SECTION 33-00-00

CONDUIT RENEWAL USING A SPIRAL WOUND PVC PROFILE METHOD

PART 1 -- GENERAL

1.01 DESCRIPTION

A. General: The Contractor shall furnish all tools, equipment, materials and supplies and shall perform all labor required to complete the conduit renewal process in full conformity with the Contract Documents.

B. The conduit renewal process utilizes an extruded polyvinyl chloride (PVC) single profile strip that is machine spiral wound into an existing conduit (host pipe). The spiral wound profile renewal process shall create a rehabilitated conduit with improved chemical resistance characteristics, improved flow coefficients, and, where required, structural enhancement.

The SPIRAL WOUND process is;

B-1 A single PVC extruded profile strip, with or without steel reinforcement, mechanically locked together by virtue of the profile design and the use of a proprietary winding machine. The installation system shall provide precise control of the internal dimensions of the newly formed PVC conduit that will ensure the specified annular grout space is maintained throughout the renewal length. Host pipe round and non-round shapes can be accommodated with this process. The annular space is to be filled with a purpose designed thixotropic cementitious grout

C. **Scope:** The spiral wound PVC profile renewal process utilizes an extruded polyvinyl chloride (PVC) single profile strip that is machine spiral wound into an existing conduit (host pipe). The extruded profile strip is mechanically double locked together on the grouting side by virtue of the profile design and the use of the winding machine. There shall be no internal adhesive, locking strip, or hand applied device to secure the profile. Welding of the seam may be acceptable if approved by the design engineer. This section covers both structural and non-structural conduit renewal applications. The renewal system is intended for circular and non-circular, low gravity, pipe-work systems and shall be capable of being installed with little or no surface excavation and some pipeline flow. A typical entry point into the system will be from a manhole or outfall. When completed, the continuous, machine wound profile liner pipe shall extend over the contractually specified renewal limits.

1.02 CODES AND STANDARDS

A. American Society for Testing and Materials (ASTM):

1. A653/A653M-06 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

2. C109-05 Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. Cube Specimen)

3. ASTM C940-98 Standard Test Method for Expansion and Bleeding of Freshly Mixed Grouts for Pre-placed Aggregate Concrete in the Laboratory.

4. C1090-01 Standard Test method for Measuring Changes in Height of Cylindrical Specimens of Hydraulic Cement Grout

5. D256-06 Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics

6. D638-03 Standard Test Method for Tensile Properties of Plastics

7. D648-06 Standard Test Method for Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position

8. D1784-03 Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compound.

9. F1697-18 Standard Specification for Poly(Vinyl Chloride) (PVC) Profile Strip for Machine Spiral Wound Liner Pipe Rehabilitation of Existing Sewers and Conduits.

10. F1741-18 Standard Practice for Installation of Machine Spiral Wound Poly(Vinyl Chloride) (PVC) Liner Pipe for Rehabilitation of Existing Sewers and Conduits.

1.03 QUALITY ASSURANCE

A. Work shall be performed by a Contractor, with a proven record of performance for similar installations. Contractor shall submit resumes for superintendents, foremen, and other applicable lead personnel for field installation crews demonstrating competency and experience to perform the work scope as defined in this specification and all other applicable contract documents.

B. Letters of qualification by the spiral wound profile manufacturer certifying the fitness of their products for use in the spiral wound lining system and conformance to the requirements of this specification and all other applicable contract requirements. Certification shall also provide the history of successful application of the product. The installation contractor shall be approved and qualified by the Manufacturer.

C. Final Inspection: The renewed conduit shall be subject to a final inspection, and no such work shall be scheduled or started without having made prior arrangements with the Owner to provide for the required inspections. Not less than 24 hours notice shall be provided to the Owner for scheduling such inspections.

D. Warranty:

1. Terms: Standard Manufacturers warranty

2. Warranty Period: Standard Manufacturers warranty

1.04 CONTRACTOR SUBMITTALS

A. Prior to commencing with construction the Contractor shall submit the following to the Owner for approval:

1. Design Submittal: Engineering design calculations and shop drawings for the renewed conduit. These calculations and drawings shall address the profile designation (geometry), grout strength and thickness (if any) that may be required. The calculations shall be based on an evaluation of the existing condition of the host pipe, the long-term design loads on the renewed conduit, loads on the spiral wound lining conduit during installation, and the required chemical resistance and flow capacity of the renewed pipe. A Professional Engineer, registered in the state in which the project will be constructed, shall seal the design calculations.

