

SECTION 336086

CURED IN PLACE SPOT REPAIR

PART 1 - GENERAL

1.1 SCOPE

- A. Furnish all materials, labor and equipment and perform all incidental work necessary to install and test cured-in-place spot repairs (CIPSR) as shown on the Drawings.

1.2 RELATED WORK

- A. Television inspection is included in Section 336060.
- B. Sewer line cleaning is included in Section 336070.
- C. Cured-in-place pipe lining is included in Section 336084.

1.3 SUBMITTALS

- A. Submit within 15 days of the Effective Date of the Agreement, the name of CIPSR supplier and a list of materials to be furnished.
- B. Provide two submittals of certified test reports to confirm that CIPSR materials have been manufactured and tested in accordance with the ASTM Standards specified herein.
 - 1. Within 15 days of the Effective Date of the Agreement, submit test reports for the materials to be used for this work. Test results shall be the manufacturer's standards for acceptance of field fabricated and installed CIPSR.
 - 2. Prior to the installation of any CIPSR, make test specimens from the materials to be utilized for this work. Make sufficient number of specimens for conducting the referenced testing. Specimens shall be cut from the resin-impregnated patch prior to insertion into the pipe.

1.4 REFERENCED STANDARDS (LATEST REVISION)

- A. ASTM International
 - 1. ASTM D543 - Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents.

2. ASTM D638 - Standard Test Method for Tensile Properties of Plastics.
3. ASTM D790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
4. ASTM D2412 - Standard Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading.
5. ASTM D2990 - Standard Test Methods for Tensile, Compressive, and Flexural Creep and Creep-Rupture of Plastics.

B. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.5 QUALITY ASSURANCE

A. The Contractor or subcontractor to furnish and install CIPSRs shall be fully qualified, experienced and equipped to complete the work in a timely and satisfactory manner. Submit the following information to the Engineer for review and approval before CIPSR work is performed.

1. The number of years of experience in performing this type of specialized work.
2. Name of the CIPSR manufacturer and supplier for this work and previous work performed. The Contractor shall be certified by the manufacturer to install the CIPSR patches.
3. A list of all municipal installations performed over the past 5 years along with the contact name, telephone number, and brief description of work performed.
4. The City reserves the right to disapprove the use of the CIPSR Contractor based on the submitted qualifications.

B. All CIPSR spot repairs, regardless of pipe size or length, shall be furnished, fabricated and installed by a single manufacturer.

C. As directed by the Engineer, replace all CIPSRs that utilized materials or methods of installation other than that approved. Remove and replace the CIPSR section or replace the affected pipe with new pipe at no cost to the City.

1.6 GUARANTEE

A. All CIP spot repairs shall be guaranteed by the Contractor for a period of

5 years from the date of acceptance. During this period, all defects in the CIPSR's shall be repaired in a manner satisfactory to the Engineer or the affected pipe shall be removed and replaced with new pipe at no additional cost to the City.

PART 2 - PRODUCTS

2.1 FIBERGLASS/POLYESTER FELT REPAIR MATERIAL

- A. The CIPSR shall be a resin impregnated fiberglass/polyester felt sleeve which is wrapped around an inflatable packer and positioned in the sewer to be rehabilitated and cured in place by circulating hot water to cure the resin. Ambient curing shall not be allowed.
- B. The CIPSR sleeve shall be fabricated from a minimum of two layers of fiberglass with a single layer of polyester felt sandwiched between the fiberglass layers. The material shall be sewn together with multiple polyester threads using zigzag stitching spaced evenly over the full width of the material. The three-layer composite reinforcement material shall have a minimum mass of 40.6 oz/sq. yd with a thickness not less than 0.24-in. Fiberglass alone shall not be acceptable.
- C. The fiberglass shall be woven roving having a minimum weight of 24 oz/sq. yd and shall be made of "E" glass coated with a sizing compatible with the resin being used.
- D. The polyester felt shall be needle punched and have a minimum weight of 16.5 oz/sq. yd.
- E. The resin shall be a two-part epoxy type liquid thermosetting resin suitable for the intended use as well as the proposed curing method. The diluted epoxy resin shall contain at least 60 percent of bisphenol A, 10 to 20 percent of bisphenol F with the remainder of the mixture being a diluent. Epoxy resin shall be D.E.R. (R) 353 by the Dow Chemical Company; ME 948 by Micon or equal.
- F. The epoxy resin shall be brought on site in the resin manufacturer's original containers. Each container shall be clearly labeled as to contents and product data. The resin shall be stored, mixed and applied in accordance with the manufacturer's recommendations.
- G. The CIPSR shall provide a service life of 25 years and shall have, as a minimum, the initial and long-term properties listed below.

