

Bonded Sump Entry Fitting - Termination Style

for Fuel Handling applications

Installation and Application Instructions

1. Determine entry hole location and cut entry hole in sump wall using appropriate "C" dimensions in Table 1.
2. Using 40-60 grit fresh emery cloth or sand paper, sand the sump wall surfaces, inside and outside, to the outside diameter of the alignment rings. All glazed surface must be removed. Once finished sanding, remove all dust from the sanded area with a clean, dry cloth or brush. Do not use compressed air or bare fingers.
3. Place two alignment rings on sump entry fitting and insert through sump wall from outside the sump. Locate the 1/4 inch threaded outlet to the desired angular location.

If this fitting is used in an Open (Drainage) System, locate the 1/4 inch threaded outlet in the 6 o'clock position.

Leave 1/4 inch plastic threaded outlet protector in place until 1/4 inch fitting installation.

4. Dry fit primary pipe and rotate the two rings until the desired angle is reached. Maximum allowable offset is 5°. Make alignment marks on the rings, the sump entry fitting, and the sump wall. Be sure to mark the rings so they can be placed in the same location and sequence during bonding.

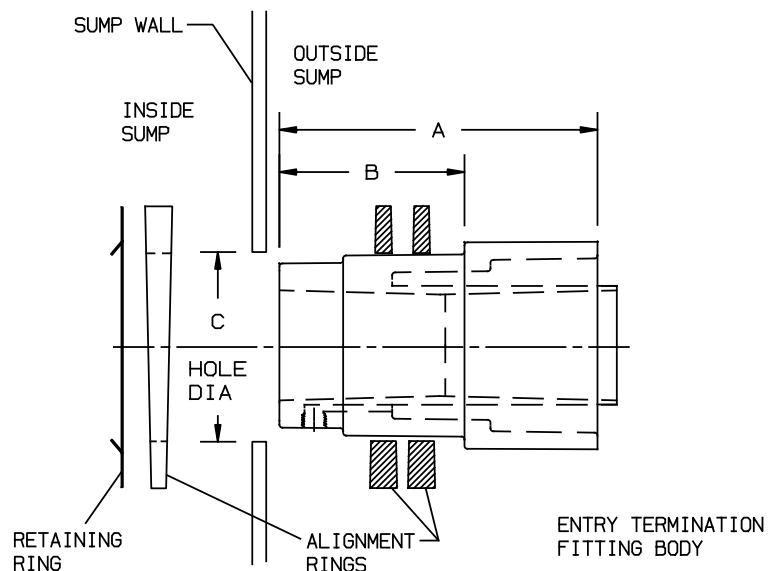


System	3x2 Part No.	4x3 Part No.
Red Thread IIA or Dualoy 3000/L	012030-626-0	012040-626-0
Dualoy 3000/LCX*	22856830	33856830

* Includes Closure Nipple

Size	A	B	C
Inch	Inch	Inch	Inch
3 x 2	6.88	4.00	4.00
4 x 3	6.88	4.00	5.00

NOTE: These fittings can only be bonded to flat walled, fiberglass sumps. **DO NOT** install on thermoplastic or round sumps.



5. Place the remaining ring over the sump entry fitting in the inside of the sump and rotate to the desired angle. Make alignment mark on both the sump wall and the ring when at the desired angle to make the "free" surface of the ring as close to perpendicular (square) to the axis of the fitting as possible.
6. Mix one 8 oz. PSX-34 or one 8069 adhesive for each fitting per the instructions in the adhesive kit. Filler should be used with 8069 to insure proper sealing of alignment rings.
7. Apply adhesive generously, approximately $\frac{1}{16}$ inch thick, to the inside and the outside of the sump walls where the alignment rings are located. Coat the edges of the hole cut in the sump wall. Apply a thin coating of adhesive to the bonding surfaces of the alignment rings.
8. Line up rings with alignment marks and press together firmly holding the fitting in place from the outside of the sump.
9. Slide the metal retaining ring over the inside section of the sump entry fitting and against the inner alignment ring until all the rings are tight against both sides of the sump wall. (A short section of 4 inch pipe may be used to drive the metal retaining ring over the fitting). Be sure there is an adhesive bead visible between the rings and the sump wall. The metal ring must hold the assembly in position while the adhesive cures. If the assembly is not tight against the sump wall, firmly press the sump entry fitting against the outside sump wall while pressing the metal ring against the alignment ring on the inside. Clean excess adhesive from all bonding surfaces.
10. Do not disturb assembly until the adhesive is cured. This includes bonding of pipe to the sump entry fitting and installing the threaded outlet fitting. See adhesive kit instructions for cure times.
11. The use of an industrial hot air gun may speed up the curing process. Do not overheat.
12. Remove $\frac{1}{4}$ inch plastic threaded outlet protector. **Apply adhesive only** to the $\frac{1}{4}$ inch fitting and screw into the $\frac{1}{4}$ inch threaded outlet. Tighten to 40 in.-lbs. or $1\frac{1}{2}$ -2 turns past hand tight.

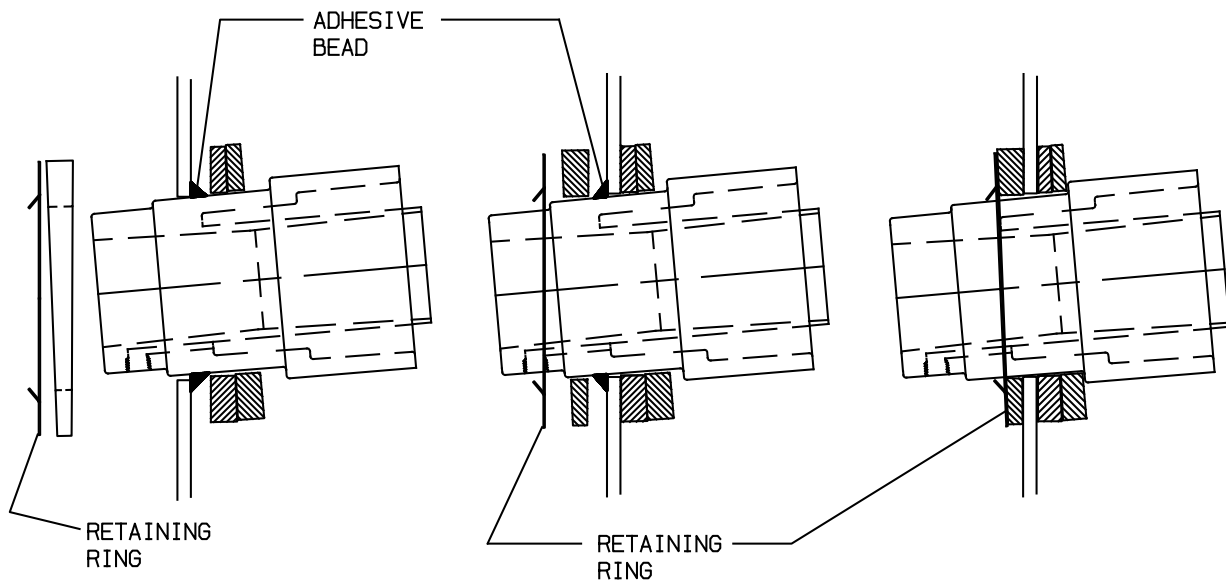
NOTE: *Over-tightening the tapered threads of the fitting may damage the fitting body. DO NOT OVER-TIGHTEN.*

