SECTION 1000

SPECIFICATIONS FOR

CURED-IN-PLACE PIPE
SECTION 1000
CURED-IN-PLACE PIPE (CIPP) SPECIFICATION

1001.0 GENERAL

1001.0.1 These specifications include the minimum requirements for the rehabilitation of sanitary sewer pipelines, sanitary leads, and manholes by the installation of Cured-In-Place Pipe (CIPP) within existing pipe as shown on the plans and/or televised inspections as part of these contract documents.

1001.0.2 The rehabilitation of pipelines, sanitary leads, and manholes shall be done by the installation of a resin-impregnated flexible tube which, when cured, shall be continuous and tight-fitting throughout the entire length of the original pipe. The CIPP shall extend the full length of the original pipe and provide a structurally sound, jointless and water-tight new pipe within a pipe. The Contractor is responsible for proper, accurate and complete installation of the CIPP using the system selected by the Contractor.

1001.0.3 Neither the CIPP system, nor its installation, shall cause adverse effects to any of the Owner’s wastewater facilities and to facilities of the adjacent private properties connected to the Owner’s wastewater facilities. The use of the product shall not result in the formation or production of any detrimental compounds or by-products at the wastewater treatment plant. The Contractor shall notify the Engineer and identify any by-products produced as a result of the installation operations, test and monitor the levels, and comply with any and all local State and Federal waste discharge requirements. The Contractor shall cleanup and restore existing surface conditions and structures, and repair any of the CIPP system determined to be defective. The Contractor shall conduct installation operations and schedule cleanup in a manner to cause the least possible obstruction and inconvenience to traffic, pedestrians, businesses, property owners, and tenants.

1001.0.4 The prices submitted by the Contractor, shall include all costs of permits, labor, equipment and materials for the various bid items necessary for furnishing and installing, complete in place, CIPP in accordance with these specifications. All items of work not specifically
mentioned herein which are required to make the product perform as intended and deliver the final product as specified herein shall be included in the respective lump sum and unit price items.

1001.1 DESCRIPTION OF WORK AND PRODUCT DELIVERY

1001.1.1 These Specifications cover all work necessary to furnish and install the CIPP. The Contractor shall provide materials, labor, equipment, and services necessary for traffic control, bypass pumping and/or diversion of sewage flows, cleaning and television inspection of sewers to be lined, liner installation, reconnection of service connections, all quality controls, samples for performance of required materials tests, final television inspection, testing of lined pipe system and warranty work, all as specified herein.

1001.1.2 The product furnished shall be a complete CIPP system including all materials, applicable equipment and installation procedures. The CIPP system manufacturer shall submit required information to the Owner with the proposal for review and approval by the Engineer. All CIPP systems or multi-component products will be required to meet the submittal requirements as contained herein.

1001.1.3 The CIPP shall be continuous and jointless from manhole to manhole or access point to access point and shall be free of all defects that will affect the long term life and operation of the pipe.

1001.1.4 The CIPP shall 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. If leakage occurs at the manholes or the service connections the Contractor shall seal these areas to stop all leakage using a material compatible with the CIPP as directed by the Engineer. If leakage occurs through the wall of the pipe the liner shall be repaired or removed as recommended by the CIPP manufacturer and approved by the Engineer. Final approval of the liner installation will be based on a leak tight pipe.

1001.1.5 The CIPP shall be designed for a minimum life of 50 years.

1001.1.6 The CIPP may be designed as a liner to rehabilitate the existing pipe or as a fully structural stand alone pipe-within-a-pipe. Where specified in
the contract documents, the installed CIPP shall be a structurally
designed pipe within a pipe, meeting or exceeding all contract specified
physical properties, fitting tightly within the existing pipe within the
tolerances specified. The installed CIPP shall withstand all applicable
surcharge loads (soil overburden, live loads, etc.) and external
hydrostatic (groundwater) pressure, if present, for each specific
installation location.

1001.1.7 The installed CIPP shall have a long term (50 year) corrosion resistance
to the typical chemicals found in domestic sewage.

1001.1.8 All existing and confirmed active sanitary lead connections and any
other sanitary leads to be reinstated, as directed by the Engineer, shall
be re-opened robotically or by hand in the case of man-entry size
piping, to their original shape and to 95% of their original capacity. All
over-cut sanitary lead connections will be properly repaired to meet the
requirements of these specifications.

1001.1.9 All materials furnished, as part of this contract shall be marked with
detailed product information, stored in a manner specified by the
manufacturer, and tested to the requirement of this contract.

1001.1.10 Testing and warranty inspections shall be executed by the Engineer
and/or Owner. Any defects found shall be repaired or replaced by the
Contractor.

1001.1.11 The Contractor shall furnish all samples for product testing at the
request of the Engineer. The Engineer shall take possession of the
samples for testing and shall maintain the chain of custody, delivering
the samples to an approved laboratory. The Owner shall pay for all
material and product testing performed under this contract.

