall provide a structurally sound, smooth, joint-less and watertight pipe.

1.02 REFERENCES

A. ASTM

1. C581 – Standard Practice for Determining Chemical Resistance of Thermosetting Resins Used in Glass Fiber Reinforced Structures Intended for Liquid Service.
2. D543 - Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents.
3. D578/D578M - Standard Specification for Glass Fiber Strands.
4. D618 - Standard Practice for Conditioning Plastics for Testing.
5. D638 - Standard Test Method for Tensile Properties of Plastics.
6. D790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
7. D1598 - Standard Test Method for Time-to-Failure of Plastic Pipe Under Constant Internal Pressure.
8. D2122 - Standard Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings.
9. D2412 - Standard Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading.
10. D2837 - Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials or Pressure Design Basis for Thermoplastic Pipe Products.
11. D2990 - Standard Test Methods for Tensile, Compressive, and Flexural Creep and Creep-Rupture of Plastics.
12. D3567 - Standard Practice for Determining Dimensions of “Fiberglass” (Glass-Fiber-Reinforced Thermosetting Resin) Pipe and Fittings.
13. D 3681 – Standard Test Method for Chemical Resistance of Fiberglass (Glass-Fiber-Reinforced Thermosetting Resin) Pipe in a Deflected Condition.
14. D5813 – Standard Specification for Cured-in Place Thermosetting Resin Sewer Pipe.
15. F1216 - Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube.

- 16. F1743 - Standard Practice for Rehabilitation of Existing Pipelines and Conduits by Pulled-in-Place Installation of Cured-in-Place Thermosetting Resin Pipe (CIPP).
- 17. F2019 - 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).
- B. National Association of Sewer Service Companies (NASSCO): Guideline for the use and handling of styrenated resins in cured-in-place-pipe, September, 2008
- C. Potable Water Main, Gravity Sanitary Sewer, and Sanitary Sewer and Force Main Design Standards, DeKalb County Department of Watershed Management.

1.03 DEFINITIONS

- A. UV-CIPP - Ultra Violet Cured-in-Place-Pipe is defined as a hollow cylinder consisting of a glass reinforced fabric tube impregnated with an ultra violet light sensitive resin. The impregnated tube is cured by the application of ultra violet light. The UV-CIPP is formed within an existing pipe and takes the shape of and fits tightly to the pipe, all as defined in ASTM Standard F1743. The definitions in ASTM Standard F1216, and ASTM F2019 shall also apply.

1.04 QUALIFICATIONS

- A. The system proposed (material, methods, workmanship) must have been proven through previous successful installations to an extent and nature satisfactory to the Owner's Representative. CIPP is intended to have a minimum fifty (50) year design life, only products deemed to meet this performance standard will be accepted. All products and their licensed installer must be pre-approved by the Owner's Representative prior to the formal opening of proposals.
- B. Product manufacturer shall have:
 - 1. Minimum 10 years' experience in CIPP manufacturing including:
 - a. Manufacture of a minimum of 100,000 linear feet of CIPP
 - b. Provided qualifications for 10 projects for CIPP with pipe diameters of similar size or greater to those found on the contract drawings.
 - c. Personal experience of the manufacturing manager with other manufacturing companies may be substituted in lieu of the current company experience
 - 1) Substitution requires approval of Owner's Representative.
 - d. Certify that their product is designed for a minimum 50-year design life.
- C. Installing Contractor shall have:
 - 1. Minimum of 10 years' experience in sewer rehabilitation including:
 - a. Minimum 50,000 linear feet of sewer rehabilitation
 - 1) In pipe diameter of similar size to those found on the contract drawings or greater utilizing CIPP trenchless technology.

- b. Personal experience of the Contractor's construction manager with other construction companies may be substituted in lieu of the current company experience
 - 1) Substitution requires approval of Owner's Representative.
- c. Contractor's Installing Personnel (foreman, crews, etc.) must have:
 - 1) Minimum 3 years active experience in commercial installation of CIPP liner
 - 2) Key personnel shall each have completed minimum 100,000 linear feet and 300 line sections of CIPP in gravity sewers.
 - 3) Certified training on installing manufacturer's product approved by the manufacturer.
- 2. Demonstrate they have a manufacturer approved quality assurance program to standardize the materials, manufacture, wet out and installation of the specific CIPP product in place.
- D. Contactor shall demonstrate experience for selected method of curing in a mock up before actual lining of pipe (if required)

1.05 SUBMITTALS

- A. Action Submittals (submit for review and approval):
 - 1. Comprehensive Construction Sequencing Plan including:
 - a. Work Site Plan including:
 - 1) Proposed access routes
 - 2) Set up locations for lining installation
 - 3) Wet out area (if required) including:
 - a) Typical insertion and curing schedule/plan
 - (1) Submit wet out, insertion and curing plan for each and every lining proposed
 - (a) Submit minimum 48 hours (2 working days) prior to each installation
 - b. Site Health and Safety Plan
 - c. Required Construction Permits
 - d. Sewer Flow Control Plan in accordance with Section 01520 including:
 - 1) Spill Containment Plan
 - 2) Emergency contingent plan
 - e. Work schedule
 - 2. Erosion Control Plan in accordance with the DeKalb County Department of Watershed Management Protocol for Providing Erosion and Sedimentation Controls on Construction Projects.
 - 3. Traffic Control Plan in accordance with GDOT requirements (where applicable).
 - 4. Analysis of design criteria and calculations for CIPP thickness per ASTM F1216 full deteriorated condition.
 - a. Submit complete data and design calculations for each lining
 - b. Include installation method statement for each lining including:

- 1) Repair details for potential sewer defects in conjunction with manholes, joints, laterals and infiltration.
 - 2) Quality Control/Quality Assurances
- c. Calculations shall be prepared and stamped by a Professional Engineer in the State of Georgia.
 - 1) Approval of the calculations shall not relieve the Contractor of any contractual obligations.
5. Curing temperature/monitoring system shop drawings
6. Shop Drawings for hydrophilic end seals and pre-liners to be used and method of installation.
7. Proposed testing procedure including:
 - a. Number, location and sampling methods
8. Proposed testing laboratory with qualifications, experience history and references.
9. Pre-installation CCTV inspection DVD.
10. Qualification requirements for the Contractor, Installer and personnel (See Item 1.04 Qualifications, this specification)

B. Informational Submittals:

1. Manufacturer's technical literature and certificate demonstrating the materials to be used meet the referenced standards and the requirements of these specifications.
2. Proposed equipment and procedures for accomplishing the cured-in-place pipe lining work.
3. Manufacturer's printed installation instructions including:
 - a. Installation method statement including:
 - 1) Details concerning curing methods,
 - 2) Inversion pressures necessary for proper installation,
 - 3) Minimum pressure required to hold tube tight against existing host pipe,
 - 4) Maximum allowable pressure that will not damage tube,
 - 5) Type of insertion,
 - 6) Defect repair:
 - a) Methods of repairing in conjunction with manholes,
 - b) Joints,
 - c) Laterals,
 - d) Active infiltration,
 - e) Quality control/quality assurance plan,
 - f) Repair material test results.
4. Product data and Manufacturer's installation procedures for resin and catalyst system including but not limited to specifications, characteristics, properties, and itemized exceptions and deviations to Specification.
5. Certified test reports on physical properties and chemical resistance of proposed resin

6. Material Safety Data Sheets for all resins, and other additives such as accelerants, colorants, and lubricants utilized in the pipe liner/lining process.
7. Manufacturer's Certificate of Compliance that resin material is appropriate for intended application and in conformance with specifications
8. Certified test reports on physical properties and chemical resistance of proposed resin
9. Annular space sealant
10. Service connection fittings

C. Project Submittals

1. The Contractor shall submit the following information during the project for the use of CIPP at a particular location:
 - a. Field measurements.
 - b. Design wall thickness calculations,
 - 1) signed and sealed by a professional engineer registered in the state of Georgia and proficient in the design of CIPP systems
 - 2) Manufacturer certification of material to values used in calculations.
2. "Wet-out" Plan: for each proposed lining section,
 - a. method for "wet-out" or flexible tube
 - b. specific insertion and curing schedule
3. Contractor's procedures and materials for installing the liner and renewing sewer services including time and duration of sewer service unavailability.
4. Sampling procedures and locations for obtaining representative samples of the finished liner.

D. The Contractor shall submit a daily written record as specified in Section 01320 Progress Reports & Videos

1. The Owner's Representative shall certify receipt of the daily record (in email format) noting any items and adding any observations with reference to claims for payment to the Contractor.
2. The Owner's Representative may request a weekly submission in the form of progress report.
 - a. Owner's Representative shall provide the Contractor a written request for a weekly progress report.

E. Record drawings, including the identification of the work completed by the Contractor, and the post-installation CCTV shall be submitted within 2 weeks after the project is completed.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Packaging, handling and shipping shall be done in accordance with the manufacturer's instructions.

1. The Contractor shall be responsible for the delivery, storage, and handling of products.
 - a. Keep products safe from damage
 - b. Promptly remove damaged products from the work site at the Contractor's expense.
 - 1) Dispose of in accordance with current applicable regulations.
 - c. Replace damaged products with undamaged products acceptable to the Manufacturer and Owner's Representative.
2. No products shall be shipped to the job site without the approval of the Owner's Representative.

B. Resin to be shipped directly to wet-out facility from resin manufacturer unless otherwise approved by the Owner's Representative.

C. Store UV light cured liners in a light proof, cool environment to prevent premature curing

D. No cuts, tears, or abrasions shall occur to liner tube during handling.

E. All materials shall be accompanied by test reports certifying the material conforms to the ASTM standards listed herein.

1. Materials shall be shipped, stored, and handled in a manner consistent with written recommendations of the manufacturer.
2. The liner wet-out report must be provided for liner material and resintype.
 - a. The ratio of resin and fiberglass must be provided by the manufacturer.

F. All damaged materials rejected by the Owner's Representative shall be promptly removed from the project site at the Contractor's expense and disposed of in accordance with current applicable regulations.

1.07 SAFETY

- A. Perform work in accordance with OSHA standards and State and Federal safety regulations.
- B. No confined space entry will be permitted without the development and implementation of a confined space entry plan.
 1. Plan shall be in accordance with OSHA standards
 2. Personnel involved shall have current training certificates
 3. Entry permit is required prior to entry.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Glass Fibers:
 1. The glass fibers shall be corrosion resistant E-CR

2. Each lot of glass fibers liner shall be inspected for defects and tested in accordance with applicable sections of ASTM F2019.

B. Tube (Liner):

1. Any materials not approved by the Program Manager prior to installation into the piping shall be rejected and shall be removed and replaced with approved materials at the Contractor's expense
2. The liner shall have an impervious internal and external coating material to protect the resin from ultra violet light exposure and from contamination during shipping and installation.
3. The fiber glass liner shall be saturated with the appropriate resin using the resin bath or vacuum suction impregnation methods and prevent the least amount of air entrapment.
4. Manufacture/construct the UV-CIPP using materials and methods that when installed:
 - a. Provides a jointless and continuous structurally sound liner
 - b. Able to withstand all imposed static, and dynamic loads on a long-term basis.
5. The impregnation of the resin into the glass fiber tube must be performed at the manufacturer's factory.
 - a. No on-site wet-out of the tube will be allowed.
 - b. The liner shall be designed to meet the contract requirements.
6. The liner shall be sized such that when installed it will tightly fit the internal circumference of the host pipe.
7. The manufacturer shall test raw materials and liner material at various stages of manufacturing.
8. Every finished liner shall be sampled and tested for modulus of elasticity, tensile strength, and wall thickness.
 - a. The results will be provided to the Program Manager.
9. The liner shall be seamless so that homogeneous properties are attained throughout the length and circumference.
10. The inner and outer membranes shall be certified styrene gas barriers.
11. All liners shall be packaged in special shipping containers and UV protection foil,
 - a. Allowing storage of the resin impregnated liner for up to 6 months, with no need for refrigeration.

C. Design liner thickness using the following criteria:

1. Design Life: 50 Years
2. Pipe Diameters: Per Contract Drawings
3. Ovality 2%
4. Pipe Condition: Fully deteriorated
5. External Water: Ground surface if not specified on the Contract Documents
6. Tensile Strength: 20,000 psi
7. Flexural Strength: 20,000 psi

8. Short Term Flexural Modules: 1,000,000 psi
9. Long Term Flexural Modules: 600,000 psi
10. Reduction Factor: 50%
11. k Enhancement Factor: 7
12. Soil Modules: 1,000 psi
13. Soil Density: 125 pcf
14. Highway Live Load: AASHTO H-25
15. Safety Factor: 2 minimum
16. Minimum Thickness: 3.0 mm
 - a. The nominal liner wall thickness shall be constructed to the nearest 0.5 mm increment.
17. Poisson's ratio: 0.3
18. Liner shall be watertight

D. Resin:

1. General purpose, unsaturated, polyester, epoxy, isophthalic neopentyl glycol, or thermosetting vinyl ester resin including:
 - a. Catalyst system, initiators, or hardeners providing specified cured physical strengths and properties,
 - b. Compatible with reconstruction inversion process.
2. Resistant to municipal wastewater environment including:
 - a. Immersion in septic sewage at temperatures up to 75 degrees F.
3. PET resins, resin fillers, resin additives, and resin enhancement agents are prohibited.
 - a. Only neat resins are acceptable.
 - b. Old resins and reworked resins are prohibited, regardless of whether or not they are mixed with new resin.
4. Chemical resistance of resin system shall have been tested by resin manufacturer in accordance with ASTM D543.
 - a. Exposure to chemical solutions listed below at temperatures of up to 75 degrees F shall be conducted for a minimum period of 1 month and shall result in a loss of not more than 20 percent of initial structural properties.
 - 1) Minimum Chemical Solution Concentration, ASTM F1216:
 - a) Tap Water, pH 6 to 9: 100 percent.
 - b) Nitric Acid: 5 percent.
 - c) Phosphoric Acid: 10 percent.
 - d) Sulfuric Acid: 10 percent.
 - e) Gasoline: 100 percent.
 - f) Vegetable Oil: 100 percent.
 - g) Detergent or Soap: 0.1 percent.
5. Produce cured tube resistant to shrinkage, not corrode or oxidize, and resistant to abrasion from solids, grit, and sand in wastewater.
6. Bond between tube layers shall be strong and uniform.

7. Layers, after cure, shall be saturated with resin.
8. The resin color will not interfere with visual inspection of cured liner.

2.02 SOURCE QUALITY CONTROL

- A. At time of manufacture, each lot of liner shall be inspected and certified to be free of defects.
- B. Mark inside of tube in at least one location per set up.
 1. Mark shall include manufacturer of liner, at regular intervals, not to exceed 5 feet, along full length.
- C. CIPP samples for testing shall be of tube and resin system similar to that proposed for actual construction.
 1. CIPP samples with and without plastic coating shall meet these chemical testing requirements.
 2. CIPP Field Samples:
 - a. Submit test results from field installations of the same resin system and tub materials as proposed for the actual installation.
 - b. Test results must verify that CIPP physical properties specified have been achieved in previous field applications.

PART 3 – EXECUTION

3.01 PREPARATION

- A. The following installation procedures shall be adhered to unless otherwise approved by the Owner's Representative.
 1. Carry out all operations in accordance with all Federal, State, and local safety laws, regulations, standards, policies, and procedures including those promulgated by OSHA and those recommended by the manufacturer.
 - a. Particular attention is drawn to those safety requirements involving entering confined spaces (follow OSHA requirements).
 - 1) The Contractor shall take additional precautions to secure the work area and insure the safety of everyone in or around the curing apparatus.
 - 2) Before utilizing this method, the Contractor shall submit a copy of the Contractor's standard operating procedures addressing safety issues for this methodology to the Program Manager.
 2. The Contractor shall bypass wastewater around the sewer segment or sewer segments designated for lining as specified in Section 01520 –Sewer Flow Control.
 - a. Service connection effluent may be plugged only after proper notification to the affected properties.
 - b. Individual's sewer service shall not be interrupted for more than 8 hours.

- 1) If proposal is to interrupt service for more than 8 hours alternative means of providing service during construction will be required.
- 3. Do not install liner if ground water temperatures and/or ambient temperatures are excessive for the manufacturer's recommended installation procedures.
- 4. Where practicable, liners can be installed in continuous runs through manholes:
 - a. Where there are two or more continuous sewer segments,
 - b. Or to connect several short segments with a continuous lining.
 - c. If a road/lane must be closed to traffic, the Contractor shall furnish a detailed traffic control plan and all labor and equipment necessary.
 - 1) No separate payment will be made for traffic control.
 - 2) It is an incidental part for CIPP installation.

3.02 PRE-INSTALLATION PROCEDURES

- A. Complete the following activities, unless otherwise approved by the Program Manager.
 - 1. Perform operations in accordance with OSHA Standards.
 - 2. Before Work commences:
 - a. Required pre-installation submittals shall be approved by Owner's Representative, including:
 - 1) Traffic management plan/measures,
 - 2) Safe pedestrian passage,
 - 3) Provision of vehicular access to property,
 - 4) Bypass/diversion pumping,
 - 5) Emergency measures/contingent plans.
 - b. Submit an Installation Access Plan including:
 - 1) Access manhole location(s)
 - 2) Site plan sketch showing dimensions of access within work limits and utilities
 - 3) Approximate installation rate (ft/day)
 - Appropriate excavation/backfill/resurfacing procedures including permits according to Georgia Dept. of Transportation and governing agency standards.
 - 3. Pre-insertion Cleaning:
 - a. Clean sewer pipe before pre-insertion television inspection.
 - 1) Immediately before installation of the lining complete a high pressure flush and vacuum in sewer sections to be rehabilitated and repaired including pertinent manholes.
 - 2) Remove any root, grease buildup and any other obstruction that may interfere with the lining operation.

- b. Debris removed from sewer during cleaning shall be transported in watertight containers and disposed of in accordance with local, State, and Federal Regulations.
- 4. Pre-insertion CCTV Inspection:
 - a. In accordance with Section 01510 – Sanitary Sewer Main Television & Sonar Inspection.
 - b. Inspect sewer pipe before insertion of resin impregnated tube to ensure pipe is clean and existing pipe conditions are acceptable for lining.
 - 1) Any notable condition that could affect the lining operation will be removed/repaired prior to initiating the lining.
- 5. Line Obstructions: If pre-installation video CCTV inspection reveals obstruction in existing pipe that cannot be removed by sewer cleaning equipment, with approval of Program Manager, perform point repair using flexible coupling.
- 6. Ensure proper sequence of work occurs between mainline and lateral lining activities.
- 7. Confirm accurate location and serviceability of existing lateral or service connection (tap). Serviceability shall be confirmed by flowing water, dye testing, or visually with CCTV inspection.
 - a. Dye Testing: Where sewer line segments may contain abandoned services, Contractor may be directed by Program Manager to perform dye testing to determine if services are live and require reinstatement.
 - 1) The Contractor shall be responsible for the identification and verification of all branch service connections prior to installing the UV-CIPP.
 - b. Line Obstructions: If pre-installation video CCTV inspection reveals obstruction in existing pipe that cannot be removed by sewer cleaning equipment, with approval of Program Manager, perform point repair using flexible coupling.
 - 1) When service connections protrude into existing pipe more than $\frac{1}{2}$ inch, as measured from inside pipe wall, remove protruding portion of service connection to within $\frac{1}{2}$ inch of inside pipe wall.
- 8. The contractor shall remove, grind or take other precautions necessary to address sharp edges or protrusions that could tear the liner or the protective sheets or films.
- 9. For pipes where sags exist in the pipe segment:
 - a. Water in the sag is to be removed to avoid trapping water between the liner and the host pipe.

3.03 INSTALLATION

- A. Verify diameters and lengths in field before manufacturing and cutting liner to length.
- B. Install in accordance with ASTM F1216, Section 7 or ASTM F1743, Section 6.

1. Active infiltration must be removed prior to insertion of the liner.

C. Resin Impregnation (Wet-Out)

1. Tube shall be either impregnated with resin either by the resin bath or vacuum suction methods under controlled conditions.
 - a. Resin bath impregnation must be performed at the manufacturer's factory.
 - b. Vacuum suction impregnation – location must be designated prior to CIPP installation.
 - c. No onsite wet-out of the tube will be allowed.
 - d. If requested, allow Program Manager to inspect materials and procedures used to impregnate the tube.
 - e. If Contractor uses an alternative method of resin impregnation, method shall produce the equivalent results.
 - 1) An alternative resin impregnation method shall be documented to Program Manager and Owner's satisfaction that saturation of CIPP is sufficient.
 - f. Handle resin impregnated tube to retard or prevent settling until it is ready for insertion.
2. Resin must be uniformly distributed throughout the tube.
 - a. Use roller system to uniformly distribute resin throughout tube.
3. Volume:
 - a. Resin shall fill voids in tube material at nominal thickness and diameter; no air spaces or pockets allowed.
 - b. Adjust by adding excess resin to change resin volume because of polymerization and to allow for migration of resin into crack and joints in original pipe.
4. Complete wet-out process control sheet for every lining completed. Control sheet shall provide the following information:
 - a. Liner manufacturer
 - b. Liner diameter
 - c. Number of layers
 - d. Resin manufacturer
 - e. Resin amount
 - f. Resin type
 - g. Batch number
 - h. Catalyst and accelerator name/type
 - i. Hardener name/type
 - j. Mixing ratios
 - k. If vacuum suction method use: pressure of impregnation process
 - l. Wet-out start time and date

D. Insertion

1. CIPP installation shall be in accordance with applicable ASTM F2019 and manufacturer's specifications.
2. The Contractor and Manufacturer shall provide all appropriate transport, handling and protection equipment to transport the impregnated tube to the project site.
 - a. All materials should be protected from the weather and exposure to UV light during the manufacture, storage, transport, and installation.
3. All fabricating and Contractor testing shall be carried out under cover and no materials shall be exposed to the weather until they are ready to be inserted.
4. Each liner shall be accompanied by suitable documentation indicating:
 - a. Time and date of manufacture,
 - b. Fiberglass thickness,
 - c. Length of liner,
 - d. Resin types,
 - e. Resin content,
 - f. Catalyst,
 - g. Relevant batch numbers,
 - h. etc.
5. Liner protection – Prior to inserting the Liner, a plastic slip/rub sheet 10 mil thick will be pulled and laid flat into the host pipe such that it protects the Liner from damage as the Liner is pulled in.
6. Liner Insertion –
 - a. Insert the liner through an existing manhole or approved access point
 - b. Fully extend to the next designated manhole or termination point.
 - c. Pulling speed shall not exceed 15 ft/min.
 - d. Exercise care that no axial stretching occurs so that there is no damage to the tube during the pulling phase.
7. The tube shall be positioned in the pipeline using the method specified by the manufacturer.
 - a. Exercise care not to damage the tube as a result of installation.
8. Liner Inflation –
 - a. Pressurize the tube to achieve and maintain a tight fit (no gap) against the host pipe throughout the curing process.
 - 1) End plugs or packers shall be used to cap each end of the liner to prepare for pressurizing.
 - 2) The end caps shall be secured with straps or by other means to prevent them from being expelled.
 - b. The curing light train and CCTV camera shall be installed and directed through the entire length of the tube during which a detailed CCTV inspection is performed of the uncured tube.
 - c. Any defects, such as water bubbles, shall be addressed before the curing begins.

- d. The light train is activated and moved back along the length of the tube to affect the curing of the tube into a UV-CIPP.
- 9. The liner ends shall be the full size of the host pipe and shall be tight fitting to the end of the host pipe.
 - a. No wrinkles are acceptable at the termination of the liner.
 - b. No leaking from the liner/host pipe interface will be accepted.
- 10. The light cure train shall be fitted with suitable monitors to gauge the cure achieved throughout the length of the liner.
 - a. The speed of cure shall be as per the manufacturer's requirements.
- 11. The inner tube protective membrane shall be removed after the liner has been cured.
- 12. Complete installation process control sheets for every lining completed. Control sheet shall provide the following information:
 - a. Date and time
 - b. Liner length
 - c. Pressure required to inflate tube and hold tight until curing process complete
 - d. Time curing process started
 - e. Curing time
 - f. Time curing process ended
 - g. Light source and wattage
 - h. Exothermic (curing) Temperatures
 - i. Time cutting ends started
 - j. Time cutting laterals started
 - k. Number of laterals cut

E. Curing

- 1. The Contractor shall be responsible for the thorough curing of the liner to achieve the specified results.
 - a. The curing process shall be performed in accordance with the manufacturer's recommendations.
- 2. Contractor shall extend, at their expense, curing time to achieve a hard, sound liner demonstrating the specified mechanical and chemical properties, if required.
- 3. Service Lateral Re-Instatement:
 - a. After liner has been cured in place:
 - 1) Use CCTV and a robotic cutter device to field locate existing service connections,
 - 2) Confirm the number of service connections to be reinstated and complete work to bring them back on line.
 - a) Recover coupons at downstream manhole and remove.
 - b) All service lateral reinstatements will be wire brushed to eliminate burrs and snags.
 - 3) Service interruptions shall not exceed 8 hours.

- 4) Existing sewer service laterals will be internally reinstated to 100% of their pre-CIPP flow diameter.
 - a) The finished opening shall be smooth with no ragged edges and shall prevent clogging or blockages.
 - b. Do not reconnect services from abandoned or vacant lots, unless otherwise directed by the Program Manager.
 - c. Show distance from nearest downstream manhole to reconnected service on record drawings.
 - d. When a remote cutting device is used and a cleanout is available, then a mini-camera down the service may also be used to assist the operator in cutting or trimming.

3.04 POST INSTALLATION

- A. UV-CIPP installation shall be free from visual defects such as foreign inclusions, dry spots, keel, boat hull, pinholes, wrinkles, and other deformities.
 - 1. Defects and deformities may, at discretion of the Program Manager, be cause for rejection of entire liner.
 - 2. Contractor shall correct failed UV-CIPP and defective UV-CIPP,
 - a. identified from post installation television inspection,
 - b. test reports for structural values
 - c. thickness
 - 3. Method of repair, which may require field or workshop demonstration, shall be approved by the Program Manager prior to commencement of work.
 - 4. Remove and replace pipe identified with defects or deformities that cannot be repaired to the satisfaction of the Program Manager and/or the Manufacturer.
- B. Both ends of the cured Liner shall be cut smoothly 2" from the inlet and outlet points in the manhole
 - 1. Seal with an epoxy or resin mixture compatible with the Liner/resin system, providing a watertight seal.
 - 2. Sealing material and installation method shall be submitted and approved by the Owner's Representative prior to start of construction.
 - a. Tube manufacturer shall also be consulted for appropriate sealing material and installation method.
 - 3. Hydraulic cements and quick-set cement products are not acceptable.
- C. Where liners of any type are installed in two or more continuous manhole segments, the liner invert through the intermediate manholes shall be left intact.
 - 1. Final finishing of the installation in those intermediate manholes shall require removal of the top of the exposed liner
 - 2. Neat trimming of the liner edge where it touches the lip of the manhole bench.
 - 3. Sealing between the new liner and pre-existing manhole channel.

- D. Portions of any piece of liner material removed during installation shall be available for inspection and retention by the Owner's Representative.
- E. All manhole drop connections will be reviewed on an individual basis.
 - 1. Reinstate openings for all drop assemblies after relining mainline sewer.
 - 2. Everywhere possible, outside drop assemblies shall be lined with a cured-in-place liner compatible with the mainline liner, for the full length of the drop assembly and bend.
 - 3. Drop assemblies inside of manholes are not required to be relined, unless directed by the Owner's Representative.
- F. Each line segment lined shall be CCTV inspected as soon as practical after processing to assure complete curing.
 - 1. Segments not fully conforming to these Specifications must be immediately brought to the Owner's Representative attention with a proposed method of correction without cost to the Owner.

3.05 SAMPLE TESTING

- A. The Contractor shall have an independent testing lab analyze finished liner samples taken from manhole cutoffs, service coupons, etc.
 - 1. A minimum of two (2) 12-inch long restrained samples shall be taken from the first segment installed, or as directed by the Owner's Representative.
 - 2. A minimum of two (2) 12-inch long restrained samples shall be taken for each 2,500 LF of liner material installed
 - a. for each manufacturing lot, if less than 2,500 LF liner installed
 - b. Or as directed by the Owner's Representative.
 - 3. A minimum of six (6) 12-inch long restrained samples per project shall be taken for each type of liner furnished,
 - a. Or as directed by the Owner's Representative.
 - 4. Physical samples removed for testing shall be individually labeled and logged to record the following:
 - a. Owner's Project number and title
 - b. Sample number
 - c. Segment number of line as noted on plans
 - d. Date and time of sample
 - e. Name of Contractor
 - f. Location and by whom tested
 - g. Results of test
 - h. Street name and address
 - 5. Send one sample from the first segment installed, one sample from each 2,500 LF installed to test in accordance with ASTM standards for:
 - a. Tensile Properties,
 - b. Flexural Modulus,

- c. Flexural Strength
- d. Wall thickness shall be conducted, a minimum of three samples per project will be tested.
- e. If tests do not meet the minimum values:
 - 1) Additional samples originally not sent for testing may be required to be tested, as directed by the Program Manager.
 - 2) Contractor bears all costs associated with additional testing.

Property	ASTM Test Method	Minimum Value
Flexural Strength	D790	20,000 psi
Flexural Modulus	D790	1,000,000 psi
Tensile Strength	D638	20,000 psi
Thickness	D2122 (per F2019)	Contract requirement

B. Resin Sampling:

- 1. Wet-out facility resin mixing equipment shall have a valve downstream of the mixing function and immediately upstream of application of mixed resin of tube where resin samples may be drawn.
- 2. Batch mix facilities, if any, shall provide sampling of mixed batch.
- 3. Submitted “wet-out” schedule cannot be modified without 24-hour notice to Owner’s Representative.
- 4. Resin samples shall be drawn at times determined by Owner’s Representative.

C. Field thickness testing:

- 1. Perform prior to conducting laboratory tests.
- 2. Take a wall thickness measurement in accordance with ASTM D2122
- 3. Make a minimum of four measurements, evenly spaced, on each test specimen.
 - a. Calculate average thickness using measured values.
- 4. Average thickness shall be equal or greater than required design thickness.
- 5. Failure of thickness test shall be grounds for rejection for CIPP liner

- D. If properties tests do not meet the minimum physical and thickness requirements, the CIPP shall be repaired or replaced at the Contractor’s expense.
- E. All curing, cutting, and identification of samples will be witnessed by the Owner’s Representative.

3.06 TELEVISION INSPECTION

- A. Perform television survey in accordance with the requirements of Section 01510 – Sanitary Sewer Main Television and Sonar Inspection (CCTV).
 - 1. CCTV shall be performed:

- a. Prior to installation of the UV-CIPP but after cleaning.
 - b. After installation of CIPP line and the reconnection of all active sewer laterals.
- B. Conduct finished inspections continuous over entire length of sewer between manholes within 48 hours of installation.
 - 1. Liner shall be free from visual defects, damage, and deflection.
 - a. No visible infiltration through the liner, at the joints, at the service connections or at the manholes
 - 2. Base acceptance of liner on videotaped CCTV inspection and that defects described in 1, above, do not exist.
 - a. Corrections of defects or failures identified in post-installation CCTV shall be repaired at no cost to Owner
 - b. Method of repair shall be approved by Owner's Representative prior to completion of work.

3.07 TESTING

- A. Test full Length CIPP testing shall be in accordance with Section 02650 – Testing for Acceptance of Sanitary Sewers.

3.08 ACCEPTANCE

- A. Laboratory Testing: one sample shall be sent to an independent laboratory and tested.
 - 1. Preparation and testing standards shall be performed in accordance with the approved submittals.
 - 2. Failure of any test can be grounds for rejection of the CIPP liner.
 - 3. At the direction of the Program Manager a second sample shall be tested.
- B. Destructive Testing: Where test results of samples from the 12-inch long pipe section are lower than required values, at the direction of the Program Manager, Contractor shall cut samples from liner along length of pipe.
 - 1. The size and shape of the samples shall be determined by Program Manager.
 - 2. The Contractor shall repair the CIPP liner and host pipe at no additional cost to the Owner.
 - 3. Failure of test shall be grounds for rejection for the CIPP liner.
- C. Resin Sampling: Program Manager drawing the samples will arrive unannounced and shall be afforded immediate access to the equipment.
 - 1. Resin sample shall be sent to the independent laboratory and tested.
 - 2. Testing standards shall be performed in accordance with approved submittals.
 - 3. Failure of any test can be grounds for rejection for the CIPP liner.
- D. Low-pressure air testing or hydrostatic exfiltration test: acceptance based on successful completion of this test as specified herein.

- E. The Contractor shall submit to the Owner's Representative, for acceptance and approval,
 - 1. Two (2) copies of unedited post-installation CD/DVDs
 - 2. Associated certified test reports for each sewer main segment within 10 working days of the Liner installation.
 - 3. No more than one sewer main segment shall be included on a post-installation Inspection CD/DVD or curing report.
- F. It is the intent of these specifications the completed liner, with all appurtenances, to be essentially equivalent in final quality and appearance to new sewer pipe installation.
 - 1. The conditions of the existing host pipe will be taken into consideration.
- G. Where, in the opinion of the Program Manager, a defect in the CIPP liner requires removing a section of the CIPP liner, the Contractor shall make all repairs as directed by the Program Manager and shall install a segmental liner, compatible with the CIPP liner, to accomplish a continuous finished liner.
 - 1. No separate measurement and payment will be made for such defect repair or for the post-repair segmental liner.

3.09 PRIVATE SERVICE LINE SHUTDOWN

- A. Notify Owner's Representative at least 1 week prior to shut down.
- B. When it is necessary to shut down a private sewer service line notify building occupants regarding service lateral disconnection by placing a door hanger approved by the Owner's Representative.
 - 1. Place door hangers 48 hours prior to shut down.
- C. When service lateral will be disconnected from main for more than 8 hours, lateral shall be positively drained or pump down.
 - 1. Monitor status of flow and storage.
 - 2. Pump lateral more frequently where flows exceed storage capacity of lateral or Contractor provided temporary storage.
- D. If service lateral cannot be positively drained or pumped down or disconnection of service is anticipated being 8 hours or longer,
 - 1. Contractor shall provide temporary living accommodations for resident at no additional cost to Owner or resident.
 - 2. Temporary living quarters accommodations shall be approved by Program Manager and coordinated through resident and Owner's Customer Support Representative.
 - 3. Alternatively, Contractor may supply a temporary bypass pumping system to keep the lateral operational.
- E. Notify building occupants when work is complete and uninterrupted service restored.

- F. Commercial sewer services shall be maintained at all times while the business is open.
 - 1. No sewage from the services or main line shall be discharged on the ground or in waterways.
 - 2. Holding pits or tanks are not allowed unless permitted by Federal, State, and local authorities having jurisdiction.

3.010 CLEANUP

- A. After the CIPP liner installation work has been completed and all testing acceptable, the Contractor shall clean up the work area.
 - 1. All excess material and debris not incorporated into the permanent installation shall be disposed of by the Contractor.
 - a. The debris and liquids are to be disposed of properly in accordance with all applicable laws.
 - b. The local municipality can furnish a letter to the landfill stating the Contractor is authorized to dispose of the non-hazardous materials.
 - c. Debris and liquids type and quantities are to be tracked in the daily Contractor diary.
 - d. Hauling and disposal costs will be borne by the Contractor.
 - 2. The work area shall be left in a condition equal to or better than prior condition.
 - a. Disturbed grassed areas shall be seeded or sod placed as directed by the Owner's Representative at no additional cost to the Owner.
 - b. The work site restoration work shall be completed in accordance with the requirements of Section 02480 – Site Restoration and Erosion Control.

3.011 DOCUMENTATION

- A. The Contractor shall complete work on each asset as assigned via the Owner's Computerized Work Order Management system.
 - 1. Upon start of work, the Contractor shall receive work orders as assigned by the Owner's Representative.
 - 2. The Contractor shall maintain and synchronize the status of each rehabilitation work order issued.

3.012 WARRANTY

- A. Material Warranty: A written guarantee of 2 years shall be provided by manufacturer against breakdown of material effectiveness of structural repair elements.
- B. Workmanship Warranty: The Contractor shall guarantee his work for a warranty period of two (2) years from the date of final acceptance against any leakage, cracking, loss of bond, or other discontinuity is identified.
- C. Warrantees Inspection: A warranty inspection shall be conducted in the 23rd month following final acceptance of the Work.

1. Contractor and liner manufacturer representative shall participate in inspection.
2. Deficiencies related to material and workmanship shall be repaired by contractor to the satisfaction of the Program Manager at no additional cost.
3. If repairs are made, then the Contractor shall warrant the work for one (1) year in addition to the original warranty period required by the Contract.

END OF SECTION

SECTION 02520 INTERNAL POINT REPAIRS TO SANITARY SEWERS

PART 1 – GENERAL

1.01 SECTION INCLUDES

The work covered under this section includes furnishing all labor, equipment, and materials required to furnish, install, test, and inspect internal point repairs of sanitary sewers with cured-in-place pipe (CIPP) liner as shown on the Plans and specified in this section.

1.02 RELATED SECTIONS

- A. Section 01510 - Sanitary Sewer Main and Lateral Television Sonar Inspection
- B. Section 01520 - Sewer Flow Control
- C. Section 02276 – Site Restoration and Erosion Control
- D. Section 02500 - Lining with Cured-In Place Pipe (CIPP)
- E. Section 02956 - Sanitary Sewer Cleaning

1.03 REFERENCES

- A. ASTM D638 - Standard Test Method for Tensile Properties of Plastics.
- B. ASTM D790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
- C. ASTM D2990 - Standard Test Methods for Tensile, Compressive, and Flexural Creep and Creep-Rupture of Plastics.
- D. ASTM D5813 - Standard Specification for Cured-In-Place Thermosetting Resin Sewer Piping Systems.
- E. ASTM F1216 - Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube.
- F. ASTM F1743 - Standard Practice for Rehabilitation of Existing Pipelines and Conduits by Pulled-in-Place Installation of Cured-in-Place Thermosetting Resin Pipe.
- G. ASTM F2019 - 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.
- H. Potable Water Main, Gravity Sewer, Gravity Sanitary Sewer, and Sanitary Sewer and Force Main Design Standards, DeKalb County Department of Watershed Management.

1.04 QUALIFICATION REQUIREMENTS

- A. The system proposed (material, methods, workmanship) must have been proven through previous successful installations to an extent and nature satisfactory to the Owner's Representative. Since CIPP is intended to have a fifty (50) year design life, only products deemed to have this performance standard will be accepted. All products and their licensed installer must be pre-approved by the Owner's Representative prior to the formal opening of proposals.
- B. Products and Installers must meet all of the following criteria to be deemed commercially acceptable:
 - 1. For a Product to be considered commercially proven, a minimum of 500 Point Repairs using the same manufacturer's product must have successfully been installed and in place for a minimum period of 5 years. The Manufacturer (Licensor) shall have completed enough testing to document the material and the method(s) of installation proposed will produce the desired long-term performance.
 - 2. For an Installer to be considered commercially proven, the Installer must satisfy all insurance, financial, and bonding requirements of the County, and must have at least three (3) years active experience in the commercial installation of the product bid. The Installer's key personnel shall each have at least three hundred (300) successful point repair installations with the majority of those installations within pipes in the range of eight (8) to twenty-seven (27) inch diameter. The Installer shall demonstrate they have a quality assurance program in place.
 - 3. Documentation for products and installers seeking pre-approved status must be submitted to the Owner's Representative prior to the proposal due date to allow time for adequate consideration. The Owner's Representative will advise of acceptance (or rejection). The deadlines for submitting the proposal and for obtaining a response from the Owner's Representative will be specified in the bid documents. All required submittals must be satisfactory to the County.

1.05 SUBMITTALS

- A. The Contractor shall submit a comprehensive construction sequencing plan for approval prior to the beginning of the project. At minimum the plan shall include the following:
 - 1. A proposed schedule.
 - 2. Identification of all proposed access routes.
 - 3. Identification of set-up locations for CIPP point repair installation.
 - 4. Bypass pumping plan in accordance with the requirements of the Section 01520 Sewer Flow Control.
 - 5. Traffic Control Plan in accordance with Georgia Department of Transportation (GDOT) requirements (where applicable).

6. Erosion Control Plan in accordance with the DeKalb County Department of Watershed Management Protocol for Providing Erosion & Sedimentation Controls on Construction Projects.

B. The Contractor shall submit the following items for product and installer pre-approval:

1. Manufacturer's certificate the materials to be used meet the referenced standards and the requirements of these Specifications.
2. License or certificate verifying manufacturer's/licensor's approval of the installer.
3. Proposed equipment and procedures for accomplishing the work.
4. Product data and manufacturer's installation for resin and catalyst system.

C. The Contractor shall submit the following information during the project for approval of the use of CIPP point repair at a particular location:

1. Calculations for the wall thickness designs including data, field measurements, and assumptions. To be completed by a Georgia registered professional engineer proficient in the design of CIPP systems.
2. The Contractor's procedures and materials for service renewal including time and duration of sewer service unavailability, if point repair area contains service connections.

D. A final certificate of compliance with this specification shall be provided by the manufacturer for all lining material furnished. Tests for compliance by an independent laboratory shall be performed in accordance with applicable ASTM standards and the manufacturer's quality control program.

E. The Contractor shall furnish an extended warranty for liner materials from the Contractor and the liner manufacturer for a total of one (1) year from the date of Final Acceptance.

F. The Contractor shall complete a daily written record (diary) detailing the work performed and any small items incidental to the Work in the form of an email. The Contractor shall include the following information in his daily record:

1. Delays and causes of delays: Dense traffic, lack of information, sickness, labor, or equipment shortage, etc.
2. Weather conditions: Rain, sunny, windy, temperature, snow, etc.
3. Types of equipment on site: Specialty cleaning, by-pass equipment, etc.
4. Submittals: To the Owner's Engineer (Project Manager).
5. Personnel on site: Name, labor category, specialty personnel, etc.
6. Accidents/injuries: Injuries, vehicle/equipment accidents, etc.
7. Incidents: Vehicle and equipment damage, damage to property, property owner complaint, etc.
8. Major defects encountered: Collapsed pipe, cave-ins, sink holes, etc.

- 9. Visitors: Names and affiliations.
- 10. Disposals: Type and quantity of debris (including liquids).
- G. The Owner's Representative shall certify receipt of the daily record (in email format) noting any items and adding any observations with reference to claims for payment to the Contractor. The Owner's Representative may, at his/her discretion, for which the Contractor must receive direction in writing, provide weekly submission in the form of progress report.
- H. As-built drawings including the identification of the work completed by the Contractor and the post-installation CCTV shall be submitted within 2 weeks after the project is completed.

