UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated January 2023
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RELINING SEWERS

11/21

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USACE / NAVFAC / AFCEC / NASA **UFGS-33 01 30.72 (November 2021)**

Preparing Activity: NAVFAC **Superseding**
UFGS-33 01 30.72 (May 2016)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

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SECTION 33 01 30.72

RELINING SEWERS
11/21

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NOTE: This guide specification covers the requirements for storm sewer and sanitary sewer pipeline renewal utilizing Cured-In-Place Pipe (CIPP) and Fold-and-Form Pipe (FFP). Use tailoring options FOLD-AND-FORM PIPELINER or CURED-IN-PLACE PIPE to select the appropriate system for the project.

Adhere to UFC 1-300-02 Unified Facilities Guide Specifications (UFGS) Format Standard when editing this guide specification or preparing new project specification sections. Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable item(s) or insert appropriate information.

Remove information and requirements not required in respective project, whether or not brackets are present.

Comments, suggestions and recommended changes for this guide specification are welcome and should be submitted as a Criteria Change Request (CCR).
****

PART 1 GENERAL

1.1 REFERENCES

****

NOTE: This paragraph is used to list the publications cited in the text of the guide specification. The publications are referred to in the text by basic designation only and listed in this paragraph by organization, designation, date, and title.

Use the Reference Wizard's Check Reference feature

when you add a Reference Identifier (RID) outside of the Section's Reference Article to automatically place the reference in the Reference Article. Also use the Reference Wizard's Check Reference feature to update the issue dates.

References not used in the text will automatically be deleted from this section of the project specification when you choose to reconcile references in the publish print process.

****

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN SOCIETY OF CIVIL ENGINEERS (ASCE)

ASCE MOP 120	(2009) Trenchless Renewal of Culverts and Storm Sewers

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA M45	(2013; 3rd Ed) Fiberglass Pipe Design

ASTM INTERNATIONAL (ASTM)

ASTM D790	(2017) Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
ASTM D2412	(2021) Standard Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading
ASTM D2990	(2017) Standard Test Methods for Tensile, Compressive, and Flexural Creep and Creep-Rupture of Plastics
ASTM D5813	(2004; R 2018) Standard Specification for Cured-In-Place Thermosetting Resin Sewer Piping Systems
ASTM F1216	(2022) Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube
ASTM F1504	(2014) Standard Specification for Folded Poly(Vinyl Chloride) (PVC) Pipe for Existing Sewer and Conduit Rehabilitation
ASTM F1533	(2001; R 2009) Standard Specification for Deformed Polyethylene (PE) Liner
ASTM F1606	(2019) Standard Practice for Rehabilitation of Existing Sewers and

	Conduits with Deformed Polyethylene (PE) Liner
ASTM F1743	(2016) Standard Practice for Rehabilitation of Existing Pipeline and Conduits by Pulled-In-Place Installation of Cured-In-Place Thermosetting Resin Pipe (CIPP)
ASTM F1867	(2006; R 2012) Standard Practice for Installation of Folded/Formed Poly (Vinyl Chloride) (PVC) Pipe Type A for Existing Sewer and Conduit Rehabilitation
ASTM F1871	(2011) Standard Specification for Folded/Formed Poly (Vinyl Chloride) Pipe Type A for Existing Sewer and Conduit Rehabilitation
ASTM F2019	(2011) Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Pulled in Place Installation of Glass Reinforced Plastic (GRP) Cured-in-Place Thermosetting Resin Pipe (CIPP)

1.2 DEFINITIONS

Use the definitions in the applicable standard. When the the applicable standard does not have a definition, use ASCE MOP 120.

1.3 ADMINISTRATIVE REQUIREMENTS

1.3.1 Scheduling

Minimize obstruction and inconvenience to traffic, pedestrians, and tenants.

1.4 SUBMITTALS

****

NOTE: Review Submittal Description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list, and corresponding submittal items in the text, to reflect only the submittals required for the project. The Guide Specification technical editors have classified those items that require Government approval, due to their complexity or criticality, with a "G". Generally, other submittal items can be reviewed by the Contractor's Quality Control System. Only add a "G" to an item if the submittal is sufficiently important or complex in context of the project.

For Army projects, fill in the empty brackets following the "G" classification, with a code of up to three characters to indicate the approving authority. Codes for Army projects using the Resident Management System (RMS) are: "AE" for

Architect-Engineer; "DO" for District Office (Engineering Division or other organization in the District Office); "AO" for Area Office; "RO" for Resident Office; and "PO" for Project Office. Codes following the "G" typically are not used for Navy, Air Force, and NASA projects.

The "S" classification indicates submittals required as proof of compliance for sustainability Guiding Principles Validation or Third Party Certification and as described in Section 01 33 00 SUBMITTAL PROCEDURES.

Choose the first bracketed item for Navy, Air Force, and NASA projects, or choose the second bracketed item for Army projects.

****

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are [for Contractor Quality Control approval.][for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government.] Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Contractor Quality Control (CQC) Plan; G[, [_____]]

Sequence Of Liner Installation; G[, [_____]]

Traffic Control Plan; G[, [_____]]

Bypass Plan; G[, [_____]]

Disposal Of Process Water; G[, [_____]]

SD-02 Shop Drawings

****

NOTE: This submittal is tailored for FOLD-AND-FORM PIPELINER.

****

FFP Repair Method; G[, [_____]]

SD-03 Product Data

Hydrophilic Seal; G[, [_____]]

Lubricant; G[, [_____]]

****

NOTE: The following five submittals are tailored for CURED-IN-PLACE PIPE.