1001.2 REFERENCES

1001.2.1 The following documents form a part of this specification to the extent
stated herein and shall be the latest editions thereof. Where differences
exist between codes and standards, the requirements of these
specifications shall apply.
ASTM – F1216 Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube

ASTM – F1743 Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Pull in and inflate and Curing of a Resin-Impregnated Tube

ASTM – D543 Standard and Practice for Evaluating the Resistance of Plastics to Chemical Reagents


ASTM – D792 Standard Test Methods for Density and Specific Gravity of Plastics by displacement

ASTM – F2019-03 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)


ASTM – D5813 Standard Specification for Cured-in Place Thermosetting Resin Sewer Pipe
1001.3 PERFORMANCE WORK STATEMENT (PWS) SUBMITTAL

The Contractor shall submit, to the Engineer, a Performance Work Statement (PWS) at the pre-construction meeting, which clearly defines the CIPP product delivery in conformance with the requirements of these contract documents. Unless otherwise directed by the Engineer, the PWS shall at a minimum contain the following:

1001.3.1 Attest to the fact that the CIPP will conform to the project requirements as outlined in the Description of Work and as delineated in these specifications.

1001.3.2 A detailed installation plan describing all preparation work, cleaning operations, pre-CCTV inspections, by-pass pumping, traffic control, installation procedure, method of curing, service reconnection, quality control, testing to be performed, final CCTV inspection, warranties furnished and all other items necessary and appropriate for a complete CIPP liner installation shall be provided. A detailed installation schedule shall be prepared and submitted and shall conform to the requirements of this contract.

1001.3.3 Contractor’s description of the proposed CIPP lining technology, including a detailed plan for identifying all active service connections, and maintaining service during mainline installation to each home connected to the section of pipe being lined, including temporary service if required by the contract.

1001.3.4 A description of the CIPP materials to be furnished for the project. Materials shall be fully detailed in the submittals and conform to these specifications.

1001.3.5 A statement of the Contractors experience (Submitted as part of the qualifications statement submitted within the bid). The Contractor shall have a minimum of three (3) years of continuous experience installing CIPP liners in pipe of a similar size, length and configuration as contained in the contract. A minimum of 150,000 linear feet of shop wet-out liner installation is required and minimum of 6 onsite wet-out installations are required as applicable to this contract. The lead personnel including the superintendent, the foreman and the lead crew personnel for the CCTV inspection, resin wet-out, the CIPP liner
installation, liner curing and the robotic service reconnections must have a minimum of three (3) years of total experience with the CIPP technology proposed for this contract and must have demonstrated competency and experience to perform the scope of work contained in this contract. The name and experience of each lead individual performing work on this contract shall be submitted with the PWS.

1001.3.6 Engineering design calculations, in accordance with the Appendix of ASTM F 1216, for each length of liner for sewers, sanitary leads, and manholes to be installed including the thickness of each proposed CIPP. It will be acceptable for the Contractor to submit a design for the most severe line condition and apply that design to all of the line sections. These calculations shall be performed and certified by a qualified, Professional Engineer licensed in the state of Michigan. All calculations shall include data that conforms to the requirements of these specifications.

1001.3.7 Proposed manufacturers technology data shall be submitted for all CIPP products and all associated technologies to be furnished.

1001.3.8 Submittals shall include information on the cured-in-place pipe intended for installation and all tools and equipment required for a complete installation. The PWS shall identify which tools and equipment will be redundant on the job site in the event of equipment breakdown. All equipment, to be furnished for the project, including proposed back-up equipment, shall be clearly described. The Contractor shall outline the mitigation procedure to be implemented in the event of key equipment failure during the installation process.

1001.3.9 A detailed description of the Contractor’s proposed procedures for removal of any existing blockages in the pipeline that may be encountered during the cleaning process.

1001.3.10 Compensation for all work required for the submittal of the PWS shall be included in the various unit price items contained in the Proposal.

1001.4 PRODUCT SUBMITTALS

1001.4.1 Fabric Tube – including the manufacturer and description of product components.
1001.4.2 Flexible membrane (coating) material – including recommended repair (patching) procedure if applicable.

1001.4.3 Raw Resin Data – including the manufacturer and description of product components.

1001.4.4 Manufacturers’ shipping, storage and handling recommendations for all components of the CIPP system.

1001.4.5 All MSDS sheets for all materials to be furnished for the project.

1001.4.6 Tube wet-out & cure method including:

1001.4.7 A complete description of the proposed wet-out procedure for the proposed technology.

1001.4.8 The Manufacturer’s recommended cure method – for each diameter and thickness of CIPP liner to be installed. The PWS shall contain a detailed curing procedure detailing the curing medium and the method of application.

1001.4.9 Compensation for all work required for the submittal of product data shall be included in the various unit price items contained in the proposal.

1001.5 SAFETY

1001.5.1 The Contractor shall conform to all work safety requirements of pertinent regulatory agencies, and shall secure the site for the working conditions in compliance with the same. The Contractor shall erect such signs and other devices as are necessary for the safety of the work site.

