

SECTION 026610
REINFORCED PLASTIC MORTAR (RPM) LINER PIPE FOR SLIPLINING (S-67)

1. SCOPE

- 1.1 This specification covers constant outside diameter reinforced plastic mortar (RPM) pipe intended for use as a liner to rehabilitate existing sewer pipelines conveying sanitary sewage, storm water and those industrial wastes and corrosive fluids for which the pipe is determined to be suitable.
- 1.2 The RPM pipe furnished under this specification shall be a composite structure manufactured from thermosetting resin, glass fiber reinforcement and aggregate. The RP shall have a chemical resistant resin inner surface liner meeting ASTM specification D3262. This liner shall be capable for conveying sewage flows with a pH range lower than 3 and higher than 11.
- 1.3 Liner pipe furnished under this specification shall be furnished in classes designated as GRAVITY, intended to operate at up to 25 feet of water head (10 psig) external pressure, and 115 feet of water head (50 psig) internal pressure.

2. MATERIALS

- 2.1 The structure of the pipe shall be composite consisting of a resin binder, an aggregate filler and fiberglass reinforcement.

Resin - The resin shall be catalyzed isophthalic polyester resin.

Aggregate - The aggregate shall be a siliceous sand conforming to the requirements of the current specifications for concrete aggregate (ASTM C-33), except that the requirements for gradation shall not apply.

Fiberglass - The fiberglass reinforcement shall be a borosilicate "E" type glass roving with a polyester compatible finish.

Liner - The chemical resistant resin liner shall be a reinforced thermosetting resin without aggregate filler.

- 2.2 The gaskets used with this pipe shall have a round cross section and shall conform to the requirements of ASTM F-477, "Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe". Gasket material shall be chemically resistant to the fluids described in Section 026610.1.2.

3. PHYSICAL REQUIREMENTS

- 3.1 Axial Compressive Strength - Each length of liner pipe shall have sufficient strength to withstand, without structural damage, the axial compressive proof load specified below:

<u>Nominal Size (Inches)</u>	<u>Axial Compressive Proof Load (1 lbs.)</u>
36	90,000
42	110,000

when tested in accordance with the following:

The axial compression proof load shall be uniformly applied to the bearing faces of the liner pipe section for a period of not less than 30 seconds. There shall be no structural damage to the liner pipe wall. The pipe shall pass the hydrostatic soundness test after withstanding the axial compressive proof load.

- 3.2 Hydrostatic Soundness - Liner pipe shall be capable of withstanding, without leakage, the hydrostatic proof pressure below:

<u>HYDROSTATIC PROOF PRESSURE</u>			
<u>Rated Operating Pressure psi (feet of water)</u>		<u>Hydrostatic Proof Pressure psi (feet of head)</u>	
Gravity	(25)	25	(60)
50	(115)	100	(230)

when tested in accordance with the following:

Place the liner pipe in a hydrostatic pressure testing machine which seals the ends and exerts no end loads. Then fill the liner pipe with water, expelling all air, and apply internal pressure at a uniform rate until the specified test pressure is reached. The pressure shall be maintained for one minute to assure hydrostatic soundness.

- 3.3 **Joints** - Inverted bell and spigot joints shall be furnished. The outside diameter of the liner pipe shall be constant over its entire length and shall be sealed with a solid, uniform cross section gasket conforming to Section 026610.2.2. The gasket shall be contained in a groove and shall not support the weight of the pipe when two sections are joined. The joint assemblies shall be so formed that when pipe sections are drawn together, the pipe shall form a continuous watertight conduit, and shall provide for slight movements of any pipe in the pipeline due to contraction, settlement, or lateral displacement.

- 3.4 **Stiffness Factor** - The fitness factor shall be as follows when tested in accordance with the method of ASTM D-3262.

STIFFNESS FACTOR REQUIREMENTS

<u>Nominal Size (Inches)</u>	<u>Minimum Stiffness Factor (lbs.-in.2/in.)</u>
36	8,690
42	13,799

- 3.5 **Beam Strength** - The beam strength of liner pipe shall be as follows when tested in accordance with ASTM D-3262. This is a design qualification requirement and a copy of the manufacturer's test report shall be the basis of acceptance.

MINIMUM BEAM STRENGTH

<u>Nominal Size (inc.)</u>	<u>Beam Load, P (lbg)</u>	<u>Alternative Axial Flexure Min. Longitudinal Tensile Strength (lbf/inch circum.)</u>	<u>Strength Requirements Min. Longitudinal Compressive Strength (lbs/inch circum.)</u>
36	----	700	700
42	----	800	800

4. DIMENSIONS AND PERMISSIBLE VARIATIONS

- 4.1 **Inside Diameter** - The diameter of the liner pipe, except at the joints, shall not be less than the nominal by more than one and one-half percent or one quarter inch, whichever is greater.
- 4.2 **Laying Lengths** - The laying length of each line pipe section shall be as follows:
- Inverted Bell and Spigot - 20 feet, 3 inches ∇ 1 inch
- 4.3 **Wall Thickness** - The minimum wall thickness of the liner pipe barrel shall be as follows:

<u>Nominal Size, Inches</u>	<u>Minimum Wall Thickness, Inc.</u>
36	0.28
42	0.32

5. WORKMANSHIP, FINISH AND APPEARANCE

- 5.1 The inside surface of each liner pipe shall conform to the requirements of ASTM D-3262 and shall be free of bulges, dents, ridges, or other defects that result in a variation of inside diameter of more than one-eighth inch from that obtained on adjacent unaffected portions of the surface.
- 5.2 Joint sealing surfaces shall be free of dents and gouges that will affect the integrity of the joints.
- 5.3 No glass fiber reinforcement shall penetrate the interior surface of the pipe wall.

6. CONSTRUCTION

6.1 General

- a. **Insertion Pits** - The Contractor shall provide all necessary pits to completely reline the sewers. The location of any access pits shall be subject to the approval of the Engineer. The number of access pits shall be minimized.
- b. **Access Pits and Lateral Connection Excavations** - Access pits shall be constructed to the minimum size necessary for insertion of liner pipe. All pits shall be constructed with properly applied vertical side support. At access pits, lateral service connections and at all points where liner pipe is exposed, the Contractor shall encase liner and fittings as detailed in the plans.
- c. **Pipe Stockpiling and Handling** - Pipe and fittings shall be stockpiled in a safe manner at each contractor staging area or liner pit location. The stockpiling shall be arranged to cause a minimum of interference to pedestrian and vehicular traffic. No stockpiling will be permitted on the opposite side of the street from construction without prior approval of the Engineer. When handling liner pipe, the Contractor shall take all precautions necessary to avoid damage to the pipe. Dragging of the pipe over sharp objects shall be avoided. Pipe with deep cuts, scratches or gouges shall be rejected and replaced.

6.2 Liner Pipe Installation

- a. **General** - Liner pipe grade shall be maintained equal to the grade of the sewer being relined. As the work progresses, the interior of the pipe shall be cleared of all dirt and debris. At times when work is not in progress for whatever reason, open ends of pipe or fittings shall be protected.

Pipe shall not be installed if the condition of the existing sewer line is unsuitable, or if the weather is such that anticipated sewer flows will be in excess of those flows maintained during insertion.

The Contractor shall make all necessary arrangements and provide all necessary equipment to maintain sewage flows at all times. This shall be accomplished by allowing flows to pass around and through the liner pipes or by other means acceptable to the Engineer.

- b. **RPM Liner Pipe Installation** - Within the insertion pit, the top half of the exposed existing pipe is to be removed to the springline. The bottom half is to be left in place where it shall serve as a cradle for the liner pipe. The liner pipe shall be either jacked into the existing pipe or pushed as determined by the Contractor. An aqueous solution of Bentonite may be used as a lubricant to minimize jacking loads. A tapered guide shall be attached to the leading end of each section to be installed to help pipe clear small obstructions. A jacking ring shall be used to distribute load as per manufacturer's recommendations for installation of the liner pipe. For each section to be laid, insertion shall be one continuous operation until the planned termination point is reached. Closure in the insertion pit after jacking may be accomplished using a long bell closure kit or other methods, as approved by the Engineer.

Pipe jointing shall be carried out in strict accordance with the manufacturer's recommendation. Total jacking loads shall not exceed the values recommended by the manufacturer. The Contractor shall provide a suitable means for measuring jacking loads, and shall monitor the load as the liner pipe is being installed. If at any time the load appears to rise non-uniformly, indicating possible obstruction of the pipe, jacking operations shall be terminated and the obstruction removed before continuing.

- c. **Manhole Replacement** - In those places where the entrance pit is excavated at an existing manhole, the manhole shall be repaired or it shall be replaced with a new manhole conforming to the section on manhole construction and, further, in accordance with Standard Details included in the drawings.

- 6.3 **Manholes** - Pipe at manholes shall be grouted one pipe diameter back from inside edge of manholes. The liner pipe shall be cut out at manholes as detailed after insertion and grouting. The method of cutting shall be such as to leave a smooth clean straight plastic edge. Where detailed or required mild steel ties shall be provided as required to tie the liner to the manhole benching. The liner pipe shall be suitably struttred or blocked during grout and concrete placement so that no bowing or other deviation from a parallel sided channel occurs.

- 6.4 Pipe grade shall be maintained within the limit shown on the drawing. The Contractor shall be responsible for and take all necessary precautions to ensure that no liner pipe flotation, adverse pipe grades, or pipe rotation about the vertical axis results, or collapse of the liner pipe occurs during grouting operations. Multiple low pressure application grout lifts are recommended. Grouting shall be in accordance with Section 027610.3.7.

- 6.5 **Measurement and Payment** - Unless indicated otherwise in the Proposal, Reinforced Plastic Mortar Pipe for Sliplining shall be measured and paid for by the linear foot, complete in place.