After installing the fitting, be sure the interstitial space is free from excess adhesive. Install a short hose and blow excess adhesive through the air passage.

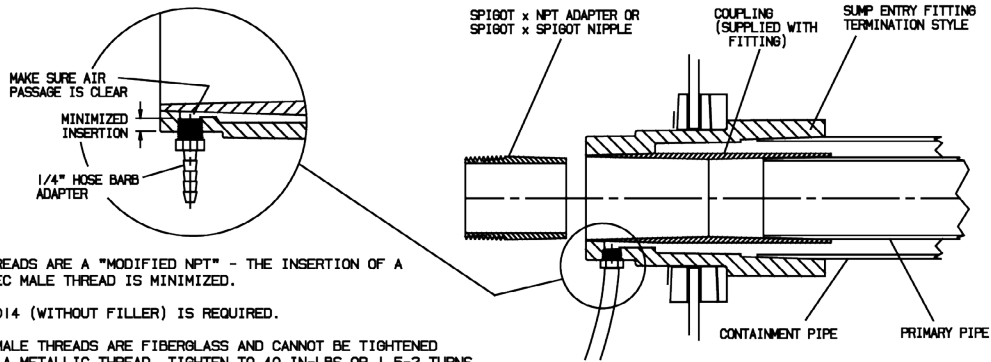
NOTE: *Verify with testing company or monitoring manufacturer if a larger thread is needed for their equipment. After the port fitting is installed, do not remove.*
13. Connect only flexible tubing or hoses to the port fitting.

NOTE: *Tubing or hoses must be rated to full vacuum.*

Drawings below show the assembly of the fitting and associated pipe when using either size-over-size containment systems or coaxial pipe.

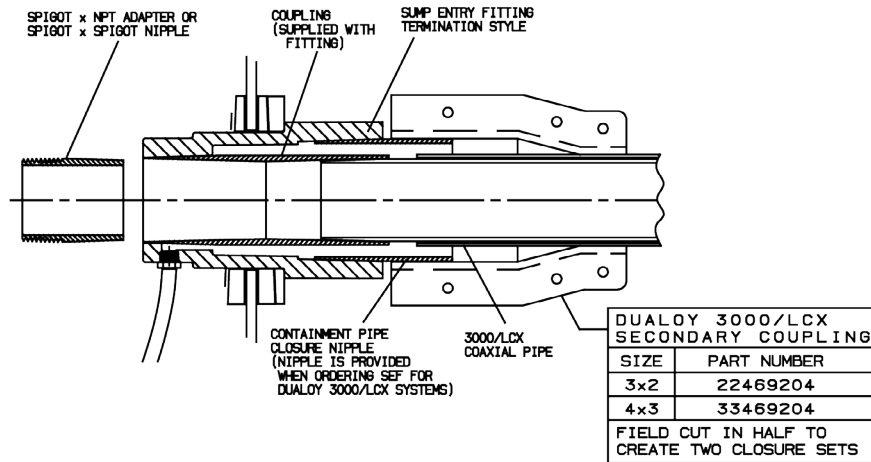


**SUMP ENTRY FITTING - TERMINATION STYLE
EXAMPLE FOR PIPE OVER PIPE, RTIIA OR DUALOY 3000/L**



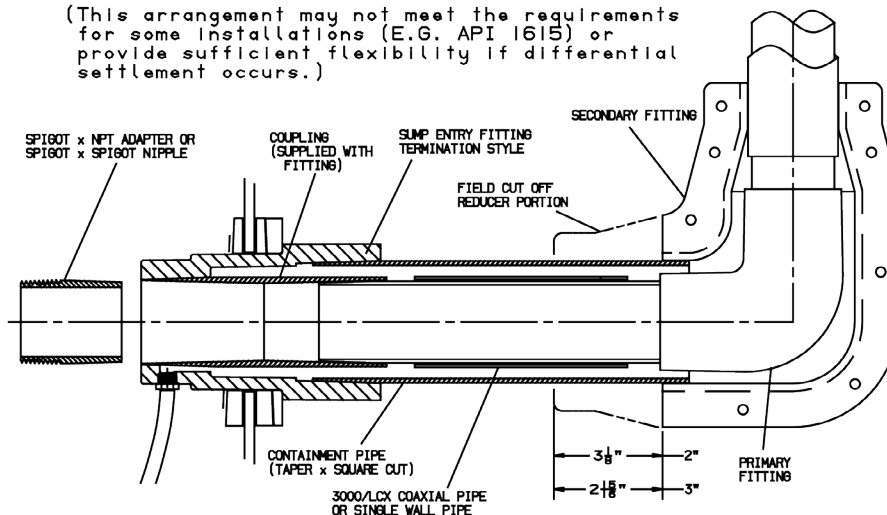
- THE 1/4" THREADS ARE A "MODIFIED NPT" - THE INSERTION OF A STANDARD SPEC MALE THREAD IS MINIMIZED.
- PSX-20 OR 8014 (WITHOUT FILLER) IS REQUIRED.
- THE 1/4" FEMALE THREADS ARE FIBERGLASS AND CANNOT BE TIGHTENED THE SAME AS A METALLIC THREAD. TIGHTEN TO 40 IN-LBS OR 1.5-2 TURNS
- AFTER INSTALLING A 1/4" NPT FITTING, THE PASSAGEWAY TO THE PIPING INTERSTITIAL SPACE SHOULD BE CLEARED WITH AIR PRESSURE TO INSURE THAT IT IS FREE OF THREAD SEALANT AND/OR ADHESIVE.