****

Fabric Tube; G[, [_____]]

CIPP Product Data; G[, [_____]]

Catalyst; G[, [_____]]

Raw Resin Data; G[, [_____]]

Flexible Membrane; G[, [_____]]

SD-05 Design Data

****
NOTE: The following two submittals are tailored for CURED-IN-PLACE PIPE.
****

Engineering Design Calculations; G[, [_____]]

Resin To Tube Ratio; G[, [_____]]

****
NOTE: The following submittal is tailored for FOLD-AND-FORM PIPELINER.
****

FFP Engineering Design Calculations; G[, [_____]]

SD-06 Test Reports

****
NOTE: The following four submittals are tailored for CURED-IN-PLACE PIPE.
****

IR Analyses; G[, [_____]]

Temperature Logs; G[, [_____]]

Curing Logs; G[, [_____]]

CIPP Sample Test Results; G[, [_____]]

****
NOTE: The following three submittals are tailored for FOLD-AND-FORM PIPELINER.
****

FFP Temperature Logs; G[, [_____]]

FFP Curing Logs; G[, [_____]]

FFP Sample Test Results; G[, [_____]]

SD-07 Certificates

Contractor's Qualifications; G[, [_____]]

Superintendent's Qualifications; G[, [_____]]

Certificate of QC Laboratory Accreditation; G[, [_____]]

Resin Dye; G[, [_____]]

****
NOTE: The following four submittals are tailored for CURED-IN-PLACE PIPE.
****

Liner Manufacturer; G[, [_____]]

CIPP Installer's Qualifications; G[, [_____]]

Shipping Documents; G[, [_____]]

Manufacturing Certificate; G[, [_____]]

SD-08 Manufacturer's Instructions

Manufacturer's Instructions; G[, [_____]]

1.5 QUALITY CONTROL

1.5.1 Qualifications

1.5.1.1 Contractor's Qualifications

****
NOTE: The following paragraphs are tailored. Select the first paragraph for CURED-IN-PLACE PIPE; select the second paragraph for FOLD-AND-FORM PIPELINER.
****

The Contractor is to have a minimum of three years of continuous experience installing Cured-In Place Pipe (CIPP) in pipe of a similar size, length and configuration. A minimum of 45,720 meters 150,000 linear feet of shop wet-out liner installation is required and a minimum of six onsite wet-out installations are required as specifically applicable to this Contract.

A minimum of three years experience using the proposed Fold-And-Form Pipe (FFP) rehabilitation of sewers' product is required as well as the installation of at least 15,240 meters 50,000 linear feet of the proposed FFP product(s). Employees and subcontractors performing work on the FFP rehabilitation are to be certified by the FFP rehabilitation system supplier as qualified to perform work with the proposed product. The firm performing the work is to be licensed by the liner process manufacturer.

1.5.1.2 CIPP Installer's Qualifications

****
NOTE: This paragraph is tailored for CURED-IN-PLACE PIPE.
****

The lead personnel including the superintendent, the foreman and the lead crew personnel for the resin wet-out, the CIPP installation, liner curing and the robotic service reconnections each are to have a minimum of three years of total experience with the CIPP technology utilized.

1.5.1.3 Superintendent's Qualifications

The superintendent for the Contract is to have supervised projects in which at least 7620 meters 25,000 linear feet of pipe has been rehabilitated using the product. The superintendent must be on-site during all phases of the work involving the insertion and processing of the liner.

1.5.1.4 Quality Control Specialist

****
NOTE: The following paragraph contains tailoring options for FOLD-AND-FORM PIPELINER and CURED-IN-PLACE PIPE.
****

The Quality Control (QC) Specialist is responsible for monitoring and documenting activities related to QC of the liner system from manufacturing through installation. The QC Specialist is to have a minimum of three years of continuous experience installing FFP CIPP of similar size, length and configuration as contained in this contract. The QC Specialist is to be certified by the liner system supplier as qualified to perform work with the proposed liner system.

1.5.1.5 Liner Manufacturer

****
NOTE: This paragraph is tailored for CURED-IN-PLACE PIPE.
****

Use felt material manufactured by companies specializing in felt production for CIPP. The manufacturer is to have manufactured felt material for CIPP for at least two years as documented by references. Submit felt manufacturer, references and location of the manufacturing facility. The felt material manufacturer and facility cannot change during construction unless specifically approved by the Contracting Officer in writing and in advance of its use.

1.5.1.6 Quality Control Laboratory

Select a QC Laboratory that has provided QC testing for at least three completed projects with the proposed liner system; and is independent from, and not associated with, the Contractor. QC Laboratory must be certified to perform testing in accordance with the following standards: ASTM D790, ASTM D2412, ASTM D2990, ASTM D5813, and ASTM F1216. Submit the Certificate of QC Laboratory Accreditation.

1.5.2 Quality Control Plan

Submit a detailed Contractor Quality Control (CQC) Plan that fully represents and conforms to the requirements of these specifications. At a minimum the CQC is to include the following:

a. Defined responsibilities, of the personnel, for assuring that quality requirements, for this Contract are met. Assign these responsibilities to specific personnel.

b. Submit clearly defined proposed procedures for quality control, product sampling and testing as part of the plan.

c. Proposed methods for product performance controls, including method of and frequency of product sampling and testing both in raw material form and cured product form.

d. A scheduled performance and product test result review with the Contracting Officer at a regularly scheduled progress meeting.

e. Prepare Inspection Forms and guidelines for quality control inspections in accordance with the standards specified in this Contract and submitted with the QCP.

f. Outline specific repair or replacement procedures for potential defects that occur in the installed liner system, following repair or replacement procedures that are compatible with the system being used. Submit Repair or Replacement Procedures must adhere to the product manufacturer's written specifications for repair or replacement.

1.6 DELIVERY, STORAGE, AND HANDLING

Ship, store, and handle materials in a manner consistent with the written specifications of the liner system manufacturer to avoid damage. Damage may include, but is not limited to, gouging, abrasion, flattening, cutting, puncturing, or ultra-violet (UV) degradation. Select on site storage locations for approval by the Contracting Officer. Promptly remove and dispose of damaged materials.

****
NOTE: The following paragraph is tailored for FOLD-AND-FORM PIPELINER.
****

As a minimum the FFP delivered to the job site is to contain the manufacturers name or trademark, the nominal outside diameter, the cell classification, the DR designation, and the ASTM designation of the pipe.

1.6.1 Resin

****
NOTE: This paragraph is tailored for CURED-IN-PLACE PIPE.
****

Ship the resin directly from the resin manufacturer's facility to the CIPP wet-out facility. Submit copies of the shipping documents from the resin manufacturer to the Contracting Officer showing dates of shipment, the originating location and the receiving location.

1.7 PROJECT/SITE CONDITIONS

The use of the product is not to result in the formation or production of any detrimental compounds or by-products including cuttings and pipe coupons, at the wastewater treatment plant or environment.

1.7.1 Environmental Requirements

Cool superheated water to below 38 degrees C 100 degrees F before discharge. Notify the Contracting Officer and identify any by-products produced as a result of the installation operations. Comply with local waste discharge requirements.

1.7.1.1 Disposal Of Process Water

Submit a procedure for the containment and disposal of process water for approval by the Contracting Officer.

1.8 WARRANTY

1.8.1 Warranty-TV Inspection

****
NOTE: The default warranty is one year and the warranty-TV inspection is generally performed 10 months after liner installation or 60 days prior to warranty expiration. This inspection reveals flaws in material and workmanship not otherwise seen, such as settlement, leaks and delamination that need to be repaired prior to warranty expiration.

