

CURED-IN-PLACE CHIMNEY LINER

COR+GARD® CHIMNEY SEAL by AP/M PERMAFORM

1. INTENT

- 1.1 This specification covers requirements and test methods for the rehabilitation of manhole chimneys without excavation. The manhole chimney is accessed through the existing manhole cover. The rehabilitation is accomplished by the installation of a one-piece resin impregnated stretchable liner that is cured under pressure. The liner is pressed against the existing chimney by a pressurized bladder until the thermo-set resin has cured ambiently. The liner shall start at the manhole cover seat and overlap onto the existing cone/corbel section of the manhole. The cured-in-place manhole chimney liner shall be bonded to the contours of the existing structure from the base of the casting to line and seal the chimney. It shall significantly increase structural integrity, eliminate inflow and infiltration (I&I), and provide a surface resistant to sewer gases.

2. GENERAL

- 2.1 The rehabilitation is accomplished using a stretchable-coated non-woven textile tube of particular length and a silicate based thermo-set resin with physical and chemical properties appropriate for the application. The liner is vacuum impregnated (saturated) on-site with the silicate based thermo-set resin. The saturated liner is then lowered into the manhole and is temporarily held in position. The installation device is then lowered and properly positioned inside of the liner. The bladder on the installation device is then pressurized so that the liner is pressed against the existing structure. Once the resin-saturated liner is cured, the installation device is removed. The liner is then trimmed flush with the manhole cover seat.

3. MATERIAL

- 3.1 The liner shall be continuous in length and consist of one or more layers of a stretchable absorbent textile material. The liner is designed to prevent I&I, withstand hydrostatic pressures, bridge small voids of missing mortar or brick segments, withstand multiple freeze/thaw cycles, and conform to the contours of the existing structure. The saturated liner shall have uniform thickness and have excess resin distribution that when compressed at installation pressures will meet or exceed the design thickness after cure.
- 3.2 The exposed layer of the stretchable liner shall be coated with an impermeable, translucent, flexible membrane. The liner shall be marked correlating to the address or manhole identification number, and date of installation.
- 3.3 The liner shall be a one-piece assembly sewn in the shape of a tube at a set length to seal the casting and to overlap onto the cone/corbel. The sewn seams shall be sealed using a tape compatible with the liner coating. The liner wall thickness shall be uniform throughout. The liner will be capable of conforming to offset bricks and grade rings, missing mortar gaps, and disfigured and deteriorated chimneys.

4. RESIN SYSTEM

- 4.1 The resin system shall be a corrosion resistant silicate resin, containing 100% solids and no volatile organic compounds (VOC). The catalyst system when properly cured within the stretchable liner, forms a tenacious bond with well prepared surfaces, withstands multiple freeze/thaw cycles without cracking, and meets the physical properties stated herein.

Table 1 Structural Properties of Cured-In-Place Chimney Liner

PROPERTY	TEST	MINIMUM VALUE
Compressive	ASTM D 695	1500 psi
Bond	Peel Test	Concrete Failure
Hardness	ASTM D 2240	74
Freeze/Thaw Resistance	Simulated Freeze/Thaw	No cracking or bond failure

5. DESIGN CONSIDERATIONS

- 5.1 The existing structure is carrying the soil and live loads.
- 5.2 The liner will only be subjected to hydrostatic pressure; therefore the pressure exerted on the liner will be uniform around the structure, placing the liner in compression. Therefore, the minimum liner thickness (t_{min}) shall be based on the following formula;

$$T_{min} = \frac{(.036 \text{ lbs/in}^3 * h * D * FS)}{2(C)}$$

H=Height of liner in inches
D=Diameter of liner in inches
FS=Factor of safety (2 is suggested)
C=Compressive strength of liner in psi
.036lbs/in³ unit weight of water

6. INSTALLATION RECOMMENDATIONS

- 6.1 Safety – All precautions for safety will meet or exceed OSHA regulations. Areas of concern are traffic, PPE, confined space (if necessary), and small tool safety. MSDS sheets for the resin and first aid kit shall be kept on site.
- 6.2 Preparation – All surfaces to be lined must be thoroughly pressure washed to a clean and sound substrate. Other alternatives to clean the structure may be used along with pressure washing such as an abrasive blasting. The existing casting shall be cleaned using a grinder or by sand blasting. Large voids and missing bricks shall be filled with PERMACAST® PATCH or equal to provide an area to which the liner will adhere. Smaller voids and missing mortar may go un-patched, since these areas will be filled with excess resin. Steps that are located in the area to be lined shall be removed.
- 6.3 Vacuum Impregnation – The liner shall be vacuum impregnated (saturated) on-site under controlled conditions. The resin shall be pre-measured at the manufacturing plant prior to shipment. The volume of resin used shall be sufficient to fill all voids in the liner material at nominal thickness and diameter. No dry or unsaturated areas in the liner shall be acceptable upon visual inspection.
- 6.4 Installation Device – The liner is placed with the saturated resin side facing the substrate to allow for resin migration. Once the liner is placed in the manhole and rested on the spacing rings, then the installation device is inserted inside the

liner. The spacing rings located on top of the manhole allow the installation device to rest at the correct depth. Once the installation device inserted, the bladder is pressurized. The installation device stays in place and pressurized until the liner is cured.

6.5 Curing – The liner is cured at ambient temperatures as it is pressed firmly against the structure. The curing time must take into consideration the resin system, ground conditions (temperature and moisture level), and weather conditions. Typically, one hour is needed to cure the liner. A curing log shall be documented the cure time, pressure, resin usage, and other pertinent information.

6.6 Trimming – Once cured, the installation device is removed and the liner is trimmed at the manhole cover seat.

7. COMPLETED LINER

7.1 The finished cured-in-place chimney liner shall be continuous from the manhole cover seat to the overlap onto the cone/corbel section. The liner shall provide a smooth surface that conforms to the existing structure. The liner shall be free of dry spots and delamination. The finished product must provide an air and watertight corrosion resistant liner protecting the manhole chimney.

8. RECOMMENDED INSPECTION AND TESTING PRACTICES

8.1 The liner shall be visually inspected to insure bonding, resin saturation, complete cure, and a smooth surface free from cracks or significant hollow spots.

9. PAYMENT

9.1 Unit price shall include preparation and installation for chimneys 20" to 30" in diameter up to and including 24" deep. Additional depths shall be in 3" increments. Mobilization, traffic control and severe leak control are itemized separately.