MEMORANDUM

State of Alaska

Department of Transportation & Public Facilities Design and Engineering Services – Central Region Highway Design

TO: Christina Huber, P.E. PIH Distribution

DATE: April 9, 2025

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FROM:	Jeremiah Gingrich, P.E	SUBJECT:	PIH Specifications Memo
	Project Engineer		Old Seward Highway: O'Malley
			Road To Rabbit Creek Road
			Pavement Preservation
			0537010/CFHWY00886

This memo was prepared to summarize the proposed project changes to the 2020 Standard Specifications for Highway Construction, the Standard Modifications, Statewide Specials, and Central Region Specials for the above listed project.

Project specific specifications including sections are attached to this memo for review:

656 – Cured In Place Pipe (CIPP)

To see the Standard Specifications for Highway Construction 2020 edition please see the DOT&PF website:

http://dot.alaska.gov/stwddes/dcsspecs/index.shtml

To see the Standard Modifications, Statewide Specials, and CR Specials please see our ftp site for the latest edition.

http://www.dot.state.ak.us/creg/design/highways/specs/

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* No anticipated changes to the 2020 Standard Specifications for Highway Construction, Standard Modifications, Statewide Specials, or the current CR Specials.

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SECTION 656 CURED IN PLACE PIPE (CIPP)

656-1.01 DESCRIPTION.

Where indicated on the plans perform lining of existing storm drain pipes with a cured-in-place pipe (CIPP), complete in place. The Contractor shall furnish all labor, materials, and equipment for doing the work including planning and coordination, inspection and documentation, storm drain cleaning, flow control, pipe lining installation, and sampling and testing.

The CIPP shall meet the requirements of ASTM F-1216 or ASTM 1743 or ASTM F-2019. The CIPP shall extend the full length of the host pipe being rehabilitated and shall provide a structurally sound, impermeable, jointless, close-fitting pipe that when cured is mechanically fixed inside the host pipe.

Attain all permits required to complete the work.

656-1.01 SUBMITTALS. Submit the following for review and approval by the Engineer:

- 1. General Submittals:
 - a. A plan listing the required permits and detailing the means and methods for collecting and disposing of all debris, cleaning, construction, and testing materials, including water.
 - b. A plan for bypass pumping storm water around pipe sections scheduled for rehabilitation. Include a detailed list of equipment.
 - c. Product information for the lining system materials, methods of repair and Material Safety Data Sheets (MSDSs) for all materials used.
 - d. Calculations showing that the CIPP thickness and strength has been designed to meet the requirements of this specification. These calculations shall be performed and sealed by a qualified Professional Engineer.
 - e. Satisfactory sample test results from three previous projects where the lining system has been used. This requirement is not necessary if a Senior Installation Supervisor (SIS) meeting requirement "i" is provided. sample test results from three previous projects where the lining system has been used. This requirement is not necessary if a Senior Installation Supervisor (SIS) meeting requirement "j" is provided.
 - f. Letter certifying the lining system for "long term" (minimum of 50-year design life) integrity and effective life span. Submit certification for soil cell testing, chemical resistance, creep, and long-term structural loading.
 - g. Information confirming that the pipe conforms to the requirements of the Materials Section of this Specification.
 - h. Closed-circuit television (CCTV) operator resume. List three projects using CCTV inspection to locate and identify obstacles inside existing pipe in preparation for pipe lining. Submit documentation confirming that the CCTV operator is a currently certified in the National Association of Sewer Service Companies (NASSCO) Pipeline Assessment and Certification Program (PACP).
 - i. Submit documented evidence of the ability and capacity of the CIPP installer to perform this work, including the name and qualifications of the Senior Installation Supervisor (SIS) who will be on the project whenever lining materials are being handled, impregnated with resin, or installed. The SIS shall have installed a minimum of 3,000 feet of similar CIPP liner of the same CIPP system. Personnel replaced by the Contractor shall have similar, verifiable experience as the SIS originally submitted for the project. If the Contractor does not have a senior installation supervisor that meets these requirements, the Contractor shall provide a certified installer or manufacturer's representative who is qualified in the CIPP lining work at the project site for the first seven (7) days

of CIPP installation. Contractor shall submit evidence of the certified installers or manufacturer representatives experience and qualifications for approval by the Engineer prior to the site visit.

