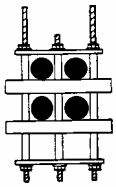
UNITED FIBERGLASS of America, Inc.



United Fiberglass of America

Specification

Bullet Resistant XHW Conduit, Fittings and Supports

1. Bullet Resistant XHW Rigid Fiberglass Conduit

Conduit and fittings shall be made from reinforced thermosetting resin conduit (RTRC) utilizing ECR-glass roving encapsulated in an epoxy matrix and shall meet the fabrication and testing requirements of Underwriters Laboratories Inc., Standard UL 1684A and NEMA TC-2002, except as modified herein.

The term "Bullet Resistant" is used to indicate that the product has been demonstrated under field conditions to resist damage caused by low velocity projectiles such as bullets and rocks. Alternatives to this material specification will not be allowed.

The nominal wall thickness shall be .250 XHW for 2-inch through 6-inch diameter ID conduit. Dimensions shall be ID.

The conduit shall be furnished in 20' lengths. Each length shall be free from defects including delaminations, foreign inclusions, etc. It shall be nominally uniform (as commercially practical) in color, density and physical properties. It shall be straight and the ends shall be cut square to the inside diameter.

The conduit and fittings will be pigmented with a mixture of carbon black and/or titanium dioxide and U.V. Inhibitor Solution dispersed homogeneously throughout the epoxy matrix to provide UV resistance for prolonged outdoor storage and use beyond that which is required by UL 1684A and NEMA TC-2002.

The conduit and fittings shall be composed of chemically resistant epoxy resins that are impervious to a wide variety of chemicals. Particularly important are chemicals typically located around highways and railroad bridges such as; carbon dioxide, carbon monoxide, chlorine, detergents, diesel fuel, gasoline, hydraulic fluid, salt, salt water, kerosene, propane, transformer oil, antifreeze, petroleum solvents, cleaning agents and transmission fluid.

Conduit and fittings type AG XW shall be suitable for direct burial, concrete encased, pole risers and bridge attachments where suspended or encased and for concealed or exposed areas subject to physical damage.

a) Submittals

The manufacturer upon request will furnish the following:

UFOA product data and specifications
Representative conduit sample delivered to site
UFOA certification at time of delivery
UFOA warranty at time of delivery

2. Fittings

A complete line of fittings shall be available and shall be manufactured from the same materials and manufacturing process as the conduit. Minimum available fittings: Male and Female Threaded Adaptors, Threaded Box Connectors, Single and Back-to-Back Expansion Joints (with or without O-Ring), Split Stop Rings, Sleeve Couplings, Double Bell Stop Couplings, 5 Degree Couplings, 11.25, 22.5, 45 and 90 Degree Elbows, Fiberglass Junction Boxes of various dimensions, Fiberglass to PVC Adaptors, Radius End Bells, Fiberglass Reducers and Split Repair Conduit.

a) Expansion Joints

Expansion joints shall be manufactured with an internal stop ring fixed 4” inside the expansion sleeve(s) to ensure that the nipple portion of the joint does not pull out. A rubber O-ring will be inserted to keep the joint free of moisture and debris.

3. Conduit Joining Method

Each length of conduit shall be supplied with a machined tapered spigot and integral bell to be used with adhesive. The bell end shall have a depth of 4” +/- 0.25”.