1001.5.2 The Contractor shall perform all of the work in accordance with applicable OSHA standards. Emphasis shall be placed upon the requirements for entering confined spaces and with the equipment being utilized for pipe renewal.
1001.5.3 The Contractor shall submit a proposed Safety Plan to the Engineer, prior to beginning any work, identifying all competent persons. The plan shall include a description of a daily safety program for the job site and all emergency procedures to be implemented in the event of a safety incident. All work shall be conducted in accordance with the Contractor’s submitted Safety Plan.

1001.5.4 Compensation for all work required for the submittal of the Safety Plan shall be included in the various unit price items contained in the proposal.

1001.6 TRAFFIC CONTROL

1001.6.1 Construction signing, barricades and lighting shall be provided at all locations to insure safety to vehicular and pedestrian traffic as directed by the Michigan Manual of Uniform Traffic Control Devices.

1001.6.2 A traffic control plan shall be submitted by the Contractor to the Engineer for review and approval. During working hours affected streets may be closed to through traffic. Local traffic to adjacent properties shall be maintained at all times. Streets closed to through traffic shall be opened up at the end of each day unless permission to close them is approved by the engineer.

1001.6.3 The contractor shall coordinate all street closures on a daily basis by notifying the owners, police and fire departments. If the street to be closed is on a school bus route, advance notice and street closure shall be coordinated with the affected school district.

1001.6.4 Should the barricades and lighting provided be deemed inadequate by the Police Department or the Engineer, the City of Warren reserves the right to have additional barricades and lighting placed for which the Contractor shall be required to pay all costs incurred.

1001.6.5 Safety precautions shall be followed at all openings in streets, alleys, or easements. Substantial barricades shall be erected as deemed necessary to prevent accidents to vehicular or pedestrian traffic. Red flags by day and yellow lights by night shall be diligently posted by the Contractor at all points of possible danger. In case detours or other traffic instruction are necessary, suitable warning or direction signs shall be
1001.6.6 Should the Contractor in any instance refuse to place or maintain adequate barricades, lighting, or flagmen, all work on the project may be halted until these measures are complied with.

1001.7 QUALITY CONTROL PLAN (QCP)

1001.7.1 A detailed quality control plan (QCP) shall be submitted to the Engineer that fully represents and conforms to the requirements of these specifications. At a minimum the QCP shall include the following:

1001.7.2 A detailed discussion of the proposed quality controls to be performed by the Contractor.

1001.7.3 Defined responsibilities, of the Contractor’s personnel, for assuring that all quality requirements, for this contract are met. These shall be assigned, by the Contractor, to specific personnel.

1001.7.4 Proposed procedures for quality control, product sampling and testing shall be defined and submitted as part of the plan.

1001.7.5 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.

1001.7.6 A scheduled performance and product test result reviews between the Contractor and the Engineer at a regularly scheduled job meeting.

1001.7.7 Compensation for all work required for the submittal of the QCP shall be included in the various unit price items contained in the Proposal.
1001.8  **CIPP REPAIR/REPLACEMENT**

1001.8.1 The Contractor shall outline specific repair or replacement procedures for potential defects that may occur in the installed CIPP. Repair/replacement procedures shall be as recommended by the CIPP system manufacturer and shall be submitted as part of the PWS.

1001.8.2 Defects in the installed CIPP that will not affect the operation and long term life of the product shall be identified and defined.

1001.8.3 Repairable defects that may occur in the installed CIPP shall be specifically defined by the Contractor based on manufacturer’s recommendations, including a detailed step-by-step repair procedure, resulting in a finished product meeting the requirements of these contract specifications.

1001.8.4 Un-repairable defects that may occur in the CIPP shall be clearly defined by the Contractor based on the manufacturer’s recommendations, including a recommended procedure for the removal and replacement of the CIPP.
1001.9 **WARRANTY**

1001.9.1 The materials used for the project shall be certified by the manufacturer for the specified purpose. The manufacturer shall warrant the liner to be free from defects in raw materials for one (1) year from the date of final payment by the Owner. The Contractor shall warrant the liner installation for a period of one (1) year from the date of final payment by the Owner. During the Contractor warranty period any defect, which may materially affect the integrity, strength, function and/or operation of the pipe, shall be repaired at the Contractor’s expense in accordance with procedures included in Section 1.8 CIPP Repair/Replacement.