- j. Host pipe interior diameter measurement data acquired by the Contractor.
- k. The CCTV DVD records, or other preapproved storage format, and inspection logs before lining the pipe.
- I. Sampling and testing plan that shall include the Contractors proposed procedures for quality control, product sampling and testing. The plan shall also include a schedule that states when test results will be available.
- m. Quality Control Plan (QCP) as described in this specification.
- n. Plan that describes the procedures that would be used to repair and/or replace defective CIPP lining work.
- o. The post-installation water quality test results from a third -party certified laboratory.
- 2. <u>Quality Control Plan</u>. Submit a detailed Quality Control Plan (QCP) that includes the following:
 - a. A description of the quality controls to be performed by the Contractor.
 - b. Defined responsibilities of the Contractors personnel who are responsible for quality control.
 - c. Procedures and methods that will be followed for quality control, product sampling and testing including method and frequency of product sampling and testing both in the raw materials form and cured product form.
 - d. Provide performance and product test reviews for approval by the Engineer at regularly scheduled project meetings.
 - e. Inspection forms and guidelines for quality control inspections prepared in accordance with the standards specified in these Contract Documents
- 3. <u>CIPP Repair or Replacement Procedure</u>. Provide a description of specific procedures that would be followed to repair or replace defective CIPP work that includes the following:
 - a. Sharks-fin wrinkles greater than 1-inch tall.
 - b. Loss of resin and thin liner wall.
 - c. Loss of resin and sagging or weak liner wall.
 - d. Separation gaps between the host pipe and the liner or bulging of the liner due to groundwater infiltration.
 - e. Incomplete liner installation due to curing of the liner prior to completion of the inversion or pull-in.
 - f. Damage to the liner due to overheating.
 - g. Fracturing of the liner due to accelerated cooling.
 - h. Weak liner wall due to lack of cure heat or cure time.
 - i. CIPP liner that does not meet minimum thickness or strength requirements as determined by CIPP sampling and testing results.
- 4. Submit the following after completion of work:

- a. The CCTV DVD, or other preapproved storage format, records and inspection logs after lining of pipe.
- b. Material sample test results including soil cell testing, chemical resistance, SDR, creep and longterm structural loading tests.

MATERIALS

656-2.01 FABRIC TUBE. Felt tubing shall consist of one or more layers of flexible, needled felt or an equivalent woven and/or non-woven material capable of carrying resin, withstanding installation pressures and curing temperatures and compatible with the resin system used. The tube shall meet the requirements of ASTM D 5813.

Fiberglass tubing shall consist of at least two separate tubes made of corrosion resistant (E-CR) glass fibers in accordance with ASTM D 578. The fiberglass tube shall meet the requirements of ASTM F 2019.

The CIPP's interior wall color after installation shall be a relatively light reflective color so a clear detailed examination with CCTV equipment may be made. Hue of the color shall be dark enough to distinguish a contrast between fully resin saturated felt fabric and dry or resin lean areas.

The Contractor shall field verify all pipe diameters prior to ordering materials. Measurements of existing host pipes shall be completed as outlined in this specification.

656-2.02 RESINS AND CATALYST. The Contractor shall furnish an ultraviolet (UV) or thermosetting polyester or vinylester resin compatible with the approved liner and a compatible catalyst system as specified by the resin manufacturer. The resin shall be approved for use in the CIPP process for storm sewer applications. The resin manufacturer shall provide the Contractor with their recommended cure method for each diameter and thickness of CIPP to be installed and shall submit the same to the Engineer for approval. The submittal shall contain a detailed curing procedure outlining the curing medium, the method of application and how the curing temperatures will be monitored.

The CIPP system installed shall meet the chemical resistance requirements of ASTM D 5813.

