FRE® SPECIFICATION FOR BELOW GROUND APPLICATIONS

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Section 1: General

1.1 Description

This specification outlines the requirements for the design, construction and performance of FRE® rigid non-metallic fiberglass conduits and fittings.

1.2 Product application & use

Conduits and fittings shall be suitable for Encased Burial (EB) or Direct Burial (DB) installations.

1.3 Materials

Conduits and fittings shall be manufactured with continuous E or E-CR glass roving encapsulated in an internally steam cured, corrosion resistant epoxy resin system with UV inhibiting carbon black pigment dispersed homogeneously for use at temperatures ranging from –40 °F (-40 °C) to 230 °F (110 °C). Resin system substitution shall not be permitted.

Epoxy resin system shall be impervious to a wide spectrum of chemicals and shall contain by weight less than 0.2 % halogens such as chlorine and shall not contain other toxic materials in excess of trace level limits compliant with OSHA requirements.

Section 2: General Requirements

2.1 Sizes & wall thicknesses

Conduits and fittings shall be manufactured with nominal wall thicknesses as outlined below:

ENCASED BURIAL (EB) INSTALLATIONS

IPS Encased Burial (TW)

Diameter		Wall thickness	
in	mm	in	mm
4	103	0.055	1.4
5	129	0.070	1.8
6	155	0.095	2.4
8*	203	0.095	2.4

ID Encased Burial (TW)

Diameter		Wall thickness	
in	mm	in	mm
4	103	0.055	1.4
4½	116	0.070	1.8
5	129	0.070	1.8
6	155	0.070	1.8

DIRECT BURIAL (DB) INSTALLATIONS

IPS Direct Burial (SW)

Diameter		Wall thickness	
in	mm	in	mm
¾	21	0.066	1.7
1	27	0.066	1.7
1¼	35	0.066	1.7
1½	41	0.066	1.7
2	53	0.070	1.8
3	78	0.070	1.8
4	103	0.070	1.8
5	129	0.095	2.4
6	155	0.110	2.8
8*	203	0.115	2.9

ID Direct Burial (SW)

Diameter		Wall thickness	
in	mm	in	mm
2	53	0.070	1.8
2½	63	0.070	1.8
3	78	0.070	1.8
3½	91	0.070	1.8
4	103	0.070	1.8
4½	116	0.095	2.4
5	129	0.095	2.4
6	155	0.095	2.4

DIRECT BURIAL (DB) HEAVY LOAD INSTALLATIONS

IPS Direct Burial (HW)

Diameter		Wall thickness	
in	mm	in	mm
4	103	0.095	2.4
5	129	0.115	2.9
6	155	0.115	2.9

ID Direct Burial (HW)

Diameter		Wall thickness	
in	mm	in	mm
4	103	0.095	2.4
4½	116	0.115	2.9
5	129	0.115	2.9
6	155	0.115	2.9

2.2 Joining Method

Each length of conduit is supplied with an integral inside tapered bell with a one piece molded urethane TriSeal™ gasket held in place with a retainer ring for sealing. Pull out force for the TriSeal™ joint shall be a minimum of 500 lb. (227 kg). No threads or adhesives shall be required to assemble the joints unless otherwise required.

2.3 Fittings

All fittings, adapters and elbows shall be constructed of the same filament wound materials as the conduit and shall have socket depth and an inside tapered bell design consistent with the conduit. All fittings shall contain a TriSeal™ gasket unless adhesive bonding is otherwise required (see section 2.2).

Section 3: Requirements

3.1 Workmanship

Conduits and fittings shall be free from defects and commercially practicable in color, opacity, density and other physical properties. The exterior surface finish shall be smooth per acceptable industry practices.

3.2 Marking

Conduits and fittings shall be marked at least once with a suitable identifying mark printed on the outside of the product. Such marking shall contain:
(1) RTRC (2) for use -40 °C to 110 °C (-40 °F to 230 °F) or other applicable temperature (3) trade size (4) manufacturer's name or trademark (5) BG (6) part number (7) degrees and radii (elbows only) (8) date of manufacture.

Section 4: Conduit system properties

4.1 Physical Properties

	Test Results	Test protocol
Glass Content	68% ± 3%	API 15LR
Specific Gravity	1.94 g/cm^3	ASTM D792
Barcol Hardness	54 ± 2	ASTM D2583
Water Absorption	< 1%	ASTM D570
U.V. Resistance	> 3500 Hrs (Xenon Arc)	UL 2420

4.2 Friction Properties

	Test Results	Test protocol
Cross Linked Polyethylene Cable	.0233 ± .02	CSA B196.1
PVC Jacketed Cable	.0385 ± .06	CSA B196.1
Concentric Neutral Cable	.0160 ± .03	CSA B196.1
Teck (Armored) Cable	.0161 ± .03	CSA B196.1

4.3 Electrical Properties

	Test Results	Test protocol
Dielectric Strength	500 volts/mil (19.68 kV/mm)	ASTM D149
Dielectric Breakdown Voltage	29.7 kV	ASTM D149
Dissipation Factor	0.5%	ASTM D150

4.4 Surface finish

Exterior (average)	<2000 microinches (50.8 micrometers)
Interior (average)	<125 microinches (3.2 micrometers)
Color	Black (standard)

4.5 Thermal Properties

	Test Results	Test protocol
Coefficient of Thermal Expansion	1.37 E-^{5} in./in./°F (2.47 E-^{5}m./m./°C)	ASTM D696
Thermal Conductivity	2 Btu.in/ft^2.h. °F (0.288W/ m.K)	ASTM D335
Thermal Resistivity	0.5°F. ft^2.h/Btu.in (3.47 mK/W)	ASTM D335
Flammability	HB Rating	UL 94
Heat Deflection Temperature (HDT)	312°F (156°C)	ASTM D648

Section 5: Specification

Conduits and fittings shall bear nationally accepted testing laboratory approval per Harmonized CSA C22.2 No.2420 Certification file No. 028032S, UL Listing file No. E53373 or NEMA TC 14A/B Standard or FRE Composites' own specification. Products identified in section 2.1 with "*" are not UL Listed.

Section 6: Manufacturers

Conduits and fittings shall be manufactured by FRE Composites. No substitute will be accepted.