6021 - REHABILITATION OF EXISTING MANHOLES

WITH CURED-IN-PLACE LINERS

**PART 1 - GENERAL**

**1.01 SECTION INCLUDES**

Rehabilitation of existing manholes by Cured-In-Place (CIP) liner methods.

**1.02 DESCRIPTION OF WORK**

Rehabilitate existing manholes to waterproof and to prevent inflow and infiltration, to prevent corrosion, or to reestablish the structural integrity of the manhole without excavation. The rehabilitation is accomplished by the installation of a one-piece, resin impregnated liner that is cured under pressure.

**1.03 SUBMITTALS**

Follow the General Provisions (Requirements) and Covenants as well as the following:

1. Manufacturer’s Product Data:

1. Product literature, including physical characteristics, catalog data, and third party test results supporting the structural performance.

2. Evidence that the product has been manufactured continuously for a minimum of 5 years and has been successfully installed in a minimum of 2,500 structures.

3. Certification that the product meets these specifications.

4. Liner thickness design calculations as completed by and certified by a licensed Professional Engineer.

1. Contractor/Installer requirements:

1. Evidence that the Contractor is an approved installer of the product.

2. Ensure a manufacturer’s representative is present throughout the duration of the project.

3. A written work outline identifying the step-by-step procedures that will be used for the liner installations. Any changes must be approved by the Engineer.

4. The proposed plan for public notification of service interruption and bypassing of manholes.

**1.04 SUBSTITUTIONS**

Follow the General Provisions (Requirements) and Covenants

**1.05 DELIVERY, STORAGE, AND HANDLING**

Follow the General Provisions (Requirements) and Covenants.

**1.06 SCHEDULING AND CONFLICTS**

Follow the General Provisions (Requirements) and Covenants.

**1.07 SPECIAL REQUIREMENTS**

Provide manhole liner products that a minimum of 50 year service life. Furnish a 5 year non-prorated warranty from the Contractor for material, equipment, and labor to repair or replace any failing installations. The Engineer will determine if the extent of the deficiency is such that it can be repaired or must be replaced.

**1.08 MEASUREMENT AND PAYMENT**

**A. Cured-In-Place Manhole Liner:**

**1. Measurement:** The vertical dimension of cured-in-place manhole liner will be measured in feet from the manhole cover seat to the bottom of the liner.

**2. Payment:** Payment will be at the unit price per vertical foot.

**3. Includes:** Unit price includes, but is not limited to, handling of sewer flows as required to properly complete installing, cleaning, and repairing the existing manhole; furnishing and installing the liner; and testing the manhole upon completion.

1. **Chemical Foam Grout Injection on Active Manhole Leaks:**

**1. Measurement:** Each individual location requiring chemical grouting to stop actively running leaks will be counted.

**2.** **Payment:** Payment will be at the unit price for each location chemically grouted.

**3. Includes:** Unit price includes, but is not limited to, drilling injection holes adjacent to a crack or joint, plugging high flow active water leaks prior to grout injection, injecting up to 24 ounces of chemical grout per location. Locations requiring additional grout will be paid for as additional work.

1. **Cured-In-Place Manhole Bench Liner:**
2. **Measurement:** Each manhole bench liner that is installed will be counted.
3. **Payment:** Payment will be at the unit price for each manhole bench liner.
4. **Includes:** Unitprice includes, but is not limited to, handling sewer flows as required to properly complete the installation, cleaning the manhole bench area, furnishing and installing the liner, cutting the liner around all piping, and cutting the liner at the invert.

**PART 2 - PRODUCTS**

**2.01 CURED-IN-PLACE LINER**

A. Provide a liner system consisting of one or more layers of absorbent textile material and epoxy resin meeting the manufacturer’s specifications and the following requirements:

|  |  |  |
| --- | --- | --- |
| **Table 6021.01: Physical Properties** | | |
| **Property** | **ASTM Test Method** | **Acceptable Value** |
| Compressive strength | D 695 | 1500 psi, minimum |
| Hardness | D 2240, Shore D | 70, minimum |

B. Liner to be manufactured or sewn into a single section and includes a non-porous membrane or an impermeable coating to prevent infiltration.

C. Provide stretchable manhole liner material that conforms to the shape of the manhole or non-stretchable manhole liner custom fabricated to match the inside dimensions of the manhole.

D. Provide liner that is uniform in thickness.

**2.02 LINER THICKNESS**

Provide thickness design calculations certified by a licensed Professional Engineer using the following criteria:

* The existing structure will continue to carry soil and live loads
* Water table at the ground surface level.
* Factor of safety of 2.0

**2.03 RESIN**

Provide thermo-set resin meeting the manufacturer’s specifications appropriate for the application.

**2.04 GROUT**

Provide grout appropriate for the application to seal the manhole:

A. Hydraulic cement

B. Type II Portland cement

C. Chemical grout for active manhole leaks:

1. Provide hydrophilic polyurethane foam grout manufactured specifically for the sealing of active water leaks in manholes and other underground concrete structures.

