

ADDENDUM NO. 1
AUGUST 7, 2017

This Addendum forms a part of the Contract Documents and modifies the original Bidding Documents as noted within this Addendum. All provisions of the Contract Documents not in conflict with this Addendum shall remain in full force. Any questions you may have on the information contained in this addendum should be directed to as specified in the Contract Documents. Bidders are required to acknowledge receipt of this Addendum in the space provided on the Bid Form. Failure to do so may subject the Bidder to disqualification.

The attention of all Bidders is directed to the following additions and/or deletions to the Contract Documents.

CHANGES TO THE BIDDING DOCUMENTS

TABLE OF CONTENTS

1. **Replace** Table of Contents in its entirety with Table of Contents attached to this Addendum.

SS-8, CURED-IN-PLACE PIPE LINER

1. **Add** Sewer Specification 8, Cast-in-Place Pipe Liner attached to this Addendum.

ATTACHMENTS

1. Revised Table of Contents
2. New Sewer Specification 8, Cured-in-Place Pipe Liner

END OF ADDENDUM

2017 SANITARY SEWER IMPROVEMENTS PROJECT

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END OF SECTION

SEWER SPECIFICATION 8
CURED-IN-PLACE PIPE LINER

PART 1 GENERAL

1.01 SUMMARY

- A. The Contractor shall provide all labor, materials, operation, and equipment necessary to repair and rehabilitate sewers in accordance with the Contract Documents or as designated by the Village Engineer. The Work shall include cleaning and lining; elimination of inflow and/or infiltration; excavation; removal and disposal of excess materials; restoration; backfill; permanent and temporary pavement replacement; and dewatering required for placing cast-in-place pipe (CIPP) liner.
- B. Specific work to be performed at each sewer is identified in the Contract Documents.
- C. Related Sections:
 - 1. Sewer Specification 0, Sewer Specification Definitions.

1.02 REFERENCES

- A. Reference Standards: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified:
 - 1. American Association of State Highway and Transportation Officials (AASHTO).
 - 2. ASTM D543, Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents.
 - 3. ASTM D2122, Standard Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings.
 - 4. ASTM F1216, Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube.
 - 5. ASTM F1743, Standard Practice for Rehabilitation of Existing Pipelines and Conduits by Pulled-in-Place Installation of Cured-in-Place Thermosetting Resins Pipe (CIPP).
 - 6. ASTM F2019, 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).
 - 7. ASTM F2599, Standard Practice for the Sectional Repair of Damaged Pipe by Means of an Inverted Cured-In-Place Liner.
- B. Manufacturer's Recommendations: Comply with the provisions and recommendations of the manufacturers.

1.03 DEFINITIONS

(Not Used)

1.04 SYSTEM DESCRIPTION

- A. Design Criteria:
1. Design Life: 50 years.
 2. Pipe Diameter: As shown in the Contract Documents.
 3. Ovality: 3%.
 4. Pipe Condition: Fully deteriorated.
 5. External Water: Ground surface.
 6. Flexural Strength: 4,500 psi.
 7. Short-Term Flexural Modulus: 250,000 psi.
 8. Reduction Factor: 50%.
 9. Long-Term Flexural Modulus: 125,000 psi.
 10. k Enhancement Factor: 7.
 11. Soil Modulus: 1,000 psi.
 12. Soil Density: 120 pcf.
 13. Highway Live Load: AASHTO HS20-44.
 14. Safety Factor: 2, minimum.
 15. Minimum Thickness:
 - a. Pipe 10 Inches and Smaller: 6 millimeters.
 - b. Pipe Larger than 10 Inches: 7.5 millimeters.
 - c. If calculations require a thicker wall, round to next higher multiple of 0.5 millimeter.
 16. Poisson's Ratio: 0.3.
 17. Liner shall be watertight.