1001.9.2 After a pipe section, sanitary lead, and manhole has been lined and for a period of time up to one (1) year following the date of final payment by the Owner of this project, the Engineer may inspect all or portions of the lined system. If it is found that any of the CIPP has developed abnormalities since the time of “Post Construction Television Inspection,” the abnormalities shall be repaired and/or replaced as defined in Section 1.8 CIPP Repair/Replacement. All verified defects shall be repaired and/or replaced by the Contractor and shall be performed in accordance with Section 1.8 CIPP Repair/Replacement and per the original specifications, all at no additional cost to the Owner.
PRODUCTS

1001.10 MATERIALS

1001.10.1 The CIPP System must meet the Chemical resistance requirements of these contract documents.

1001.10.2 All materials, shipped to the project site, shall be accompanied by test reports certifying that the material conforms to the ASTM standards listed herein. Materials shall be shipped, stored, and handled in a manner consistent with written recommendations of the CIPP system manufacturer to avoid damage. Damage includes, but is not limited to, gouging, abrasion, flattening, cutting, puncturing, or ultra-violet (UV) degradation. On site storage locations, shall be approved by the Engineer. All damaged materials shall be promptly removed from the project site at the Contractor’s expense and disposed of in accordance with all current applicable agency regulations.

1001.11 FABRIC TUBE

1001.11.1 The fabric tube shall consist of one or more layers of absorbent non-woven felt fabric, felt/fiberglass or fiberglass and meet the requirements of ASTM F 1216, ASTM F 1743, ASTM D 5813 & ASTM F 2019. The fabric tube shall be 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. The Contractor shall submit certified information from the felt manufacturer on the nominal void volume in the felt fabric that will be filled with resin.

1001.11.2 The wet-out fabric tube shall have a uniform thickness and excess resin distribution that when compressed at installation pressures will meet or exceed the design thickness after cure.

1001.11.3 The fabric tube shall be manufactured to a size length that when installed will tightly fit the internal circumference, meeting applicable ASTM standards or better, of the original pipe. Allowance shall be made for circumferential stretching during installation. The tube shall
be properly sized 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. The Contractor shall determine the minimum tube length necessary to effectively span the designated run between manholes. The Contractor shall verify the lengths in the field prior to ordering and prior to impregnation of the tube with resin, to ensure that the tube will have sufficient length to extend the entire length of the run. The Contractor shall also 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.

1001.11.4 The outside and/or inside layer of the fabric tube (before inversion/pull-in, as applicable) shall be coated with an impermeable, flexible membrane that will contain the resin and facilitate, if applicable, vacuum impregnation and monitoring of the resin saturation during the resin impregnation (wet-out) procedure.

1001.11.5 No material shall be included in the fabric tube that may cause delamination in the cured CIPP. No dry or unsaturated layers shall be acceptable upon visual inspection as evident by color contrast between the felt fabric and the activated resin containing a colorant.

1001.11.6 The wall color of the interior pipe surface of CIPP after installation shall be a light reflective color so that a clear detailed examination with closed circuit television inspection equipment may be made. The hue of the color shall be dark enough to distinguish a contrast between the fully resin saturated felt fabric and dry or resin lean areas.

1001.11.7 Seams in the fabric tube, if applicable, shall meet the requirement of ASTM D 5813.

1001.11.8 The outside of the fabric tube shall be marked every 5 feet with the name of the manufacturer or CIPP system, manufacturing lot and production footage.

1001.11.9 The minimum length of the fabric tube shall be that deemed necessary by the installer 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.

1001.11.10 The nominal fabric tube wall thickness shall be constructed, as a minimum, to the nearest 0.5 mm increment, rounded up from the design thickness for that section of installed CIPP. Wall thickness transitions, in 0.5 mm increments or greater as appropriate, may be fabricated into the fabric tube between installation entrance and exit points. The quantity of resin used in the impregnation shall be sufficient to fill all of the felt voids for the nominal felt thickness.

1001.12 RESIN

1001.12.1 The resin shall be a corrosion resistant polyester or vinyl ester resin and catalyst system that when properly cured within the tube composite meets the requirements of ASTM F1216, ASTM F1743 or F2019, the physical properties herein, and those, which are to be utilized in the design of the CIPP for this project. The resin shall produce CIPP which will comply with or exceed the structural and chemical resistance requirements of this specification.
1001.13 **STRUCTURAL REQUIREMENTS**

1001.13.1 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. It shall be the responsibility of the Contractor to control these variables and to provide a CIPP system which meets or exceeds the minimum properties specified herein:

1001.13.2 The CIPP shall be designated as per ASTM standards. The CIPP design shall assume no bonding to the original pipe wall.

1001.13.3 The design engineer shall set the long term (50 year extrapolated) Creep Retention Factor at 33% of the initial design flexural modulus as determined by ASTM D-790 test method. This value shall be used unless the Contractor submits long term test data (ASTM D2990) to substantiate a higher retention factor.

1001.13.4 The cured pipe, sanitary lead, and manhole material (CIPP) shall, at a minimum, meet or exceed the structural properties, as listed below.