2. Ensure all materials, additives, and mixture ratios comply with the grout manufacturer’s published recommendations.

**PART 3 - EXECUTION**

**3.01 EQUIPMENT**

Provide all equipment required to clean the structure, impregnate resin into the liner, pressurize the inflation diaphragm, and heat the lining material, if required, to meet the specifications of the liner manufacturer.

**3.02 MANHOLE PREPARATION**

Prepare each manhole for lining according to the liner manufacturer’s published specifications and the following requirements:

A. Prior to installation, inspect and measure manhole depth and diameter. Notify the Engineer of any areas of apparent structural damage.

B. Remove all existing manhole steps. Remove the metal portion of all steps flush with the manhole wall surface, and patch any remaining holes with hydraulic cement prior to installing the CIP liner.

C. Trim protruding main and lateral connections, including internal drop connections, so they do not protrude more than 2 inches beyond the manhole wall. Construct a fillet between the edge of the pipe and manhole wall with hydraulic cement or grout to provide a smooth surface for the liner to bond to.

D. Remove all cracked and disintegrated material. Fill large voids and areas with missing bricks or blocks with hydraulic cement.

E. Stop all active water leaks by the use of chemical foam grout injection according to grout manufacturer’s recommendations. After stopping leaks with chemical grout, use hydraulic cement to refinish the surface where the leak was occurring.

F. Clear the manhole of all obstructions, such as roots, which will prevent the insertion of the liner.

G. Clean all surfaces of the host structure with a high pressure hydro-jet sprayer with an operating pressure of at least 3,500 psi at 5 gallons per minute. Remove all dirt, grease, sand, and surface contaminants on the casting, walls, and floor of the manhole. If recommended by the liner manufacturer, clean the surface with a degreaser or solvent and rinse with water.

H. Failure of the CIP liner due to an inadequately cleaned manhole will be repaired by the Contractor/Installer at no cost to the Owner.

I. Capture, remove, and properly dispose of all waste materials related to cleaning that could potentially cause a sewer backup, damage existing facilities such as pump stations, or cause sedimentation in the downstream sewer system.

**3.03 BYPASSING SEWAGE**

A.If bypass pumping is required, submit a bypassing plan to the Engineer for review and approval prior to start of the bypassing process.

B. After approval by the Engineer, complete the bypass by plugging an existing upstream manhole, if necessary, and pumping the sewage into a downstream manhole or adjacent sewer line that has sufficient capacity and size to handle the flow. Ensure the pump(s) and bypass line(s) have adequate capacity to accommodate peak sewage flows during the liner installation and curing process. Provide adequate reserve pumps on site for emergency use and for storm flows.

**3.03 BYPASSING SEWAGE (Continued)**

C. Provide a public notification program to notify area residences or businesses that will be impacted by the bypassing operation. Provide a minimum of 24 hour notification to impacted individuals prior to bypassing.

**3.04 MANHOLE LINER INSTALLATION**

A. Cut liner to length from the top of the casting to a point 3 inches above the manhole bench.

B. Saturate liner with resin at job site according to manufacturer’s published specifications. Fill all voids in the liner material. Provide 5% to 7% excess resin for migration into manhole joints and cracks during installation.

C. Position saturated liner in manhole and apply pressure with inflation diaphragm according to manufacturer’s specifications.

D. Cure liner according to manufacturer’s recommendations. Maintain constant pressure with air or water throughout the curing process.

E. After curing with steam, ambient or heated water, or ambient or heated air, remove the inflation diaphragm, re-open all lines, and trim the excess liner off at the manhole cover seat.

F. Clean and neatly cut all pipe openings. Buff the opening with a wire brush to remove rough edges and provide a smooth finish. Ensure the bottom of the opening is flush with the bottom of the pipe to remove any lip that will catch debris. Inlet and outlet lines must be reopened within one hour from the time the curing process is completed.

**3.05 MANHOLE BENCH LINER INSTALLATION**

A. If manhole bench area and floors are to be lined, provide liner materials saturated with resin in the same manner as the manhole liner extending from the top of the invert pipe to the bottom of the manhole liner.

B. Install in the same manner as the liner according to the manufacturer’s recommendations.

**3.06 CLEAN UP**

A. Verify that all sewers entering the manhole are fully operable.

B. At completion of the work, remove all equipment, rubbish, dirt, excess material, and debris from the site. Clean all adjacent surfaces soiled by and during the course of the work. Restore project area affected by the operations to a condition at least equal to that existing prior to the beginning of the work.

**3.07 QUALITY ASSURANCE**

Ensure the finished liner is continuous over the entire surface and free from visual defects of wrinkles, bulges, tears, crazing, foreign inclusions, dry spots, delamination, and pinholes. Ensure the liner is adequately bonded to the manhole surface and is watertight from the ring to the invert.

END OF SECTION