656-2.03 STRUCTURAL REQUIREMENTS. Design Criteria: The liner thickness shall be calculated per ASTM F 1216, Appendix X.1 The cured-in-place-pipe thickness shall be calculated and designed based upon the following physical condition of each pipe to be rehabilitated. It will be acceptable for the Contractor to submit a design for the most severe section condition and apply that design to the entire length of pipe. The design shall be stamped by a Professional Engineer licensed to practice in the State of Alaska.

- 1. All pipes shall be considered fully deteriorated and gravity flow.
- 2. Design life of the liner shall be 50 years.
- 3. All pipes shall be considered to have a height of cover as described in the plans.
- 4. Water table elevations are unknown. For the purposes of this project, assume all pipes shall be subject to a water table of not less than 5 feet above the invert of the pipe.
- 5. All pipes shall have a minimum of 5% ovality. Contractor to field verify % ovality and revise as necessary.
- 6. A factor of safety of not less than 2.0 shall be applied.
- 7. The enhancement factor K shall not be higher than 7.
- 8. Live loads shall be AASHTO HL-93.
- 9. Soil density shall be minimum 135 pcf.

- 10. Constrained Soil Modulus shall be attained from ASTM D3839-14 Appendix X2.
- 11. Pipe interior is gritty and abrasive.
- 12. The CIPP shall have a wall thickness that is no less than 10 percent (10%) larger than the minimum calculated design thickness.

656-2.04 MECHANICAL PROPERTIES. The CIPP when cured shall have the following minimum values when tested in accordance with ASTM F 1216 by an independent testing laboratory:

Flexural Strength (tested in accordance with ASTM D790)4,500 psiFlexural Modulus (tested in accordance with ASTM D790)250,000 psiChemical Resistance Meet Minimum Requirements of ASTM F 1216, Table X2.1

CONSTRUCTION REQUIREMENTS

656-3.01 SAFETY. The Contractor shall carry out this operation in accordance with all OSHA and manufacturer's safety requirements.

656-3.02 HOST PIPE MEASUREMENT. Pipe sizes and lengths shown in the plans are approximate. Measure the inside diameter of the host pipe to confirm the proper tube diameter before ordering the liner tube materials. This shall be done at time of initial inspection. Measure the host pipe diameter at the widest distance between the corrugations and at the narrowest distance between the corrugations. Measurements shall be taken at a minimum of three separate locations for each diameter host pipe on the project. Submit the measurement information to the Engineer. Provide a manufacturer recommended tube diameter to fit in the host pipe.

656-3.03 PRE-INSTALLATION.

Storm drain pipe shall be carefully inspected to determine the location of breaks, obstacles, service connections and any conditions which may prevent proper installation of the liner, and it shall be noted so that these conditions can be corrected. Immediately after the inspection is complete, the Contractor shall provide the Engineer with an inspection recording and suitable log for later reference.

CCTV Requirements: CCTV work shall be completed by an operator who is currently certified in the Pipeline Assessment and Certification Program (PACP) that is provided by the National Association of Sewer Service Companies (NASSCO). Provide quality color images, meeting industry standards for resolution, clarity, and sharpness. Record the audio and video CCTV inspection on standard DVD format, or other format as approved by the Engineer, and index to written inspection logs. Provide DVD records and written inspection logs to the Engineer. Provide separate DVD and logs for the pre-cleaning and the post-cleaning of pipes. Complete each CCTV video inspection supplemented with audio. Record audio identifying the date of inspection, location of main, manholes, pipe type and size, and direction of travel through the pipe.

If necessary, prior to the television inspection, clean the pipe. Selection of the equipment used shall be based on the condition of the storm drain pipes at the time the work commences. The equipment shall be capable of removing dirt, grease, rocks, sand, pipe coating debris and other materials and obstructions from the storm drain pipes. If cleaning of an entire section cannot be successfully performed from one storm drain structure to another, the equipment shall be set up on the other structure and cleaning again attempted. Cleaning debris shall not go beyond the downstream structure. Cleaning shall be performed to a level required to provide satisfactory television inspections and to prepare the pipe for lining.