1.05 SUBMITTALS

- A. Pre-Installation Submittals: The Contractor shall submit to the Village Engineer information pertaining to each sewer repair or rehabilitation that will include, but not be limited to:
1. Proposed materials to be used to perform repairs and rehabilitations, including City of Columbus CMS item number if applicable.
 2. Manufacturer's product data, delivery, storage, and handling instructions, installation instructions, applicable referenced work standards, approved laboratory tests, and materials certification for each product to be used in the Work.
 3. Material Safety Data Sheets (MSDS), if applicable, for all materials to be used in the rehabilitation.
 4. CIPP liner thickness calculations.
 5. Contractor's qualifications listing all similar projects completed in the last 3 years and manufacturer's licensee certificate, if applicable.
 6. Written description of materials application methods including the equipment to be used. "Wet-out" plan describing method for "wet out" of flexible tube including specific insertion and curing schedule.
 7. Right of Entry (ROE) agreements or similar authorization from private property owners should Contractor propose using areas outside Owner's right-of-way or easements.
 8. Method of handling traffic where streets are to be excavated.

- B. Post-Installation Submittals:
 - 1. Process control sheet for each section, including temperature and time log information, tap cut information, and curing cycle.
 - 2. Post-installation sewer videos in the format specified in SS-2, Sewer Video Recording and Inspection
 - 3. Manufacturer's certification of proper installation of CIPP liner
- C. The Contractor shall submit a copy of all property owner/resident notifications and door hangers to the Village Engineer prior to notification distribution as specified in Paragraph 3.03.

1.06 QUALITY ASSURANCE

- A. Codes: Perform all work in accordance with current federal, state, and local codes.
- B. Standards: All work shall meet or exceed the requirements of the National Association of Sewer Service Companies (NASSCO) Recommended Specifications for Sewer Collection System Rehabilitation (latest edition), except as otherwise specified herein.
- C. Contractor's Qualifications:
 - 1. The Contractor shall have a minimum of 3 years continuous successful experience in sewer repairs and rehabilitations similar to the required for this Project.
 - 2. The Contractor shall be certified or trained by the CIPP liner material manufacturer to install the CIPP liner material if the manufacturer requires certified applicators. The Owner reserves the right to require an on-site manufacturer's representative for a minimum of 2 hours for each supplied material. The manufacturer's representative shall direct and instruct the Contractor on the proper application and installation procedure. The manufacturer's representative shall be provided at no cost to the Owner.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Resin: Shipped directly to wet-out facility from resin manufacturer.
- B. Store water-cured or steam-cured resin-impregnated tubes in refrigerated truck trailers at a temperature below 45 °F to prevent premature curing.
- C. If liner tube is impregnated with resin at the factory, transport, install, and cure liner tube before expiration of shelf life.
- D. No cuts, tears, or abrasions shall occur to liner tub during handling.
- E. Prior to beginning installation, do not subject resin-impregnated liner to sunlight or ultraviolet (UV) radiation.
 - 1. UV liner may be stored up to 3 months before installation.
 - 2. Remove resin-impregnated tubes with signs of premature curing from Site.

1.08 PROJECT/SITE CONDITIONS

- A. The Contractor shall use caution when working in sewers. During rain events, sewers may reach capacity quickly.
- B. If required to complete the Work, the Contractor shall provide temporary bypass pumping and flow control in accordance with SS-3, Bypass Pumping and Flow Control.

1.09 SEQUENCING (Not Used)

1.10 SCHEDULING (Not Used)

1.11 WARRANTY

- A. Provide manufacturer's standard written warranty and guarantee, dated from time of Substantial Completion, for all materials provided as part of the Work.
- B. The Contractor shall guarantee all labor as specified in Section 11030 of the General Conditions.
- C. Warranty Inspection: The Owner or the Owner's designated representative will conduct a warranty inspection in the 11th month following Substantial Completion. The Contractor and a manufacturer's representative shall be present for the inspection. Deficiencies related to material and workmanship shall be repaired in accordance with the accepted warranties and the Contract Documents, at no cost to the Owner.

1.12 SYSTEM STARTUP (Not Used)

1.13 INSTRUCTION OF OWNER'S PERSONNEL (Not Used)

1.14 COMMISSIONING (Not Used)

1.15 MAINTENANCE (Not Used)

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers are specified in the individual material specifications below.

