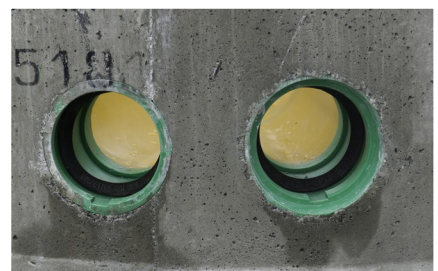
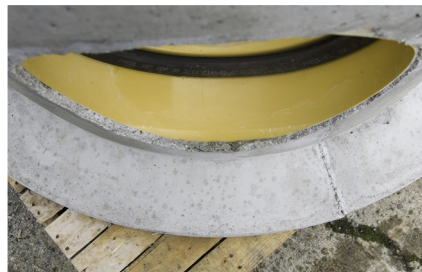


# PREDLsystems North America Inc.

## Specifications for Manhole Base Liner With Compression Gasket Pipe Connections





**DESCRIPTION**

A pre-fabricated Manhole Base Liner constructed of polypropylene (PP) and/or Fiberglass Reinforced Polymer (FRP) which is resistant to the chemical environment normally found in wastewater transmission systems. The Manhole Base Liner is integrally cast and anchored in the new precast concrete manhole base section at the precast concrete manufacturing facility. The Manhole Base Liner provides protection from corrosion, abrasion, water infiltration and leakage of the concrete structure.

can be used in either open mold laminating or casting operations. Because this system contains less than 20% styrene, it is in full compliance with all local AQMD regulations. VOC's are negligible with this system. IPS 7000 – 204HB offers a unique combination of superior physical properties compared with standard GP, isophthalic, or vinyl ester polyester resins. Toughness or resilience is unsurpassed with this material, with higher tensile strengths and much higher elongation and flexural modulus. Chemical and corrosion resistance are excellent. Heat distortion temperatures with 30% Glass, are above 230°F.

**FRP Resin Data**

IPS 7000 – 204HB is a two-component MDI / polyester hybrid resin system designed for the FRP industry. It

**TYPICAL PHYSICAL PROPERTIES**

<b>(For components)</b>	<b>TEST METHOD</b>	<b>COMP.A</b>	<b>COMP.B</b>
Viscosity, cps	Brookfield L.V.F. Spindle #2 @ 30 RPM	200	400 – 600
Specific Gravity	ASTM D – 1638	1.20	1.15
Weight per Gal, Lbs.		10.00	9.58
Color	Visual	Dark Brown	Light Brown
Styrene monomer content		20% (in system)	
Mix ratio	by weight	31	69
<b>(For cured material)</b>	<b>TEST METHOD</b>	<b>RESULTS (0% glass)</b>	
Tensile strength, psi	ASTM D – 638	11,000 – 13,000	
Tensile modulus, psi	ASTM D – 638	250,000 – 400,000	
Flexural strength, psi	ASTM D – 790	28,000	
Flexural modulus	ASTM D – 790	400,000	
Heat distortion temperature	ASTM D – 648	160° F	
Elongation, %	ASTM D – 638	5	
Shore D hardness		85	
Linear shrinkage, %	ASTM D – 2566 – 88	0.7	

**REACTIVITY DATA (100 gram mass @ 74° F)**

Demold time	10 - 15 minutes
Gel time*	120 - 180 seconds

**PERFORMANCE CHARACTERISTICS**

Fiber wetting	excellent
Sagging / draining	minimal
Fabricating method	all room temperature methods

\* Gel times can be varied from several seconds to 20 minutes or more.



## POLYPROPYLENE AND/OR FIBERGLASS REINFORCED POLYMER MANHOLE BASE LINER

The pre-fabricated Manhole Base Liner shall be constructed from polypropylene (PP) and/or Fiberglass Reinforced Polymer (FRP) with a minimum thickness of 0.12" (3mm). The Manhole Base Liners are supplied in nominal inside diameters corresponding to precast concrete manhole base sections.

Each Manhole Base Liner includes:

**Channel(s)** - Full flow through channel(s) with side walls to the crown of the pipe(s).

**Bench Surface** - A non-skid pattern on inner bench surface.

**Bell** - Bell-type pipe connections for specific pipe types are included. The bells are integrally cast with and anchored in concrete structures. Bells provide a watertight, flexible and easy to install joint for incoming connections to precast structures.

