RESINATING LLC

Your Solution for Sewer Pipe and Manhole Renewal

SECTION 33 XX XX

PIPE REHABILITATION SPECIFICATION USING EIPI TECHNOLOGY

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Existing pipe rehabilitation system including:
   1. Substrate preparation.
   2. Fiberglass expansion liner composite system consisting of fiberglass expansion liners, corbels and other components.
   3. Accessory components including primers, bonding agents, resin and sealants.
   4. Testing and inspection.

1.2 RELATED SECTIONS

A. Section 31 20 00 - Earth Moving

B. Section 03 30 00 - Cast-in-Place Concrete.

1.3 REFERENCES

A. ASTM International (ASTM):
   1. ASTM D3753 Load Rating Test for AASHTO H-20 Load Rating, if required
   2. ASTM D790 Flexural Strength (Axial)
   3. ASTM D790 Flexural Strength (Transverse)
   4. ASTM D695 Compressive Strength (Axial)
   5. ASTM D695 Compressive Strength (Transverse)
   6. ASTM D2584 Ignition Loss of Cured Reinforced Plastics
   7. ASTM D583 Barcol Test

B. ASCE
   1. MOP 145 Design of Close Fit Liners for the Rehabilitation of Gravity Pipes

1.4 SUBMITTALS

A. Submit under provisions of Section 01 30 00 - Administrative Requirements.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Fiberglass strands.
   2. Resin.
   3. Fiberglass mesh for glassing work.
   4. Preparation instructions and recommendations.
   5. Storage and handling requirements and recommendations.
   6. Installation methods.

7. Testing and inspection.

C. Fiberglass expansion liner composite system manufacturer's Sample Warranty.

D. Material Certificates: Certification that fiberglass expansion liner composite system and component materials comply with specified performance characteristics and physical requirements and are supplied by single-source manufacturer.

E. Contractor Certificate: Provide certification from manufacturer that Contractor is an Authorized Resinating Installer.

F. Shop Drawings: Provide shop drawings, including:
1. Drawings showing fiberglass expansion liner diameters and lengths and installation layout. Provide details for special project installation requirements.
2. Details on the type of resin to be used, based on Project conditions and requirements.
3. Details showing pipe access points, excavation pits and other construction details as required to install liners.
4. Plans showing bypass pumping and/or diversion of sewage flows, as required (“Bypass Plan”).
5. Plans showing traffic control measures, as required (“Traffic Control Plan”).
6. Details for accessories, if any.

1.5 QUALITY ASSURANCE

A. Installer Qualifications:
1. Have minimum five (5) years of experience in pipe rehabilitation projects.
2. Comply with manufacturer's warranty requirements.
3. Be an Authorized Resinating Installer as determined by the fiberglass expansion liner composite system manufacturer.
4. Attend necessary job meetings. Provide competent and full-time supervision, experienced mechanics, all materials, tools, and equipment necessary to complete, in an acceptable manner, the fiberglass expansion liner composite system installation.

B. Manufacturer Qualifications:
1. Capable to supply all components of complete fiberglass expansion liner composite system.
2. Minimum of ten (10) years of experience in manufacturing of fiberglass liner composite systems.
3. Capable of providing product and technical support representation during construction, approving an acceptable Installer and suggesting appropriate installation methods.

C. Contractor Inspection: Contractor to inspect fiberglass expansion liner composite material installation. Inspection to include:
1. Compliance with project contract documents.
2. Compliance with manufacturer's published literature and site-specific details.
3. Produce reports and digital photographs documenting each inspection. Make reports available in timely manner to Owner, Engineer, Authorized Resinating Installer and fiberglass expansion liner composite system manufacturer.
4. Substrate examination and cleaning at beginning of liner system installation, at periodic intervals during installation and at final inspection.

1.6 PRE-INSTALLATION MEETINGS

A. Pre-Installation Conference:
1. Establish procedures to maintain required working conditions.
2. Coordinate this work with related and adjacent work and trades.

3. Review special project details and safety protocols.
4. Verify with Owner that planned work complies with fiberglass expansion liner composite system manufacturer's current installation requirements and recommendations.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver materials in factory labeled packaging. Sequence material deliveries to avoid work delays and minimize on-site storage. Follow manufacturer's instructions, recommendations and safety data sheets for material handling and storage.

B. Storage: Do not double-stack pallets during shipping or storage. Cover material top and all sides while stored on-site, allowing for adequate ventilation. Protect material from construction operation, weather, excessive temperatures and prolonged sunlight.

C. Store and manage hazardous materials in accordance with Contract Requirements and Division 1. Remove damaged material from site and dispose of in accordance with applicable regulations.

