LANZO TRENCHLESS TECHNOLOGIES

Delivering innovative trenchless technology solutions to rehabilitate the world's diverse infrastructure

CIPP REFERENCE SPECIFICATION

This CIPP Reference Specification serves as only a guideline and is not intended to encompass the requirements of every municipality or industrial application. However, the points put forth in this document have been used successfully to specify and complete CIPP projects.

First, it is the recommendation of Lanzo Trenchless Technologies that an overall project be evaluated, specified and bid with the unique underground construction technologies separated. By so doing, the strengths and economics of each technology can properly be utilized for the best final result on any given project. Once it has been determined by the project engineer that a project be completed with trenchless underground technologies to minimize disruption to the surrounding community and businesses, the next task involves specification development for advertising and bidding the project. In any given large project there may be sections of pipe best rehabilitated with sliplining or segmental sliplining, fold and form, CIPP and/or other technologies. When this is the case, separate specifications should be developed and the project bid accordingly. For example, bidding slipling, fold and form and CIPP together would typically not allow the end user to have a fold and form or CIPP project because of cost considerations. In addition, the community would not have a project devoid of digging and disruption.

When determining how and under what circumstances CIPP should be specified there are a number of factors to consider. The exclusive use of CIPP in areas where any or a combination of the following conditions may prevail:

1. Suspect structural characteristics in the host pipe where axial, radial, or longitudinal cracks, joint offsets, or shear conditions exist.
2. Pipe ovality sufficient to preclude other products from reaching its full round configuration which is required in the design of this product with ring compression theory.
3. Pipe where line and/or grade differentials may preclude other products from becoming fully rounded (i.e. lines with existing bellies, etc.).
4. Pipe where segments of pipe may be missing.
5. Pipe subject to highway loading in shallow depths where live loading is present or in deep bury locations where soil prism loading is possible.
6. Pipes under State Roads or under roads requiring FDOT maintenance. Typical common concerns of a project include traffic control, by-pass pumping, lateral reinstatement, and chemical grouting of reinstated lateral connections.

SUGGESTED SPECIFICATIONS FOR CURED-IN-PLACE PIPE (CIPP)
AS RECOMMENDED BY LANZO TRENCHLESS TECHOLOGIES

1. INTENT AND DESCRIPTION

1.1 The intent of this specification is to provide a recommended set of guidelines for the reconstruction of pipelines and conduits through the use of cured-in-place pipe (CIPP). In this specification recommended references, prequalification requirements, materials, pre- and post-installation inspection tests have been provided. The process generally consists of inserting a resin impregnated fabric tube into an existing pipe or conduit, expanding the tube against the existing pipe, and curing the tube to form a pipe within a pipe. The tube my be inserted into the pipe by direct inversion or pulling in place. Curing is accomplished by either circulating heated water or steam or ambient temperature air or water to affect the desired cure throughout the pipe from access point to access point.

Although the Contractor my have an approved or licensed process, no material changes or design changes shall be undertaken unless approved by the Agency specifying the project.

2. CONTRACTOR PREQUALIFICATION EXPERIENCE

2.1 The process must be proven through previous successful installations of CIPP rehabilitation projects on lines of 8” or larger in the United States within the last five years. The footage total for these projects shall be a minimum of 1,000,000 lineal feet. Additionally the Contractor shall submit a minimum of 50,000 lf of the size specified or larger to demonstrate competence with the magnitude of the project being constructed. Experience records shall be submitted with submittals according to the guidelines of the specifying agency. Contractors using sub-contractors shall submit information about the sub-contractor (i.e. name, experience records, jobs which the general and sub-contractor have worked jointly, etc.).

3. REFERENCE DOCUMENTS

3.1 ASTM F1216 - Standard Practice for rehabilitation of existing pipelines and conduits by the inversion and curing of a resin-impregnated tube.

3.2 ASTM F1743 - Standard practice for the rehabilitation of existing pipelines and conduits by the pulled-in-place installation of cured-in-place thermosetting resin pipe (CIPP).

3.3 ASTM D5813 - Standard specification for cured-in-place thermosetting resin sewer pipe.

3.4 ASTM C581 - Standard practice for determining chemical resistance of thermosetting resins used in glass fiber reinforced structures, intended for liquid service.

3.5 ASTM D790 - Test methods for flexural properties of unreinforced and reinforced plastics and electrical insulating materials.

3.6 Plans, drawing and profiles of lines to be rehabilitated are included, as available. Videotapes may also be available for review. It is the Contractor's responsibility to visit the site and investigate the project, as necessary, for preparation of any proposal.

3.7 In the event of a conflict, documents shall have the following priorities: (1) Specifications for CIPP, (2) General conditions, (3) ASTM F1216, F1743, and D5813 (as appropriate).

4. PREBID PREQUALIFICATION SUBMITTALS

4.1 Submittals shall be made according to the guidelines of the Agency

4.2 Resin

4.2.1 Submit technical data sheets showing physical properties of the products modified for the CIPP process.

4.2.2 Submit one year chemical resistance tests of flexural properties and weight change evaluations that have been carried out with the submitted resin(s) and the fabric tube material(s) to be used on the project. The edges or surfaces of the test specimens shall not be sealed or coated unless it can be conclusively proven that these modifications can be successfully completed in the field and that these product modifications will remain intact throughout the expected life of the product. The chemicals evaluated should be consistent with those specified in ASTM F1216 and/or ASTM D5813. These tests shall be run in a manner consistent with ASTM C581 with flexural property and weight change data available at intervals of 1, 3, 6 and 12 months to establish a trend of product performance. Tests should be carried out by an accredited lab and preferably through an independent third party lab.