**SUMP ENTRY FITTING - TERMINATION STYLE
EXAMPLE FOR DUALOY 3000/LCX COAXIAL PIPE**



**SUMP ENTRY FITTING - TERMINATION STYLE
EXAMPLE FOR CLOSE PROXIMITY FITTING**

(This arrangement may not meet the requirements for some installations (E.G. API 1615) or provide sufficient flexibility if differential settlement occurs.)





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Dualoy™ 3000/L Fiberglass Pipe

(Product Data)



Applications

- Service Station
- Vent/Vapor Recovery
- Bulk Plant Terminals
- Fueling Terminals
- Central Fuel Oil Systems
- Marinas Terminals
- Ethanol Fuel Blends
- Diesel Exhaust Fluid
- UL/ULC Systems that require MV, HB, CT, A&M Fuels

Materials and Construction

Filament-wound fiberglass reinforced epoxy pipe with integral epoxy liner and exterior coating. When classified in accordance with ASTM D2310 and ASTM D2996, the pipe meets the following cell limits: RTRP 11CXF1-5420. The operating pressure of the pipe is up to 200 psig (13.8 bar) with continuous operating temperature to 150°F (66°C).

Dualoy 3000/L is Listed with Underwriters Laboratories Standard 971-2004 for nonmetallic underground piping for motor vehicle (MV), high blend (HB), concentrated (CT) and aviation and marine (A&M) fuels (File MH9162). Dualoy 3000/L pipe and fittings are

also Listed with Underwriters Laboratories of Canada (File CMH 715). In Great Britain the Dualoy 3000/L system has been tested and accepted by the London Fire and Civil Defence Authority. Dualoy 3000/L has been issued a Certificate of Compliance to the Institute of Petroleum (IP) Specification by ERA Technology, Ltd.

Performance

Individual system components may not have the same ratings as the pipe. Refer to the detailed product information for the specific components to determine the pressure rating for the system as a whole.

Fittings

Compression-molded and filament-wound fiberglass reinforced epoxy.

For dimensions of fittings, consult publication Dualoy 3000/L Fittings Dimensions.

Pressure ratings of fittings without UL listing are available on request

Joining System

- **Bell & Spigot** - The primary joining method for fitting joints.

Nominal Dimensional Data

Pipe Size		Inside Diameter		Outside Diameter ⁽¹⁾		Wall Thickness				Capacity		Weight		Max. Deflection per 20 ft Joint	Min. Length Req. for 10° Change		Stiffness Factor ⁽²⁾	
						Total		Structural										
in	mm	in	mm	in	mm	in	mm	in	mm	gal/ft	l/m	lb/ft	kg/m	deg	ft	m	lb•in ³ /in ²	N•m
2	50	2.21	56	2.37	60	0.080	2.03	0.060	1.5	0.20	2.50	0.47	0.70	15	13	4	45	5.1
3	80	3.32	84	3.50	89	0.085	2.16	0.065	1.6	0.45	5.60	0.72	1.07	9	22	7	75	8.5
4	100	4.33	110	4.50	114	0.087	2.21	0.070	1.8	0.77	2.92	1.00	1.49	7.5	27	8	60	6.8
6	150	6.39	162	6.63	168	0.120	3.10	0.100	2.5	1.67	6.35	2.10	3.13	5	40	12	275	31.1

⁽¹⁾ Typical outside diameters of 2 through 6-inch pipe are within API, ASTM and ANSI fiberglass and steel pipe dimensions.

⁽²⁾ At 5% deflection.

View of Joint Illustrations (Joint illustration only depicts type of connection available, not type of pipe featured in data sheet)



Bell & Spigot

Typical Pipe Performance

Nominal Pipe Size		Pressure Rating ⁽¹⁾		Ultimate Internal Pressure ⁽¹⁾		Ultimate Collapse Pressure ⁽²⁾	
in	mm	psig	MPa	psig	MPa	psig	MPa
2	50	200	2.07	3200	22.1	153	1.05
3	80	200	1.38	2400	16.5	90	0.62
4	100	175	1.21	2000	13.8	39	0.27
6	150	175	1.21	2000	13.8	38	0.26

⁽¹⁾ At 80°F (27°C).

⁽²⁾ At 80°F (27°C). For continuous service do not exceed 75% of these values.

Typical Mechanical Properties

Pipe Property ⁽¹⁾	Method		
Tensile Strength			
Longitudinal	35,000 psi	241.3 MPa	ASTM D2105
Circumferential	70,000 psi	482.7 MPa	ASTM D1599
Poisson's Ratio $\nu_{ha}^{(2)} - \nu_{ha}^{(3)}$	0.16 - 0.26		
Tensile Modulus			
Longitudinal	25,000 psi	172.4 Mpa	ASTM D2105
Circumferential	38,000 psi	262.0 MPa	FGSTM
Compressive Strength			
Longitudinal	24,500 psi	168.9 MPa	FGSTM
Compressive Modulus			
Longitudinal	26,000 psi	179.3 MPa	FGSTM
Cyclic	8,000 psi	55.2 MPa	ASTM D2992 Procedure A

Typical Physical Properties

Pipe Property	Value	Value	Method
Thermal Conductivity	1.7 BTU-in/hr·ft ² ·°F	7.6 W/m·°C	ASTM C177
Thermal Expansion	8.5 x 10 ⁻⁶ in/in·°F	15.3 x 10 ⁻⁶ cm/cm·°C	ASTM D696
Friction Factor	Hazen-Williams 150.0		-
Absolute Roughness	0.00021 in	0.00053 mm	
Specific Gravity	1.8		ASTM D792
Barcol Hardness	65.0 (Impressor 934-1)		ASTM D2583

⁽¹⁾ Based on structural wall thickness.

⁽²⁾ ν_{ha} = The ratio of axial strain to hoop strain resulting from stress in the hoop direction.

⁽³⁾ ν_{ah} = The ratio of hoop strain to axial strain resulting from stress in the axial direction.

Pipe Length

Size		Standard		Random	
in	mm	ft	m	ft	m
2-6	50-150	20	6.1	17-21	5.2 - 6.4

Minimum Bending Radius

Size		Minimum Bending Radius ⁽¹⁾	
in	mm	ft	m
2	50	75	23
3	80	100	38
4	100	150	46
6	150	200	61

⁽¹⁾ At rated pressure. Sharper bends may create excessive stress concentrations. Do not bend pipe until adhesive has cured.

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Fiber Glass Systems

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Dualoy® 3000/L Fittings Dimensions Product Data

Units

All dimensions are in U.S. Customary units (inches).
Diametric dimensions are maximums.
Insertion depths (X1, X2) are typical.
All weights (lb) are approximate.