MECHANICAL PROPERTY	INITIAL	LONG-TERM
Flexural Strength	8,000 psi	-----
Flexural Modulus of Elasticity	280,000 psi	140,000 psi
Tensile Strength	5,000 psi	-----
Tensile Modulus of Elasticity	280,000 psi	140,000 psi

- H. When cured, the CIPSR shall form a continuous, tight-fitting, hard, impermeable liner which is chemically resistant to any chemicals normally found in domestic sewage. The CIPSR shall have a suitable membrane coating for protection of the interior surface and to provide a uniform, smooth flow surface. No membranes or plastic coating shall be allowed between the repair patch and the pipe wall.
- I. The fiberglass/polyester felt sleeve shall be fabricated to a size that will tightly fit the sewer being rehabilitated after being installed and cured. The transition from the patch to the existing pipe must be smoothly tapered.
- J. The CIPSR shall be by Avanti International of Webster, TX or equal.
- K. Thickness of the cured liner shall be as recommended by the manufacturer but shall not exceed 1/4-in when cured unless authorized in writing by the Engineer.
- L. Spot repairs shall have a minimum length of 3-ft and shall not exceed 30-ft in length. CIPSR lengths shall extend a minimum of 1-ft beyond the pipe defects at each end of the repaired section. Length of each required repair shall be verified in the field prior to installation.
- M. CIP spot repairs shall not begin or end at a service connection or pipe joint.
- N. All cured-in-place spot repairs shall be one piece. Separately fabricated or installed CIPSRs utilizing overlapped or "butted" ends shall not be acceptable.

PART 3 – EXECUTION

3.1 INTSTALLATION

- A. Clean each length of pipe to be lined and dispose of all resulting material as specified in Section 336070.
- B. All obstructions in the sewer which may impede the insertion of the

liner shall be removed by the Contractor.

NOTE: Verify location.

- C. Conduct a television inspection of each length of pipe after it is cleaned as specified in Section 336060. Document the location of all active service connections and verify the lengths of repairs. A copy of these videos shall be submitted to the Engineer and provided to the City.
- D. Notify all property owners who discharge sewage directly to the sewer being repaired that their service will be interrupted while the CIPSR is being inserted, cured and active service connections reopened. Notify individual property owners at least 48 hours in advance, giving the date, start time and estimated completion time for the work being conducted.
- E. Furnish bypass pumping of sewage flows where the rehabilitation work is being performed. Bypass pumping shall be conducted in conformance with the requirements of the technical specifications
- F. The CIPSR material shall be measured, cut and impregnated with epoxy resin in the field to the measurements determined from the videotape inspections. The installation and curing of the CIPSRs shall be in complete accordance with the manufacturers' specifications and a representative of the manufacturer shall be present during the first day of installation.
- G. The installed spot repair shall be cured by circulating hot water through the resin impregnated patch. Ambient curing shall not be allowed.
- H. The inflatable element and hydrostatic pressure used during the installation process shall be sufficient to tightly hold the CIPSR to the existing pipe wall, producing dimples at all service connections and squeezing surplus resin into any cracks in the pipe. This pressure shall be great enough to overcome or prevent infiltration from entering the existing pipeline during the curing process.
- I. The Contractor shall ensure that the shroud covering the packer is completely removed from the repaired pipe.
- J. Where CIPSRs connect to existing manholes, the repair shall create a watertight seal at the pipe connection and into the trough. All cut edges of the cured liner shall be thoroughly sealed with the same resin as was used in the CIPSR materials.
- K. Reestablish all the existing service connections on each length of sewer following patching. The service connections shall be

reestablished per Section 336084 and opened from inside the sewer by means of a cutting device controlled by a closed-circuit television camera. All cut out material shall be flushed out of the sewer, removed out of the sewer so as not to end up in a lift station.

- L. Each service connection shall be cut completely open and shall have smooth edges with no protruding material capable of hindering flow or catching and holding solids contained in the flow stream.
- M. Following installation of the spot repairs and reopening the active service connections, conduct a second video inspection of the completed work. This video, along with the video made in Paragraph 3.1C above shall become the property of the City.

3.2 FIELD TESTING AND ACCEPTANCE

- A. Field acceptance of all CIP spot repairs shall be based on the Engineer's/City's evaluation of the installation and curing data along with review of the TV videos and manhole inspections.
- B. Groundwater infiltration of CIPSR shall be zero.
- C. All active service connections shall be open and clear.
- D. There shall be no dry spots, voids, lifts, delamination or any other type defect in the CIPSR.
- E. Defective CIPSRs shall be removed and replaced with new CIPSRs. If the replacement CIPSR is not satisfactory to the Engineer or City, then remove the entire section of pipe being rehabilitated and replace it with new PVC pipe at no additional cost to the City.

END OF SECTION