1.06 EXPERIENCE

- A. Manufacturer – see the above requirements in Section 1.4 – Qualification Requirements.
- B. Installer – see the above requirements in Section 1.4 – Qualification Requirements.
- C. The Contractor shall have a company history of supporting this type of function including the proper training in these types of materials, equipment, and activities and have a minimum of three (3) years, or three (300) successful installations, experience in performing such assignments including safe work practices, etc.
- D. Supervisor of the field crews shall have a history of supporting this type of function including these types of materials, equipment and activities and have a minimum of three (3) years, or two hundred (200) successful installations, experience in performing such assignments including safe work practices, etc.
- E. Field crew leaders shall have a history of supporting this type of function including the proper training in these types of materials, equipment, and activities and have a minimum of two (2) years, or one hundred (100) successful installations, experience in performing such assignments including safe working practices, etc.
- F. The Contractor shall provide the Owner's Representative with written documentation (certification) indicating the supervisor, field crew leader, and all crewmembers responsible for these assignments have the proper training and the requisite experience.
- G. No crewmembers of the Manufacturer, Installer, or Contractor shall enter confined spaces without the necessary certified training.
- H. The required training and experience shall be documented in the Contractor's bid submittal.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. The Contractor shall be responsible for the delivery, storage, and handling of products. No product shall be shipped to the Site of the Work without the approval of the Owner's Representative.
- B. The Contractor shall keep products safe from damage. The Contractor shall promptly remove damaged products from the Work Site and replace damaged products with undamaged products acceptable to the Owner's Representative.
- C. Comply with the requirements of the CIPP point repair manufacturer.

1.08 RESPONSIBILITY FOR SANITARY SEWER OVERFLOWS AND DAMAGE TO PROPERTY AND UTILITY

- A. Reference Specification Section 01030 – Special Project Procedures, Paragraph B.

1.09 SAFETY

- A. All work shall be performed in accordance with OSHA standards and State and Federal safety regulations.
- B. No person shall enter a confined space without the documented requisite training, certification, and entry permit.

PART 2 – PRODUCTS

2.01 GENERAL

- A. All materials shall be in strict compliance with the requirements of ASTM, ANSI, and/or AWWA and the requirements of these Specifications.
- B. The finished pipe liner in-place shall be fabricated from materials when completed is chemically resistant to and will withstand internal exposure to domestic wastewater.
- C. Field measurements of the existing pipe diameters, ovality, and length shall be taken by the Contractor to verify actual pipe dimensions.

2.02 CURED-IN-PLACE LINER

- A. All cured-in-place lining products shall comply with the most recent versions of ASTM F-1216, ASTM F-1743 or intent thereof as determined by the Owner's Representative.
- B. The flexible tube shall be fabricated to a size when installed will neatly fit (minimum 99.75%) the internal circumference of the existing sanitary sewer lines (including services). Allowance shall be made for circumferential stretching during insertion so the final cured product is snug against the wall of the host pipe.

- C. The minimum length shall be, as deemed necessary by the Contractor, to effectively span the distance from the adjacent pipe joints plus 1.0 feet each side unless otherwise shown on the Plans or directed by the Owner's Representative. The Contractor shall verify the lengths in the field before impregnation.
- D. Unless otherwise shown on the Plans or directed by the Owner's Representative, the Contractor shall furnish a general purpose, unsaturated, polyester or vinyl ester resin and catalyst system compatible with the reconstruction inversion process providing cured physical strengths specified in this section.
- E. Physical Strength:
 - 1. The cured pipe shall conform to the following minimum structural standards:

	Test Method	Results
Flexural Stress	ASTM D790	4,500 psi
Flexural Modulus of Elasticity	ASTM D790	250,000
psi Tensile Strength	ASTM D638	3,000 psi
 - 2. The liner thickness shall be sized for a minimum hydrostatic load of eight (8) feet and the maximum depth of earth cover as shown on the Plans. The hydrostatic load shall be increased to manhole depth plus one (1) foot for bury depths in excess of eight (8) feet.
- F. Corrosion Requirements: The cured pipe shall be chemically resistant to internal exposure of sewage having a pH range of 5 to 11 and a peak temperature of 180°F.

PART 3 – EXECUTION

3.01 PREPARATION

- A. The following installation procedures shall be adhered to unless otherwise approved by the Owner's Representative.
 - 1. The Contractor shall carry out his operations in strict accordance with all OSHA and manufacturer's safety requirements. Particular attention is drawn to those safety requirements involving entering confined spaces.
 - 2. It shall be the responsibility of the Contractor to remove all internal debris and clean the existing sewer line prior to installation of the liner. Cleaning and disposal of material shall be performed in conformance with the requirements of the Sanitary Sewer Cleaning section of these Specifications. The debris is to be disposed of properly in accordance with all applicable laws. The Owner's Representative can furnish a letter to the landfill stating the Contractor is authorized to dispose of non-hazardous materials. Debris and liquids quantities are to be tracked in the daily contractor diary.

3. Experienced personnel trained in locating breaks, obstacles, and service connections by closed circuit television shall perform inspection of existing sewer lines. The interior of the line shall be carefully inspected to determine the location of any conditions preventing proper installation of the CIPP point repair into the lines, and such conditions shall be noted so they can be corrected. A video recording and suitable log shall be kept for later reference by the Owner's Representative as specified in Section 01510, Sanitary Sewer Main Television and Sonar Inspection (CCTV).
4. The Contractor shall provide for the flow of wastewater around the section or sections of pipe designated for internal point repairs as specified in Section 01520, Sewer Flow Control.
5. The Contractor shall clear the line of obstructions such as solids, dropped joints, protruding service connections or collapsed pipe preventing the insertion of the materials or equipment. If inspection reveals an obstruction cannot be removed by conventional sewer cleaning equipment or robotic equipment, then the Contractor may be ordered to make a point repair excavation to uncover and remove or repair the obstruction.
6. Groundwater temperatures and ambient temperatures shall not be excessive for the product installation procedures.

3.02 INSTALLATION

A. Cured-in-Place Liner:

1. The Contractor shall designate a location where the reconstruction tube will be impregnated prior to installation. The Contractor shall allow the Owner's Representative to inspect the materials and "wet out" procedure. A catalyst system compatible with the resin and reconstruction tube shall be used. Sufficient excess resin will be provided to insure a mechanical bond with the host pipe after curing.
2. The wet out reconstruction tube shall be inserted through an existing manhole or other approved access and moved through the pipe to the termination point. The insertion bladder will then be inflated to hold the CIPP point repair snugly against the existing pipe in the correction location. Care shall be taken during the elevated curing temperature so as not to overstress the felt fiber. Alternative methods of liner insertion and pressurization may be used for products and processes approved by the Georgia Department of Natural Resources and the Owner's Representative, and when the final cured-in-place product meets the intent of ASTM F1216. Installation shall be in accordance with the manufacturer's recommendations and available for verification by the inspector.
3. The CIPP point repair shall be an ambient cure system and the cure period shall be of a duration recommended by the resin manufacturer.
4. The finished pipe shall be continuous over the length of the internal point repair, overlap point repairs if necessary, and be as free as commercially practicable from visual defects such as foreign inclusions, wrinkles, dry

spots, pinholes, and delamination. It shall also meet the leakage test requirements.

5. Alternate curing mediums may be used, including, but not limited to steam and ambient cure. When alternate curing mediums are used, the end product must meet or exceed the requirements of this section. Alternate curing mediums and alternate installation methodologies must be submitted for approval to the Owner's Representative prior to the bid opening date as specified in the bid documents. Notification of approval (or rejection) shall be made prior to bid opening.
6. When alternate curing mediums and/or alternate installation methodologies are approved for use, the Contractor shall follow all of the manufacturer's recommendations for installation and curing, no exceptions shall be permitted.

3.03 POST INSTALLATION

- A. Portions of any piece of liner material removed during installation shall be available for inspection and retention by the Owner's Representative.
- B. Each internal point repair shall be CCTV inspected as soon as practical after internal repair. The Contractor shall provide a copy of the video to the Owner's Engineer on an External Hard Drive media.

3.04 MANUFACTURER CERTIFICATION

- A. The manufacturer shall certify the Contractor is properly trained in the method or system being used.
- B. The manufacturer should be on site for 2 to 5 eight-hour days or more depending on project size to confirm the Contractor is doing the installation correctly.

3.05 TESTING

- A. After installation every liner shall be CCTV inspected with a 360-degree integral light-head camera as soon as practical to verify proper installation.
- B. At the existing pipe/internal point repair interface, no visible leaks shall be allowed.

3.06 EXISTING UTILITIES

- A. The Contractor shall protect all known and unknown existing sewer lines, water lines, gas lines, sidewalks, curbs, gutters, pavements, electric lines, and other utilities and structures in the vicinity of the work from damage at all times. Where it is necessary for the proper execution of the work to repair, remove, and/or replace any such utility or structure, the Contractor shall do so in accordance with the provisions set forth in the General and Special Conditions of the Contract. Any such work to be done at the Contractor's expense shall be considered incidental to the construction of sewers, and no additional payment will be allowed therefore.

3.07 COLLAPSED SEWERS/DEFECTIVE MANHOLES

- A. Any sewer found with greater than ten (10) percent deformation (i.e. collapsed or near collapse) shall be reported to the Owner's Representative immediately for remedial action.
- B. Any manhole found broken, cracked, with missing covers, or surcharged, shall be reported to the Owner's Representative immediately for remedial action.
- C. Any sewer found where the existing conditions pose a threat of personal injury to the public, such as a collapsed sewer with attendant depression to roadway, shall be protected by the Contractor until the Owner's Representative arrives at the Work Site.
- D. Any manhole found where the existing conditions pose a threat of personal injury to the public, such as broken, cracked, or missing covers, or covers found in traveled portions of any sidewalk or roadway shall be protected by the Contractor until the Owner's Representative arrives at the Work Site.

3.08 PRIVATE SERVICE LINE SHUTDOWN

- A. When it is necessary to shut down a private sewer service line while work is in progress and before the service lines are reconnected, the residents shall be notified by the Contractor at least forty-eight (48) hours prior to the shutdown. No sewer or water service is to remain shut down for more than a period of eight (8) hours unless the Contractor provides substitute services/accommodations to the residents. Commercial sewer services shall be maintained at all times the business is open. No wastewater from the services or main line shall be discharged on the ground or in waterways. Holding pits or tanks are not allowed unless permitted by the State and the County.

3.09 CLEANUP

- A. After the CIPP liner installation work has been completed and all testing acceptable, the Contractor shall clean up the work area. All excess material and debris not incorporated into the permanent installation shall be disposed of by the Contractor. The debris and liquids are to be disposed of properly in accordance with all applicable laws. The Owner can furnish a letter to the landfill stating the Contractor is authorized to dispose of the non-hazardous materials. Debris and liquids type and quantities are to be tracked in the daily Contractor diary. Hauling and disposal costs will be borne by the Contractor. The work area shall be left in a condition equal to or better than prior condition. Disturbed grassed areas shall be seeded or sod placed as directed by the Owner's Representative at no additional cost to the Owner. The work site restoration work shall be completed in accordance with the requirements of Section 02480 – Site Restoration and Erosion Control.

3.10 WARRANTY

- A. The Contractor shall guarantee his work for a warranty period of two (2) years from the date of final acceptance. If, at any time during the warranty period, any leakage, cracking, loss of bond, or other discontinuity/abnormalities is identified the Contractor shall make repairs acceptable and at no additional cost to the Owner. In this case, the Contractor shall warrant the work for one (1) year in addition to the warranty required by the Contract.
- B. If the frequency of similar defects requiring repair increases, then the entire project will be re-evaluated.

END OF SECTION

SECTION 02530
SERVICE LATERAL RECONNECTION AND REPLACEMENT

PART 1 -- GENERAL

1.01 SECTION INCLUDES

- A. Work this section includes the reconnection of existing service laterals to the sewer main and the replacement of sewer laterals.

1.02 RELATED SECTIONS

- A. Section 01510: Sanitary Sewer Main and Lateral Television Sonar Inspection
- B. Section 01520: Sewer Flow Control
- C. Section 02324: Trenching and Trench Backfilling
- D. Section 02535: Gravity Flow Sanitary Sewers
- E. Section 02537: Ductile Iron Sanitary Sewer Pipe and Fittings
- F. Section 02622: PVC Gravity Sewer Pipe

1.03 SECTION 02600 – WASTEWATER FLOW CONTROL REFERENCES

- A. ASTM A746 - 09 Standard Specification for Ductile Iron Gravity Sewer Pipe.
- B. ASTM D1784 - 11 Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
- C. ASTM D3034 - 08 Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
- D. ASTM D3212 - 07(2013) Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.
- E. Potable Water Main, Gravity Sanitary Sewer, and Sanitary Sewer and Force Main Design Standards, DeKalb County Department of Watershed Management, Latest Edition and Version.

1.04 SUBMITTALS

- A. The Contractor shall complete a daily written record (diary) detailing the work carried out and any small items of Work which were incidental to the Work. The Contractor shall include in his daily record and reference to the following:
 - 1. Delays: Dense traffic, lack of information, sickness, labor or equipment shortage, etc.
 - 2. Weather: Conditions (e.g., rain, sunny, windy, etc.).
 - 3. Equipment: On site (e.g., specialty cleaning, by-pass equipment, etc.).

4. Submittals: To the Owner's Engineer.
5. Personnel: On site by name (e.g., all labor, specialty services, etc.).
6. Accident: Report (e.g., all injuries, vehicles, etc.).
7. Incident: Report (e.g., damage to property, property owner complaint, etc.).
8. Major defects encountered: including collapsed pipe, if any, cave-ins, sink holes, etc.
9. Visitors: On site.
10. Disposals: Type and quantity of debris (including liquids).

1.05 EXPERIENCE

- A. The supervisor of the field crews shall have received proper training and have a minimum of three (3) years' experience in performing the type of work covered under this section of these Specifications including safe working practices, confined space entry procedures, the types of equipment being used, product/materials being used, etc.
- B. Field crew leaders shall have received proper training in this function and have a minimum of two (2) years' experience in performing the type of work covered under this section of these Specifications including safe working practices, confined space entry procedures, the types of equipment being used, product/materials being used, etc.
- C. No crewmembers shall enter confined spaces without the necessary certified training as required under applicable Federal, State, and local laws, regulations, standards, policies, procedures, and requirements.
- D. The Contractor shall provide the Owner's Engineer with written documentation that the supervisor, crew leader/s, and all crewmembers have received the proper training and where required the requisite experience.

1.06 RESPONSIBILITY FOR SANITARY SEWER OVERFLOWS AND DAMAGE TO PROPERTY AND UTILITY

- A. Reference Specification Section 01030 – Special Project Procedures

1.07 SAFETY

- A. All work shall be performed in accordance with OSHA standards and state and federal safety regulations.
- B. No person shall enter a confined space without the documented requisite training, certification, and entry permit.

PART 2 – PRODUCTS

2.01 PIPE AND FITTINGS

- A. All materials shall be pre-approved by the Owner.

- B. The Contractor shall use PVC (minimum SDR 35) pipe, or class 50 ductile iron pipe for 6-inch service lateral connections.
- C. PVC pipe shall be gasket jointed conforming to the requirements of ASTM D-3212.
- D. For reconnection of existing services, the Contractor shall select service connection pipe diameter to match existing service diameter.
- E. The Contractor shall connect service laterals to the sewer mains with prefabricated sewer wye conforming to the specifications for the sewer main pipe material as specified in other sections of these Specifications, or other as approved by Owner's Engineer. The use of tees is prohibited without permission from the Owner's Engineer.

2.02 PIPE SADDLES

- A. The Contractor shall use pipe saddles only on rehabilitated sanitary sewer mains.
- B. The Contractor shall supply Romac Industries, Inc. Style "CB" sewer saddle, branch type universal or Owner approved equal. The Contractor shall use a saddle fabricated to fit the outside diameter of the pipe to which it will be attached.

2.03 COUPLINGS AND ADAPTER

- A. For connection between new PVC pipe or DIP service lateral and an existing service, the Contractor shall use a PVC C-900 rubber-gasket transition adapter when going from Ductile Iron or C-900 to Schedule 40 pipe.

2.04 CLEANOUTS

- A. PVC, SDR 35 pipe and fitting shall be utilized for the installation of six- (6) inch cleanouts.
- B. Rubber couplings as manufactured by Fernco, Inc. or Owner approved equal shall be utilized for pipe connection to the existing pipe.
- C. Rubber doughnut gasket adapters shall be manufactured by Fernco, Inc. or Owner approved equal.
- D. Non-traffic grade cleanout boxes shall comply with the Potable Water Main, Gravity Sanitary Sewer, and Sanitary Sewer and Force Main Design Standards, DeKalb County Department of Watershed Management, Latest Edition and Version.
- E. Traffic grade cleanout boxes shall comply with the Potable Water Main, Gravity Sanitary Sewer, and Sanitary Sewer and Force Main Design Standards, DeKalb County Department of Watershed Management

PART 3 – EXECUTION

3.01 PROTECTION

- A. The Contractor shall not allow sand, debris, or runoff to enter the sewer system.

- B. The Contractor shall ensure that wastewater does not backup into private property. The Contractor shall establish a plan to prevent sewer backups when reconnections are not accomplished in a timely manner.
- C. The Contractor shall provide for diversion of wastewater if necessary, in accordance with the requirements of Section 01520 – Sewer Flow Control. The Owner may direct the Contractor to use cleanouts to bypass wastewater from adjacent facilities if the possibility of wastewater backup is likely.
- D. The Contractor shall be responsible for any and all damage to property due to his work.

3.02 PREPARATION

- A. The Contractor shall provide a minimum of forty-eight- (48) hour written notice to property owners whose sanitary sewer service will potentially be interrupted.
- B. The Contractor shall properly disconnect existing connections from the sewer and reconnect to the main line, as described in this section.
- C. The Contractor shall reconnect service connections, including those that go to unoccupied or abandoned buildings, unless directed otherwise by the Owner's Engineer.
- D. The Contractor shall complete reconnection of all service lines within twentyfour (24) hours.

3.03 RECONNECTION OF SEGMENTS REPLACED VIA PIPE BURSTING

- A. The Contractor shall remove a portion of the existing sanitary sewer main or host pipe to expose the new sewer main and to provide sufficient working space for installing a prefabricated pipe saddle.
- B. The Contractor shall use a tapping machine to carefully cut the new sewer main making a circular hole properly sized to accept the stub-out protruding from the underside of the saddle.
- C. The Contractor shall strap on the saddle using a stainless steel band on each side of the saddle and tighten the bands to produce a watertight seal.
- D. The Contractor shall remove and replace cracked, offset, or leaking service line from the center of the new sewer main up to the first fitting or five (5) feet, whichever occurs first.
- E. The Contractor shall make up the connection between new sewer main and existing service lateral using PVC or ductile iron sewer pipe and approved fittings and couplings.

3.04 RECONNECTION ON REPLACEMENT SEGMENTS

- A. The Contractor shall install a new service wye on the new sanitary sewer main for each service connection. The service wye shall be of a material compatible with the sewer main material.
- B. The Contractor shall remove and replace cracked, offset, or leaking service line from the center of the new sewer main up to the first fitting or five (5) feet, whichever occurs first.
- C. The Contractor shall make up the connection between new sewer main and existing service lateral using PVC C-900 or ductile iron sewer pipe and approved fittings and couplings.

3.05 UTILITY SERVICE REPAIRS

- A. Where service connections or lines from water or gas mains or sewers to the user's premises are disconnected, broken, damaged, or otherwise rendered inoperative by the Contractor for any reason, the Contractor shall, at his own expense, arrange with the respective utility company for any repairs of lines under their jurisdiction. For lines not within their jurisdiction, the Contractor shall repair or replace same and restore service to the premises.

3.06 SPECIAL CONSIDERATIONS

- A. The Contractor shall notify the Owner's Engineer of any service stub that is collapsed, has severe root intrusions, or is otherwise in poor condition. The Owner's Engineer will make a determination on a case-by-case basis whether to proceed with the cleanout installation or replace the entire service stub. All replacement service stubs will be six- (6) inch and shall be installed in accordance with the Potable Water Main, Gravity Sanitary Sewer, and Sanitary Sewer and Force Main Design Standards, DeKalb County Department of Watershed Management.
- B. The Contractor shall notify the Owner of conflicts with other utilities, which prevent the installation of a cleanout as specified herein and make recommendations to resolve such conflicts.
- C. Every effort shall be made to complete the installation and backfill excavations each day. In situations where the installation cannot be completed, the site may only be left open overnight with proper safety barriers and warning signs alerting the public to the hazard. The Contractor shall be responsible for providing and installing all barriers, barricades, fence, warning tape, and other items necessary to safely secure the work site.
- D. Without written permission from the property owner, the spoil pile may only be placed within the easement area, right-of-way or Owner roadway and is not to be placed on private property. Where pedestrian or vehicular traffic is obstructed, the Contractor shall provide adequate safety measures to protect against accident or injury.
- E. Vehicles and construction equipment shall not be parked and left on private property.

- F. The Contractor shall repair damages to sprinkler systems including those that are installed within the Owner right-of-way and/or sanitary sewer easement. It is recommended that the Contractor confer with each property owner concerning the possibility of sprinklers and the locations thereof during the notification process.

3.07 TESTING

- A. The completed cleanout installation shall be televised, both externally and internally with a color CCTV camera. The same camera shall capture and record a picture of the house or street address of the installation. Without pause in recording, the Contractor shall pan over the restoration of property, the cleanout box, and insert the camera into the cleanout installation. The Contractor shall pass the camera through the cleanout, into the wye and through that portion of the six- (6) inch pipe installed. Any defects found during inspection shall be noted and corrected at no additional expense to the Owner. The Contractor shall make appropriate repairs until the cleanout installation passes the video inspection.
- B. When directed by the Owner's Engineer, the Contractor shall perform smoke testing, dye testing, or low pressure hydraulic testing to confirm reconnection.
- C. All inspections shall be submitted following the standards and formats as outlined in Section 01510 – Sanitary Sewer Main and Lateral Television Sonar Inspection.

3.08 CLEANUP

- A. After installation work has been completed and all testing acceptable, the Contractor shall clean up the work area. All excess material and debris not incorporated into the permanent installation shall be disposed of by the Contractor. The debris and liquids are to be disposed of properly in accordance with all applicable laws. The local municipality can furnish a letter to the landfill stating that the contractor is authorized to dispose of the non-hazardous materials. Debris and liquids type and quantities are to be tracked in the daily contractor diary. Hauling and disposal costs will be borne by the contractor. The work area shall be left in a condition equal to or better than prior condition. Disturbed grassed areas shall be seeded or sod placed as directed by the Owner's Engineer at no additional cost to the Owner. The work site restoration work shall be completed in accordance with the Section 02480 – Site Restoration and Landscaping.

3.09 WARRANTY

- A. The Contractor shall guarantee his work for a warranty period of two (2) years from the date of final acceptance.
- B. Within the warranty period, the Owner may inspect the work, and if repairs are needed, the repairs shall be made on a case by case basis at no cost to the Owner. For the localized repairs, the warranty period shall be one additional year.
- C. If the frequency of similar defects requiring repair increases, then the entire project will be re-evaluated.

END OF SECTION

SECTION 02535
GRAVITY FLOW SANITARY SEWERS

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. The work covered under this section includes furnishing all labor, equipment, and materials required to install, inspect, and test full length sections (manhole to manhole) and external point repairs on gravity flow sanitary sewers.
 - 1. External Point repair is the method for correcting a defect on a mainline requiring excavation.
 - a. This type of repair shall include:
 - 1) Excavation, shoring, removal and disposal of debris and spoil materials, dewatering, required surface demolition including but not limited to the cutting and removal of asphalt or concrete pavement, sub-pavement, curb and gutter, sidewalk, etc., removal and reinstallation of all obstructing surface features, complete.
 - 2) Replacing a section of pipe up to fifteen (15) liner feet in length as required for structural defect repair
 - 3) Replacing service connections as required
 - 4) Installing flexible repair couplings, collars or boots as applicable, and approved
 - 5) Backfilling complete
 - 6) Disposal removed pipe and used or unused materials
 - 7) Site restoration
 - 2. The pipe material shall be as directed by the Owner's Representative.
 - B. It is the Contractor's sole responsibility to establish elevation and/or survey controls necessary to attain true line and grade for the replacement pipe section for all External Point Repairs. No abrupt deflections in line or grade will be allowed.

1.02 REFERENCES

- A. American Association of State Highway and Transportation Officials (AASHTO): T99 (ASTM 698), Standard Method of Test for the Moisture-Density Relations of Soils Using a 2.5-kg (5.5-lb) Rammer and a 305-mm (12-in.) Drop.
- B. American Society for Testing Materials (ASTM)
 - 1. A746 - Standard Specification for Ductile Iron Gravity Sewer Pipe.
 - 2. C76 - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
 - 3. C425 – Standard Specification for compression Joints for Vitrified Clay Pipe and Fittings

4. D698 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lb/ft³ (600 kN-m/m³)).
5. D1557 - Standard Test Method for Laboratory, Compaction Characteristics of Soils Using Modified Proctor Effort (56,000 ft-lb/ft³ (2,700 kN-m/m³))
6. D2922 - Standard Test Method for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
7. D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

C. American Water Works Association (AWWA), Latest Revisions.

1.03 SUBMITTALS

- A. Submittals shall conform to the requirements of Section 01300 -Submittals.
- B. Action Submittals
 1. Materials to be obtained and installed,
 - a. Pipe material, diameter (inside and outside), stick length, joint make up, bedding and backfill.
 2. Surface operations plan, proposed:
 - a. Temporary lay down area(s) as needed
 - b. Temporary installation staging area(s) as needed
 - 1) Points of ingress and egress.
 - 2) Waste storage, disposal
 3. The Contractor shall submit Record Documents per Section 01720 – Record Documents.
- C. Test reports.
- D. Complete and submit a daily report detailing the work carried out and any small items of Work incidental to the Work. The Contractor shall include in his daily report the above and reference to the following:
 1. Delays: Dense traffic, lack of information, sickness, labor or equipment shortage, etc.
 2. Weather: Conditions (e.g., rain, sunny, windy, etc.).
 3. Equipment: On site (e.g., specialty cleaning, by-pass equipment, etc.).
 4. Submittals: To and from the Owner's Representative.
 5. Personnel: On site by name (e.g., all labor, specialty services, etc.).
 6. Accident: Report (e.g., all injuries, vehicles, etc.).
 7. Incident: Report (e.g., damage to property, property owner complaint, etc.).
 8. Major defects encountered: including collapsed pipe, if any, cave-ins, sink holes, etc.
 9. Visitors: On site.
 10. Disposals: Type and quantity of debris (including liquids).

- E. For projects entering a Georgia Department of Transportation (GDOT) controlled Right-of-Way shall conform to the requirements outlined in Section 01060 – Regulatory Requirements

1.04 QUALITY ASSURANCE

- A. Provide the Owner's Representative with the product manufacturers' written certification indicating all products furnished comply with applicable provisions of these Specifications.
 - 1. Unless modified herein, materials used in the manufacture of pipe, linings, manholes, and castings shall be new and shall be tested in accordance with the referenced standards.
 - 2. Perform and pay for sampling and testing as necessary for the certifications.
 - a. The Owner's Representative shall have the right to witness testing of the materials.
- B. Test and inspect the sewer pipe at the place of manufacture:
 - 1. Pipe shall meet all requirements of the latest applicable ASTM standards,
 - a. Certified copies of the test report covering each shipment shall be submitted to the Owner's Representative prior to laying.
 - 2. All pipes shall be subject to inspection by the Owner's Representative at the place of manufacture.
 - 3. Notify the Owner's Representative in writing of the manufacturing start date at least fourteen (14) days prior to the start of manufacturing.
 - a. The Contractor shall be responsible for all inspection costs.
- C. After delivery, pipe and fittings will be subject to inspection by and approval of the Owner's Representative.
 - a. No broken, cracked, misshaped, or otherwise damaged or unsatisfactory pipe, fittings, or damaged concrete lining, or coatings shall be used,
 - b. Remove and properly dispose of unsatisfactory materials from the job site at no cost to the Owner.
- D. Check each pipe stick prior to lowering into trench:
 - a. Pipe interior shall be clean
 - b. Check for joint scratches, chipped ends, damaged linings and coatings, and imperfect gasket seats.
- E. Any defective pipe or fitting discovered after the pipe is laid shall be removed and replaced with a satisfactory pipe or fitting without additional cost to the owner.
- F. Each pipe shall be clearly marked as required by the applicable ASTM standard specifications to show pipe class, date of manufacture, date coated, type of coating, and manufacturer's trademark.
- G. All pipe, accessories, and specials shall be new material.

H. When directed by the Owner's Representative:

1. Pipe manufacturer shall furnish the services of a competent factory representative to supervise and/or inspect the installation of pipe.
2. Service shall be furnished for a minimum of five (5) days during initial pipe installation.

1.05 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Inspect pipe materials and fittings upon arrival at the Work Site.
- B. Handle and store pipe materials and fittings to protect them from damage due to impact, shock, shear, or free fall.
 1. Do not drag pipe and fittings along the ground.
 2. Do not roll pipe unrestrained from delivery trucks.
 3. Do not insert forks inside pipe or fittings without suitable effective protection that prohibits damage to linings or coatings.
- C. Employ acceptable mechanical means to move or handle pipe.
- D. Comply with the storage and handling requirements per manufacturer's recommendations.

1.06 RESPONSIBILITY FOR SANITARY SEWER OVERFLOWS AND DAMAGE TO PROPERTY AND UTILITY

Reference Specification 01030 – Special Project Procedures.

1.07 SAFETY

- A. All work shall be performed in accordance with OSHA standards and State and Federal safety regulations.
- B. No person shall enter a confined space without the documented requisite training, certification, entry permit and safety equipment.

PART 2 - PRODUCTS

2.01 PIPE MATERIALS

- A. All materials shall be in strict compliance with the required standards and specifications including, but not limited to ASTM, ANSI, and AWWA.
- B. At points of the sewer where a change in pipe classification (pressure rating, etc.) is shown on the Plans,
 1. Begin new classification at the next joint of pipe rather than cutting the pipe and constructing a collar unless there is a change in horizontal or vertical alignment.

- a. In the event the pipe is cut, there shall be no torch cutting, only saw cutting will be allowed.
- C. Ductile Iron Pipe and fittings shall conform to the requirements of Section 02537 – Ductile Iron Sanitary Sewer Pipe and Fittings.

2.02 TRANSITION COUPLINGS

- A. The same Pipe Material shall be used when installing pipe from manhole to manhole. For point repairs, approved transition joints shall be used if that matching materials are not approved for use or it is not possible to match.
 - 1. Use of concrete collar walls for transition joints between sewer pipes of different materials shall be only used only as approved by the Owner's Representative on a case by case basis.
 - 2. Use of transition couplings or gaskets shall require approval by the Owner's Representative before use.

2.03 PIPE TO PIPE CONNECTIONS

- A. Pipe to pipe connections shall be made using flexible banded couplings or adapters, should couplings with compression joints be required then they shall be in accordance with ASTM C425.

2.04 PIPE TO MANHOLE CONNECTIONS

- A. Shall conform to the requirements of Section 02641 – Precast Concrete Manholes

2.05 APPURTENANCES

- A. Service connections shall conform to requirements of this specification.
- B. Manholes shall conform to the requirements of Section 02641 – Precast Concrete Manholes.

2.06 BACKFILL AND SITE RESTORATION

- A. Pipe backfill materials shall conform to the requirements of Section 02324 – Trenching and Trench Backfilling.
- B. Site Restoration shall conform to the requirements of Section 02276 – Site Restoration and Erosion Control.

PART 3 – EXECUTION

3.01 GENERAL

- A. Identify the location of all existing underground and overhead utilities prior to commencing excavation activities.
 - 1. The Contractor shall consult with the local Call Before You Dig and utility companies, to verify the locations of existing underground utilities.

- B. Immediately notify the Owner (agency or company) of any utility line, appurtenance, cathodic protection system, etc. damaged, broken, or disturbed during installation.
 - 1. Obtain approval from the:
 - a. Owner's Representative and the utility owner prior to performing any temporary or permanent repairs or relocating utilities.
- C. Install and operate a dewatering system in accordance with the requirements of Section 02205 – Dewatering (when required).
- D. Provide wastewater flow diversion in accordance with the Section 01520 – Sewer Flow Control (when required).

3.02 MANUFACTURER CERTIFICATION

- A. The manufacturer shall certify the Contractor is properly trained in the method or system being used.

3.03 PIPE LAYING

- A. Accurately place pipe to the exact line and grade shown on the Plans.
 - 1. Control of vertical and horizontal alignments shall be accomplished by the use of a laser beam instrument.
 - a. When a laser is used, the elevation and alignment of the pipe shall be checked by transit and level rod:
 - 1) Every fifty (50) feet for pipe smaller than thirty (30) inches
 - 2) Every joint for pipe thirty (30) inches and larger.
 - 3) Other methods of controlling vertical and horizontal alignments may be used if specifically authorized by the Owner's Representative.
 - 2. The pipe section may be adjusted by the use of "come-along" of approved design and anchorage.
 - a. Bumping or snatching (with backhoe or crane, etc.) to adjust pipe after placement in the trench, will not be permitted.
 - 3. The Contractor shall furnish all labor and materials necessary for controlling and documenting the line and grade.
- B. External point repair:
 - 1. Lines shall be laid straight and depth of cover shall be maintained uniform with respect to finish grade, whether grading is completed or proposed at time of pipe installation.
 - 2. No abrupt changes in direction or grade will be allowed.
- C. Each piece of pipe and special fitting shall be carefully inspected before it is placed, and no defective pipe shall be laid in the trench.
 - 1. Before a sewer pipe is placed in position in the trench, the bottom and sides of the trench shall be carefully prepared.

2. Pipe laying shall proceed upgrade, starting at the lower end of the grade and with the bells uphill.
3. Trench inverts (bottoms) found to be unsuitable for foundations:
 - a. Over-excavate to remove unsuitable material,
 - b. Bring back to exact line and grade with foundation backfill as recommended in Section 2324 – Trenching and Trench Backfilling.
 - c. Or as directed by the Owner's Representative.

D. Bell holes shall be of sufficient size to allow ample room for properly making the pipe joints.

1. Cut bell holes no more than five (5) joints ahead of pipe laying.
2. Carefully grade the bottom of the trench between bell holes so the pipe barrel will rest on pipe bedding laid on a solid foundation for its entire length.
3. Each joint shall be laid so it will form a close concentric joint with adjoining pipe and avoid sudden offsets or inequalities in the flow line.

E. Water shall not be allowed to run or stand in the trench while pipe-laying is in progress or before the trench has been backfilled.

1. At no time shall the Contractor open up at more trench than the available dewatering system is able to dewater.
2. Movement of water (no matter what the cause) tending to erode or affect the trench walls or trench bottom will not be allowed.

F. Thoroughly inspect each pipe after it has been laid and joined.

1. Clean the interior of each pipe removing all earth, trash, rags and other foreign matter.

G. Backfilling of trenches shall be started immediately after the pipe is in place and the joints completed, inspected, and approved by the Owner's Representative.

H. Each night or at other times when work has been suspended:

1. Securely seal off open ends of pipe and fittings to the satisfaction of the Owner's Representative using approved commercially manufactured plugs or caps,
2. Prevent entry of water, earth or other substances and animals.

3.04 JOINT CONSTRUCTION

A. Bell and spigot pipe:

1. Clean the inside of all bells and the outside of all spigots to remove all dirt, water, or other foreign matter so their surfaces are clean and dry when the pipes are joined.
2. The use of manufacturer recommended joint lubricant is required.

B. Rubber ring gasket joints for sewer pipe shall be installed in accordance with the pipe manufacturer's specifications and recommendations.

1. Extreme care shall be used in joining pipe to avoid damaging the rubber ring or displacing it from the proper operating position.
- C. Joints on bell and spigot ductile iron pipe sewers shall be compression joints,
 1. Mechanical or flanged joints shall be installed in accordance with the pipe manufacturers' specifications and recommendations.
- D. Completed joints shall be inspected by the Owner's Representative before they are covered.
 1. Any leaks or defects discovered at any time after completion of the Work shall be repaired immediately at the Contractor's sole expense.
 2. Testing of new gravity sewers shall be performed in accordance with the requirements of Section 02650 – Testing for Acceptance of Sanitary Sewers.
 3. All pipes and appurtenances in place shall be carefully protected from damage until the backfilling operations have been completed.
 4. Any pipe disturbed after jointing shall be removed, the joint cleaned and remade and the pipe re-laid at the Contractor's expense.

3.05 LATERAL TEE CONNECTIONS

- A. Tee branches shall be installed in sanitary sewer lines at points shown on the Plans or as directed by the Owner's Representative.
 1. If such branches are not to be used immediately, they shall be closed with approved stoppers and shall be physically restrained.
- B. Tees shall be installed in sanitary sewers to:
 1. Properly connect each existing customer.
 2. Serve each vacant lot facing or abutting on the street or alley in which the sewer is being laid
 3. At such other locations as may be designated by the Owner's Representative.
 4. The exact location of each connection shall be recorded by the Contractor, on the record drawings, utilizing conventional GPS survey, before backfilling and said records delivered to the Owner's Representative.

3.06 CONNECTING RISERS

- A. Where the depth of cut is over eight (8) feet or where the grade of a sanitary sewer is lower than necessary to drain abutting property, and at such other locations as may be designated by the Owner's Representative:
 1. Install risers to connect each existing house and to serve each vacant lot facing or abutting on the street on which the sewer is being laid.
- B. Connecting risers shall be sized in accordance with the plumbing code in effect at the time of construction, but shall not be smaller in size than shown on the Plans.
 1. Risers shall be installed from a tee connection to the elevation needed to connect house services, the elevations shown on the Plans, or as directed by the Owner's Representative.

2. The tee connection shall be installed at the location shown on the Plans, and in accordance with the Detail Drawings.
3. Open ends of connecting risers shall be closed with approved stoppers and be physically restrained.
4. Backfilling shall be carefully done around risers using materials specified in Section 02324 – Trenching and Trench Backfilling, and compacted to the equivalent density of the surrounding undisturbed material.

3.07 CONNECTING EXISTING SANITARY SEWERS TO NEW SANITARY SEWERS

- A. All new sanitary sewers shall be connected to existing sanitary sewers as shown on the Plans or as directed by the Owner's Representative.
 1. Connections shall be made by constructing a manhole or utilizing an existing manhole.
- B. Connecting lateral collector sewers to large diameter trunk sewers shall be made at existing manholes or new manholes.
 1. Connecting to existing manholes shall be made by:
 - a. Coring a hole in the wall of the existing manhole,
 - b. Installing a boot,
 - c. Inserting one end of a minimum length of eighteen (18) feet of pipe through the boot into the manhole,
 - d. Filling around same with non-shrinking grout
 - e. Troweling the inside and outside surfaces of the joint to a neat finish.

3.08 TOLERANCES

- A. Invert Elevations:
 1. The invert elevations shown on the Plans shall be for the invert at the centerline of the precast concrete manhole.
 - a. Verify the elevation of the sewer installed at the manhole prior to setting the laser or other vertical alignment control system for the sewer upstream of the manhole.
 - b. Should the elevation differ from what is shown on the Plans, the Contractor shall take the following corrective action:
 - 1) If the sewer is laid at negative grade: remove and reinstall the sewer at the correct grade at no additional cost to the Owner.
 - 2) If the sewer is laid at a grade less than shown on the Plans (reducing the sewer's capacity):
 - a) Owner's Representative may require the sewer to be removed and re-laid at the correct grade at no additional cost to the Owner.
 - b) As a minimum, the grade to the next upstream manhole shall be adjusted so the next upstream manhole shall be set at the correct elevation.
 - 3) If this causes no conflicts with upstream existing utilities or obstructions:

- a) Adjust the grade of the next upstream manhole so the next upstream manhole shall be set at the correct elevation.
 - (1) If such an adjustment, in the Owner's opinion, is substantial,
 - (a) The grade adjustment shall be spread over multiple sections of the sewer.
 - (2) If such an adjustment, in the Owner's Representative opinion, significantly reduces the sewer's capacity,
 - (a) The Owner's Representative may require the Contractor to remove and relay that portion of the sewer laid at the improper grade.

3.09 PIPE PROTECTION

- A. Trench Cut-Off Walls are required on steep slopes in excess of 20 percent and other locations as shown on the plans to prevent erosion of the backfilled trench.

3.010 CONCRETE ENCASEMENT

- A. Provide concrete encasement of pipe where shown on the plans, or as required of the DeKalb County Department of Watershed Management Potable Water Main, Gravity Sanitary Sewer, and Sanitary Sewer and Force Main Design Standards, Latest Edition and Version. If required by the Owner's Representative, provide calculations verifying that the encased pipe will not surpass the capacity of the unsuitable foundation material and cause a sag in the new line.
- B. Submit mix designs for concrete to the Owner's Representative for approval.

3.011 FLOWABLE FILL

- A. Furnish and place flowable fill where shown in the plans, or as directed by the Owner's Representative.
 - 1. Potential applications include:
 - a. Abandonment of pipe.
 - b. General backfill for trenches.
- B. Conform to the requirements of the Georgia Department of Transportation Specifications, current edition, Section 600 for controlled low strength flowable fill and requirements set forth in Section 02324 – Trenching and Trench Backfilling.
- C. Submit mix designs for flowable fill to the Owner's Representative for approval.

3.012 ABANDONMENT OF GRAVITY SEWER LINES

- A. Do not begin cut, plug and abandonment operations until replacement sewer has been constructed and tested, and all service connections have been installed.

- B. Sewer pipelines specifically identified to be abandoned in-place shall be slurry filled with flowable fill and the ends plugged.
 - 1. Grout Plugs shall be cement-based dry-pack grout conforming to ASTM C 1107, Grade B or C.
 - a. Plugs will be a minimum of 12 inches thick in mains 15-inches and larger and a minimum of 6 inches thick in mains smaller than 15-inches.
 - 2. Manufactured Plugs shall be a commercially available plug or cap specifically designed and manufactured to be used with pipe being abandoned. Wing nut type 'plumber's plugs are not acceptable for use.
 - 3. Plugging method and materials to be approved by the Owner's Representative.
- C. Sewer laterals shall be cut and capped at the main or property line, as directed by the Owner's Representative.
- D. Trowel smooth abandoned main lines inside the manhole that they connect to.
 - 1. Eliminate pockets in the areas of the abandoned pipes potentially trapping debris and sewer solids.
 - 2. Any grout in the main sewers and/or manholes remaining in service shall be removed by the Contractor at no cost to the Owner.

3.013 TESTING

- A. New manholes shall be vacuum tested in accordance with the requirements Section 02650 – Testing for Acceptance of Gravity Sanitary Sewers.
- B. New gravity flow sanitary sewer and joints shall be low pressure tested in accordance with the requirements of Section 02650 – Testing for Acceptance of Gravity Sanitary Sewers.
- C. Testing shall be performed in the presence of the Owner's Representative.
- D. Testing for external point repairs after the joints have been completed that shall be inspected using CCTV inspection per Section -01510- - Sanitary Sewer Main Television and Sonar Inspection.
 - 1. Post-installation CCTV inspection shall take place as quickly after completion of each section as feasible, but in no case more than forty-eight (48) hours thereafter.
 - a. Submit the post-installation inspection within forty-eight (48) hours after the completion of the CCTV inspection.
 - b. Repairs shall demonstrate the full and effective rectification of the extant defect and/or obstruction, including infiltration etc., to the complete satisfaction of the Owner's Representative.
 - 2. The post construction CCTV inspection is not required for repairs performed prior to pipe-bursting or pipe replacement.