2. Host pipe cleaning method(s).

3. Bypass pumping plan (if required)

4. Pre-installation video survey of host pipe.

5. Work plan for spiral winding process including details of all materials and equipment to be used during the winding process.

6. Grout mix design with test data showing that the proposed grout mix will satisfy the requirements of this specification and the Contractor's design submittal *(if applicable)*

7. Work plan for annulus grouting that addresses the spacing and details of bulkheads, details of the bracing system (including design calculations), grout injection/vent holes, the number of grout lifts required to fill the annular space, and methods for repairing holes in the spiral wound lining *(if applicable)*

8. Documentation for the steel strip reinforcing, if applicable, confirming that the steel satisfies the requirements of this specification and the Contractor's design submittal.

9. Documentation for the profile strip material confirming that the material satisfies the requirements of this specification and the Contractor's design submittal.

B. During construction the Contractor shall submit the following to the Owner:

1. Compressive strength test results for annulus grout *(if applicable)*

C. Within 2 weeks of final acceptance of the work the Contractor shall submit the following to the Owner:

1. As-built drawings for the renewed conduit.

2. Post-installation video survey of the renewed conduit.

PART 2 -- PRODUCTS

2.01 MATERIALS

A. Spiral wound Profile Strip:

- Profile strip shall be made from compounds conforming to ASTM D1784-03 with a cell classification of 12344 or higher.
- Profile strip must have enough structural integrity to be capable of being wound by either a static winding machine or self-traversing machine
- Profile strip must have a minimum of 3 "T" locks molded in the to the profile.
- The profile strip must be a single strip consisting of all mechanical locks within it self. No additional joiner strips will be allowed to lock the profile into shape.
- The profile strip and the seal must be coextruded together.
- The profile strip must be continuously spiral wound to form the new pipe.

- Profile designation (geometry) shall be compatible with the design requirements for the renewed conduit and shall be suitable for installation in the host pipe.

B. Annulus Grout:

- Grout to be used to fill the annular void space must be approved by the manufacturer and typically consists of Portland cement, flyash, water, and suitable admixtures.

- Flow characteristics, maximum drying shrinkage, and minimum compressive strength requirements for the grout shall be compatible with the design requirements for the renewed conduit and shall be compatible with the field conditions under which the grout will be installed.

C. Steel Reinforcing Strip: (Dependent on design if applicable)

1. The steel reinforcing strip shall by fabricated from sheet steel conforming to ASTM A653 or ASTM A1011

2. The thickness, formed shape, and yield strength of the strip shall be compatible with the design requirements for the renewed conduit and the specified profile designation.

2.02 PRODUCT HANDLING

A. The spiral profiles shall be shipped on appropriately sized reels for ease of handling and product protection. The product shall be inspected for defects at the time of manufacture and again in the field prior to installation. Defects to the profiles include, but are not limited to, gouges, abrasion, flattening, cuts, punctures, and ultra-violet (UV) degradation. Defective product shall not be installed and shall be removed from the jobsite. Handling and storage of the profile reels shall be in accordance with the manufacturer's instructions.

B. All other products required to complete the spiral wound lining renewal process shall be handled and stored in accordance with the manufacturer's instructions. Each product shall be accompanied by its relevant specification and MSDS information.

2.03 MATERIAL MARKING

A. The profile strip shall be distinctly marked on its inside surface at appropriate intervals with a code number identifying the manufacturer, plant, date of manufacture, and profile designation.

B. All other products required to complete the spiral winding lining renewal process shall be distinctly marked with product type and manufacturer.

PART 3 -- EXECUTION

3.1 SAFETY

A. Perform all work in accordance with applicable OSHA standards.

3.2 PREPARATION

A. **Host Pipe Access:**

1. Unless otherwise specified by the Owner, the Contractor may utilize any of the existing manholes in the project area as access points.

2. Should temporary excavations be needed to access the host pipe, such work shall be coordinated with the Owner. Excavations shall be sloped or shored in accordance with all applicable safety regulations.

B. **Cleaning:**

1. All debris and obstructions shall be removed from the host pipe and disposed of in accordance with the requirements of the contract, and local codes and ordinances.

2. Water jetting shall be used to clean and prepare the surface of the host pipe. All loose material, acids, grease and other deleterious substances shall be removed during cleaning, and the prepared surface shall be suitable for mechanical bonding with cementitious grout.

