Specification For Fiberglass Conduit For Use Above Ground

I. References

A. When a standard or other referenced document referred to in this specification is superseded by an approved revision, the revision shall apply.

II. Listing

All conduit shall be listed by Underwriters Laboratories, UL, standard UL 1684.

III. Manufacturing

The fiberglass conduit shall have a winding angle as close as possible to 54.75 degrees. All conduit in diameters 3/4" - 6" shall be manufactured by applying single circuit winding.

The resin system shall be epoxy based using an anhydride curing agent. The fiberglass shall consist of continuous E- glass roving. All additives for increasing flame spread and lowering smoke density, shall be halogen free, i.e. not contain chlorine or bromine.

Carbon black shall be used as ultra violet inhibitor to protect the conduit and fittings during storage and if it is exposed outside.

Curing shall be done using on oven and shall take place in two steps. First curing zone shall bring the pipe slowly to the gel temperature. The second zone shall post-cure the pipe at no less than 350° F, and the pipe has to be properly cured, i.e. when measuring the glass transition temperature with a differential calorimeter, the difference between the first measurement and the second shall not exceed 5 degrees F.

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IV. Dimensions

All conduit shall be manufactured with following nominal dimensions:

		Outside Diameter (inch)	Inside Diameter (inch)	Wall Thickness (inch)
3/4"	SW	1.050	0.910	.070
1"	SW	1.315	1.175	.070
1-1/4"	SW	1.660	1.520	.070
1-1/2"	SW	1.900	1.760	.070
2"	SW	2.375	2.235	.070
2-1/2"	SW	2.875	2.735	.070
3"	SW	3.500	3.360	.070
3-1/2"	SW	4.000	3.860	.070
4"	SW	4.460	4.320	.070
5"	MW	5.572	5.380	.096
6"	MW	6.572	6.380	.096

All conduit shall be manufactured having non-tapered sections (except for belled ends).

V. Electrical Characteristics

Dielectric strength shall exceed 400 volts/mil when tested in accordance with ASTM D-149.

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VI. Mechanical Characteristics

The conduit shall have following mechanical strength when tested in accordance with referenced test method:

Tensile strength, ultimate	9,000 psi	ASTM D2105
Coefficient of thermal expansion	$1.5x10^{-5}$ in/in/oF	ASTM D696
Glass content	65-70%	API 15LR
Water absorption	1% max	ASTM D570

Impact resistance: ASTM D2444

Size	3/4"	15 ft.lbs.
	1"	15 ft.lbs.
	1-1/4"	15 ft.lbs.
	1-1/2"	20 ft.lbs.
	2"	40 ft.lbs.
	2-1/2"	45 ft.lbs.
	3"	60 ft.lbs.
	3-1/2"	60 ft.lbs.
	4"	60 ft.lbs.
	5"	100 ft.lbs.
	6"	100 ft.lbs.

Stiffness at 5% Deflection: ASTM D2412

Size	3/4"	1,500 lb/in/in
	1"	1,200 lb/in/in
	1-1/4"	850 lb/in/in
	1-1/2"	600 lb/in/in
	2"	320 lb/in/in
	2-1/2"	220 lb/in/in
	3"	140 lb/in/in
	3-1/2"	85 lb/in/in
	4"	50 lb/in/in
	5"	75 lb/in/in
	6"	55 lb/in/in

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VII. Joining System

A. Conduit Subjected to Changes in Ambient Temperature
The conduit shall be supplied with an integral wound bell on one end and a machined end spigot on the other end. A two component epoxy adhesive shall be applied to the spigot end before joining the conduit together. The adhesive shall be supplied in 20 fl. oz. plastic cartridges, using a plastic static mixer attached to the cartridges and be applied with an adhesive gun. The adhesive shall be available for three different ambient temperatures, 70°F, 40°F and 20°F. The adhesive will applied by using an adhesive gun. Adhesive shall be supplied from the same manufacturer of conduit and fittings in order not to void the listing by UL.

B. Constant Ambient Temperature
The conduit shall be supplied with a gasketed joining system can be used for both encased in concrete as well as direct buried installations. The gasketed shall be a three-ribbed gasket made from water resistant rubber material. The gasket shall be fit into a permanent groove in the belled end of the conduit. Retainer rings etc. are not permitted in order to create the groove.

VIII. Fire Resistance And Flame Spread

Conduit shall meet specification UL 1684, i.e. the flame shall extinguish within 30 seconds each time after 4 consecutive applications of 15 seconds and shall extinguish within 60 seconds after the 5th application, also being 15 seconds long.

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IX. Toxicity

The conduit shall not contain any compounds that can release halogens, i.e. chlorine, bromine, flour and iodine in more than trace amounts when burning. Following shall be the maximum values when tested in accordance to ASTM E-800:

Gases	Values (max p.p.m.)
Hydrogen Chloride	0
Hydrogen Bromide	0
Hydrogen Cyanide	< 1
Hydrogen Sulfide	0
Vinyl Chloride	10
Ammonia	0
Aldehydes as HCHO	< 10
Oxides of Nitrogen	< 50
Carbon Dioxide	< 12,500
Carbon Monoxide	< 250

X. Fittings And Accessories

All fittings, elbows and accessories shall be manufactured from the same process, using the same methods and chemicals as the pipe. Only two exceptions apply. The first is conduit bodies, which are manufactured using compression molding process (Sheet Molding Compound, SMC). The material for conduit bodies is vinylester resin with +30% reinforcement of glass. Glass fibers should be long fibers, approx. 1" in length. The material is fire resistant according to UL 1684 and halogen free. Second exception, being plastic duct plugs made from PVC.

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