

SPECIFICATION FOR

**PROTECTIVE LINING SYSTEM FOR CONCRETE MANHOLE/LIFT STATION
CONES AND FLAT SLAB TOPS 03/09**

With

Polypropylene (PE) and/or Fiberglass Reinforced Plastic (FRP) Liners

(A) SCOPE:

Furnish a prefabricated Polyethylene (PE) and/or Fiberglass Reinforced Plastic (FRP) liner to be installed in concrete cones and flat slab tops which is resistant to the chemical environment normally found in wastewater transmission systems. The PE and/or FRP liner shall be a non load-bearing component integrally cast with and anchored in new precast concrete manhole/lift station/wet well cones and flat slab tops during the casting process at a precast concrete manufacturing facility.

(B) POLYETHYLENE (PE) AND/OR FIBERGLASS REINFORCED PLASTIC (FRP) CONE/FLAT SLAB TOP LINER:

- 1.0 The prefabricated cone and flat slab top liners shall be a one piece PE and/or FRP composite construction manufactured in diameters corresponding to the inside diameter of the precast concrete structure.
- 1.1 PE and/or FRP cone liners shall incorporate a lined opening of a diameter to accept a grade ring protective liner with a 24 inch diameter access opening (see "GU Convertible Collar").
- 1.2 PE and/or FRP flat slab top liners shall incorporate a lined access opening equal in height to the thickness of the precast concrete structure. Access openings shall be sized and configured for hatches or the traditional round cast iron frame and cover with concrete grade rings or GU ABS grade rings.
- 1.3 Alternatively the flat slab top liner may incorporate a lined opening of a diameter to accept a grade ring protective liner with a 24 inch diameter access opening (see "GU Convertible Collar")
- 1.4 Cone and flat slab top liners shall incorporate an outward facing horizontal return on top of the opening that will be flush with the top of the precast concrete section.
- 1.5 The outside surface of the PE and/or FRP cone/flat slab top liner shall have ribs molded in opposing directions on the vertical axis, studs molded in opposing directions, PE bridges, steel coils, a coating of multi-faceted aggregate or a combination thereof. All bonding mediums to ensure adequate anchoring with the precast concrete section and meeting a pressure test of 1 bar (14.7 PSI) or the prescribed ASTM criteria for vacuum testing of concrete sewer manholes.

(C) MATERIALS:

- 1.0 POLYETHYLENE (PE)
- 1.1 Minimum thickness – 0.24" (6mm)
- 1.2 Colour – dull mustard/goldenrod

1.3 Hardness – 80 Rockwell (R scale)

2.0 FIBERGLASS REINFORCED POLYURETHANE COMPOSITE (FRP)

2.1 Minimum thickness – 0.16” (4mm)

2.2 Glass fiber – Type E, Min fiber length – 0.625 inches. Content by weight – 10%-12%

2.3 Inert filler content by weight – 10%-13%

2.4 Aggregate bonding medium – processed sand containing crushed & uncrushed dry and cleaned semi-round particles in the 2-3mm size range.

2.5 Colour – dull mustard/goldenrod

(D) PHYSICAL PROPERTIES:

1.0 Abrasion resistance - Falling Sand (ASTM D968) Thickness of material removed passes

Passes	0-5	5-10	10-15	15-20	20-25	Total for 25 passes
Thickness removed	.04 mil	0.04 mil	0.6 mil	0.04 mil	0.12 mil	1.2 mil

1.2 Density of FRP Polyurethane Hybrid Composite (ASTM D1622) - 1.17g/cm3

1.3 Shore "A" Hardness Durometer (ASTM D2240) - Exceeds 90 on scale

1.4 Percolation Test - Water absorption of top surface - 0.032%

1.5 Thermal shock (CSA-B45-M93) 100 thermal cycles- no sign of surface defects

2.0 Chemical Resistance

2.1 Chemical Resistance (Selected Reagents) (ASTM D1308)

Nitric Acid 69%	No surface Degradation - Surface Staining
Hydrochloric Acid 60%	No surface Degradation
Ammonia 28%	No surface Degradation
Sodium Hydroxide 5.25%	No surface Degradation
Sulfuric Acid 50%	No surface Degradation
Sulfuric Acid 70%	No surface Degradation
Sulfuric Acid 80%	No surface Degradation
Acetone	No surface Degradation
Unleaded Gasoline	No surface Degradation
Turpentine	No surface Degradation
Acetone Immersion (ASTM. D2152)	No Attack

(E) INSTALLATION IN CONCRETE (PRECAST):

1.0 The PE and/or FRP cone and flat slab top liner shall be cast integrally within monolithic precast concrete manhole riser section(s) or lift station/wet well section(s) in accordance with the liner manufacturer’s recommendations and specifications.