4.2.3 At any point in the project, the specifying agency may request dated certificates of analysis for each delivery of resin during the project to confirm that the specified resin is being used on the given project.

4.3 Tube Materials

4.3.1 Submit technical data sheets showing that the physical properties of the tube materials meet the requirements of ASTM D5813.

4.3.2 Submit tabular summary of calculated sewer segment design thickness and recommended dry tube thickness for each installation. Dry tube thickness shall exceed calculated design thickness for all cases.

5. POST-INSTALLATION SUBMITTALS

5.1 Submit pre-installation tapes of the line segments being rehabilitated in a format specified by the agency (i.e. full pipe circumference, resolution, color, etc.).

5.2 Submit post-installation tapes of the completed CIPP and reinstated laterals in a format specified by the agency.

5.3 Submit flexural property test data from an independent third party testing lab of each line segment installed.

5.4 Submit installed CIPP thickness measurements from an independent third party testing lab of each line segment installed.

6. MATERIALS

6.1 Flexible Tube

6.1.1 The flexible tube shall be manufactured and fabricated under quality-controlled conditions set by the process manufacturer. The tube shall be manufactured of a size that when installed it will fit snuggly to the internal circumference of the pipe or conduit being rehabilitated and have minimal wrinkling.

6.1.2 The tube thickness shall also be specified such that the installed thickness meets the requirements of the specifying agency.

6.1.3 The tube length shall be manufactured such that it will span the entire length of the access points. When the product is installed between manholes, the CIPP shall extend beyond and seal the end of each manhole.

6.1.4 The specified tube material shall have a minimum tensile strength in the longitudinal and transverse directions as specified in ASTM D5813.

6.2 Resin

6.2.1 Provide a liquid thermosetting resin that will properly saturate the tube without draining out and will produce a properly cured pipe, which is resistant to abrasion and the effluent passing through the CIPP.

6.2.2 The approved polyester resin shall be made by a reaction of isophthalic/terathalic acid, maleic anhydride, and a glycol characterized by reactive unsaturation located along the molecular chain. This resin is compounded with a reactive styrene monomer and reacted together with initiators/promoters to produce cross-linked copolymer matrices. Use of recycled polyethylene terephthalic (PET)

6.2.3 resins shall not be allowed. In addition, only branched glycol chemistry shall be allowed in the composition of the polyester resin.

6.2.4 The approved vinyl ester shall be made by a reaction of epoxy resin with methacrylic acid and characterized by reactive unsaturation located in terminal positions of the molecular chain. This resin is compounded with a reactive styrene monomer and reacted together with initiators/opromoters to produce cross-linked copolymer matrices.

6.2.5 The approved epoxy resin shall be made by a reaction of bisphenol A and epichlorhydrin producing glycidyl ether reactive sites at the terminal positions of the molecular chain. This resin is cross-linked with the reactive equivalent of a curing agent suitable for the CIPP process.

6.3 Minimum physical properties

6.3.1 The minimum physical properties of the installed CIPP shall meet the following requirements.

Property	**Reference**	**Minimum**
Flexural Modulus	ASTM D790	250,000 psi
Flexural Strength	ASTM D790	4,500 psi

7. PRECONSTRUCTION CONFERENCE

7.1 After the contract is awarded and prior to commencing work, the Contractor will attend a pre-construction meeting with the Agency. At the meeting it is recommended that the work schedule, traffic controls, materials and other submittals, major sub-contractors, by-pass pumping plan, and certificates of insurance be submitted at that time.

8. TRAFFIC CONTROL

8.1 A traffic control plan shall include detailed diagrams showing the location of all traffic control devices and the length of time for all lane closures, as well as location of any flaggers, as necessary. One lane of traffic in each direction must be maintained at all times, and local streets may only be closed with prior approval of the Traffic Engineer.

8.2 A written method of handling traffic for each different phase of the project shall be submitted and include both vehicular and pedestrian traffic.

8.3 The name and number of the Contractor representative responsible for traffic control shall be made available to solve traffic problems at each job site location.

9. PERMITS

9.1 Depending on the project and location, there may be a number of required permits that must be obtained prior to commencement of the work. An example of permits that might be required include projects within State Highway right of ways, water permits, industrial waste permits, etc.

10. PUMPING AND BY-PASS PUMPING

10.1 The contractor shall submit a written plan at the preconstruction conference outlining the by-pass pumping scheme. The plan shall describe in writing and with diagrams the logistics of by-passing each pipe segment to be rehabilitated. Typically the Contractor or Sub-Contractor will provide the pumps for a given project. The by-pass shall be designed to handle peak flows with additional capacity in the event of a rainstorm. The by-pass shall be watertight and not leak. The plan should address contingencies in the event of a major rainfall or equipment malfunction.

11. CLEANING OF SEWER LINES

11.1 The Contractor, when required, shall remove all internal debris out of the pipe prior to installing the CIPP. The Contractor shall be responsible for disposing of all the debris in accordance with Agency requirements. Any hazardous waste encountered during a project, unless otherwise specified , is considered a changed condition.

12. PATENTS

12.1 The Contractor shall warrant and hold harmless the Agency against all claims for patent infringement and any loss thereof.