2.02 EXISTING PRODUCTS (Not Used)

2.03 MATERIALS

- A. Resin:
 - 1. General purpose, unsaturated, polyester, epoxy, isophthalic neopentyl glycol, or thermosetting vinyl ester resin, catalyst system, initiators, or hardeners that provide specified cured physical strengths and properties, and compatible with reconstruction inversion process.
 - 2. Resistant to municipal wastewater environment; immersion in septic sewage at temperatures up to 75 °F.
 - 3. Curing:

- a. Designed to cure properly within selected curing method.
- b. Initiation Temperature: 180 °F, maximum.
- 4. Resistant to ultra-violet light (sunlight) prior to installation.
- 5. PET resins, resin filters, resin additives, and resin enhancement agents are prohibited. Only neat resins are acceptable. Old resins and reworked resins are prohibited, regardless of whether or not they are mixed with new resin.
- 6. Chemical resistance of resin system shall have been tested by resin manufacturer in accordance with ASTM D543. Exposure to chemical solutions listed below at temperatures of up to 75 °F shall be conducted for a minimum period of 1 month and shall result in a loss of not more than 20% of initial structural properties.
 - a. Minimum Chemical Solution Concentration, ASTM F1216:
 - 1) Tap Water, pH 6 to 9: 100%.
 - 2) Nitric Acid: 5%.
 - 3) Phosphoric Acid: 10%.
 - 4) Sulfuric Acid: 10%.
 - 5) Gasoline: 100%.
 - 6) Vegetable Oil: 100%.
 - 7) Detergent or Soap: 0.1%.
- 7. Produce cured tube resistant to shrinkage, not corrode or oxidize, and resistant to abrasion from solids, grit, and sand in wastewater.
- 8. Bond between tube layers shall be strong and uniform.
- 9. Layers, after cure, shall be saturated with resin.
- 10. Manufacturers and Products:
 - a. Reichhold: Polylite #33420 or DION 9800 20.
 - b. Interplastic Corporation: #COR72 AA 455HV, #COR72 AA 656, or #CORVE8190.
 - c. Ashland Specialty Chemical Company: #AROPOL MR12018 or HETRON Q6405.
 - d. AOC: 701 or 102NA.
 - e. Vipel: L704NET 11 or L704AAP 12.
 - f. Or equal

B. Catalyst:

- 1. Primary: 1% maximum of resin by volume.
- 2. Secondary: ½% of resin by volume.
- 3. Manufacturers and Products:
 - a. Primary Catalyst:
 - 1) Akzo: Perkadox 16, Perkadox BTW 50, or Norox 600.
 - 2) Or equal
 - b. Secondary Catalyst:
 - 1) Akzo: Trigonox C or Norox TBPB.
 - 2) Puritan Products: N, N-dimethyl aniline (DMA).
 - 3) Or equal

C. Flexible Liner Tube:

- 1. Consist of layers of flexible nonwoven and absorbent polyester felt manufactured under quality controlled conditions set by manufacturer and applicable requirements set forth in ASTM F1216 and ASTM F1743.

