SEWER SLIP-LINING

PART 1 – GENERAL

It is the intent of this portion of the Specification to provide for rehabilitating sewer lines via the installation of a fiberglass, HDPE or PVC slip-lining pipe.

1.01 WORK INCLUDED

A. Scope of Work
Shall be per the design submittal and the Contract Documents.

B. Work may include installation of equipment and incidentals required for sanitary sewer system improvements, including sewer mains, laterals, manholes, flushing inlets, grease traps and interceptors, and pumping facilities in accordance with the requirements of the Contract Documents.

C. Any and all work to be performed on the Collection System shall be inspected and approved by City Staff.

D. The Contractor shall comply with the City's NPDES Discharge permit, as updated, for discharges to the storm drain system, including adherence to all applicable Best Management Practices to prevent pollutants, including sediment, from entering the storm drains.

1.02 RELATED REQUIREMENTS

1.03 REFERENCE STANDARDS

A. ASTM C 900 "All Standard Applicable for SDR35, SDR26, SDR21 AND ASTM C 900 Pipe and Fittings"

B. ASTM D 3034 "All Standards Applicable for SDR35, SDR26, SDR21 Pipe and Fittings"

C. ASTM D 3350 "Standard Specification for Polyethylene Plastic Pipe and Fitting".

D. ASTM F585 Standard Practice for Insertion of Flexible Polyethylene Pipe into Existing Sewers

E. ASTM F 679 "All Standards Applicable for SDR35, SDR26, SDR21 Pipe and Fittings"

1.04 QUALITY ASSURANCE

A. All materials and equipment furnished under this Section shall be:

1. From a manufacturer who has been regularly engaged in the design and manufacture of the materials and equipment for at least five (5) years; and

2. Approved by the Engineer before installation. The Engineer shall verify that the quality is equal to the materials and equipment made by those manufacturers specifically named herein, if an alternate product manufacturer is proposed.

1.05 SUBMITTALS

A. Shop Drawings: Submit data to show that the product conforms to the specification requirements.

B. Materials List: Submit a list of all materials proposed to be used on the project, showing manufacturer's name, product trade name, type, grade, and weight. Materials list shall be submitted and approved before any installation occurs.

C. Manufacturer's Warranty: Submit manufacturer's warranty on the product and a certificate showing compliance with applicable ASTM Standards.

PART 2- PRODUCTS

2.01 MATERIALS

A. Fiberglass pipe shall be centrifugally cast with glass fiber reinforcement in a cured thermosetting resin manufactured in accordance with ASTM D3262, cell classification Type 1, Liner 2, Grade 3. Fiberglass liner shall be shown by tests to be resistant to long-term corrosion. Testing shall be performed in accordance with ASTM D3681 using 1.0N sulfuric acid for sanitary sewage, and ASTM C581 for industrial sewage.

B. PVC pipe shall have a minimum cell classification of 12364 B or C as defined in ASTM D1784. Pipe shall be closed profile. The joint shall be designed so that neither the outside diameter of the pipe is increased, nor the internal diameter of the pipe is decreased at the joint. The joint shall meet the requirements of ASTM D3212. PVC liner pipe shall have a minimum pipe stiffness of 46 psi when tested in accordance with ASTM D2412.

C. Polyethylene pipe and fittings shall be manufactured from high-density compounds in accordance with ASTM D3350. All HDPE pipe shall be closed profile and have a minimum SDR rating of 35 and a minimum pipe stiffness of 46 psi.

D. All pipes shall be provided with joints designed so that neither the outside diameter of the pipe is increased nor the internal diameter of the pipe is decreased at the joint.

E. Cellular concrete grout for annular space provided under this Specification shall have the following characteristics:

1. 250 psi, 28-day compressive strength; 100 psi, 24-hour compressive strength, minimum.

2. Foam concentrate: ASTM C869.

3. Cement: ASTM C150.

4. Fly ash: ASTM C618, Class F, except loss of ignition shall not exceed 5%.

5. Water: Potable.

6. Admixtures: Only as approved by foam concentrate manufacturer and the Engineer.

F. All connectors provided for reinstatement of laterals shall be as follows:

1. All connectors shall be composed of synthetic rubber based compounds formulated to resist acids, alkalis, solvents, and greases encountered in sanitary and storm sewer and shall contain no reclaimed rubber. Contractor shall submit evidence of satisfactory testing in accordance with ASTM D543 with no weight loss in 1.0N sulfuric acid, 1.0N hydrochloric acid or 1.0N nitric acid. Materials shall show no etching, blistering, distortion or other evidence of chemical attack. Ultimate tensile strength shall exceed 750 psi at 80 degrees F and elongation shall exceed 150%. Water absorption shall not exceed 4% when tested in accordance with ASTM D570 and hardness shall not exceed 55 in a 5 second reading interval when tested in accordance with ASTM D2240, Type A Hardness.

2. All compression bands shall be Series 316 Stainless Steel. All nuts and bolts shall be Series 305 Stainless Steel.

3. The completed joint shall comply with ASTM C425 for resilient sewer pipe joints.

2.02 DESIGN REQUIREMENTS

A. Conveyance Capacity

1. Slip-lining pipe provided under this Specification shall provide the maximum conveyance capacity possible and in no case shall provide less capacity than currently exists.