Tolerances

Tolerance for centerline-to-face dimensions on fittings with bell-end configuration is $\pm 1/16$ inch.

Listings

Dualoy 3000/L is Listed in the U.S. with Underwriters Laboratories for nonmetallic underground piping for motor vehicle (MV), high blend (HB), concentrated (CT) and aviation and marine (A&M) fuels (File MH9162). Dualoy 3000/L pipe and fittings are also listed with Underwriters Laboratories of Canada (File CMH 715). In Great Britain the Dualoy 3000/L system has been tested and accepted by the London Fire and Civil Defence Authority. Dualoy 3000/L has been issued a Certificate of Compliance to the Institute of Petroleum (IP) Specification by ERA Technology, Ltd.

End Configurations

Bell end is standard.

Taper Angle

The taper angle on all bell and spigot end configurations is $1\frac{3}{4}^\circ$.

Pressure Ratings

See publication Dualoy 3000/L Fiberglass Pipe and Fittings, FP265, for pressure ratings. Individual system components may not have the same ratings as the pipe. Refer to the detailed product information for the specific components to determine the pressure rating for the system as a whole.

Manufacturing Methods

The fiberglass-reinforced epoxy resin fittings shown in this document are manufactured by filament winding or compression molding.

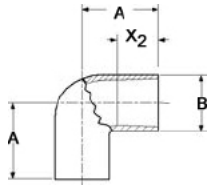
Adapters: bell x NPT female
Adapters: bell x NPT male
Adapters: isolation
Adapters: spigot x NPT female
Adapters: spigot x NPT male
45° Elbows
90° Elbows
End caps

Flange rings
Flange stub ends
Nipples
Reducer bushings
Repair couplings
Sleeve couplings
Sump penetration pieces
Tees

Fittings Dimensions

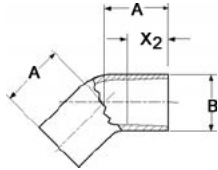
Nominal Pipe Size		Bell A	Bell B	Bell X ₂	Weight
(in)	(mm)	(in)	(in)	(in)	(lb)

90° Elbows (Molded)



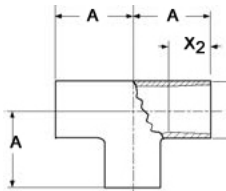
2	50	3.82	2.78	2.05	1.0
3	80	4.42	3.99	3.32	1.5
4	100	5.50	5.00	3.15	3.0
6	150	7.50	7.34	4.00	8.5

45° Elbows (Molded)



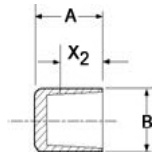
2	50	3.18	2.78	2.05	0.9
3	80	3.43	3.99	2.32	1.5
4	100	4.23	5.00	3.15	2.5
6	150	5.56	7.34	4.00	7.0

Tees (Molded)



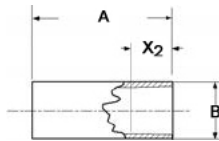
2	50	3.82	2.78	2.05	1.3
3	80	4.50	3.99	2.40	2.5
4	100	5.50	5.00	3.15	4.0
6	150	7.50	7.34	4.00	12.0

End Caps (Molded)



2	50	3.25	2.93	2.00	0.6
3	80	3.38	4.05	2.25	1.0
4	100	3.38	5.05	2.25	1.4
6	150	4.63	7.44	3.30	4.5

Sleeve Couplings (Filament Wound)

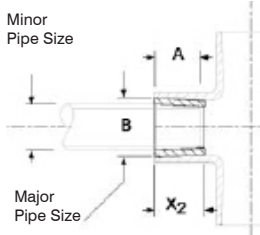


2	50	6.25	2.80	2.13	0.5
3	80	6.50	4.05	2.19	1.1
4*	100	5.45	5.10	2.38	2.1
6*	150	7.00	7.30	3.13	4.6

* 4" & 6" are wound-on tooling couplings.

Reducer Bushings (Molded)

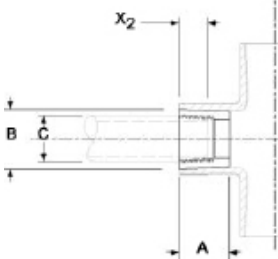
Bonded Bushing



Nominal Pipe Size		Length A	OD B	Thread Size C	D	E	X ₁	Insertion X ₂	Wt
(in)	(mm)	(in)	(in)	(in)	(in)	(in)	(in)	(in)	(lb)
3 x 2	80 x 50	1.88	3.51	—	—	—	—	1.75	0.7
4 x 3	100 x 80	1.96	4.51	—	—	—	—	2.00	0.9
6 x 4	150 x 100	2.86	6.65	—	—	—	—	2.20	4.1

1) Reducer bushings with tapered minor NPS are generally used in the bell ends of elbows and tees.

Threaded Bushing



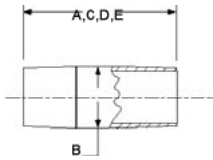
Nominal Pipe Size		Length A	OD B	Thread Size C	D	E	X ₁	Insertion X ₂	Wt
(in)	(mm)	(in)	(in)	(in)	(in)	(in)	(in)	(in)	(lb)
2 x 1½	50 x 40	1.80	2.40	1½ x 11½	—	—	—	0.7	0.3

1) Outlet NPS x outlet NPT threads per inch. Reducer bushing with BSP threads available. Outlet sizes smaller than 1½ inch are obtained by using galvanized steel bushings in the fiberglass bushing.

Fittings Dimensions

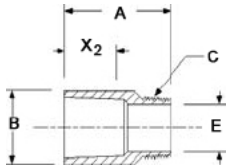
Nominal Pipe Size		Length A	OD B	C	D	E	X ₁	Insertion X ₂	Wt
(in)	(mm)	(in)	(in)	(in)	(in)	(in)	(in)	(in)	(lb)
2	50	6.00	2.38	8.00	10.00	12.00	—	—	0.5 ⁽¹⁾
3	80	—	3.50	8.00	10.00	12.00	—	—	0.7
4	100	—	4.50	—	10.00	12.00	—	—	1.0
6	150	—	6.63	—	—	12.00	—	—	1.7

Nipples (filament wound)



(1) Lb/ft.