2. Capable of stretching to fit irregular pipe sections.
3. Fabricated and sized for each section to ensure snug and firm fit inside existing sewer; produce required thickness after resin is cured.
4. Inside layer of tube shall be coated with an impermeable material compatible with resin and felt.
5. Fit length and diameter of manhole with allowance for longitudinal and circumferential stretching or shrinkage.
6. Maximum Stretching Allowance: In accordance with ASTM F1216.
7. Fabricate in lengths that, when installed, liner occupies length of pipeline between launch and reception manholes.
8. Lining shall be correct diameter; after installation there shall be no wrinkles or form permanent fins.
9. Contain no intermediate layers that may delaminate after resin curing. Not capable of separating layers with a probe or knife blade such that layers separate cleanly or probe or knife blade moves freely between layers.
10. Where several layers of felt are required, inner layer shall be stitched to form a tube.
 - a. Each successive layer shall be individually wrapped around previous one and stitched together.
 - b. Outer layer of felt shall have an installation tube prebonded to it, or a sheet of this material shall be wrapped around completed felt tube.
 - c. Where a prebonded material is used, bond a covering strip over seam to form airtight joint.
11. Fabricated from materials which when cured will be chemically resistant to reagents as defined in ASTM D543.
12. Preliner:
 - a. If required by Village Engineer, apply to tube on what will become interior wall of finished CIPP.
 - b. Polypropylene compatible with resin system and shall not adversely affect adhesive properties of resin used in mainline or lateral liners.
13. Interior Pipe Wall Color: Shall not be a dark or nonreflective nature that could inhibit proper closed circuit television (CCTV) inspection.
14. Manufacturers:
 - a. Applied Felts.
 - b. Insituform Technologies.
 - c. Liner Products.
 - d. National Liner.
 - e. Or equal.

D. Annular Space Sealant. Hydrophilic Rubber Joint Seal:

1. Greenstreak, Inc.: Hydrotite
2. Or equal.

2.04	MANUFACTURED UNITS	(Not Used)
2.05	EQUIPMENT	(Not Used)
2.06	COMPONENTS	(Not Used)
2.07	ACCESSORIES	(Not Used)
2.08	MIXES	(Not Used)

- 2.09 FABRICATION (Not Used)
- 2.10 FINISHES (Not Used)
- 2.11 SOURCE QUALITY CONTROL

- A. At the time of manufacture, each lot of liner shall be inspected and certified to be free of defects.
- B. Mark inside of tube in at least one location per setup. Mark shall include manufacturer of liner at regular intervals, not to exceed 10 feet, along full length of tube.

PART 3 EXECUTION

- 3.01 ACCEPTABLE INSTALLERS (Not Used)

- 3.02 EXAMINATION

- A. The Contractor shall examine all materials delivered to the site which are to be used in the Work to ensure all materials meet the requirements stated herein. All materials which do not meet the requirements of the Contract Documents shall be removed from the site and replaced with acceptable materials at no additional cost to the Owner.

- 3.03 PREPARATION

- A. Traffic Control: Should the Contractor require law enforcement officers (LEO) to assist with the Contractor's traffic control, the Contractor shall coordinate directly with the Village of Minerva Park Police Department, Chief Kim Nuesse (614-882-1408). Contractor shall contact the police department 72 hours before needing LEO. LEO will be provided to the Contractor at no cost unless noted otherwise.
- B. Right of Entry: When private property must be crossed for bypass pumping the Contractor shall obtain written Right of Entry (ROE) signed by the property owner. The ROE shall describe the extent of work, items to be restored, warranty and schedule. A signed copy of the ROE shall be submitted to the Village Engineer prior to commencing work. The cost for obtaining the ROE and all associated restoration work shall be included in the unit bid prices for the work.
- C. Utilities Notification: The Contractor shall contact the appropriate utility protection service or the utility owner if utility owners are not members of a protection service within the timeframe specified by Ohio law. The Contractor shall support, protect, and restore all existing utilities encounter or disturbed during the Work.
- D. Resident Notification: The Contractor shall notify, in writing, all adjacent landowners at least one week in advance of performing Work near their property.
- E. Resident Notification, Laterals Out of Service:
 - 1. The Contractor shall provide 48-hour prior written notification to all property owners and residents whose sewer lateral will be affected by the Work. The notice shall clearly state the approximate time when sewage cannot be received,

when the sewer will be available again for receiving sewage, and the purpose of the work. It shall also advise all affected customers against water usage until the sewer line is placed back in service, and shall clearly state the potential consequences of the use of residential wastewater generating facilities during the time when the building sewer service will be out of service (i.e. sewer back-up).

2. The Contractor shall place a door hanger reminder 24 hours (excluding weekends and holidays) prior to reducing the sanitary service.