Consider adding Warranty-TV inspection to the commissioning requirements of the project. The benefits include a final internal examination of selected portions of the newly installed culverts and storm drain piping system.
****

a. Complete a Warranty-TV inspection starting no earlier than [60][_____] days prior to expiration of the warranty. Perform Warranty-TV Inspection as specified in Section 33 01 30.16 TV INSPECTION OF SEWER LINES and at a time directed by the Contracting Officer. The specific locations will be selected by the Contracting Officer.

b. Repair any defects or abnormalities in lining, laterals or manhole connections which may materially affect the integrity, strength, function or operation of the pipe in accordance with Repair or Replacement Procedures.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

****
NOTE: The following paragraph contains tailoring options for FOLD-AND-FORM PIPELINER and CURED-IN-PLACE PIPE.
****

Rehabilitate sewer pipelines by the installation of FFP CIPP.

2.1.1 Design Requirements

****
NOTE: Use ASCE MOP 120 as applicable.

****

2.1.1.1 Structural Requirements

2.1.1.1.1 Cured-In-Place Pipe

****
NOTE: This paragraph is tailored for CURED-IN-PLACE PIPE.
****

Design the CIPP in accordance with the applicable provisions of ASTM F1216 for [fully deteriorated][partially deteriorated] gravity pipe conditions. Provide engineering design calculations, performed and sealed by a qualified registered Professional Engineer in accordance with ASTM F1216 Appendix X1 Design Considerations for each length of liner to be installed including the thickness of each pipe segment. It is acceptable to submit a design for the most severe line condition and apply that design to all of the line sections of the same diameter. Provide a CIPP system which meets or exceeds the minimum properties specified herein:

a. Provide calculations supporting the liner thickness. The data is to include both the calculated thicknesses and the thicknesses proposed to be installed.

b. The installed, cured liner thickness is the largest thickness as determined by calculations for deflection, bending, buckling and minimum stiffness. The minimum installed, cured liner thickness is as follows, regardless of what the calculations indicate as the required minimum thickness:

****
NOTE: Thickness values are stated in SI/metric units since they are regarded as the standard; therefore, English units are not provided for thickness values below.
****

150 mm 6 inch sewer: 4.5 mm

200 mm 8 inch sewer: 6 mm up to 5.2 meters 17 feet deep

200 mm 8 inch sewer: 7.5 mm up to 7.6 meters 25 feet deep

250 mm 10 inch sewer: 6 mm up to 3.4 meters 11 feet deep

250 mm 10 inch sewer: 7.5 mm up to 5.5 meters 18 feet deep

250 mm 10 inch sewer: 9 mm up to 7.6 meters 25 feet deep

300 mm 12 inch sewer: 7.5 mm up to 3.7 meters 12 feet deep

300 mm 12 inch sewer: 9 mm up to 5.5 meters 18 feet deep

300 mm 12 inch sewer: 10.5 mm up to 7.6 meters 25 feet deep

375 mm 15 inch sewer: 7.5 mm up to 3.0 meters 10 feet deep

375 mm 15 inch sewer: 9 mm up to 4.3 meters 14 feet deep

375 mm 15 inch sewer: 10.5 mm up to 6.1 meters 20 feet deep

c. The physical properties and characteristics of the finished liner will vary considerably, depending on the types and mixing proportions of the materials used, and the degree of cure executed. Control these variables and provide a CIPP system which meets or exceeds the minimum properties specified herein:

(1) Design the CIPP to meet or exceed ASTM F1216 Appendixes. The CIPP design is to assume no bonding to the original pipe wall.

(2) The CIPP design engineer is to set the long term (50 year extrapolated) Creep Retention Factor at 50 percent of the initial design flexural modulus as determined by ASTM D790 test method. Use this value unless long term test data ASTM D2990 substantiates a higher retention factor is required.

(3) At a minimum, the CIPP is to meet or exceed the structural properties, as listed below:

	MINIMUM PHYSICAL PROPERTIES	
Property	Test Method	Cured Composite (ASTM F1216)
Flexural Modulus of Elasticity (Short Term) (Felt Tubes) Felt/Fiberglass, Fiberglass meeting manufacturer's specifications	ASTM D790	1724 MPa 250,000 psi
Flexural Strength (Short Term) (Felt Tubes) Felt/Fiberglass, Fiberglass meeting Manufacturer's specifications	ASTM D790	31.0 MPa 4,500 psi

(4) As a minimum, base the required structural CIPP wall thickness on the physical properties of the cured composite and the design of the Contractor's Professional Engineer and in accordance with the Design Equations contained in the Appendix of the ASTM standards, and the following design parameters:

Design Safety Factor	2.0 (1.5 for pipes 900 mm 36 inch or larger)
Creep Retention Factor	50 percent
Ovality	2 percent or as measured by field inspection
Constrained Soil Modulus	AASHTO LRFD Section 12 and AWWA M45
Groundwater Depth	As specified or indicated on the plans, in the specifications or geotechnical report
Soil Depth (above the crown)	As specified or indicated on the plans
Live Load	Highway, railroad or airport as applicable
Soil Load (assumed)	1922 kg/cu. m 120 lb/cu.ft.
Minimum service life	50 years

(5) Prior to installation of the lining materials, submit certification of compliance with these specifications or the requirements of the pre-approved CIPP system. Include certified material test results that confirm materials conform to these specifications. Materials not complying with these requirements will be rejected.

2.1.1.1.2 Fold and Form Pipe

****

NOTE: This paragraph is tailored for FOLD-AND-FORM PIPELINER.

****

Provide FFP engineering design calculations, performed and sealed by a qualified registered Professional Engineer in accordance with ASTM F1216 Appendix X1 Design Considerations for each length of liner to be installed including the thickness of each pipe segment. It is acceptable to submit a design for the most severe line condition and apply that design to all of the line sections of the same diameter.

a. The physical properties, wall thickness and characteristics of the finished FFP will vary according to the material installed. Provide a FFP system which meets or exceeds the minimum properties specified herein:

(1) Design the FFP in accordance with the applicable ASTM Standard, depending on the material being installed. The FFP design is not to assume bonding to the original pipe wall.

(2) The FFP design engineer is to set the long term (50 year extrapolated) Modulus Retention Factor as a percentage of the flexural modulus as determined by ASTM D790 test method. Base the Modulus Retention Factor on long term test data (ASTM D2990 or equal) submitted by the manufacturer of the product selected to substantiate the long term creep retention factor.