1001.14 **MINIMUM PHYSICAL PROPERTIES**

<table>
<thead>
<tr>
<th>Property</th>
<th>Test Method</th>
<th>Cured Composite Per ASTM F1216</th>
<th>Cured Compromise Per Design</th>
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<tbody>
<tr>
<td>Flexural Modulus of Elasticity</td>
<td>ASTM D790</td>
<td>250,000 psi</td>
<td>Contractor Value</td>
</tr>
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<td></td>
<td></td>
</tr>
<tr>
<td>Flexural Strength</td>
<td>ASTM D790</td>
<td>4,500 psi</td>
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</tr>
<tr>
<td>(Short Term)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1001.14.1 The required structural CIPP wall thickness shall be based, as a minimum, on the physical properties of the cured composite and per the design of the Professional Engineer (see section 1.3) 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 36” or larger)
Creep Retention Factor | 33%
Ovality | 2% or as measured by field inspection
Constrained Soil Modulus | Per AASHTO LRFD Section 12 and AWWA Manual 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) | 120 lb/cu. Ft.
Minimum Service Life | 50 years

1001.14.2 The Contractor shall submit, prior to installation of the lining materials, certification of compliance with these specifications and/or requirements of the pre-approved CIPP system. Certified material test results shall be included that confirm that all materials conform to these specifications and/or the pre-approved system. Materials not complying with these requirements will be rejected.

1001.14.3 The design soil modulus may be adjusted based on data determined from detailed project soil testing results as may be obtained by the contractor, or if provided by the Owner in the contract documents.

INSTALLATION

1001.15 CONSTRUCTION REQUIREMENTS

1001.15.1 The Contractor shall clean the interior of the existing host pipe, sanitary lead, and manhole prior to installation of the CIPP liner. All debris and obstructions, that will effect the installation and the final CIPP product delivery to the Owner, shall be removed and disposed of.

1001.15.2 The CIPP liner shall be constructed of materials and methods, that when installed, shall provide a jointless and continuous structurally sound liner able to withstand all imposed static, and dynamic loads on a long-term basis.
1001.15.3 The Contractor may, under the direction of the Engineer, utilize any of the existing manholes in the project area as installation access points. If a street must be closed to traffic because of the location of the sewer, the Contractor shall furnish a detailed traffic control plan and all labor and equipment necessary. The plan shall be in conformance with the requirements of the Michigan Manual of Traffic Control Devices and the local agency having jurisdiction over traffic control.

1001.15.4 Cleaning of pipe lines, sanitary leads, and manholes – The Contractor shall remove all internal debris from the pipe line that will interfere with the installation and the final product delivery of the CIPP as required in these specifications. Solid debris and deposits shall be removed from the system and disposed of properly by the Contractor. Moving material from manhole section to manhole section shall not be allowed. As applicable the Contractor shall either plug or install a flow bypass pumping system to properly clean the pipe lines. Precaution shall be taken, by the Contractor in the use of cleaning equipment to avoid damage to the existing pipe and sewer leads. The repair of any damage, caused by the cleaning equipment, shall be the responsibility of the Contractor. The Owner will designate a site for the disposal of all debris removed, from the Owner’s sewer system, as a direct result of the cleaning operation. Unless otherwise specified by the Owner, the Contractor shall dispose of all debris at no charge.

1001.15.5 By-passing pumping of Existing Sewage Flows – The Contractor shall provide for the flow of existing mainline and service connection effluent around the section or sections of pipe designated for CIPP installation. Service connection effluent may be plugged only after proper notification to the affected residences and businesses and may not remain plugged overnight. Installation of the liner shall not begin until the Contractor has installed a sewage by-pass system and all pumping facilities have been installed and tested under full operating conditions including the bypass of mainline and sewer lead flows. Once the lining process has begun, existing sewage flows shall be maintained, until the resin/felt tube composite is fully cured, cooled down, televised and the CIPP ends finished. The Contractor shall coordinate sewer bypass and flow interruptions with the Engineer at least 14 days in advance and with the property owners and business.
at least 3 business days in advance. The pump and bypass lines shall be of adequate capacity and size to handle peak flows. The Contractor shall submit a detail of the bypass plan and design to the Engineer for review and approval before proceeding with any CIPP installation. Pumping of individual sewer leads on an emergency basis as needed, shall be performed as directed by the Engineer at no additional cost.

1001.15.6 The Contractor shall perform post-cleaning video inspections of the pipelines, sanitary leads, and manholes. Only PACP certified personnel trained in locating breaks, obstacles and service connections by closed circuit television shall perform the inspection. The Contractor shall provide the Engineer a copy of the pre-cleaning and post-cleaning video and suitable log in digital format for review prior to installation of the CIPP and for later reference by the Engineer.

The Contractor shall perform a televised inspection of each sanitary lead from its connection to the sewer to the ROW line. The camera shall be inserted into the sanitary lead from the sanitary sewer. If the sanitary lead is rehabilitated, a post cleaning and post rehabilitation televised inspection should also be provided. The contractor shall provide a copy of all televising to the Engineer, in digital format for later reference.