3.014 CLEANUP

- A. Remove all debris and construction materials and equipment from the Work Site after completion of each section of sewer line;
 - 1. Grade and smooth over the surface on both sides of the line;
 - 2. Leave the entire construction area in a clean, neat, and serviceable condition.
- B. Dispose of debris and liquids properly in accordance with all applicable laws.
 - 1. The local municipality can furnish a letter to the landfill stating the Contractor is authorized to dispose of the non-hazardous materials.
 - 2. Debris and liquids type and quantities are to be tracked in the daily Contractor diary.
 - 3. Hauling and disposal costs will be borne by the Contractor.
 - 4. Restore the Work Site to the original or better condition in accordance with requirements of Section 02276 – Site Restoration and Erosion Control.
- C. Prior to requesting a final inspection, the Contractor shall remove and dispose of all shipping timbers, shipping bands, boxes, and other like debris brought to the Work Site.
- D. Repair or replace lawns, fences, drainage culverts, or property damaged by the sewer construction to equal or better condition than existing prior to commencement of the Work.
- E. All shoulders, ditches, culverts, and other areas affected by the sewer construction shall be at the proper grades and smooth in appearance to provide positive drainage of the Work Site.
- F. All manhole covers shall be brought to grade, as shown on the Plans, or as directed by the Owner's Representative.
 - 1. Manholes in the unpaved area shall be above grade according to the local municipal Design Standards.

3.015 WARRANTY

- A. The Contractor shall guarantee his work for a warranty period of one (1) year from the date of final acceptance. For point repairs, the warranty period shall be one additional year for a total of two (2) years from the date of final acceptance.
- B. Within the warranty period, the Owner's Representative may inspect the work, and, if repairs are needed, the repairs shall be made on a case by case basis at no cost to the Owner.
- C. If the frequency of similar defects requiring repair increases, then the entire project will be re-evaluated.

END OF SECTION

SECTION 02537
DUCTILE IRON SANITARY SEWER PIPE AND FITTINGS

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Requirements for the production, installation and testing of ductile iron pipe, fittings and appurtenances.
- B. Specifications for ductile iron pipe fittings and applicable ASTM/AWWA code requirements.
- C. Testing and product specifications and requirements for ductile iron pipe, fittings and appurtenances.

1.02 REFERENCES

- A. The following is a list of standards that may be referenced in this section:
 - 1. American Association of State Highway and Transportation Officials (AASHTO): T99, Standard Method of Test for the Moisture-Density Relations of Soils Using a 2.5-kg (5.5-lb) Rammer and a 305-mm (12-in.) Drop.
 - 2. American Society of Mechanical Engineers (ASME):
 - a. B16.21, Nonmetallic Flat Gaskets for Pipe Flanges.
 - b. B16.42, Ductile Iron Pipe Flanges and Flanged Fittings Classes 150 and 300.
 - 3. American Water Works Association (AWWA)/American National Standards Institute (ANSI):
 - a. C104/A21.4, Cement-Mortar Lining for Ductile-Iron Pipe and Fittings.
 - b. C105/A21.5, Polyethylene Encasement for Ductile-Iron Pipe Systems.
 - c. C110/A21.10, Ductile-Iron and Gray-Iron Fittings.
 - d. C111/A21.11, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
 - e. C115/A21.15, Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Fittings.
 - f. C116/A21.16, Protective Fusion-Bonded Epoxy Coatings for the Interior and Exterior Surfaces of Ductile-Iron and Gray-Iron Fittings for Water Supply Service.
 - g. C150/A21.50, Thickness Design of Ductile-Iron Pipe.
 - h. C151/A21.51, Ductile-Iron Pipe. Centrifugally Cast, for Water.
 - i. C153/A21.53, Ductile-Iron Compact Fittings for Water Service.
 - j. C600, Installation of Ductile-Iron Water Mains and Their Appurtenances.
 - k. C606, Grooved and Shouldered Joints.
 - 4. ASTM International (ASTM):

- a. A307, Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.
- b. A563, Standard Specification for Carbons and Alloy Steel Nuts.
- c. D882, Standard Test Method for Tensile Properties of Thin Plastic Sheeting.
- d. D1330, Standard Specification for Rubber Sheet Gaskets.
- e. D1922, Standard Test Method for Propagation Tear Resistance of Plastic Film and Thin Sheeting by Pendulum Method.
- f. D2000, Standard Classification System for Rubber Products in Automotive Applications.
- g. D4976, Standard Specification for Polyethylene Plastics Molding and Extrusion Materials.

5. International Organization for Standardization (ISO): 9001, Quality Management Systems – Requirements

1.03 SUBMITTALS

- A. Action Submittals:
 - 1. Shop Drawings including:
 - a. Plan and details of standard pipe section showing:
 - 1) Dimensions
 - 2) Pipe joints
 - 3) Fittings and special fittings,
 - 4) Pressure rating and thickness
 - 5) Size (diameter and lengths)
 - 6) Coating and lining data
 - 7) Tee fabrication details.
 - b. If required, pipe layout data in plan and profile completely dimensioned
 - 1) Include a complete schedule of all pipe, fittings, specials, hangers and supports.
 - 2) Special castings shall be clearly detailed showing all pertinent dimensions.
 - c. Information on gasket polymer properties.
 - d. Polyethylene wrap and tape
 - e. joint lubricant
 - B. Informational Submittals:
 - 1. Manufacturer's Certificate of Compliance stating that inspections and specified tests have been made and that results thereby comply with requirements of AWWA/ANSI applicable requirements
 - a. Furnish sworn certificates that pipe and fittings have been manufactured, tested, and inspected in accordance with this and all applicable Specifications.
 - b. Product certification shall include:

- 1) Tensile and Charpy test results traceable to pipe numbers and testing periods.
2. Pipe sizes thirty (30) inches and larger include:
 - a. Hydrostatic test charts including pipe numbers for each test cycle shall be furnished as part of the certification test reports.
 - b. Complete traceability is required throughout the certification process and must be clearly legible on each pipe at the point of installation.
3. Hydrostatic test results for any size pipe shall be furnished to the Owner's Representative.
4. Application methods, application requirements, and chemical resistance data for coating and lining products in accordance with manufacturers' recommendations.
5. Manufacturer's written in-plant quality control program:
 - a. Submit prior to manufacture of pipe for this Project.
6. Field Hydrostatic Testing Plan: Submit at least 15 days prior to testing and at minimum, include the following:
 - a. Testing dates.
 - b. Piping systems and section(s) to be tested.
 - c. Method of isolation.
 - d. Method of conveying water from source to system being tested.
 - e. Calculation of maximum allowable leakage for piping section(s) to be tested.
 - f. Provide certifications insuring all pipe joints have been tested and meet the requirements of ANSI A21.11 (AWWA C151).
 - g. Certifications of Calibration: Approved testing laboratory certificate if pressure gauge for hydrostatic test has been previously used. If pressure gauge is new, no certificate is required.
 - h. Test documentation form and results.
7. The Contractor shall furnish the Owner's Representative with lists, in duplicate, of all pieces of pipe and fittings in each shipment received. These lists shall give the serial or mark number, weight, class, size, and description of each item received.

C. At project closeout, the Contractor shall submit record drawings of installed sanitary sewer piping and products.

PART 2 – PRODUCTS

2.01 DUCTILE IRON PIPE

- A. Pipe:
 1. General:
 - a. Pipe shall be new. Refurbished pipe shall not be provided.
 - b. Lined and coated as specified.
 2. Meet requirements of AWWA/ANSI: C150/A21.50; C151/A21.51; C111/A21.11.

- 3. Centrifugally cast, grade 60-42-10 iron.
- 4. Standard stick lengths.
- 5. Pressure rating of pipe: 350 psi unless otherwise specified.
- 6. Pipe wall thickness of threaded pipe for a flanged pipe end shall be minimum special thickness Class 53 from 12-inch to 54-inch diameter pipe in accordance with AWWA C115/A21.15.
- B. All materials to be tested in accordance and meet or exceed the requirements of AWWA C151.
- C. Markings:
 - 1. Show the weight, pressure class or nominal thickness class, and casting period on each pipe.
 - 2. Manufacturer's identifying mark, the year the pipe is produced, and the letters "DI" or "DUCTILE" are to be cast or stamped on the pipe.
 - 3. All pipe markings are to be on or near the bell.

2.02 FITTINGS

- A. The Contractor shall use fittings of the same size, lining and coating, and pressure rating as the pipe.
- B. Fittings shall be new and recently manufactured.
 - 1. Refurbished fittings will not be accepted.
- C. Provide fittings with:
 - 1. Body thickness and radii of curvature conforming to the latest ANSI A21.10/AWWA C110 Standard Specifications
 - 2. Joints in accordance with the latest ANSI A21.11/AWWA C110 Standard Specification.
- D. Use push-on or mechanical joint type joints for fittings unless otherwise specified.
 - 1. Ductile iron fittings for push-on pipe shall be designed for the same working pressure, laying conditions, and cover as the pipe which is used.
- E. Fittings manufactured for ductile iron pipe shall conform to the requirements of ANSI A21.10/AWWA C110.
- F. Welded Outlet: Only weld to pipe in manufacturer's shop.
 - 1. Field welding is not acceptable

2.03 JOINTS

- A. Push-On Joint: Minimum working pressure rating equal to pipe material design.
- B. Joints for ductile iron pipe shall be push-on type or mechanical joint.
- C. Mechanical joints may be specified or approved by the Owner's Representative. Mechanical Joints:

1. Mechanical joints shall consist of a bolt joint of the stuffing box type as detailed in ANSI A21.10/AWWA C110 and described in ANSI A21.11/AWWA C111.
2. Bolted in accordance with the manufacturer's recommendations with Tee Head Bolts and bolts of high strength,
 - a. Bolts:
 - 1) Heat treated cast iron containing 0.50 percent copper or high strength low-alloy steel
 - 2) Minimum yield point strength of 40,000 pounds per square inch
 - 3) Ultimate tensile strength of 70,000 pounds per square inch.
3. Gaskets and bolts and nuts: Conform to ANSI A21.11/AWWA C111.
 - a. Gaskets shall be of neoprene or rubber
 - b. Appropriate for the intended service.
4. Glands for ductile iron shall be of high strength ductile iron, and glands for cast iron shall be of high strength cast iron.

2.04 EXTERIOR COATINGS AND INTERIOR LININGS

- A. All buried or submerged ductile iron pipe and fittings and cast iron fittings shall have a standard bituminous outside coating conforming to AWWA C151/A21.51, AWWA C115/A21.15, AWWA C110/A21.10, and AWWA C153/A21.53.
- B. All exposed ductile iron pipe and ductile iron and cast iron fittings shall have an outside coating of universal primer.
- C. Interior lining for ductile iron pipe and fittings used in wastewater service shall be as required of the DeKalb County Department of Watershed Management Potable Water Main, Gravity Sanitary Sewer, and Sanitary Sewer and Force Main Design Standards, Latest Edition and Version except ductile iron for gravity sewers to be lined with Protecto 401.

2.05 POLYETHYLENE ENCASEMENT

- A. Point Repairs are to be wrapped in polyethylene encasement. This should include ALL ductile iron installed, whether point repairs or line work, (pipe and fittings).
- B. Use polyethylene encasement for corrosion protection system for Ductile Iron Pipe as required of the DeKalb County Department of Watershed Management Potable Water Main, Gravity Sanitary Sewer, and Sanitary Sewer and Force Main Design Standards, Latest Edition and Version.
- C. Polyethylene encasement is to be specifically manufactured to meet the formulation, physical tests, thickness, and dimensional requirements specified in standard ANSI/AWWA C105/A21.5.
 1. Low density film is to be minimum 8 mil, group 2, linear low density, flat tube.
 2. Use virgin polyethylene raw material conforming to ASTM D4976.
 3. Provide tubes for straight pipe and sheets for fittings or tees.
 4. Markings:
 - a. Mark encasement with trademark,

- b. Year of manufacture,
- c. Type of resin,
- d. Specification conformance,
- e. Applicable pipe sizes
- f. Statement: "warning corrosion protection-repair any damage."

5. Polyethylene:

Property	Minimum Strength	Standard
Tensile Strength	3600 psi	ASTM D882
Elongation	800%	ASTM D882
Dielectric Strength	800 V/ mil	ASTM D149
Impact Resistance	600 g	ASTM D1709-B
Propagation Tear Resistance	2550 gf	ASTM D1922

2.06 SPARE PARTS

- A. Furnish four (4) spare gaskets for each size and type of joint requiring the use of a gasket.
- B. Furnish eight (8) spare bolts and nuts of each size and type used for mechanical and flange joints.

2.07 MATERIAL TESTING

- A. The Owner's Representative may elect to visit pipe manufacturer's plant and inspect pipe in production, testing, and shipping in accordance with ANSI A21.5/AWWA C151.
 - 1. Reasonable facilities shall be provided for the Owner or the Owner's Representative to facilitate their work while at the manufacturing facility.
 - 2. All production and quality assurance records shall be made available for review by the Owner's Representative upon request.
- B. The manufacturer shall perform all tests in house as part of their quality assurance/quality control.
 - 1. Test results shall be submitted to the Owner's Representative in accordance with the requirements of this section.
- C. Factory Tests:
 - 1. General:
 - a. Tests shall be performed on pipe with metal thickness equal to that specified.
 - b. Only pipe that passes leak test shall be shipped.
 - 2. Hydrostatic Proof Test:
 - a. All Pipe: Perform at 500 psi for a minimum duration of 10 seconds.

- b. Pipe 30 Inches and Larger: Additionally, test to 75 percent of minimum yield strength during test duration which shall not be less than 15 seconds.
- c. Record each test cycle on a strip chart.
- d. Each test cycle for 30-inch and larger pipe shall be marked by pipe number.
- e. Inspect each pipe during testing for leaks.
- f. Pipe which shows evidence of leaks shall be scrapped.
- g. Repair welding of leaks is not permitted.
- 3. Perform a 15-psi air test on welded-on outlet pipe.
- 4. Pipe ends (spigot end, bell and socket) shall be gauged with suitable gauges at sufficiently frequent intervals to ensure compliance to standard dimensions of AWWA C151/A21.51.
 - a. In addition, each socket and spigot shall be inspected in a well-lighted area for injurious defects which could affect the joint performance.
 - b. Remove defects by cutting of pipe ends.
 - c. Pipe with injurious defects in the bell shall be scrapped.
 - d. Manufacturer shall have a recommended ovality tolerance for pipes 18 inches inch and larger.
 - e. Each end of each 18-inch and larger pipe shall be measured and approved by manufacturer's quality assurance inspector to meet tolerances.
- 5. Submit a certified inspection report from the independent agency of witnessed tests within 10 days of the inspection.

D. Test results shall show restrained joints in the sizes specified have been successfully tested to at least twice the specified pressure rating of the joint without leakage or failure.

PART 3 – EXECUTION

3.01 GENERAL

- A. Gravity sanitary sewer construction shall not commence prior to:
 - 1. approval of all plans, materials, submittals
 - 2. receipt of all required documents including necessary easements and permits
 - 3. Completion of the Preconstruction Conference and any required Pre-installation Conference held with the Owner's Representative.
- B. Install gravity sanitary sewer lines, manholes, and other appurtenances to lines and grades on approved plans and profiles.
 - 1. Field changes (when necessary) require:
 - a. Submittal of redesigned area(s) for approval prior to installation, in accordance with Georgia Environmental Protection Division's Rules and Regulations for Water Quality Control, Chapter 391 3 6 .02(10).

- b. Maintain on site throughout construction a set of the "approved" design containing an original Owner stamp with a copy of these Design Standards, current edition.
- C. Construction shall be done in a manner to protect lines, sanitary sewers or structures from unusual stresses.
- D. The Contractor shall provide for the flow of all sanitary sewers, drains or creeks interrupted during the progress of the Work and shall restore same to preconstruction or better condition.
- E. At the start of construction, the Contractor shall install an air plug in the first pipe laid out of the entrance manhole and in the downgrade side of the first newly installed manhole.
 - 1. Plugs shall remain in place until final inspection and approval is given by the Owner's Representative.
 - 2. Exercise extreme caution to insure plugs are not lost into the gravity sanitary sewer system.
- F. The Contractor must comply with:
 - 1. Requirements of the County's Soil Erosion and Sediment Control Ordinance,
 - 2. Provisions of the State Manual for Erosion and Sediment Control
 - 3. Special conditions required by the EPD associated with any variances issued by the same,
 - 4. Special conditions required by the Owner's Representative.

3.02 DUCTILE IRON PIPE

- A. Conform to the installation requirements of Section 02535 - Gravity Flow Sanitary Sewers.
- B. Inspect pipe and fittings to ensure no cracked, broken, or otherwise defective or damaged materials, linings or coatings are being used. All linings shall be protected during handling and shall be inspected for damage. Any repairs necessary shall be performed in strict accordance with the lining manufacturer's published instructions. Repairs shall be holiday tested at no additional cost to the Owner, if directed by the Owner's Representative.
- C. Join pipe with push-on joints and mechanical joint fittings in accordance with manufacturer's recommendations and applicable sections of AWWA C600.
- D. Provide special tools and devices, such as special jacks, chokers, and similar items required for installation.
- E. Lubricate pipe gaskets using lubricant furnished by pipe manufacturer.
 - 1. No substitutes will be accepted.
- F. Clean ends of fittings of dirt, mud, and foreign matter by washing with water and scrubbing with a wire brush, after which, slip gland and gasket on plain end of pipe.
 - 1. If necessary, lubricate end of pipe to facilitate sliding gasket in place, then guide fitting into spigot of pipe previously laid.

- G. Gaskets per AWWA C111.
- H. Field welding of ductile iron pipe is prohibited.

3.03 PREPARATION

- A. Trench Grade:
 - 1. Grade bottom of trench by hand to specified line and grade with proper allowance for pipe thickness and pipe base.
 - a. Trench bottom and bedding material shall form a continuous and uniform bearing and support for pipe between bell holes.
- B. Bell (Joint) Holes: At each joint, dig bell holes of ample dimensions in bottom of trench, and at sides where necessary, to permit joint to be made properly and to permit easy visual inspection of entire joint.
- C. Before laying each section of pipe, check grade and correct irregularities found.
 - 1. Grade may be disturbed and require repair during removal of lifting tackle.

3.04 FITTINGS

- A. The Contractor shall install fittings in accordance with applicable ANSI/AWWA standards and manufacturers' recommendations.

3.05 TESTING

- A. Testing for point repairs shall be completed using CCTV inspection per section 01510 – Sanitary Sewer Main Television and Sonar Inspection and section 02535 – Gravity Flow Sanitary Sewers.
- B. Following the installation of ductile iron pipe, the Contractor shall test all pipe & joints in accordance with the requirements of Section 02650 - Testing for Acceptance of Sanitary Sewers.
 - 1. Failure of testing is subject to rejection, repair, or replacement at the Contractor's expense.

END OF SECTION

SECTION 02542

SILT FENCE

PART 1 – GENERAL

1.01 SECTION INCLUDES

The work covered by this Section consists of furnishing all materials, equipment, and labor and performing all operations in connection with the construction of the Silt Fence System in accordance with the Contract Documents.

1.02 RELATED SECTIONS

- A. Section 01300: Submittals
- B. Section 02276: Site Restoration and Erosion Control

1.03 QUALIFICATIONS

- A. Contractor and Applicator shall have all State erosion control certifications and be active at the time of installation, and shall remain current throughout project involvement.
- B. Installation shall be by an experienced applicator approved by the manufacturer of the material supplied.
- C. Applicator shall have a minimum of one year experience.
- D. Submit written proof of qualifications to the Owner's Representative.
- E. The woven fiber filter and appurtenances specified under this Section shall be furnished by a manufacturer who is fully experienced, reputable, and qualified in the manufacture of the fabric furnished. The woven fiber filter and all related appurtenances shall be designed, constructed and installed with the best practices and methods.

1.04 SUBMITTALS

- A. Furnish an affidavit that all materials comply with these Specification requirements.
- B. State erosion control certifications.
- C. Manufacturer's approval of installer.
- D. Written proof of all required qualifications.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Prevent damage during delivery and handling.

- B. Store all fabric in undamaged condition as packaged by the manufacturer, with manufacturer's seals and labels intact.
- C. Store all materials in a clean, dry storage area.
- D. Do not store fabric in an upright position.
- E. Storage area temperature shall be maintained above 40 degrees F. with normal humidity.

PART 2 – PRODUCTS

2.01 MATERIALS AND PRODUCTS

Silt fence shall be Type C as specified by the Manual for Erosion and Sediment Control in Georgia, Latest Edition, Georgia Soil and Water Conservation Commission (GSWCC) for Sd1-.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Installation instructions shall be supplied by the manufacturer. The fabric shall be applied in accordance with the manufacturer's recommendations.
- B. The surfaces to be protected shall be prepared and graded to the extent they are normally stable in the absence of erosion forces. All stones, roots, and other waste material exposed on the slopes which could disturb the finished mat profile shall be removed. The fabric shall be positioned over these surfaces.
- C. Sediment barriers being used shall have a support spacing of no greater than 4 feet on center.
- D. Along all State waters and other sensitive areas, two rows of sediment barriers shall be used. The two rows should be placed a minimum of 36 inches apart.

3.02 MAINTENANCE

- A. Sediment shall be removed once it has accumulated to one-half the original height of the barrier.
- B. Sediment barriers shall be replaced whenever they have deteriorated to such an extent the effectiveness of the product is reduced (approximately six months) or the height of the product is not maintaining 80% of its properly installed height.
- C. Temporary sediment barriers shall remain in place until disturbed areas have been permanently stabilized. All sediment accumulated at the barrier shall be removed and properly disposed of before the barrier is removed.

END OF SECTION

SECTION 02607

MANHOLE HEIGHT ADJUSTMENT

PART 1 - GENERAL

1.01 SECTION INCLUDES

The requirements for adjusting the height of manholes where tops are below grade. These manhole height adjustments can facilitate sanitary sewer operation, maintenance and assessment activities.

1.02 REFERENCES

- A. The following reference standards should not be considered an exhaustive listing of standards that could be applied to this Specification.
 - 1. ASTM
 - a. C32 - Standard Specification for Sewer and Manhole Brick (Made From Clay or Shale).
 - b. C443 - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
 - c. A48/A48M - Standard Specification for Gray Iron Castings.
 - d. A536 - Standard Specification for Ductile Iron Castings
 - e. C270 – 12a Standard Specification for Mortar for Unit Masonry
 - 2. Manual for Uniform Traffic Control Devices (MUTCD) standards
 - 3. “Potable Water Main, Gravity Sanitary Sewer, and Sanitary Sewer and Force Main Design Standards”, Latest Edition and Version, DeKalb County Department of Watershed Management.

1.03 SUBMITTALS

- A. The Contractor shall submit shop drawings and product data for all materials listed in accordance with the requirements of Specifications Section 01300.
- B. The Contractor shall complete a daily written record detailing the work carried out and any items incidental to the Work. The Contractor shall include in his daily record:
 - 1. Delays: Dense traffic, lack of information, sickness, labor or equipment shortage, etc.
 - 2. Weather: Conditions [e.g., rain (quantity, time, duration), sunny, windy, etc.].
 - 3. Equipment: On site (e.g., specialty cleaning, by-pass equipment, etc.).
 - 4. Submittals: To the Owner's Program Manager or as directed in the submittals portion of these specifications.
 - 5. Personnel: On site by name (e.g., all labor, specialty services, etc.).
 - 6. Accident: Report (e.g., all injuries, vehicles, etc.).
 - 7. Incident: Report (e.g., damage to property, property owner complaint, etc.).

8. Major defects encountered: including, but not limited to, collapsed pipe, cave-ins, sink holes, etc.
9. Visitors: On site, time in and out.
10. Disposals: Type and quantity of debris (including liquids).

C. Precast grade rings

D. Frame and Cover

E. Precast Riser and Cone Product submittal and manufacturer's specifications

F. Brick

G. Mortar

H. Traffic safety plan and procedures for Right-of-Way work.

I. DOT Documents for permit.

J. Safety Plan

K. Confined Space Entry Plan

1.04 RESPONSIBILITY FOR SANITARY SEWER OVERFLOWS AND DAMAGE TO PROPERTY AND UTILITY

A. Reference Specification Section 01030 – Special Project Procedures, 3.01, B.

1.05 SAFETY

A. All work shall be performed in accordance with OSHA, local and State DOT standards, and local, State and Federal safety regulations.

B. Confined Space Entry:

1. Minimize the physical entry into manholes.
2. Enter Manholes only in accordance with Federal, State, local and any other regulations for confined space entry.
3. Only trained crews and staff may perform confined space entry.
 - a. Entry shall be performed only under a current permit, using certified personnel and a Confined Space Entry Plan.
 - b. Entry personnel must use well maintained or new safety required equipment, including harnesses, ventilation equipment, etc.

C. Traffic Control:

1. Protect work area at all times.

- a. Utilize cones, barricades, flags, flaggers, and other measures necessary to meet the Manual for Uniform Traffic Control Devices (MUTCD) standards
- b. Properly and safely protect both vehicular and pedestrian traffic.
- c. Certified Flagmen shall work to secure all affected streets.
- d. Further requirement for traffic control may be imposed by the specific agency having jurisdiction.
- e. All traffic control measures shall comply with the requirements of MUTCD, Part 6 – Temporary Traffic Control, Latest Edition as published by USDOT/FHWA.

PART 2 - PRODUCTS

2.01 BRICK

- A. Brick shall conform to the requirements of ASTM C32 for grade SM. For any work that is 2 feet or more above the maximum water level in a manhole, C216, type FBS, grade SW brick complying with the requirements of C32 type MM and MS brick properties is acceptable.
- B. Brick shall be new and whole, of uniform standard size, and with substantially straight and parallel edges and square corners.
 - 1. No soft or salmon brick shall be used.
 - 2. Concrete brick shall not be used
 - 3. Brick shall be culled after delivery, if required, and no culls shall be used except as approved by the Owner's Representative.
 - 4. Proof of material compliance shall be provided with brick delivered for use on project.

2.02 PRECAST BARREL JOINTS & CONES

- A. Barrel joints shall be tongue and groove and shall meet the latest revision of ASTM C443 for O-ring gaskets; see Standard Detail S-003 in Appendix I of "Potable Water Main, Gravity Sanitary Sewer, and Sanitary Sewer and Force Main Design Standards", 2009 Edition, Version 1.0, DeKalb County Department of Watershed Management. All barrel joints shall be installed to allow no infiltration into the manhole. Care should be exercised during the handling of the precast units to avoid disturbing or damaging the gasket and to attain proper alignment of the joints. Joints and lift holes shall be grouted smooth with cement grout on inside and outside. In precast manhole construction, combination of joint lengths shall be selected to minimize the number of individual segments required to provide the total depth specified. Long joints shall be used in the bottom with shorter segments utilized for the top adjustments
- B. Pre-formed flexible joint sealants and primer may be submitted for use in applications as approved by the Program Manager. Joints with flexible joint sealants shall also receive an approved joint wrap.

- C. The top elevation of manhole frames shall be adjusted to grade in areas such as streets, alleys, and parking lots or where indicated by the Program Manager. Only brick and mortar will be allowed to make grade adjustments in streets or right-of-ways, alleys, and parking lots or other paved surface or where indicated by the Program Manager. Adjustments which result in manhole chimneys that exceed a total finished height greater than twelve (12) inches must be made by changing precast riser sections. The top of the wall of all manholes shall be leveled off with mortar so as to form a flat surface upon which the manhole frame is to rest.

2.03 MORTAR

- A. Meet the requirements of ASTM C270 Type S unless directed and approved otherwise by the Owner's Representative.
- B. Prepare mortar only in quantities needed for immediate use. Mortar mixed for more than thirty (30) minutes or greater than the manufacturer's limits, whichever is more restrictive, has set, or has been re-tempered shall not be used.

2.04 FRAMES & COVERS

- A. Conform to the requirements outlined in pages 73-74 of "Potable Water Main, Gravity Sanitary Sewer, and Sanitary Sewer and Force Main Design Standards", Latest Edition and Version, DeKalb County Department of Watershed Management.
- B. Installation: Conform to Specification 02608, Manhole Frame and Cover Installation.

PART 3 - EXECUTION

3.01 GENERAL

- A. The Contractor shall take all necessary measures to prevent debris from entering the manhole under reconstruction. A temporary (waterproof) cover shall be required during the reconstruction period. ANY DEBRIS THAT ENTERS OR FALLS INTO THE MANHOLE SHALL BE REMOVED IMMEDIATELY TO THE SATISFACTION OF THE OWNER
- B. The Contractor shall take all necessary measures to prevent damage to the existing manhole frame and cover during the adjustment work.
- C. In the event the existing manhole is being located into a paved area, the Contractor is required to replace existing manhole frame and cover with a traffic manhole frame and cover. The Contractor is also required to provide a traffic safety plan to the Program Manager if the paved area is within the municipal or state Right-of-Way.

D. Adjustment Rings (IN APPROVED AREAS OUTSIDE OF PAVEMENT, STREETS, ALLEYS AND PARKING LOTS): The Contractor shall replace existing, deteriorated riser rings with new precast concrete riser rings. All manholes designated to receive casting adjustment and/or alignment shall be adjusted to meet existing finished grade unless an alternative elevation is specified. A TYPE S mortar shall be placed in between individual precast concrete riser rings, and precast concrete riser ring and cone joints. The mortar shall be struck smooth with the interior surface of the manhole and floated with a sponge float to a surface profile of 8-10 mils.

E. Manhole Frame and Cover:

1. Salvage, existing frames and covers removed to facilitate manhole rehabilitation, riser reconstruction, and/or casting alignment or grade adjustments.
 - a. Reuse rehabilitated frame and cover unless determined to be defective by the Owner's Representative.
 - 1) Defective frame and/or Cover:
 - a) Replace with new frame and/or cover appropriate for service intended.
 - b) Furnish and install replacement frames and/or covers as approved by the Owner's Representative in accordance with this specification section and Section 2608, Manhole Frame and Cover Installation.
 - c) Set frames in full mortar bed. Mortar shall be struck smooth with the interior surface of the manhole and floated with a sponge float to a surface profile of 8-10 mils.

3.02 PROCEDURES FOR MANHOLE HEIGHT ADJUSTMENT

A. The Contractor shall utilize maps, surveys, sounding instruments, or information from local residents to determine approximate locations of buried manholes. Manholes shall be exposed utilizing hand techniques or by carefully probing with mechanical equipment. Manhole exposure in paved areas shall be accomplished by making a square cut in the surface with sufficient width to allow for the excavation of the material around the manhole to expose it to a depth necessary for adequate adjustment.

B. Raising Manholes:

1. The Contractor shall adjust the top elevation of the manhole frame to grade as directed by the Program Manager conforming to the requirements of this section. A maximum completed adjustment which results in manhole chimneys that do not exceed a total finished height of twelve (12) inches will be allowed using brick and mortar. Brick and mortar shall be used to adjust manholes within paved areas. Mortar shall be applied to create a smooth finish on the interior and exterior prior to backfill. Adjustments which result in manhole chimneys that exceed a total finished height greater than twelve (12) inches shall be made by removing the cone section and adding the appropriate precast riser sections.
2. In green (grass) areas (outside the right-of-way), vertical height adjustments can be made using precast adjustment (riser) rings in lieu of brick and mortar. A maximum completed adjustment which results in manhole

chimneys that do not exceed a total finished height adjustment of twelve (12) inches will be allowed using precast riser rings. Adjustments which result in manhole chimneys that exceed a total finished height greater than twelve (12) inches shall be made by removing the cone section and adding the appropriate precast riser section(s). The number of riser rings shall be limited to the minimum number that is required to achieve grade.

- a. Joint sealant shall be applied on existing manhole frame and each joint of the riser ring(s) required to achieve grade. If the outdoor temperature is below 70 degrees Fahrenheit, the Contractor must heat the joint sealant before application.
- b. The Contractor shall place concrete (Class B) collar (8 inch at the bottom of the frame to 2 inch at the top of the frame) on exterior of the manhole frame. The concrete collar on exterior of the manhole frame shall receive a broom finish.

C. Lowering or raising manholes in paved and green areas require the removal of the manhole cone if the completed vertical height adjustment of the existing manhole will result in a finished manhole chimney height that is greater than 12 inches or the existing manhole must be lowered, the Contractor shall remove the manhole cone section to the straight barrel section of the existing manhole.

D. Raising Brick Manholes

1. The manhole shall be carefully demolished down to the straight section of wall and shall be consistent with a level point of brick coursing.
2. The cut line for the demo shall be made with a masonry saw or other approved method that will minimize disturbance of the remaining brick and mortar.
3. All mortar shall be removed from the top of the remaining brick without disturbing the remaining mortared joints.
4. Extend manhole walls using ASTM C32 grade SM brick and Type S mortar.
5. All work shall comply with the applicable requirements of the “Potable Water Main, Gravity Sanitary Sewer, and Sanitary Sewer and Force Main Design Standards”, 2009 Edition, Version 1.0, DeKalb County Department of Watershed Management.

E. Raising Cast In Place Manholes

1. The manhole shall be carefully demolished down to the straight section of wall and shall be consistent with a level point of cut.
2. Work shall be in accordance with ACI 350R.
3. Concrete shall have a minimum 28 day strength of 4000 PSI and conform to ASTM C94.
4. All reinforcing steel shall be fabricated and installed in accordance with applicable portions of ACI 318.
5. All form work shall be in accordance with applicable portions of ACI 347R.
6. The extension of the wall shall be connected to the existing structure using adhesive dowels of the size and location on approved shop drawings.
7. All work shall comply with the applicable requirements of the “Potable Water Main, Gravity Sanitary Sewer, and Sanitary Sewer and Force Main Design Standards”, 2009 Edition, Version 1.0, DeKalb County Department of Watershed Management.

Standards", Latest Edition and Version, DeKalb County Department of Watershed Management.

3.03 CLEANUP

- A. After the work is completed and accepted, the Contractor shall clean up the work area in accordance with these specifications.
- B. All excess material and debris not incorporated into the permanent installation shall be disposed of by the Contractor. The debris and liquids are to be disposed of properly in accordance with all applicable laws. The County can furnish a letter to the landfill stating the Contractor is authorized to dispose of the non-hazardous materials. Debris and liquids type and quantities are to be tracked in the daily Contractor diary and substantiated with trip tickets provided to the Program Manager. Hauling and disposal costs will be borne by the Contractor.
- C. The work area shall be left in a condition equal to or better than prior condition. Disturbed grassed areas shall be seeded or sod placed as directed by the Owner's Program Manager. The work site restoration work shall be completed in accordance with the requirements of these Specifications.

3.04 RECORD DRAWINGS

- A. Record Documents shall be made available to the Owner's Representative for the Owner per 01720.
- B. Reference Section 01056, GPS Data Collection, for Contractor's responsibilities related to GIS updates to update manhole locations within the mapping inventory. This applies to newly discovered assets or assets with significant locational discrepancies.

3.05 WARRANTY

- A. The Contractor shall guarantee the work for a warranty period of one (1) year from the date of final written acceptance of the Owner. If, at any time during the warranty period, any defect is identified the Contractor shall make repairs acceptable and at no additional cost to the Owner. In this case, the Contractor shall warrant the work for one (1) year in addition to the warranty required by the Contract from the date of repairs' final written acceptance.
- B. If the frequency of similar defects requiring repair increases, then the entire project will be re-evaluated for warranty extensions.

END OF SECTION

SECTION 02608
MANHOLE FRAME AND COVER INSTALLATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. This section includes procedures for Manhole Frame and Cover Installation.

1.02 REFERENCES

- A. The following is a partial listing of reference standards that could be applicable to this specification. This should not be considered an exhaustive list. Other standards should be applied when applicable.
- B. ASTM
 - 1. A48 / A48M - Standard Specification for Gray Iron Castings.
 - 2. A536 - Standard Specification for Ductile Iron Castings
- C. Manual for Uniform Traffic Control Devices (MUTCD) standards
- D. *Potable Water Main, Gravity Sanitary Sewer, and Sanitary Sewer and Force Main Design Standards*, DeKalb County Department of Watershed Management.

1.03 SUBMITTALS

- A. Submittals shall conform Section 01300 Submittals. Submit shop drawings of manhole frames and covers to the Owner's Representative for approval before installation.

1.04 RESPONSIBILITY FOR SANITARY SEWER OVERFLOWS AND DAMAGE TO PROPERTY AND UTILITY

- A. Reference Specification Section 01030 – Special Project Procedures

1.05 SAFETY

- A. All work shall be performed in accordance with OSHA standards and local, State and Federal safety regulations.
- B. No person shall enter a confined space without the documented requisite training, certification, and entry permit.
 - 1. Entry plan is also required.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Provide and install complete manhole covers and frames at each new sanitary sewer manhole, and in all other locations shown on the Plans or directed by the Owner's Representative.
- B. Manhole covers shall be of either Standard Type or Bolt-Down Type, as indicated on the Plans or as otherwise specified. If not otherwise indicated, manhole covers shall be Standard Type.
- C. The Contractor shall provide manhole covers and frames approved by the Owner's Representative.

2.02 MATERIALS

- A. Manhole covers and frames shall be constructed of cast iron conforming to the requirements of ASTM A48 Class 30.
 - 1. Tensile strength of the cast iron shall be a minimum of 30,000 psi.
 - 2. Covers and frames shall be "Heavy Duty" type, rated for a minimum of H-20 loading.
- B. All castings shall be sound, smooth and clean, and free of blisters, pits, cracks, and other defects.
 - 1. Castings judged to be defective by the Owner's Representative will be rejected, and shall be replaced by the Contractor at no additional cost to the Owner.
 - 2. Casting tolerances shall be $\pm \frac{1}{16}$ -inch, with an additional one-sixteenth ($\frac{1}{16}$) inch per foot of dimension.
 - 3. Covers shall not rock or chatter" when in-place in frames
- C. Manhole covers shall be cast with two (2) non-penetrating type pick-holes, located as indicated in the Detail Drawings.
 - 1. Pick-holes shall conform to the dimensions indicated in the Detail Drawings.
 - 2. Manhole covers shall not have vent holes.
- D. The seating surfaces of frames and covers shall be machined flat to ensure contact between the cover and frame along the full perimeter.
- E. Gaskets shall be provided and installed on all manhole frames.
 - 1. Secured to the seating surface of the frame with non-degrading glue by the manufacturer.
 - 2. Be flat, one-eighth- ($\frac{1}{8}$) inch thick, black neoprene, with a tensile strength of 2,000 psi.
- F. For manhole covers indicated as Bolt-Down Type, frames shall be cast and machined to accept four (4) cover bolts, on the pattern shown in the Detail Drawings.

1. Covers shall be cast with four (4) holes, three-quarter (¾) inch diameter, for the bolts on the pattern shown in the Detail Drawings.
2. Bolts shall be stainless steel hex-head cap screws, and shall be provided with all bolt-down type covers.
3. Bolts shall include stainless steel washers and rubber sealing gaskets.

G. Covers and frames shall bear the emblem of "Sewer" as illustrated in the Detail Drawings.

H. Covers and frames shall conform to the DeKalb County Department of Watershed Management Potable Water Main, Gravity Sanitary Sewer, and Sanitary Sewer and Force Main Design Standards, Latest Edition and Version.

PART 3 EXECUTION

3.01 PROCEDURES FOR MANHOLE FRAME AND COVER INSTALLATION

A. Contractor Shall:

1. Prepare the manhole top cone for frame installation per manhole and manhole cover manufacturer recommendations.
2. Prepare and install manhole frames and covers per manufacturer recommendations.
3. Check the installation and condition of gaskets and replace all missing or damaged gaskets.
4. Install new frames and covers to the required elevations shown on the Plans or to the existing grade as directed by the Owner's Representative.
5. Check the manhole covers for fit in the frame.
 - a. If a manhole cover is either excessively loose or tight in the frame, or rocks, wobbles, or otherwise moves in its frame, the frame and cover shall be removed and replaced by the Contractor at no additional cost to the Owner.
6. Install and tighten all Bolt-Down Type covers.

3.02 CLEANUP

A. After the work has been completed and all testing acceptable, the Contractor shall clean up the work area.

1. The work area shall be left in a condition equal to or better than prior condition.
2. Disturbed grassed areas shall be seeded or sod placed as directed by the Owner's Representative at no additional cost to the Owner.

The work site restoration work shall be completed in accordance with the requirements of the applicable Site Restoration sections of these Specifications.

B. All excess material and debris not incorporated into the permanent installation shall be disposed of by the Contractor.

1. The debris and liquids are to be disposed of properly in accordance with all applicable laws.
 - a. The Owner can furnish a letter to the landfill stating the Contractor is authorized to dispose of the non-hazardous materials.
2. Debris and liquids type and quantities are to be tracked in the daily Contractor diary.
3. Hauling and disposal costs will be borne by the Contractor.

3.03 DOCUMENTATION

- A. The Contractor shall complete work on each asset as assigned via the County's Computerized Work Order Management system.
 1. Upon start of work, the Contractor shall receive work orders as assigned by the Owner's Representative.
 2. The Contractor shall maintain and synchronize the status of each rehabilitation work order issued.

3.04 WARRANTY

- A. The Contractor shall guarantee the work for a warranty period of one (1) year from the date of final acceptance.
 1. If, at any time during the warranty period, any defect is identified the Contractor shall make repairs acceptable and at no additional cost to the Owner.
 - a. In this case, the Contractor shall warrant the work for one (1) year in addition to the warranty required by the Contract.
- B. If the frequency of similar defects requiring repair increases, then the entire project will be re-evaluated.

END OF SECTION

SECTION 02609
MANHOLE FRAME AND COVER SEALING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. This section covers the materials and methods for sealing leaking manhole frames for sanitary sewers.

1.02 SCOPE

- A. Frame Sealing includes:
 1. Sealing the frame joint area and the chimney above the cone of the manhole with either a manufactured or applied internal or external flexible seal.
 2. Design seal to prevent leakage of water into the manhole through these areas throughout a minimum 50-year design life.
 3. Installed seal shall remain flexible,
 - a. Allow for repeated vertical movements of the frame due to frost lift, ground movement, or other causes of not less than 2 inches
 - b. Repeated horizontal movement of the frame due to thermal movement of pavement or other causes of not less than $\frac{1}{2}$ inch throughout the design life.
- B. Manhole Cover Sealing includes:
 1. Either the replacing or sealing existing manhole covers.
 2. Methods described require at a minimum, the thorough cleaning of the frame rim surface by wire brushing. More aggressive cleaning methods shall be employed if either the existing conditions or the manufacturer dictate. The more stringent shall apply.
 3. Detailed installation procedures shall be in accordance with the manufacturer's instructions.

1.03 REFERENCES

- A. American Society of Testing Materials (ASTM):
 1. A240/A240M - 13a Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
 2. C923 - Standard Specification for Resilient Connectors between Reinforced Concrete Manhole Structures, Pipes and Laterals.
 3. D412-06a - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension.
 4. D476 - Standard Classification for Dry Pigmentary Titanium Dioxide Products.
 5. D903 - Standard Test Method for Peel or Stripping Strength of Adhesive Bonds.