(3) The installed FFP material is to meet or exceed the structural

properties, as listed below.

(a) As a minimum, base the required structural FFP wall thickness on the physical properties of the manufactured FFP and according to the design of the Professional Engineer and in accordance with ASTM F1504 and ASTM F1533.

Design Safety Factor	2.0
Modulus Retention Factor	As submitted and specific to type of pipe material
Ovality	2% or as measured by field inspection
Constrained Soil Modulus	Per AASHTO LRFD Section 12 and AWWA M45
Groundwater Depth	As specified or indicated on the Plans
Soil Depth (above the crown)	As specified or indicated on the Plans
Live Load	Highway, railroad or airport as applicable
Soil Load (assumed)	1922 kg/cu. m120 lb/cu. ft. (or data from specific project soil borings)
Minimum service life	50 years

MINIMUM PHYSICAL PROPERTIES

Property	Test Method	Per Applicable ASTM
Flexural Modulus of Elasticity	ASTM D790	HDPE - 814 MPa 118,000 psi PVC - 1931 MPa 280,000 psi PVC Type A - 1000 MPa 145,000 psi
Flexural Strength	ASTM D790	HDPE - N/A PVC - 34.5 MPa 5,000 psi PVC Type A - 28.3 MPa 4,100 psi

2.1.2 Performance Requirements

****
NOTE: The following paragraph contains tailoring options for FOLD-AND-FORM PIPELINER and CURED-IN-PLACE PIPE.
****

Provide a continuous and tight-fitting liner throughout the entire length of the original pipe. Extend the FFP CIPP the full length of the original pipe, from entry point to exit point, and provide a structurally sound and

water-tight new pipe within a pipe. Cleanup, restore existing surface conditions and structures, and repair portions of the FFPCIPP system determined to be defective.

2.1.2.1 Cured-In-Place Pipe

****
NOTE: This paragraph is tailored for CURED-IN-PLACE PIPE.
****

a. Provide a continuous and jointless CIPP from manhole to manhole or access point to access point, free of defects that will affect the long term life and operation of the pipe.

b. Fit the CIPP sufficiently tight within the existing pipe so as to not leak at the manholes, at the service connections or through the wall of the installed pipe. Seal leaks at the manholes or the service connections using a material compatible with the CIPP. If leakage occurs through the wall of the pipe, repair or replace the liner.

c. Design the CIPP for a life expectancy of 50 years or greater and to have a 50 year corrosion resistance to the typical chemicals found in domestic sewage.

d. Robotically re-open existing and confirmed active service connections and any other service laterals to be reinstated as directed by the Contracting Officer to their original shape and to a minimum of 90 percent of their original capacity. Repair over-cut service connections to meet the requirements of these specifications. Re-establish the service openings utilizing a remotely controlled brushing device to smoothly cut and remove jagged edges, material and shavings resulting in the cutting operation.

2.1.2.2 Fold-And-Form Pipe

****
NOTE: This paragraph is tailored for FOLD-AND-FORM PIPELINER.
****

a. Provide continuous and jointless FFP from manhole to manhole, free of defects that will affect the long term life and operation of the pipe.

(1) The FFP is to fit sufficiently tight within the existing pipe so as to not leak at the manholes, at the service connections, or through the wall of the installed pipe.

(2) Seal these areas to stop leakage using a material compatible with the FFP. Repair or replace the liner if leakage occurs through the wall of the pipe. Final approval of the liner installation will be based on a leak tight pipe.

b. The installed FFP is to have a 50 year corrosion resistance to the typical chemicals found in domestic sewage.

2.1.3 Tolerances

Maintain the largest possible hydraulic capacity. At a minimum, the

rehabilitated pipe is to equal or exceed the full flow capacity of the original pipe before rehabilitation.

All recommended values from the ASTM's referenced in this specification are required.

2.1.3.1 Cured-In-Place Pipe

****
NOTE: This paragraph is tailored for CURED-IN-PLACE PIPE.
****

The installed CIPP thickness tolerance is minus 5 percent to plus 10 percent as compared to the approved liner design.

2.1.3.2 Fold-And-Form Pipe

****
NOTE: This paragraph is tailored for FOLD-AND-FORM PIPELINER.
****

2.1.3.2.1 Fold-And-Form Poly (Vinyl Chloride) Pipe

****
NOTE: This paragraph is tailored for FOLD-AND-FORM PIPELINER.
****

Comply with ASTM F1871, ASTM F1867 or ASTM F1504.

2.1.3.2.2 Polyethylene (PE) Liner

****
NOTE: This paragraph is tailored for FOLD-AND-FORM PIPELINER.
****

Comply with ASTM F1606 or ASTM F1533.

2.2 MATERIALS

2.2.1 Hydrophilic Seals

Submit Hydrophilic Seal information that specifically indicates that the seal material is compatible with the liner material being utilized and the hydrophilic seal will produce a tight fitting, waterproof seal between the liner and the host pipe at the manhole location.

2.2.2 Lubricant

Submit detailed description of the lubricant proposed for the insertion or inversion process. Ensure that the lubricant is compatible with the wastewater treatment plant operations and pre-treatment program.

2.2.3 Cured-In-Place Pipe

****

NOTE: This paragraph is tailored for CURED-IN-PLACE PIPE.

****

Provide a fabric tube manufactured of one or more layers of absorbent non-woven felt fabric, felt fiberglass composite or fiberglass and meet the requirements of ASTM F1216, ASTM F1743, ASTM D5813, and ASTM F2019 that is capable of absorbing and carrying resins, constructed to withstand installation pressures and curing temperatures and have sufficient strength to bridge missing pipe segments, and stretch to fit irregular pipe sections. Submit certified information from the felt manufacturer of the nominal void volume in the fabric tube that will be filled with resin.

When combined as a composite structure, the fabric tube, resins, tube coatings, and other materials must produce CIPP that meets the requirements of this specification. Fabricate the CIPP to a size that will tightly fit the internal circumference and the length of the original conduit when installed.

2.2.3.1 Resin-Impregnated Tube

****

NOTE: This paragraph is tailored for CURED-IN-PLACE PIPE.

CIPP can be used for structural and nonstructural purposes for pipes ranging from 2 to 108-in. diameter.

The installation of a resin-impregnated, flexible tube which is inverted into the existing conduit by use of a hydrostatic head or air pressure. The resin is cured by circulating hot water or introducing controlled steam within the tube. When cured, the finished pipe will be continuous and tight-fitting.

