

Coker Pipeline Rehabilitation Ltd.

CPR_{Ltd} Specifications

1.00 SCOPE

This section of the specifications covers the reconstruction of resigned sanitary and/or storm sewer lines by the cured-in-place-pipe (CIPP) method. The CIPP method is defined as the reconstruction of gravity sewer pipe by the installation of a (thermosetting) resin impregnated polyester felt fiber tube. Said tube shall have an impermeable inner surface and shall be formed to the host pipe by means of a water column or suitable pressure system. The cured-in-place-pipe shall extend the full length of the pipe reach being rehabilitated, and shall provide a structural sound, impermeable, joint-less, and close-fitting pipe within a pipe when cured.

2.00 GENERAL

2.01 Description of Work

The work required by the project shall consist of furnishing all labor, equipment, materials, plant and supervision, and performing all work necessary to rehabilitate the gravity sewer lines. The work shall consist of, but not necessarily be limited to, performing the following work tasks:

1. Sewer line cleaning
2. Sewer flow control
3. Closed circuit television inspection
4. Cured-in-place-pipe rehabilitation
5. Lateral reinstatement

2.02 Reference of Specifications

This specification references American society for Testing and Materials (ASTM) standard specifications, which are made a part of hereof by such reference and shall be the latest edition and revision thereof.

F-1216 Standard Practice for rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin Impregnated Tube.

D-5813 Standard Specification for Cured-In-Place Thermosetting Resin Sewer Pipe.

D-638 Test Method for Tensile Properties of Plastics

D-790 Test Method for Tensile Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.

C-581 Standard Practice for Determining Chemical Resistance of Thermosetting Resins.

D-2990 Standard Test Methods for Tensile, Compressive, Flexural Creep, and Creep Rupture of Plastics.

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2.03 Submittals

Design:

The contractor shall submit designs for each manhole-to-manhole section of pipe with the bid. These designs shall be made in accordance with ASTM F-1216 and the project specifications. Designs shall include any assumptions made in addition to those specified herein, all calculations and inputs, and design output.

Materials Certification:

Joint certification of materials from the manufacturer and contractor shall state with the bid that the materials supplied for this project will meet or exceed the requirement of the specification once installed under field conditions. The certification must include a statement indicating that physical properties of 95% or more of field samples of the composite will meet or exceed properties used as input for the designs submitted for this project.

3.00 CURED-IN-PLACE-PIPE MATERIALS

3.01 Felt Tube

The tube shall be supplied by the system licensor to the licensed contractor according to ASTM F-1216. The tube shall consist of one or more layers of flexible, needled felt or an equivalent woven and/or non-woven material capable of carrying resin, withstanding installation pressures and curing temperatures, and compatible with the resin system used. No single layer of the system will be less than 1.5mm in thickness. The liner manufacturer shall determine the felt content.

3.02 Resin/Catalyst

The contractor shall furnish a polyester, vinylester, or epoxy resin compatible with the approved liner and a compatible catalyst system as specified by the resin manufacturer. The resin manufacturer shall provide the contractor with their recommended curing cycle and shall submit the same to the project engineer for his approval. The resin shall not contain fillers or additives, except those required for viscosity control, fire retardant, modulus enhancement, chemical resistance, or extension of pot life. Thixotropic agents that will not interfere with visual inspection may be added for viscosity control. Resins may contain pigments, dyes, or colors that do not interfere with the cured-in-place-pipe or its required structural properties.

4.00 STRUCTURAL REQUIREMENTS

4.01 Design Criteria

The cured-in-place-pipe thickness shall be calculated and designed based upon the following physical condition of the existing pipe to be rehabilitated.

- 1). All pipes shall be considered partially deteriorated.
- 2). All pipes shall be subjected to soil load of 120 lbs./c.ft. With applicable live load and water table 5 feet below the top of the ground.

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- 3). All pipes shall have a minimum of 2% ovality in the circumference.
- 4). Any pipelines running under highways, city streets, or other roadways shall be assumed to carry highway live loads of (16,000lbs.), if pipe is fully deteriorated.

4.02 Mechanical Properties

The installed cured-in-place-pipe shall meet the following minimum structural standards:

Flexural Strength (ASTM D790) 4,000 psi
Flexural Modulus (ASTM D790) 300,000 psi
Heat Distortion Temperature 70^o C
Retention of Properties to Account for Long Term Effects 50%

5.00 INSTALLATION PROCEDURES

5.01 Safety

The Contractor shall carry out this operation in strict accordance with all OSHA and manufacturer's safety requirements. Particular attention is drawn to those safety requirements involving working with scaffolding entering confined spaces and operations with hot media.

