

Triplex™ Liner System

STANDARD SPECIFICATIONS

CURED-IN-PLACE STRUCTURAL LINER
Designed for Structural Repair and Protection
of Wastewater and Stormwater Sewers.

- Structural Sewer Rehabilitation
- Corrects In-filtration & Ex-filtration
- Stops & Prevents Further Chemical Corrosion
- Also for Preventive Maintenance in New Structures

Specifically designed for use in Sewer Manholes,
Catch Basins, Lift Stations, Wet Wells, Vaults,
and Stormwater Culverts & Pipes



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Triplex™ Liner System

STANDARD SPECIFICATIONS

1. PRODUCTS

Triplex-11600 Liner - Multiple structural fiberglass layers with a non-porous membrane bonded between the layers of fiberglass, with a total fabric weight of 116 oz. per square yard, saturated with 100% solids epoxy, cured-in-place, and bonded to the existing structure.

Triplex-6800 Liner - Multiple structural fiberglass layers with a non-porous membrane bonded between the layers of fiberglass, with a total fabric weight of 68 oz. per square yard, saturated with 100% solids epoxy, cured-in-place, and bonded to the existing structure.

Triplex-5600 Liner - Multiple structural fiberglass layers with a non-porous membrane bonded between the layers of fiberglass, with a total fabric weight of 56 oz. per square yard, saturated with 100% solids epoxy, cured-in-place, and bonded to the existing structure.

Triplex-4400 Liner - Multiple layer composite with non-porous membrane mechanically bonded between the layers of polyester fiber or 2 layers of 12 oz. PSY woven roving fiberglass, saturated with 100% solids epoxy, cured-in-place, and bonded to the existing structure.

2. MANUFACTURER/DISTRIBUTOR/INSTALLER

Manufacturer: McNeil Technologies LLC
404 Stewart Street, Bonifay, Florida 32425
Phone: (850) 687-9696

Distributor/Installer: Please contact Manufacturer for the Distributor/Installer in your area.

3. PRODUCT DESCRIPTION

Usage: The Triplex™ Liner System is a cured-in-place structural liner designed for use as a non-porous, multi-layer structural system for rehabilitation for structures such as manholes, pump stations, wet wells, vaults, storage tanks, large diameter pipe, and corrugated culvert pipe. It provides an impervious water and sewer gas resistant membrane, layered between layers of structural fiberglass or polyester fiber. Therefore, the liner system is ideal for correcting H₂S gas deterioration, infiltration and exfiltration problems in structures of most any shape or size.

This waterproof liner system completely seals off infiltration and exfiltration. The epoxy resins used in conjunction with the fiberglass liner fabric are resistant to gases and chemicals typically encountered in domestic sewer systems. The liner permanently adheres to wet or dry surfaces of brick, concrete, PVC, and ductile iron; it prevents further deterioration, infiltration, and exfiltration, while providing structural reinforcement to the existing structure, and provides a chemical and sewer gas resistant protective lining system. Other epoxy or vinyl-ester resins may also be used in conjunction with the Triplex Liner for special chemical and industrial applications.

The Triplex™ Liner System is manufactured in four (4) standard liner weights that are designed for varying depths and varying structural conditions. These five liner designs provide the end-user with the right choice for fulfilling lining needs ranging from preventive maintenance to very serious structural problems with infiltration and/or exfiltration.

Each liner is a type that allows rehabilitation of concentric, eccentric or flat top structures without removing the ring top section or corbel. This minimizes traffic disruption and eliminates the need for road repairs. All liner material and components are custom fabricated at the McNeil Technologies LLC, manufacturing facility to fit the size and shape of each individual structure. Structure measurements are taken and liners are manufactured prior to commencement of the liner installation to minimize the on-site field time required for the liner installation.

Materials and Liner Installation System:

The 4400 series is a three-layered composite system. The 4400 is designed for structures up to 8' in depth. Layer #1 is non-woven polyester or 12-oz. structural fiberglass, impregnated with a modified epoxy resin and bonded to the existing substructure. Layer #2 is a non-porous membrane of special synthetic materials mechanically bonded between layer #1 and layer #3. Layer #3 consists of non-woven polyester or 12-oz. structural fiberglass that is saturated with epoxy resins, forming a smooth interior wall to the host structure.

The 5600 series is a three-layered composite system with a total pre-saturated fabric weight of 56-ozs. per square yard. The 5600 is designed for structures up to 29' in depth. Layer #1 is 18-oz. structural fiberglass impregnated with a modified epoxy resin and bonded to the existing substructure. Layer #2 is a 20-oz. non-porous membrane of special synthetic materials bonded to layer #1 and layer #3. Layer #3 consists of 18-oz. structural fiberglass saturated with epoxy and bonded to the nonporous membrane, forming a smooth interior wall to the host structure.