1001.15.7 Line Obstructions – It shall be the responsibility of the Contractor to clear the line of obstructions that will interfere with the installation and long-term performance of the CIPP. If pre-installation inspection reveals an obstruction, misalignment, broken or collapsed section or sag that was not identified as part of the original scope of work and will prohibit proper installation of the CIPP, the Contractor may be directed by the Engineer to correct the problem(s) prior to lining by utilizing open cut removal and replacement repair methods. The Contractor shall be compensated for this work under a sewer removal and replacement pay item. Removal of any previously unknown obstructions shall be considered as a changed condition. The cost of removal of obstructions that appeared on pre-bid video documentation and made available to the Contractor, prior to the bid opening, shall be considered incidental to the project.
1001.15.8 The Contractor shall be responsible for confirming the locations of all branch service connections prior to installing and curing the CIPP. If required in the contract documents, each connection will be dye tested to determine whether or not the connection is live or abandoned. The cost for dye testing of existing service connections, where necessary, shall be compensated at the unit price bid in the Proposal for Dye Testing of Existing Service Connections. In the event the status of a service connection cannot be adequately defined, the Engineer will make the final decision, prior to installation and curing of the liner, as to the status. Typically only service connections deemed “active” shall be reopened by the Contractor.

1001.15.9 The Contractor shall be allowed use of water from an Owner-approved fire hydrant in the project vicinity. Use of a City approved double check backflow assembly shall be required. The Contractor shall provide his own approved assembly. Water will be supplied at no cost to the Contractor by the Owner.

1001.16 INSTALLATION OF LINER

1001.16.1 The CIPP Liner shall be installed and cured in the host pipe per the manufacturer’s specifications as described and submitted in the PWS.

1001.16.2 CIPP installation shall be in accordance with the applicable ASTM standards and per sub-sections 3.2.3, 3.2.4 and 3.2.5.

1001.16.3 The wet-out tube shall be positioned in the pipeline using the method specified by the manufacturer. Care should be exercised not to damage the tube as a result of installation. The tube should be pulled-in or inverted through an existing manhole or approved access point and fully extended to the next designated manhole or termination point.

1001.16.4 Prior to installation and as recommended by the manufacturer remote temperature gauges or sensors shall be placed inside the host pipe to monitor the temperatures during the cure cycle. Liner and/or host pipe interface temperature shall be monitored and logged during curing of the liner.
1001.16.5 Curing shall be accomplished by utilizing the appropriate medium in accordance with the manufacturer’s recommended cure schedule. The curing source or in and output temperatures shall be monitored and logged during the cure cycles. The manufacturer’s recommended cure schedule shall be used for each line segment installed, and the liner wall thickness and the existing ground conditions with regard to temperature, moisture level, and thermal conductivity of soil, per ASTM as applicable, shall be taken into account by the Contractor.

1001.17 COOL DOWN

1001.17.1 The Contractor shall cool the CIPP in accordance with the approved CIPP manufacturer’s recommendations as described and outlined in the PWS.

1001.17.2 Temperatures and curing data shall be monitored and recorded, by the Contractor, throughout the installation process to ensure that each phase of the process is achieved as approved in accordance with the CIPP System manufacturer’s recommendations.

1001.18 FINISH

1001.18.1 The installed CIPP shall be continuous over the entire length of a sewer line section and shall be free from visual defects such as foreign inclusions, dry spots, pinholes, major wrinkles and delamination. The lining shall be impervious and free of any leakage from the pipe to the surrounding ground or from the ground to inside the lined pipe.

1001.18.2 Any defect, which will or could affect the structural integrity or strength of the linings, shall be repaired at the Contractor’s expense, in accordance with the procedures submitted under Section 1.7 CIPP Repair/Replacement.

1001.18.3 The beginning and end of the CIPP shall be sealed to the existing host pipe. The sealing material shall be compatible with the pipe end and shall provide a water tight seal.
1001.18.4 If any of the Service connections leak water between the host pipe and the installed liner, the connection mainline interface shall be sealed to provide a watertight connection.

1001.18.5 If the wall of the CIPP leaks, it shall be repaired or removed and replaced with a watertight pipe as recommended by the manufacturer of the CIPP system.
MANHOLE CONNECTIONS AND RECONNECTIONS OF EXISTING SANITARY LEADS

1001.19.1 A seal, consisting of a resin mixture or hydrophilic seal compatible with the installed CIPP shall be applied at manhole walls in accordance with the CIPP System manufacturer’s recommendations.

1001.19.2 Existing sanitary leads shall be internally or externally reconnected unless indicated otherwise in the contract documents.

1001.19.3 Reconnections of existing sanitary leads shall be made after the CIPP has been installed, fully cured, and cooled down. It is the CONTRACTOR’S responsibility to make sure that all active sanitary leads are reconnected.

1001.19.4 External reconnections are to be made with a tee fitting in accordance with CIPP system manufacturer’s recommendations. Saddle connections shall be seated and sealed to the new CIPP using grout or resin compatible with the CIPP.