5.02 Pre-Installation

Experienced personnel trained in locating breaks, obstacles, and service connections by closed-circuit television shall perform inspection of pipelines. The interior of the pipeline shall be carefully inspected to determine the location of any conditions, which may prevent proper installation of the lining of the pipelines, and it shall be noted so that these conditions can be corrected. The Owner shall keep a videotape and suitable log for later reference.

(A) Bypass

Bypass Pumping: The contractor shall provide for the flow of sewage around the section of sewer lines designated for lining. Plugging the line at an existing upstream manhole and pumping or directing the flow to a downstream manhole or adjacent sanitary sewer system shall make the bypass. The pump(s) and bypass lines shall be of adequate capacity and size to handle the flow. Raw sewage shall be routed back to the sanitary sewerage system.

(B) Cleaning

Pre-Installation Cleaning: It shall be the responsibility of the Contractor to remove all debris that is located within the sewer pipe and dispose of the debris in accordance with all applicable laws and regulations.

(C) Pre-Inspection

Pre-Installation Television Inspection: It shall be the responsibility of the Contractor to video (TV) inspect the sewer pipe immediately before

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the insertion of the impregnated tube to assure that the pipe is clean and existing pipe conditions are acceptable for lining.

5.03 Resin Impregnation

The Contractor will designate a location where the felt tube will be impregnated. The quantity of resin used for tube impregnation shall be sufficient to fill the volume of air voids in the tube with additional allowances for polymerization shrinkage and the loss of resin through cracks and irregularities in the original pipe wall. A vacuum impregnation process and a roller system shall be used to uniformly distribute the resin through out the tube.

5.04 Inversion Using Hydrostatic Head

The resin-impregnated tube shall be inserted through an existing manhole by means of an inversion ring or standpipe, capable of applying the hydrostatic head required to fully extend the tube to the next designated manhole or termination point. The tube shall be inserted into the inversion standpipe; the tube shall be turned inside out and attached to the inversion standpipe so that a leak-proof seal is corrugated. The inversion head shall be adjusted to a sufficient height to invert the tube from the manhole to manhole and to hold it tight against the existing pipe wall, producing dimples at side connections and flared ends at the manhole. Care shall be taken not to overstress the felt tube at the elevated curing temperatures, which may cause damage or failure prior to cure.

5.05 Curing Using Circulated Heated Water

After the inversion process is completed, the Contractor shall supply a suitable heat source and water throughout the section to uniformly raise the water temperature above the temperature required to affect a cure of the resin. The resin/catalyst system manufacturer shall recommend this temperature.

The heat source shall be fitted with suitable monitors to gauge the temperature of the incoming and outgoing water supply. Another such gauge shall be placed between the layers of the impregnated felt tube in the upstream, downstream, and intermediate manholes to determine the temperature during curing. Water temperature in the line during the curing period shall not be less than 140 degrees F or more than 200 degrees F as measured at the heat source return line. Initial cure may be considered complete when the exposed portions of the felt tube pipe appear to be hard, and the remote sensing device indicates the temperatures to be adequate, as recommended by the resin/catalyst system manufacturer.

5.06 Cooling Down

The Contractor shall cool the hardened cured-in-place-pipe to a temperature below 100 degrees F before relieving the water column. Cool water may be added to the water column while draining hot water from a small hole at the end of the cured-in-place-pipe so that a constant water column height is maintained until cool-down is completed. Careful attention shall be taken not to cool too quickly to eliminate the possibility of thermoshock.

5.07 Service Connection

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After curing, the Contractor shall reinstate the existing live building laterals designated by the Construction Engineer. All lateral services shall be reinstated within 24 hours of beginning the inversion process. This shall generally be done without excavation from the interior of the pipe by means of a television camera and a cutting device that reinstates the building laterals to not less than 90% of their original capacity. The Contractor shall certify that he has a minimum of one (1) complete working unit plus spare key components on the site before each inversion.

5.08 Fit/Finish

The finished pipe shall be continuous over the entire length of the sewer section. The finished liner will tightly conform to the walls of the existing (host) pipe, therefore, it is the Contractor's responsibility to verify the section lengths and pipe dimensions. No gap or annular space between the finished liner and the host pipe shall be allowed or be visible at the manhole, sewer service connection, or other exposed points within the finished liner section. The finished liner shall be homogenous throughout and free of any protrusions, holes, cracks, etc., which in the opinion of the Engineer will affect the liner's structural integrity, hydraulic performance, future maintenance access, and overall line performance. After the work is completed, the Contractor shall provide the Engineer with a videotape showing both the before and after conditions of the liner including the reinstated building lateral connections.

5.09 Clean Up

After the installation work has been completed and all testing acceptable, the Contractor shall clean up the entire project area. The Contractor shall dispose of all excess material and debris not incorporated into the permanent installation.