****

Provide ASTM F1216 resin-impregnated, flexible tube for installation by inversion. The flexible tube must consist of one or more layers of flexible needled felt, nonwoven or woven material, or a combination of nonwoven and woven materials, capable of carrying resin and withstanding installation pressures and curing temperatures. The tube must be compatible with the resin system used and have a plastic coated outside layer material that is compatible with the resin system used. Make allowance for circumferential stretching during inversion.

Use thermoset resin and catalyst system or an epoxy resin and hardener that is compatible with the inversion process. The resin must be able to cure in the presence of water and the initiation temperature for cure should be less than 82.2 deg. C 180 deg. F.

2.2.3.2 Thermosetting Resin Pipe

****

NOTE: This paragraph is tailored for CURED-IN-PLACE PIPE.

CIPP can be used for pipes ranging from 2 to 96-in.

diameter.

The installation of a flexible tube capable of carrying resin which is pulled into the existing conduit and secondarily inflated by hydrostatic head or air pressure. The resin is cured by circulating hot water or introducing controlled steam within the tube. When cured, the finished pipe will be continuous and tight-fitting.

****

Provide ASTM F1743 coated fabric tube filled with thermosetting resin installed by pull in place methods. The flexible tube must consist of one or more layers of flexible needled felt, nonwoven or woven material, or both, capable of carrying resin and withstanding installation pressures and curing temperatures. The outside layer of the fabric tube should have an impermeable flexible coating whose function is to contain the resin during and after fabric tube impregnation. The outer coating must facilitate monitoring of resin saturation. Allowance should be made for circumferential and longitudinal stretching of the fabric tube during installation. All of the materials used must be compatible with the resin system used and have a plastic coated outside layer material that is compatible with the resin system used.

Use a chemically resistant isophthalic based polyester or vinyl ester thermoset resin and catalyst system or an epoxy resin and hardner that is compatible with the installation process. The resin must be able to cure in the presence of water and the initiation temperature for cure should be less than 82.2 deg. C 180 deg. F.

2.2.3.3 Product Data

****

NOTE: This paragraph is tailored for CURED-IN-PLACE PIPE.

****

Submit CIPP product data from the CIPP manufacturer.

a. Submit product data for the Flexible Membrane (coating) material including the manufacturer's recommended repair (patching) procedure.

b. Include infrared spectrum (IR) analysis for proposed resin and confirmation that the resins meet ASTM D5813.

c. Catalyst product data and quantity.

d. Raw Resin Data, including the manufacturer and description of product components.

2.2.3.4 Test Reports

****

NOTE: This paragraph is tailored for CURED-IN-PLACE PIPE.

****

Include test reports certifying that the materials shipped to the project site conform to the applicable ASTM standards.

a. Submit results of IR analyses of the proposed resin and resin catalyst mixture, performed and certified by the resin manufacturer, prior to manufacturing CIPP.

b. The results of the IR analyses (the resin's chemical fingerprint) will be used to verify that the resin and the resin catalyst composition and mixture being used is the approved resin and resin catalyst system.

2.2.3.5 Certificates

****
NOTE: This paragraph is tailored for CURED-IN-PLACE PIPE.
****

a. Submit a manufacturing certificate that the CIPP was manufactured in accordance with these specifications and ASTM D5813 with each shipment. The certifications are to include:

b. A signed statement by the wet-out manager/supervisor that no fillers were added to the resin system during manufacture of the CIPP.

c. Wet-out forms documenting the wet-out for each section of CIPP manufactured without delay or claim to any confidentiality.

(1) The wet-out forms are to document the date and time of wet-out, the wet-out supervisor, the wet-out facility address, the location where the CIPP will be installed (by work order and manhole numbers), the CIPP diameter, the length of wet-tube and dry-tube, the thickness of the CIPP, the roller gap setting for establishing the liner thickness, the felt manufacturer, the resin used (by product name and batch or shipment number) and quantity, the catalyst(s) used (by product name) and quantity, quality control samples taken, and other information pertinent to the wet-out process.

d. Submit a Certificate of Authenticity from the resin manufacturer for each shipment to the wet-out facility as part of the Catalyst product data submittal. Include the date of manufacture and the Heat Distortion Temperature.

e. Submit certification that the Resin Dye quantity and type is compatible with the components of the lining system.

2.2.3.6 Manufacturer's Instructions

****
NOTE: This paragraph is tailored for CURED-IN-PLACE PIPE.
****

Submit manufacturer's instruction for installation, repair and patching of the CIPP.

2.2.3.7 Resin

****
NOTE: This paragraph is tailored for CURED-IN-PLACE

PIPE.

****

a. Provide a corrosion resistant polyester or vinyl ester resin and catalyst system or epoxy and hardener system that, when cured within the tube composite, meets the requirements of ASTM F1216, ASTM F1743, or ASTM F2019, the physical properties herein, and those, indicated in the design of the CIPP for this project. The resin is to produce CIPP which will comply with or exceed the structural and chemical resistance requirements of this specification.

b. Submit the resin to tube ratio, by volume, as determined by the Design Calculations.

c. Provide the polyester or vinyl ester resin that is PREMIUM, NON-RECYCLED resin only. Do not use Polyethylene Terephthalate (PET) resins, or those containing fillers, additives or enhancement agents. Old resin or reworked resin is not permitted.

d. Do not use Quick-cure or accelerated resin systems that cure in half the specified time or substantially quicker than the minimum three hours.

2.2.4 Fold-And-Form Pipe

****

NOTE: This paragraph is tailored for FOLD-AND-FORM PIPELINER.

****

Provide an FFP system that is chemical resistant to domestic sewage.

2.2.4.1 Manufacturer's Instructions

****

NOTE: This paragraph is tailored for FOLD-AND-FORM PIPELINER.

****

Submit manufacturer's instruction for installation and repair of the FFP.

PART 3 EXECUTION

3.1 EXAMINATION

Complete Pre-TV inspection in accordance with Section 33 01 30.16 TV INSPECTION OF SEWER LINES.

3.2 PREPARATION

3.2.1 Traffic Control

a. Submit a detailed Traffic Control Plan to the Contracting Officer at least 10 days in advance when the manholes used to access and install the liner are located in or adjacent to the road. Comply with all applicable State Highway, Local and Installation requirements when preparing the traffic control plan.

b. Provide labor, signs, barricades, cones, arrow boards, flaggers and

any additional equipment necessary to complete the work.