1.1 The “Wet Cast” method is the recommended precasting process for lift station/wet well liners.

1.2 Inside surfaces of PE and/or FRP liners shall be free of bulges, dents and other defects that could interfere with the fit and seal to the section joint. No liner shall have holes or openings which will permit the intrusion of liquids or gasses through the liner wall and into the concrete matrix. Manhole lifting devices shall not penetrate any surface of the liner.

1.3 The access opening of the liner must be fully supported during the casting process.

1.4 The precast concrete joint surface shall be of one plane and free of excess concrete to assist in creating a proper seal with the section joint.

1.5 The finished cone or flat slab to shall not be moved until adequate hydration has occurred so as to not damage a semi-rigid casting.

(F) FIELD ASSEMBLY AND INSPECTION OF PRECAST CONCRETE CONES AND FLAT SLAB TOPS WITH PP AND FRP LINERS:

1.0 Outer joints of precast concrete sections shall be gasketed or sealed as directed by the utility and/or precast manufacturer.

1.1 All internal PE and/or FRP seams at the section joints shall be sealed.

1.2 Recommended method of sealing internal PE and/or FRP joint seams is with preformed butyl strips (ASTM C-990 section 6.2) applied to the top face of the outward facing horizontal return of the liner at the same time as gaskets or other sealing materials are attached to the outer joint (see supply sources for preformed butyl strips).

1.3 Mechanical anchoring attachments through liner surfaces must be sealed with an approved elastomeric sealant. (See approved source recommendations).

1.4 After assembly is complete, the interior surface of the liner shall be free of pinholes, cracks, pits or defect which are detrimental to the intended use of the liner. No liner shall have holes or openings which will permit the intrusion of liquids or gasses through the liner wall and into the concrete matrix. There shall be no exposed concrete/mortar on any liner surface to include (but not limited to) section joints, hatch frame/cast iron frame and cover mating/sealing surface.

1.5 Testing of the lined lift station/wet well structure to meet pressure test of 1 bar (14.7 PSI) or the prescribed ASTM criteria for vacuum testing.

PLEASE NOTE: There is no correlation between vacuum (air) and hydrostatic tests (see ASTM C1244-93). Vacuum testing with the presence of hydrostatic pressure (high ground water conditions) provides unreliable test results.

SUPPLY SOURCES OF RECOMMENDED ELASTOMERIC BUTYL SEALANTS AND ADHESIVES FOR INSTALLATION OF THE PP AND/OR FRP MANHOLE BASE LINER

BUTYL RUBBER PREFORMED FLEXIBLE JOINT SEALANT

PRODUCT: RU106-RUB' R-NEK “LTM”
HENRY COMPANY, SEALANTS DIVISION
1277 Boyles St.
Houston, TX 77020

PRODUCT: PRO-STIK
PRESS-SEAL GASKET CORPORATION
2424 W. State Blvd.
Fort Wayne, IN 46804

TEL: 713 /671-2494 - 800 / 231-4549

FAX: 713 / 673-7714

www.henry.com

TEL: 219 / 436-0521 - 800 / 348-7325

FAX: 219 / 436-1908

www.press-seal.com

ELASTOMERIC SEALANTS - RESILIENT CURING NON SHRINK CAULK TYPE

(MECHANICAL ANCHOR PENETRATIONS AND REMEDIAL “CAULK” SEAL OF MISCELLANEOUS JOINTS OR SEAMS - 1” WIDTH OR LESS)

NOTE: The sealant manufacturer’s application and surface preparation procedures (including primer) must be followed. This includes recommended maximum joint depth of 1/2” (1/4” minimum thickness) and the use of bond-breaker polyethylene closed cell foam backer rod or polyethylene bond breaker tape.

PRODUCT: SIKAFLEX 1a
Polyurethane sealant;
Use SIKAFLEX 449-203 PRIMER
SIKA CORPORATION
201 Polito Ave.
Lyndhurst, NJ 07071
TEL: 800 / 933-7452
www.sikaconstruction.com

PRODUCT: SCS 1003
PRODUCT: VULKEM 921
Polyurethane Sealant;
Tremco 171 PRIMER (porous substrates)
TREMprime NON-POROUS PRIMER (metal substrates)
TREMCO, INCORPORATED
3735 Green Road
Beachwood, OH 44122
TEL: 800 / 852-8173
www.tremcosealants.com

BONDING AGENT FOR DISSIMILAR MATERIALS I.E. POLYPROPYLENE, POLYETHYLENE, FIBERGLASS, URETHANE & VARIOUS METALS ETC.

PRODUCT: SCOTCH WELD DP-8010NS
3M
INDUSTRIAL BUSINESS
INDUSTRIAL ADHESIVES AND TAPES DIVISION
3M Center, Building 21-1W-10, 900 Bush Ave
St. Paul, MN 55144-1000
TEL: 800/362-3550
www.3M.com/industrial