6. D1004 - Standard Test Method for Tear Resistance (Graves Tear) of Plastic Film and Sheeting.
7. F594- Standard Specification for Stainless Steel Nuts.

1.04 SUBMITTALS

- A. Submittals shall conform Section 1300 Submittals of these specifications.
- B. Action Submittals:
 1. Manufacturer's Certificate of Compliance certifying compliance with applicable specifications and standards and that the submitted product is appropriate for the service intended.
 - a. Certified copies of test reports of factory tests required by the applicable standards and this Section.
 - b. Manufacturer's installation instructions and procedures and insertion runs.
 2. Procedures and materials for manhole frame sealing. Product data to include;
 - a. Material handling and storage,
 - b. Material properties,
 - c. Mixing and proportioning requirements,
 - d. Maximum pot life,
 - e. Film/coating thickness,
 - f. Certification of all rehabilitation materials.
 - g. Recommended testing
 3. Plan for capturing extraneous debris during rehabilitation process and debris disposal.
 4. Material Safety Data Sheets (MSDS).
 5. Applicator's Certification Qualifications/referenced projects.
 6. Approval of applicators equipment to be used for applying the product
 7. Safety Plan; Confined Space Entry Plan/Permit.
 - a. Confined space training documentation for affected personnel
 8. Field Test Report.
 9. Construction Photographs.
 10. Complete a daily written record (diary) as required in Section 01320 = Progress Reports, Videos and Photographs.
 11. Confined Space Entry Plan
 - a. Personnel certificates of training for confined space entry

1.05 APPLICATOR'S QUALIFICATIONS

- A. Applicator's Qualifications
 1. Minimum 5 years' experience in application of products to be used.
 2. Manufacturer's Certifications:

- a. Applicator has been trained and approved in the handling, mixing and application of the products to be used.
- b. Equipment to be used for applying the product has been approved and the applicator personnel have been trained and certified for proper use of equipment.
- c. Five (5) recent references of applicator (projects of similar size and scope) indicating successful application within the past 10 years.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Responsible for delivery, storage, and handling of products.
 - 1. Store, handle products in accordance with manufacturer's written recommendations.
 - 2. In accordance with Federal, State and Local laws and regulations.
- B. Protect products from damage.
 - 1. Damaged products shall be removed from the Site of the Work promptly.
 - 2. Damaged products shall be replaced with undamaged products at no additional cost to the contract.

1.07 RESPONSIBILITY FOR SANITARY SEWER OVERFLOWS AND DAMAGE TO PROPERTY AND UTILITY

- A. Reference Specification Section 01030, Special Project Procedures, Section 3.01, B.

1.08 SAFETY

- A. All work shall be performed in accordance with OSHA standards and Federal, State, and local safety regulations.
- B. No person shall enter a confined space without the documented requisite training, certification, entry permit and confined space entry plan.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Products proposed for manhole frame sealing shall be approved during the submittal process prior to use on the project.
- B. Obtain approval and a hydrant water meter from the DeKalb County Department of Watershed Management before operating fire hydrants.

2.02 FLEXIBLE INTERNAL RUBBER SLEEVE

- A. Extensions and wedge strips shall be extruded or molded from a high grade rubber compound conforming to the applicable requirements of ASTM C923,
 - 1. Minimum of 1500 psi tensile strength,
 - 2. Maximum eighteen (18) percent compression set

3. Hardness (durometer) of forty-eight (48) \pm 5.
- B. Either double or triple pleated with a minimum unexpanded vertical height of eight (8) inches and ten (10) inches respectively
 1. Minimum thickness of 3/16 inch.
 2. Top and bottom section of the flexible rubber sleeve shall contain an integrally formed expansion band recess and multiple sealing fins.
- C. Top section of the extension shall have a minimum thickness of 3/32 inch and shall be shaped to fit into the bottom band recess of the flexible rubber sleeve under the bottom chimney seal band and the remainder of the extension shall have a minimum thickness of 3/16 inch.
 1. The bottom section of the extension shall contain an integrally formed expansion band recess and multiple sealing fins matching that of the flexible rubber sleeve.
 2. Any splice used to fabricate the flexible rubber sleeve and extension shall be hot vulcanized and have a strength so the sleeve can withstand a 180 degree bend with no visible separation.
 3. The continuous wedge strip used to adapt the flexible rubber sleeve to sloping surfaces shall have the slope differential needed to provide a vertical band recess surface, be shaped to fit into the band recess, and have an integral band restraint.
 - a. The length of the wedge strip, when its ends are butted together, will cover the entire inside circumference of the band recess needing slope adjustment.
 4. Expansion bands, studs, and nuts used to compress the sleeve against the manhole shall be integrally formed from sixteen (16) gauge stainless steel conforming to the requirements of ASTM A240, Type 304, with no welded attachments
 - a. Minimum width of 1 $\frac{3}{4}$ inches.
 - b. Minimum adjustment range of two and one half (2 1/2) diameter inches.
 - c. Positive locking mechanism used to expand the band shall have the capacity to develop the pressures necessary to make a watertight seal.
 - d. Band shall be permanently held in place with a positive locking mechanism which secures the band in its expanded position after tightening.
- D. Flexible rubber sleeve manhole frame seal shall be manufactured by:
 1. Cretex Specialty Products,
 2. Sealing Systems Inc.
 3. or submitted and approved "or equal" product.
 - a. Products substituted for use must follow the requirements found in the DeKalb County General Requirements.

- b. It is the Contractor's responsibility to timely submit information/tests for the Owner's Representative to make the determination of "or equal" status.

2.03 FLEXIBLE URETHANE RESIN

- A. Manhole frame seal shall be used to form a flexible seal to stop inflow/infiltration and provide corrosion protection to the internal wall of a manhole from three (3) inches above the bottom of the frame to three (3) inches below the top of the cone.
- 1. The finished product shall conform to the minimum requirements listed below:

	Prime Coat		Final Coat	
Hardness	ASTM-D 2240	85-90	ASTM-D 2240	75
Elongation	ASTM-D 412	400%	ASTM-D 412	800%
Tensile Strength	ASTM-D 412	3200 psi	ASTM-D 412	1150 psi
Adhesive Strength	ASTM-D 903	400 lb l/in	ASTM-D 903	175 lb l/in
Tear Resistance	ASTM-D 1004	210 lb l/in	ASTM-D 1004	155 lb l/in

- B. Flexible urethane resin manhole frame seal shall be Flex Seal Utility Sealant as manufacturer by Sealing Systems, Inc. or approved equal.

2.04 COVER CONVERSION AND REPLACEMENT

- A. Replace frame and cover as directed by Owner's Representative in writing on a per-manhole basis.
- B. Reuse the existing cover by making it watertight.
 - 1. Accomplish by installing a gasket between the cover and the cover-bearing surface of the frame
 - 2. Plug the vent and pick holes.
 - 3. Make one of the plugs removable to facilitate removal of the cover.
- C. Manhole cover gaskets and plugs shall be as specified in Section 02608.

2.05 MANHOLE INSERT

- A. The manhole insert shall be manufactured from stainless steel, Type 304, 16-gauge minimum.
 - 1. Insert shall have
 - a. Factory installed handle that is a minimum of 5-feet long, 3/16-inch plastic coated stainless steel cable retaining tether that passes through a watertight grommet in the bottom of the dish

- b. High-grade stainless steel adjustable locking device located between bottom of the dish and lift loop at the top end of tether.
 - c. Stainless steel terminal and eye and the handle shall be attached with a No. 6 high-grade stainless steel rivet.
- B. Gasket shall be made of a closed-cell neoprene with pressure sensitive adhesive on one side and shall be installed by the manufacturer.
- C. Insert shall have a gas relief valve designed to release at a pressure of 0.5 to 1.5 psi.
 - 1. Material shall be Nitrile for prevention of corrosion from contact with hydrogen sulfide, diluted sulfuric acid, and other gases associated with wastewater collection systems.

PART 3 - EXECUTION

3.01 GENERAL

- A. Perform all installation in accordance with the manufacturer's recommendations and in accordance with the requirements of Federal, State, and local laws and regulations.
- B. Perform all tests in accordance with OSHA, Federal, State and local safety regulations prior to initiating entry in to confined space.
 - 1. Entry into Confined Space shall only be undertaken in compliance with submitted Confined Space Entry Plan.
- C. Active leaks must be corrected before the installation of any approved product.
- D. Provide traffic control in accordance with the requirements of applicable State and local Georgia Department of Transportation (GDOT) requirements.
- E. Manhole frames misaligned from the chimney or cone by three (3) inches or more shall be excavated and realigned.
 - 1. Existing frames shall be thoroughly cleaned before reinstallation.
 - 2. Realignment work shall be performed in accordance with Section 02900, Sanitary Sewer Manhole Rehabilitation.
- F. Loose and protruding mortar and brick interfering with the seal's performance shall be removed
 - 1. Clean appropriate areas of the manhole frame, chimney, and/or cone/corbel by wire brushing or by more aggressive means if required by the manufacturer. The most stringent shall apply.
 - 2. Sealing surfaces shall be reasonably smooth and circular, clean, and free of any loose material or excessive voids.

3.02 FLEXIBLE INTERNAL RUBBER SLEEVE

- A. The Contractor shall be properly trained, certified, and licensed in the installation of frame seals by the manufacturer

- 1. Have a manufacturer's recommended expansion tool and all other equipment/tools necessary to install the frame seals.
- B. Field measure the manhole to determine the information required on the manufacturer's "Sizing and Ordering" procedure.
- C. Contact surface for the sleeve and/or extensions shall be reasonably clean and smooth, circular and free from excessive voids or defects.
- D. Detailed surface preparation, including providing a vertical surface on a cone when none exists, shall be in accordance with the frame seal manufacturer's instructions.
- E. The Contractor shall install the flexible rubber sleeve in accordance with the manufacturer's instructions.
- F. 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.
- G. Following the expansion of the lower band:
 - 1. Perform a QA/QC test 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.
 - 2. Pour the water behind the seal and observe the lower sealing area for any visible leaks.
 - 3. Consider the seal effective if no water leaks behind the seal at the lower sealing area.
 - 4. Owner's Representative shall witness test
- H. If an extension is used;
 - 1. Place the 3/32" thick extension flap 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.
 - 2. 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.
 - 3. Installation procedures shall be in accordance with the manufacturer's recommended instructions.

3.03 FLEXIBLE URETHANE RESIN

- A. Detailed surface preparation shall be in accordance with the frame seal manufacturer's instructions.
- B. The Contractor shall install the flexible rubber sleeve in accordance with the manufacturer's instructions.

3.04 INSTALLATION OF MANHOLE INSERT

- A. Use the existing cover in conjunction with a watertight insert installed under the cover that prevents entry of water into the manhole.

1. Manhole insert shall be designed to prevent inflow through and around manhole covers and manufactured to fit the manhole frame rim upon which the manhole cover rests.
2. Installation shall be in accordance with the insert manufacturer's instructions.

B. The manhole insert shall be fully seated upon the manhole frame rim and the cover replaced to complete the installation.

3.05 INSPECTION

- A. Manhole frame seals shall be visually inspected after installation to insure the seal is properly installed,
 1. No voids or leakage points shall exist,
 2. Manhole frame seal shall not detach from the manhole.
 3. Any seals failing this visual test shall be reworked, as necessary, and retested at the Contractor's own expense.

3.06 TESTING

- A. Any seals not passing this visual inspection may, at the Contractor expense, be tested for leakage using a method approved by the Owner's Representative. Owner's Representative shall witness test.
- B. Frame Sealing Test:
 1. Manufactured frame seals shall be visually inspected to insure
 - a. Sleeve is properly positioned,
 - b. Tight against the manhole surfaces,
 - c. No voids or leakage points exist under the sleeve,
 - d. Bands and locking nuts are tight.
 2. Applied seals shall be visually inspected to insure they have been applied according to the manufacturer's instructions.
 3. Manhole frame sealing shall be randomly tested for leakage using a method approved by the Owner's Representative.
 - a. A minimum of 10 percent of the sealed manholes shall be tested.
 - b. Failing manholes shall be reworked and retested by the Contractor at no additional compensation.
 - c. If more than 5 percent of the manholes tested fail the initial test, an additional 10 percent of the sealed manholes shall be tested.
 - d. This process will continue until the testing is satisfactory, or until all manholes have been tested.
- C. Cover Sealing Test:
 1. The sealed manhole covers shall be visually inspected to insure the bearing surface was properly cleaned, products were properly sized, installed according to the manufacturer's instructions.

2. Manholes leaking, visually unacceptable, or failing the test shall be reworked and retested.
 - a. Contractor shall be reimbursed for the cost of this additional work if an inspection by the Contractor and the Owner's Representative shows the work performed by the Contractor was not the reason for the failure of the manhole to pass the leakage test.
 - b. The Owner's Representative reserves the right to inspect the sealed manholes during the warranty period.
 - 1) Any leakage or defects in the work found by this inspection shall be corrected by the Contractor within an agreed-upon time at no additional cost to the Owner.

3.07 CLEANUP

- A. After the work has been completed and all testing acceptable, the Contractor shall clean up the work area.
 1. Leave the work area in a condition equal to or better than prior condition.
 - a. Disturbed grassed areas shall be seeded or sod placed as directed by the Owner's Representative at no additional cost to the Owner.
 - b. The work site restoration work shall be completed in accordance with the requirements of Section 02776, Site Restoration and Erosion Control.
- B. All debris and excess material not incorporated into the permanent installation shall be disposed of by the Contractor.
 1. Debris and liquids are to be disposed of properly in accordance with all applicable laws.
 2. Local municipality can furnish a letter to the landfill stating the Contractor is authorized to dispose of the non-hazardous materials.
 3. Debris and liquids type and quantities are to be tracked in the daily contractor diary.
 4. Hauling and disposal costs will be borne by the Contractor.

3.08 WARRANTY

- A. The Contractor shall guarantee the work for a warranty period of one (1) year from the date of final acceptance.
 1. If at any time during the warranty period, any defect is identified the Contractor shall make repairs acceptable to the Owner's Representative and at no additional cost to the Owner.
 - a. In this case, the Contractor shall warrant the work for one (1) year in addition to the warranty required by the Contract.
- B. If the frequency of similar defects requiring repair increases, then the entire project will be re-evaluated.

END OF SECTION

SECTION 02622

PVC GRAVITY SEWER PIPE

PART 1 - GENERAL

1.01 SECTION INCLUDES

This section includes requirements to furnish, install, make the joints, and test PVC gravity sewer pipe and appurtenances as shown on the drawings and as required by these Specifications.

1.02 RELATED SECTIONS

- A. Section 02324: Trenching and Trench Backfilling
- B. Section 02608: Manhole Frame and Cover Installation
- C. Section 02641: Precast Concrete Manholes
- D. Section 02650: Testing for Acceptance of Sanitary Sewers

1.03 REFERENCES

- A. ASTM D 2241 – Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)
- B. ASTM D 2321 – Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
- C. ASTM D 3034 – Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe Fittings
- D. ASTM F 679 - Standard Specification for Poly(Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings

1.04 SUBMITTALS

- A. Submit for review completely detailed working drawings and schedules of all PVC pipe and fittings required.
- B. Submit all product data

- C. Submit for review the proposed exfiltration and/or infiltration testing method.

PART 2 - PRODUCTS

2.01 PVC GRAVITY SEWER PIPE

- A. PVC pipe and fittings shall be solid wall PVC gravity sewer pipe conforming to ASTM D 3034, SDR 26 in sizes 4-inch through 15-inch and ASTM D 2241 for 18-inch. All pipe shall be thoroughly inspected by the contractor and the Owner's Representative upon delivery, and any pipe not conforming to the above requirements will be rejected and shall be removed immediately from the Work Site by the Contractor. The Owner's Representative will apply all standard tests of the pipe necessary to assure conformity with the specifications. All such tests shall be made in accordance with the methods prescribed by, and the acceptance or rejection of PVC pipe shall be based upon the ASTM Standard Specifications referred to above.
- B. Pipe out of round, or otherwise defective will be rejected even though it meets the strength requirements of the specifications. Rejected pipe shall be removed from the site at once.
- C. Attention is called to the proper method of stacking integral bell gasketed joint pipe. To avoid stress in the bell end of the pipe due to a pipe resting thereon, the pipes shall be stacked with bell ends projecting from the stack in opposite directions for alternate rows. The bottom row of pipe shall be supported free of the ground.

2.02 PVC FITTINGS

- A. PVC gravity sewer fittings shall meet the requirements of ASTM D 3034 Type PSM Poly (Vinyl-Chloride) (PVC) Sewer Pipe and Fittings for sizes 4-inch through 15-inch, and ASTM F679 Poly (Vinyl-Chloride) (PVC) Large Diameter Plastic Gravity Sewer Pipe and Fittings in sizes 18-inch and larger.
- B. All pipe and fittings shall have integral bell gasketed joints especially engineered for gravity sewer mains and laterals. Rubber gaskets shall be factory installed in a precision formed recessed groove.
- C. Laying instructions of the manufacturer of the pipe and joint shall be followed explicitly. Examine each bell and spigot end to determine whether the preformed joint has been damaged prior to installation. Any pipe having defective joint surfaces shall be rejected.

PART 3 - EXECUTION

3.01 LAYING PVC PIPE

- A. Gravity sewer lines shall be laid according to the details shown on the drawing or specified herein, and according to the applicable portions of ASTM D2321 – Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
- B. The trench bottom shall be graded to the proposed elevation of the pipeline and the bottom shaped to fit the lower quadrant of the pipe. Holes shall be excavated at each bell so the pipe is supported along the barrel only. Pipe bedding shall be described in Section 02324 – Trenching and Trench Backfilling.
- C. Pipe shall be protected during handling against impact shocks and free fall. Pipe laying shall not precede backfilling by more than 100 feet unless limited further by the Owner's Representative.
- D. Laying pipe in finished trenches shall be commenced at the lowest point, with the spigot ends pointing in the direction of flow. The interior of the pipe and the jointing seal shall be free from sand, dirt, and trash before installing in the line. Extreme care must be taken to keep the bells of the pipe free from dirt and rocks so joints may be properly assembled without overstressing the bells. Pipe jointing shall be done in strict accordance with the pipe manufacturer's instructions and shall be done entirely in the trench.
- E. Each time the work on the sewer is halted for more than one (1) hour, the ends of the pipe shall be sealed by means of a commercially manufactured plug to prevent foreign material from entering the pipe.

3.02 Y-BRANCHES

- A. PVC Y-branches shall be manufactured with watertight preformed joints suitable for use with PVC gravity sewer pipe. Each Y-branch shall be provided with a PVC plug. The Y-branches shall be installed as detailed on the plans at locations indicated by the Owner's Representative in the field.
- B. The manhole drops, where indicated on the plans, shall be constructed of ductile iron pipe and fittings as detailed on the plans and encased in concrete.
- C. Stubs for future pipe connections shall be installed from the main to the property line (right-of-way) at locations as shown on the drawings. Stubs shall be PVC gravity sewer pipe with a PVC plug.

3.03 TESTING AND CLEANING

- A. See Section 02650 – Testing for Acceptance of Sanitary Sewers
- B. Cleaning
 - 1. At the conclusion of the work the Contractor shall thoroughly clean all of the pipe by flushing with water or other means to remove all dirt, stones, pieces of wood, or other material entering during the construction period. Debris cleaned from the lines shall be captured and removed from the lowest outlet. If, after this outlet cleaning, obstructions remain, they shall be removed. After the pipe is cleaned and if the groundwater level is above the pipe, or following a heavy rain, the Owner's Representative will examine the pipe for leaks. If defective pipes or joints are discovered at this time, they shall be repaired by the Contractor.

END OF SECTION

SECTION 02641

PRECAST CONCRETE MANHOLES

PART 1 - GENERAL

1.01 SECTION INCLUDES

The work covered by this section includes furnishing all labor, equipment, and materials required to install precast concrete manholes complete with frames and covers as described herein and as shown on the Plans. Frames and covers shall be supplied and installed per Section 02608.

1.02 REFERENCES

A. The following is a list of standards that may be referenced in this section:

1. American Association of State Highway and Transportation Officials (AASHTO): M198, Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants.
2. ASTM International (ASTM):
 - a. A36/A36M, Standard Specification for Carbon Structural Steel.
 - b. A48/A48M, Standard Specification for Gray Iron Castings.
 - c. A123/A123M, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - d. A536, Standard Specification for Ductile Iron Castings.
 - e. A615/A615M, Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
 - f. B139/B139M, Standard Specification for Phosphor Bronze Rod, Bar, and Shapes.
 - g. C14, Standard Specification for Non-reinforced Concrete Sewer, Storm Drain, and Culvert Pipe.
 - h. C31/C31M, Standard Practice for Making and Curing Concrete Test Specimens in the Field.
 - i. C39/C39M, Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
 - j. C150/C150M, Standard Specification for Portland Cement.
 - k. C192/C192M, Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory.
 - l. C270 - Standard Specification for Mortar for Unit Masonry.
 - m. C387/C387M, Standard Specification for Packaged, Dry, Combined Materials for Mortar and Concrete.
 - n. C443, Standard Specification for Joints for Concrete Pipe and Manholes Using Rubber Gaskets.
 - o. C478, Standard Specification for Precast Reinforced Concrete Manhole Sections.
 - p. C923, Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals.

- q. C990, Standard Specification for Joints in Concrete Pipe, Manholes, and Precast Box Sections using Preformed Flexible Joint Sealants.
- r. C1107 - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (non-shrink).
- s. C1311, Standard Specification for Solvent Release Sealants.
- t. C1244, Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test Prior to Backfill.
- u. D698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).
- v. D4101, Standard Specification for Propylene Injection and Extrusion Materials.
- w. F593, Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
- x. F594, Standard Specification for Stainless Steel Nuts.

1.03 SUBMITTALS

- A. Submittals shall conform to the requirements of Specification 1300, Submittals.
- B. Action Submittals:
 - 1. Shop Drawings including details of construction, reinforcing and joints, anchors, lifting, external straps, erection inserts, and other items cast into members.
 - 2. Product Data:
 - a. Concrete mix design. Compressive strength result report for production week.
 - b. Method of curing proposed.
 - c. Manhole frame to structure seals.
 - d. Manhole frame to structure anchor bolt.
 - e. Rubber gaskets and sealants.
 - f. External joint wrap.
 - 3. Materials to be used in fabricating drop connections.
 - 4. Materials to be used for pipe connections at manhole walls.
 - 5. Materials to be used for stubs and stub plugs, if required.
 - 6. Materials and procedures for corrosion resistant liner and coatings, if required.
 - 7. Plugs to be used for vacuum testing.
 - 8. Bitumastic coated steel strap and anchors
 - 9. Stack out drawings
 - 10. Non-shrink grout
 - 11. Test equipment complete with current calibration report identifiable to actual equipment being used.
- C. Informational Submittals:

1. Experience Record:
 - a. Precast concrete production capabilities.
 - b. Evidence of current PCI plant certification.
2. Calculations: Proposed details and design calculations for stresses in precast concrete members for loading conditions including earth pressures and transportation, handling, and erection.
 - a. Calculations shall be stamped by engineer registered in the same state as the Project.
3. Certificate of Compliance: Certify admixtures and concrete do not contain calcium chloride.
4. Test Reports:
 - a. Precast manufacturer's concrete test cylinders.
 - b. Core compression test.
5. Manufacturer's recommended installation instructions.

D. Field quality control report.

E. Safety Plan

F. Confined Space Entry Plan

G. The Contractor shall provide a ~~complete~~ a-daily written record (diary) as required per section 01320 – Progress Reports & Videos

1.04 DESIGN CRITERIA

A. General

1. Manholes shall be constructed of specified materials to the sizes, shapes, and dimensions and at the locations shown on the Plans or as otherwise directed by the Owner's Representative.
 - a. Depth of the manhole will vary with the locations,
 - b. Top of the manhole frame will be at the finished grade of the pavement or
 - c. Higher than the ground surface as shown on the Plans
 - d. Invert will be at the designed elevations.
2. Manholes in wooded or unmaintained easement areas:
 - a. Minimum of twenty-four (24) inches above ground level
 - b. Minimum of two (2) feet above the one hundred (100) year flood plain;
 - c. Whichever is greater.
3. Flood Plain Areas:
 - a. Manholes located within the one hundred (100) year flood plain shall contain manhole frames bolted to the eccentric cone in order to stabilize the manhole adjustment rings.
 - b. The manhole adjustment rings shall contain pre-drilled holes for the bolts from the pre-cast manufacturer.

- c. Manhole concrete rings shall be secured to each other to protect against slide and tilt of rings due to buoyancy.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
 - 1. Precast Concrete and Precast Prestressed Concrete: Product of manufacturer with 3 years' experience producing precast concrete products of quality specified.
 - 2. Precast Plant: PCI certified plant with current certification.
- B. Prior to delivery:
 - 1. Basic materials specified in this section shall be tested and inspected by an approved independent commercial testing laboratory
 - a. Certified copies of test reports prepared by the manufacturer's testing laboratory will be acceptable if approved by the Owner's Representative.
 - b. All materials failing to conform to these Specifications shall be rejected.
- C. Any materials damaged in transit to the work site or are otherwise unsuitable for use in the Work shall be rejected and removed from the project.

1.06 RESPONSIBILITY FOR SANITARY SEWER OVERFLOWS AND DAMAGE TO PROPERTY AND UTILITY

- A. Reference Specification Section 01030: Special Project Procedures, 3.01, B

1.07 SAFETY

- A. All work shall be performed in accordance with OSHA standards and State and Federal safety regulations.
- B. No person shall enter a confined space without the documented requisite training, certification, Confined Space Entry Plan and entry permit.

PART 2 - PRODUCTS

2.01 PRECAST CONCRETE MANHOLES

- A. Unless specified otherwise in the Plans or in the Special Conditions of the Contract, all new manholes will be precast concrete manholes as specified in this section. The minimum wall thickness for a four (4) foot diameter manhole shall be five (5) inches.
- B. Construct in accordance with the requirements of ASTM C478.
 - 1. Reinforced concrete manholes shall consist of manhole base sections, riser sections, transition sections, and conical sections as described herein.
 - 2. Configure components to minimize the number of joints required per manhole.

3. Owner's Representative may require any manhole not composed of the minimum number of sections to be replaced.
4. The installation of steps in any manhole or manhole section is prohibited.

C. Portland cement concrete used in the precast reinforced concrete manholes:

1. Have a minimum compressive strength of 4,000 psi at twenty-eight (28) days.
2. Contain type II Portland cement with a C3A content of five and one-half (5½) percent or less and meet the requirements of ASTM C478.
3. Newly cast manholes shall be cured in accordance with the requirements of ASTM C478.
 - a. The method of curing proposed must be submitted to the Owner's Representative prior to manufacture.
4. Manholes shall be cured for a minimum of seven (7) days prior to shipment to the Work Site unless otherwise instructed in writing by the Owner's Representative. Manufacturer shall test the compressive strength of a minimum of two (2) concrete cylinders per calendar week.
 - a. Reports verifying the results of the compression tests shall be maintained at the manufacturer's facility.
 - b. Reports shall be made available for inspection and review by the Owner's Representative.
 - c. The manhole manufacturer shall permit the Owner's Representative to make unannounced reviews of compression test records and inspection of manufacturing facilities at any time during normal business hours.
 - d. The maximum allowable absorption of the concrete used for manhole construction shall not exceed eight (8) percent of the dry weight.
5. Manufacturer shall notify the Owner's Representative of manholes delivered for use that were manufactured during a week when a concrete compressive strength test yielded a result of less than 4,000 psi.

D. Reinforcing steel shall be:

1. Bars of intermediate grade,
2. Open hearth, billet steel, conforming to the requirements of ASTM A615,
3. Or Cold-Drawn Steel Wire for Concrete Reinforcement conforming to the requirements of ASTM A82;
4. Or of wire fabric conforming to the requirements of ASTM A185.
5. The circumferential reinforcement in the riser and conical top sections shall have an area of not less than 0.12 square inches per linear foot.

E. The interior and exterior surfaces of the manhole shall have a smooth hard finish, and shall be free from cracks, chips, spalls, and exposed reinforcing.

F. Manhole base sections:

1. Circular, wet cast,
2. Supplied in forty-eight (48) inches, sixty (60) inches, seventy-two (72), and ninety-six (96) inches diameters.

3. Heights shall range from forty-eight (48) inches to ninety-six (96) inches depending on availability with diameter and as specified or approved by the Owner's Representative.
4. Supply with Manhole Lift System inserts.
 - a. Lifting eye bolts shall be supplied to the Contractor upon request.
 - b. Pipe openings shall be furnished in accordance with Section 3.03.B.

G. Riser sections:

1. Circular, wet or dry cast,
2. Supplied in forty-eight (48) inches, sixty (60) inches, and seventy-two (72) inches diameters.
3. Heights: range from sixteen (16) inches to forty-eight (48) inches in sixteen (16) inch multiples depending on availability with diameter and as specified or approved by the Owner's Representative.
4. Riser sections shall be supplied with Manhole Lift System inserts.
 - a. Lifting eye bolts shall be supplied to the Contractor upon request.

H. Transition sections:

1. Conical transition sections shall be supplied for sixty (60) inches to forty-eight (48) inches diameter transitions.
 - a. Conical transitions shall be thirty-two (32) inches high.
 - 1) Sixteen (16) inches high conical transitions may only be used when approved by the Owner's Representative.
 - b. All conical transition sections shall be supplied with a Manhole Lift.
 - c. Wet or dry cast, concentric only.
 - 1) Eccentric sections will not be allowed.
 - 2) Transition from forty-eight (48) inches diameter to a twenty-seven (27) inches clear access opening
 - 3) Either twenty-four (24) inches, thirty-six (36) inches, or forty-six (46) inches high.
2. Flat slab transitions:
 - a. Supplied for base sections seventy-two (72) inches to ninety-six (96) inches in diameter.
 - b. Flat slab transitions shall be manufactured structurally to meet individual project requirements.
 - c. Clear access openings shall be provided to accommodate riser sections as shown in the Plans or as detailed in the Detail Drawings.

I. Precast manhole riser joints:

1. Offset tongue and groove type,
 - a. Supplied with Tylox Super Seal pre-lubricated gasket.
 - b. Each joint shall also be supplied with Conseal CS-231 waterstop sealant,
 - 1) As manufactured by Concrete Sealants,
 - 2) In widths as recommended by the manufacturer.

- c. All joints shall be permanently strapped utilizing three (3) stainless steel (SST) strap anchors located one-hundred and twenty (120) degrees apart.
- d. Anchored onto the manhole walls with *SST adhesive anchors*.
- J. The ends of each reinforced concrete manhole riser section and the bottom end of the manhole top section shall be so formed so when assembled, they will form a continuous uniform manhole.
- K. Precast manholes having entering sewers of twenty-four (24) inches diameter or smaller shall have precast openings in the manhole walls for incoming or outgoing sewers as indicated on the Plans.
- L. Clearly mark manhole components for each installation site to correctly assemble manhole to suit construction conditions existing at that particular location.
- M. Set concrete manhole base sections on a foundation of #57 compacted stone aggregate,
 - 1. Twelve (12) inch minimum thickness,
 - 2. Covering the entire bottom of the excavation for the manhole.
 - 3. Aggregate size may be adjusted by the Owner's Representative based on field conditions.
- N. Manhole riser rings (non paved areas only) and/or brick and mortar used to adjust manhole frame to grade, shall conform to Section 02607 – Manhole Height Adjustment.

2.02 STRUCTURAL MATERIALS AND CASTINGS

- A. Structural steel shall conform to the requirements of ASTM A283, unless otherwise indicated on the Plans.
- B. Steel castings shall conform to the requirements of ASTM A27.
 - 1. Grades to be used will be as indicated on the Plans.
- C. Gray iron castings: Conform to Specification 02608, Manhole Frame and Cover Installation.
- D. Aluminum castings: Conform to the requirements of ASTM B108.
- E. Structural aluminum: Conform to the requirements of either ASTM B209, B221, B308, B241, or B211, as applicable.
 - 1. Finished bolts and nuts shall be given an anodic coating of at least 0.0002 inches in thickness.

2.03 SPECIALTY ITEMS

- A. One piece manholes:
- B. Manufacture in accordance with the requirements of ASTM C478 and as detailed in the Detail Drawings.

- 1. Cast utilizing concrete as required above.
- 2. Manufactured with a minimum eight (8) inches thick base with dowel steel reinforcement and waterstop.
- 3. Used only in situations which will not accommodate a twenty-four (24) inch base section and twenty-four (24) inch conical section.
- C. 36" x 48" Manhole Tees shall be manufactured in accordance with the requirements of ASTM C478 and as detailed in the Detail Drawings.
 - 1. Cast utilizing concrete as specified above.
- D. Saddle manholes shall be manufactured in accordance with the requirements of ASTM C478 and as shown in the Detail Drawings.
 - 1. Cast utilizing concrete as specified above.
- E. Drop Manholes (Memphis Tees) shall be manufactured in accordance with the requirements of ASTM C478 and as detailed in the Detail Drawings.
 - 1. Cast utilizing concrete as specified above.
- F. For manholes in corrosive environments that will require special protection, comply with the requirements of Section 03462 – Polymer Concrete Manholes

2.04 CONCRETE

Concrete shall conform to the requirements of Section 03300 – Cast-In-Place Concrete.

PART 3 - EXECUTION

3.01 GENERAL

- A. All activities shall be performed in accordance with the manufacturer's recommendations and regulations established by OSHA.
- B. The Contractor shall verify the lines and grades are as specified in the Plans. Notify the Owner's Representative immediately if discrepancies are discovered.

3.02 INSTALLATION

- A. Reinforced Concrete Sewers Forty-eight (48) inches Diameter and Larger:
 - 1. As specified above, except that they shall be installed on a saddle constructed on the barrel of the sewer.
- B. Joints for precast manhole stacks:
 - 1. Offset tongue and groove with Tylox Super Seal pre-lubricated gaskets as manufactured by Hamilton Kent.
 - 2. Each joint shall also be sealed with Conseal CS-231 waterstop sealant as manufactured by Concrete Sealants.
 - 3. Width and installation of the joint sealant shall be in accordance with the manufacturer's recommendations.
 - 4. All joints shall be supplied with 3" x 16" x 1/2" inch SST strap anchors.

- a. Three (3) strap anchors, one-hundred and twenty (120) degrees apart per joint.
- C. Where the difference in the invert elevation of
 - 1. two (2) or more sewers,
 - 2. eighteen (18) inches in diameter or smaller,
 - 3. intersecting in one (1) manhole is two (2) feet or more,
 - 4. a drop manhole shall be constructed in the manner shown in the Detail Drawings.
 - a. Similar in construction to the standard manhole, except that a drop connection of a pipe and fittings of the proper size and material shall be constructed outside the manhole:
 - 1) Supported by Class B concrete as indicated on the Plans and in the Detail Drawings.
 - 2) Manhole and the drop connection shall be placed on twelve (12) inch reinforced concrete base as detailed in the Detail Drawings.
 - 3) Drop connection piping assembly shall be bolted to the barrel of the manhole riser using a minimum of four 5/8-inch diameter stainless steel (316) bolts adhesive type with suitable washers to prevent failure caused by pulling the bolt head through the manhole wall.
- D. Base sections shall be precast with the vertical walls of sufficient height to allow entry of the required pipes as shown on the Plans, and as detailed in the Detail Drawings.
 - 1. Manhole inverts shall be constructed of cement mortar and shall have the same cross-section as the invert of the sewers which they connect.
 - 2. Carefully form the manhole invert to the required size and grade by gradual and even changes in sections.
 - 3. Changes in direction of flow through the sewer shall be made to a true curve with as large a radius as the size of the manhole will permit.
- E. All water standing in the trench shall be removed before placing of concrete is started, and the foundation maintained in a dry condition per Section 02205, Dewatering.
- F. Shallow manholes shall be constructed to the sizes, shapes, and dimensions as detailed in the Detail Drawings, and at the locations shown on the Plans.
 - 1. They shall be constructed of precast concrete sections as shown on the Plan or as directed by the Owner's Representative.
- G. Top elevation of manhole frames shall be adjusted to grade in areas such as streets, alleys, and parking lots or where indicated on the Plans in accordance with the requirements of this Specification 02607, Manhole Height Adjustment.

3.03 PIPE CONNECTIONS AT MANHOLES

- A. Openings in manhole walls for incoming and outgoing sewers shall be:
 - 1. Precast
 - 2. After pipe installation, seal with an approved non-shrink grout.
 - 3. These manholes shall be installed on compacted stone bedding per Standard Detail, S-001 Standard Precast Manhole.
- B. Flexible manhole connector may be approved by the Owner's Representative as an alternate method of sealing the space between the manhole wall and the pipe for connections greater than eighteen (18) inches.
 - 1. Flexible manhole sleeves shall be required for all pipes eighteen (18) inches and smaller
 - a. Cast into the manhole by the precast Manufacturer.
 - b. Flexible connector shall be:
 - 1) A-Lok,
 - 2) Z-Lok,
 - 3) or Kor-N-Seal
 - 4) Conforming to the requirements of ASTM C923
 - 5) Made from ethylene propylene rubber (EPDM) designed to be resistant to ozone, weather elements, chemicals, including acids, alkalis, animal and vegetable fats, oils, and petroleum products.
 - 6) Manhole sleeves shall be secured to pipe by stainless steel clamp and bolt assembly conforming to the requirements of ASTM C923.
- C. Stainless steel elements of the manhole connector shall be:
 - 1. Non-magnetic Series 304 Stainless,
 - a. Excluding the worm screw for tightening the steel band around the pipe which shall be Series 305 Stainless.
 - 1) Tightening the steel band worm screw shall be torqued by a break-away torque wrench available from the precast manhole supplier,
 - a) Set torque for 60-70 inch/lb.
 - 2) Connector shall be installed in the manhole wall by activating the expanding mechanism in strict accordance with the recommendation of the connector manufacturer.
 - 3) Connector shall be of a size specifically designed for the pipe material and size being utilized on the Project.

3.04 MANHOLE TESTING

- A. All manhole inserts, new manholes, and replacement manholes shall be tested by the Contractor using the vacuum test method,
 - 1. Follow manufacturer's recommendations for proper and safe procedures.

2. Perform test after installation of inserts.
3. Repair leakage in the manhole or structure, before, during, or after the test at no additional cost to the Owner.

B. Manholes:

1. Prior to testing manholes for water tightness:
 - a. Plug lift holes with a non-shrink grout,
 - b. Confirm joints between precast sections are properly sealed
 - c. Pipe openings are temporarily plugged and properly braced.
2. Vacuum Tests shall be performed in accordance with ASTM C1244-11 prior to backfilling:
 - a. If the manhole fails the initial test,
 - 1) Make repairs with non-shrink grout on exterior and interior
 - b. Retesting shall proceed until a satisfactory test is obtained.
 - c. Vacuum testing equipment shall be as manufactured by P.A. Glazier, Inc., or approved equal.

C. The Owner's Representative reserves the right to have third party consultants perform construction materials testing and assessments to any new manhole.

D. The use of soapy water on the manhole walls to help determine the areas of leakage is permitted.

E. Contractor shall provide record of Owner Representative's witnessed test for each manhole.

3.05 BACKFILL

The Contractor shall place and compact backfill materials in the area of excavation surrounding manholes in accordance with the requirements Section 02324 – Trenching and Trench Backfilling only after successful leak testing of manholes is complete

3.06 CLEANUP

A. After the work has been completed and all testing acceptable, the Contractor shall clean up the work area.

1. Work area shall be left in a condition equal to or better than prior condition.
2. Disturbed grassed areas shall be seeded or sod placed per applicable Sections of the Contract and as directed by the Owner's Representative at no additional cost to the Owner.
3. The work site restoration work shall be completed in accordance with the requirements of Section 02276 – Site Restoration and Erosion Control.

B. All debris and excess material not incorporated into the permanent installation shall be disposed of by the Contractor.

1. Debris and liquids are to be disposed of properly in accordance with all applicable laws.

- a. Owner's Representative can furnish a letter to the landfill stating the Contractor is authorized to dispose of the non-hazardous materials.
2. Debris and liquids type and quantities are to be tracked in the daily contractor diary.
3. Hauling and disposal costs will be borne by the Contractor.

3.07 WARRANTY

- A. The Contractor shall guarantee the work for a warranty period of one (1) year from the date of final acceptance.
 1. If, at any time during the warranty period, any defect is identified the Contractor shall make acceptable repairs at no additional cost to the Owner.
 2. In this case, the Contractor shall warrant the work for one (1) year in addition to the warranty required by the Contract.
- B. If the frequency of similar defects requiring repair increases, then the entire project will be re-evaluated.

END OF SECTION

SECTION 02650
TESTING FOR ACCEPTANCE OF GRAVITY SANITARY SEWERS

PART 1 -- GENERAL

1.01 SECTION INCLUDES

- A. This section of the specifications provides for testing for acceptance of non-pressurized sanitary sewer installations. Upon completion of all or a part of a gravity sanitary sewer line installation, the Contractor shall test and/or inspect the sewer for acceptability. Testing and inspection shall be performed in accordance with the requirements of this section. Should the requirements of this Section differ from other portions of these Specifications, or a manufacturer's published instructions, the Owner's Representative shall make the final determination regarding the correct method of testing. The Contractor shall assume that the most stringent applies.
- B. One or more of the following tests and/or inspections may be required:
 - 1. Exfiltration of water.
 - 2. Infiltration of water.
 - 3. Exfiltration of air under pressure.
 - 4. Joint testing.
 - 5. Direct visual inspection, including lamping.
 - 6. Deflection testing.
 - 7. Closed Circuit Television Inspection (CCTV).
 - 8. Smoke Testing
 - 9. Vacuum Testing
- C. Unless otherwise required, prior to any testing, lines shall be backfilled, cleaned of debris and flushed clean. Debris shall be caught and removed from the line and shall not be flushed into existing live sanitary sewers. The debris is to be disposed of properly in accordance with all laws. The Owner can furnish a letter to the landfill stating the Contractor is authorized to dispose of the materials. Debris and liquids quantities are to be tracked in the daily contractor reports.

1.02 RELATED SECTIONS

- A. Section 01510: Sanitary Sewer Main and Lateral Television Sonar Inspection
- B. Section 02324: Trenching and Trench Backfilling
- C. Section 02535: Gravity Flow Sanitary Sewers
- D. Section 02641: Precast Concrete Manholes
- E. Section 02956: Sanitary Sewer Cleaning

1.03 REFERENCES

- A. ASTM C924-02 - Standard Practice for Testing Concrete Pipe Sewer Lines by Low-Pressure Air Test Method
- B. ASTM C969-02 - Standard Practice for Infiltration and Exfiltration Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines
- C. ASTM F1417-11a - Standard Practice for Installation Acceptance of Plastic Non-pressure Sewer Lines Using Low-Pressure Air
- D. ASTM C1244-11 – Standard Test Method for Concrete Sewer Manholes by Negative Air Pressure (Vacuum) Test Prior to Backfill
- E. Codes, Specification, and Standards
 - 1. NASSCO – National Association of Sewer Service Companies

1.04 SUBMITTALS

- A. Field Leakage Testing Plan: Submit at least 15 working days in advance of the testing and include the following information as a minimum:
 - 1. Test equipment to be used, with all applicable calibration certificates
 - 2. Test forms to be used
 - 3. Testing dates
 - 4. Piping systems, sections and manholes to be tested
 - 5. Test type
 - 6. Method of and materials used for isolation
 - 7. Method of conveying water from the source to system being tested
 - 8. Location and approval of use of water source
 - 9. Calculation of maximum allowable leakage for piping section(s) to be tested.
 - 10. Method and location of disposal of test water, if applicable
- B. Leakage test results
- C. Pipe deflection test results
- D. CCTV inspection data in accordance with Section 01510: Sanitary Sewer Main and Lateral Television Sonar Inspection (CCTV)
- E. Pipeline lamping test results

1.05 TEST SECTIONS

- A. Unless otherwise specified or directed by the Owner's Representative, each section of sanitary sewer between manholes shall be tested by the air testing method.
- B. Testing shall be conducted in accordance with ASTM C924-02, ASTM C969-02, ASTM F1417-11a, ASTM C1244-11, and ASTM C1244-13. The Owner's Representative

may allow alternate testing methods, at his discretion, or require additional testing methods if, in his opinion, they are warranted.