1.8 PROJECT CONDITIONS

A. Substrate Condition: Proceed with work only when substrate cleaning and preparation work inside pipe is complete and is acceptable for fiberglass expansion liner application. Substrate preparation to comply with fiberglass expansion liner composite manufacturer's guidelines.

B. Weather Conditions: Perform work only when existing and forecasted weather conditions are within manufacturer's guidelines including but not limited to:
1. Do not apply fiberglass expansion liner composite materials in areas of excessive standing or active water.
2. Timely remove standing water caused by precipitation or ground water seepage to maintain acceptable site conditions.

C. Flow from existing active service connections entering the pipe shall be stopped, bypassed or diverted if the flow will affect proper installation.

1.9 WARRANTY

A. Fiberglass expansion liner composite system warranty: fiberglass expansion liner composite manufacturer to provide sample of twenty (20) year warranty for materials and workmanship, including fiberglass expansion liner composite system requirements. Issuance of manufacturer's fiberglass expansion liner composite warranty requires the following:
1. Use products furnished by authorized manufacturer for fiberglass expansion liner composite system.
2. Install fiberglass expansion liner composite system using Authorized Resinating Installer.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Resinating LLC, 2417 Weaver Street, Haltom City, TX 76117, Tel: 817-838-6786, Fax: 817-838-6789, Email: EdRau@resinatingllc.com, Web: http://resinatingllc.com

B. Substitutions: Not permitted.

C. All references to manufacturer in this specification refer to Resinating LLC, the fiberglass

expansion liner composite system manufacturer, unless noted otherwise.

2.2 FIBERGLASS EXPANSION LINER

A. General: Furnish Resinating fiberglass expansion liner manufactured using continuous E-Class fiberglass strands and a premium grade resin suitable for the Project.

B. All liners shall be manufactured using premium-grade, white, UV-resistant pigment throughout the laminate by winding a continuous strand of E-Class or better fiberglass, soaked in resin, around a mandrel. The resin used in manufacturing shall be matched to the environment in which the product will be used for the Project.

C. No fillers may be used in the manufacture of the liners in order to ensure a structurally consistent and strengthened laminate.

D. The laminate shall meet or exceed all structural requirements of ANSI/ASTM D3753, latest edition, Standard Specification for Glass-Fiber-Reinforced liners.

E. The flexural strength in the axial and transverse directions for the installed liner as determined by ASTM D790 will vary depending on thickness of the liner and the diameter of the installed liner but will always significantly exceed the normal industry standard strength in both directions.

F. Furnish fiberglass expansion liners sufficiently stiff to resist expected vertical and horizontal external loads when installed. Pipe stiffness factors for the liner shall be in accordance with ANSI/ASTM Standard Specification for Glass-Fiber-Reinforced Liners as specified on the approval documents for the project as noted on the specification drawings.

G. Unless noted otherwise, furnish fiberglass expansion liners in 1/4”, 3/8” or 1/2" thicknesses consistent with the needs of the Project. Thicker liners are available based on specific project requirements.

H. Each pipe liner will be properly marked and labeled in accordance with the ASTM standard used in the production of the liner. The label shall contain the following information: (1) the ASTM method used, if applicable; (2) the Resinating LLC Job Number; and (3) the Resinating LLC Serial Number, as required.

2.3 ACCESSORIES AND COMPONENTS

A. Primer: All concrete surfaces shall require application of proprietary RESINATING™ Primer.
1. Primer shall not contain volatile organic compounds (VOCs).
2. Primer shall have a workable pot life of at least 4-5 hours at 72° F.
3. Primer shall provide for a recoating time of two (2) hours minimum and 24 hours (24) maximum
4. Primer shall be non-toxic.

B. Bonding Agent: All fiberglass expansion liners shall be affixed to the pipe wall using proprietary Polymeric RESINATING™ Flexible Bonding Agent.
1. Bonding agent shall be unaffected by water, wet/dry cycles or UV radiation.
2. Bonding agent shall not contain volatile organic compounds (VOCs).
3. Bonding agent shall be solvent free.
4. Bonding agent shall have a tear strength of at least 375 pounds per square inch.
5. Bonding agent shall be non-toxic.
6. Bonding agent shall be either trowelable or flowable.

C. Sealant: All joints and seams shall be sealed using the approved resin and fiberglass material recommended and furnished by manufacturer.

PART 3 EXECUTION

3.1 SUBSTRATE INSPECTION AND CONDITIONS

A. Examine the condition of pipe substrates and other conditions affecting work of this section with fiberglass expansion liner composite installer and Owner's independent inspector present and address areas of apparent structural damage or other defects in substrate in shop drawings.

B. Inspect pipe before installation to ensure that conditions are unchanged from the approved shop drawings. Notify Owner, in writing, of defects in substrate preventing installation of fiberglass expansion liner that cannot be rehabilitated by adjusting the liner.