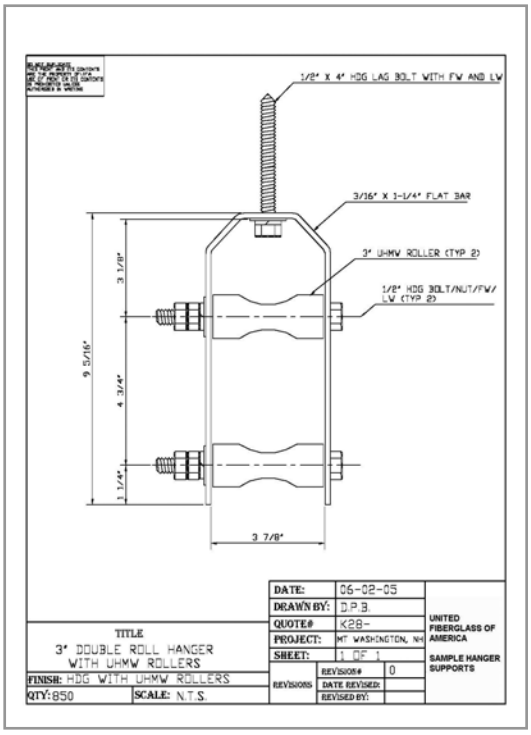
b) Adhesive

A dual component 22 oz “Quick Mix” epoxy adhesive cartridge will be supplied by United Fiberglass for joints requiring adhesive. The adhesive shall be capable of being applied with an ambient temperature range of 50 F and higher. A cold weather adhesive is available for installations below 50° F. The use of a two-channel applicator gun shall be required to apply the adhesive. Each kit supplies enough epoxy to glue approximately 16 – 18 2” ID XHW joints, 12 - 14 4” ID XWH joints and 6 - 8 6” ID XHW joints. The adhesive joint shall have a minimum pull out strength of 3000 lbs. The adhesive must be stored at an ambient temperature range of 70° F prior to use. No alternative adhesive systems will be allowed.

4. Supports

For underbridge installations, in order to ensure system integrity, use only United Fiberglass of America designed hangers and supports. Contact United Fiberglass early in your design process for assistance.

Shown as example only



Shown as example only

5. Properties and Specifications

Surface	
Interior Finish	< 125 micro inches Clean, smooth and free of abrasive surfaces
Exterior Finish	< 2000 micro inches Shall contain UV 9 Absorber Solution and pigmented carbon black or gray
Coefficient of Friction	0.385 (PVC cable) 0.233 (XLP cable) 0.160 (concentric neutral cable)
Electrical	
Dielectric Strength	> 500 volts/mil per ASTM-D 149
Dissipation Factor	0.5% per ASTM-D 150
Mechanical	
Tensile Strength (axial)	>11,000 psi per ASTM-D 2105
Ultimate Elongation	2%
Modulus of Elasticity	1,250,000 psi
Representative Weight	2" – 1.245 lbs/ft 3" – 1.83lbs/ft 4" – 2.60lbs/ft 5" - 3.47" lb/ft 6" - 3.83 lb/ft
Modulus of Elasticity in Tension	1,250,000 psi
Min. Impact Resistance (UL1684A)	2" 150ft/lbs 3" – 225ft/lbs 4" – 300ft/lbs 5" – 375ft/lbs 6" – 450ft/lbs
Physical	
Specific Gravity	1.9 – 2.0 per ASTM-D792
Glass Content	68% +/- 2%
Water Absorption	< 1%
Barcol Hardness	56 +/- .75
Compression Test	2" – 6" > 2000 lbf (8900N) per ASTM-D2412
Thermal	
Heat Deflection Temp.	312 F ASTM-D 648
Continuous Operating Temp.	-40 F to 230 F (-40 C to 110 C) per ULA 1684A
Coefficient of Thermal Expansion	1.25 x 10_5 in/in/F per ASTM D 696

Conduit diameters shall be fabricated per the following tolerance and out-of-roundness:

Nominal Inside Diameter	Minimum Inside Diameter	Outside Diameter Nominal	Maximum Out-of-Roundness
2"	2.00"	2.50"	0.40"
3"	3.00"	2.50"	0.40"
4"	4.00"	2.50"	0.40"
5"	5.00"	2.50"	0.40"
6"	6.00"	2.50"	0.40"

6. Marking

Conduit and fittings may be marked at least once with a nylon label of dimensions 1" x 3". The label shall contain the following markings; (1) Type: RTRC Conduit (2) Trade Size (3) Mfg Name/Trademark (4) For Use -40°C to 110°C (5) "Above Ground", "AG" or Equivalent.
Upon request, conduit can also be labeled or stenciled with conduit owners name and/or trademark.

7. Packaging

The conduit and fittings shall be packaged in accordance with United Fiberglass of America, Inc., and commercial practices to ensure safe delivery without damage. Conduit lengths will be bundled and strapped for ease of offloading and use. Fittings and elbows will arrive on skids. Hanger systems will arrive pre-assembled and on skids.