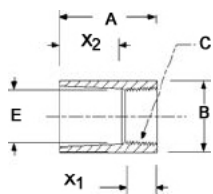
Adaptors: Bell x NPT male (molded)



2	50	4.16	2.92	2 x 11½ ⁽¹⁾	—	1.90	—	2.00	0.4
3	80	5.00	3.92	3 x 8	—	2.80	—	2.05	0.7
4	100	5.19	4.88	4 x 8	—	3.90	—	2.05	0.9
6	150	6.00	7.40	6 x 8	—	5.90	—	3.20	2.1

(1) Nominal pipe size x NPT threads per inch. BSP threads available.

Adaptors: Bell x NPT female (filament wound)

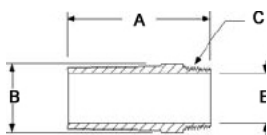


2 x 1½ ⁽¹⁾	50 x 40	6.00	2.80	1½ x 11½ ⁽²⁾	—	2.29	0.70	2.31	0.8
2 x 2	50 x 50	4.75	2.50	2 x 11½ ⁽²⁾	—	2.29	1.13	2.31	0.4
3 x 3	80 x 80	5.38	3.65	3 x 8	—	3.00	1.00	2.00	0.7
4 x 4	100 x 100	5.38	4.65	4 x 8	—	4.00	1.10	2.25	0.9
6 x 6	150 x 150	6.75	6.90	6 x 8	—	6.00	1.20	3.48	2.1

(1) Consists of a 2-inch filament-wound sleeve coupling with a factory-bonded 2 x 1½ NPT molded bushing. The end of the sleeve coupling containing the bushing has been reduced in length to facilitate thread make-up in the field.

(2) Nominal pipe size x NPT threads per inch. BSP threads available.

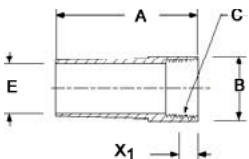
Adaptors: Spigot x NPT male (filament wound)



2	50	4.38	2.55	2 x 11½ ⁽¹⁾	—	2.00	—	—	0.5
3	80	5.50	3.65	3 x 8	—	3.00	—	—	1.3
4	100	6.00	4.65	4 x 8	—	4.00	—	—	1.7
6	150	6.00	6.90	6 x 8	—	6.00	—	—	4.2

(1) Nominal pipe size x NPT threads per inch. BSP threads available

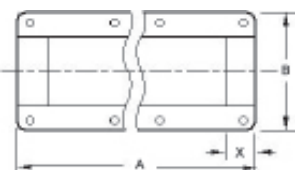
Adaptors: Spigot x NPT female (filament wound)



2	50	4.38	2.55	2 x 11½ ⁽¹⁾	—	2.00	0.70	—	0.5
3	80	5.50	3.65	3 x 8	—	3.00	1.00	—	1.3
4	100	6.00	4.65	4 x 8	—	4.00	1.20	—	1.7
6	150	6.00	6.90	6 x 8	—	6.00	1.00	—	4.2

(1) Nominal pipe size x NPT threads per inch. BSP threads available

Repair Couplings (molded)



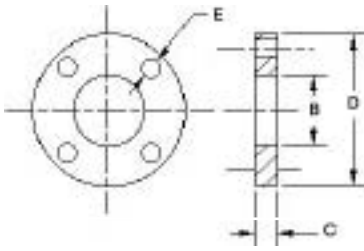
2 ⁽¹⁾	50	14.00	4.00	—	—	—	8 ⁽²⁾	1.50	1.3
3	80	14.00	6.00	—	—	—	8	1.50	1.7
4	100	14.00	7.00	—	—	—	8	1.50	2.0

(1) Repair coupling inside diameters match pipe inside diameters of the same nominal pipe size.

(2) Number of bolt holes.

Fittings Dimensions

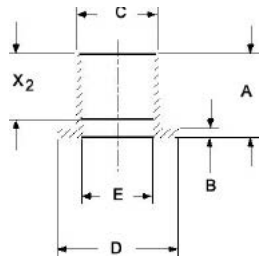
Flange Rings (molded)



Nominal Pipe Size		A	B	C	D	E	Number of Bolt Holes ₂	X ₂	Wt
(in)	(mm)	(in)	(in)	(in)	(in)	(in)		(in)	(lb)
2	50	—	2.78	0.82	6.00	0.75	4	—	1.0
3	80	—	3.90	1.10	7.50	0.75	4	—	1.6
4	100	—	4.90	1.10	9.00	0.75	8	—	2.5
6	150	—	7.26	1.25	11.00	0.88	8	—	4.9

Flange Stub Ends⁽¹⁾ (molded)

Flanged connections in Dualoy 3000/L piping systems are made using one-piece flange rings and stub ends that are bonded onto the pipe ends. Both flange rings and stub ends are fabricated by compression molding epoxy resins and discontinuous glass fibers. Bolt holes are drilled in accordance with ANSI B16.5, Cl150. Dualoy 3000/L flanged connections are rated to the same pressures as pipe and fittings of the same nominal pipe size.

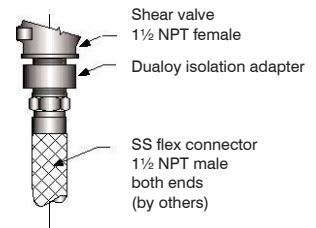
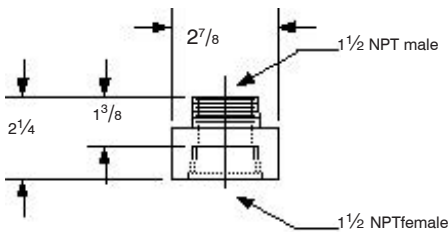


Nominal Pipe Size		A	B	C	D	E	Number of Bolt Holes ₂	X ₂	Wt
(in)	(mm)	(in)	(in)	(in)	(in)	(in)		(in)	(lb)
2	50	2.75	0.27	2.65	3.91	2.26	—	2.15	0.5
3	80	2.88	0.28	3.75	5.16	3.38	—	2.40	0.7
4	100	2.88	0.28	4.75	6.66	4.38	—	3.25	1.0
6	150	3.88	0.39	7.10	8.53	6.46	—	3.25	2.4

(1) For use with flange rings shown in previous table.

Isolation Adapter (molded)

The Dualoy isolation adapter provides electrical isolation from the dispenser for flex connectors that are directly buried and which must be cathodically protected. The adapter is fabricated of compression-molded fiberglass reinforced epoxy resins.