E. Dewatering: The Contractor shall provide for dewatering as necessary to perform the Work on firm, dry materials.

3.04 ERECTION (Not Used)

3.05 INSTALLATION (Not Used)

3.06 APPLICATION

A. Private Service Lateral Shutdown:

1. When service lateral will be disconnected from sewer main for more than 8 hours, lateral shall be positively drained or pumped down. The Contractor shall monitor the status of the flow and storage and shall pump down the lateral more frequently where flows exceed storage capacity of the lateral or the Contractor's temporary storage.
2. If service lateral cannot be positively drained or pumped down or if disconnection is anticipated to last 48 hours or longer, the Contractor shall provide temporary living accommodations to the resident(s) at no additional cost to the Owner or the resident. Temporary living accommodations shall be coordinated with and approved by the Owner, the Village Engineer, and the resident.
3. Temporarily restore services in incomplete sections during nonwork hours, as available.
4. Notify building occupants when the Work is complete and uninterrupted service is restored.
5. All commercial establishments shall be provided with temporary sewer service. The means and methods shall be coordinated with the managers and the affected residents.

B. Cured-in-Place Liner:

1. Verify lengths in field before cutting liner to length.
2. Wet-Out:
 - a. Tube shall be vacuum impregnated with resin (wet-out) under controlled conditions.
 - 1). Designate vacuum-impregnated location prior to CIPP installation.
 - 2). If requested, allow Village Engineer to inspect materials and procedures used to vacuum impregnate tube.
 - 3). If the Contractor uses an alternative method of resin impregnation, method shall produce the equivalent results of a roller system. An alternative resin impregnation method shall be

- documented to Village Engineer's and Owner's satisfaction that saturation of CIPP is sufficient.
- 4). Handle resin impregnated tube to retard or prevent settling until it is ready for insertion.
- b. Use roller system to uniformly distribute resin throughout tube.
 - c. Volume:
 - 1). Resin shall fill voids in tube material at nominal thickness and diameter; no air spaces or pockets allowed.
 - 2). Adjust by adding excess resin to change resin volume because of polymerization and to allow for migration of resin into cracks and joints in original pipe.
 - d. Complete wet-out process control sheet for every lining completed. Control sheet shall provide the following information:
 - 1). Liner manufacturer.
 - 2). Liner diameter.
 - 3). Number of layers.
 - 4). Resin manufacturer.
 - 5). Resin amount.
 - 6). Resin type.
 - 7). Batch number.
 - 8). Catalyst and accelerator name/type.
 - 9). Hardener name/type.
 - 10). Filler name/type, if any.
 - 11). Percent of filler, if any.
 - 12). Mixing ratios.
 - 13). Vacuum pressure of impregnation process.
 - 14). Wet-out start time and date.
3. Insertion:
- a. Install CIPP in accordance with practices outlined in ASTM F1216 for direct inversion installations and ASTM F1743 for pull in installations.
 - b. Dewater existing host pipe for CIPP installation that does not use an inversion method to expand tube against pipe wall.
 - c. If vacuum impregnation process is used, point of vacuum shall be no farther than 25 feet from point of initial resin introduction. After vacuum in tube is established, vacuum point shall be no farther than 75 feet from leading edge of resin. Leading edge of resin slug shall be as near to perpendicular to longitudinal axis of tube as possible.
 - d. Insert wet-out tube through existing manhole or approved access point by means of an inversion process or pulled in method and application of hydrostatic head sufficient to extend tube to next designated manhole or termination point.
 - e. Alternately, tube may be pulled into place and expanded with inflation bladder. Insertion method shall not result in abrasion or scuffing of the tube.
 - f. Once installation has begun, maintain pressure between minimum and maximum pressures until installation has been completed. Pressure shall be sufficient to hold tube tight against host sewer pipe.