During storm drain cleaning operations, satisfactory precautions shall be taken in the use of cleaning equipment. Care shall be exercised to avoid damage to the pipe structure. The Contractor shall repair, at no cost to the Department, any damage to the structure of a sound storm drain pipe caused by use of the storm drain cleaning equipment. Further, the Contractor shall be responsible for any damage to properties connected to the storm drain which result from the storm drain cleaning operation.

Prepare the pipe for lining, referencing results of the CCTV inspection performed after pipe cleaning. Remove all intruding pipe ends, all intruding pipe material, and all other obstructions and deleterious material that remains within the pipe cross-section following cleaning throughout the full length of the pipe as necessary. Perform this work using remote-controlled equipment, including a pipe cutter. Remove the obstructions as set forth by the lining system manufacturer's specifications for preparation of the substrate pipe and applicable industry standards.

In addition to the work described above, perform all other actions and operations required by the lining system manufacturer and industry standards to prepare the pipe for acceptance of the lining system. Ensure that any substances and compounds used in the preparation of the substrate pipe for the installation of the proposed lining system are acceptable in all respects to the manufacturer of the lining system.

The Contractor shall inspect the storm drain pipe immediately before the insertion of the impregnated tube to assure that the pipe is clean and existing pipe conditions are acceptable for lining.

656-3.04 HOST PIPE CONDITION. The Contractor shall closely inspect the interior of the host pipe and determine if additional work will be necessary to prepare the pipe for lining using the Contractors CIPP lining method. Contractor shall notify the engineer immediately upon discovery of a condition in the pipe that requires repair prior to installing the CIPP liner.

656-3.05 STORM WATER BYPASS PUMPING. Include a detailed list of equipment (hoses, pumps, and other) and deployment schedule to maintain storm flows during construction including cleaning and lining activities during storm events. Provide for a minimum of 500-gpm normal flow and minimum storm event of 2700-gpm.

Provide primary bypass pump(s) and standby backup pump(s) of equal capacity connected into the bypass piping system available for immediate operation. Maintain the hydraulic gradient, both upstream and downstream, of the bypassed pipe, at an elevation to prevent damage to properties served. Do not discharge storm water onto the ground. During bypass pumping, maintain continuous monitoring and observation of the equipment.

Muffle the equipment to minimize noise. Attain a noise permit where required by the local authorities. A limited operation time required by the local authority is not cause for additional time or compensation.

656-3.06 LINE OBSTRUCTIONS. If the pre-insertion inspection reveals an obstruction in the existing pipe (heavy solids, dropped joint, collapsed pipe, boulders, etc.) the obstruction shall be removed by the Contractor in conformance with these Contract Documents.

656-3.07 RESIN IMPREGNATION. The Contractor shall designate a location where the felt tube will be impregnated with resin, using distribution rollers and vacuum, to thoroughly saturate the felt tube prior to its dispatch for installation. A catalyst system or additive(s) compatible with the resin and tube may be used per the manufacturer's recommendation. They shall, however, not impair or reduce the resin's ability to withstand the minimum chemical resistance or load bearing criteria. The quantity of resin used for tube impregnation shall be sufficient to fill the volume of air voids in the tube with additional allowances for polymerization shrinkage and the loss of resin through cracks and irregularities in the original pipe wall.

656-3.08 INSTALLATION. The wetted out tube shall be protected during transportation and insertion into the manholes. The insertion area, equipment platform, etc., shall be securely protected, and all damaged structures shall be repaired by the Contractor.

The CIPP shall be installed in accordance with ASTM F 1216 or ASTM F 1743. Care shall be taken not to overstress the felt or fiberglass tube at the elevated curing temperatures, which may cause damage or failure prior to cure.

656-3.09 CURING. After completion of the insertion, the Contractor shall follow manufacturer's recommended curing method. The Contractor shall use a hot water recirculation, steam system, or ultraviolet light (depending on the requirements described below), capable of delivering a consistent cure of the resin.