The 6800 series is a three-layered composite system with a total pre-saturated fabric weight of 68-ozs. per square yard. The 6800 is typically designed for structures up to 38' in depth. Layer #1 is 24-oz. structural fiberglass impregnated with a modified epoxy resin and bonded to the existing substructure. Layer #2 is a 20-oz. non-porous membrane of special synthetic materials bonded to layer #1 and layer #3. Layer #3 consists of 24-oz. structural fiberglass saturated with epoxy and bonded to the nonporous membrane, forming a smooth interior wall to the host structure. For structures deeper than 24 feet, or for structures experiences heavy infiltration, additional layer(s) of fiberglass may be added as needed.

The 11600 series is a three-component composite system with a total pre-saturated fabric weight of 116-ozs. per square yard. The 11600 series is designed for culvert pipe and manhole type structures up to 55' in depth. Component #1 is (2) 24-oz. structural fiberglass layers impregnated with a modified epoxy resin and bonded to the existing substructure. Component #2 is a 20-oz. non-porous membrane of special synthetic materials bonded to layer #1 and layer #3. Component #3 consists of (2) 24-oz. structural fiberglass layers saturated with epoxy and bonded to the nonporous membrane, forming a smooth interior wall to the host structure. Additional layer(s) of fiberglass may be added as needed.

The standard impregnating resin for typical domestic wastewater sewer system liners is a modified Polyamide Bisphenol "A" Epichlorodhydrin system that is field applied. After the resin is applied, the liner is lowered into the manhole where, in most cases, it is cured in place with a temperature inversion system of air pressure and steam heat injection. Most liners are cured within two hours and become a structural monolithic wall bonded to the host structure. Other chemical and industrial applications may require alternate resin system depending on the site conditions and chemicals present in the structures. In these cases the Owner shall supply an analytical report of chemicals present to McNeil Technologies LLC. The resin system used in these cases is determined on a case-by-case basis.

Sizes: Each liner is custom fabricated to fit the individual structure. There is no standard configuration in manholes and many other structures; therefore, exact measurements must be completed and submitted prior to manufacturing each liner. McNeil Technologies LLC provides diagrams for location, configuration, measurements, site & structure conditions, notes and observations.

4. INSTALLATION PROCESS

Cleaning: All surfaces of the host structure are to be cleaned with a high-pressure hydro-jet sprayer with an operating pressure of at least 4,000-psi. After pressure cleaning, surface may be cleaned with degreaser or other solvents, as needed, in order to remove any film or residue on the surface. Structure shall then be pressure rinsed with water.

Final Preparation: All incoming laterals and main truck line openings shall be properly trimmed and grouted with hydraulic or Portland Type II Cement, forming a fillet between the structure wall and each pipe. All inlet and outlet pipes should be trimmed so they do not extend into the structure more than two inches. Such application of grout shall extend at least six inches from the outlet onto the wall area. Manhole steps shall be removed flush to within ½" of the structure wall. Any remaining protrusion shall be grouted over to provide smooth surface for the liner.

Benches, walls, and floors shall be repaired or refinished as appropriate, using chemical grout, hydraulic cement or Portland type II cement. Bench areas and floors shall be lined with Triplex™ Liner System materials saturated with the epoxy resin and placed in the bottom, extending approximately 6 inches up the wall section, so as to overlap with the liner wall section.

Manhole Liner Installation:

Once the liner is fully saturated with resin at the job site, it shall be lowered into the structure to the pre-marked position at the cover seat of the structure entrance. The liner shall form a monolithic structure permanently connecting the ring & cover seat to the chimney, corbel, walls, and benches. Unless otherwise required, the liner will end at, but include, the bench. In cases where invert channel lining is required, the sewage flow must be stopped for a minimum period of 3 hours, and should be a separate cost item.

Normal installation procedures do not require the restricting or bypassing of the main trunk line in manholes where the sewage flow is contained within the channels, and channel lining is not required.

In cases where channel is required to be lined, the same process may be used as on the bench area however, the sewage flow must be stopped. Channels may also be lined with a hand lay-up method using EPOSeal™ fast setting mastic and fiberglass. Using the hand lay-up method, the channel shall be dry and free of infiltration of groundwater. The channel will receive not less than 1 24-oz structural fiberglass layer along with structural fiber reinforced epoxy mastic. Once the channel lining is cured, additional layers may be applied as needed. If channel lining is required it shall be specifically noted in the liner proposal or the client's quotation request.

The Triplex™ Liner for manholes shall be pressurized with air or water, and cured with steam, ambient or heated air, or ambient or heated water. Most typical Triplex™ manhole liner installations will be pressurized at 432-1,008 lbs. per square foot, depending on the condition of the structure and the amount of hydrostatic pressure from incoming infiltration.