- g. Place temperature gauges between tube and host pipe's invert position to monitor temperature during cure cycle.
- h. CIPP shall be continuous over entire length from manhole to manhole.
- i. Complete installation process control sheet for every lining completed. Control sheet shall provide the following information:
 - 1). Liner length.
 - 2). Hydrostatic head at point of inversion.
 - 3). Hydrostatic head at termination point.
 - 4). Time inversion process started.
 - 5). Time cutting ends started.
 - 6). Time cutting laterals started.
 - 7). Number of laterals cut.
- 4. Inflation Bladder Removal: For pulled-in-place installation techniques where inflation bladder is designed not to bond to CIPP, remove bladder material from CIPP.
- 5. Curing:
 - a. Complete curing process control sheet for every lining completed.
 - b. Control sheets shall provide required temperatures and time for the different steps of curing process; initial cure, post cure, and cooling as outlined in ASTM F1216.
 - 1). Initial cure may be considered completed when exposed portions of flexible tube pipe take a hard set and temperature is adequate, as recommended by manufacturer.
 - c. After installation, apply steam, hot water, or ultraviolet (UV) light as recommended by liner manufacturer.
 - 1). Steam:
 - a). Provide safety system specifically structured for use of steam.
 - b). Thermoset Resin: Designed to cure properly when using steam.
 - c). CIPP Tube Thermoplastic Coating:
 - i). Formulated from material designed specifically to withstand high temperature curing process utilizing steam.
 - ii). Polypropylene/polyethylene blend or equal.
 - d). Equipment:
 - i). Heat source shall be capable of delivering steam throughout section and uniformly raising steam temperature above temperature required to affect cure of resin.
 - ii). Install temperature gauges in the following areas:
 - (a). Incoming steam supply.
 - (b). Outgoing steam supply.
 - (c). Between impregnated tube and pipe invert at lining termination point.
 - e). Steam Temperature: 230 °F, minimum.

- f). Minimum Interface Temperature between Liner and Tube: 120 °F.
 - g). Pressure Required to Keep Tube Inflated: Per manufacturer's instructions.
 - h). Time: Per manufacturer's instructions.
 - i). Cool Down:
 - i). Send air through steam cured CIPP liner until liner cools down to 120 °F interface temperature.
 - ii). Once 120 °F has been reached, water may be introduced to finish cooling line down to 90 °F.
 - iii). During release of water, prevent vacuum that could damage newly installed CIPP.
- 2). Hot Water:
- a). Equipment:
 - i). Heat source shall be capable of delivering hot water throughout section and uniformly raising water temperature above temperature required to affect cure of resin.
 - ii). Install temperature gauges in the following areas:
 - (a). Incoming water supply.
 - (b). Outgoing water supply.
 - (c). Between impregnated tube and pipe invert at lining termination point.
 - b). Minimum Interface Temperature between Liner and Tube: 120 °F.
 - c). Time: 3 hours, minimum.
 - d). Cool Down:
 - i). Introduce cool water into CIPP to replace water being drained from small hole made in downstream end.
 - ii). Cool liner to temperature below 90 °F before relieving hydrostatic head.
 - iii). During release of water, prevent vacuum that could damage newly installed CIPP.
- 3). UV: If this method of curing is selected, material shall be a polyester needle felt or fiberglass based CIPP liner impregnated with an isophthalic neopentyl glycol resin.
- a). Curing parameters, such as curing speed, inner air pressure, and wattage, per the manufacturer.
 - b). Optimal curing speed or travel speed of energized UV light sources is determined for each length of liner based on liner diameter, liner thickness, and exothermic reaction temperature.
 - c). Invert liner into pipe with standard pressure drum.
 - d). After completion of inversion process introduce light chain in liner and close ends with couplings.

- e). Remove and discard inner film material after curing to provide optimal quality of final product.
- f). Control panel operating UV curing unit light chain may be pulled on a trailer attached to UV unit.
- g). Flushing of UV cured CIPP liner to reduce styrene residual is not required.