C. Review and ensure compliance with Bypass Plan and Traffic Control Plan before starting installation.

D. Review and ensure compliance with safety requirements, including working in confined spaces and protective equipment for personnel.

3.2 PREPARATION OF SUBSTRATE

A. Clean interior surfaces of pipe of debris, dirt, oil, grease, remains of old coating materials, and any other extraneous materials

B. If present, areas where rebar or other reinforcement have been exposed shall be repaired in accordance with the recommendations of the manufacturer.

C. Pressure wash interior pipe walls to remove loose mortar and debris. Pressure washing levels, used for cleaning, shall be as recommended by the manufacturer.

D. Verify that all voids are identified, and field modifications and adjustments are made to correct such unexpected issues that may be discovered while pressure washing the pipe interior, as recommended by the manufacturer

3.3 GENERAL INSTALLATION GUIDELINES

A. Comply with contract documents and manufacturer's product data, including product application and installation instructions.

B. Maintain adequate ventilation during preparation and application of materials.

C. Grind joints and seams before inserting the liner to allow for a cleaner dust free environment in the lined pipe.

D. Ambient temperature during installation should be maintained between 60^{o} F and 100^{o} F, or as otherwise recommended by manufacturer.

E. Provide access points, excavation pits and other construction details as required to install liners.

3.4 FIBERGLASS EXPANSION LINER INSTALLATION - GENERAL

A. Verify field measurements against approved shop drawings and make adjustments or field cuts to liners as needed.

B. Provide and use suitable means to lift and set the prefabricated fiberglass expansion liners into place in the pipe such that the liners are not subjected to torsion or impact loads due to being dropped or rolled over rocky terrain.

C. Dig a short trench approximately two feet or so longer than the liner sections to be inserted in the run of existing pipe to be repaired, unless another access point is available, for each section of pipe liner. Small trenches are also dug at each end of the run of existing pipe being repaired for access by workman if access via manholes is not feasible.

3.5 FIBERGLASS EXPANSION LINER INSTALLATION – INTERIOR PIPE WALLS

A. Apply Resinating Primer to all wall surface areas receiving fiberglass expansion liner using a plural sprayer or hand applied using brushes.

B. Apply Resinating Bonding Agent to wall surface areas receiving fiberglass expansion liner after Primer is applied. Apply trowelable Bonding Agent using spatulas and apply flowable Bonding Agent using a plural sprayer or hand apply with brushes.

C. The liner should be compressed to a minimum ½" smaller diameter than the pipe to be lined. Load compressed liner into the existing pipe section. This can be accomplished using straps, metal bands, pneumatics, hydraulics, chains, come-a-longs, or booms. The compressed section can be pulled or pushed into place depending on the requirements of the project.

D. Once in place, expand liner against the existing substrate using mechanical, pneumatic or hydraulic expansion equipment. Locate the horizontal seam at 4-5 o'clock or at 7-8 o'clock with 12 o'clock being the top of the pipe.

E. Fill the seam using the trowelable Bonding Agent. After the seam is filled, apply fiberglass mesh and resin in layers over the seam to a minimum of 1/4".

F. Locate all voids 18 square inches or greater that may interfere with the liner adhering to the pipe substrate before installing the liner. If the voids are not repaired before installing the liner, fill the voids before returning the line back into service, as follows:

1. Drill injection ports into liner to inject fill material furnished by manufacturer behind the liner.

2. For long voids drill an injection port at both ends of the void. Inject the material into the first port until the material exits the second port.

3. When the material begins flowing from the second port, plug the first port, inject additional material in the second port, and then then plug the second port.

4. After the fill material fully sets, remove the plugs and insert putty or paste grade resin furnished by manufacturer into the ports. Then grind and glass over the ports with ¼" of fiberglass and resin.

3.6 TESTING AND ACCEPTANCE

A. At Owner's expense, use cameras or visually observe that all liners, joints and seams are smooth and free of areas deficient of resin and any other defects that will affect the life expectancy of the fiberglass expansion liner composite system.

B. At Owner's expense, conduct inspection of all pipe sections using Electro Scan Inc. FELL technology system or CCTV to verify that no measurable defects remain in the rehabilitated pipe sections that could contribute to future inflow and infiltration.

C. Manufacturer recommends that Owner perform, at its cost, an additional Electro Scan Inc. or CCTV inspection of the pipe within one (1) year to verify that the fiberglass expansion liner composite system is performing as required.

3.7 CLEAN UP

A. Remove all tools, equipment and remaining product on-site. Dispose of debris and damaged product in accordance with applicable regulations.

B. Maintain work area in a neat and workmanlike condition. Remove empty cartons and rubbish from site daily.

END OF SECTION