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1.0 GENERAL

The Contractor shall have at least five years experienced with cured-in-place lining. The Contractor shall be responsible for delegation and coordinating the work and supply of all materials that shall produce a complete and operating job.

The Contractor shall be familiar with the codes, bylaws, specifications and other regulations governing their work. The Contractor shall examine all drawings and supplied videos and shall conduct their own video inspection and report any discrepancies to the Engineer prior to start of the lining. The contractors shall coordinate all work to provide minimum interference and maximum useable space and in accordance with manufactures recommendations for safety, access and maintenance.

2.0 STANDARD CONSTRUCTION SPECIFICATIONS AND DRAWINGS

This specification references American Society for Testing and Materials (ASTM) Standard Specification F1216, F1743, D790, D903 and their reference standards, which are made a part hereof by such reference and shall be the latest edition and revision thereof. All work shall comply with the reference standard unless specifically stated otherwise in this Specification.

3.0 PROJECT CONTACT

Inquiries regarding all aspects of the project shall be directed to:

Rabindra Bhowmik, C.E.T. Phone: (306) 694-4525
Engineering Technologist Email: rbhowmik@moosejaw.ca
Throughout the specification the Engineer will refer to either Colin or Rabindra

4.0 HOURS OF WORK

The Contractor shall limit the work under this contract to the hours between 7:00 a.m. and 10:00 p.m. on non-statutory weekdays and between the hours 9:00 a.m. and 10:00 p.m. on Sundays and Statutory holidays. The hours of work may only be extended with written approval from the Manager of Engineering.

5.0 DESCRIPTION OF THE WORK

The intent of this contract is to provide for the restoration of sanitary sewer mains by in place installation of a resin-impregnated liner. The resin is cured either by circulating hot water under hydrostatic pressure or steam pressure within the tube. When cured, the finished Cured-in-Place Pipe (CIPP) will be continuous, tight fitting, and bonded to the host pipe. Defective that reduce pipe diameter or workmanship issues like overcooking and accelerant burns, and improper curing, will not be acceptable. The work shall be completed in a timely manner by the completion date in the "Notice to Bidders".

The location and details of the project related to restoration of existing sanitary sewer mains are listed below. Please see map attached for site and pipe location. Sanitary main sections are classified as partially or fully deteriorated.

CCTV inspection videos for the pipes listed below and will be made available at the request of interested bidders for viewing.

The Engineer's estimate of quantities in this tender is approximate and the Engineer has the right to increase or decrease these quantities by twenty-five per cent (25%). Any increase or decrease in quantities from those stated below will be established at the time of initial award.

Location:

i.	Athabasca St. W. from 10th Ave. NW to 12th Ave NW	
	Pipe Length:	531 m.
	Pipe size:	200 mm. (Sanitary, Clay Tile)
	Sections/Manholes:	7
	Classification:	Fully Deteriorated
	Work Required:	Cleaning, CIPP installation
ii	Hopkins Cres from Albert St. W. to Grayson Cres.	
	Pipe Length:	259 m.
	Pipe size:	200 mm. (Sanitary, Clay Tile)
	Sections/Manholes:	4
	Classification:	Partially Deteriorated
	Work Required:	Cleaning, CIPP installation
iii	River St. W. from 2nd Ave. N.W. to Midblock to 3rd Ave. NW	
	Pipe Length:	93 m.
	Pipe size:	200 mm. (Sanitary, Clay Tile)
	Sections/Manholes:	2
	Classification:	Partially Deteriorated
	Work Required:	Cleaning, CIPP installation

iv	River St. W. from Midblock of 2nd & 3rd Ave. to 3rd Ave. N.W.	
	Pipe Length:	80 m.
	Pipe size:	250 mm. (Sanitary, Clay Tile)
	Sections/Manholes:	2
	Classification:	Partially Deteriorated
	Work Required:	Cleaning, CIPP installation
v	Caribou St. W. from 4th Ave. NW to 2nd Ave. N.W.	
	Pipe Length:	344 m.
	Pipe size:	250 mm. (Sanitary, Clay Tile)
	Sections/Manholes:	4
	Classification:	Partially Deteriorated
	Work Required:	Cleaning, CIPP installation

