SPECIFICATION FOR

PROTECTIVE LINING SYSTEM FOR CONCRETE LIFT STATIONS/WET WELLS.

With

Prefabricated Rigid Polypropylene (PP) and/or Fiberglass Reinforced Plastic(FRP) Liner Sections 03/09

(A) SCOPE:

Furnish a prefabricated Polypropylene (PP) and/or Fiberglass Reinforced Plastic (FRP) liner to be installed in concrete sanitary sewer lift stations/wet wells, which is resistant to the chemical environment normally found in wastewater transmission systems. The PP and/or FRP liner shall be a non load-bearing component integrally cast with and anchored in new precast concrete lift station/wet well section(s) during the casting process at a precast concrete manufacturing facility.

(B) POLYPROPYLENE (PP) AND/OR FIBERGLASS REINFORCED PLASTIC (FRP) LIFT STATION/WET WELL LINER:

1.0 The prefabricated (PP) liner sections shall consist of 3 or more segments of equal height and radial length that when welded together will form a section which corresponds to the inside diameter of the concrete structure and be of suitable heights. The prefabricated FRP liner sections shall be a one piece construction of unlayered, homogenous composite corresponding to the inside diameter of the concrete structure and be of suitable heights.

1.1 The liner sections shall incorporate an outward facing horizontal return that will be flush with the top and bottom ends of the concrete joint mating faces.

1.2 The outer surface of the PP liner shall have ribs molded in opposing directions on the vertical axis and waterstop turnbacks on the horizontal axis.

1.3 The outer surface of the FRP liner shall have steel spirals/lattice bonded and a coating of multi-faceted aggregate.

1.4 The prefabricated PP and/or FRP flat slab top liner shall be manufactured to a diameter corresponding to the inside diameter of the precast concrete structure. The liner shall incorporate a fully lined access opening equal in height to the thickness of the precast concrete section and shall incorporate a horizontal return on the top surface to accept the hatch cast iron frame and cover. The hatch frame/cast iron frame and cover shall be sealed to the lined concrete surface.

1.5 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.

1.6 Watertight pipe/electrical connections for PP liners shall be by gasketed PP pipe bell connectors or PP sleeves for boot type connectors at locations as specified. PP connectors shall be attached to the PP liner by hot air extrusion welding with PP welding bead and shall extend to the outside profile of the precast concrete structure.

1.7 Watertight pipe/electrical connections for FRP liners shall be by gasketed FRP, PVC pipe connecting bells and/or PP, FRP, PVC sleeves for boot type connectors at locations as specified. Connectors shall be monolithically attached to the liner and shall extend to the outside profile of the precast concrete structure.

(C) MATERIALS:

1.0 POLYPROPYLENE (PP) – 100% Polypropylene copolymer

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 PP and/or FRP liner shall be cast integrally within a monolithic precast concrete lift station/wet well structure 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 PP and/or FRP liners shall be free of bulges, dents and other defects that could result in inside diameter variation(s) greater than ½ inch (13mm). 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 liner must be fully supported during the casting process. Pipe connecting bells and/or boot sleeves greater than 12 inch (300mm) diameter must be supported.

1.4 The precast concrete section joint surfaces shall be parallel and free of excess concrete to assist in creating a proper seal of the section joints.
1.5 The finished riser section(s) 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 LIFT STATION/WET WELLS WITH PP AND/OR FRP LINER:

1.0 During installation of the lined sections pipe/electrical connections shall be completed as per the manufacturer's standard method and details.
1.1 Outer joints of precast concrete sections shall be gasketed or sealed as directed by the utility and/or precast manufacturer.
1.2 All internal PP and/or FRP seams at the section joints shall be sealed.
1.3 Recommended method of sealing internal PP 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).
1.3a It is optional to seal internal PP seams at the section joints by hot air extrusion welding with PP welding bead as per the liner manufacturer's standard method and details.
1.3b Field welding of PP internal section joints is acceptable only after vacuum testing the structure has been completed in a satisfactory manner. It shall be the responsibility of the contractor to field weld the manhole section joints (see list of certified welding contractors).
1.4 Mechanical anchoring attachments through liner surfaces must be sealed with an approved elastomeric sealant. (See approved source recommendations).
1.5 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 with 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) pipe/electrical connectors, section joints, hatch frame/cast iron frame and cover mating/sealing surface.
1.6 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
TEL: 713 /671-2494 - 800 / 231-4549
FAX: 713 / 673-7714
www.henry.com

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

CERTIFIED POLYPROPYLENE FIELD WELDING

Northwest Concrete Waterproofing
10410 40th Ave East
Tacoma, WA 98446
Tel 253-606 4964

Global Liner Systems
PO Box 326
Spanaway, WA 98387
Tel 253 686 1114

Plastic Composites Inc.
1222 Camp Ave
Mount Dora, Fl 32757
Tel 352-383-0194
www.yourpci.com