

SPECIFICATION FOR CURED IN PLACE POINT REPAIR

(As Provided by GREAT LAKES TV SEAL, INC. for the MAGNALINE™ Point Repair Process)

1. Intent:

It is the intent of this specification to provide for the rehabilitation of sewers by installation of a resin-impregnated Fiberglas / carbon fiber patch into the existing pipe using an inflatable element and air / steam pressure. Curing shall be accomplished by either ambient curing or by steam to cure the resin / fiber glass / carbon fiber cloth to a hard, impermeable corrosion resistant pipe within a pipe.

2. General:

a. Design:

A cured-in-place pipe installed in a limited portion of a partially deteriorated or damaged existing underground, nonpressurized pipe designed to support hydraulic, soil and live loads.

b. General Procedures:

The installation of a pipe within a pipe shall be defined as the rehabilitation of an existing conduit by the installation of a composite material tube (resin-impregnated glass fiber / carbon fiber composite), which is first formed into a freely overlapping tube from a sheet and is then pulled into the sewer by a winch.

After insertion, the tube shall be inflated using air pressure, then cured by ambient temperature or steam to make the said composite material tube into a hard, impermeable pipe. The repair shall extend a minimum of one foot past either end of the defect.

c. Corrosion Resistance:

The pipe within a pipe shall be fabricated from materials which, when cured, will be able to withstand internal exposure to sewage gases containing hydrogen sulfide, carbon monoxide, carbon dioxide, methane, dilute sulfuric acid, and external exposure to soil bacteria and chemical attack which may be due to materials in the surrounding ground or sewage within.

3. Application:

The application of this process is applicable in the repair of structural defects in pipes 4 to 30 inches in diameter and to repair defects 2 to 50 feet in length. Other sizes of special requirements may be requested by the Owner's Representative and designed by the licenser for approval by the Owner's Representative.

4. Reference Specifications:

The design, materials, method of installation, and test method shall be in accordance with design criteria published by the licenser and supplied to the Engineer.

5. Materials:

a. The tube shall be fabricated from a resin-impregnated glass fiber / carbon fiber sheet to a size which, when installed, will closely approximate the internal circumference of the conduit specified. An allowance shall be made for changes in circumference of the conduit by free overlap during inflation of the tube.

b. The minimum length shall be determined to effectively span the designated defective section, plus one foot at either end. The lengths shall be verified in the field before pulling the tube into the pipe.

c. The thickness of the pipe within a pipe shall be designed to conform to actual field conditions.

d. Physical Properties: The cured repair material shall conform to the following structural standards:

Flexural stress	50,000 psi
Flexural Modulus of Elasticity	1,500,000 psi

6. Preparatory Procedures:

The following procedures shall be adhered to unless otherwise approved.

- a. Safety:

Safety shall be in strict accordance with all applicable OSHA standards. Particular attention is drawn to those safety requirements involving entry into a confined space.
- b. Flow Control:

As required for acceptable completion of installation, the sewage flow maintenance around the sections of pipe designated for rehabilitation shall be carried out. The bypass shall be made by plugging the line at a point upstream of the pipe to be rehabilitated and pumping the flow to a downstream point of adjacent system. The pump and bypass lines shall be of adequate capacity and size to handle the flow specified in the job specifications. When necessary, any bypass pumping shall be arranged to prevent any backflow in the sewer system.
- c. Cleaning:

Cleaning of the sewer pipe shall be carried out immediately before TV inspection.
- d. TV Inspection:

TV inspection of the sewer pipe shall be carried out immediately before insertion of the tube to ensure that the sewer is clean and that the pipe conditions have not changed.

7. Installation Procedures:

The process of installing a repair using the system involves the following steps:

- a. Inspect fault in conduit using closed circuit television (CCTV) and record detail. Estimate dimensions of fault and length of repair required. Wherever possible, flow through a conduit should be interrupted during inspection and cleaning.
- b. Clean conduit by whatever method is deemed suitable for the type of deposits / debris encountered and condition of the conduit. High pressure water jet cleaning is normally most effective.
- c. Reinspect conduit using CCTV
- d. Prepare epoxy resin and fiber glass and carbon fiber cloth using pre-measured kits. The pot life of the resin can be adjusted and supplied to suit the ambient temperature of the site. The resin can also be cured with steam.
- e. Mix resin and hardener and wet out cloth in accordance with manufactures recommendations.
- f. Place the wetted cloth around the deflated packer and tie into place with plastic strips.
- g. Winch inflatable packer and repair material into conduit and accurately position.
- h. Inflate the packer, which breaks the ties, and forms the resin impregnated cloth to the inside of the pipe, excess resin being forced into cracks and open joints.
1. If steam is used to accelerate cure, start injecting steam and monitor temperature and pressure. Cure for approximately one hour.
- j. When the resin has cured, the steam is turned off and cold water is injected into the packer to cool the pipe and repair sleeve. The repair be cooled to 60 F
- k. When the repair has fully cooled, release inflation pressure and pump the water out of the inflatable packer or expel it using compressed air, or vacuum.
1. Withdraw inflatable packer and inspect the finished repair using the CCTV.
- m. Remove all equipment from the conduit and pack up.

8. Finish:

The finished pipe within a pipe repair shall be as smooth as commercially feasible, with a smooth transition from the host pipe to the repair pipe and either end. The repair shall overlap past the defect by at least one foot onto sound pipe at either end.

9. Cleanup:

After all work has been completed, the Contractor will clean up the project area. Excess material and debris will be disposed of by the Contractor.

10. Final Acceptance:

In addition to any specific acceptance criteria specified in the contract, the following standards should be met:

- a. Finish:
The finished pipe should be continuous over the length of a defect plus two feet and be free as practical from significant defects.
- b. Defects:
Any defects which will affect (in the foreseeable future or warranty period) the integrity of the installed pipe should be repaired at the Contractor's expense, in a manner mutually agreed upon by the Owner and the Contractor.
- c. Service Connections:
Reinstatement of all building sewer connections must be done neatly and smoothly.

11. Warranty:

Unless otherwise agreed upon prior to bid, the Contractor shall warrant the liner installation for a period of one year. During the warranty period, any defects which affects the integrity or strength of the repair shall be repaired at the Contractor's expense in a manner mutually agreed upon by the Owner and the Contractor.

12. Measurements for Payments:

Payment shall be based upon an accepted bid price agreed upon prior to the work being performed, and each repair shall be treated as a separate bid, unless other agreements are mutually approved prior to commencement of work.