6.0 COMMUNICATION

The contractor will designate a Project Manager, whom, with the City Engineer or his designate, will form the primary link between the contractor and the City. All instructions, guidance, data and reports will flow between these two persons. The Project Manager will communicate with the City Engineer or his designate to discuss progress, clarify instructions and to solve problems as required. It is the responsibility of the Contractor to ensure that a list of contact numbers of all supervisory staff is provided prior to start the work. The Contractor shall request to the City Engineer for all contact numbers at least two business days in advance.

7.0 CONSTRUCTION SCHEDULES AND COMPLETION

At least 3 days prior to commencement of the work, the Contractor is responsible for preparing and submitting the CIPP lining schedule for this projects in the form of a chart, showing the commencement date and completion of all principal phases of work

If, in the opinion of the Engineer, any Schedule is inadequate as a control tool or if it does not show the work being fully completed by the Contract Completion date, the Engineer may reject it until one is acceptable. The Contractor shall execute the work in such a manner as to **complete it on or before December 31, 2017**. The successful bidder shall supply all equipment, labour and materials to ensure that the completion dates are met.

8.0 DOCUMENTS REQUIRED

Maintain at least one copy at the job site at all times:

- Contract drawings
- Specifications
- Pre and Post videos
- Field test reports
- Copy of approved schedule

9.0 CONSTRUCTION USE OF SITE

The Contractor shall have full use of the site, provided that the Contractor permits access to the City for purposes of inspections, reviews, tests, and carrying out related work. The contractor shall return the site in a clean state, free of all materials and construction debris. Protect all trees, plants, fences and other items from damage during construction.

10.0 STAGING / STORAGE

The City will allow the contractor to deliver, store, and maintain packaged material and product with manufactures seals and labels intact at the project site. Staging of equipment and material stock piling will also be allowed near the City Yards (1000 block High St. W).

11.0 POWER MOBILE EQUIPMENT (PME) TRAINING REQUIREMENTS

Occupational Health and Safety Legislation requires that only trained and competent operators are required or permitted to operate PME. Training must meet the specific requirements under Table 14.1, and be provided by a competent person(s) and that a written record of all training delivered to workers is kept readily available. Contractors will be required to produce written documentation prior to commencing work that they, and/or their operators, have been trained and are competent within the meaning of Section 154 of the Occupational Health & Safety Regulations.

12.0 SAFETY PROGRAM

The Contractor shall provide safe working conditions for all their respective employees. The work shall fully respond to the requirements of applicable laws, ordinates, rules, regulations, orders, and general construction practices for safety. The Contractor shall

comply with the Occupational Health and Safety Act, R.S.A, Chapter 0-2, as amended and regulations here under (the "Act").

13.0 PUBLIC PROTECTION & WARNING

i. The contractor shall as far as practicable will carry out the work causing the least possible obstruction to streets, lanes, or thoroughfares leading to, crossing, adjacent to or alongside of the work, and shall provide temporary access to locations as directed by the Engineer. The contractor shall not break up or otherwise obstruct any street, lane or thoroughfare without the written approval from the Engineer. The contractor shall provide and maintain all necessary notices, detour signs, barriers, warning lights or other means of protection for the safety of the public from the commencement to the completion of its work.

ii. The contractor shall not deposit any material on any street, sidewalk, boulevard or private property without the permission of the Engineer. Any material placed on these locations by the contractor must be removed as quickly as possible and the area thoroughly cleaned and restored to its original condition at the contractor's expense.

14.0 DAMAGE TO PUBLIC OR PRIVATE PROPERTY

The contractor must be careful to not damage any adjacent property, public or private, or any infrastructure, and if damage occurs it must be restored to its original stage by the contractor at his own expense and to the satisfaction of the Engineer and party concerned. It is recommended that the contractor discuss items at risk with the City prior to construction as well as mitigation strategies.