3.2.2 Set-Up and Sequence

Submit a sewer Bypass Plan to the Contracting Officer at least [14] [_____] days in advance. Coordinate sewer bypass and flow interruptions with the Contracting Officer before proceeding with liner installation.

Submit a Sequence of Liner Installation plan. Include proposed set-up locations in the plan that are coordinated with the Traffic Control Plan.

3.2.3 Sewer Flow Control

Plug the pipe or install a bypass pumping system to facilitate the proper cleaning of pipe lines. In the event of a spill, immediately notify the Contracting Officer and take appropriate actions to stop, contain and cleanup the spill. Immediately clean up raw sewage spills caused by the Contractor's operations and disinfect the spill area using methods and materials approved by the Contracting Officer.

3.2.3.1 Bypassing Existing Sewage Flows

a. Provide for the flow of existing mainline and service connection effluent around the section or sections of pipe designated for liner installation.

b. Provide pump(s) and bypass line(s) of adequate capacity and size to handle peak flows.

c. Plug service connections only after proper notification to the Contracting Officer. Service connections are not to remain plugged overnight.

d. Begin work after plugs or a sewage bypass system and pumping facilities have been installed and tested under full operating conditions, including the bypass of mainline and side sewer flows.

****
NOTE: The following is tailored for CURED-IN-PLACE PIPE.
****

e. Once the lining process has begun, maintain bypass flows until the resin/felt tube composite is fully cured, cooled down, fully televised and the CIPP ends finished.

3.2.4 Cleaning

****
NOTE: Types of cleaning may include hydraulic jetting, mechanical, hydromechanical, hand rodding, power rodding, or bucket machines. Consider the type of work to be performed and the condition of the existing pipe The type of cleaning used
****

Select a cleaning method that will prepare the surface for the type of point repair or renewal work being performed taking into consideration the condition of the existing pipeline. Sewer cleaning includes the removal

of roots, sediment and debris, incrustations from sewer walls, and removing protruding objects or lateral connections.

a. Clean mains and services as indicated in SECTION 33 01 30.16 TV INSPECTION OF SEWER LINES.

b. Remove internal debris from the existing pipe line that will interfere with the installation of the liner.

3.2.4.1 Line Obstructions

****
NOTE: The vast majority of point repairs are made by the open cut method. No dig sectional point repairs are typically suited for high volume traffic areas and deeper mains.
****

Remove obstructions, correct misalignments, repair broken or collapsed sections and sags that will prohibit the installation or will interfere with the long-term performance of the lining materials by performing a point repair. Make point repairs by [open cut repair methods][or][sectional point repair methods in accordance with ASTM F1216].

3.2.5 Protection

Prevent damage to the existing piping during cleaning.

3.2.6 Surface Preparation

Perform Pre-TV inspections of the pipelines after cleaning has been completed in accordance with SECTION 33 01 30.16 TV INSPECTION OF SEWER LINES.

Confirm the locations of branch service connections prior to installing and curing the liner material. In the event the status of a service connection cannot be adequately defined, the Contracting Officer will make the final decision, prior to installation and curing of the liner, as to the status.

3.3 INSTALLATION

Stop or by-pass sewer flow prior to beginning renewal work such as cleaning, CCTV, installing liners, and re-instating service connections.

3.3.1 Cured-In-Place Pipe

****
NOTE: This paragraph is tailored for CURED-IN-PLACE PIPE.
****

a. Prior to the installation of the liner, place temperature sensors in the host pipe in order to monitor the temperature of the liner wall and to verify correct curing. Place temperature sensors between the host pipe and the liner in the bottom of the host pipe (invert) throughout its length and monitor the temperature on the outside of the liner during the curing process.

b. Place the temperature sensors at intervals as indicated in the sensor manufacturer's written specifications. Place additional sensors where significant heat sinks are likely or anticipated.

c. Monitor the sensors by a computer using a tamper proof data base that is capable of recording temperatures at the interface of the liner and the host pipe.

d. Install the liner in accordance with ASTM F1216 and ASTM F1743 with the following modification: Position the wet-out tube in the pipeline using the method indicated in the manufacturer's instructions. Pull-in or invert through an existing manhole or access point and fully extend to the next manhole or termination point. Prevent damage to the tube during installation.

e. Install and cure the CIPP in the host pipe as indicated in the manufacturer's specifications and as described in the approved submittals.

f. Accomplish curing by utilizing the medium in accordance with the cure schedule. Continuously monitor the curing source, or input and output temperatures and log the temperatures during the cure cycles. Use the manufacturer's recommended cure method and schedule for each line segment installed. Take the liner wall thickness and the existing ground conditions with regard to temperature, moisture level, and thermal conductivity of soil into account during the curing process.

g. For heat cured liners, if one or more temperature sensors do not reach the temperature specified by the manufacturer to achieve proper curing or cooling, the installer is to make necessary adjustments required to conform with the manufacturer's specifications.

h. For UV Cured Liners, record all light train sensor readings along the entire length of the installed liner into a tamper proof computer. Follow the cure procedure in accordance with the manufacturer's written product data.

i. Monitor and record temperatures and curing data throughout the installation process to ensure that each phase of the process is achieved in accordance with the product specifications. Provide curing logs from the system computer that specifically identifies each installed sensor station in the length of pipe, indicates the maximum temperature achieved and the sustained temperature time. Each sensor is to record both the maximum temperature and the minimum cool down temperature and comply with the manufacturer's written product data. Submit temperature logs and curing logs for each pipe segment.

j. Cool in accordance with the approved product specifications.

3.3.1.1 Finish

****
NOTE: This paragraph is tailored for CURED-IN-PLACE PIPE.
****

a. Provide a CIPP that is continuous over the entire length of a sewer line, is free from visual defects such as foreign inclusions, dry spots, pinholes, major wrinkles and de-lamination, and is impervious

and free of leakage from the pipe to the surrounding ground or from the ground to inside the lined pipe.

b. Seal the beginning and end of the CIPP to the existing host pipe utilizing a hydrophilic end sealing material compatible with the existing (HOST) pipe and the liner.

c. Provide watertight service connections.

