



**SECTION 1: GENERAL**

**1.1 Description**

This specification outlines the requirements for the design, construction and performance of FRE<sub>®</sub> rigid non-metallic fiberglass HazGuard<sub>®</sub> conduits and fittings, often referred to as “Bullet Resistant” by industrial users. This term is used to indicate that the product has been demonstrated under laboratory conditions to resist damage caused by small caliber, low velocity projectiles such as bullets.

**1.2 Product application & use**

Conduits and fittings shall be suitable for use in hazardous location which can be subject to physical damage, Class 1 Division 2.

**1.3 Materials**

Conduits and fittings shall consist of continuous E or E-CR glass roving encapsulated in an internally steam cured, corrosion resistant epoxy resin system pigmented with UV inhibiting carbon black dispersed homogeneously manufactured 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 as chlorine and shall not contain other toxic materials in excess of trace levels limits compliant with OSHA requirements.

**SECTION 2: GENERAL REQUIREMENTS**

**2.1 Sizes & wall thicknesses**

HazGuard<sub>®</sub> conduits and fittings shall be manufactured with nominal wall thicknesses as outlined below:

**TYPICAL HAZARDOUS LOCATION SUBJECT TO PHYSICAL DAMAGE**

IPS STANDARD WALL (XW)			
Diameter		Wall thickness	
in	mm	in	mm
¾	21	0.250	6.4
1	27	0.250	6.4
1 ¼	35	0.250	6.4
1 ½	41	0.250	6.4
8*	203	0.250	6.4

\*Not UL listed or CSA certified.

ID STANDARD WALL (XW)			
Diameter		Wall thickness	
in	mm	in	mm
2	53	0.250	6.4
2 ½	63	0.250	6.4
3	78	0.250	6.4
3 ½	91	0.250	6.4
4	103	0.250	6.4
5	129	0.250	6.4
6	155	0.250	6.4

**2.2 Joining Method**

Each length of conduit is supplied with an integral straight bell end. All joints shall be adhesive bonded inside a straight bell end of even socket depth throughout the raceway. Adhesive shall be supplied by the manufacturer of the conduit and shall have a minimum joint pull out load of 1 000 lb. (454 kg) per inch diameter trade size.

**2.3 Fittings**

All fittings, adapters and elbows shall be constructed of the same filament wound materials as the conduit and shall have a socket depth and a straight bell design consistent with the conduit.

**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) XW AG (6) part number (7) degrees and radii (elbows only) (8) date of manufacture.

## SECTION 4: CONDUIT SYSTEM PROPERTIES

	Test Results	Test Protocol
<b>4.1 Physical Properties</b>		
Glass Content	68% ± 3%	API 15LR
Specific Gravity	1.94 g/cm <sup>3</sup>	ASTM D792
Barcol Hardness	54 ± 2	ASTM D2583
Water Absorption	≤ 1%	ASTM D570
U.V. Resistance	> 3 500 Hrs (Xenon Arc)	CSA C22.2 No. 2515
<b>4.2 Friction Properties</b>		
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
<b>4.3 Electrical Properties</b>		
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
<b>4.4 Surface finish</b>		
Exterior (average)	<2000 microinches (50.8 micrometers)	
Interior (average)	<125 microinches (3.2 micrometers)	
Color	Black (standard)	
<b>4.5 Thermal Properties</b>		
Coefficient of Thermal Expansion	1.37 E- <sup>5</sup> in./in./°F (2.47 E- <sup>5</sup> m./m./°C)	ASTM D696
Thermal Conductivity	2 Btu.in/ft <sup>2</sup> .h. °F (0.288W/ m.K)	ASTM D335
Thermal Resistivity	0.5°F. ft <sup>2</sup> .h/Btu.in (3.47 mK/W)	ASTM D335
Flammability	Article 5.10	UL 2515
Heat Deflection Temperature (HDT)	312°F (156°C)	ASTM D648

## SECTION 5: SPECIFICATION

Conduits and fittings shall bear nationally accepted testing laboratory approval per UL 2515A UL Listing file No. E53373 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 shall be accepted.