15.0 PRIME CONTRACTOR

The Contractor is the "Prime Contractor", and they have the primary responsibility for the safety of all the workers including subcontractors, and the equipment. The City does not anticipate that there will be anyone, other than those performing the Work of this Contract engaged in work at the "work site" during the performance of this Contract.

16.0 QUALITY ASSURANCE

The contractor shall submit the following information to Engineer prior to the commencement of any work. No Changes shall be allowed without written approval form the Engineer.

- CIPP Design and System Data
- Manufacturer's Resin Data Test Results

Flexural strength (astm d-790)	9,435 psi
Flexural modulus (astm d-790)	398,400 psi

- Resin Enhancer Manufacturer's Data
- Bond Enhancer Manufacturer's Data
- Certification of Applicability of Resin

The cured pipe material (CIPP) shall confirm to the structural properties as listed below:

- Property Modulus of Elasticity
- Flexural Stress
- Ground Water Depth
- Soil Depth
- Manhole Depth

17.0 MATERIALS

i. The liner, including any plastic covering and the thermosetting resin, shall meet the minimum mechanical properties defined in ASTM F1216. If so directed by the Engineer, contractor shall furnish prior to use of the materials satisfactory written certification of compliance with the ASTM and manufacturer's standards for all materials including the tube, resin and catalyst system, and conformance with installation methods of ASTM and the manufacturer's processes.

ii. The felt material shall be manufactured by companies specializing in felt production for CIPP. The manufacturer shall have manufactured felt material for CIPP for at least two (2) years as documented by references. The felt manufacturer, references and location of the manufacturing facility shall be submitted to the Engineer for review and approval. The felt material manufacturer and facility shall not change throughout the duration of the Contract unless specifically approved by the Engineer in writing.

iii. The makeup of the resin shall be submitted to the Engineer including chemical resistance information, cure logs and temperatures. The design mixture ratio of resin and catalyst shall also be submitted. The catalyst system shall be identified by product name. Resins, Catalysts and resin/catalysts mixing ratios shall not be changed during the project unless specifically approved by the Engineer in writing.

iv. The contractor will use an epoxy vinyl ester resin and catalyst system, isophthalic polyester, or epoxy resin system that is compatible with the pulled in place installation process. The minimum physical properties for the cured in place pipe shall be as follows and contractor shall submit the cured liner 0.5m length as sample to the Engineer.

Flexural Modulus of Elasticity ASTM D790 300,000 psi

Flexural Strength ASTM D790 5,000 psi

v. The tube shall consist of one or more layers of flexible, needle punched felt polypropylene. The material shall be capable of carrying epoxy vinyl ester resin, be able to withstand installation pressures and curing temperatures, and be compatible with the epoxy vinyl ester resin used. The epoxy vinyl ester resin shall be compatible with the application and pipeline environment and be able to be cured in presence of water.

vi. The outer tube coating shall consist of translucent material that allows for visual inspection and verification of proper resin impregnation. The tube used shall be fabricated to a size that, when installed, will tightly fit the internal circumference and the length of the original conduit. The material of construction shall be able to stretch to fit irregular pipe section and negotiate bends.

vii. The calibration hose shall consists of an impermeable plastic coating on a flexible needled punched felt that is capable of absorbing resin and is of a thickness to become fully saturated with resin.

viii. The calibration hose shall be fabricated to a size that, when installed, will tightly fit the internal circumference and the length of the resin saturated tube. Once inverted the calibration hose becomes a part of the tube, and once properly cured shall bond to and become a permanent part of the tube.

18.0 GENERAL COROSION REQUIREMENT

The cured-in-place pipe shall be fabricated from materials which, when cured, will be able to withstand internal exposure to and corrosive effects of normal sewage effluent liquids and gases containing hydrogen sulphide, carbon monoxide, carbon dioxide, methane, dilute sulphuric acid, and external exposure to soil bacteria and chemical attack which may be

due to materials in the surrounding ground or sewage within. Unless otherwise specified, corrosion requirements for sewers conveying commercial and industrial discharges shall be as specified in ASTM F1216 and ASTM F1743.