3.3.2 Fold-And-Form Pipe

****
NOTE: This paragraph is tailored for FOLD-AND-FORM PIPELINER.
****

a. Prior to installation of the FFP, place temperature sensors in the host pipe to monitor the temperatures during the processing of the FFP. Monitor and log temperatures during processing and cool down.

b. Install and process the FFP in the host pipe according to these specifications, ASTM F1867 or ASTM F1606 and the manufacturer's instructions.

c. Position the FFP in the pipeline using the method specified by the manufacturer. Pull-in the FFP through an existing manhole or access point and fully extend the FFP to the next designated manhole or termination point.

d. Complete the processing of the FFP by utilizing the appropriate medium in accordance with the manufacturer's instructions. Use ASTM F1867 or ASTM F1606 and the manufacturer's recommended processing procedure for each line segment installed. Evaluate all factors that may impact installation, such as FFP wall thickness and the existing ground conditions with regard to temperature, moisture level, and thermal conductivity of the host pipe and soil, during the installation of the FFP. Adjust pressures according to site conditions to ensure a tight expansion out against the host pipe.

e. Monitor and record temperatures and curing data throughout the installation process to ensure that each phase of the process is achieved in accordance with the product specifications. Submit FFP temperature logs and FFP curing logs for each pipe segment.

f. Cool in accordance with the approved product specifications.

3.3.2.1 Finish

****
NOTE: This paragraph is tailored for FOLD-AND-FORM PIPELINER.
****

a. Provide FFP that is fully expanded and continuous over the entire length of a sewer line section, is free from visual defects such as foreign inclusions, dry spots, pinholes, major wrinkles, is impervious and free of any leakage from the pipe to the surrounding ground or from the ground to inside the lined pipe.

b. Seal the beginning and end of the FFP to the existing host pipe using a hydrophilic end sealing material compatible with the existing (host) pipe and the FFP.

c. Provide watertight service connections.

3.3.3 Manhole Connections

Form a tight seal between the rehabilitation (lining) material and the host pipe at the pipe penetration of the manhole wall. Apply the seal consisting of a resin mixture or hydrophilic seal compatible with the installed liner at the manhole-wall interface in accordance with the liner system manufacturer's specifications. Seal annular spaces greater than 13 mm 1/2 inch with manhole wall repair material. Finish off the seal with non-shrink grout or cementitious liner material placed around the pipe opening from the inside of the manhole in a band at least 100 mm 4 inches wide. Provide an epoxy coating over the repair on the manhole walls.

Provide a continuous and smooth invert through manholes. If a liner is installed through a manhole, the bottom portion of the liner is to remain. Grout and shape the bench of the manhole as necessary to support the liner. If the liner terminates on either side of the manhole, build up the invert to remove flow restrictions and to form a continuous invert through the manhole.

3.3.4 Cured-In-Place Pipe

****
NOTE: This paragraph is tailored for CURED-IN-PLACE PIPE.
****

a. The wet-out fabric tube is to have a uniform thickness and excess resin distribution that, when compressed at installation pressures, will meet or exceed the design thickness after cure.

b. Install the fabric tube to a size and length that will tightly fit the internal circumference of the host pipe. Allowance for circumferential stretching during installation. Size the tube to the diameter of the existing pipe and the length to be rehabilitated, and be able to stretch to fit irregular pipe sections and negotiate bends. Prior to ordering, measure in the field the minimum tube length necessary to effectively span the designated run between manholes to ensure that the tube will have sufficient length to extend the entire length of the run. Measure the inside diameter of the existing pipelines in the field prior to ordering liner so that the liner can be installed in a tight-fitted condition.

c. Coat the outside or inside layer of the fabric tube (before inversion or pull-in, as applicable) with an impermeable, flexible membrane that contains the resin and facilitates, if applicable, vacuum impregnation and monitoring of the resin saturation during the resin impregnation (wet out) procedure.

d. Do not include material in the fabric tube that may cause delamination in the cured CIPP. Dry or unsaturated layers are not acceptable upon visual inspection as evident by color contrast between the tube fabric and the active resin containing a colorant.

e. Use a light reflective interior pipe surface color so that a clear detailed examination of the CIPP can be made with closed circuit television inspection equipment. Provide a hue of the color dark enough to distinguish a contrast between the fully resin saturated felt fabric and dry or resin lean areas.

f. When seams in the fabric are required, sew them so that the seams are stronger than unseamed felt.

g. Spirally form and sew where the length requires joining.

h. Mark the outside of the fabric tube every 1.5 meters 5 feet with the name of the manufacturer or CIPP system, manufacturing lot and production footage.

i. The installer will determine the minimum length of the fabric tube to effectively span the distance from the starting manhole to the terminating manhole or access point, plus that amount required to run-in and run-out for the installation process.

****
NOTE: Thickness values are stated in SI or metric units since they are regarded as the standard; therefore, English units are not provided for thickness values below. Refer to ASTM D790, paragraph 1.3.
****

j. As a minimum, provide the fabric tube wall thickness manufactured to the nearest 0.5 mm 0.02 in increment, rounded up from the design thickness for that section of installed CIPP. Wall thickness transitions, in 0.5 mm 0.02 in increments or greater as appropriate, may be fabricated into the fabric tube between installation entrance and exit access points. Provide a sufficient quantity of resin used in the impregnation to entirely fill the felt voids for the nominal felt thickness.

3.3.4.1 Resin

****
NOTE: This paragraph is tailored for CURED-IN-PLACE PIPE.
****

a. Do not change resins, catalysts, resin/catalysts, or mixing ratios during this Contract unless specifically approved by the Contracting Officer in writing in advance.

b. Use the resin as shipped. Do not add fillers or additives at the wet-out facility except for the required catalyst.

c. Apply the resin to the felt tubing (wet-out) under factory conditions. Protect the materials against ultraviolet (UV) light, excessive heat and contamination at all times.

3.3.5 Reconnections Of Existing Services

a. Make reconnections of existing services after the liner has been installed, fully cured, and cooled down.

****
NOTE: The following item contains tailoring options for CURED-IN-PLACE PIPE and FOLD-AND-FORM PIPELINER.
****

b. Make external reconnections with a tee fitting in accordance with the lining system manufacturer's written specifications. Seat and seal saddle connections to the new CIPP using grout or resin compatible with the CIPPFFP following manufacturer's specifications.

c. Utilize a CCTV camera and remote cutting tool for internal reconnections. The machined opening must be at least 90 percent of the service connection opening and the bottom of both openings are required to match. The opening cannot be more than 100 percent of the service connection opening. Smooth the edges of the opening and remove pipe or liner fragments, which may obstruct flow or snag debris. Cut the invert of the sewer connection flush with the invert entering the mainline.

d. In the event that service reinstatements result in openings that are greater than 100 percent of the service connection opening, install a repair, sufficient in size to completely cover the over-cut service connection according to the manufacturer's specifications.

e. Collect coupons of pipe material resulting from service tap cutting at the next manhole downstream of the pipe rehabilitation operation prior to leaving the site. Account for all pipe coupons and do not allow them to pass through the system.