- C. The Contractor may at his option divide a section of sewer into subsections of more convenient length for testing. If the section or subsection tested does not pass the tests, it shall be repaired and the test repeated until a satisfactory test is obtained. A complete section of piping between manholes shall be tested and pass before acceptance will be granted.
- D. Manholes shall be tested and accepted before a complete section of sewer is accepted.

1.06 SAFETY

- A. All work shall be performed in accordance with OSHA standards and State and Federal safety regulations.
- B. No person shall enter a confined space without the documented requisite training, certification, entry permit, and appropriate safety and Personal Protection Equipment (PPE).
- C. Refer to Section 02324 – Trenching and Trench Backfilling for trench safety and protective systems.

1.07 RESPONSIBILITY FOR SANITARY SEWER OVERFLOWS AND DAMAGE TO PROPERTY AND UTILITY

- A. Reference Specification Section 01030 – Special Project Procedures

PART 2 – PRODUCTS

(None Cited)

PART 3 – EXECUTION

3.01 SANITARY SEWERS INSPECTION AND TESTING METHODS

- A. Contractor to notify the Owner's Representative in writing 5 working days in advance of testing and perform testing in presence of the Owner's Representative.
- B. Individual joints may be tested on pipe 36 inches in diameter and larger, if approved by the Owner or the Owner's Representative.
- C. Pipe shall successfully pass leakage test prior to acceptance
- D. Contractor to furnish calibrated testing equipment and perform tests as approved by the Owner's Representative. Testing equipment shall provide observable and accurate measurement of leakage under specified conditions.
- E. All Testing Methods: All wyes, tees, and stubs shall be plugged with flexible jointed caps, or acceptable alternate, and securely fastened to withstand the internal test

pressure. Such plugs or caps shall be readily removable without disturbing tested joints.

- F. The Contractor shall backfill, clean and test lines before requesting final acceptance. Where any obstruction is met, the Contractor shall clean the sewers by means of rods, swabs, or other instruments. The Contractor shall flush out lines and manholes before inspection and testing and again before final inspection in accordance with Section 02956 – Sanitary Sewer Cleaning.
- G. Alignment: Pipe lines shall be lamed to ensure they are straight and show a uniform grade between manholes, except for curves specifically shown on the Plans or approved by the Owner's Representative. The Contractor shall correct any discrepancies discovered during inspection at no additional cost to the Owner.
- H. Water tightness: All sewers constructed shall be tested for specified water tightness. Infiltration and exfiltration tests shall be performed on all new or replacement sewers constructed as specified in this section. For sewers thirty-six (36) inches and larger, individual joint testing can be performed only when approved by the Owner or their Owner's Representative. All leaks, whether visible or detected by testing methods, including those found via television inspection, shall be repaired at no additional cost to the Owner.
- I. Infiltration Tests:
 - 1. If groundwater is present and is 2 feet above the top of the pipe of the segment being tested, then an infiltration test is required.
 - 2. The Contractor shall install suitable weirs in manholes selected by the Owner's Representative to determine the leakage of ground water into the sewer. The maximum length of line for each infiltration test shall be five-thousand (5,000) feet. The Contractor shall install weirs for a minimum of four (4) hours before measuring flow. If leakage in any section of the sewer line exceeds 0.01 gallons per inch of nominal pipe diameter per foot of pipe per twenty-four (24) hours, the Contractor shall locate and repair leaks. No infiltration or leaks are allowed in sanitary sewers 16-inch diameter or less. Repair methods must be approved by the Owner's Representative. After repairs are completed, the Contractor shall re-test for leakage. Infiltration testing shall be performed before sanitary sewer lateral reconnections are made.
 - 3. The Contractor shall furnish, install, and remove the necessary weirs, plugs, and bulkheads required to perform the leakage tests.
 - 4. Weirs shall be V-notch type by Pollard, or equivalent approved by the Owner's Representative.
- J. Exfiltration Tests:
 - 1. Exfiltration Water Test:
 - a. For VCP, Ductile Iron Pipe (DIP) with cement mortar lining, and concrete pipe fill pipe test section 24 hours prior to time of testing, if desired, to permit normal absorption into pipe walls.
 - b. Procedure:
 - 1) Expel air from piping system during filling.

- 2) Maintain hydrostatic test pressure continuously for 2 hours minimum, adding additional make up water only as necessary to restore test pressure.
- 3) Determine actual leakage by measuring quantity of water necessary to maintain specified test pressure for duration of test.
- c. Measurement Accuracy: Plus or minus 1/8 gallon of water leakage under specified conditions.
- d. PVC and ductile iron pipe and joints shall sustain maximum water loss limit of 0.8 gallon per inch diameter per 1,000 feet of pipe, including service connections within test section, per 2 hours. Allowable leakage shall be modified as stated below if hydrostatic head is other than 6 feet.
- e. Clay and concrete pipe and joints shall sustain maximum water loss limit of 1.5 gallons per inch diameter per 1,000 feet of pipe, including service connections within test section, per 2 hours. Allowable leakage shall be modified as stated below if hydrostatic head is other than 6 feet.
- f. Hydrostatic Head:
 - 1) At least 2 feet above maximum estimated groundwater level in section being tested, but no less than 6 feet above inside top of highest section of pipe in test section, including service connections.
 - 2) In every case, determine height of water table at time of test by exploratory holes or other methods approved by Owner's Representative. The Owner's Representative will make the final decision regarding test height for water in the pipe section being tested.
 - 3) If hydrostatic head is other than 6 feet, allowable leakage as computed by the criteria above shall be adjusted by the square root of actual head divided by square root of 6.
- g. Length of Pipe Tested: Limit length so the pressure on the invert of lower end of the section does not exceed 16 feet of water column. In no case shall the length be greater than 700 feet or the distance between manholes greater than 700 feet.
- h. Dispose of test water so there is no damage to or interference with adjacent property and in a manner acceptable with Owner's Representative and regulatory agencies.

2. Low-Pressure Air Test: Sewer diameters less than or equal to thirty-six (36) inches (note: low pressure air test not allowed on any exposed PVC because of its shattering characteristics upon exploding):

- a. Prior to air testing, the section of sewer between manholes shall be thoroughly cleaned and wetted. Immediately after cleaning or while the pipe is water soaked, the sewer shall be tested with low-pressure air. At the Contractor's option, sewers may be tested in lengths between manholes or in short sections (twenty-five [25] feet or less) using inflatable balls pulled through the line from manhole to manhole. Acceptance tests shall be conducted from manhole to manhole. Air shall be slowly supplied to the plugged sewer section until internal air pressure reaches approximately four (4) psig. After

this pressure is reached and the pressure allowed to stabilize (approximately two (2) to five (5) minutes), the pressure may be reduced to three and one-half (3.5) psi before starting the test. If a one (1) psi drop does not occur during the test time, then the line will be considered as having passed the test. If the pressure drops more than one (1) psi during the test time, the line will be presumed to have failed the test, and the Contractor shall be required to locate the failure, make necessary repairs, and retest the line at no additional cost to the Owner. Refer to ASTM C924-02 and ASTM F1417-11a for detailed testing requirements and minimum test times for various pipe sizes and types.

- b. Required test equipment, including, but not limited to: inflatable balls, braces, cut-off valves, air hose, rotameter (standard CFM reading with an accuracy of \pm two (2) percent), mechanical or pneumatic plugs, time measuring equipment with an accuracy of 0.1s, oil free air source with a singular control panel containing a main shut-off valve, pressure regulating valve, pressure-relief valve, input pressure gauge, and a continuous monitoring pressure gauge having a pressure range of 0 psi to at least 10 psi with minimum divisions of 0.10 psi and an accuracy of \pm two (2) percent shall be provided by the Contractor. Testing equipment shall be equal to Cherne Air-Loc Testing Systems and shall have current calibration certification.
- c. The Contractor shall keep records of all tests made and copies of such records given to the Owner's Representative. Such records shall show date, line number and stations, operator, and such other pertinent information required by the Owner's Representative and as specified in this Section.
- d. The Contractor is cautioned to observe proper safety precautions when performing the air testing. No person shall enter manhole or structure, or occupy area above opening of manhole or structure where pipe is under pressure. It is imperative the plugs be properly installed, restrained and braced to prevent the sudden expulsion of a poorly installed or partially inflated plug. Care shall be exercised in their removal. Every precaution shall be taken to avoid the possibility of over-pressurizing the sewer line.

3. Individual Joint Test: Pipe joints for sewers thirty-six (36) inches or greater in diameter individual joint testing may be performed only if approved by the Owner or their Representative and shall follow paragraph 3.02 Joint Testing Procedures found in these specifications.

K. Deflection Test: All PVC gravity sewers:

1. Test deflection of the pipe by manually pulling a go/no-go mandrel (sized in accordance with ASTM D3034) through the pipe. Within 24 hours after compaction of the backfill is complete, the line shall be tested using a 5 percent deflection mandrel. If the line is satisfactory, it shall be retested using a 7.5 percent deflection mandrel no less than 30 days following the completion of backfill compaction. The Contractor shall replace any section of pipe that does not pass the test or retest.
2. The Contractor shall excavate and properly install any section of pipe failing this test and re-test until results are satisfactory at no additional cost to the Owner.

- L. Closed Circuit Television Inspection: The Owner's Representative may require the interior of a new gravity sewer be subjected to television inspection. Such television inspection shall be conducted and documented and submitted to the Owner or their Representative in accordance with the requirements of Section 01510 - Sanitary Sewer Television - Sonar Inspection. The report shall contain the condition of pipe, type of pipe, depth, location of services, length, type of joints, roundness, and distance between manholes. Any pipe found to be cracked, leaking, misaligned, bellied, or otherwise defective shall be removed and replaced at no additional cost to the Owner.
- M. Direct/Manual Visual Inspection: At the direction of the Owner or their Representative the inspection of new pipe 36 inches in diameter and larger may be manually inspected. The Contractor shall provide any specialized equipment for inspection for the Owner's Representative. Voice communication between in-pipe and aboveground personnel will be maintained at all times during the inspection. The Contractor will record the inspection in a format, and submitted to the Owner or the Owner's Representative in accordance with the requirements of Section 01510 - Sanitary Sewer Television – Sonar Inspection. Log sheets to include, but not limited to: time and date of inspection, location, upstream and downstream structure numbers, pipeline length, pipe size, pipe segment length, pipe material, lateral connection located by pipe segment number, and location and detail of defects encountered.

3.02 JOINT TESTING PROCEDURES

- A. Joint Testing Procedures: Each sanitary sewer joint for pipe thirty-six (36) inches and above may be individually air tested, if approved by the Owner or the Owner's Representative, using a packer or other approved and calibrated testing device at the following test pressure:
 1. Joint test pressure shall be 3-psi higher than the groundwater pressure, if any, outside the pipe. Groundwater pressure may be determined by positioning the testing device on a visibly infiltrating joint and measuring the resulting VOID pressure with the VOID pressure monitoring equipment.
 2. In the absence of groundwater pressure data, the test pressure shall be equal to 1/2 psi per vertical foot of pipe depth or 3 psi, whichever is greater.
 3. The testing device shall be positioned within the line in such a manner as to straddle the pipe joint to be tested. The testing device end elements (sleeves) shall be expanded to isolate the joint from the remainder of the line and create a VOID area between the testing device and the pipe joint. The ends of the testing device shall be expanded against the pipe with sufficient inflation pressure to contain the air within the VOID without leakage past the expanded ends. Air shall then be introduced into the VOID area until a pressure equal to or greater than the required test pressure is observed with the VOID pressure monitoring equipment. If the required test pressure cannot be developed (due to joint leakage), the joint will have failed the test. After the VOID pressure is observed to be equal to or greater than the required test pressure, the air flow shall be stopped. If the VOID pressure decays by more than 2 psi within 15 seconds (due to joint leakage), the joint will have failed the test.

4. All test monitoring shall be in a location to allow for simultaneous and continuous observation by the Owner's Representative. The void pressure data shall be transmitted electronically from the void to the monitoring equipment.
5. Prior to starting the sanitary sewer joint testing, the testing equipment shall be required to have an up to date calibration certificate.
6. During the sanitary sewer joint testing work, the Contractor shall keep the following records:
 - a. Identification of the manhole to manhole section tested.
 - b. Pipe diameter and material
 - c. Test pressure used.
 - d. Location (footage) of each joint tested.
 - e. Test results for each joint tested.

B. Lamping Procedures: Lamping will be performed on all sewer pipelines first by the Contractor and then by the Owner. When lamping is to be performed by the Owner, the Contractor shall provide safe and suitable access to the sewer and assist and facilitate the Owner in execution, as needed.

3.03 MANHOLE TESTING METHODS

- A. All manhole inserts, new manholes, and replacement manholes shall be tested by the Contractor using the vacuum test method, prior to backfilling, following the manufacturer's recommendations for proper and safe procedures. Vacuum testing of manholes and structures shall be performed after installation of inserts. Any leakage in the manhole or structure, before, during, or after the test shall be repaired at no additional cost to the Owner. Joints dislodged or suspected of being dislodged during backfilling shall be re-excavated and tested. If the test passes the Contractor will be reimbursed, if the test fails the Contractor shall pay all costs.
- B. Manholes:
 1. Prior to testing manholes for water tightness, all lift holes shall be plugged with a non-shrink grout, all joints between precast sections shall be properly sealed and all pipe openings shall be temporarily plugged and properly braced
 2. Manholes shall be cleaned of all debris
 3. Vacuum Tests shall be performed in accordance with ASTM C1244-11: If the manhole fails the initial test, necessary repairs shall be made with non-shrink grout. Retesting shall proceed until a satisfactory test is obtained. Vacuum testing equipment shall be as manufactured by P.A. Glazier, Inc., or approved equal.
- C. The Owner's Representative reserves the right to have third party consultants perform construction materials testing and assessments to any new manhole.
- D. The use of soapy water on the manhole walls to help determine the areas of leakage is permitted.

END OF SECTION

SECTION 02700

PAVEMENT REPAIRS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Guidelines and requirements for pavement replacement.
- B. Procedures and requirements for surface preparation.
- C. Equipment requirements for appropriate completion of the Work.
- D. Requirements for asphaltic concrete placement and compaction.
- E. Requirements for pavement milling.
- F. Requirements for the cleaning and protection of pavement operations.
- G. Requirements for the installation and replacement of Standard Granite Curb, Grade B.
- H. Specifications for temporary pavement repairs.
- I. Requirements for specialty brick paver replacement.
- J. Requirements for special brick sidewalk replacement.

1.02 RELATED SECTIONS

- A. Section 02710: Concrete Curbs, Gutters, and Sidewalks
- B. Section 03300: Cast-In-Place Concrete

1.03 REFERENCES

- A. ASTM C94 - Standard Specification for Ready Mix Concrete.
- B. ASTM C33 - Standard Specification for Concrete Aggregates.
- C. ASTM C150 - Standard Specification for Portland Cement.
- D. ACI 301 - Specifications for Structural Concrete.
- E. ACI 304 - Guide for Measuring, Mixing, Transporting, and Placing Concrete.
- F. ASTM A185 - Welded Steel Wire Fabric for Concrete Reinforcement.
- G. ASTM A497 - Welded Deformed Steel Wire Fabric for Concrete Reinforcement.
- H. ASTM C494 - Chemical Admixtures for Concrete.

- I. ASTM D1751 - Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction.
- J. ASTM D3371 - Standard Specification for Viscosity-Graded Asphalt Cement for use in Pavement Construction.
- K. ASTM D946 - Standard Specification for Penetration Graded Asphalt Cement for use in Pavement Construction.
- L. AI (Asphalt Institute) - MS-2- Mix Design Methods for Asphalt Concrete and Other Hot Mix Types.
- M. AI (Asphalt Institute) - MS-3- Asphalt Plant Manual.
- N. AI (Asphalt Institute) - MS-8- Asphalt Paving Manual.
- O. AI (Asphalt Institute) - MS-19 - Basic Asphalt Emulsion Manual.
- P. AASHTO M147-65 - Materials for Aggregate and Soil Aggregates.
- Q. ASTM C-136 - Sieve Analysis of Fine and Coarse Aggregates.
- R. Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, latest edition.

1.04 SUBMITTALS

- A. The Contractor shall submit asphalt mix design to the Owner's Representative for approval.
- B. The Contractor shall submit tack and prime coat along with temporary and permanent marking materials.
- C. The Contractor shall submit certification of quality control and compliance with the requirements of this section. Certificates must be signed by asphalt and concrete producers and the Contractor.

1.05 PERFORMANCE REQUIREMENTS

- A. The Contractor shall comply with the performance standards and requirements established by the Georgia Department of Transportation (latest edition).
- B. Pavement shall be designed for movement of trucks up to 60,000 lbs.
- C. In addition to other specified conditions, the Contractor shall comply with the following minimum requirements:
 - 1. Finished asphaltic concrete courses shall be compacted to the following densities:
 - a. Asphaltic Concrete Hot Mix Surface Course; Not less than ninety-two (92) percent of theoretical density.

- b. b. Asphaltic Concrete Hot Mix Binder Course: Not less than ninety (90) percent of theoretical density.
2. On the day following placement of asphaltic materials, samples for the determination of in-place density shall be taken from the finished pavement. The Contractor's or Owner's testing agent shall core the samples at locations and in the manner directed by the Owner's Representative. The cuts made in taking such samples shall be repaired by the Contractor at no expense to the Owner other than for materials.
3. The finished surface, when checked with a ten-foot straightedge placed parallel to the centerline, shall show no variation more than one-quarter (1/4) inch for base and intermediate courses, and not more than one-eighth (1/8) inch for surface courses. All testing will be made in a longitudinal direction at intervals as directed by the Owner's Representative. Surface deviations for intermediate courses may be corrected by skin patching, feather-edging, or other methods providing the required smoothness and maintain quality material. However, surface deviations for surface courses shall be corrected to maintain a quality pavement having the same uniform texture and appearance as the adjoining surface. All corrective work shall be performed at the expense of the Contractor.

D. The Contractor shall conform to latest edition of all applicable codes and standards for paving work on public and private properties.

1.06 JOB CONDITIONS

- A. Weather Limitations:
 1. The Contractor shall apply bituminous prime and tack coats only when the ambient temperature in the shade is at least forty (40) degrees F.
 2. The Contractor shall not conduct paving operations when the surface is wet, frozen, or contains excess moisture preventing uniform distribution and required penetration.
 3. The Contractor shall construct asphaltic courses only when atmospheric temperature in the shade is above forty (40) degrees F, when the underlying base is dry and when weather is not rainy.
 4. The Contractor shall place base course when air temperature is above forty (40) degrees F and rising. The Contractor shall not place base course on a frozen or muddy subgrade.
 5. Subgrade shall be proof-rolled before placement of base course and all soft, spongy or rejected areas repaired at contractor's expense.
- B. Traffic Control:
 1. The Contractor shall maintain vehicular and pedestrian traffic during paving operations, as required for other construction activities.
 2. In addition, the Contractor shall provide certified flagmen, barricades, and warning signs for the safe and expeditious movement of traffic through construction zones within public rights-of-way.
- C. The Contractor shall establish and maintain the required lines and grades, including crown and cross-slope, for each course during construction operations.

- D. Temporary and permanent pavement markings/striping shall conform to the Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, latest edition.

1.07 QUALITY ASSURANCE

- A. The Contractor shall perform Work per the Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, latest edition.
- B. The Contractor shall obtain materials from the same approved source throughout the duration of the paving Work.
- C. The Contractor shall use only approved materials furnished by a bulk asphalt concrete producer regularly engaged in production of hot-mix, hot-laid asphalt concrete.

1.08 SOURCE QUALITY CONTROL

- A. The Contractor shall submit proposed mix design of each class of mix to the Owner's Representative for review prior to commencement of the Work.
- B. The Owner's independent testing laboratory shall test samples per AIMS-2.
- C. Designs shall be submitted in timely fashion near the beginning of project to allow for review time.

1.09 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed.
- B. The Owner's independent testing laboratory shall take samples and perform tests per the Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, latest edition.

1.010 PROTECTION

- A. Immediately after placement, the Contractor shall protect pavement from mechanical injury for seven (7) days.

PART 2 - PRODUCTS

2.01 FLEXIBLE PAVEMENT

- A. All materials shall be on the Georgia Department of Transportation's Qualified Products List (QPL).
- B. Aggregates for asphaltic concrete shall comply with the applicable requirements of the Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, latest edition.
- C. Asphaltic Cement for asphaltic concrete shall comply with the applicable requirements of the Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, latest edition

- D. Bituminous Prime Coat shall comply with the applicable requirements of the Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, latest edition.
- E. Bituminous Tack Coat shall comply with the applicable requirements of the Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, latest edition.
- F. Hot Mix Asphaltic Concrete construction shall comply with the applicable requirements of the Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, latest edition.

2.02 RIGID PAVEMENT

- A. Concrete and reinforcing bars (where required) for rigid pavement shall conform to GDOT requirements. Concrete for pavement shall be Class A.

2.03 CURB AND GUTTER

- A. Concrete for curb, curb and gutter, or valley gutter shall be Class A. Concrete shall conform to the requirements of Section 02710 – Concrete Curbs, Gutters, Sidewalks, and Driveways.

2.04 SIDEWALKS

- A. Concrete for sidewalks shall be Class A conforming to the requirements of Section 02710 – Concrete Curbs, Gutters, Sidewalks and Driveways.

2.05 DRIVEWAYS

- A. Concrete for driveways shall be Class A conforming to the requirements of Section 02710 – Concrete Curbs, Gutters, and Sidewalks and Driveways.

2.06 STANDARD GRANITE CURB, GRADE B

- A. Curbs shall be furnished in standard lengths of eight (8) feet in so far as possible employing shorter lengths where required so the minimum length employed shall not be less than four (4) feet long. Curb sections shall have a split face and split top. Each joint shall have an unreinforced concrete footing. On wheel chair ramps and driveways, the granite curb shall continue through depressed sections of these elements. On curved sections of roadway, the granite curb shall be split or cut on the curve.

2.07 SPECIALTY BRICK PAVER REPLACEMENT

- A. The Contractor shall verify the size, type, color, and pattern of the existing specialty brick pavement surface prior to removal. The Contractor shall submit to the Owner's Representative for review the proposed replacement brick paver material and installation information. Materials shall conform to the existing installation for pattern, color, and size.

2.08 SPECIALTY BRICK SIDEWALK REPLACEMENT

- A. All brick shall be solid pavers conforming to the requirements of the Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, Latest Edition. The Contractor shall submit to the Owner's Representative for review on the brick to be used to replace brick sidewalks within the Project area. Materials shall conform to the existing installation for pattern, color, and size and be on current GDOT QPL

PART 3 - EXECUTION

3.01 PAVEMENT REPLACEMENT

- A. The Contractor shall obtain prior approval from the Owner's Representative for any paving subcontracts.
- B. The Contractor shall replace all pavements following the guidelines established by the Georgia Department of Transportation and other authorities having jurisdiction.
- C. Where paved streets, sidewalks, driveways, and gutters are removed or damaged by the Contractor beyond the specified construction limits they shall be replaced per these specifications at the Contractor's expense. At any time an existing road (other than under GDOT jurisdiction), is cut longitudinally for a distance greater than one hundred (100) feet the extent of curb to curb restoration shall be provided as per the County Standards.
- D. Where chert, gravel, slag, or other unpaved street or driveway surfaces are removed or damaged, they shall be replaced with the same type of materials removed as an incidental part of the Work and no specific payment shall be allowed. Unpaved drives shall be topped with gravel at no additional cost to the Owner.
- E. In replacing pavements and unpaved surfaces, the materials used and the construction methods shall comply with the applicable requirements of the Georgia Department of Transportation Standard Specifications Construction of Transportation Systems, latest edition.
- F. All concrete pavement replaced shall not be less than four (4) inches thick or equal to the original if greater than four (4) inches.
- G. Pavements replaced shall be of the same type of construction as was removed, except no asphalt surface replaced shall be less than three (3) inches thick consisting of a binder and seal coat. Wearing surfaces shall be slag sealed in accordance with the requirements established by the Georgia Department of Transportation.

3.02 SURFACE PREPARATION

- A. Graded Aggregate Base Course:
 - 1. The Contractor shall check subgrade for stability, conformity with elevations and cross-section immediately before placing aggregate base material.
 - 2. The Contractor shall place aggregate base material in compacted layers not more than six (6) inches thick.

3. The Contractor shall spread, shape, and compact all aggregate base material deposited on the subgrade during the same day. The subgrade shall be compacted and proof-rolled.
4. The compacted base shall have sufficient stability to support construction traffic without pumping.
5. If compacted base becomes unstable as a result of too much moisture, the base material and underlying subgrade, if necessary, shall be dried and reworked to a moisture content that can be re-compacted and not exhibit signs of pumping.

B. Loose and Foreign Material:

1. The Contractor shall remove loose and foreign material from the surface immediately before application of prime and paving.
2. The Contractor shall use power brooms or blowers, and hand brooming as required.
3. The Contractor shall not displace surface material.

C. Prime Coat:

1. The Contractor shall uniformly apply at a rate of 0.20 to 0.50 gallon per square yard over compacted and cleaned sub base surface.
2. The Contractor shall apply enough material to penetrate and seal, but not flood the surface.
3. The Contractor shall allow material to cure and dry as long as required to attain penetration and evaporation of volatiles, and in no case less than twenty-four (24) hours, unless otherwise acceptable to the Engineer.
4. The Contractor shall blot excess asphalt with just enough sand to prevent pick-up under traffic.
5. The Contractor shall remove loose sand before paving.

D. Tack Coat:

1. The Contractor shall dilute material with equal parts of water and apply to contact surfaces of previously constructed asphalt concrete or Portland cement concrete and similar surfaces.
2. The Contractor shall apply at a rate of 0.05 to 0.15 gallons per square yard of surface.
3. The Contractor shall apply tack coat by brush to contact surfaces of curbs, gutters, manholes, and other structures projecting into or abutting asphalt concrete pavement.
4. The Contractor shall allow surfaces to dry until material is at a condition of tackiness to receive pavement.

3.03 EQUIPMENT

A. The Contractor shall provide size and quantity of equipment to complete the work specified in this section. Note: If breakdown rolling is going to be done to establish production compaction, then the same rollers and operators need to be used. Any changes should require a new breakdown strip.

- B. Bituminous pavers shall be in good operable condition, self-propelled and spread hot asphalt concrete mixtures without tearing, shoving, or gouging surfaces, and control pavement edges to true lines without use of stationary forms.
- C. Rolling equipment shall be self-propelled, steel-wheeled, or pneumatic-tired rollers that can reverse direction without backlash.
- D. The Contractor shall provide rakes, lutes, shovels, tampers, smoothing irons, pavement cutters, portable heaters, and other miscellaneous small tools to complete the work specified in this section.

3.04 ASPHALTIC CONCRETE PLACEMENT

- A. The Contractor shall place asphalt concrete mix on prepared surfaces, spread, and strike-off using paving machine.
- B. Mix design maximum and minimum temperatures should govern. The Contractor shall spread the asphaltic concrete mixture at a minimum temperature of two-hundred and twenty-five (225) degrees F. Contractor shall closely monitor temperature of the asphaltic concrete mixture delivered to the project and deposited in the paver. Material that drops below the target temperature shall be removed from the project. Material shall be delivered and deposited without segregation.
- C. Inaccessible and small areas may be placed by hand.
- D. The Contractor shall place each course at a thickness such that when compacted it will conform to the indicated grade, cross-section, finish thickness, and density indicated in the Plans.
- E. Pavement Placing:
 1. Unless otherwise directed by the Engineer, the Contractor shall begin placing asphaltic concrete along the centerline of areas to be paved on crowned section, and at high side of sections on one-way slope, and in direction of traffic flow.
 2. After first strip has been placed and rolled, the Contractor shall place succeeding strips and extend rolling to overlap previous strips.
 3. The Contractor shall complete base courses for a section before placing surface courses.
 4. The Contractor shall place the asphaltic concrete mixture in as continuous an operation as practical.
- F. Hand Placing:
 1. The Contractor shall spread, tamp, and finish the asphaltic concrete mixture using hand tools in areas where machine spreading is not possible, as acceptable to Owner's Representative.
 2. The Contractor shall place the asphaltic concrete mixture at a rate ensuring handling and compaction before mixture becomes cooler than acceptable working temperature. Material that cools beyond acceptable limits shall be removed.

G. Joints:

1. The Contractor shall carefully make joints between old and new pavements, or between successive days work, to ensure a continuous bond between adjoining Work.
2. The Contractor shall construct joints to have the same texture, density, and smoothness as adjacent sections of asphalt concrete course.
3. The Contractor shall clean contact surfaces free of sand, dirt, or other objectionable material and apply tack coat.
4. The Contractor shall offset transverse joints in succeeding courses not less than twenty-four (24) inches.
5. The Contractor shall cut back edge of previously placed course to expose an even, vertical surface for full course thickness.
6. The Contractor shall offset longitudinal joints in succeeding courses not less than six (6) inches.
7. When the edges of longitudinal joints are irregular, honeycombed, or inadequately compacted, the Contractor shall cut back unsatisfactory sections to expose an even, vertical surface for full course thickness.

3.05 ASPHALTIC CONCRETE COMPACTION

- A. The Contractor shall provide sufficient rollers to obtain the required pavement density.
- B. The Contractor shall begin rolling operations as soon after placing as the mixture will bear weight of roller without excessive displacement.
- C. The Contractor shall not permit heavy equipment, including rollers, to stand on finished surface before it has thoroughly cooled or set.
- D. The Contractor shall compact the asphaltic concrete mixture with hot hand tampers or vibrating plate compactors in areas inaccessible to rollers.
- E. The Contractor shall start rolling longitudinally at extreme lower side of sections and proceed toward center of pavement. The Contractor shall roll to slightly different lengths on alternate roller runs.
- F. The Contractor shall not roll centers of sections first under any circumstances.
- G. Breakdown Rolling:

1. The Contractor shall accomplish breakdown or initial rolling immediately following rolling of transverse and longitudinal joints and the outside edge.
2. The Contractor shall operate rollers as close as possible to paver without causing pavement displacement.
3. The Contractor shall check crown, grade, and smoothness after breakdown rolling.
4. The Contractor shall repair displaced areas by loosening at once with lutes or rakes and filling, if required, with hot loose material before continuing rolling.

H. Second Rolling:

1. The Contractor shall follow breakdown rolling as soon as possible, while the asphaltic concrete mixture is hot and in condition for compaction.
2. The Contractor shall continue second rolling until the asphaltic concrete mixture has been thoroughly compacted.

I. Finish Rolling:

1. The Contractor shall perform finish rolling while the asphaltic concrete mixture is still warm enough for removal of roller marks.
2. The Contractor shall continue rolling until roller marks are eliminated and the course has attained specified density.

J. Patching:

1. The Contractor shall remove and replace defective areas.
2. The Contractor shall cut-out and fill with fresh, hot asphalt concrete.
3. The Contractor shall compact by rolling to specified surface density and smoothness.
4. The Contractor shall remove deficient areas for full depth of course.
5. The Contractor shall cut sides perpendicular and parallel to direction of traffic with edges vertical.
6. The Contractor shall apply tack coat to exposed surfaces before placing new asphaltic concrete mixture.

3.06 PAVEMENT MILLING

A. In street areas where pavement replacement occurs, pavement milling will be performed by the Contractor to eliminate excessive buildup of pavement. The depth of milling will range from zero (0) inches measured at six (6) feet from each edge of pavement to a minimum depth of one and one-half (1½) inches measured at each edge of pavement or as directed by the Owner's Representative.

3.07 CLEANING AND PROTECTION

A. Cleaning: After completion of paving operations, the Contractor shall clean surfaces of excess or spilled asphalt materials to the satisfaction of the Engineer.

B. Protection:

1. After final rolling, the Contractor shall not permit vehicular traffic on asphaltic concrete pavements until it has cooled and hardened and in no case no sooner than six (6) hours.
2. The Contractor shall provide barricades and warning devices as required to protect pavement and the general public.

C. Maintenance: The Contractor shall maintain the surfaces of pavements until the acceptance of the Work. Maintenance shall include replacement, overlaying, milling, and reshaping as necessary to prevent raveling of the road material, the preservation of smooth surfaces and the repair of damaged or unsatisfactory surfaces, to the satisfaction of the Owner's Representative.

3.08 TEMPORARY ROADWAY PAVING REPAIRS

- A. Temporary cold or permanent hot asphalt patching will be required for both transverse and longitudinal roadway cuts upon completing backfilling requirements at the end of each day's work if the road is to be opened for local traffic while work has stopped.
- B. It shall be the Contractor's responsibility to maintain the temporary paving in such condition as to prevent hindrance or hazard to traffic. When final paving is undertaken the temporary surfacing materials shall be removed to accommodate final paving of types and thicknesses as specified in this section, the edges of the existing paving shall be neatly and uniformly trimmed, and the permanent pavement shall be placed.
- C. Steel Plate Bridging

- 1. At the Owner's Representative's discretion, steel plate bridging may be used. The Contractor must adhere to the following chart with respect to minimum plate size and thickness.

Trench Width	Minimum Plate Thickness
10" (0.25 m)	1/2" (13 mm)
1'-11" (0.58 m)	3/4" (19 mm)
2'-7" (0.80 m)	7/8" (22 mm)
3'-5" (1.04 m)	1" (25 mm)
5'-3" (1.60 m)	1 1/4" (32 mm)

*For trench widths greater than 5' 3", the Engineer will determine the plate thickness.

- 2. Steel plates used for bridging must extend a minimum of twelve (12) inches beyond all edges of the trench.
 - 3. For traffic speeds less than forty-five (45) mph, the surrounding pavement shall be cold planed to a depth equal to that of the steel plate selected.
 - 4. For traffic speeds greater than forty-five (45) mph, approach plate(s) and ending plate (if longitudinal placement) shall be attached to the roadway by a minimum of two (2) dowels pre-drilled into the corners of the plate and drilled two (2) inches into the pavement. Subsequent plates shall be butted to each other. Fine graded asphalt concrete shall be compacted to form ramps, maximum slope eight and one-half (8 1/2) percent with a minimum twelve (12) inches taper to cover all edges of the steel plates. When steel plates are removed, the dowel holes in the pavement shall be backfilled with either graded fines of asphalt concrete mix, concrete slurry, or equivalent slurry that is satisfactory to the Owner's Representative.
 - 5. Steel plates shall not be left on the road for more than the minimum required days for the timely and expeditious performance of paving.

- D. Crusher Run Aggregate

1. Temporary patch paving using crusher run aggregate (8910 stone) shall be placed and maintained only as approved and directed by the Owner's Representative. All compacted material shall conform closely enough to the existing road surface so as to permit safe travel.
2. Crusher run aggregate shall consist of coarse crushed stone, crushed slag fragments, or Portland cement concrete fragments blended with crushed particles of the same material.

3.09 STANDARD GRANITE CURB, GRADE B

- A. This work shall consist of furnishing and installing the standard granite curb where indicated in the Plans or directed by the Owner's Representative. In general, granite curb to be installed shall match existing granite curb either removed or damaged in the progress of the Work.
- B. Installing standard granite curb, Grade B, shall include saw cutting existing asphalt concrete pavement a minimum of one (1) inch and removing remaining pavement to subgrade, excavating base and subgrade as necessary to install the granite curbing and backfilling and compacting the installation.

3.010 REPLACEMENT OF EXISTING BRICK PAVEMENT

- A. This work shall consist of replacing existing brick pavement removed to install sanitary sewers or connection of services.
- B. Existing brick pavers removed to accommodate sanitary sewers or services or damaged by the Work shall be removed in neat, rectangular sections the full width of the pavement as shown on the Plans. Existing concrete base slabs shall be cut with a concrete saw and removed prior to replacement. Replacement construction shall match existing pavement section, including concrete base slab.

3.011 SPECIALTY BRICK SIDEWALK REPLACEMENT

- A. This work shall consist of replacing existing brick sidewalks removed for connecting services or for installing sanitary sewers.
- B. Existing brick sidewalk removed to accommodate the sanitary sewers or services or damaged by the Work shall be removed in neat, rectangular sections the full width of the sidewalk or driveway on a line perpendicular to the street. Existing concrete base slabs shall be cut with a concrete saw and removed prior to replacement. Brick pavers shall be laid on a four (4)-inch thick concrete base slab and meet the same requirements as Standard Concrete Sidewalk four (4) inches thick.

END OF SECTION

SECTION 02710
CONCRETE CURBS, GUTTERS, SIDEWALKS AND DRIVEWAYS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Preparation of Subgrade.
- B. Setting Forms.
- C. Curb Construction.
- D. Sidewalk Construction.
- E. Driveway Construction

1.02 RELATED SECTIONS

- A. Section 02700 - Pavement Repairs
- B. Section 03300 – Cast-in-Place Concrete

1.03 SUBMITTALS

- A. The Contractor shall submit concrete mix design for curbs, gutters, sidewalks and driveways design to the Owner's Representative for approval.
- B. The Contractor shall submit the following for approval if required of the specific project application:
 - 1. Curing compound
 - 2. Expansion joint
 - 3. Standard granite curb, grade B
 - 4. Specialty brick paver materials

PART 2 - PRODUCTS

2.01 FORMS

- A. Materials for curb forms shall be standard metal, wood, or fiberglass forms free from defects impairing the appearance or structural quality of the completed curb. Form material for the face of the curb shall not have any horizontal joints closer than seven (7) inches from the top of the curb. The Contractor shall provide stakes and bracing materials as required to hold forms securely in place.
- B. Materials for sidewalk and driveway forms shall be standard metal forms. The Contractor shall provide stakes and bracing materials as required to hold forms securely in place.

- C. Use flexible spring steel forms or laminated boards to form radius bends as required.

2.02 CRUSHED ROCK BASE

Crushed rock base shall consist of clean three-quarters (3) inch or smaller crushed rock or crushed gravel, free from foreign material and meeting the GDOT Standard Specifications, Construction and Transportation Systems, latest edition.

2.03 EXPANSION JOINT FILLER

Expansion joint filler shall be one-half (1/2) inch thick, preformed asphalt- impregnated, expansion joint material conforming to the requirements of ASTM D994.

2.04 CONCRETE

Concrete shall be Ready-Mix, Class A, 3,000 psi compressive strength, conforming to ASTM C94.

2.05 CURING COMPOUND

Liquid membrane-forming curing compound shall be clear or translucent, suitable for spray application and shall conform to the requirements of ASTM C309, Type 1.

PART 3 - EXECUTION

3.01 PREPARATION OF SUBGRADE

The Contractor shall bring the areas where curbs and sidewalks are to be constructed to required grade on undisturbed ground and compact by sprinkling and rolling or mechanical tamping. As depressions occur, the Contractor shall refill with suitable material and re-compact.

3.02 SETTING FORMS

- A. The Contractor shall construct forms to the shape, lines, grades, and dimensions shown on the Plans. The Contractor shall stake wood or steel forms securely in place, true to line and grade.
- B. Forms on the face of the curb shall not have any horizontal joints within seven (7) inches of the top of the curb. The Contractor shall brace forms to prevent change of shape or movement in any direction resulting from the weight of the concrete during placement. The Contractor shall construct short-radius curved forms to exact radius. Tops of forms shall not depart from grade line more than one-eighth (1/8) inch when checked with a ten (10) foot straightedge. Alignment of straight sections shall not vary more than one-eighth (1/8) inch in ten (10) feet.

3.03 CURB CONSTRUCTION

- A. The Contractor shall construct curbs to line and grade shown on the Plans. Curbs shall conform to the details shown on the Plans.

- B. The Contractor shall place preformed asphalt-impregnated expansion joints at intervals not exceeding fifty (50) feet and at the beginning and end of curved portions of the curb and where abutting existing surfaces
- C. The Contractor shall place contraction joints in the curb at intervals not exceeding fifteen (15) feet. Contraction joints shall be of the open joint type and shall be provided by inserting a thin, oiled steel sheet vertically in the fresh concrete to force coarse aggregate away from the joint. The steel sheet shall be inserted in the full depth of the curb. The Contractor shall place, process, finish, and cure concrete in conformance with the applicable requirements of ACI 614, and the requirements of this section. Whenever the requirements differ, the more stringent shall govern. After initial set has occurred in the concrete and prior to removing the front curb form, steel sheet shall be removed with a sawing motion. The Contractor shall finish top of curb with a steel trowel and finish edges with a steel edging tool.
- D. As soon as the concrete has set sufficiently to support its own weight, the Contractor shall form and finish all exposed surfaces. The Contractor shall finish formed face by rubbing with a burlap sack or similar device producing a uniformly textured surface, free of form marks, honeycomb, and other defects. All defective concrete shall be removed and replaced at the Contractor's sole expense. Upon completion of the finishing, the Contractor shall apply an approved curing compound to exposed surfaces of the curb. Curing shall continue for a minimum of five (5) days. The Contractor shall protect the curb from damage for a period of seven (7) days from the date of pouring.
- E. Upon completion of the curing period, but not before seven (7) days have elapsed since pouring the concrete, the Contractor shall backfill the curb with earth, free from rocks two (2) inches or larger and other foreign material. The Contractor shall tamp backfill firmly in place.
- F. Finished curb shall present a uniform appearance for both grade and alignment. The Contractor shall remove any section of the curb showing abrupt changes in alignment or grade, or is more than one-quarter (1/4.) inch away from its location as staked, and construct new curb in its place at the Contractor's sole expense.

3.04 SIDEWALK CONSTRUCTION

- A. Sidewalks shall be four (4) inches thick in walk areas and six (6) inches thick in driveway areas.
- B. At locations where the new sidewalks are to abut existing concrete, the Contractor shall saw concrete for a depth of one-half (1/2) inch and chip the old concrete back to sound material on a straight line, clean the surface, and apply a neat cement paste just prior to pouring the new sidewalk.
- C. The Contractor shall place preformed asphalt expansion joints as in the adjacent curb, where the sidewalk ends at a curb, and around posts, poles, or other objects protruding through the sidewalk and where abutting existing surfaces.
- D. The Contractor shall provide contraction joints transversely to the walks at locations opposite the contraction joints in the curb. These joints shall be three-sixteenths

(3/16) inch weakened plane joints. They shall be straight and at right angles to the surface of the walk.