19.0 SIZING

The liner shall be fabricated to a size that when installed shall neatly and tightly fit to the internal circumference of the pipe being restored as specified by the Engineer. Allowance for circumferential and longitudinal stretching during insertion shall be made per manufacturer's standards. The diameter and length of pipes indicated in the BID documents are approximate. It is the responsibility of the contractor to verify the actual pipe diameters prior to construction. The length shall be that deemed necessary by contractor to effectively carry out the insertion from inlet to outlet points (generally manhole to manhole). Contractor shall verify all lengths in the field prior to fabrication of the tube. Individual installation runs may be made over one or more access points as determined in the field by contractor and approved by the Engineer.

20.0 DESIGN REQUIREMENT TESTING

The proposed cured-in-place pipe liner must be designed for a minimum fifty-year service life under continuous loading conditions. Design of the liner shall be based on the condition of the existing pipes classified in Project Location (Section F-5) which are partially deteriorated or fully deteriorated based upon the definitions thereof contained in ASTM F1216. The liner shall be designed to withstand all imposed loads, including live loads, if applicable, and hydrostatic pressure. The liner shall be designed by a Registered Professional Engineer and shall have sufficient wall thickness to withstand the anticipated internal and external pressures and loads which may be imposed after installation. The design of the liner shall include considerations for ring bending, deflection, combined loading, buckling, and ovality. Calculations which determine wall thickness requirements of the liner to be used shall be submitted to the Engineer for approval prior to fabrication of the tube. The wall thickness of the finished product shall be designed in accordance with guidelines of ASTM-1743 and F-1216. A safety factor of at least 2 shall be utilized.

21.0 INSPECTION AND CLEANING OF PIPELINES

i. Prior to entering confined spaces, such as manholes, and performing inspection or cleaning the contractor shall undertake, in accordance with provincial Occupational Health and Safety (OH&S) regulations, an evaluation of the atmosphere to determine the presence of toxic or flammable vapours or lack of oxygen.

ii. All Manholes have been located along this section and are shown in the attached map. It shall be the responsibility of the contractor to locate and determine access to specific Manholes to complete their work.

iii. Prior to the installation of cured-in-place liner, the contractor shall inspect the sewer segment(s) designated to receive the liner. The contractor shall be responsible for a pre-installation television inspection and if it reveals an obstruction that cannot be removed by conventional cleaning and/or cutting equipment, the location will be removed from the lining list. Another location might be substituted. The cleaning of the unlineable pipe will be paid on a force account basis.

iv. Prior to the installation of cured-in-place liner a pre inspection television video must be submitted to the Engineering for approval and the contractor should allow at least 4 hours for review and approval between 8:15a.m to 5:00p.m. Prior to the installation of cured-in-place liner, the contractor shall be responsible for clearing the designated collection line of obstructions such as tree roots, grease, and debris which will prevent proper installation of the liner. The contractor shall be responsible for confirming the locations of all branch service connections, if present, prior to installing and curing the CIPP. Pipe conditions or debris that are clearly significantly different that the video provided at the time of their construction will be handled as "Force Account or Extra work". In this case, the contractor must immediately notify the engineer. Any extras need to be approved prior to completing the work and the site inspector must provide sign approval at the end of day.

v. The City will provide a dumpsite for all debris removed from the sewers during the cleaning operations. Any hazardous waste material encountered during this project will be considered as a changed condition.

22.0 TRAFFIC CONTROL

All traffic control, barricading as per approval of the Engineer that is required for this project will be the responsibility of the contractor. The City shall provide access to water hydrants subject to written request to the Engineer.

23.0 SEWAGE FLOW CONTROL/BYPASS

The contractor shall provide for the flow of sewage around the section of pipe designated for repair. The bypass must be made by plugging the line at an existing upstream manhole and pumping the flow into a downstream manhole or adjacent system. The pump and bypass lines shall be of adequate capacity and size to handle the flow. The City requires a detail of the bypass plan to be submitted. Any spillage of sewage due to lining activities will be the sole responsibility of the contractor to clean and disinfected. Any cost related to spillage/surcharge, damage of public/private property is the responsibility of the contractor.

