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APPROVED :

REVISION : NO: DATE:

1 June 07, 2013

2 June 10, 2013

SCALE : N.T.S.

LOAD RATING

MATERIAL SPECIFICATION:

SEE DWG. NO. 19

SPECIFIED FOR:

DESCRIPTION:

MATERIAL SPECIFICATIONS

DWG. NO. 19
REV. NO. *

CATALOG NUMBER:

1.

Property	Testing Method	Unit	Typical Values PPC Baseline	Typical Values PPR Concrete Protective Liner
Density	ISO 1183 (ASTM D 792)	g/cm ³	0.90	0.90
Melt Flow Rate	ISO 1133 (ASTM D 1238)	g/10 min.	0.43 (230/2, 16)	0.27 (230/2, 16)
Heat Reversion (Dimensional Stability)	EN ISO 14632	%	<3 (90°C/ 1.5h)	<3 (90°C/ 1.5h)
Tensile Stress at Yield	ISO 527	N/mm ²	18	20
Elongation at Yield	ISO 527	%	3.5	12
Elongation at Break	ISO 527	%	200	250
Flexural Modulus	ISO 178	MPa	1250	800
FIRE CLASSIFICATION	DIN 4102/part 1 UL 94		B2 94-HB	B2 94-HB
Surface Resistivity	DIN 4102/ (ASTM D 257)	N/mm Ohm	X	X
Resistance to pull-out (Corprotect only)	SKZ test directives	t/m ²	**	>42
Recommended Maximum Working Temperature		°C °F	90 194	90 194

2.

Typical Physical Properties - FRP Concrete Protective liner

(For components)	TESTING METHOD	Comp.A	Comp.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
Colour	Visual	Dark Brown	Light Brown
Styrene monomer content	ASTM D-1638	1.20	1.15
Mix ratio	by weight	31	69

(For cured material)	TESTING METHOD	RESULTS (0% glass)
Tensile strength, psi	ASTM D-638	13,000
Tensile modulus, psi	ASTM D-638	450,000
Flexural strength, psi	ASTM D-790	28,000
Flexural modulus, psi	ASTM D-790	400,000
Heat distortion temp.	ASTM D-648	160° F
Elongation, %	ASTM D-638	4
Barcol hardness		42
Shore D hardness		85
Linear shrinkage, %	ASTM D-2566-88	85

REACTIVITY DATA (100 gram mass @ 74° F)

Demold time	10 - 15 min.
Gel time	120 - 180 seconds

PERFORMANCE CHARACTERISTICS

Fiber wetting	excellent
Sagging / Draining	minimal
Fabricating Method	All room temperature methods

MATERIAL SPECIFICATION

5. Technical Specifications for Pred Systems Polypropylene (PP) or Fiber Reinforced Plastic Base Liner and Corprotect Concrete Protective Liner (CPL) Welding rods shall be of the same resins and meet the same standards.

NOTES:

A. The baseliner and the wall liner are compatible and form a homogeneous lining system designed to make the structure gas tight and watertight (ASTM 1244)

B. All welded seams will be spark tested in accordance with spark-tester manufacturers instructions.

C. After all pipes are installed and backfilled the manhole may at the engineer's option, be vacuum tested in accordance with ASTM C1244 (latest revision).

D. Only Pred Certified Welders and Fabricators are authorized to fabricate, repair, weld or test, the baseliners or wall liners.

3.

Property	Test Standard DIN/ON EN ISO	corr.to ASTM	Unit	Value				Testing Frequency
				78 2.0 +10/-5	100 2.5 +10/-5	98 3.0 +10/-5	196 5.0 +10/-5	
Nominal Thickness	DIN EN ISO 14632	D 5994	mil mm	78 2.0 +10/-5	100 2.5 +10/-5	98 3.0 +10/-5	196 5.0 +10/-5	every hour
Density (Black) Density (base/coloured)	ISO 1183	D792	g/cm3 g/cm3	≥ 0.94 ≥ 0.931/935				per production run 1)
Melt Flow Rate (190°/5kg) (190/2, 16kg)	ISO 1183 Cond T D 1238 Cond E	D 1238 Cond P D 1238 Cond E	g/10 min	≤ 3 ≤ 1	≤ 3 ≤ 1	≤ 3 ≤ 1	≤ 3 ≤ 1	per production run 1)
Heat Reversion (110°C/1, 5h)	DIN EN ISO 14632	D 1204 modified	%	≤ 3	≤ 3	≤ 3	≤ 2	per production run 1)
Tensile Stress at Yield	DIN EN ISO 527	D 6693	MPa (PSI)	≥ 15 2,200	≥ 15 2,200	≥ 15 2,200	≥ 15 2,200	per production run 1)
Elongated at Yield	DIN EN ISO 527	D 6693	%	≥ 9	≥ 9	≥ 9	≥ 9	per production run 1)
Elongated at Break	DIN EN ISO 527	D 6693	%	≥ 300	≥ 300	≥ 300	≥ 300	per production run 1)
Instrumented Puncture Test (Penetration Test)	ON EN ISO 6603-2	D 4833	N N (lbs)	≥ 1500 ≥ 537	≥ 1800 ≥ 625	≥ 2000 ≥ 750	≥ 2500 ≥ 1250	Approval Testing

4.

Property	Test Standard DIN/ON EN ISO	corr.to ASTM	Unit	Value	Testing Frequency
Low Temp Brittleness		D746	°C	-77	--
Water Absorption	ISO 62	D570	%	≤ 0.1	--
Root Resistance Biological Resistance Rodent Resistance	ON S 2073 ON S 2073 ON S 2073			corresponds * corresponds * corresponds *	Approval Testing Approval Testing Approval Testing
Resistance to Leachate	DIN EN ISO 175	ASTM D 543	%	Dimensional change ≤5 Change of mechanical properties ≤20	per formulation
Carbon Black Content Carbon Black Dispersion Oxidation Induction Time NCTL	EN ISO 11 358 EN ISO 18 553	D 1603 D 5596 D 3885 ASTM D 5397-app	% h	2.0 - 3.0 A1/A2 100 400h	per production run 1) per production run 1) per formulation per formulation

System Testing Sure Grip Type 560

Property	Test Standard DIN/ON EN ISO	Unit	Value	Testing Frequency
Pull Out Resistance (short term)	ISO 4624	kN/m2	400	Approval Testing
Back Pressure Resistance (long term)	SKZ-Test 700mm x 700mm	1000h at 1,5 bar (14,6 psi)	fulfilled	Approval Testing

MATERIAL SPECIFICATIONS - Polypropylene (PP), Fiber Reinforced Plastic (FRP), Polyethylene (PE)