- E. The Contractor shall place, process, finish, and cure concrete in conformance with the applicable requirements of ACI 614 and the requirements of this section. Where the requirements differ, the more stringent shall govern.
- F. The Contractor shall broom the surface with a fine-hair broom at right angles to the length of the walk and tool all edges, joints, and markings. The Contractor shall mark the walks transversely at five (5) foot intervals with a joining tool. Upon completion of the finishing, the Contractor shall apply an approved curing compound to exposed surfaces. The Contractor shall protect the sidewalk from damage for a period of seven (7) days from the date of pouring.

3.05 DRIVEWAY CONSTRUCTION

- A. Driveways shall be minimum of six (6) inches thick.
- B. At locations where the new driveways are to abut existing concrete, the Contractor shall saw concrete for a depth of one-half (1/2) inch and chip the old concrete back to sound material on a straight line, clean the surface, and apply a neat cement paste just prior to pouring the new sidewalk. If existing driveway has reinforcing, same shall be put back matching existing. Dowel and epoxy bars in to existing if required by Owner's Representative.
- C. The Contractor shall place preformed asphalt expansion joints as in the adjacent curb, where the driveway ends at a curb.
- D. The Contractor shall provide contraction joints transversely to the walks at locations opposite the contraction joints in the curb. These joints shall be three- sixteenths (3/16) inch weakened plane joints. They shall be straight and at right angles to the surface of the driveway.
- E. The Contractor shall place, process, finish, and cure concrete in conformance with the applicable requirements of ACI 614 and the requirements of this section. Where the requirements differ, the more stringent shall govern.
- F. The Contractor shall broom the surface with a fine-hair broom at right angles to the length of the drive and tool all edges, joints, and markings. The Contractor shall mark the drives transversely at fifteen (15) foot intervals with a joining tool. Upon completion of the finishing, the Contractor shall apply an approved curing compound to exposed surfaces. The Contractor shall protect the driveway from damage for a period of seven (7) days from the date of pouring.

END OF SECTION

SECTION 02900
SANITARY SEWER MANHOLE REHABILITATION

PART 1 -- GENERAL

1.01 SECTION INCLUDES

- A. This section of these Specifications provides for rehabilitating manholes to include the repair/replacement/rebuilding/sealing of the base, trough, bench, walls, and cone, and removal of unsound construction material. Work includes surface preparation, sealing, and testing.

1.02 RELATED SECTIONS

- A. Section 01520: Sewer Flow Control
- B. Section 02276: Site Restoration and Erosion Control
- C. Section 02901: Rehabilitation of Concrete and Masonry Structures with a Protective Coating

1.03 REFERENCES

- A. The following published standards from the American Society for Testing and Materials (ASTM)
 - ASTM C78 Flexural Strength of Concrete (Using Simple Beam With Third-Point Loading)
 - ASTM C109 Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimen)
 - ASTM C157 Length Change of Hardened Hydraulic-Cement Mortar and Concrete
 - ASTM C-191-08 Standard Test Methods for Time of Setting of Hydraulic Cement by Vicat Needle
 - ASTM C882 Standard Test Method for Bond Strength of Epoxy- Resin Systems Used With Concrete by Slant Shear
 - ASTM C876 Half-Cell Potentials of Uncoated Reinforcing Steel in Concrete
 - ASTM D543 Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents
 - ASTM D638-10 Standard Test Method for Tensile Properties of Plastics
 - ASTM D695-10 Standard Test Method for Compressive Properties of Rigid Plastics
 - ASTM D-790 Properties of Unreinforced and Reinforced Plastics and

Electrical Insulating Materials

ASTM D2240-05 (2010) Standard Test Method for Rubber Property—Durometer Hardness BS 7816-3:1998- (ASTM D2240-75 not found; this standard published 07/15/1998 by British Standards Institution.)

ASTM D2566 Withdrawn Standard: ASTM D2566 Test Method for Linear Shrinkage of Cured Thermosetting Casting Resins During Cure (Withdrawn 1993)

ASTM D2584 Standard Test Method for Ignition Loss of Cured Reinforced Resins

ASTM D4138 Measurement of Dry Film Thickness of Protective Coating Systems by Destructive Means

ASTM D4414 Standard Practice for Measurement of Wet Film Thickness by Notch Gages

ASTM D4541 Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers

ASTM D4787 Standard Practice for Continuity Verification of Liquid or Sheet Linings Applied to Concrete Substrates

- B. National Association of Corrosion Engineers International, NACE RP 0188 currently known as SP0188-Discontinuity (Holiday) Testing of Protective Coatings.
- C. SSPC- The published standards of the Society of Protective Coatings, Pittsburgh, PA.
- D. International Concrete Repair Institute (ICRI) Technical Guideline No. 03730 -Surface Preparation Guidelines for the Repair of Deteriorated Concrete Resulting From Reinforcing Steel Corrosion.
- E. Potable Water Main, Gravity Sanitary Sewer, and Sanitary Sewer and Force Main Design Standards, DeKalb County Department of Watershed Management, Latest Edition and Version.

1.04 SUBMITTALS

- A. All Submittals shall be received and approved by the Owner's Representative prior to beginning work.
- B. The Contractor shall submit the following items at least thirty (30) calendar days prior to starting manhole/vault rehabilitation:
 1. Manufacturers' Certificate of Compliance certifying compliance with the applicable specifications and standards. The certifications shall list all materials furnished under this Section and confirm the materials furnished for rehabilitation system selected are compatible with one another.
 2. Certified copies of factory test reports required by the applicable standards, the manufacturer, and this Section.

3. Manufacturer's handling, storage, and installation instructions and procedures.
4. Manufacturer's Certification indicating the installer is approved to install specified rehabilitation system.
5. Documentation of successful projects in the specified rehabilitation system and confirmation of required experience.
6. Shop drawings and samples for any material proposed as equal to a specified material. The Contractor shall submit sufficient manufacturer's information to include, but not be limited to, the rehabilitation system, equipment components, material/chemical properties, mixing and proportioning requirements, maximum pot life, film/coating thickness, curing, and environmental requirements for application.
7. Written daily reports from manufacturer regarding specified site visits.

C. The Contractor shall complete, and provide to the Owner's Representative, a daily written record (diary) detailing the work carried out and any small items of Work incidental to the Work. The Contractor shall include in his daily record and reference to the following:

1. Delays: Dense traffic, lack of information, sickness, labor or equipment shortage, etc.
2. Weather: Conditions (e.g., rain, sunny, windy, etc.).
3. Equipment: On site (e.g., specialty cleaning, by-pass equipment, etc.).
4. Submittals: To the Owner's Representative.
5. Personnel: On site by name (e.g., all labor, specialty services, etc.).
6. Accident: Report (e.g., all injuries, vehicles, etc.).
7. Incident: Report (e.g., damage to property, property owner complaint, etc.).
8. Major defects encountered: including collapsed pipe, if any, cave-ins, sink holes, etc.
9. Visitors: On site.
10. Disposals: Type and quantity of debris (including liquids).

1.05 EXPERIENCE/QUALIFICATIONS

- A. The supervisor of the field crews shall have received manufacturer certified proper training and have a minimum of three (3) years' experience in applying the specified product(s) covered under this section of the Specifications, practicing safe working practices and confined space entry procedures, and using the types of equipment and product/materials required. Submit confirming documentation.
- B. Field crew leaders shall have received manufacturer certified proper training in this function and have a minimum of two (2) years' experience in applying the specified product(s) covered under this section of the Specifications, practicing safe working practices and confined space entry procedures, and using the types of equipment and product/materials required. Submit confirming documentation.
- C. Experience shall include, at a minimum, projects successfully completed, incorporating not less than 250 manholes and performed within the last 10 years using the specified rehabilitation system. Submit confirming documentation.

- D. No crewmembers shall enter confined spaces without the necessary certified training as required under applicable Federal, State, and local laws, regulations, standards, policies, procedures, and requirements, and permit.

1.06 LINING SYSTEMS

The lining system used shall result in a monolithic structure to the shape and contour of the interior of the existing manhole. The lining system shall be completely water tight and free of any defects, joints or openings other than pipe inlets, pipe outlets and the rim opening. The junction of the lining material with the pipe material at the inlets and outlets shall be watertight. Defects shall include, but not be limited to uncured material, inadequate thickness, pinholes, blisters, delamination, foreign matter, unspecified materials or other objectionable conditions as determined by the Owner.

1.07 RESPONSIBILITY FOR OVERFLOWS/SPILLS AND DAMAGE TO PROPERTY AND UTILITY

- A. Reference Specification Section 01030 – Special Project Procedures.

1.08 SAFETY

- A. All work shall be performed in accordance with OSHA standards and local, State and Federal safety regulations.
- B. No person shall enter a confined space without the documented requisite training, certification, and entry permit.

PART 2 – PRODUCTS

2.01 GENERAL

- A. Materials:
 - 1. The materials used shall be designed, manufactured, and intended for sewer manhole/vault rehabilitation and the specific application for which they are used. The materials shall have a proven history of performance in sewer manhole/vault rehabilitation for a minimum of 10 years nationally, regarding similar age, groundwater levels, and environmental characteristics. The materials shall be delivered to the Work Site in original unopened packages and clearly labeled with the manufacturer's identification and printed instructions. All materials shall be stored and handled per the manufacturer's published recommendations. All materials shall be mixed and applied per the manufacturer's written instructions. Materials that have been stored or handled incorrectly, or are outside the shelf life shall not be used.
 - 2. The Contractor shall warrant and save harmless the Owner against all claims for patent infringement and any loss thereof.
 - 3. Dispose of all wastes in accordance with applicable regulations.
 - 4. Each coating/lining system shall be designed for application over wet surfaces, but not active running water, without degradation of the final product and/or the bond between the product and the manhole/vault surfaces.
- B. Pressure grout active leaks:

1. Pressure grout shall be an acrylamide gel pressure sealant system provided by a single manufacturer. The acrylamide gel pressure sealant system shall consist of a dry powder chemical readily dissolvable in water to form a low viscosity solution stiffening to a gel when mixed with an aqueous persulphate catalyst and a triethanolamine activator.
2. During injection, chemical sealant shall be able to react in presence of infiltrating water.
3. The system shall have the following characteristics:
 - a. A minimum of ten (10) percent acrylamide base material by weight in the total sealant mix.
 - b. A higher concentration (percent) of acrylamide base material may be used to increase strength or offset dilution during injection.
 - c. Capable of withstanding submergence in water without degradation.
 - d. Prevent passage of water through manhole defect
 - e. Flexible as opposed to brittle or rigid.
 - f. In place, able to withstand freeze/thaw and wet/dry cycles without adversely affecting seal.
 - g. Mixing of component materials shall be compatible with field conditions
 - h. Residual sealing materials shall be easily removable from manhole bench.
 - i. Constant viscosity during reaction period.
 - j. Additives to increase viscosity, adjust cure time though the range of ten (10) seconds to one (1) hour, density, shrinkage, compressive strength, tensile strength, and pH.
 - 1) Diatomaceous earth (Celite 209 or equal) can be added to concentration of five percent.
 - 2) Use of other additives following manufacturer's recommendation and Engineer's approval.
 - k. Cured product shall be resistant to dehydration, homogeneous, chemically stable, non-biodegradable, firm, flexible gel. Any suggested manufacturer and material identification.
 - l. Root control additive 2, 6-Dichlorobenzonitrile, may be added following manufacturer's recommendation and the Owner's Representative's direction. Any suggested manufacturer and material identification.

C. Stopping active leaks (hydraulic cement):

1. A premixed fast-setting product, specifically formulated for leak control, creating a volume-stable waterproof cement plug consisting of hydraulic cement, graded silica aggregates, special plasticizing and accelerating agents. It shall not contain chlorides, gypsum's, plasters, iron particles, aluminum powder or gas-forming agents, or promote the corrosion of steel it may come in contact with. Set time shall be approximately one (1) minute. Ten (10) minute compressive strength shall be approximately 500 psi.
 - a. The product shall be designed to rapidly stop flowing leaks in vertical and horizontal, concrete and masonry surfaces.
 - b. The product shall develop high early compressive and tensile strength

Cure Time	Compressive Strength ASTM C109	Tensile Strength ASTM C496
1 day	3500 psi	-----
7 day	4900 psi	290 psi
28 day	5500 psi	575 psi

c. Hydraulic cement shall be Quad-Plug manufactured by Quadex, Mainstay ML-10 manufactured by Madewell Products Corporation, OCTOCRETE manufactured by IPA Systems, or approved equal.

2. A siliconate-based liquid accelerator field mixed with neat Portland cement. The set time shall be approximately one (1) minute.

3. The elastomeric polyurethane resin-soaked method, using dry twisted jute oakum, or resin-rod with polyurethane resin (water activated).

D. Patching, repointing, filling, and repairing non-leaking holes, cracks, and spalls in concrete and masonry manholes (Cement Mortar):

1. A premixed non-shrink cement-based patching material consisting of hydraulic cement, graded silica aggregates, special plasticizing and accelerating agents, which has been formulated for vertical or overhead use. It shall not contain chlorides, gypsums, plasters, iron particles, aluminum powder, or gas-forming agents or promote the corrosion of steel it may come into contact with. Set time (ASTM C-191) shall be less than thirty (30) minutes. One- (1) hour compressive strength (ASTM C-109) shall be a minimum of 200 psi and the ultimate compressive strengths (ASTM C-882-Modified) shall be a minimum of 1700 psi.

2. The product shall display the following properties:

	Strength (psi)		
	Day	7 Day	28 Day
Compressive Strength (ASTM C 109)	3,875	4,550	6,190
Flexural Strength (ASTM C 78)	-----	825	985
Tensile Strength (ASTM C 496)	-----	290	575
Shrinkage (ASTM C 157, Modified)	0.04 Percent @ 28 Days		

3. Shall be a factory blended, low shrinkage, high strength, polymer modified, sprayable or trowable, microsilica mortar.

4. The cement mortar shall be QM-1s Restore by Quadex, Inc., Mainstay ML-10 by Madewell Products Corporation, or approved alternate.

E. Spray applied or centrifugally cast lightweight structural reinforced cement manhole lining (Cement Mortar):

1. A premixed non-shrink cement-based patching material consisting of hydraulic cement, graded silica aggregates, special plasticizing and accelerating agents, formulated for vertical or overhead use. It shall not contain chlorides, gypsums, plasters, iron particles, aluminum powder, or gas-forming agents or promote the corrosion of steel it may come into contact with. Set time (ASTM C-191) shall be less than 30 minutes. One-hour compressive strength as required in ASTM C-109.

2. The product shall display the following properties:

	Strength (psi)		
	Day	7 Day	28 Day
Compressive Strength (ASTM C 109)	3,875	4,550	6,190
Flexural Strength (ASTM C 78)	-----	825	985
Tensile Strength (ASTM C 496)	-----	290	575
Shrinkage (ASTM C 157, Modified)	0.04 Percent @ 28 Days		

3. Shall be a factory blended, low shrinkage, high strength, polymer modified, sprayable, microsilica mortar.

4. Shall be suitable for low-pressure spray or trowel application for the repair of vertical and horizontal concrete and masonry structures.

5. Cement mortar shall be QM-1s Restore by Quadex, Inc., Mainstay ML-72 by Madewell Products Corporation, Silatec MSM by CemTec (A.W. Cook Cements), SewperCoat by Kerneos or approved alternate.

F. Spray applied corrosion protection (epoxy coating):

- Unless otherwise authorized, only structures exhibiting damage due to corrosion shall receive the epoxy coating.
- The material sprayed onto the surface of the manhole shall be one-hundred percent (100%) solids high build epoxy coating formulated for application within a sanitary sewer environment.
- The coating thickness shall be a minimum of 125 mils in one (1) or two (2) multi-pass coats.
- The coating color shall typically be white or off white.
- If an adhesion coating is required between the concrete structure and the epoxy coating, the cost of the adhesion coat is included in the cost of the 100% solids, high build epoxy coating and approved by the high build epoxy coating manufacturer.
- Manufacturer's published directions regarding surface preparation shall be followed and is included in the cost of the 100% solids, high build epoxy coating. Manufacturer shall approve preparation of surface prior to application.
- The cured epoxy resin system shall conform to the following minimum structural standards:

	Strength (psi)
Compressive Strength (ASTM D-695)	13,000
Flexural Strength (ASTM D-790)	13,000
Tensile Strength (ASTM D-638)	7,000
Flexural Modulus (ASTM-790)	500,000

8. The epoxy coating shall be Mainstay DS-5 by Madewell Products Corporation, Raven 405 by Raven Lining Systems, or approved alternate.

G. Composite structure/corrosion protection system:

1. Unless otherwise authorized, only structures exhibiting damage due to corrosion shall receive the composite system.
2. The coating thickness shall be a minimum of $\frac{1}{2}$ -inch.
3. If an adhesion coating is required between the concrete structure and the composite system, the cost of the adhesion coat shall be included in the cost of the composite system and approved by the composite system manufacturer.
4. The composite system shall be SewperCoat by Kerneos or approved alternate.

H. Fiberglass Insert Liner:

1. The materials used for lining manholes shall be engineered to support a standard 16,000-pound vertical dynamic wheel load (AASHTO H-20) when used in conjunction with the reinforced precast manhole cone or integral fiberglass cone section.
2. The manhole shall be fitted with a fiberglass liner with no sidewall joints, seams or sections. The fiberglass manhole insert liner shall meet all requirements of ASTM D3753 for glass fiber reinforced polyester manholes.
3. The annular void grout shall be standard 6-bag (Type II) Portland cement mix with $\frac{1}{4}$ " (maximum) coarse aggregate producing a minimum 3000 psi compressive strength at full cure (28 days).
4. A quick setting, high strength non-shrinking cement grout shall be used for positioning and sealing the fiberglass manhole insert liner prior to annular void grouting.
5. The hydraulic cement, cement mortar, epoxy coating and composite system do not have to be from the same manufacturer, however, the Contractor is responsible for assuring compatibility of the various components and obtaining written approval of the liner manufacturer.

PART 3 – EXECUTION

3.01 REHABILITATION OF MANHOLE STRUCTURE

A. Contractor to provide the following items, but not limited to, as directed by the Owner's Representative:

1. Pressure grout leaks.
2. Repair leaking crack, joint and/or lift hole with hydraulic cement mortar.
3. Repair non-leaking crack, joint and/or lift hole with non-shrink cement based mortar.
4. Clean structure in accordance with liner manufacturer's specification.
5. Restore the structural integrity by lining the manhole with cement mortar.
6. Provide corrosion barrier by lining the manhole with an epoxy coating.
7. Restore the structural integrity of the manhole while providing corrosion barrier by installing a fiberglass insert liner.
8. Rebuild bench and invert trough using approved TYPE S cement mortar and brick.
9. Provide destructive and non-destructive dry film thickness gauges, wet film thickness gauges and other testing equipment to test the thicknesses, surface profiles and coating continuity as required by this

specification.

10. Provide low and high voltage holiday detectors to conduct continuity testing.
11. Provide all necessary surface profile comparators, standards, and press-o-film kits to conduct and document surface profile measurements.
12. Perform and pass vacuum test of a manhole.
13. Perform "pull-test" in accordance with applicable ASTM Standards.
14. Provide survey grade (+/- 0.01-foot) data on a manhole using GPS.
15. Provide survey grade (+/- 0.01-foot) data on a manhole using conventional survey methods.
16. Provide bypass pumping to facilitate rehabilitation activities.
17. Provide manhole condition assessment services.
18. Locate and expose buried manholes, adjust frame and cover heights as required
19. Install internal frame seal and external seal wraps
20. Remove intruding pipe or obstruction
21. Remove manhole steps and restore surface.

B. General Procedures:

1. Cleaning: All concrete and masonry surfaces to be rehabilitated shall be clean. All grease, oil, laitance, coatings, loose bricks, mortar, unsound brick or concrete and other foreign materials shall be completely removed. Initial cleaning shall be done by utilizing a minimum 5000 psi pressure washer with the proper nozzles; however, additional required cleaning shall be accomplished by other methods including but not limited to ~~such as~~ wet or dry sandblasting, acid wash, concrete cleaners, degreasers or mechanical means, as may be required to properly provide additional cleaning of the surface. All surfaces using these methods shall be thoroughly rinsed, scrubbed, neutralized and tested with test strips, in order to confirm the removal of all cleaning agents and their reactant products. Neutralized surfaces shall be confirmed by Contractor by use of a pH testing kit. Debris resulting from cleaning shall be removed from the manhole and not discharged downstream. The debris is to be disposed of properly in accordance with all laws. The local municipality can furnish a letter to the landfill stating the Contractor is authorized to dispose of the non-hazardous materials. Debris and liquids quantities are to be tracked in the daily Contractor diary.
2. Stopping Infiltration: After surface preparation and prior to the application of mortars and coatings, infiltration shall be stopped either by plugging with a hydraulic cement or chemical grout sealing.
3. Patching: All large holes and/or voids, joints or pipes, all spalled areas, all lifting holes and all holes caused by missing or cracked brick shall be patched and all missing mortar repointed using a non-shrink cement mortar. All cracked or disintegrated material shall be removed from the area to be patched or repointed, exposing a sound sub-base. All cracks not subject to movement shall be cleaned to remove all unsound material so a solid fixed surface is established and patched with non-shrink patching mortar. If any reinforcing is exposed, a corrosion inhibiting product shall be used to coat the steel prior to patching.
4. Manhole Walls: The thicknesses of the patches, coatings, etc. must form

- a uniform, vertical wall established from the manhole bench to the manhole cone section.
- 5. Flow Control: The Contractor shall be responsible for plugging, plugging with flow-thru pipe or diverting the flow of wastewater, as needed, for repair and rehabilitation of manholes. The Contractor shall be responsible for Wastewater Flow Control in accordance with 01520 Sewer Flow Control. By-pass pumping shall be approved in advance by the Owner's Representative.
- 6. The Contractor shall remove all foreign material, loose grout, debris and rubble from the existing channel. The Contractor shall rebuild the existing channel, if required, by reshaping or repairing the slope of shelves or benches. Manhole rehabilitation work shall include aligning inflow and outflow ports to prevent the deposition of solids at the transition point. All troughs 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 as large a radius as the size of the manhole will permit, but will be shaped to allow easy entrance of maintenance equipment including buckets, T.V. camera, etc.
- 7. Manhole steps: The Contractor shall remove all manhole steps prior to rehabilitation. No steps shall be installed after rehabilitation.
- 8. Each lining system shall be installed in accordance with the manufacturer's recommendation to withstand groundwater pressures. For manholes greater than twelve (12) feet in depth, the lining shall be capable of withstanding the pressures associated with a groundwater depth equal to the manhole depth. Linings for all other manholes shall be capable of withstanding the pressures associated with groundwater depth of twelve (12) feet. The Contractor shall measure groundwater depth from manhole bench to top of ground surface. Cleaning shall be in accordance with manufacturer's recommendation.

C. Application of products shall be by factory certified applicators. Submit confirming documentation of certification.

3.02 SPRAY APPLIED LIGHTWEIGHT STRUCTURAL REINFORCED CEMENT

- A. The surface prior to spraying shall be properly prepared and pre-wetted per the manufacturer's requirements. Materials shall be spray- applied to a minimum uniform thickness to insure all cracks, crevices, and voids are filled and a smooth surface remains after light troweling. The thickness of all coats shall be verified by approved test procedures. The light troweling is performed to compact the material into voids and to set the bond.
- B. The first application shall have begun to take an initial set (disappearance of surface sheen, lasting from 15 minutes to 1 hour depending upon ambient conditions) before the second application to assure a minimum total finished thickness of 1/2 inch. The final finished thickness may need to be greater than the 1/2 inch recommended by the manufacturer to withstand groundwater pressures. A depth gauge shall be used during application, at various locations, to verify the required thickness. The readings are to be recorded in the Contractor's Daily Report. The surface then shall be troweled to a smooth finish with care taken to not over trowel in a manner bringing additional water to the surface and weaken it. The Contractor shall follow the manufacturer's recommendations.
- C. The bench covers used to catch debris and rebound shall be removed and the

bench and trough sprayed so a gradual slope is produced from the walls to the trough with the thickness at the edge of the trough being no less than 1/2 inch. The wall-bench intersection shall be rounded to a uniform radius the full circumference of the intersection.

- D. No application shall be made to frozen surfaces or if freezing is expected to occur within the manhole for twenty-four (24) hours after application. If ambient temperatures are in excess of 95° F, precautions shall be taken to keep the mix temperature at time of application below 90° F, using ice if necessary. Contractor shall monitor and maintain the temperatures within the range required by the manufacturer. The contractor shall provide a hi/lo thermometer and record the readings in the daily report.
- E. The final application shall have a cure time as required by the manufacturer before being subjected to testing and active flow.

3.03 CENTRIFUGALLY CAST STRUCTURAL REINFORCED CEMENT

- A. The rotating casting applicator shall be positioned to evenly apply the material and be withdrawn at a rate to assure a final minimum thickness of 1/2-inch. The final finished thickness may need to be greater than 1/2-inch, as recommended by the manufacturer, to withstand groundwater pressures. A depth gauge shall be used during application, at various locations, to verify the required thickness. The readings are to be recorded in the Contractor's Daily Report. The surface shall be troweled to a smooth finish with care being taken to not over trowel in a manner bringing additional water to the surface and weaken it.
- B. The bench covers used to catch debris and rebound shall be removed and the bench and trough sprayed or hand applied so a gradual slope is produced from the walls to the trough with the thickness at the edge of the trough being no less than 1/2-inch. The wall-bench intersection shall be rounded to a uniform radius the full circumference of the intersection. The surface shall be troweled to a smooth finish with care taken to not over trowel in a manner bringing additional water to the surface and weaken it.
- C. No application shall be made to frozen surfaces or if freezing is expected to occur within the manhole for 24 hours after application. If ambient temperatures are in excess of 95° F, precautions shall be taken to keep the mix temperature at time of application below 90° F. Contractor shall monitor and maintain the temperatures within the range required by the manufacturer. The contractor shall provide a hi/lo thermometer and record the readings in the daily report.
- D. The final application shall have a minimum of one (1) hour cure time before being subjected to active flow.

3.04 EPOXY COATING

- A. The epoxy coating shall be applied onto the interior surfaces of the manhole to produce a smooth coating and yield the required minimum thickness. A depth gauge shall be used during application at various locations to verify the required thickness. Wet film thickness readings shall be taken and recorded by the contractor during application. The readings are to be recorded in the Contractor's Daily Report.
- B. The epoxy resin shall be applied at the required recommended thickness. The application shall have a cure time as required by the manufacturer before

being subjected to testing and active flow.

- C. Conduct and record WFT tests during application and have Tooke gauge (DFT) tests done after application. Also suggest that high voltage holiday tests be required contingent upon required millage. All tests shall be conducted at the contractor's expense, by an independent NACE certified technician, and shall be witnessed by the Owner's Representative. Results of tests to be provided to Owner's Representative. Owner reserves the right to verify testing. Results of Owner's test takes precedence.
- D. An epoxy putty or other surfacer recommended by the epoxy manufacturer shall be used as necessary to repair any slight surface irregularities prior to applying epoxy.
- E. The sloped surface of the manhole bench shall be made non-skid by broadcasting aluminum oxide or sand into the surface prior to gelatin/set.

3.05 FIBERGLASS MANHOLE INSERT LINER

- A. This method requires the Contractor to excavate and remove the existing manhole frame, manhole cone, and other manhole components as needed to facilitate installing a prefabricated fiberglass insert liner.
- B. The Contractor shall excavate the area around the top of the existing manhole frame and part of the existing manhole sufficiently wide and deep to facilitate removing the manhole frame, cone, and the other components of the existing manhole prior to installing a prefabricated manhole insert.
- C. The bottom of the insert shall be cut to fit the existing manhole bench as closely as possible. Cutouts of inserts shall be made to accommodate existing inlets, drops, and cleanouts.
- D. The annular space between the insert and the existing brick or concrete manhole shall be filled with a non-shrinking Type II cement grout, minimum 3000 psi @ 28 days cure time.
- E. All fiberglass lamination shall result in equal thickness and strength as the insert and be constructed in accordance with the manufacturer's recommendations.
- F. The insert shall be lowered into the existing brick or concrete manhole and set into a quick setting grout mixture. A thorough bottom seal shall be obtained in order to prevent loss of grout from the annular space between the outside of the insert and the interior of the existing manhole. A 6-inch minimum height of a quick setting non-shrinking grout shall be placed above the initial bottom seal in the annular space area between the insert and the existing brick or concrete manhole to ensure adequacy of the bottom seal. The gap from drops, cleanouts, laterals and existing piping between the existing manhole and the insert wall shall be bridged with short lengths of pipe of the same material as the insert and/or as approved by the insert's design engineer.
- G. All manhole surfaces not covered by the insert shall be hand covered with like material.

3.06 MANHOLE REHABILITATION ACCEPTANCE

All manholes rehabilitated using cement mortar lining or epoxy lining, shall be subject to adhesion tests using a pull-off adhesion tester after product has sufficiently cured. At a minimum, two (2) tests shall be performed on the manhole floor (invert) and three (3) tests shall be performed on the manhole walls. Adhesion (pull) tests shall be performed in accordance with ASTM D4541 test standards and shall be conducted at locations selected by the Owner. Testing and repairs to the test areas shall be completed at no additional cost and shall be to the Owner's satisfaction.

All manholes rehabilitated using cement mortar lining shall include two standard samples taken from each day's work with the date, location and job recorded for each sample. The samples shall be sent to an established, local, and reputable commercial testing laboratory that has been approved by the Owner to determine if lining materials meet minimum requirements specified herein. The cost to perform these tests shall be incidental to the manhole rehabilitation. Cementitious materials utilized as part of the liner system shall also include the same testing.

All manholes rehabilitated using fiberglass insert lining shall be subject to close inspection after assembly is complete. The interior surfaces of the liner shall be free of pinholes, cracks, pits or defects which are detrimental to the intended use of the liner. No liner shall have holes or openings which will permit the intrusion of liquids or gasses through the liner wall and into the concrete matrix. There shall be no exposed concrete/mortar on any inside liner surface to include (but not limited to) pipe connectors and manhole riser section joints. All necessary repairs shall be completed at no additional cost and shall be to the Owner's satisfaction.

- A. All manholes rehabilitated using cement mortar lining, epoxy lining, or fiberglass insert lining, including repairs of active leaks shall be subject to testing using the vacuum test method. The Contractor shall follow the manufacturer's recommendations for proper and safe procedures. Vacuum testing manholes shall be performed after curing of linings. Any visible leakage in the manhole or structure, before, during, or after the test shall be repaired regardless of the test results.
- B. If the manhole fails the vacuum test, the Contractor shall perform additional repairs, at no additional cost to the Owner, and repeat the test procedures until obtaining satisfactory results.
- C. All pipes for vacuum testing entering the manhole shall be installed at the top access point of the manhole.
- D. A vacuum of ten (10) inches of mercury (Hg) (5.0 psi) shall be drawn on the manhole, and the time shall be measured for the vacuum to drop to nine (9) inches of mercury (Hg) (4.5 psi). Manholes will be considered to have failed the air test if the time to drop one (1) inch of mercury is less than what is shown in the following table:

Vacuum Test Timetable				
Manhole Diameter – Inches				
Depth - feet	48 inches	60 inches	72 inches	96 inches
4	30 sec.	30 sec.	30 sec.	30 sec.
8	30 sec.	30 sec.	32 sec.	38 sec.
12	30 sec.	39 sec.	48 sec.	57 sec.
16	40 sec.	52 sec.	64 sec.	76 sec.
20	50 sec.	65 sec.	80 sec.	95 sec.
24	60 sec.	78 sec.	96 sec.	114 sec.
+ Each 2'	+5 sec.	+6.5 sec.	+8.0 sec.	+9.5 sec.

- E. Manhole depths shall be rounded to the nearest foot. Intermediate values shall be interpolated. For depths above twenty-four (24) feet, the Contractor shall add the values listed in the last line of the table for each two (2) feet of additional depth.
- F. After the manhole rehabilitation work has been completed, the Owner's Representative shall visually inspect the manhole. The finished surface of all cement mortar or epoxy lined surfaces shall be free of blisters, "runs" or "sags" or other indications of uneven lining thickness. The finished surface shall not have any evidence of visible leaks. All necessary repairs shall be completed at no additional cost and shall be to the Owner's satisfaction.

3.07 MANUFACTURER CERTIFICATION

- A. The manufacturer shall be on-site for 2 to 5 eight-hour days or more depending on project size, and Owner's direction, to confirm the Contractor is doing the installation correctly. Manufacturer shall provide written report of site visit and observations and confirm proper handling and installation of materials.

3.08 CLEANUP

- A. After the work has been completed and all testing acceptable, the Contractor shall clean up the work area.
- B. All debris and excess materials not incorporated into the permanent installation shall be disposed of by the Contractor. The debris and liquids are to be disposed of properly in accordance with all applicable laws. The local municipality can furnish a letter to the landfill stating the Contractor is authorized to dispose of the non-hazardous materials. Debris and liquid type and quantities are to be tracked in the daily Contractor diary. Hauling and disposal costs will be borne by the Contractor.
- C. The work area shall be left in a condition equal to or better than prior condition. Disturbed grassed areas shall be seeded or sod placed as directed by the Owner's Representative at no additional cost to the Owner. The work site restoration work shall be completed in accordance with the requirements Section 2276 – Site Restoration and Erosion Control.

3.09 DOCUMENTATION

- A. The Contractor shall complete work on each asset as assigned via the Owner's Computerized Work Order Management system. Upon starting the work, the Contractor shall receive work orders as assigned by the Owner's Representative. The Contractor shall maintain and synchronize the status of each rehabilitation work order issued.

3.010 WARRANTY

- A. The Contractor shall guarantee the work for a warranty period of one (1) year from the date of final acceptance. If, at any time during the warranty period, any defect is identified, the Contractor shall make repairs acceptable and at no additional cost to the Owner. In this case, the Contractor shall warrant the work for one (1) year in addition to the warranty required by the Contract.
- B. If the frequency of similar defects requiring repair increases, then the entire project will be re-evaluated.

END OF SECTION

SECTION 02901

REHABILITATION OF CONCRETE AND MASONRY STRUCTURES WITH A PROTECTIVE COATING

PART 1 -- GENERAL

1.01 SECTION INCLUDES

- A. This specification covers all Work, materials and equipment required for protecting and/or rehabilitating concrete and masonry structures, such as wet wells, diversion structures or other structures (does not include sanitary sewer manholes), by spray-application of a monolithic high-build epoxy coating to eliminate infiltration, provide corrosion protection, repair voids and enhance structural integrity. Procedures for surface preparation, application, testing, and cleaning are described herein. For rehabilitating sanitary sewer manholes, refer to Section 02900 - Sanitary Sewer Manhole Rehabilitation.
- B. Requirements for surface preparation, repairs and solvent-free epoxy coating application to specified surfaces.
- C. Instructions and specifications regarding the restoration and corrosion barrier composite liner for concrete and brick structures.

1.02 RELATED SECTIONS

- A. Section 01520: Sewer Flow Control
- B. Section 02900: Sanitary Sewer Manhole Rehabilitation
- C. DeKalb County Potable Water Main, Gravity Sanitary Sewer and Force Main Design Standards, Latest Edition and Version

1.03 REFERENCES

- A. ACI 305R - Hot Weather Concreting.
- B. ACI 503R - Use of Epoxy Compounds for Coating Concrete.
- C. ASTM – The published standards of the American Society for Testing and Materials, West Conshohocken, PA.
 - ASTM C78 Flexural Strength of Concrete (Using Simple Beam With Third-Point Loading)
 - ASTM C109 Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or 50-mm Cube Specimens).
 - ASTM C157 Length Change of Hardened Hydraulic-Cement Mortar and Concrete
 - ASTM C876 Half-Cell Potentials of Uncoated Reinforcing Steel in Concrete
 - ASTM D543 Standard Practices for Evaluating the Resistance of Plastics to

Chemical Reagents

ASTM D638	Standard Test Method for Tensile Properties of Plastics
ASTM D695	Standard Test Method for Compressive Properties of Rigid Plastics
ASTM D790	Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
ASTM D2240	Standard Test Method for Rubber Property—Durometer Hardness
ASTM D2584	Standard Test Method for Ignition Loss of Cured Reinforced Resins
ASTM D4138	Measurement of Dry Film Thickness of Protective Coating Systems by Destructive Means
ASTM D4541	Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers

D. National Association of Corrosion Engineers International, NACE - RP 0188 currently known as SP0188- Discontinuity (Holiday) Testing of Protective Coatings.

E. SSPC- The published standards of the Society of Protective Coatings, Pittsburgh, PA.

F. International Concrete Repair Institute (ICRI) Technical Guideline No. 03730 -Surface Preparation Guidelines for the Repair of Deteriorated Concrete Resulting From Reinforcing Steel Corrosion.

1.04 QUALIFICATIONS AND REQUIREMENTS

A. Applicator Qualifications:

1. Trained and approved by the manufacturer in the application of the specified products.
2. Employs personnel trained to apply the specified products.

B. Pre-Application Meeting: Convene a pre-application meeting two (2) weeks before starting the application of Restoration and Corrosion Barrier Composite Liner. Require attendance of parties directly affecting work of this section, including the Contractor, Engineer, applicator, manufacturer's representative, and Owner's Representative. Review at a minimum, surface preparation, mixing, application, finishing, curing, field quality control, and coordination with other work.

1.05 SUBMITTALS

A. All submittals shall be received and approved by Owner's Representative prior to beginning work. Product substitutions must be submitted by Contractor and approved by Owner's Representative at least 14 days before bid date.

B. Technical data sheet on each product used, including physical properties, surface preparation, application instructions and curing instructions where applicable, and

ASTM test results indicating the product conforms to and is suitable for its intended use per these specifications.

- C. Written confirmation by each material manufacturer as to the suitability and compatibility of the composite use of repair materials and protective coating materials through in-place testing performed by an independent testing agency.
- D. Material Safety Data Sheets (MSDS) for each product used.
- E. The protective coating manufacturer's certification the Contractor has been trained and approved in the handling, mixing and application of the products to be used.
- F. The protective coating manufacturer's certification the equipment to be used for applying the products has been approved and Contractor personnel have been trained and certified for proper use of the equipment.
- G. Materials with a shelf life dependent upon storage conditions shall be provided with written assurance from the manufacturer that the material is new, has been properly stored prior to arrival and the full shelf life of the material delivered is still in effect and has not been impacted.
- H. Qualifications Submittals:
 - 1. The Contractor shall be certified according to SSPC-QP 1
 - 2. For general rehabilitation: a minimum of Five (5) verifiable references on projects of similar size and scope (totaling a minimum of 30,000 VF) performed by Contractor indicating successful application of the specified high-build solvent-free epoxy coating by spray or trowel application.
 - 3. For Restoration and Corrosion Barrier Composite Liner projects: a minimum of Three (3) verifiable references with at least three years of successful service history, including project name and location, names of owner and engineer, and description of products used substrates, and application procedures. As a minimum, at least one of three projects must be accessible for physical inspection prior to acceptance of restoration mortar/corrosion barrier mortar system. The submittal must include written certification both the Restoration Mortar and Corrosion Barrier Mortar were applied consecutively (essentially simultaneously) on each of the three projects submitted (both products applied within 4 hours of each other).
- I. For Restoration and Corrosion Barrier Composite Liner projects:
 - 1. Certification all products, restoration mortar, and corrosion barrier mortar are from a single source. Single source being defined as a single entity, person, or company owning all rights to both the restoration mortar and corrosion barrier mortar formulations and testing data.
 - 2. Submit qualifications of applicator to include certification by the manufacturer stating the applicator is trained and approved in the application of the specified products.
- J. List of references documenting qualifications of Section 1.9 Competent Field Supervisor.

- K. Proof of any necessary Federal, State, or local permits or licenses necessary for the project.
- L. The Contractor shall complete a daily written record (diary) detailing the work carried out and any small items of Work incidental to the Work. The Contractor shall include in his daily record and reference to the following:
 - 1. Delays: Dense traffic, lack of information, sickness, labor or equipment shortage, etc.
 - 2. Weather: Conditions (e.g., rain, sunny, windy, readings on all coating dependent conditions such as % R.H., dew point, surface temp., ambient air temp., hi/lo temps during application and curing at area of application, etc.).
 - 3. Equipment: On site (e.g., specialty cleaning equipment, application equipment, test equipment etc.).
 - 4. Submittals: To the Owner's Representative.
 - 5. Personnel: On site by name (e.g., all labor, specialty services, manufacturer, etc.).
 - 6. Accident: Report (e.g., all injuries, vehicles, etc.).
 - 7. Incident: Report (e.g., damage to property, property owner complaint, etc.).
 - 8. Documentation such as surface prep methods and results, clean up, application, testing, protection, etc.
 - 9. Visitors: On site.
 - 10. Disposals: Type and quantity of debris (including liquids).
 - 11. Materials used, lot numbers, expiration dates, etc.

1.06 DELIVERY, STORAGE, AND HANDLING

Comply with the requirements of the manufacturer of the approved products.

1.07 QUALITY ASSURANCE

Contractor shall initiate and enforce quality control procedures consistent with applicable ASTM, NACE, and SSPC standards and the protective coating manufacturer's recommendations.

1.08 SITE CONDITIONS

- A. Contractor shall conform to all local, State and Federal regulations including those set forth by OSHA, RCRA and the EPA and any other applicable authorities.
- B. Method statements and design procedures will be provided to Owner's Representative when confined space entry, flow diversion, debris removal, or bypass is necessary in order for Contractor to perform the specified work.

1.09 FIELD SUPERVISION BY CONTRACTOR

- A. The Contractor shall maintain on the Work Site, at all times, a Competent Field Supervisor in charge of the survey/inspection. The Competent Field Supervisor shall have been actively involved in rehabilitating concrete and/or masonry structures for five (5) years prior to the bid opening. He or she shall have experience with applying

cementitious-based coatings and polymer/epoxy top coatings, vacuum testing, WFT and DFT mil testing and adhesion testing procedures.

- B. A list of references shall be submitted to the Owner's Representative to verify and approve the Competent Field Supervisor's experience to include the above referenced experience, including the full charge of rehabilitating a minimum of 300 concrete and/or masonry structures. Information contained in the list of references shall include, but not limited to: project owner, contact name and phone number, project name and dates (start and completion), number of concrete and/or masonry structures rehabilitated, square feet rehabilitated or diameter and vertical feet rehabilitated, if a manhole or circular structure.
- C. The Competent Field Supervisor shall be approved in writing by the Owner's Representative prior to commencement of the Work. Any change in the Competent Field Supervisor must be approved in writing by the Owner's Representative prior to the change. The Competent Field Supervisor shall be responsible for the safety of all workers and site conditions as well as ensuring all work is conducted in conformance with the requirements of these specifications and to the level of quality specified.