24.0 RESIN IMPREGNATION

Contractor shall designate a location where the uncured resin in the original containers and the un-impregnated fabric tube will be impregnated with resin using a vacuum and distribution roller system to thoroughly saturate the tube prior to installation. Contractor shall allow designates from Engineer to inspect the materials and "wet-out" procedure. The quantities of the liquid thermosetting materials shall be per ASTM and manufacturer's standards to provide the required design lining thickness.

25.0 CIPP INSTALLATION

The resin impregnated tube shall be inserted through an existing manhole or other approved access in accordance with ASTM and manufacturer’s standards. Multiple sewer segments lining with one inversion/insertion may be permitted upon approval by the City Engineer. Care shall be taken during the insertion process to avoid overstressing of the tube. Use of a lubricant during the insertion is allowed in accordance with the manufacturer’s recommendations to reduce friction. The lubricant shall be nontoxic, unable to support bacterial growth, and shall not adversely affect the fluid to be transported. Such lubricant shall be in a container clearly marked as to its contents.

26.0 CURING

i. After installation of the liner is completed and a temperature calibration mechanism is inserted, contractor shall cure the liner in strict accordance with ASTM and manufacturer's recommendations; however, where water is utilized in the curing process, a potable water source shall be used.

ii. Initial cure shall be deemed to be completed when inspection of the exposed portions of the cured-in-place pipe appears to be hard and sound and the thermocouples indicate that an exothermic reaction has occurred. The cure and post-cure period and temperature shall be as recommended by the resin manufacturer, modified for the cured-in-place process being used. The curing process shall take into account the existing pipe material, the resin system, and ground conditions (temperature, moisture content, thermal conductivity, etc.).

27.0 COOL DOWN

Contractor shall cool the finished cured-in-place pipe to specified temperature in strict accordance with ASTM and manufacturer's recommendations before relieving the internal pressure in the cured-in-place pipe. Care shall be taken in the release of the static head such that a vacuum will not be developed that could damage the newly installed cured-in-place pipe.

28.0 FINISH

The finished cured-in-place pipe shall be continuous over the entire length of the insertion run and be free from defects including dry spots, lifts, defective epoxy, accelerant burn, bad resin, wrinkles, overcooking and de-laminations. Any defects which will affect the integrity, flow diameter, or strength of cured-in-place pipe shall be removed and replaced at contractor's expense. For pulled-in-place installation techniques where the inflation bladder does not bond to the liner, all portions of the bladder shall be removed. Written curing and cool down logs shall be submitted to the City.

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.

29.0 RESTORATION OF LATERALS AND SERVICE CONNECTONS

The contractor shall fully reopen all of the existing active service connections in each length of sewer following lining. The service connections shall be reopened from inside the sewer by means of a closed-circuit television camera controlled cutting device appropriate for the CIPP. All openings shall be clean and neatly cut and shall be flush with the lateral pipe. The opening shall also be buffed with a wire brush to remove rough edges and provide a smooth finish. The bottom of the opening shall be flushed with the bottom of the lateral pipe to remove any lip that could catch debris. Openings shall be 100% of the service lateral pipe diameter. Restoration of laterals and service connections is a requirement and no additional payment will be made.

30.0 TESTING AND ACCEPTANCE

i. The water tightness of the cured-in-place pipe shall be gauged while curing and under positive head.

ii. For pulled-in-place products in which the pipe wall is cured while not in direct contact with the pressurizing fluid, leakage testing shall be conducted prior to restoration of building sewer (lateral) service connections.

iii. For pulled-in-place products where the inflation bladder remains a permanent part of the finished work, a de-lamination test shall be performed on each installation length. A sample shall be fabricated from material taken from the tube and resin/catalyst system used, and cured in a clamped mould placed in the down tube. A portion of the inflation bladder material in the sample shall be dry and isolated from the resin in order to separate tube layers for testing. De-lamination testing shall be conducted in accordance with ASTM D903 and the exceptions contained in ASTM F1216 or ASTM F1743 as applicable. The peeling or stripping strength between any non-homogenous layers of the product laminate shall be a minimum of 10 lb/in of width.