C. **Flow Bypassing:**

1. Where required for safe and effective application of the technology, due to excessive flow, the Contractor shall determine whether full or partial bypass flows around the length of host pipe designated for renewal is required.

2. The bypass shall be made by plugging the host pipe at an existing upstream manhole and pumping the full or partial flow into a downstream manhole.

3. The pump and bypass lines shall be of adequate capacity to handle peak flows, if full bypass is required.

4. Flow interruptions shall be coordinated with the Owner at least 14 days in advance and with property owners and businesses at least 3 days in advance.

D. **Pre-Installation Inspection:**

1. After cleaning, and prior to winding the profile, the Contractor shall inspect the host pipe to ensure there are no excessive variations in the host pipe profile and no obstructions not known or shown in the plans that would hinder the spiral winding process. Contractor shall also verify that the sizing the profile (wound geometry) will be suitable for the host pipe geometry.

2. The longitudinal and radial locations of all lateral connections to the host pipe shall be logged for subsequent reinstatement.

3. The Contractor shall perform a pre-installation video survey of the host pipe as required by the Owner.

3.3 INSTALLATION

A. **Profile Winding**:

1. Winding of the profile shall conform to approved submittals and bid specifications.

2. The profile shall be wound using equipment that is either self-running or static. During the self-winding method, the winding machine traverses through the host pipe forming the spiral

wound lining conduit as it traverses. During the static method, the winding machine operates from a fixed location and feeds the spiral wound lining conduit into the host pipe.

3. Generally, the winding process will be utilized until the spiral wound lining is complete for the length of host pipe to be renewed.

***B*. Annulus Grouting (where required);**

- Annulus grouting shall conform to the Contractor's approved submittals.
- After the spiral wound lining conduit has been installed, and before the annulus is grouted, the Contractor shall restore service at all lateral connections. Field conditions will dictate whether service restoration can be done from inside the conduit or whether restoration will require the exterior of the conduit and connecting pipes to be exposed.
- Grouting shall be done between bulkheads installed at pre-determined distances apart along the conduit.
- Prior to grouting, a bracing framework shall be installed which shall be designed by the Contractor to serve the following functions during grouting; (a) prevents flotation of the spiral wound conduit, (b) align the conduit within the host pipe so that the required annular space is maintained between the spiral wound conduit and host pipe, (c) prevents excessive deflection or buckling of the spiral wound conduit.
- Grout shall be pumped into the annular space through pre-drilled locations around the circumference of the spiral wound conduit. Vent holes shall be provided at suitable locations to permit air to be expelled from the annular space and to monitor grout fill levels.
- Grout shall be sampled and tested with the following frequency: as per owner's instruction. Sample preparation and testing shall conform to ASTM C109-05.
- Grouting shall not exceed four lifts in order to completely fill the annular space

3.4 COMPLETION OF WORK AND SITE RESTORATION

A. Ends of Renewed Conduit:

1. The ends of the spiral wound conduit shall be securely grouted in position. The conduit shall be sealed to the host pipe with material capable of achieving a watertight seal.

2. The step in the flow line at the ends of the renewed conduit shall be blended into the existing flow line using appropriate materials

B. Any holes made in the spiral wound profile during the grouting operation shall be sealed using means and methods approved by the Owner.

C. At points where temporary excavation was required for access to the host pipe or lateral connections, appropriate encasement shall be provided for the exposed spiral wound profile and/or connecting pipes. Encasement materials may consist of concrete, sand slurry, or other suitable materials as approved by the Owner.

D. **Final Inspection and Acceptance:**

1. The grouted in-place, spiral wound profile lining in the renewed conduit shall be continuous over the entire length of an installation run and be free from defects such as foreign inclusions, holes, cuts, tears, and grout voids. The renewed conduit shall be impervious against leakage out of the conduit to the surrounding ground or into the conduit from the surrounding ground.

2. Any defect that will or potentially could affect the structural integrity or performance of the renewed conduit shall be repaired at the Contractor's expense using means and methods approved by the Owner.

3. The contractor shall perform a post-installation video survey of the renewed conduit as required by the owner.

Disclaimer

Sekisui SPR Americas, LLC standard materials specification does not warrant or guarantee the product for use on any specific project. Sekisui SPR Americas, LLC does warrant that our product meets this advertised material specification. Any variation or alteration of this document is done at the users own liability and may void any and all warranties.