1.010 RESPONSIBILITY FOR SANITARY SEWER OVERFLOWS AND DAMAGE TO PROPERTY AND UTILITY

- A. Reference Specification Section 01030 – Special Project Procedures

1.011 SAFETY

- A. All work shall be performed in accordance with OSHA standards and State and Federal safety regulations.
- B. No person shall enter a confined space without the documented requisite training, certification, and entry permit.
- C. Do not apply materials under the following conditions:
 - 1. Environmental and surface conditions exceeding the manufacturer's recommended maximum or minimum allowable.
 - 2. Dusty or smoke-laden atmosphere.
 - 3. Over flowing water.
 - 4. Any other unacceptable conditions defined by the manufacturer.

PART 2 – PRODUCTS

2.01 EXISTING PRODUCTS

- A. Standard Portland cement or new concrete (not quick setting high strength cement) must be well cured prior to application of the protective coating. Moisture tests required or recommended by the manufacturer or Owner's Representative shall be conducted.
- B. Remove existing coatings prior to application of the new protective coating. Contractor is to maintain strict adherence to applicable NACE and SSPC

recommendations with regard to proper surface preparation and compatibility with existing coatings.

2.02 MANUFACTURER(S) SHALL BE:

- A. Warren Environmental, Inc.
- B. Raven Lining Systems, Inc.
- C. SprayWall® products as developed by SprayRoc
- D. PerpetuWall™ by Protective Liner Systems
- E. Sherwin-Williams Sure-Flex® elastomeric polyurethane coating
- F. Cor-Gard® by APM, Inc.
- G. Sewpercoat® 100% calcium aluminate mortar and aggregate
- H. GeoSpray™ by IWPC
- I. Structure-Gard by Quadex
- J. Madewell Products Corporation, 7561 Industrial Court, Alpharetta, Georgia 30004. Phone (770) 475-8199. Fax (770) 475-8167. Internet: www.madewell.net.
- K. Approved Equal Products requested for approval as an "or equal" must present full product/system information to Owner's Representative 14 days prior to bid closing for review and approval.

2.03 REPAIR MATERIALS

Repair materials shall be used to fill voids, structurally reinforce and/or rebuild surfaces, etc. as determined necessary by the Owner's Representative, the protective coating manufacturer or Contractor. Repair materials must be compatible with the specified epoxy coating and shall be applied in accordance with manufacturer recommendations.

2.04 PROTECTIVE COATING MATERIAL

2.05 The epoxy coating system is a 100% solids, solvent-free two-component epoxy resin system meeting the following performance:

Product type	Amine cured epoxy
Color	White or as approved by Owner
Solids content (vol%)	100
Mix Ratio	Per manufacturer's specifications
Compressive Strength, psi	ASTM D695-13,000 psi
Tensile Strength, psi	ASTM D638-7,000 psi

Tensile Elongation, %	ASTM D638-2%
Flexural Strength, psi	ASTM D790-13,000
Bond Strength-Concrete	ASTM D4541-Concrete
Failure Chemical Resistance to:	
Municipal Wastewater	Continuous Service
Sulfuric Acid, 10%	ASTM D543-Immersion Service
Sodium Hydroxide, 20%	ASTM D543-Immersion Service

2.06 PROTECTIVE COATING APPLICATION EQUIPMENT

Protective coating manufacturer approved plural component spray equipment shall be used for the application of the specified protective coating.

2.07 RESTORATION AND CORROSION BARRIER COMPOSITE LINER

- A. General:
 - 1. Restoration mortar, corrosion barrier coating and manhole frame seal shall be from a single manufacturer.
 - 2. Materials compatible with substrate and with each other shall be supplied.
 - 3. In-place testing shall be conducted by Contractor and witnessed by Owner's Representative. Owner's Representative reserves the right to conduct same testing for verification purposes. Results of Owner Representative's test shall govern.
- B. Hydraulic Cement Mortar: Mainstay ML-10. Fast-setting mortar used to stop leaks through cracks and holes or approved alternate.
 - 1. Composition: Blend of hydraulic cements and fillers.
 - 2. Compressive Strength, ASTM C 109:
 - a. 1 Day: 3,500 psi.
 - b. 7 Days: 4,900 psi.
 - c. 28 Days: 5,500 psi.
 - 3. Tensile Strength, ASTM C 496
 - a. 7 Days: 290 psi.
 - b. 28 Days: 575 psi.
 - 4. Working Time: 45 to 90 seconds at 77 degrees F.
 - 5. Color: Dark gray.
- C. Restoration Mortar: Mainstay ML-72 Sprayable Microsilica Cement Mortar. Low shrinkage, high strength, sprayable microsilica mortar or approved alternate.
 - 1. Composition: Blend of cements, microsilica, thermoplastic fibers, densifiers, and modifiers. Mortar shall not contain calcium aluminate cements or aggregates.
 - 2. Compressive Strength, ASTM C 109:

- a. 1 Day: 3,000 psi.
 - b. 28 Days: 10,000 psi.
- 3. Flexural Strength, ASTM C293:
 - a. 1 Day: 535 psi.
 - b. 28 Days: 1505psi.
- 4. Tensile Strength, ASTM C-496:
 - a. 1 Day: 330 psi.
 - b. 28 Days: 910 psi.
- 5. Shrinkage, ASTM C-596: 28 Days @ 90%: 0.01 percent.
- 6. Uniaxial Tensile Bond Strength, ACI 503R, Appendix A: 28 Days: Greater than 500 psi over high strength concrete (5,000 psi compression strength concrete -bond strength governed by substrate tensile strength). Minimum acceptable bond = 145 psi.
- 7. Color: Dark gray.

D. Corrosion Barrier Coating: Mainstay DS-4 Ultra High Build Epoxy Coal Tar Coating or approved alternate.

- 1. Composition: 100 percent solids, modified epoxy coal tar coating.
- 2. Thickness: Minimum of 100 mils in 1 or 2 coats.
- 3. Number of Components: 2.
- 4. Finish: Gloss.
- 5. Color: Black.

E. Corrosion Barrier Coating: Mainstay DS-5 Ultra High Build Epoxy Coating or approved alternate.

- 1. Composition: 100 percent solids, modified epoxy coating.
- 2. Thickness: Minimum of 100 mils in 1 or 2 coats.
- 3. Number of Components: 2.
- 4. Finish: Gloss.
- 5. Color: White sky blue

F. Manhole Frame Seal: Madewell 806 Flexible Epoxy or approved alternate

- 1. Composition: 100% solids, flexible epoxy trowel-grade mastic
- 2. Thickness: Minimum of 60 mils
- 3. Number of Components: 2
- 4. Finish: Semigloss.
- 5. Color: Light gray

PART 3 – EXECUTION

3.01 ACCEPTABLE CONTRACTORS

A. Repair mortar Contractors shall be trained and approved by the manufacturer (per 1.4.A.1) to properly apply cementitious mortar according to manufacturer's recommendations.

- B. Protective coating must be applied by a ~~certified~~ Contractor trained, approved and certified by the manufacturer of the protective coating manufacturer and according to manufacturer recommendations.

3.02 PREPARATORY PROCEDURES

- A. Appropriate actions shall be taken to comply with local, State, and Federal regulatory and other applicable agencies with regard to environment, health, and safety.
- B. Any active flows shall be dammed, plugged, or diverted, as required, to ensure the liquid flow is maintained below the surfaces to be coated.
- C. Installation of the protective coating shall not commence until the concrete substrate has properly cured and been prepared in accordance with these specifications.
- D. Temperature of the surface to be coated should be in compliance with the manufacturer's requirements and maintained between 40 deg. F and 120 deg. F during application, whichever is most stringent. Prior to and during application, care should be taken to avoid exposure of direct sunlight or other intense heat source to the structure being coated.

3.03 STRUCTURE PREPARATION

- A. Contractor shall inspect all surfaces specified to receive a protective coating prior to surface preparation. Contractor shall notify the Owner's Representative of any noticeable disparity in the surfaces potentially interfering with the proper preparation or application of the repair mortar and protective coating.
- B. All contaminants including: oils, grease, unsound or incompatible existing coatings, waxes, form release, curing compounds, efflorescence, sealers, salts, or other contaminants shall be removed.
- C. All concrete unsound or damaged by chemical exposure shall be removed to a sound concrete surface or replaced.
- D. Surface preparation method(s) should be based upon the conditions of the substrate and the requirements of the protective coating to be applied.
- E. Surfaces to receive protective coating shall be cleaned and abraded to produce a sound concrete surface with adequate profile and porosity to provide a strong bond between the protective coating and the substrate. Generally, this can be achieved with high pressure water cleaning using equipment capable of 50,000 psi at 4gpm. Other methods, such as high pressure water jetting (refer to NACE Standard No. 5/SSPC-SP12) or abrasive blasting may also be used. Detergent water cleaning and hot water blasting may be necessary to remove oils, grease or other hydrocarbon residues from the concrete. Whichever method(s) are used, they shall be performed in a manner providing a uniform, sound, clean, and neutralized surface not excessively damaged.
- F. Infiltration shall be stopped by using a material compatible with the specified repair mortar and is suitable for top-coating with the specified epoxy protective coating.

3.04 APPLICATION OF REPAIR MATERIALS

- A. Repair materials shall meet the specifications contained herein. The materials shall be trowel or spray applied utilizing proper equipment on to specified surfaces. The material thickness shall be specified by the Owner's Representative according to Owner's requirements and manufacturer's recommendations. The repair materials shall be permitted to cure according to manufacturer recommendations.
- B. Cementitious repair materials shall be towed to provide a smooth surface with an average profile equivalent to coarse sandpaper to optimally receive the protective coating.
- C. Cement substrates shall be repaired to fill all bug holes or honeycomb surfaces and properly finished for suitability to receive application of the protective coating.
- D. Inverts, channels, and benches shall be rebuilt and/or repaired with adequate slope and smooth transitions for proper sewage flow.
- E. After abrasive blast and leak repairs have been performed, all surfaces shall be inspected for remaining laitance prior to protective coating application. Any evidence of remaining contamination or laitance shall be removed by additional abrasive blast or other approved method. If repair materials are used, refer to these specifications and manufacturer's data sheets for surface preparation, most stringent shall apply. Areas to be coated must also be prepared in accordance with these specifications and manufacturer's data sheets after receiving a cementitious repair mortar and prior to application of the epoxy coating, most stringent requirements shall apply.

3.05 APPLICATION OF PROTECTIVE COATING

- A. Protective coating spray equipment shall be specifically designed to accurately ratio and apply the specified protective coating materials and shall be regularly maintained and in proper working order. Spray equipment shall be approved by protective coating manufacturer.
- B. The protective coating material must be sprayed or trowel applied by a trained and certified Contractor of the protective coating manufacturer.
- C. Specified surfaces shall be coated by a moisture tolerant, solvent-free, 100% solids, epoxy protective coating as further described herein. Application shall result in dry film thickness as recommended by the manufacturer
- D. If necessary, subsequent top coating or additional coats of the protective coating should occur as soon as the basecoat becomes tack free, no later than the recoat window for the specified product. Additional surface preparation procedures will be required if this recoat window is exceeded.
- E. Coating application should be performed so as not to interfere with proper flow of sewage. Inverts, channels, benches and other transition points shall be smooth so as not to collect debris or disturb proper flow.

3.06 TESTING AND INSPECTION

- A. The Contractor shall sound test all cementitious coatings and conduct adhesion tests as directed by Owner's Representative.
- B. A wet film thickness (WFT) gauge shall be used during application of the epoxy protective coating to the specified thickness. WFT results shall be documented and provided to the Owner's Representative.
- C. After the protective coating has set hard to the touch it shall be inspected with high-voltage Holiday detection equipment. Surfaces shall first be dried; an induced Holiday shall then be made on the coated concrete surface and shall serve to determine the minimum/maximum voltage to be used to test the coating for Holidays at that particular area. The spark tester shall be necessary to detect the induced Holiday (refer to NACE RP0188-00). All detected Holidays shall be marked and repaired per the manufacturer's written recommendations. After properly abrading and cleaning, additional protective coating material can be hand applied to the repair area. All touch-up/repair procedures shall follow the protective coating manufacturer's recommendations and shall be retested for coating continuity.
- D. A final visual inspection shall be made with any deficiencies in the finished coating being repaired by Contractor.
- E. Municipal sanitary sewer flow may be returned to the areas receiving the epoxy protective coating as soon as the final inspection has taken place and the coating is ready for service.

3.07 CLEANUP

- A. After the work has been completed and all testing acceptable, the Contractor shall clean up the work area.
- B. All debris and excess material not incorporated into the permanent installation shall be disposed of by the Contractor. The debris and liquids are to be disposed of properly in accordance with all applicable laws. The Owner's Representative can furnish a letter to the landfill stating the Contractor is authorized to dispose of the non-hazardous materials. Debris and liquids type and quantities are to be tracked in the daily Contractor diary. Hauling and disposal costs will be borne by the Contractor.
- C. The work area shall be left in a condition equal to or better than prior condition. Disturbed grassed areas shall be seeded or sod placed as directed by the Owner's Representative at no additional cost to the Owner. The work site restoration work shall be completed in accordance with the requirements of the Site Restoration section of these Specifications.

3.08 DOCUMENTATION

The Contractor shall complete work on each asset as assigned via the Owner's Computerized Work Order Management system. Upon start of work, the Contractor shall receive work orders as assigned by the Project Manager/Owner's Representative. The Contractor shall maintain and synchronize the status of each rehabilitation work order issued.

3.09 WARRANTY

- A. The Contractor shall guarantee the work for a warranty period of one (1) year from the date of final acceptance. If, at any time during the warranty period, any defect is identified, the Contractor shall make repairs acceptable and at no additional cost to the Owner. In this case, the Contractor shall warrant the work for one (1) year in addition to the warranty required by the Contract.
- B. If the frequency of similar defects requiring repair increases, then the entire project will be re-evaluated.

END OF SECTION

SECTION 02956
Sanitary Sewer Cleaning

PART 1 - GENERAL

1.01 SCOPE

This section includes specifications for sewer line cleaning to remove foreign materials and debris from the mains and restore the pipe to a minimum of 95% of the through flow channel and cross section, for clear viewing of the interior surfaces of the lines during television inspection, or as required for other specified rehabilitation or purpose.

1.02 RELATED SECTIONS

- A. Section 01510: Sanitary Sewer Main and Lateral Television Sonar Inspection
- B. Section 01520: Sewer Flow Control

1.03 REFERENCES

- A. Codes, Specifications, and Standards
- B. NASSCO – National Association of Sewer Service Companies
- C. Potable Water Main, Gravity Sewer, Gravity Sanitary Sewer, and Sanitary Sewer and Force Main Design Standards, DeKalb County Department of Watershed Management, Latest Edition and Version

1.04 QUALIFICATIONS

The Contractor must meet all of the following criteria to be considered qualified to propose and/or bid on the subject contract:

- A. The Contractor, or their subcontractor, must document they, not their parent company or related company or the experience of an individual/s, have been in this line of business a minimum of five (5) years.
- B. The Contractor, or their subcontractor, must document they, not their parent company or related company or the experience of an individual/s, have cleaned a minimum of 300,000 linear feet of sewer mains of the sizes involved for this contract in the past two (2) years. This documentation shall include verifiable locations, references (including names and phone numbers), pipe sizes and linear footages of those sizes.

1.05 SUBMITTALS

- A. The Contractor shall submit to the Owner's Representative for review, documentation of Contractor or subcontractor qualifications as outlined in Section 1.4 Qualifications.
- B. The Contractor shall submit to the Owner's Representative for review, documentation of experience of supervisors and field crew leaders as outlined in Section 1.6 Experience.
- C. Contractor shall submit to the Owner's Representative the location of disposal for all materials resulting from cleaning operations if not using a disposal site designated by the Owner. Where applicable, this submittal shall include, but is not limited to, any required permits, licenses, or certifications of the disposal facility.

1.06 EXPERIENCE

- A. The Contractor shall provide the Owner's Representative with written documentation confirming the supervisor and field crew leaders, responsible for this work, have received the proper training, are certified, and have the requisite experience. This documentation will include verifiable dates of hands-on experience, employer, description of duties/experience, contact name and phone number.
- B. Supervisor of the field crews must be properly trained in this function and have a minimum of three (3) years of experience in performing sanitary sewer cleaning including safe working practices, proper cleaning procedures, and experience operating the types of cleaning equipment used for this contract.
- C. Field crew leaders must be properly trained in this function and have a minimum of two (2) years hands-on experience in performing sewer cleaning including safe working practices, proper cleaning procedures, and experience operating the types of cleaning equipment used for this contract.
- D. No crew members shall enter confined spaces without the necessary certified training and proper permit.

1.07 PERSONNEL

- A. The Supervisor must visit the project site daily checking on their personnel and subcontractors, meeting with the field crew leaders as well as checking on the status and progress of the project. The Supervisor must have responsible authority for the crews under his supervision, in all matters
- B. A field crew leader must be with their crew when their crew is working, and have responsible authority for the crew in all matters. Each field crew leader can only have one crew. Each crew must have its own field crew leader.

1.08 RESPONSIBILITY FOR OVERFLOWS/SPILLS AND DAMAGE TO PROPERTY AND UTILITY

- A. Reference Specification Section 01030 – Special Project Procedures

PART 2 – PRODUCTS

2.1 GENERAL

- A. The Contractor shall provide all supervision, labor, material, supplies, equipment, transportation, traffic control, etc., necessary to satisfactorily clean the sewer main(s).
- B. Hydraulically Propelled Equipment: The equipment used shall be of a movable dam type and be constructed so a portion of the dam may be collapsed at any time during the cleaning operation to protect against flooding of the sewer. The movable dam shall be equal in diameter to the main being cleaned and shall provide a flexible scraper around the outer periphery to insure grease removal. If sewer cleaning balls or other non-collapsible equipment is used, special precautions to prevent flooding the sewers and public or private property shall be taken.
- C. High-Velocity Jet (Hydro-cleaning) Equipment: All high-velocity sewer cleaning equipment shall be constructed for ease and safety of operation. The equipment shall have a selection of two or more high-velocity nozzles. The nozzles shall be capable of producing a scouring action from 15 to 45 degrees in all size mains designated to be cleaned. Specialized nozzles capable of concentrating pressurized water either to the crown or lower quadrant of the pipe to be cleaned shall be available on site. Equipment shall also include a high-velocity gun for washing and scouring manhole walls. The gun shall be capable of producing flows from a fine spray to a solid stream. The equipment shall carry its own water tank, auxiliary engines, pumps, and hydraulically driven hose reel.
- D. Mechanically Powered Equipment: Bucket machines shall be in pairs with sufficient power to perform the work in an efficient manner. Machines shall be belt operated or have an overload device. Machines with direct drive potentially causing damage to the main will not be allowed. A power rodding machine shall be either a sectional or continuous rod type capable of holding a minimum of 500 feet of rod. The rod shall be specifically heat-treated steel. To insure safe operation, the machine shall be fully enclosed and have an automatic safety clutch or relief valve.
- E. Large Diameter Cleaning: For cleaning large diameter sewer or combination pipes, consideration should be given to a combination hydraulic high volume water and solids separation system. The flow from the sewer will provide water for the pump operation so no potable water is necessary and treatment costs are not a factor. Water volume of up to 250 GPM at 2000 psi+ will move solids to the downstream manhole in high flow conditions. The separation system will dewater solids to 95% (passing a paint filter test) and transfer them to a dump truck suitable for transport of material to a sewage treatment plant or approved landfill without loss or leakage of liquid or solids. Sewer water will be filtered to a point where it can be used in the

pump for continuous cleaning. No by-passing of sewer flows will be necessary. The unit shall be capable of 24-hour operation and the unit shall not leave the manhole until a section is fully cleaned.

F. The flow of sewage in the sewer mains shall be utilized to provide the necessary pressures for hydraulic cleaning devices whenever possible. When additional quantities of water from fire hydrants are necessary to avoid delay in normal working procedures, the water shall be conserved and not used unnecessarily. The Contractor's truck/trailer must be permitted by the County as having the proper backflow prevention devices. The County will supply a meter required to be connected to the fire hydrants prior to the withdrawal of water to document all water usage by the Contractor. The Contractor will be required to record daily meter readings at the beginning and ending of each workday and provide these readings to the County representative with each pay request. The Contractor will not be charged any fees for the use of the meter nor for any water used in the execution of this work, unless otherwise indicated or it is determined that misuse or wasteful use took place. No fire hydrant shall be obstructed in case of a fire in the area served by the hydrant. No additional payment to the Contractor shall be made for the use of the meter or the documentation of water used. The Contractor shall be responsible for providing all other necessary hoses and tools for obtaining the water. Hoses shall be in like new condition and not leak. The hoses shall be protected against damage from vehicular or pedestrian traffic and shall not impact public movement and safety.

PART 3 – EXECUTION

3.1 GENERAL

A. Cleaning Precautions: During cleaning operations, satisfactory precautions shall be taken in the use of cleaning equipment. When hydraulically propelled cleaning tools (requiring water pressure to provide their cleaning force) or tools retarding the flow in the sewer main are used, precautions, including the direction of the cleaning operation, shall be taken to insure the water pressure created does not damage or cause flooding of public or private property being served by the pipe.

Cleaning: The designated manhole sections shall be cleaned using hydraulically propelled, high-velocity jet, or mechanically powered equipment. Selection of the equipment used shall be based on the size and conditions of pipes at the time the work commences. The equipment and methods selected shall be satisfactory to the Owner's Representative. The equipment shall be capable of cleaning a minimum of 1200' linear feet and of capturing, containing and removing dirt, grease, rocks, sand, and other materials and obstructions from the pipes and manholes. If cleaning an entire section cannot be successfully performed from one manhole, the equipment shall be set up on the other manhole and cleaning again attempted. Extreme care shall be taken when cleaning in a reverse setup so as not to cause flooding of service lines located along the sewer. If, again, successful cleaning cannot be performed or the equipment fails to traverse the entire manhole section, it will be assumed a major blockage exists and the cleaning effort shall be repeated with other types of equipment. All pipes shall be cleaned to the satisfaction of the Owner's Representative.

B. The term "clean", as used herein, shall mean the complete removal of all garbage, dirt, gravel, rocks, roots, grease, settled sludge and all other solid or semi-solid materials from the pipes and manholes.

1. Light Cleaning is defined as cleaning a pipe with an average depth of foreign material and debris equal to no more than 25% of the diameter of the main over the length of the manhole-to-manhole section. Rocks removed shall include those smaller than 3" in diameter.
2. Heavy Cleaning is defined as cleaning a pipe with an average depth of foreign material and debris equal to more than 25% of the diameter of the main over the length of the manhole-to-manhole section. Rocks removed shall include those larger than 3" in diameter. If a pipe is encountered requiring heavy cleaning, the Contractor shall notify the Owner's Representative of the problem before commencing work.
3. As part of both Light and Heavy Cleaning, the Contractor shall scour debris or grease-laden manhole walls with high velocity water gun and remove all materials from the sewer. No additional cost will be paid for such scour.
4. Specialty Cleaning is defined as cleaning a pipe with a heavy accumulation of roots and/or heavy accumulation of grease, large diameter rocks and/or debris and requires using bucketing and/or rodding methodologies to clean.

C. Conditions, such as broken mains and major blockages, may prevent cleaning from being accomplished, especially where additional damage would result if cleaning were attempted, or continued. Should such conditions be encountered, the Contractor shall not be required to clean those specific main sections unless the Owner removes the apparent obstruction.

D. Whenever mains to be cleaned show evidence of being more than one-half filled with solids, bucket machines and/or rodding machines shall be utilized to remove the major portion of the material before hydraulic equipment or high velocity, hydro-cleaning equipment is brought into use for finishing the cleaning work.

1. When bucket machines are used, the bucketing process shall be done in one main section at a time. A bucket of the proper size shall be placed into the downstream manhole and pulled, in intervals, towards the upstream manhole.
2. The bucket shall be retrieved and emptied at varying intervals depending upon the amount of materials being removed. When a bucket is retrieved and it is completely full or overflowing with materials, then the length of travel into the main shall be reduced to ensure total removal of debris. This process shall be repeated until the bucket has been pulled through the entire main section. Upon completion of the bucketing or rodding operation, hydraulically propelled cleaning equipment or high velocity hydro-cleaning equipment shall be used to complete the cleaning work.

E. Root Removal: Roots shall be removed from sections designated to be cleaned. Special attention shall be used during the cleaning operation to assure complete removal of roots from the joints. Procedures may include the use of mechanical

equipment such as rodding machines, bucket machines and winches using root saws, chain-slingers, porcupines, and equipment such as high-velocity jet cleaners.

- F. Material Removal: All sludge, dirt, sand, rocks, grease, and other solid or semisolid material resulting from the cleaning operation shall be removed at the downstream manhole of the section being cleaned. Passing material from manhole section to manhole section, potentially causing main stoppages, accumulations of sand in wet wells, or damage pumping equipment, shall not be permitted.
- G. Disposal of Materials: All solids, semisolids and/or liquids resulting from the cleaning operations shall be removed from the work site and disposed of at a site designated by the Owner's Representative and approved to accept wastewater debris and liquids. All materials shall be removed from the site no less often than at the end of each workday. Under no circumstances will the Contractor be allowed to accumulate debris, etc., on the site of work beyond the stated time, except in totally enclosed containers and as approved by the Owner's Representative. Under no circumstances shall removed debris and/or liquids be dumped onto the ground or streets or into ditches, catch basins or storm drains for any length of time. Contractor shall be responsible for legally disposing all debris and all disposal costs.
- H. Concrete Deposit Removal: Concrete deposits forming in the pipe shall be removed by means of hydraulically or mechanically operated equipment. Chain cutters, clamshell cutters, and robotic cutters are typical equipment used to remove concrete deposits. Payment will constitute full compensation for cutting and/or grinding down concrete deposits, including, but not limited to, labor, equipment, transportation, tools, and all other related procedures and materials necessary to produce the results specified in Section 01510. Removing concrete deposits will be done to remove obstructions and/or upsize sewers. Contractor will advise the Owner's Representative in writing prior to proceeding.
- I. Protruding Tap Removal: Service taps extending into the pipe shall be removed by means of hydraulically or mechanically operated equipment. Chain cutters, clamshell cutters, and robotic lateral reinstatement cutters are typical equipment used to remove protruding taps. Taps should be removed so the resulting protrusion is less than 1" at the greatest point, or 10% of sewer main diameter, whichever is smaller and the main and remaining tap is not damaged. All debris resulting from protruding tap removal shall be removed immediately from the pipe. Where protruding taps are vitrified clay, grinding wheels may be used on lateral reinstatement cutters to insure a smooth finish. Where protruding taps prevent the passage of equipment through the pipe, notify the Owner's Representative immediately for point repair execution. Note: All protruding taps must be verified via television inspection prior to inserting any type of cutting tool into the main.
- J. Grease Removal: Grease shall be removed in designated sections where grease is a known problem and shall be considered part of the cleaning procedures. The Contractor shall provide a list of lines requiring grease removal to the Program Manager and the Owner's Representative so they may be added to the Owner's on-going maintenance list. Special attention should be given during the cleaning operations to ensure the complete removal of grease from the top of the pipe.

Procedures may include the use of mechanical equipment such as rodding machines, bucket machines and winches using root cutter and porcupines, and equipment such as high-velocity jet cleaners, and hot water. Chemical means of grease removal will be considered upon request by the Contractor; however, it is considered subsidiary to Line Cleaning, and no additional payment will be allowed.

3.02 ACCEPTANCE

Acceptance of pipe cleaning shall be made upon the successful completion of the television/sonar inspection indicating a minimum of 95% of the through flow channel and cross section. If the inspection shows the cleaning to be unsatisfactory, the Contractor shall be required to reclean and reinspect the pipe, at no additional cost to the Owner, until the cleaning is shown to be satisfactory.

3.03 CLEANING PRECAUTIONS

- A. Bucket machines or rodding machines shall be used very carefully because of their tendency to "hang-up" on or "wedge against" the sewer main and break it. Only experienced and well-trained operators shall operate the machines(s). All repairs of damage or retrieval of "wedged" equipment shall be performed in accordance with this Contract and at no additional cost to the Owner.
- B. Whenever hydraulically propelled cleaning tools, or high velocity, hydro-cleaning equipment or any tools retarding the flow of water in the sewer mains are used, precautions shall be taken to ensure the water pressure created does not cause any damage or flooding to public or private property being served by the main involved. The contractor is responsible for all expenses associated with all such damages.
- C. Any damage to the sewer mains caused by the Contractor's operations shall be repaired in a manner approved by the Owner's Representative at the Contractor's expense. The Owner reserves the right to make said repairs itself and charge the Contractor accordingly.
- D. Damage due to flooding of any public or private property being served by any main over-filled by Contractor's cleaning operations shall also be repaired or otherwise paid for by the Contractor.

3.04 DOCUMENTATION

- A. The Contractor shall keep records (in a log-type form) of the work accomplished in the cleaning of the pipes. With each pay request, digital backup documentation is required. The following information shall be required as a minimum:
 - 1. Location (street address) and type of surface cover.
 - 2. Manhole ID Number to Manhole ID Number.
 - 3. Pipe ID Number
 - 4. Date and Time.

5. Length of Pipe.
6. Condition and depth of manholes.
7. Size and type of main.
8. Type and condition of manhole.
9. Type of cleaning performed and various types of equipment used.
10. Meter readings (fire hydrant use).
11. Remarks as to type of materials removed, amount of materials removed, and number of hours spent on each pipe section.

K. The Contractor shall complete work on each asset as assigned via the Owner's Computerized Work Order Management system. Upon start of work, the Contractor shall receive work orders as assigned by the Owner's Representative. The Contractor shall maintain and synchronize the status of each rehabilitation work order issued.

END OF SECTION

SECTION 02958

PIPE BURSTING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. This specification covers all Work, materials and equipment required for rehabilitating existing sanitary sewers using pipe bursting. The scope includes the complete installation of the new pipe, reconnection of existing sewer service connections, repair/rehabilitation of manholes, initial and final cleaning, CCTV inspection and full site restoration.

1.02 DESCRIPTION

The Pipe bursting process is defined as the reconstruction of pipe by installing an approved pipe material, by means of one of the approved process set forth in this specification. The existing pipe is broken by either brittle fracture or by splitting, using an applied force by a bursting tool while at the same time the new pipe is either being pulled or pushed into place. The size of the bursting tool shall be the minimum diameter necessary to facilitate the process. Oversized bursting tools shall not be allowed. No pipe bursting restoration will be accepted if it created a sag in the restored line by oversized bursting tools or other procedures. The Contractor shall be responsible for correcting existing sags and any new sags created by the new construction.

1.03 RELATED SECTIONS

- A. Section 01030: Special Projects Procedures
- B. Section 01510: Sanitary Sewer and Lateral Television Sonar Inspection
- C. Section 01520: Sewer Flow Control
- D. Section 02205: Dewatering
- E. Section 02276: Site Restoration and Erosion Control
- F. Section 02324: Trenching and Trench Backfilling
- G. Section 02530: Sewer Lateral Reconnection and Replacement
- H. Section 02537: Ductile Iron Sanitary Sewer Pipe and Fittings
- I. Section 02608: Manhole Frame and Cover Installation
- J. Section 02641: Precast Concrete Manholes
- K. Section 02650: Testing for Acceptance of Gravity Sanitary Sewers
- L. Section 02700: Pavement Repairs

- M. Section 02900: Sanitary Sewer Manhole Rehabilitation
- N. Section 02956: Sanitary Sewer Cleaning

1.04 REFERENCES

- A. ASTM D638 - Standard Test Method for Tensile Properties of Plastics.
- B. ASTM D1248 - Standard Specification for Polyethylene Plastics Extrusion Materials for Wire and Cable
- C. ASTM D1599 - Standard Test Method for Resistance to Short-Time Hydraulic Pressure of Plastic Pipe, Tubing, and Fittings.
- D. ASTM D1603 - Standard Test Method for Carbon Black Content in Olefin Plastics.
- E. ASTM D3350 - Standard Specification for Polyethylene Plastics Pipe and Fittings Materials
- F. ASTM D3550 - Standard Practice for Thick Wall, Ring-Lined, Split Barrel, Drive Sampling of Soils.
- G. ASTM F585 - Standard Guide for Insertion of Flexible Polyethylene Pipe into Existing Sewers.
- H. ASTM F714 - Standard Specification for Polyethylene (PE) Plastic Pipe(DR-PR) Based on Outside Diameter
- I. ASTM F2620 – Standard Practice for Heat Fusion Joining of Polyethylene Pipe and Fittings

1.05 QUALIFICATIONS

- A. Pipe Bursting System Installer
- B. Shall be certified and licensed by proposed pipe bursting system manufacturer and must provide a letter to the Owner's Representative documenting this requirement.
- C. Minimum of 3 years' verifiable experience using the pipe bursting method and pipe material used
- D. Experience shall include a minimum total of 25,000 LF of completed pipe bursting footage
- E. Experience shall include a minimum of 10,000 linear feet of pipe-bursting upsizing where similar sized diameter increases have been successfully completed in pipe diameters 8-inch to 12-inch range. Additionally, a minimum of 3,000 linear feet of pipe-bursting for pipe larger than 12-inches in diameter.
- F. Personnel performing pipe bursting must be certified, in writing, by manufacturer of pipe bursting system having successfully completed training in:

- G. Operating of bursting equipment used
- H. Assembling and Installing proposed replacement pipe
- I. Operation and maintenance of all equipment to be used.
- J. Personal experience of Contractor's construction manager with other construction companies may be substituted in lieu of current company experience as approved by the Owner's Representative
- K. HDPE Fusible Pipe Joiner
 - 1. Personnel performing fusing of pipe and fittings must be certified, in writing, by manufacturer of fusing equipment having successfully completed training in:
 - a. Inspecting, Handling and storing of replacement pipe materials
 - b. Butt fusion of pipe joints and saddle fusion of fittings as required
 - c. Operation and maintenance of all equipment to be used
 - 2. Verifiable Experience record of crew performing the joint fusing, including number of years and number of joints that have been fused
 - 3. Training shall be performed by pipe manufacturer's certified representative
- L. Operators:
 - 1. Fusion Equipment:
 - a. Certified in writing by pipe manufacturer
 - b. Minimum of 2 years' experience of fusion welding HDPE and DR(s) being used.
 - c. Fusion technician shall have successfully fused a minimum of 250 joints.
 - 2. Insertion Equipment:
 - a. Certified in writing by pipe manufacturer
 - b. Minimum of 10,000 LF of pipe during preceding 3 years using pipe bursting technology specified herein; additionally, 3,000 LF of pipe shall be 12-inches in diameter or larger.

1.06 SUBMITTALS

- A. The Contractor shall submit Contractor's/manufacturer's data and details of the following items for approval:
 - 1. A Comprehensive Construction Sequencing Plan. At minimum the plan shall include the following:
 - a. Construction sequencing
 - b. A proposed schedule identifying critical path items.
 - c. Identification of all proposed access routes complying with NPDES permit, when applicable.
 - d. Detailed installation procedure for the pipe bursting method to be used.

- e. Detailed procedures for the installation and bedding of the new pipe in the launching and receiving pits.
- f. Design of pipe bursting equipment
- g. Support of backstop
- h. Identification of set-up locations for pipe bursting.
- i. Location and dimensions of the pits to be excavated. Identify proposed modifications to existing manholes or replacement of existing manholes, if any manholes are to be used as machine pits or pipe insertion pits.
- j. Arrangement and position of jacks and pipe guides; complete in assembled position.
- k. Description of the method to remove and dispose of the host pipe, if required.
- l. Excavation and backfill
- m. Annular space grouting, if required
- n. Field quality control testing
- o. Contingency plan, including the following:
 - 1) Unforeseen obstructions that stop or delay the operation
 - 2) Unforeseen deflections that stop or delay the operation
 - 3) Excessive surface heaving or subsidence
 - 4) Damage to existing utility installations
 - 5) Required spot repairs of the existing line
- p. Equipment staging area.
- q. Dewatering method in accordance with Section 02205 – Dewatering.
- r. Pipe bursting distances and directions.
- s. Method used to deactivate and then reactivate service laterals.
- t. Service outage and reinstatement schedule.
- u. Site restoration.
- v. Identification of the pipe fusion area and HDPE pipe train staging area.
- w. Bypass pumping plan in accordance with Section 01520 - Sewer Flow Control.
- x. Trench safety systems, well pointing, backfill with cement-stabilized sand or bank sand, and other items associated with insertion pits
- y. Traffic Control Plan in accordance with GDOT requirements.
- z. Erosion Control Plan in accordance with Department of Watershed Management Protocol for Providing Erosion & Sedimentation Controls on Construction Projects complying with latest State approved Erosion and Sediment Control Manual as well as the NPDES permit when applicable.

2. Cold weather installation plan following the manufacturer's recommendations. Plan shall include, but not limited to, the following major components:

- a. Pipe storage

- b. Pipe handling equipment
 - c. Proper pipe preparation and joint fusion procedures
 - d. Pipe installation
 - e. Minimum allowable temperature
- 3. Design Calculations for selected material used including but not limited to:
 - a. Pull/push loads
 - b. Thrust loads
 - c. Thermal force (showing the change in length due to temperature variation and the proposed pipe burst method to either resist the thermal forces or accommodate the change in length)
- 4. Catalog cuts and specifications for the pipe material(s) selected for uses, including but not limited to (note: should DIP be selected as a pipe material to be used then the Contractor shall submit all pertinent information per Section 02534 – Ductile Iron Sanitary Sewer Pipe and Fittings):
 - a. Size
 - b. Dimensionality
 - c. DR/pressure class per applicable standard
 - d. Wall thickness
 - e. Color
 - f. Recommended minimum bending radius
 - g. Recommended maximum safe pull force
 - h. Experience record of pipe manufacturer
 - i. Electrofusion fittings
 - j. Electrofusion flex restraints
 - k. Electrofusion Saddles
 - l. Lubrication
 - m. Joining equipment
 - n. Pipe joints
 - o. Gaskets showing cushion packing ring
- 5. Fusion joint documentation containing the following information:
 - a. Pipe size and thickness
 - b. Machine size
 - c. Fusion technician identification
 - d. Job identification
 - e. Fusion joint number
 - f. Fusion, heating, and drag pressure settings
 - g. Heat plat temperature
 - h. Time stamp
 - i. Heating and cool down time of fusion
 - j. Ambient temperature
- 6. Material Safety Data Sheets (MSDS) for each product used.
- 7. Instructions for storing pipe to prevent damage from ultraviolet light

8. Qualification certificates and evidence of qualifications and experience required herein for the:
 - a. Installer
 - b. Fusion equipment operator
 - c. Insertion equipment operator.
9. Test Results:
 - a. Certified Factor
 - b. Field
 - c. Approved data logger device reports
10. Pre-installation and post-installation television inspection reports to include CCTV DVD/CD and logs.

B. The Contractor shall provide to the Owner's Representative the following verifiable information, in writing, prior to the set deadline, or at the indicated frequency, whichever is applicable. The schedule for all other submittals not listed below will be determined by the Owner's Representative:

Type of Submittal	Time/Frequency of Submittal
Experience Record of Contractor/Subcontractor	At Preconstruction Conference
Comprehensive Construction Sequencing Plan	At Commencement of Contract
Listing of Safety Precautions and Traffic Control Measures	At Commencement of Contract
Tracking quantity of Debris from Cleaning to be Disposed at County Approved Location(s)	At Commencement of Contract
Specific Project Schedule with a Project completion date	At Commencement of each specific project
Schedule of Planned Inspections/Cleaning of Sewer Reaches	Post Commencement and Weekly
Daily Logs and Progress Reports	Daily
Confined Space Entry Logs	Daily

C. Daily reports, submitted by 9.00 a.m. on the day following survey, and weekly reports, submitted by 9.00 a.m. on Monday following the week of survey, shall be emailed to the Owner's Representative in both Word and PDF format.

D. The Contractor shall complete a daily written record (diary) detailing the work carried out and any small items of Work which were incidental to the Work. The Contractor shall include in his daily record and reference to the following:

1. Delays: Dense traffic, lack of information, sickness, labor or equipment shortage, etc.
2. Weather: Conditions (e.g., rain, sunny, windy, etc.). Rain accumulation data from local national weather station.
3. Equipment: On site (e.g., specialty cleaning, by-pass equipment, etc.).
4. Submittals: To the Owner's Representative.
5. Personnel: On site by name (e.g., all labor, specialty services, etc.).
6. Accident: Report (e.g., all injuries, vehicles, etc.).
7. Incident: Report (e.g., damage to property, property owner complaint, etc.).
8. Major defects encountered: including collapsed pipe, if any, cave-ins, sink holes, etc.
9. Work accomplished
10. Visitors: On site.
11. Disposals: Type and quantity of debris (including liquids).

1.07 TRIAL TEST AND METHODOLOGY REVIEW

- A. Should Contractor submit using a pipe bursting methodology the Owner's Representative is not familiar with, the Contractor shall comply with the following conditions before a pipe bursting technique becomes accepted as a viable option on a repeat basis:
 1. A successful demonstration of a trial length of sewer pipeline requiring pipe bursting, chosen by the Owner's Representative, to include all aspects of the installation and quality control tests, as recommended by the manufacturer and in compliance with industry standards.
 2. The Contractor shall include and allow for representation by the equipment manufacturer, if requested and further requirement of the Owner's Representative, subsequent to the trial, to modify the equipment, material and/or installation methodology in order to complete the Work satisfactorily and meet all testing standards at no additional cost to the Owner.
 3. The Owner's Representative shall formally accept the Contractor as having successfully completed the trial stage, should this be the case.

1.08 QUALITY ASSURANCE

- A. The Contractor is solely responsible for quality assurance during the length of the project. The Contractor is responsible for any costs associated with corrective measures required to replace or repair items not meeting the quality standards specified by the County at no additional cost to the Owner.
- B. Product manufacturers shall provide the Owner's Representative with written certification indicating products furnished comply with all applicable provisions of these specifications.
- C. If ordered by the Owner's Representative, each pipe manufacturer shall furnish the services of a competent and certified factory representative to supervise and/or inspect the installation of the pipe. This service shall be furnished for a minimum of five (5) days during initial pipe inspection at no additional cost to the Owner.

1.09 SITE CONDITIONS

- A. Contractor shall conform to all local, State and Federal regulations including those set forth by OSHA, RCRA, GDOT, GAEPD, EPA and any other applicable authorities.
- B. Sufficiently detailed Method statements and design procedures are to be provided to the Owner's Representative when confined space entry, flow diversion, debris removal, or bypass is necessary for Contractor to perform the specified work.

1.010 FIELD SUPERVISION BY CONTRACTOR

- A. The Contractor shall maintain on the Work Site, at all times, a competent certified and trained field supervisor in charge of the Pipe Bursting and polyethylene pipe joining utilizing thermal butt fusion. Refer to the Qualification Section herein.
- B. The field supervisor shall be approved in writing by the Owner's Representative prior to commencement of the Work. Any change of supervisor must be approved in writing by the Owner's Representative prior to the change. The field supervisor shall be responsible for the safety of all workers and site conditions, as well as ensuring all work is conducted in conformance with the requirements of these specifications and to the level of quality specified. At any time, at the request of the Owner's Representative, the Contractor shall immediately replace the Contractor's field supervisor. The field supervisor shall be dedicated to this project and have no other responsibilities.

1.011 RESPONSIBILITY FOR SANITARY SEWER OVERFLOWS AND DAMAGE TO PROPERTY AND UTILITY

- A. Reference Specification Section 01030 – Special Projects Procedures, Para B.