iv. After all work is completed, contractor shall provide the City with video showing post-installation conditions including the restored connections. All defects discovered during the post-installation television inspection shall be corrected by the contractor at his expense before the work under the Contract will be considered for Substantial

Completion. After the defects, if any, are corrected, the affected sewer segment(s) shall be re-televised and video submitted for approval.

v. The post-installation television inspection video shall be submitted with two copies of final binding report to the Engineer a minimum of five (5) business days to allow the Engineer to review the video prior to issue of the Construction Completion certificate (CCC).

31.0 MEASUREMENT AND PAYMENT

Upon Acceptance of the installation work and testing, the contractor shall restore the project area affected by the operations to a condition at least equal to that existing prior to the work.

i. Contractor shall receive payment for this work on a linear meter basis per pipe diameter lined in accordance with the unit prices contained in the Bid. Measurement shall be made from the centre of the upstream manhole to the centre of the downstream manhole.

ii. The unit Bid price shall include all bypass pumping, cleaning, root cutting, flushing, pre- and post-construction televising, labour, equipment, material, installation, safety, dust/erosion control, testing, traffic controlling, noticing, site restoration and all other work specified which is reasonably required to provide a completed installation.

32.0 DEVIATION

Should the pre-installation inspection reveal conditions in the sewer to be substantially different from those used in the design of wall thickness, tube construction, tube length or resin system, the installer is required to request the appropriate changes to the design, supporting such requests with a videotape recording of the existing conditions and design parameters. The deviation, if approved, will be reflected by an appropriate addition to or reduction in the original proposal price for the scope of work.

33.0 FORCE ACCOUNTS OR EXTRAS

All Force Account work shall be authorized prior to beginning work. All force account items must be approved by the Engineer. The Force Account sheets will be signed by the Engineer and contractor the day of the work. The Force Account sheet shall indicate the equipment used, name of each worker, starting and finishing time with all unit costs.

Force Accounts with dollar extensions are to be submitted by the Contractor within two (2) weeks of the extra work being completed. Payment will be made on the following progress estimate. Force Accounts submitted without written approval will not be accepted for payment.

34.0 NOTIFICATIONS

The Contractor shall provide written notice, approved by the Engineer, to all adjacent property owners 48 hours before commence lining works. This notice shall include information on access, project schedule; sewer service interruption details, parking restrictions, Contractor Superintendent's name and phone number (including 24 hour emergency numbers). The contractor shall make every effort to maintain service usage throughout the duration of the project.

35.0 MOBILIZATION AND DEMOBILIZATION

Included in mobilization are such items as bonding, insurance, permits, moving, personnel, materials and equipment to the site, and all preparation for performing the work. Included in demobilization are preparation and submission of operation and maintenance manual. Removal of all personnel, materials, and equipment; and clean-up of the site and work. The Contractor shall demobilize his equipment and construction facilities in an orderly and expeditious manner. Mobilization and demobilization costs will be included in the unit rate for liner installation and no separate payment will be issued for this item.

36.0 CONSTRUCTION COMPLETION AND FINAL INSPECTION

Upon written request by the Contractor, the City will inspect all aspects of the final product within two weeks and provide a list of all deficiencies within one week of inspection. A representative of the Contractor must sign the inspection report.

37.0 CLEAN UP

The contractor shall clean up the site as the work progresses. It is contractor's responsibility and there will be no measurement and payment for clean up as this is considered incidental to the contract.

38.0 PROGRESS PAYMENTS

The Contractor is required to submit progress payments in a format similar to the Tender Form, detailing quantities and cost by location of work. The Contractor shall provide supporting documentation such as weigh tickets (and summaries), change orders and force account sheets to the Engineer covering the Progress Payment reporting period.

39.0 APPENDIX - A

Appendix A1, A2, A3, & "A4" Location Maps.

END OF SPECIFICATIONS