1001.19.5 A CCTV camera and remote cutting tool shall be used for internal reconnections. The machined opening shall be at least 95 percent of the service connection opening and the bottom of both openings must match. The opening shall not be more than 100 percent of the sanitary lead opening. The edges of the opening shall not have pipe fragments or liner fragments, which may obstruct flow or snag debris.

1001.19.6 In the event that sanitary leads result in openings that are greater than 100 percent of the service connection opening, the Contractor shall install a CIPP type repair, sufficient in size to completely cover the over-cut service connection. No additional compensation will be paid for the repair of over-cut service connections.

1001.19.7 Coupons of pipe material resulting from sanitary lead cutting shall be collected at the next manhole downstream of the pipe rehabilitation operation prior to leaving the site. Coupons may not be allowed to pass through the system. The Contractor shall provide the coupons to the Engineer for inspection prior to disposal by the Contractor.
1001.20 TESTING OF INSTALLED CIPP

1001.20.1 The physical properties of the installed CIPP may be verified through field sampling and laboratory testing. All materials for testing shall be furnished by the Contractor to the Engineer for testing. All materials testing shall be performed at the Owner’s expense, by an independent third party laboratory selected by the Engineer. All tests shall be in accordance with applicable ASTM test methods to confirm compliance with the requirements specified in these contract documents.

1001.20.2 The Contractor shall provide samples for testing to the Engineer from the actual installed CIPP liner. Samples shall be provided, at a minimum from one location per 1000 linear feet of CIPP installed. The sample shall be cut 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 suitable heat sink, such as sandbags. All curing, cutting and identification of samples will be witnessed by the Engineer and transmitted by the Engineer to the testing laboratory.

On pipelines greater in diameter than is practical to produce restrained samples, the Owner may at its discretion, require plate samples cured with the CIPP or designate a location in the newly installed CIPP where the Contractor shall take a sample. The opening produced from the sample shall be repaired in accordance with manufacturers recommended procedures.

1001.20.3 The laboratory results shall identify the test sample location as referenced to the nearest manhole station. Final payment for the project shall be withheld pending receipt and approval of the test results. If properties tested do not meet minimum requirements, the CIPP shall be repaired or replaced by the Contractor, at no additional cost to the Owner.

1001.20.4 Chemical Resistance – The CIPP system installed shall meet the chemical resistance requirements of ASTM standards. CIPP samples tested shall be of fabric tube and the specific resin proposed for actual construction. It is required that CIPP samples without plastic coating meet these chemical testing requirements.
1001.20.5 Hydraulic Capacity – The installed CIPP shall at a minimum be equal to the full flow capacity of the original pipe before rehabilitation. In those cases where full capacity cannot be achieved after liner installation, the Contractor shall submit a request to waive his requirement, together with the reasons for the waiver request. Calculated capacities may be derived using a commonly accepted roughness coefficient for the existing pipe material taking into consideration its age and condition.

1001.20.6 The installed CIPP thickness shall be measured for each line section installed. If the CIPP thickness does not meet that specified in the contract and submitted as the approved design by the Contractor then the liner shall be repaired or removed. The liner thickness shall have tolerance of minus 5% plus 10%. In man-entry size piping the Contractor shall remove a minimum of one sample or one sample every line section of installed CIPP, not meeting the specified design thickness, to be used to check the liner thickness. The samples shall be taken by core drilling 2-inch diameter test plugs at random locations selected by the Engineer. As an alternative the Contractor may use industry proven, non-destructive methods for confirming the thickness of the installed CIPP.

1001.20.7 All costs to the Contractor, associated with providing cured CIPP samples for testing shall be included in the unit price items in the Proposal. Payment for all testing by a laboratory will be paid for by the Owner directly to the laboratory.

1001.21 FINAL ACCEPTANCE

1001.21.1 All CIPP sample testing and repairs to the installed CIPP as applicable shall be completed, before final acceptance, meeting the requirements of these specifications and documented in written form.

1001.21.2 The Contractor shall perform a detailed closed-circuit television inspection in accordance with ASTM standards, in the presence of the Engineer after installation of the CIPP liner and reconnection of the service leads. A radial view (pan and tilt) TV camera shall be used. The camera shall be panned 360 degrees around the circumference of the pipe and along the wall of the finished pipe at 10 foot intervals.
The finished liner shall be continuous over the entire length of the installation and shall be free of visual defects, damage, deflection, holes, leaks and other defects. Unedited digital documentation of the inspection shall be provided to the Engineer within ten (10) working days of the liner installation. The data shall note the inspection date, location of all days of liner installation. The data shall note the inspection date, location of all reconnected service leads, debris, as well as any other defects in the liner, including, but not limited to, gouges, cracks, bumps, or bulges. If post installation inspection documentation is not submitted within ten (10) working days of the liner installation, the Engineer may at his/her discretion suspend any further installation of CIPP until the post-installation documentation is submitted. As a result of this suspension, no additional working days will be added to the contract, nor will any adjustment be made for increase in cost. Immediately prior to conducting the closed circuit television inspection, the Contractor shall thoroughly clean the newly installed liner removing all debris and build-up that may have accumulated.