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Dualoy® 3000/L Secondary Containment Pipe and Fittings

Uses and Applications

- Service station product, vent and vapor recovery piping
- Bulk plant terminals and fueling terminals
- Central fuel oil systems
- Marinas and marine terminals (onshore only)
- All piping systems requiring UL or ULC Listing for MV, HB, CT and A&M fuels
- Containment piping for all of the above

Description

Dualoy 3000/L secondary containment systems require pipe one size larger than the primary and specially designed fittings. The system provides complete enclosure of UL- and ULC-Listed Dualoy primary piping used in product lines and vapor recovery lines from the sump at the product storage tank to the shear valve connector at the dispenser, and vent lines from the tank. Dualoy containment systems have been sized for close make-up and ease of installation.

Features of Dualoy 3000/L containment systems include:

- Filament-wound, fiberglass-reinforced pipe with integral liner;
- Compact fittings dimensions to minimize trench excavation;
- Smooth exterior pipe surface that eliminates the need for special end preparation tools;
- Ready accessibility to and complete inspectability of primary fittings prior to closure of the containment;
- Complete testability during installation and at any time thereafter;
- Rapid joint makeup with pre-inserted nuts and ambient cure adhesive.

Listings

Dualoy 3000/L is Listed in the United States with Underwriters Laboratories Standard 971-2004 for nonmetallic underground piping for motor vehicle (MV), high blend (HB), concentrated (CT) and aviation and marine (A&M) fuels for both primary and contained piping systems (File MH9162). Dualoy 3000/L pipe and fittings are also Listed with Underwriters' Laboratories of Canada (File CMH715). In Great Britain the Dualoy/3000L system has been tested and accepted by the London Fire and Civil Defense Authority. Dualoy 3000/L has been issued a Certificate of Compliance to the Institute of Petroleum (IP) Specification by ERA Technology, Ltd.

Performance

Operating pressures to 100 psig

Continuous operating temperatures to 150°F (66°C)

Individual system components may not have the same ratings as the pipe. Refer to the detailed product information for the specific components to determine the pressure rating for the system as a whole.

Secondary employs full-performance pipe — Many contained fuel handling systems employ materials in the secondary that fall far short of the primary piping in regard to chemical resistance and mechanical strength. By contrast, Dualoy 3000/L systems are manufactured with the same high-performance fiberglass-reinforced pipe in the secondary as in the primary. Thus, Dualoy 3000/L containment systems easily withstand both high external loads from backfill and traffic as well as internal pressures as high as 100 psig.

Compact containment fittings — Dualoy 3000/L containment fittings are compact clamshell-type closure pieces. Crossovers can be made with the same centerline-to-centerline dimension as single-wall system.

Piping System Characteristics

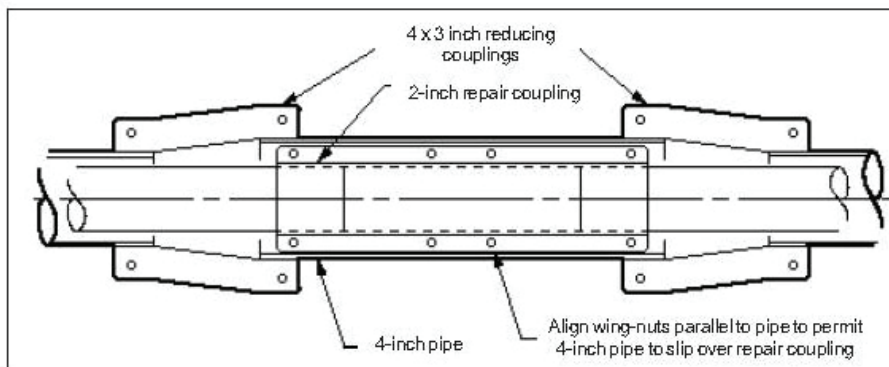
Precision pipe exterior eliminates scarfing — Dualoy pipe is manufactured in a proprietary continuous winding process that provides an extremely precise, consistent outside diameter. Light sanding of the pipe end to remove the surface gloss and obtain a suitable bonding surface is the only end prep required, although the scarfing feature of tapering tools can be used.

Easy containment fitting assembly — Dualoy 3000/L containment fitting clamshells are supplied in matched pairs. One half of each pair is fitted with pre-inserted propeller nuts, allowing the fitting to be assembled from one side, using the bolts provided.

Complete retestability — Dualoy 3000/L containment employs rigid-wall pipe and fittings that maintain their slope during the entire service life of the station. When installed with isolating penetration fittings (see page 3), Dualoy 3000/L containment piping can be repeatedly retested whenever desired.

Convenient repair capability — Contained piping systems are occasionally damaged after installation. Damage is generally caused by paving or excavation operations. Dualoy 3000/L contained piping systems are designed so that only the damaged section need be replaced instead of the entire line. The 2-inch Dualoy repair coupling is sized so that it can be contained within 4-inch Dualoy 3000/L containment pipe.

Two-inch primary pipe contained within 3-inch containment pipe can be repaired with a UL-listed 2-inch repair coupling. The containment is restored by replacement of a section of the existing containment pipe with a 4-inch containment nipple. The 4-inch replacement nipple is then joined to the existing containment pipe with Dualoy reducing couplings.

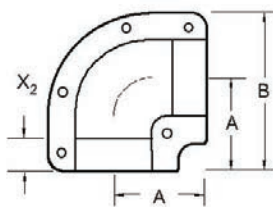


Containment Pipe and Fittings Dimensions

Pipe

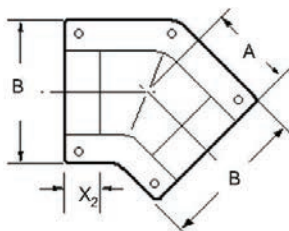
Nominal Pipe Size		A	B	C	X ₂	No. of Bolt Holes	Wt. lb
in	mm	in	in	in	in		
3	80	3.50	3.32	—	—	—	0.72
4	100	4.50	4.33	—	—	—	1.00
6	150	6.63	6.39	—	—	—	2.10

90° Elbows



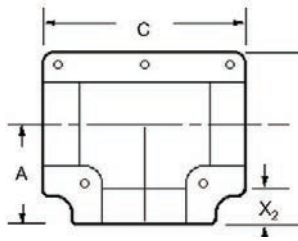
3	80	4.28	7.28	—	1.50	5	1.1
4	100	4.77	8.25	—	1.50	5	1.3
6	150	5.62	10.53	—	2.00	8	1.5