For UV cure provide equipment capable of delivering desired UV light intensity, pressure, and temperature uniformly throughout the liner. The UV light intensity, pressure, and temperature shall be continuously monitored by both computer and video as recommended by the liner manufacturer.

For water or steam cure, the heat source shall be fitted with suitable monitors to gauge the temperature of the outgoing and incoming curing water or steam. Another such gauge shall be placed between the impregnated tube and the invert to the original pipe at all manholes along the length of the liner (including intermediate manholes) to determine the temperatures during the resin curing process. Initial cure may be considered completed when the exposed portions of the felt tube pipe appear to be hard, and the remote sensing device indicates the temperatures to be adequate, as recommended by the resin/catalyst system manufacturer. Curing and cooling temperatures and duration shall comply with previously submitted data and information. The curing temperature shall be as recommended by the resin manufacturer.

Coupon samples shall be obtained for testing as stated below.

656-3.10 COOLING DOWN. For water cure, cool the hardened cured-in-place-pipe to a temperature below 100 degrees Fahrenheit before relieving the internal pressure. Cool down shall be accomplished with water. Careful attention shall be taken not to cool too quickly to eliminate the possibility of thermal shock. Care shall be taken in the release of the internal pressure so that a vacuum will not be developed that could damage the newly installed liner. Cool down process may vary depending on the installation technique of the manufacturer/Contractor

The cure water shall be disposed of once the curing cycle is complete. If Styrene based resins are used cure shall be discharged to a sanitary sewer with adequate flow for dilution or hauled to a wastewater treatment plant for disposal. Permission shall be obtained, in writing, from the sewer or plant owner before discharging.

If uncured resin is above non-detection levels, take immediate steps to prevent release into the environment. Capture the water, uncured resin, and all contaminated materials.

656-3.11 FIT AND FINISH. The finished pipe shall be mechanically fixed and continuous over the entire length of the storm drain section. The finished liner shall tightly conform to the walls of the existing host pipe. No gap or annular space between the finished liner and the host pipe shall be allowed or be visible at the manhole, storm drain service connection, or other exposed points within the finished liner section. The finished liner shall be homogenous throughout and free of any protrusions, holes, cracks, etc., which in the opinion of the Engineer will affect the liner's structural integrity, hydraulic performance, future maintenance access, and overall line performance.

The CIPP shall provide a structurally sound, impermeable, jointless, and close-fitting pipe.

It is not acceptable for the installed liner to cause a backwater or reduce the pipes hydraulic capacity.

At liner termination points in storm drain structures, provide a smooth transition from the liner to the manhole wall or invert. If necessary, grind the exposed liner edge smooth or fill with mortar to eliminate rough or abrupt edges that may collect debris or hamper CCTV equipment operation. If mortar is used, it shall provide a smooth transition on both the upstream and downstream inverts and shall be applied the entire circumference of the liner. For sealing the ends of new liners in corrugated host pipes, a hydrophilic resin may be used to fill the annular space. The exposed resin shall be capped with cement grout.

656-3.12 REINSTATEMENT OF PIPE CONNECTIONS TO THE CIPP LINED PIPE. Reinstate pipe connections to the CIPP lined pipe using trenchless techniques in accordance with the manufacturer's requirements. The work shall be accomplished from within the storm drain or culvert pipe by either robotic or man-entry means. Excavation to reinstate pipe connections to the CIPP lined pipe will not be allowed. Re-opening of the pipe connection entrances shall be performed in a manner to prevent blockage of flow at the opening. The reinstated pipe connection opening shall be no less than 95 percent and no more than 100 percent of the size of the original connection opening. The reinstated service connection shall be smooth and uniform with no rough edges or protrusions along the trimmed edge of the liner that could cause debris to collect at the pipe connection opening. Each reinstated pipe connection shall be thoroughly inspected with the camera during the post rehabilitation CCTV inspection to confirm that the final fit and

finish is acceptable. The CCTV inspection will include stopping at each reinstated pipe connection, pausing for 10 seconds and view the entire circumference of the reinstated pipe connection.