### Gaskets - (ASTM C923) -

Resilient materials for connectors and filler rings shall be manufactured from natural or synthetic rubber and shall conform to the requirements prescribed in **Table 1**. If a splice is used in the manufacture of the seal, its strength shall be such that the seal shall withstand a 180° bend with no visible separation.

**TABLE 1 Resilient Material Tests**

Test	Test Requirements <sup>A</sup>	ASTM Test Method
Chemical resistance: 1 N sulfuric acid 1 N hydrochloric acid	no weight loss no weight loss	D543, at 22°C for 48 h
Tensile strength	8.5 MPa, min	D412
Elongation at break	350%, min	
Hardness <sup>B</sup>	± 5 from the connector manufacturer's specified hardness	D2240 (Shore A durometer)
Accelerated oven-aging	decrease of 15%, max, of original tensile strength, decrease of 20%, max, of elongation	D573, 70 ± 1°C for 7 days
Compression set	decrease of 25%, max, of original deflection	D395, Method B, at 70°C for 22 h
Water absorption	increase of 10%, max, of original by weight	D471, immerse 19 by 25-mm specimen in distilled water at 70°C for 48 h
Ozone resistance	rating 0	D1149
Low-temperature brittle point	no fracture at - 40°C	D2137
Tear resistance	34 kN/m	D624, Die B

## Mechanical Devices

Expansion rings, tension bands, and take-up devices used for mechanically compressing the resilient portion of the connector against the pipe or manhole shall be made from a material or materials in combination that will ensure durability, strength, resistance to corrosion, and have properties that will ensure continued resistance to leakage.

All metallic mechanical devices and bolt assemblies used to mechanically deform resilient materials shall be constructed of corrosion resistant materials meeting the physical properties and chemical composition requirements of Spec-

ifications **A493** and **A666**, Type 302 through Type 316.

The gasketed, flexible and watertight pipe connecting Bells are attached to the Manhole Base Liner channel(s). Alignment and grades of each Bell are set to specifications and extend to the outside profile of the precast concrete structure.

The vertical side wall "skirt" of the Manhole Base Liner corresponding to the inside diameter of the manhole structure is a minimum of 2" (51mm) extending vertically. This "skirt" can be extended to the first manhole riser joint for fully lined structures or a fabric backed PP Transition.



The Base Liners are manufactured with polypropylene and/or steel “bonding bridge” anchors and a coating of polypropylene pellets and/or multi-faceted aggregate bonded to the outer surface. The bonding materials ensure sufficient anchoring to withstand vacuum testing of concrete sewer manholes in accordance with ASTM C1244.

This test method covers procedures for testing precast concrete manhole sections when using the vacuum test method to demonstrate the integrity of the installed materi-

als and the construction procedures. This test method is used for testing concrete manhole sections utilizing mortar, mastic, or gasketed joints. A vacuum of 10 in. Hg shall be drawn on the manhole with the valve on the vacuum line of the test head closed, and the vacuum pump shut off. The time shall be measured for the vacuum to drop to 9 in. Hg. The manhole is acceptable if the time for the vacuum reading to drop from 10 in. Hg to 9 in. Hg meets or exceeds the values indicated in **Table 1**.

**TABLE 1 Minimum Test Times for Various Manhole Diameters (30 – 120 in.) in Seconds**

Depth (ft)	Diameter, in.								
	30	33	36	42	48	54	60	66	72
Time, in seconds									
<4	6	7	7	9	10	12	13	15	16
6	9	10	11	13	15	18	20	22	25
8	11	12	14	17	20	23	26	29	33
10	14	15	18	21	25	29	33	36	41
12	17	18	21	25	30	35	39	43	49
14	20	21	25	30	35	41	46	51	57
16	22	24	29	34	40	46	52	58	67
18	25	27	32	38	45	52	59	65	73
20	28	30	35	42	50	53	65	72	81
22	31	33	39	46	55	64	72	79	89
24	33	36	42	51	59	64	78	87	97
26	36	39	46	55	64	75	85	94	105
28	39	42	49	59	69	81	91	101	113
30	42	45	53	63	74	87	98	108	121