45° Elbows



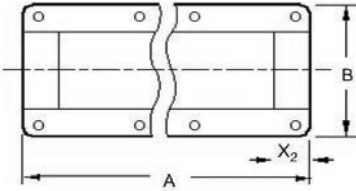
3	80	3.50	6.00	—	1.50	5	0.8
4	100	3.75	7.00	—	1.50	5	1.2
6	150	6.32	9.75	—	2.00	8	1.5

Tees



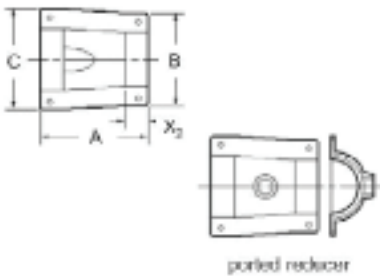
Nominal Pipe Size		A	B	C	X ₂	No. of Bolt Holes	Wt.
in	mm	in	in	in	in		lb
3	80	4.28	7.24	8.56	1.50	5	1.2
4	100	4.78	8.25	9.58	1.50	5	1.6
6	150	5.72	10.67	11.65	2.00	6	1.7

Couplings



2	50	14.00	4.00	—	1.50	8	1.3
3	80	14.00	6.00	—	1.50	8	1.7
4	100	14.00	7.00	—	1.50	8	2.0
6	150	5.37	9.75	—	4.00	10	2.0

Reducers, Plain and with 3/4 inch NPT Outlet

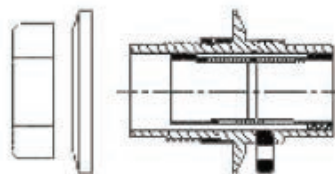


3 x 1½	80 x 40	6.25	4.48	6.10	1.50	4	0.6
3 x 1½	80 x 40	6.25	4.47	6.10	1.50	4	1.1 ⁽¹⁾
3 x 2	80 x 50	6.25	4.90	6.10	1.00	4	0.7
3 x 2	80 x 50	6.25	4.90	6.10	1.00	4	1.1 ⁽¹⁾
4 x 3	100 x 80	7.00	6.00	7.00	1.50	4	0.9
4 x 3	100 x 80	7.00	6.00	7.00	1.50	4	2.0 ⁽¹⁾
6 x 4	150 x 100	7.17	7.62	9.74	2.00	6	1.0

(1) Ported reducer

Sump Penetration Fittings

Sump penetrations are designed for use at turbine sumps and dispenser pans. Plain sump penetration fittings permit the annular space between the primary and secondary lines to communicate with the interior of the sump or pan. Penetration fittings with factory-installed centralizers, sleeve couplings and monitoring ports may be used to isolate the pipe annular space from the sump or pan. When the annular space is so isolated, the secondary containment line can be retested at any time and as often as desired.



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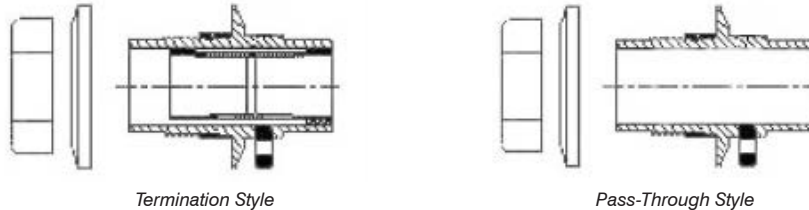
NOV Fiber Glass Systems

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FH3510 March 2013

Dualoy Sump Penetration Fitting for Secondary Containment Piping Systems

Description

The Dualoy sump penetration fitting provides a superior means of routing contained fuel handling systems through standard flat sided fiberglass tank sumps or dispenser sumps (single or double wall). The standard fitting consists of a body that mounts through the sump wall, a washer, and a threaded nut that engages from the outside to hold the assembly in place. The body of the fitting, the washer and the nut are fabricated from corrosion-resistant, chemically inert, fiberglass-reinforced epoxy resins. The inside diameter of the fitting accommodates the primary line; the outside diameter is sized to make up to the next size larger Dualoy 3000/L pipe or the same size of LCX, by use of a half coupling. The standard penetration fitting permits the annular space between the primary line and the containment to communicate with the space inside the sump, by means of a pipe nipple. The fittings can also be used with continuous monitoring systems, such as vacuum, pressure or hydrostatic sump wall, a washer, and a threaded nut that engages from the outside to hold the assembly in place. The body of the fitting, the washer and the nut are fabricated from corrosion-resistant, chemically inert, fiberglass-reinforced epoxy resins. The inside diameter of the fitting accommodates the primary line; the outside diameter is sized to make up to the next size larger Dualoy 3000/L pipe or the same size of LCX, by use of a half coupling. The standard penetration fitting permits the annular space between the primary line and the containment to communicate with the space inside of the sump, by means of a pipe nipple. The fittings can also be used with continuous monitoring systems, such as vacuum, pressure or hydrostatic.

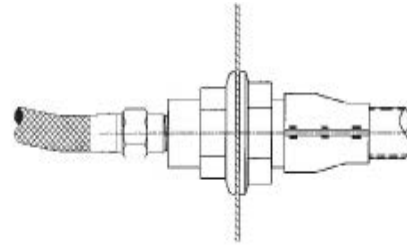


Advantages

The Dualoy penetration fitting offers a number of benefits to both contractor and user:

- **Corrosion-resistant construction** — The standard sump penetration fitting is fabricated from chemically inert, fiberglass-reinforced epoxy resins throughout.
- **Positive, adhesive seal at riser wall** — The Dualoy penetration fitting is joined to the sump wall using PSX™ •20 epoxy adhesive and does not rely on rubber or thermoplastic grommets, cuffs or flashings to protect the inside of the riser or sump from intrusion of ground water or soil contaminants.
- **Simple installation** — The penetration can be mounted in place with the same tools used to install any Dualoy 3000/L contained piping system and a hole saw.
- **Variety of sizes** — The Dualoy sump penetration fitting is available in 2-inch, 3-inch and 4-inch sizes. These sizes designate the size of the primary pipe and the secondary pipe would be one size larger or, in the case of Dualoy 3000/LCX, the same nominal size.
- **Variety of configurations** — The Dualoy sump penetration fitting is available in two configurations:
 - The **Termination Style** fitting has a primary coupling installed in the body of the fitting. When the fitting is installed, the primary pipe is joined to this coupling from outside the sump. A threaded reducer bushing or a spigot end adapter is joined to the coupling from inside the sump. A flex connector can be attached to the bushing or adapter. Alternately, a pipe nipple can be bonded to the primary coupling inside the sump, with a primary fitting (usually a 90° elbow) bonded to the other end. A half coupling is then installed on the end outside the sump using the appropriate size to connect the containment pipe onto the outside of the fitting. A test port is provided on the fitting to allow easy testing from inside the sump.