C. Manholes:

- 1. CIPP terminating in manhole shall be cut in shape and manner approved by Engineer.
- 2. Seal pipe openings and fill in annular space using products specified in Part 2 Products.
 - a. CIPP connections at manhole opening shall be watertight seal.
 - b. Install seal per manufacturer's instructions.
 - c. Recheck seal repair after 48 hours. If seal does not hold, continue to repair until there are no leaks.
- 3. Channels: When CIPP is installed continuous through manhole, create per Engineer's instructions. Do not break or shear pipe.
- 4. Inverts:
 - a. Finish manhole inverts to provide smooth transition between connections.
 - b. Use CIPP liner material, an approved epoxy, or similar material to form smooth transition to eliminate sharp edges of CIPP, within host pipe, and in manholes at concrete bench and channel invert.
 - c. Invert rehabilitation shall be compatible with manhole rehabilitation activities.

D. Service Reinstatements:

- 1. General:
 - a. After liner has been cured in placed, reconnect service connections.
 - b. Using previously-performed CCTV, field locate existing and determine number of service connections.
 - c. Service interruptions shall not exceed 24 hours.
 - d. Do not reconnect services from abandoned or vacant lots, unless directed otherwise by Owner.
 - e. Do not reactivate reconnected services until accepted by Village Engineer. This process shall be completed prior to the work described in Paragraph, Liner Cutting, below and before installation of lateral liner.
 - f. Show distance from nearest downstream manhole to reconnected service on record drawings.
- 2. Liner Cutting:
 - a. Cut liner pipe from interior of pipeline using a robotic cutter.
 - b. Holes cut through liner shall be neat and smooth in order to prevent blockage at service connections.
 - c. Cut-in service connections shall be opened to a minimum of 90% of building's sewer flow capacity.
 - d. Recover coupons at downstream manhole and remove.

3. Make connections to existing lateral using elastomeric boots, full-encirclement clamps, or by other method approved by Village Engineer.
4. External Reconnection:
 - a. Service connections to new 8" CIPP shall be reinstated by excavation and reconnecting service with a PVC full saddle tee.
 - 1). Remove appropriate amount of carrier pipe to allow saddle to be directly connected to outside wall of CIPP.
 - 2). Apply epoxy, meeting manufacturer's recommendations, to saddle to ensure watertight seal between saddle and CIPP.
 - 3). Secure saddle with stainless steel bands.
 - 4). After epoxy has set and prior to backfilling, seal open annular space between existing sewer and new liner pipe with nonshrink grout.
 - b. Service lateral connections to new 10" CIPP and larger to be made with an Inserta-Tee manufactured by Inserta Fittings Company. Remove appropriate amount of carrier pipe to allow Inserta-Tee to be installed.

3.07 CONSTRUCTION (Not Used)

3.08 REPAIR/RESTORATION

- A. Site Restoration, General: The Contractor shall be aware of the conditions at each repair location. This shall include but not be limited to trees, shrubbery, landscaping, structures, fences, mail boxes, driveways, curbs, sidewalks, pavements, etc. The Contractor shall videotape all ROE areas prior to use. All pre-construction conditions shall be fully restored as close to its original condition as practicable.
- B. Site Restoration, Grass Areas: Repair sites that are located in grass areas shall be backfilled with native soil and then seeded and mulched Item 659.09 of the City of Columbus CMS including all other items referenced therein. The cost for seeding and mulching shall be included in the unit bid price for the repair.
- C. Site Restoration, Paved Areas: Repair sites that are located in pavement areas shall be restored in accordance with City of Columbus Standard Drawing 1441, latest edition. The cost for pavement restoration shall be included in the unit price bid for the repair.
- D. Acknowledgment of Completion: When working on private property, the Contractor shall obtain Acknowledgement-of-Completion (AOC) from the property owner that work was completed in accordance with the Right of Entry (ROE) agreement. No payment for this work will be made until the copy of AOC is submitted to the Village Engineer.

3.09 RE-INSTALLATION (Not Used)

3.10 FIELD QUALITY CONTROL

- A. General:
 1. CIPP installation shall be free from visual defects such as foreign inclusions, dry spots, keel, boat hull, pinholes, wrinkles, and other deformities.