**TABLE 1 Minimum Test Times for Various Manhole Diameters (30 – 120 in.) in Seconds (continued)**

Depth (ft)	Diameter, in.							
	78	84	90	96	102	108	114	120
Time, in seconds								
<4	18	19	21	23	24	25	27	29
6	26	29	31	34	36	38	41	43
8	35	38	41	45	48	51	54	57
10	44	48	52	56	60	63	67	71
12	53	57	62	67	71	76	81	85
14	62	67	72	78	83	89	94	100
16	70	76	83	89	95	101	108	114
18	79	86	93	100	107	114	121	128
20	88	95	103	111	119	126	135	142
22	97	105	114	122	131	139	148	156
24	106	114	124	133	143	152	161	170
26	114	124	134	144	155	164	175	185
28	123	133	145	155	167	177	188	199
30	132	143	155	166	178	189	202	213

**MATERIAL PROPERTIES**

**Thermoplastic Resin: Polypropylene (PP) Copolymer**

**Hardness:** 75 Shore D

**Density:** 56.8 lb/ft3 (0.91 g/cm3) **Colour:** Dull mustard/goldenrod

**Fiberglass Reinforced Polymer (FRP) Resin: Polyurethane Polyester Hybrid Composite**

**Glass fiber:** Type E

**Glass fiber length:** Mean fiber length of 0.625” (16mm) **Glass fiber content:** 10% - 12% content by weight

**Inert filler content:** 10% - 13% content by weight **Hardness:** 85 Shore D

**Density:** 73.0 lb/ft3 (1.17 g/cm3)

**Colour:** Dull mustard/goldenrod

**Bonding Material**

**Aggregate:** Processed sand containing crushed & uncrushed dry and cleaned semi-round particles **Size range:** 0.08” - 0.12” (2mm - 3mm)

**Gaskets (Meets or exceeds ASTM C923M)**

**Material:** Polyisoprene, unless otherwise specified.

**Hardness:** 50 - 55 Shore A

### INSTALLATION IN CONCRETE (PRECASTING)

The Manhole Base Liner shall be monolithically cast within a concrete manhole base. The following requirements must be met by the precaster.

- The wet cast method is recommended for all Predl Systems' liners.
- The base liner bench must be fully supported during the concrete pouring process. The base liner shall be placed upside down on a steel and/or fiberglass "support dome" made specifically for Predl Manhole Base Liners. The support dome must be clean and free of debris to ensure full contact with the liner.
- All channels must be supported against the vertical and horizontal forces created by the concrete during casting. Channels must be supported in the following cases:
  - Channels sized 10" (250mm) and larger. Channels between 170° and 190° are most critical.
  - Channels with extended height (non-standard) due to invert differences over 6" (150mm).
  - All bells greater than 12" (300mm) in nominal diameter must be supported with a support disc or rigid foam plug to maintain roundness.
- The poured manhole base must not be moved until adequate hydration has occurred.
- No liner may have holes or openings which will permit the intrusion of liquids or gases through the liner wall and into the concrete. Manhole lifting devices must not penetrate any surface of the liner.



### FIELD ASSEMBLY AND INSPECTION

- Outer joints of the precast concrete sections are gasketed or sealed as directed by the utility and/or precast concrete manufacturer.
- If the structure is fully lined, all internal seams at the section joints shall be sealed. Sealing of joints can be accomplished using preformed butyl strips applied at the same time that gaskets or other sealing materials are attached to the outer joint.
- It is recommended to seal internal seams at the manhole section joints by hot air extrusion welding with a polypropylene welding bead and/or cap strip.
- Field welding of internal manhole section joints is acceptable only after vacuum testing of the structure has been completed in a satisfactory manner.
- It is the responsibility of the contractor to field-weld the manhole section joints.
- Mechanical anchors that penetrate any liner surface must be sealed with an approved elastomeric sealant.
- After assembly is complete, the interior surface of the liner shall be free of pinholes, cracks, pits or defects which are detrimental to the intended use of the liner.
- No liner shall have holes or openings which permit the penetration of liquids or gases through the liner wall and into the concrete.
- There shall not be any exposed concrete/mortar on any inside liner surface including, but not limited to, pipe connectors and manhole section joints.