Pump Station, Wet Well and Vault Installation:

All pumps, pipes, and switches shall be removed from the structure, providing the Triplex™ Liner installer an empty structure. Unless otherwise specified by the owner, the liner will include walls, the floor, and the underside of top slab. The underside of the top slab may be lined in conjunction with the walls and floor, or it may be coated with EPOSeal™ Mastic. The underside of the top slab may also be lined by removing the top slab for installation of the liner and applying Triplex™ materials or EPOSeal™ Mastic, then allowing it to cure at ambient temperature. Removal of the top slab method will allow the top slab to be removed in the future.

Once the liner is fully saturated with resin, it shall be lowered into the structure to the appropriate pre-marked position at structure entrance. In the case of large or non-cylindrical structures, the liner may be installed in sections with multiple cure times. The liner shall form a monolithic structure permanently connecting the walls and floor of the structure (and top slab where applicable).

Pump stations and larger structures are typically pressurized at a minimum 300 lbs. per square foot, with major infiltration being stopped prior to installation. This is due to the limited weight of the deck slab restricting the amount of internal pressure that can be applied during the installation process. The liner may also be pressurized and cured-in-place at ambient temperature by filling the structure with water to approximately one foot above the surface area to be lined. Depending upon specific site conditions, the water method is preferred for structures such as square or rectangular manholes, or vaults and large pump stations.

Culvert/Pipeline Installations: The Triplex™ Lining System is designed for pipes from 12" to 96" in diameter. Once the liner is saturated with resin, it is lowered into the pipe and then pulled through the section to be lined. A dual inflation canister system will be attached to the liner on each end. Air pressure and steam heat will be injected from one end and the other end will be equipped with an exhaust valve to control the amount of pressure within the structure. The liner will cover the entire circumference of the pipe or the section of pipe, or may be installed from waterline-to-waterline.

Point repairs may be necessary to provide a smooth surface that will allow the insertion of the liner through the pipe. Sewage flow control will be required during the installation process. Bypass pumping will be required for pipes to receive liner to entire circumference of the structure. In the case of waterline-to-waterline installation, the

sewage may continue to flow during the process, but shall be controlled to provide Triplex™ installer a consistent flow-line.

Curing Process: Once positioned inside the structure, the liner is pressurized with air or water. It is then cured with steam, ambient or heated air, or ambient or heated water. Most typical installations are heated by a temperature inversion system of pressurization with steam injection and a high velocity hot air column. This creates a steam/convection oven atmosphere which brings the liner temperature to approximately 150° to 190° F. The liner is heated for approximately one to three hours. The actual curing time will generally be based on the size of the structure. Regardless of curing process, the Triplex™ Liner System will be fully covered under Triplex™ warranty.

Upon completion of the liner curing process, the inflation bladder shall be removed, all lines reopened. and the excess liner cut off at the manhole cover seat or structure opening.

5. AVAILABILITY AND COST

Availability: The Triplex™ Lining System is available in all major marketing areas in the United States, Canada, Australia, Mexico and Western Europe.

Cost: The Triplex™ Liner System requires custom manufacturing and installation procedures tailored for each structure. The end result is a long-term solution to infiltration and H₂S gas deterioration, with true value spread over the life of the liner.

6. WARRANTY

McNeil Technologies LLC and the Triplex™ Authorized Licensed Installer, jointly provides their standard Ten (10) Year unlimited and non-prorated Materials Warranty and One (1) Year Labor Warranty for all Triplex™ Liners. Triplex™ fabrics and resins are warranted to be free of defects in materials and workmanship, to prevent infiltration, prohibit root intrusion and provide a surface coating resistant to sewer gases and chemicals typically found in domestic sewer collection systems. This warranty is for the repair or replacement of the liner as needed. Labor and Materials Warranties are as follows:

Triplex™ Liner System for Manholes, Sewage Pump Stations, Wet Wells & Culverts
Unlimited, Non-prorated Ten-Year Materials and One-Year Labor

McNeil Technologies LLC does not certify the structural integrity of existing structure or substructure, but the liner system will eliminate further deterioration due to sewer gases and significantly increase the life of the existing structure. In the case of industrial or chemical applications, warranty will be provided on a case-by-case basis.

7. MAINTENANCE

Although no maintenance is anticipated for decades, the Triplex™ Liner System is easily repaired. Small holes or cracks can be repaired with EPOSeal™ Mastic. Larger areas may be repaired using fiberglass material coated on both sides with EPOSeal™ Mastic for greater structural integrity. The liner may be core drilled through for the addition of incoming lateral lines. EPOSEAL™ Mastic Grout is recommended for use as a seal between the new line and the liner wall.

9. TECHNICAL SERVICE

Manufacturer:

McNeil Technologies LLC

404 Stewart Street

Bonifay, Florida 32425

Phone: (850) 687-9696

Email: ronmcneil2012@gmail.com

Website: www.mcneiltec.com