8. Installation

a. United Fiberglass of America shall provide the contractor methods to ensure proper alignment of joints and conduit runs prior to installation.
b. The installer of the conduit system shall be familiar with the installation guides provided by United Fiberglass of America, Inc., or an equivalent guide.
c. Expansion Joints must be installed for every 160' of conduit run.
d. An expansion joint must always be located between an abutment wall and an anchor point hanger regardless of the space between them.
e. Expansion joints are to be set to factory recommendations prior to securing split stop rings.
f. Split stop rings must be located on each side of the anchor point hangers to secure the conduit in place.
g. Field Joints. An adhesive gun shall apply a two-component epoxy adhesive to the bell and spigot ends and field cuts before joining the conduit together. All joints shall be cured before moving conduit.
h. The epoxy manufacturer's temperature restrictions should be carefully observed. Care must also be taken to store the epoxy material at room temperature prior to use.
i. Each joint shall be seated using a block of wood placed over the bell end and a hammer. A stab and twist motion should be used to properly seat the joint.
j. The conduit must be loose and properly aligned in the hangers.
k. The conduit and bell ends shall be able to pass through the hanger support window.
l. Couplings, bell ends and fittings should be placed a minimum of 24" from the hanger windows.
m. Couplings, bell ends and fittings should be staggered so as to not bind up against each other. This is achieved by staggering each run of conduit at the abutment wall.
n. All non-metallic hanger parts shall be fiberglass.
o. A representative of United Fiberglass of America, Inc., will be on site if requested to ensure proper installation procedures.

FOR INSTALLATION QUESTIONS, PLEASE CALL THE UFOA CONTRACTORS HELP-LINE:

Toll Free: 800-905-7506 AFTER HOURS: 937-605-1559

9. Approved Manufacturer: United Fiberglass of America, Inc.

ID XHW .250 Part Number Guide

Description	ID Trade Size	Nominal Wall Thickness	UFOA Catalog #
Conduit, 20' Lengths, Bell and Spigot Joint	2"-6"	.250"	20B-60B-XW-AG-1
Stop Couplings (used to join field cut ends)	2"-6"	.250"	20B-60B-XW-AG-510-1
Sleeve Couplings	2"-6"	.250"	20B-60B-XW-AG-500-1
Single Exp Joint, O Ring	2"-6"	.250"	20B-60B-XW-AG-410-1
Back-to-Back Exp Joint, O Ring	2"-6"	.250"	20B-60B-XW-AG-430-1
Split Stops (used to anchor conduit between expansion joints)	2"-6"	.250"	20B-60B-XW-AG-440-1
Male Threaded Adaptors	2"-6"	.250"	20B-60B-XW-AG-570-1
Female Threaded Adaptors	2"-6"	.250"	20B-60B-XW-AG-580-1
Threaded Box Connectors w/ Nut	2"-6"	.250"	20B-60B-XW-AG-590-1
11.25 x 48" Elbow	2"-6""	.250"	20B-60B-XW-AG-1148-1
22.5 x 48" Elbow	2"-6""	.250"	20B-60B-XW-AG-2248-1
30 x 48" Elbow	2"-6"	.250"	20B-60B-XW-AG-3048-1
45 x 48" Elbow	2"-6"	.250"	20B-60B-XW-AG-4548-1
90 x 48" Elbow	2"-6"	.250"	20B-60B-XW-AG-9048-1
5 Degree Offset Couplings	2"-6"	.250"	20B-60B-XW-AG-490-1
End Bells	2"-6"	.250"	20B-60B-XW-AG-480-1
22 oz. Adhesive Kit – Warm Weather			ADH600
22 oz. Adhesive Kit – Cold Weather			ADH610
Dual Cartridge Applicator Gun			ADH650
Static Mixing Tip			ADH 620

For gray conduit, replace the number 1 with a 2 at the end of the part #.

For special radius bends, fiberglass junction boxes, or specialty items, please consult United Fiberglass.