1.012 SAFETY

- A. All work shall be performed in accordance with OSHA standards and local, State and Federal safety regulations.
- B. No person shall enter a confined space without the documented requisite training, certification, and entry permit.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. HDPE pipe shall meet the applicable requirements of ASTM F714, ASTM D1248, and ASTM D3550.
 - 1. All pipes shall be made of virgin material. No rework shall be used, except when obtained from the manufacturer's own production of the same formulation.
 - 2. The pipe shall be homogeneous throughout and shall be free of visible cracks, holes, foreign material, blisters, or other deleterious faults.

3. HDPE Pipe with the designation of PE 3408 shall have a minimum cell classification of 345464C, D, or E as described in ASTM D3350.
4. HDPE Pipe with the designation of PE 4710 shall have a minimum cell classification of 44574C, D, or E as described in ASTM D3350
5. Pipe sizes to be measured in ductile iron pipe (DIP) sizes. The minimum dimension ratio (DR) of the pipe shall be DR 17 unless otherwise noted on the drawings or approved by the Owner and/or their Representative
6. Color:
 - a. Inside: Inner wall shall be light color interior (soft gray or white).
 - b. Outside: Outer wall black with co-extruded green cover or extruded green stripes designating use for sanitary sewer. Pipe with extruded green stripes shall have a minimum of three equally spaced stripes. Pipe shall have a heat indented print line containing the information required in ASTM D3035. Color print lines are not an acceptable method for designation of sewer mains.
7. Fittings shall be HDPE butt fusion welded fittings in accordance with ASTM D3261 as modified for the specified material
8. Joints:
 - a. Pipe jointing shall be by butt fusion welding.
 - b. Electrofusion Couplings may be used for repairs or connecting pipe burst segments in the trench with approval from the Owner's Representative.
 - c. Service Connections using service saddles shall be butt fusion or electrofusion couplings saddle type fitting with DIP outside dimension branch connection:
 - 1) Specifically designed for connection to type of HDPE being installed.
 - 2) If approved by the Owner's Representative for HDPE pipe larger than 10-inches in diameter the Contractor may opt to install an Inserta type tee.
9. Stiffeners inserts: Stainless steel stiffener inserts, ASTM 240, shall be used for all fittings and connections to HDPE pipe. Stiffeners shall be of SS 304, wedge-type design.

B. Ductile Iron Pipe (DIP):

1. Minimum 350 pressure rating.
2. Boltless restrained joint design capable of developing a minimum 20,000 pound allowable dead end thrust pulling force without separation or permanent deformation.
3. Meet all applicable requirements in Section 02537, Ductile Iron Sanitary Sewer Pipe and Fittings

2.02 EQUIPMENT

A. Pipe Bursting Equipment:

1. The pipe bursting system be designed and manufactured to force its way through existing pipe materials by fragmenting the pipe and compressing the

broken pieces into the surrounding soil as it progresses. The bursting unit shall generate sufficient force to burst and expand the existing pipeline and allow for the insertion of the liner pipe.

2. Joining: Capable of meeting Project conditions and as recommended by the pipe manufacturer, including, but not limited to, fusion temperature, alignment, and fusion pressure.
3. Provide equipment of sufficient size and power to accomplish specified pipe replacement. The following systems may be used:
 - a. Static pull
 - b. Pneumatic pipe bursting
 - c. Hydraulic expansion

B. Bursting Lubricants:

1. Bursting lubricants shall be used at the request of the pipe bursting contractor and at the discretion of the Owner and/or their Representative.
2. Lubricants shall be compatible for long term use with HDPE and DIP pipe.

C. Pipe Pull Heads:

1. Pipe pull heads shall be utilized that employ a positive through-bolt design assuring a smooth wall against the pipe cross-section at all times.
2. Pipe pull heads shall be specifically designed for use with liner pipe, and shall be as recommended by the pipe supplier.

D. Pipe Rollers

1. Pipe rollers, if required, shall be of sufficient size to fully support the weight of the pipe during handling and pullback operations.
2. A sufficient quantity of rollers and spacing, per the pipe supplier's guidelines shall be used to assure adequate support and resist excessive sagging of the product pipe.

2.03 DELIVERY, STORAGE, AND HANDLING

- A. The Contractor shall deliver only materials fully conforming to these specifications or for submittals previously provided and approved for use by the Owner's Representative.
- B. The Contractor shall load, transport, and unload pipe and appurtenances at project site.
- C. The Contractor shall store materials and handle to avoid damage. The interior of all pipe, fittings and other appurtenances shall be kept free from dirt or foreign matter at all times. The Contractor shall replace any damaged materials and remove damaged materials from site and replace at Contractor's cost.
- D. Pipe shall not be stacked higher than the limits recommended by the manufacturer. The bottom tier shall be kept off the ground on timbers, rails or concrete. At least two rows of timbers shall be placed between tiers and chocks, affixed to each other in order to prevent movement. The timbers shall be large enough to prevent contact

between the pipes in adjacent tiers. Support for HDPE pipe shall suitably prevent damaging contact with the ground.

PART 3 – EXECUTION

3.01 GENERAL STANDARDS AND REQUIREMENTS

- A. In addition to DeKalb County General Requirements and Minimum Guidance Specifications; the Contractor must comply with the latest editions of the following specifications and standards: Georgia Department of Transportation (GDOT) Specification Construction of Transportation Systems; the Georgia Erosion and Sedimentation Act; the Manual on Uniform Traffic Control Devices for Streets and Highways; the American Society for Testing and Materials, (hereinafter ASTM); the American Water Works Association (hereinafter AWWA); the American Association of State Highway and Transportation Officials (hereinafter AASHTO); American Wood Preservers Bureau (hereinafter AWPB); National Sanitation Foundation (hereinafter NSF); American Concrete Institute (hereinafter ACI); 33 CFR Parts 323 & 328; and 40 CFR Part 110; Plastic Pipe Institute (PPI), DIPRA and any other applicable standards.
- B. The Work under this contract shall comply with these specifications, requirements of work orders, and with all applicable codes, laws, and regulations of the local City, County, State, and Federal Agencies having jurisdiction. In the event of any conflict between the terms of these specifications and such codes, laws, and/or regulations shall prevail. If the Contractor performs any work knowing it to be contrary to such codes, laws, or regulations, and without such notice to the Owner, the Contractor shall assume full responsibility therefore and shall bear any and all costs necessary to correct the Work.
- C. Prior to initiation of a specific project, a schedule for the project shall be submitted to the Owner's Representative. Once the schedule is approved by the Owner's Representative, it will become part of the scope of work for the specific project. It is the responsibility of the Contractor to maintain this schedule. If circumstances arise affecting the project schedule, the Contractor shall notify the Owner's Representative in writing and request approval from the Owner's Representative for a schedule change.
- D. It is the responsibility of the Contractor to notify all residents potentially affected by the Pipe Bursting activities. This notification shall consist of written information and verbal communication outlining the Pipe Bursting process and timing of the project. The written information shall be delivered to each home/business at least one week prior to the start of the project, and at a minimum shall describe the work, schedule, how it affects the home/business, and local telephone numbers for the Contractor and Owner's Representative. The written notification shall be approved by the Owner's Representative before distribution. At the request of the Owner's Representative, the Contractor shall participate in public meetings regarding the project.
- E. At no time shall water and sewer service be interrupted by the pipe bursting operations.
- F. The Contractor shall locate all wastewater service lines, plug, and pump prior to pipe bursting and continuously pump until the services are reconnected.

3.02 PREPARATORY PROCEDURES

- A. Prior to entering any private property, the Contractor shall ascertain the requirements of applicable permits or recorded easements, and shall conduct the work in accordance with the requirements thereof; including giving notice and obtaining right-to-enter onto existing easement. The Contractor shall be fully responsible for complying with the requirements of any permit or easement granting entry, although such requirements may be more stringent than otherwise stipulated by this Contract. The Contractor shall compensate the Owner fully for any loss or expense arising from failure of the Contractor to comply with the aforementioned requirements.
- B. Sub-surface and Surface Conditions
 - 1. Locate and mark existing utilities in areas where excavation is to be performed prior to beginning excavation.
 - 2. Any known pre-existing concrete encasements shall be excavated and broken out prior to the bursting operation to allow the steady and free passage of the pipe bursting head
 - 3. Examine surface and subsurface path of proposed line segment and notify Owner's Representative if conditions exist that could cause problems with pipe bursting method. This could include utilities and nearby services that could be damaged by the operations, existing slabs that could be damaged, expansive soils, or less than acceptable depth of cover.
- C. Locate insertion or access pits in order that total number is minimized and footage of pipe installed in a single run is maximized. Use excavations at locations of existing manholes scheduled for replacement or at point repair locations where possible. Locate pits where interference to vehicular traffic and inconvenience to public is minimized. Safe and suitable temporary access shall be provided and maintained to all private property and businesses. The duration pits are open shall be kept to a minimum. Pits shall be kept as dry and shall be excavated to at least one foot below the pipe invert to minimize the potential for contamination during connection of the new pipe, fittings, and services.

3.03 TRAFFIC CONTROL

- A. The Contractor shall be fully responsible for Traffic Control and shall expedite the Work so as not to interfere with the traffic along and across the street and at entrances to properties.
- B. The flow of traffic will be maintained at all times during all aspects of the Work being performed by permitting at least one lane of traffic to move through the Work site. The Contractor shall furnish all flagmen, warning signs, barricades, lights, necessary to control traffic and protect the public or as required by the Owner or jurisdictional authority without any additional cost to the Owner. Traffic control devices shall be in accordance with "The Manual on Uniform Traffic Control Devices for Streets and Highways" most current edition. The Local Municipality and/or GDOT shall approve all traffic control plans prior to the start of Work.
- C. The Contractor shall advise residents when their respective driveways, sidewalks, alley ways, etc. will be blocked by the fused HDPE pipe train prior to installation and according to a notification schedule approved by the Owner's Representative. Where

the fused HDPE pipe train crosses streets, a traffic detour plan must be submitted to the Owner's Representative for approval prior to the commencement of the activity.

3.04 FLOW CONTROL

Refer to Section 01520 - Sewer Flow Control, for specification on bypass pumping or plugging of the sewer lines.

3.05 CLEANING

The existing pipe and manholes shall be cleaned prior to the CCTV Pre-Inspection. The installed pipe and restored manholes shall be cleaned prior to the Post CCTV inspection. Refer to Section 02956 - Sanitary Sewer Cleaning.

3.06 CCTV PRE-INSPECTION OF SEWER LINE

Refer to Section 01510 - Sanitary Sewer and Lateral Television Sonar Inspection. Inspection of the sewer line or lateral shall be performed by experienced personnel trained in locating breaks, obstacles, and service connections by CCTV or man-entry inspection. The interior of the sewer shall be carefully inspected to determine the location of any conditions preventing the proper installation of the new pipe utilizing the pipe bursting method.

3.07 LINE SAG

- A. If pre-installation CCTV inspection reveals sag in existing sewer greater than one-half diameter of existing pipe, eliminate sag by one of the following:
 1. Dig pit around area of sag and install backfill to bring bottom of pipe trench to uniform grade in line with existing pipe invert.
 2. Perform point repair per Section 02535, Gravity Flow Sanitary Sewers.
 3. Contractor proposed method shall be acceptable to Owner and/or their Representative

3.08 PIPE JOINTING

- A. No materials shall be dumped, dropped, pushed or rolled into a trench. Pipe may be pulled longitudinally into the trench after fusion of the pipeline. Pulling of the main shall be accomplished by mechanical action during pipe bursting operations.
- B. The Contractor shall install all pulleys, rollers, bumpers, alignment control devices and other equipment required to protect existing manholes, and to protect the new pipe from damage during installation. Lubrication may be used as recommended by the manufacturer. Under no circumstances shall the pipe be stressed beyond its elastic limit (polyethylene) or compressive or tensile limit (ductile iron).
- C. Pipe Jointing:
 1. Fusion Welds:
 - a. Prior to pipe installation, perform sample fusion welds for examination by Owner's Representative. The Owner's Representative reserves the right to randomly inspect welds as deemed necessary.

- b. Fusion machine employed for trial welds shall be same machine utilized for project installation.
- 2. Owner's Representative will evaluate sample joints to verify quality. After visual examination, Owner's Representative may conduct destructive tests.
- 3. If requested by the Owner and/or their Representative, conduct additional training of pipe joint personnel.

D. Butt Fusion:

- 1. Conform to ASTM F2620 and pipe manufacturer's criteria for type of joining.
- 2. Joint strength shall be equal to that of adjacent pipe

E. Heater Plate:

- 1. Equipped with means, such as infrared thermometer or pyrometer (and associated data loggers), to measure temperature of plate surface and to ensure uniform heating.
- 2. Use fire-retardant bag or suitable enclosure to facilitate control of heating process and to protect heater plate surfaces from dirt and other debris when not in use.
- 3. Clean surfaces regularly to prevent accumulation of fusion welding residues or other substances that may result in faulty pipe joining.

F. Joint Preparation:

- 1. Clean inside and outside of pipe ends with cotton or non-synthetic cloth to remove dirt, water, greats, and other foreign materials.
- 2. Cut pipe ends square and carefully aligned prior to heating.

G. Joining:

- 1. Upon achieving proper melt pattern, bring pipe ends together in firm, rapid motion, applying sufficient pressure to form pipe bead (1/8-inch to 3/16-inch high) around the inside of entire circumference of pipe.
- 2. Join sections of pipe onsite into continuous lengths aboveground.
- 3. Electrofusion may be used for field closures when appropriate fusion equipment can be utilized in trench type environment.
- 4. For end sections or "tail" pipe, use of electrofusion couplings may be utilized.
- 5. Terminal sections of pipe that are joined within insertion pit shall be connected with mechanical coupling, electrofusion coupling, or non-shear restraint coupling.
- 6. Connections shall be in conformance with manufacturer's installation procedures.
- 7. Butt gap between pipe ends shall not exceed 1/2-inch.

3.09 PIPE INSTALLATION

A. General:

- 1. Existing pipe shall be clean and free of obstructions so as not to prohibit pipe bursting operations.

2. Pipe insertion shall be continuous and without interruption from one manhole to another, except as approved by the Owner's Representative.
3. Lubrication may be used as recommended by manufacturer
4. Lay pipe true to lines and grade within existing sewer as shown on Drawings
5. Conduct pipe laying operations to prevent damage to liner or adjacent facilities.
6. Advancement of bursting head with "chain" shall be prohibited
7. Under no circumstances shall pipe be stressed beyond its yield stress.

B. Maintain sewage flow. Contractor may plug upstream line and store flows in upstream line segments. When inadequate storage exists to make this alternative acceptable, then bypass pumping shall be required (Section 01520, Sewer Flow Control)

C. Pit Shaft or Trench Excavation:

1. Excavate for purpose of conducting trenchless operations and for placing end joints of pipe.
2. Wherever end trenches are cut in sides of embankment or beyond, such work shall be sheeted and braced in accordance with Section 02324, Trenching and Trench Backfilling.
3. Install safety barriers around pits during normal working hours.
4. Insertion pits shall be securely plated over and/or barricaded as required at end of each work day.
5. Prior to backfilling insertion pits ensure new pipe is properly supported and on required grade.
6. Backfill after pipe has been installed and tested.
7. Restore insertion pits and associated surface areas to their original condition.

D. Where existing main to be replaced is less than 4 feet deep, utilities and services crossing the main or running parallel to it, and lying within a distance of 2 feet horizontal from edge of existing line shall be exposed prior to pipe bursting.

E. Void created by bursting device shall be sufficient in size to accommodate new carrier pipe. Oversized hammers shall not be used.

F. After insertion, allow liner a minimum of 12 hours (or as otherwise recommended by pipe manufacturer) to reach temperature equilibrium with sewer and to stress-relieve itself. No connection shall be made to liner during this period. Pipe shall not protrude or recede past pipe seal at manhole.

G. Existing Manhole:

1. Utilize where practical. Otherwise, excavate predetermined machine and insertion pits.
2. Remove inverts, benches, drops, and channels to permit access for installation equipment.
3. Enlarge input and output openings to accommodate maximum OD size of bursting device.

4. At no time shall bursting device and installation process place undue stress on existing manhole opening surface.
5. Secure pipe to concrete structure or manhole after pipe has been installed.
 - a. Install water stop or flange adapter that is fused and seated perpendicular to pipe axis, around pipe exterior, and grouted into structure wall to create watertight seal at manhole wall.
 - b. Install pipe to extend 12 inches inside manhole opening.
 - c. Make structure and manhole connections 12 hours, minimum, after pipe insertion.
6. Reconstruct benches and channels after new pipe is installed.

H. Sealing Manhole:

1. Place electrofusion flex restraints on top (180 degrees) section around newly installed pipe against inner manhole wall and fuse in place. Installation of electrofusion flex restraints shall be carried out in conformance with manufacturer's printed instructions by personnel certified by pipe manufacturer in proper method of installing electrofusion fittings.
2. Seal annular space at manhole. Seal shall extend a minimum of 8 inches into manhole wall in such a manner as to form smooth, uniform, watertight joint.
3. Reshape and smooth manhole invert as specified in Section 02900, Sanitary Sewer Manhole Rehabilitation.
4. Use approved rehabilitation materials to form a smooth transition with a reshaped invert and a raised manhole bench to eliminate sharp edges of liner pipe, concrete bench, and channeled invert.
5. Build up and smooth invert of manhole to match flow line of new sewer
6. Repair pipe seals in accordance with Section 02641, Precast Concrete Manholes

I. Manhole Replacement: Where insertion or pull pit is excavated adjacent to existing manhole not scheduled to be replaced, and the manhole sustains visible damage as a result of excavation or activity in the pit, replace manhole with new manhole conforming to Section 02641, Precast Concrete Manholes.

3.010 RECONNECTION OF SEWER SERVICE CONNECTIONS

- A. Refer to Section 02530 – Sewer Lateral Reconnection and Replacement. After the pipe has been installed, all existing active laterals and service connections shall be reinstated. All cut laterals and service connections shall be free of burrs, frayed edges, or any restriction preventing free flow of wastewater. Laterals shall be reinstated to a minimum of 100% of their original diameter and no more than 100% of their minimum diameter. The burst pipe shall be tightly sealed at the cut openings with no gaps.
- B. If the Contractor fails to reinstall a lateral or service connection and hence causes flooding or damage to the private property it serves, then the Contractor shall be held responsible.

- C. Service Pits: Pits shall be required to install service connection fittings and reconnect services to the newly installed pipe.

3.011 TESTING

Tests for compliance with this specification shall be made as specific herein and in accordance with the applicable ASTM Specification. A certificate with this specification shall be furnished, by the manufacturer for all material furnished under this specification. All PE pipe and fittings will be inspected to ensure they meet the requirements of this specification. Refer to Section 02650 – Testing for Acceptance of Sanitary Sewers for testing of installed replacement manholes.

3.012 POST CCTV INSPECTION

- A. Refer to Section 01510, Sanitary Sewer and Lateral Television Sonar Inspection. Upon completion and before acceptance of the pipe bursting Work by the Owner's Representative, the Contractor will inspect the rehabilitated pipeline by the use of CCTV cameras and shall submit the inspection to the Owner's Representative for approval/acceptance.
- B. Defects affecting the integrity or strength of the pipe, in the opinion of the Owner's Representative, shall be repaired or the pipe replaced at the Contractor's expense.

3.013 ACCEPTANCE

- A. It is the intent of these specifications for the newly installed pipe all appurtenances to be essentially equivalent in final quality and appearance to new sewer pipe installations, service connections and manholes.

3.014 COLLAPSED SEWERS/DEFECTIVE MANHOLES

- A. Any sewer found with greater than ten (10) percent deformation (i.e., collapsed or near collapse) shall be reported to the Owner's Representative immediately for remedial action.
- B. Any manhole found broken, cracked/leaking, with missing covers, or surcharged, shall be reported to the Owner's Representative immediately for remedial action.
- C. Any sewer found where the existing conditions pose a threat of personal injury to the public, such as a collapsed sewer with attendant depression to roadway, shall be reported to the Owner's dispatch call center immediately.
- D. Any manhole found where the existing conditions pose a threat of personal injury to the public, such as broken, cracked, or missing covers shall be reported to the Owner's dispatch call center immediately.

3.015 REMOVAL OF DEBRIS

- A. The Contractor shall provide all appropriately sealed equipment and personnel necessary to safely remove and extract silt and debris, load it onto trucks for disposal, and dispose of the silt and debris at the site(s) approved by the Owner's Representative. The debris and liquids are to be disposed of properly in accordance with all applicable laws. DeKalb County can

furnish a letter to the landfill stating the Contractor is authorized to dispose of the non-hazardous materials. Debris and liquids type and quantities are to be tracked in the daily Contractor diary. Hauling and disposal costs will be borne by the Contractor.

3.016 SITE RESTORATION

- A. The intent is to return all items and all areas disturbed, directly or indirectly by the Work under this Contract, to their original condition or better immediately after the Work is completed.
- B. The Contractor shall conduct the Work so when completing any part of the Work, the contour and topography of the construction area has not been substantially altered. Altering previously established storm drainage patterns will not be permitted unless such alteration is proven to the Owner's Representative's satisfaction to substantially improve the drainage pattern. Damage to ground cover, grass, trees, deep ruts, and gouges in the earth occasioned by the passage of heavy equipment or the depositing of any materials or equipment shall be repaired or replaced to its original or better condition as soon as possible. If the Work is being performed in paved areas, refer to Section 02700 – Pavement Repairs. Refer to Section 02710 – Concrete Curbs, Gutters, and Sidewalks for curb and sidewalk restoration. Refer to Section 02276 – Site Restoration and Erosion Control for grassed areas and general restoration.

3.017 EROSION CONTROL

- A. Refer to Section 02276 – Site Restoration and Erosion Control

3.018 WARRANTY

- A. The Contractor shall guarantee the work for a warranty period of one (1) year from the date of final acceptance. If, at any time during the warranty period, any defect is identified, such as, but not limited to, leaks, cracks, loss of bond, etc., affecting the integrity or strength of the pipe, collected solids, or reduced hydraulic flow capabilities of the product, the Contractor shall make repairs acceptable and at no additional cost to the Owner. In this case, the Contractor shall warrant the work for one (1) year in addition to the warranty required by the Contract.
- B. If the frequency of similar defects requiring repair increases, then the entire project will be re-evaluated.

END OF SECTION

SECTION 03300
CAST-IN-PLACE CONCRETE

PART 1 – GENERAL

1.01 SECTION INCLUDES

- A. Mixing and Placing Concrete.
- B. Protection of New Work.
- C. Curing.
- D. Testing and Inspecting Concrete.
- E. Defective Concrete.

1.02 RELATED SECTIONS

- A. Section 02700: Pavement Repairs
- B. Section 02710: Concrete Curbs, Gutters, and Sidewalks

1.03 REFERENCES

- A. ASTM C33 – “Standard Specification for Concrete Aggregates”
- B. ASTM C494 – “Standard Specification for Chemical Admixtures for Concrete”

1.04 SUBMITTALS

- A. Mix Designs: to contain portions of materials and admixtures to be used on Project, signed by mix designer, documentation of average strength for each proposed mix design and Manufacturer's Certificate of Compliance.
- B. Test Reports for aggregates used in the mix design
- C. Admixtures: manufacturer's catalog cut sheets and product data sheets for each admixture used in proposed mix design
- D. Product Data: Specified ancillary materials.
- E. Detailed plan for curing and protection of concrete placed and cured in cold weather. Details shall include, but not be limited to, the following:
 - 1. Procedures for protecting subgrade from frost and accumulation of ice or snow on reinforcement, other metallic embeds, and forms prior to placement.
 - 2. Procedures for measuring and recording temperatures of reinforcement and other embedded items prior to concrete placement.
 - 3. Methods for temperature protection during placement.
 - 4. Types of covering, insulation, housing, or heating to be provided.

5. Curing methods to be used during and following protection period.
6. Use of strength accelerating admixtures.
7. Methods for verification of in-place strength.
8. Procedures for measuring and recording concrete temperatures.
9. Procedures for preventing drying during dry, windy conditions.

F. Detailed plan for hot weather placements including curing and protection for concrete placed in ambient temperatures over 80 degrees F. Plan shall include, but not be limited to, the following:

1. Procedures for measuring, and recording temperatures of reinforcement and other embedded items prior to concrete placement.
2. Use of retarding admixture.
3. Methods for controlling temperature of reinforcement and other embedded items and concrete materials before and during placement.
4. Types of shading and wind protection to be provided.
5. Curing methods, including use of evaporation retardant.
6. Procedures for measuring and recording concrete temperatures.
7. Procedures for preventing drying during dry, windy conditions

G. Manufacturer's Certificate of Compliance to specified standards

H. Statement of Qualification:

1. Batch Plant: Certification as specified herein.
2. Mix designer.
3. Installer.
4. Testing agency.

I. Field test reports

PART 2 - PRODUCTS

2.01 MATERIAL

- A. Portland Cement: Conform to ASTM "Standard Specifications for Portland Cement", C150, Type I/II. Use one brand of cement. Mix shall contain at least 520 lb. of Portland Cement per cubic yard of concrete.
- B. Aggregates: Conform to ASTM "Standard Specifications for Portland Cement", C33. Provide aggregate of natural sand and gravel or prepared from stone or gravel, free from adherent coatings, maximum size of pieces 1". Use pea gravel aggregate for concrete mix used in filling voids in concrete block walls where required.
- C. Water: Clean and free from injurious amounts of oils, acids, alkalis, organic materials, and deleterious substances. Non-potable water will not be used in concrete mixing.
- D. Admixtures: Conform to ASTM C494 "Standard Specification for Chemical Admixtures for Concrete"

2.02 CONCRETE STRENGTHS

- A. Cast-in-place Concrete: Designed to develop 3,000 psi minimum compressive strength at twenty-eight (28) days and 3,500 IF EXPOSED TO WEATHER, unless noted otherwise.
- B. Cast-in-place pavement uses will need to develop 4000 psi minimum compressive strength at twenty-eight (28) days.

PART 3 - EXECUTION

3.01 PREPARATION AND INSTALLATION

- A. Notify Owner's Representative at least 1 full working day in advance before starting to place concrete
- B. Clean equipment for transporting concrete. Remove debris, water, and ice from places to be occupied by concrete. Remove laitance and unsound material from hardened concrete before additional concrete is added.
- C. No concrete shall be placed when mixed longer than ninety (90) minutes, has exceeded three hundred (300) truck drum revolutions, or evidence of curing prior to placement.
- D. Concrete, when deposited, shall have a temperature ranging between a minimum of 50° F and a maximum of 90° F.
- E. Falling concrete shall be closely confined in a drop chute of the proper size when drop is over four (4) feet, and the final drop must be vertical to avoid segregation of aggregates. In no case shall concrete be deposited from a height causing separation of the aggregates.
- F. Pumping of Concrete
 - 1. Provide standby pump, conveyor system, crane and concrete bucket, or other system onsite during pumping, for adequate redundancy to ensure completion of concrete placement without cold joints in case of primary placing equipment breakdown.
 - 2. Minimum pump hose diameter: 4 inches
 - 3. Replace pumping equipment and hoses that are not functioning properly.
- G. Concrete shall be mixed in such quantities as required for immediate use and shall be placed while fresh before loss of slump occurs. Re-tempering by adding water to restore slump lost during excessive mixing or due to too long a lapse of time since initial mixing will not be permitted.
- H. Concrete shall be rodded or vibrated to remove excess voids and air pockets when applicable

3.02 POST INSTALLATION

- A. All freshly placed concrete shall be adequately protected from mechanical injury or by action of the elements until such time as the concrete is thoroughly set.
- B. Curing
 - 1. Curing shall be performed on all concrete surfaces not immediately back-filled when hard.
 - 2. Curing shall be started immediately upon completion of the finishing operation. Curing shall continue uninterrupted for a minimum period of seven (7) days unless a longer period is hereinafter specified. Rapid drying upon completion of the curing period shall be prevented. At no time during the curing period shall the temperature of the concrete be permitted to drop below 40° F.
 - 3. Curing may be by water curing, sheet or liquid membrane. Do not use liquid membrane where a later concrete or masonry joint may occur unless the material has been certified as a non-bond breaker.

3.03 TESTING

- A. Four (4) test cylinders shall be molded each day for each fifty (50) cubic yards or fraction thereof. A slump and air test shall be made for each set of cylinders and whenever the concrete appears to vary in consistency.
- B. Mold and cure test cylinders in accordance with ASTM C-31 or PTM 611.
 - 1. Test one (1) cylinder at seven (7) days. If break does not meet specification, break two (2) cylinders at twenty-eight (28) days for acceptance.
 - 2. The remaining cylinder shall be kept for reference or additional testing if required.
- C. Slump
 - 1. Prior to submitting mix design, consult with concrete producer and select a target slump value at point of delivery, for each application of each design mix. Unless otherwise permitted, target slump value will then be enforced for duration of project. Unless otherwise permitted, target slump value is 4 inches at point of delivery, for concrete without high-range, water-reducing admixture.
- D. Source Quality Control Inspection: Owner shall have access to and have the right to inspect batch plants, cement mills, and supply facilities of suppliers, manufacturers, and Subcontractors, providing products included in this section.

3.04 ACCEPTANCE

- A. Defective concrete is defined as concrete in place not conforming to strength, shapes, alignments and/or elevations as specified or shown on the Drawings.
- B. All defective concrete shall be removed and replaced in a manner meeting specifications at no additional cost to the Owner.

END OF SECTION

SECTION 03462

POLYMER CONCRETE MANHOLES

PART 1 – GENERAL

1.01 SECTION INCLUDES

This specification shall govern furnishing all work necessary for installing polymer concrete manholes to be constructed.

1.02 RELATED SECTIONS

- A. Section 02205: Dewatering
- B. Section 02324: Trenching and Trench Backfilling
- C. Section 02276: Site Restoration and Erosion Control
- D. Section 02650: Testing for Acceptance of Sanitary Sewers
- E. Section 03300: Cast-In-Place Concrete

1.03 REFERENCES

- A. The following documents form a part of this specification to the extent stated and shall be the latest editions. Where differences exist between codes and standards, the requirements of these specifications shall apply.
 - ASTM D 6783 Standard specification for polymer concrete pipe
 - ASTM C 478 Standard specification for precast reinforced concrete manhole sections
 - ASTM C 443 Standard specification for joints for concrete pipe and manholes using rubber gaskets
 - ASTM C 923 Standard specification for resilient connectors between reinforced concrete manholes structures, pipes, and laterals
 - ASTM C 33 Standard specification for concrete aggregates
 - ASTM C 497 Standard test methods for concrete pipe, manhole sections, or tile

1.04 SUBMITTALS

- A. Submittals shall be made in accordance with contract submittal requirements and shall be as follows:
 - 1. Shop drawings for each manhole. Drawings shall include manhole number, location, rim and invert elevations, dimensions, reinforcing details, joint details, and component parts.

2. Calculations signed by a Professional Engineer demonstrating the manhole meets the design criteria as shown on the plans.
3. Manufacturer's certification and load test data for manhole steps (if applicable).
4. Manufacturer's certification for each type of cast iron frame, grate, and cover.

1.05 TOLERANCES

- A. Departure from and return to true vertical from the established manhole alignment shall not exceed $\frac{1}{2}$ inch per 10 feet, up to 2 inches for the total manhole depth.
- B. Manufacturing tolerances shall be per ASTM C 478

1.06 DESIGN CRITERIA

- A. Manholes shall be constructed of specified materials to the sizes, shapes, and dimensions and at the locations shown on the Plans or as otherwise directed by the Owner's Representative.
- B. The height or depth of the manhole will vary with the locations, but unless shown otherwise on the Plans, the top of the manhole frame will be at the finished grade of the pavement or higher than the ground surface as shown on the Plans and the invert will be at the designed elevations.

1.07 QUALITY ASSURANCE

- A. Prior to delivery, all basic materials specified in this section shall be tested and inspected by an approved independent commercial testing laboratory or, if approved by the Owner's Representative, certified copies of test reports prepared by the manufacturer's testing laboratory will be acceptable. All materials failing to conform to these Specifications shall be rejected.
- B. After delivery to the Work Site, any materials damaged in transit or are otherwise unsuitable for use in the Work shall be rejected and removed from the Work Site.

1.08 RESPONSIBILITY FOR SANITARY SEWER OVERFLOWS AND DAMAGE TO PROPERTY AND UTILITY

- A. Reference Specification Section 01030 – Special Project Procedures, Para. B.

1.09 SAFETY

- A. All work shall be performed in accordance with OSHA standards and State and Federal safety regulations.
- B. No person shall enter a confined space without the documented requisite training, certification, and entry permit.

PART 2 – PRODUCTS

2.01 MATERIALS (per ASTM D 6783)

- A. Resin: The manufacturer shall use only polyester or vinyl ester resin systems designed for use with this particular application. Resin content shall be a minimum of 7% by weight.
- B. Filler: All aggregate, sand and quartz powder shall meet the requirements of ASTM C 33, where applicable
- C. Additives: Resin additives, such as curing agents, pigments, dyes, fillers and thixotropic agents, when used, shall not be detrimental to the manhole
- D. Elastomeric Gaskets: Gaskets shall be suitable for the service intended. All gaskets shall meet the requirement of ASTM C 443

2.02 MANUFACTURING AND PRODUCT CONSTRUCTION

- A. Manholes: Manhole components shall be manufactured by the vibratory vertical casting process resulting in a dense, non-porous, corrosion-resistant, homogeneous, composite structure. Manholes shall be steel reinforced per ASTM C 478
- B. Joints: The manhole components shall be connected with an elastomeric sealing gasket as the sole means to maintain joint water-tightness. Joints at pipe tie-ins shall use resilient flexible pipe to manhole connectors per ASTM C 923. In cases where ASTM C 923 connectors cannot be used, the pipe shall be grouted into the manhole wall using a corrosion resistant grout and rubber water stop grout ring.
- C. Fittings: Cones, reducer slabs, base slabs and adjusting rings shall be of the same material as adjoining riser sections. Fittings shall be manufactured elastomeric gaskets, epoxy bonding or fiberglass overlay.
- D. Invert Channels: Invert channels may be built in the field after the manhole and pipe have been installed. If Portland cement concrete is used to form the bench and channel it shall have a minimum compressive strength of 3,000 psi. The exposed Portland cement concrete shall then be lined with either sewer grade brick or epoxy. Epoxy shall be Sauereisen Sewergard #210T, Raven 405 Epoxy Lining, or approved equal, and applied per the manufacturer's recommendation.
 - 1. Brick shall be sewer grade brick (Grade SS) in accordance with ASTM C32-05. Mortar shall be furan resin-based brick mortar. Mortar shall be 100% carbon filled and have the following physical properties:

Physical Property	Min Value	Test Method
Compression Strength	14,500 psi	ASTM C579
Tensile Strength	1,400 psi	ASTM C307
Flexural Strength	3,900 psi	ASTM C580
Bond Strength to Bricks	750 psi	Pull Blocks
Water Absorption	.15%	ASTM C413

2. Concrete surfaces having a furan resin mortar placed against them must be coated with the furan resin mortar manufacturer's recommended primer and prepared in accordance with the furan resin mortar manufacturer's recommendations.
3. The bench and channel brick mortar components shall be free of cracks, holes, de-laminations, foreign inclusions, blisters, or other defects resulting in a variation of inside diameter of more than 1/8 inch from that obtained on the adjacent unaffected portions of the surface or defects that would, due to their nature, degree, or extent, have a deleterious effect on the manhole performance as determined by the Owner's Representative.
4. Mortar Manufacturers: Furalac Green Panel Mortar by Henkel, PENCHEM® Mortar by Ergon Armor, or approved equal.

E. Acceptable manufacturer: Manufacturer of manholes shall employ manufacturing methods and material formulation in use for a minimum of 5 years. Manufacturer of manholes shall have been actively producing manholes under current name for a minimum of 4 years with no more than one year between manhole projects. References demonstrating this requirement shall be submitted for review. Polymer concrete manholes shall be manufactured in accordance with ASTM C 478.

F. Frames, Covers, And Steps

1. New manhole rims, toe pockets, frames, and covers shall be cast iron conforming to the requirements of ASTM A48 for Class 30 Gray Iron Castings. All castings shall be made accurately to the required dimensions, fully interchangeable, sound, smooth, clean, and free from blisters or other defects. Defective castings either plugged or otherwise treated shall not be used. All castings shall be thoroughly cleaned and painted or coated with bituminous paint. Each casting shall have its actual weight in pounds stenciled or painted on it in white paint.
2. Manhole frames and covers shall be as detailed on the Plans, and as manufactured by Vulcan Foundry, Russell Pipe & Foundry Co., or equal.
3. Sanitary sewer manhole covers shall have the words "DeKalb County Sanitary Sewer" cast on the top in letters two (2) inches high.
4. Manhole inlet steps shall be made of steel reinforced copolymer polypropylene model PS-1 PF manufactured by MA Industries or approved equal. They shall be installed at maximum sixteen (16) inch intervals. Manhole steps shall be as shown in the Detail Drawings with rod and pull ratings meeting OSHA standards.

G. Brick

1. Brick shall comply with the following requirements for its intended use. Bricks with holes through them will not be allowed in the Work.
2. Bricks used to adjust manhole frame to grade shall conform to the requirements of ASTM C32 for Grade SM. Bricks shall conform to the following dimensions, unless otherwise approved by the Owner's Representative.

	Depth (Inches)	Width (Inches)	Length (Inches)
Standard Size	2-1/4	3-3/4	8
Allowable Variation	+1/4	+1/4	+1/2

3. All brick shall be new and whole, of uniform standard size, and with substantially straight and parallel edges and square corners. Bricks shall be of compact textures, burned hard entirely through, tough and strong, free from injurious cracks and flaws, and shall have a clear ring when struck together. No soft or salmon brick shall be used in any part of the Work. Brick shall be culled after delivery, if required, and no culs shall be used except at such places, to such extent, and under such conditions as may be approved by the Owner's Representative.

2.03 MANUFACTURER

Polymer concrete manholes shall be manufactured by U.S. Composite Pipe, Inc. (www.uscompositepipe.com), Oldcastle Precast, Inc., or approved equal.

2.04 DESIGN

- A. Manholes shall be designed to withstand all live loads and dead loads as described in project plans and specifications. Dead loads shall include overburden load, soil side pressure and hydrostatic loading conditions. Manhole shop drawings shall be sealed by a licensed Professional Engineer.
- B. Manholes wall thickness shall be designed to resist hydrostatic pressures with a minimum safety factor of 2.0 for full depth conditions from grade to invert. In no cases shall the wall thickness be less than 3 inches
- C. Manholes shall be designed with sufficient bottom anchorage and side friction to resist buoyancy.
- D. The manhole shall be manufactured in one class of load rating. This class shall be H-20 wheel load (minimum 16,000 pounds dynamic wheel load).

2.05 TESTING

- A. Manholes: Manholes shall be manufactured in accordance with ASTM C 478
- B. Joints: Joints shall meet the requirements of ASTM C 443
- C. Compressive strength: Polymer concrete shall have a minimum unconfined compressive strength of 9,000 psi when measured in accordance with ASTM C 497
- E. Manhole Leakage: Manhole shall be tested in accordance with ASTM C 1244 Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Departure from and return to true vertical from the established manhole alignment shall not exceed $\frac{1}{2}$ inch per 10 feet, up to 2 inches for the total manhole depth.
- B. Manufacturing tolerances shall be per ASTM C 478
- C. Installation: The installation of manholes shall be in accordance with the project plans and specifications and the manufacturer's recommended practices
- D. Handling: Properly rated slings and spreader bar shall be used for lifting. The type of rigging used shall be per the manufacturer's recommendation.
- E. Jointing:
 - 1. Sealing surfaces and joint components shall be inspected for damage and cleaned of all debris.
 - 2. Apply joint lubricant to elastomeric seals. Use only lubricants approved by the manufacturer.
 - 3. Use suitable equipment handle and set manholes.
 - 4. Placement and compaction of surrounding backfill material shall be applied so as to provide sufficient and equal side pressure on the manhole.
- F. Pipe connections at manholes:
 - 1. Openings in manhole walls for incoming and outgoing sewers shall be precast or cored and after installation sealed with an approved non-shrink grout. These manholes shall be installed on choked and compacted stone bedding as detailed in the Detail Drawings.
 - 2. A flexible manhole connector may be approved by the Owner's Representative as an alternate method of sealing the space between the manhole wall and the pipe. Flexible manhole sleeves shall be required for all pipes eighteen (18) inches and smaller. The manhole connector shall be Korn-N-Seal or equal and conform to the requirements of ASTM C923 and shall be made from ethylene propylene rubber (EPDM) designed to be resistant to ozone, weather elements, chemicals, including acids, alkalis, animal and vegetable fats, oils, and petroleum products. Manhole sleeves shall be secured to pipe by stainless steel clamp and bolt assembly conforming to the requirements of ASTM C923 and ASTM A167.
 - 3. All stainless steel elements of the manhole connector shall be totally non-magnetic Series 304 Stainless, excluding the worm screw for tightening the steel band around the pipe which shall be Series 305 Stainless. The worm screw for tightening the steel band shall be torqued by a break-away torque wrench available from the precast manhole supplier, and set for 60-70 inch/lb. The connector shall be installed in the manhole wall by activating the expanding mechanism in strict accordance with the recommendation of the connector manufacturer. The connector shall be of a size specifically designed for the pipe material and size being utilized on the Project.

G. Field Tests:

1. Infiltration/Exfiltration Test: Maximum allowable leakage shall be per local specification requirements.
2. Low-Pressure Air Test: Each section may be tested with air pressure (5 psi max). After allowing the pressure to stabilize, the system passes the test if the pressure drop, due to leakage, is equal to or lesser than that specified.

3.02 MANHOLE TESTING

All manholes shall be vacuum tested in accordance with Section 02650 – Testing for Acceptance of Sanitary Sewers.

3.03 BACKFILL

The Contractor shall place and compact backfill materials, in the area of excavation surrounding manholes in accordance with the requirements Section 02324 – Trenching and Trench Backfilling section of these Specifications.

3.04 CLEANUP

- A. After the work has been completed and all testing acceptable, the Contractor shall clean up the work area.
- B. All excess material and debris not incorporated into the permanent installation shall be disposed of by the Contractor. The debris and liquids are to be disposed of properly in accordance with all applicable laws. The local municipality can furnish a letter to the landfill stating that the contractor is authorized to dispose of the non-hazardous materials. Debris and liquids type and quantities are to be tracked in the daily contractor diary. Hauling and disposal costs will be borne by the contractor.
- C. The work area shall be left in a condition equal to or better than prior condition. Disturbed grassed areas shall be seeded or sod placed as directed by the Owner's Engineer at no additional cost to the Owner. The work site restoration work shall be completed in accordance with the requirements of Section 02480 – Site Restoration and Landscaping.

3.05 DOCUMENTATION

- A. The Contractor shall complete work on each asset as assigned via the Owner's Computerized Work Order Management system. Upon start of work, the Contractor shall receive work orders as assigned by the Project Manager/Owner's Representative. The Contractor shall maintain and synchronize the status of each rehabilitation work order issued.

END OF SECTION