1001.21.3 Bypass pumping or plugging from the upstream manhole shall be utilized to minimize sewage from entering the line during inspection. In the case of sags in the line, the pipe shall be cleared of any standing water to provide continuous visibility during the inspection.

1001.21.4 Where leakage is observed through the wall of the pipe, the contractor shall institute additional testing included but not limited to air testing, localized testing and any other testing that will verify the leak-proof integrity of the installed CIPP to the satisfaction of the Engineer.

1001.22 BASIS OF PAYMENT

1001.22.1 Sewer Televising Inspection will be paid for at the contract unit price per lineal foot of lateral (main line sewer) measured from center of manhole to center of manhole with no deductions for intermediate manholes. The contract unit price shall be payment in full for furnishing all equipment, materials, labor and all other items indicated therefor for providing televised inspection during pre-cleaning and post cleaning of the pipe, just prior to and after CIPP installation. All of the televised inspection shall be recorded in DVD format with a
copy to be provided to the Engineer. Payment shall be for all televised inspections performed and not on a per televised inspection basis. Payment for this item shall be paid following successful CIPP installation.

1001.22.2 Sanitary lead televising inspection will be paid for at the contract unit price each. The contract unit price shall be payment in full for furnishing all equipment, materials, labor and all other items indicated thereto for providing during precleaning, and if required, post cleaning of the sanitary lead connections, just prior to and after CIPP installation. All of the televised inspection shall be recorded in DVD format with a copy to be provided to the Engineer. Payment shall be for all televised inspections of sanitary lead connections and not on a per televised inspection basis. Payment for this item will be made at the completion of work at each sanitary lead connection.

1001.22.3 Dye Testing of sanitary lead connections, if required to confirm an existing sewer connection, will be paid for at the contract unit price each of the service connections dye tested. The contract unit price shall be payment in full for furnishing all equipment, materials, labor and all other items incidental thereto for the dye testing of sanitary lead connections. This is a contingency item.

1001.22.4 Sewer cleaning will be paid for at the contract unit price per lineal foot of lateral (main line sewer) measured from center of manhole to center of manhole. The contract unit price shall be payment in full for furnishing all equipment, materials, labor, sewer debris removal and disposal, and all other items incidental thereto for sewer cleaning. Payment shall be all inclusive for the required number of sewer cleanings in order to complete the rehabilitation work.

1001.22.5 Sanitary lead cleaning will be paid for at the contract unit price per each from the sewer to the ROW line. The contract unit price shall be payment in full for furnishing all equipment, materials, labor, sewer debris removal and disposal, and all other items incidental thereto for sanitary lead cleaning. Payment shall be all inclusive for the required number of sewer cleanings in order to complete the rehabilitation work. This is a contingency item.
1001.22.6 Manhole cleaning will be considered incidental to the 12-inch Diameter Sewer Rehabilitation and shall include furnishing all equipment, materials, labor, sewer debris removal and disposal, and all other items incidental thereto for manhole cleaning.

1001.22.7 Sewer rehabilitation of the type and diameter specified will be paid for at the contract unit price per lineal foot, measured in place from center of manhole to center of manhole with no deduction for intermediate manholes. The contract unit price shall be payment in full for furnishing all equipment, materials, labor and all other items incidental thereto for the sewer rehabilitation.

1001.22.8 Sanitary lead rehabilitation of the type specified will be paid for at the contract unit price per each, for rehabilitation from the sewer to the ROW line and including installation of any necessary cleanouts. The contract unit price shall be payment in full for furnishing all equipment, materials, labor and all other items incidental thereto for the sanitary lead rehabilitation, inclusive of installation of any necessary 4” dia. clean-outs.

1001.22.9 Manhole rehabilitation of the type specified will be paid for at the contract unit price per each. The contract unit price shall be payment in full for furnishing all equipment, materials, labor and all other items incidental thereto for the manhole rehabilitation.

1001.22.10 Traffic control will be paid for at the contract unit price lump sum. The contract unit price shall be payment in full for furnishing all equipment, materials, labor and all other items incidental thereto for traffic control.

1001.22.11 Bypass of existing sewer flows will be paid for at the contract unit price lump sum. The contract unit price shall be payment in full for furnishing all equipment, materials, labor and all other items incidental thereto for providing any required bypass pumping. Any pumping of individual sewer leads on an emergency basis will be considered incidental to this item. Payment for this item shall be paid on a pro rated basis of the total footage of sewer rehabilitation following the completion of each sewer segment.
1001.22.12 Sanitary lead reconnections and sealing will be paid for at the contract unit price per each. The contract unit price shall be payment in full for furnishing all equipment, materials, labor and all other items incidental thereto for reconnecting and sealing sanitary lead connections at connection to the rehabilitated sewer.

END OF SECTION