3.4 FIELD QUALITY CONTROL

All costs associated with inspection and the collection, transportation and testing of samples are the responsibility of the Contractor.

3.4.1 Tests

3.4.1.1 Cured-In-Place Pipe

****
NOTE: This paragraph is tailored for CURED-IN-PLACE PIPE.
****

a. Verify the physical properties of the installed CIPP through field sampling and laboratory testing. Use an independent third party laboratory to test CIPP Samples. Test in accordance with ASTM F1216, ASTM F1743, and ASTM D5813 for chemical resistance. Test methods to confirm compliance with the requirements specified in these Contract documents. Measure the installed CIPP thickness for each line section installed. Submit a minimum of one CIPP sample for every line section of installed CIPP to be used to check the liner thickness. Replace sections where the CIPP thickness does not fall within the approved design thickness.

b. Collect samples from the installed CIPP. At a minimum, one sample for each 305 meters 1000 linear feet of CIPP installed; one sample for each size of CIPP installed; and one plate sample cured with CIPP on pipelines greater than 450 mm 18 inches in diameter. Cut the samples

from a section of cured CIPP that has been inverted or pulled through a like diameter pipe which has been held in place by a heat sink, such as sandbags.

c. Process, cut, and label test samples in the presence of the Contracting Officer. Immediately package the samples in a pre-addressed, postage paid, pre-labeled, unsealed packing, addressed for delivery to the testing laboratory. Seal packages in the presence of the Contracting Officer; and ship or transport to the testing lab.

d. Submit CIPP sample test results.

3.4.1.2 Fold-And-Form Pipe

****
NOTE: This paragraph is tailored for FOLD-AND-FORM PIPELINER.
****

a. Verify the physical properties of the installed FFP through field sampling and laboratory testing. Use an independent laboratory that specializes in material testing to test FFP Samples. Test in accordance with ASTM F1871 and ASTM F1504 test methods to confirm compliance with the requirements specified in these Contract documents.

b. Take samples from the installed FFP. At a minimum, provide samples from one location per 762 meters 2500 linear feet of installed pipe. Cut the sample from a section of processed FFP that has been installed through a like diameter pipe which has been held in place by a suitable heat sink, such as sandbags. Process, cut, and label test samples in the presence of the Contracting Officer. Immediately package the samples in a pre-addressed, postage paid, pre-labeled, unsealed packing, addressed for delivery to the testing laboratory. Seal packages in the presence of the Contracting Officer; and ship or transport to the testing lab.

c. On pipelines greater in diameter than is practical to produce restrained samples, the Contracting Officer may at his or her discretion designate a location in the newly installed FFP where the Contractor is to take a sample.

d. Identify on the sample and as built drawings the test sample location as referenced to the nearest manhole and station. One re-testing of failed samples will be permitted for proper protocol compliance verification. If properties tested do not meet minimum requirements, repair or replace the FFP pipe section. Sample and test sections of the replaced FFP section.

e. Repair the opening produced from the sample, in accordance with manufacturer's specifications.

f. Submit FFP sample test results.

3.4.2 Inspection

Complete Post-TV, Re-TV and Warranty-TV inspections in accordance with Section 33 01 30.16 TV INSPECTION OF SEWER LINES.

3.4.2.1 Cured-In-Place Pipe

****
NOTE: This paragraph is tailored for CURED-IN-PLACE PIPE.
****

a. Provide the Contracting Officer the opportunity to examine operations during the installation and impregnation of the liner throughout the entire process.

b. Provide full access to witness the CIPP wet-out process and provide information related to the manufacturing as requested by the Contracting Officer, without delay and without claims of confidentiality or product privacy.

3.4.2.2 Fold-And-Form Pipe

****
NOTE: This paragraph is tailored for FOLD-AND-FORM PIPELINER.
****

a. Use non-destructive methods to measure the thickness for each section of installed FFP.

b. Where leakage is observed through the wall of the pipe, institute localized testing (weirs or similar) that will verify that the leakage rate of the installed liner does not exceed acceptable tolerances for new sanitary sewer installations for the local jurisdictions.

3.4.3 Inspections

Provide Pre-TV, Post-TV, Warranty-TV and Re-TV inspections in accordance with Section 33 01 30.16 TV INSPECTION OF SEWER LINES.

a. Complete Post-TV inspections and repairs to the installed liner before acceptance.

b. Submit as-built drawings for the portions of the sanitary sewer system that were rehabilitated showing complete detail with dimensions, both above and below grade, including invert elevations at the manholes in accordance with Section 01 78 00 CLOSEOUT SUBMITTALS.

c. Include the identification of the work completed on one set of Contract Drawings. Keep legible as-built drawings on the project site at times and maintain them as the work progresses. Continuously update the as-built drawings with accurate dimensions and notations concerning locations, sizes, pipe lengths and specific material types. Include dimensional location, size and type of point repairs on the as-built drawings.

d. Within 10 working days of final acceptance of said work, provide As-built drawings and Inspection forms.

3.4.4 Repair Of Defects

3.4.4.1 Cured-In-Place Pipe

****
NOTE: This paragraph is tailored for CURED-IN-PLACE PIPE.
****

a. Locate and succinctly define defects in the installed CIPP that will not affect the operation and long term life of the product. The warranty CCTV inspection will include pipe segments with noted defects that were not repaired.

b. Locate and succinctly define repairable defects that occur in the installed CIPP based on approved product specifications, including a detailed step-by-step repair procedure.

c. Clearly locate and define un-repairable defects in the CIPP based on the approved product specifications, including a recommended procedure for the removal and replacement of the CIPP.

3.4.4.2 Fold-And-Form Pipe

****
NOTE: This paragraph is tailored for FOLD-AND-FORM PIPELINER.
****

a. Repair any of the FFP system determined to be defective.

b. Repair or replace any defects which, in the judgment of the Contracting Officer, will affect the integrity or strength of the lining.

c. Prior to the repair of defective work, submit a Shop Drawing indicating the FFP Repair Method.

d. Provide field or workshop demonstration of the method of repair if requested by the Contracting Officer.

e. Make the repairs in full compliance with the FFP manufacturer's specifications.

f. Re-TV repairs to FFP in accordance in accordance with Section 33 01 30.16 TV INSPECTION OF SEWER LINES.

3.5 ADJUSTING AND CLEANING

3.5.1 Lateral Connections

All active lateral connections must be re-opened and remain water tight.

-- End of Section --