B. Design Criteria

Slip liner structural properties shall be calculated and provided to the City prior to construction. In addition to the requirements for submittals set forth in the construction contracts and the requirements for submittals contained in companion sections of these specifications, Contractor shall submit the following:

1. Manufacturer's literature for materials used in liner, gaskets and fittings.
2. Proposed grout mixture and pressures.
3. Test results and certification of compliance for materials.
4. Proposed plan for bypassing sewage during liner installation, if applicable.
5. Manufacturer's design analysis.
6. Proposed method of reconnecting service laterals, if applicable.
7. Details identifying proposed installation method, equipment, and location of access shaft, pit or approach tunnel.

PART 3- EXECUTION

3.01 INSTALLATION

A. Cleaning

Prior to the installation of the slip-liner pipe, Contractor shall thoroughly clean the sewer designated to receive the liner. Cleaning shall constitute removal of all debris, solids, roots, deposits, and other matter, which would preclude the installation of the slip-liner into the sewer line.

B. Inspection of Pipelines

Prior to the installation of slip-liner, Contractor shall inspect the sewer designated to receive the liner by Closed Circuit Television Inspection (CCTV).to identify all structural defects and location of all sewer lateral and other connections.

C. Sewage Flow Control

1. Contractor shall provide for maintenance of flow in the affected portions of the sewer system during installation of the slip-liner.

2. Unless otherwise specifically required, Contractor shall locate excavation(s) for insertion of slip liner to cause the least disruption to existing utilities, traffic and area business. The existing sewer line shall be exposed for the length necessary to accommodate the maximum length of liner pipe and for equipment. If Contractor locates insertion pit at an existing precast concrete manhole location, Contractor shall remove manhole frame, cover, cone, riser and manhole sections as necessary and store for reinstallation upon completion.

3. Sections of liner shall be field connected above the insertion pit using low profile bell and spigot joints, butt-fused joints or jacking pipe sleeve joints. Bell and spigot and jacking pipe sleeve joints shall be equipped with an elastomeric gasket meeting the requirements of ASTM F477 to provide a watertight seal at each joint. Maximum allowable deflection shall be two degrees. Contractor shall take precautions to prevent ragged edges of broken sewer pipe from scoring slip liner as it is being pushed/ pulled into sewer.

4. Contractor shall seal the annular space between the slip liner and the existing sewer pipe with cellular concrete as specified. Contractor shall take appropriate precautions to avoid over pressurization, buckling and floating of the slip liner pipe during the grouting process. Contractor shall comply with pipe manufacturer's recommendations for grouting procedures and with the grout manufacturer's procedures for placement of grout, grout pressures and grout quantity. Multiple grout lift installations may be required to avoid buckling of the liner pipe. Contractor shall also take precautions to avoid movement of the liner during the grouting operation. No grout shall be placed until service connections have been restored. Grout placement method and pressure shall be in accordance with manufacturer's recommendations and shall be submitted to the Engineer prior to the placement of grout.

D. Service Connections

1. Contractor shall reconnect all service connections to the sewer unless the Engineer deems connection to be inactive or abandoned. Contractor shall machine core through liner at each connection point, and comply with the following connection procedures:

   i. Contractor shall excavate and install a tee fitting with saddle configured to the outside diameter of the slip liner and of tee length necessary to connect existing service or lateral. Contractor shall bond saddle to outside of liner pipe per manufacturer's recommendations. A minimum of 90% capacity restoration is required.

   ii. To join pipes of dissimilar material, Contractor shall joint plain ends and connect the existing pipes and services using flexible pipe connectors equipped with stainless steel bands and fastening devices as specified.

E. Manholes

1. Contractor shall cut the upper half of liner out at manholes, and as required to accommodate lateral and service connections at manholes. Contractor shall reconstruct manhole benches to match new invert elevations

2. Where existing manhole locations have been used as access pit sites, Contractor shall reconstruct precast manholes using salvaged materials. If existing manhole materials are not suitable for salvage, Contractor shall reconstruct manhole utilizing cast-in-place or new precast concrete manhole elements. All construction shall comply with the companion sections of these specifications

3.02 TESTING AND ACCEPTANCE

A. Contractor shall employ an independent testing agency to conduct and report compressive strength testing of the grout utilized in the construction. Contractor shall prepare and submit for testing four cellular concrete cylinders from each day's grouting activities. Testing shall occur at one (1) and twenty-eight (28) days. All test results shall be submitted to the City.

B. After all work is completed, Contractor shall provide the City with a DVD showing both the pre- and post-installation conditions, including the restored connections. All defects discovered during the post-installation television inspection shall be corrected by the Contractor at its expense before the work under the Contract will be considered for Substantial Completion. After the defects, if any, are corrected, the affected sewer segment(s) shall be video inspected again. The post-installation television inspection shall be

submitted in sufficient time to allow the City to review the video prior to the Substantial Completion milestone.

PART 4- MEASUREMENT AND PAYMENT

A. Payment shall include all bypass pumping, cleaning, pre- and post-construction televising, labor, equipment, material, supervision, sheeting, shoring, bracing, installation, manhole reconstruction at access pit locations, safety, dust/erosion control, testing, site restoration and all other work specified or not which is reasonably required to provide a completed installation. Any item not specified shall be considered incidental to the work. Contractor shall include all incidental cost in the unit price for the slip liner.

B. Contractor shall receive payment for building sewer lateral reinstatement on a unit price basis per lateral connection diameter reinstated in accordance with the unit prices contained in the Contract Documents.

C. Contractor shall receive payment for Mobilization/Demobilization and Traffic Control on a lump sum basis in accordance with the prices contained in the Contract Documents.

- END OF SECTION -