- a. Defects and deformities may, at discretion of Owner, be cause for rejection of entire liner.
 - b. Correct failed CIPP and defective CIPP from post-installation television inspection or test reports for structural values or thickness as determined by the Village Engineer.
 - c. Method of repair, which may require field or workshop demonstration, shall be approved by the Village Engineer prior to commencement of the Work.
 - d. Remove and replace pipe identified with defects or deformities.
- B. CCTV Visual Inspection: All sewer segments repaired using CIPP liner shall be visually inspected in accordance with SS-2, Sewer Video Recording and Inspection.
- C. Properties Testing:
- 1. Sampling and Measuring:
 - a. Cut 1 12-inch long, minimum, restrained pipe section from cured liner. Samples will be used to satisfy material testing requirements.
 - b. Prepare samples in accordance with restrained sample method referenced in ASTM F1216 or ASTM F2019.
 - c. Take restrained samples from excess cured CIPP at manhole connection where installation was started or terminated.
 - d. Each sample shall be large enough to provide three specimens for tensile testing and five specimens for flexural properties testing.
 - 2. Field Thickness Testing:
 - a. Perform prior to conducting laboratory tests.
 - b. Take wall thickness measurements in accordance with ASTM D2122.
 - c. Make a minimum of four measurements, evenly spaced, on each test specimen.
 - d. Calculate average thickness using measured values.
 - e. Average thickness shall be equal or greater than required design thickness.
 - f. Failure of thickness test shall be grounds for rejection for CIPP liner.
 - 3. Laboratory Testing:
 - a. Send one sample to independent laboratory and test for modulus of elasticity and flexural strength.
 - b. Preparation and testing standards shall be performed in accordance with approved submittals.
 - c. Failure of a test may be grounds for rejection of CIPP liner. Test second sample at direction of the Owner.
 - 4. Resin Sampling:
 - a. Wet-out facility resin mixing equipment shall have a valve downstream of the mixing function and immediately upstream of application of mixed resin to tube where resin samples may be drawn.
 - b. Batch mix facilities, if any, shall provide for sampling of mixed batch.
 - c. Submitted “wet-out” schedule cannot be modified without 24 hour notice to Village Engineer.
 - d. Resin samples shall be drawn at times determined by Village Engineer.

5. Physical samples removed for testing as requested by Village Engineer shall be individually labeled and logged to record the following:
 - a. Owner's Project number and title.
 - b. Sample number.
 - c. Segment number of line as noted on plans.
 - d. Date and time of sample.
 - e. Name of Contractor.
 - f. Location and by whom tested.
 - g. Results of test.
 - h. Street name and address.
 - i. Starting and ending manhole identification number for each length of pipe lined.
 - j. Label as follows:
 - 1). Sample A: Restrain Sample.
 - 2). Sample B: Restrain Sample.

D. CIPP Correction:

1. Correct failed liner or liner deemed unacceptable by the Owner as a result of CCTV inspection, laboratory testing, or thickness testing.
2. Remedy for failed laboratory and thickness testing shall be as shown in the following table:

Pipe Correction			
Test	Required Value	Test Result	Remedy
Flexural Strength	4,500 psi	4,300 to 4,490 psi	10% unit price reduction
	4,500 psi	4,100 to 4,290 psi	30% unit price reduction
	4,500 psi	Less than 4,100 psi	Pipe replacement
Flexural Modulus	250,000 psi	238,000 to 249,000 psi	10% unit price reduction
	250,000 psi	225,000 to 237,900 psi	30% unit price reduction
	250,000 psi	Less than 225,000 psi	Pipe replacement
Thickness	Minimum or design, whichever is greater	≥90% to 100%	No unit price reduction
	Minimum or design, whichever is greater	≥80%, but less than 90%	15% unit price reduction
	Minimum or design, whichever is greater	<80%	Pipe replacement

3.11 ADJUSTING
3.12 CLEANING

(Not Used)
(Not Used)

3.13 DEMONSTRATION
3.14 PROTECTION
3.15 SCHEDULES

(Not Used)
(Not Used)
(Not Used)

END OF SECTION