If the Contractor cuts through the liner outside of the pipe connection to be reinstated, the Contractor will repair the damaged liner at no additional cost to the Department.

656-3.13 CLEANUP. After the installation work has been completed and all testing accepted, the Contractor shall clean up the entire project area. The Contractor shall dispose of all excess material and debris not incorporated into the permanent installation.

Dispose of removed/captured materials as required dependent on the type of materials, and as required by these specifications and Federal, State, and local regulations.

656-3.14 SAMPLING AND TESTING. Sampling and testing shall meet the requirements of ASTM F-1216 and shall include the following:

- 1. Prepare a minimum of two CIPP samples from each diameter of liner installed.
- 2. Samples shall be large enough to provide a minimum of five specimens.
- 3. Test for initial tangent flexural modulus of elasticity and flexural stress in accordance with Test Methods D 790 and meet the requirements of the Mechanical Properties within this specification
- 4. Verify that the liner thickness of the sample meets the requirements of this specification.
- 5. Submit test results to the Engineer for review and approval within the time approved by the submittals.
- 6. Samples shall be cut from a section of cured CIPP at the termination point that has been inverted through a like diameter pipe which has been held in place by a suitable heat sink, such as sand bags or other similar material.

656-3.15 FINAL INSPECTION. After the liner is inserted but before final acceptance, the Contractor shall complete a television inspection of the cured in place lined pipe and submit the video and log to the Engineer for review. The final television inspection shall conform to Subsection 695-3.03 PRE-INSTALLATION. The entire circumference of the liner shall be observed during the television inspection. The Contractor shall by pass or temporarily block the storm drain flow in accordance with Subsection 695-3.05 STORM WATER BYPASS PUMPING if necessary, to achieve this condition. The entire circumference of the liner shall be readily visible with the television camera.

656-4.01 METHOD OF MEASUREMENT. Section 109, and as follows:

Cured In Place Pipe ____Inch. Measured by the linear foot of liner from center of manhole to center of manhole.

Cured-In-Place-Pipe – Host Pipe Preparation. Measured by the linear foot of liner from center of manhole to center of manhole.

Cured-In-Place-Pipe – Host Pipe Spot Repair. Per Section 109.

656-5.01 BASIS OF PAYMENT.

<u>Item 656.2001.</u> <u>Cured-in-place Pipe</u> <u>Inch</u>. Payment for furnishing and installing CIPP liner shall constitute full payment for furnishing all materials, including liner, resin, and sampling and testing. Payment for the liner will also include the cost of sealing the liner at the termination points, water quality sampling and testing, along with disposal of excess material and debris associated with lining activities. Collection and delivery of post-installation CCTV, removal of manhole cones as required to install CIPP liner, and incidental excavation and backfill are subsidiary to this item. Item

<u>656.2004.</u> <u>Cured-in-place Pipe – Host Pipe Preparation</u>. Payment for preparation of the host pipe shall include storm drain pipe cleaning and preparation, inspection, storm water bypass pumping, disposal of excess material and cleaning debris. Collection and delivery of pre-installation CCTV is subsidiary to this item.

<u>Item 656.2005.</u> <u>Cured-in-place Pipe – Host Pipe Spot Repair</u>. Prices for this item will be by time and materials according to Subsection 109-1.05, or by mutual agreement between the Engineer and Contractor.

Replacement of segments of pipe prior to lining will be paid under section 603, or according to Section 109 by mutual agreement between the Engineer and Contractor.

Additional permits, labor, equipment, materials, disposal, and all other incidentals to perform the work are subsidiary to 656 pay items. No separate payment will be made for excavation and backfill work to install CIPP liners.

Payment will be made under:

PAYITEM			
Item Number	Item Description	Unit	
656.2001	Cured-In-Place Pipe Inch	LF	
656.2004	Cured-In-Place Pipe – Host Pipe Preparation	LF	
656.2005	Cured-In-Place Pipe – Host Pipe Spot Repair	CS	

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