- A second configuration involves the fitting without an internal coupling (**Pass-Through Style**). Using the proper size pipe, this allows the primary pipe or LCX coaxial pipe to travel through the fitting to a primary elbow or tee. If a tee is used, the pipe can continue on through another penetration fitting in the opposite wall of the sump (for series layouts). The secondary pipe outside the sump is again attached to the fitting using the correct half coupling. The containment can be left open inside the sump (for inspection), can be terminated at each end (to create "zones" in the containment) or can be continuous through the sump.



Assembly of Termination Style Fitting
with Flex Connector

Tapered Alignment Rings

The Dualoy sump penetration fittings are designed to be installed with 3000/L or LCX pipe at a 90° angle from the existing sump wall. Installation of the system should begin at each sump with length and fit adjustments made in the "middle" of the pipe run. If for any reason the pipe cannot maintain a 90° angle, or a slope beyond the flexibility of the pipe wall is needed, NOV Fiber Glass Systems has tapered alignment rings available. These rings, used in pairs, will adjust the angle of the penetration fitting and allow for up to 5° articulation of the fitting and pipe. The rings are fiberglass and are installed using standard adhesive.

Sump Penetration Fittings Part Numbers for use with	Termination Style	Pass-Through Style
2" 3000/LCX or 3" over 2" 3000/L	22856821	22856822
3" 3000/LCX or 4" over 3" 3000/L	33856821	33856822
4" 3000/LCX or 6" over 4" 3000/L	44856821	44856822

Alignment Rings Part Numbers	
3"	22359224
4"	33359224
6"	44359224

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Fuel Handling Piping Systems

RED THREAD™ IIA, DUALOY™ 3000/LCX, 3000/L

**BOOST
YOUR
BOTTOM
LINE**

1st to
50
Red Thread™ IIA



1968-2018
Fiber Glass Systems



Fuel Handling: The Industry Leader

Fiber Glass Systems is the leader for time-tested piping systems for underground fueling systems. We have proven our leadership with almost 50 years of continuous supply of two brands of UL Listed products for underground fuel handling. With a combined experience approaching 100 years, Red Thread IIA, Dualoy 3000/L and 3000/LCX have never been removed due to fuel incompatibility. Our products are manufactured for today's fuel blends and tomorrow's.

Lower Your Total Cost of Ownership

Our products are made with thermosetting, aromatic amine cured epoxy resin, ensuring no maintenance or replacement costs due to fuel incompatibility. In addition, our superior flow capabilities mean more flow at significantly lower pumping costs when compared to competitive products. Finally, using our Bonded Sump Entry Fitting – Termination Style helps eliminate the expense of pumping out leaking sumps, which can be substantial.



Over 100 million feet of Red Thread IIA and Dualoy fiberglass piping systems have been installed.



Over 2.1 trillion gallons of gasoline and diesel have been pumped using Red Thread IIA and Dualoy fiberglass piping systems in the last 30 years



30-year pipe warranty for both internal/external corrosion when using our Red Thread IIA and Dualoy fiberglass piping systems.



Our Red Thread IIA product line was the FIRST composite pipe to receive UL LISTED (UL 971) approval in 1968 for underground fuel handling.

HISTORY OF FIBERGLASS PIPE IN FUEL HANDLING

Fiberglass pipe was first listed by Underwriters Laboratories Inc. (UL) in 1968. The product was a welcome addition to the market due to the corrosion and thread leak problems associated with single-wall steel pipe, the incumbent material.

UL physical requirements for pressure, bending and tensile performance vs. rating have remained virtually unchanged since that time. The “chemical” requirements have changed significantly since the original draft of UL Subject 971, “Standard for Nonmetallic Underground Piping for Flammable Liquids”. The original requirements of the standard allowed no measurable weight change of the product holding a variety of fuels and liquids over a 180 day period. Both of the NOV products, Red Thread IIA and Dualoy 3000/L met this requirement. Another stringent requirement passed by fiberglass pipe was the required strength retention after 270 days of total immersion (open, square-cut pieces of pipe immersed in a battery of fuels and other liquids).

Since the initial authorization to apply the Listing Mark was given, the fuel market has changed, most notably with the use of alcohol in fuel (both ethanol and methanol) and the requirement for secondary containment. Requirements for the piping have changed, also. In 1995, UL relaxed the requirements for fuel permeation (tested in terms of weight loss) and also allowed candidate products to be tested with “single-sided immersion” where the test fuel or liquid was only in contact with the interior surface of the product. With fiberglass pipe already passing the more demanding test criteria, this level of performance was easily demonstrated.

In 2004, after poor field experience with several products, UL “tightened” the requirements on permeation and instituted new criteria for dimensional stability and weight gain, and also increased the percent strength retention requirements. Following the permeation requirements for primary pipe through this chronology reveals the allowable fluid migration through piping to go from zero (from 1968 to 1995) to 4 grams per square meter per day (to 2004) to the current 1 gram per square meter per day.

Put in more practical terms, this equates to a little over 1/20 (one-twentieth) of a gallon per day per 100 ft. of 2-inch pipe. This is down from the 1/5 of a gallon per day per 100 ft. of 2-inch pipe that existed between 1995 and 2004, but is still higher than the “zero” originally allowed.

The 30-year warranty against internal and external corrosion when used for underground transfer of fuels has been proven repeatedly through almost 50 years of unparalleled performance by any other product offered, ever.

Fiber Glass Systems offers piping products for all fuel types, services and product types. These include:

Red Thread IIA

Listed with Underwriters Laboratories Standard 971-2004 for non-metallic underground piping for motor vehicle (MV), high blend (HB), concentrated (CT) and aviation and marine (A&M) fuels. The pipe and fittings are also Listed with Underwriters Laboratories of Canada with both Listings under File MH9162.

Dualoy 3000/L

Listed with Underwriters Laboratories Standard 971-2004 for nonmetallic underground piping for motor vehicle (MV), high blend (HB), concentrated (CT) and aviation and marine (A&M) fuels (File MH9162). Dualoy 3000/L pipe and fittings are also Listed with Underwriters Laboratories of Canada (File CMH 715). In Great Britain the Dualoy 3000/L system has been tested and accepted by the London Fire and Civil Defence Authority. Dualoy 3000/L has been issued a Certificate of Compliance to the Institute of Petroleum (IP) Specification by ERA Technology, Ltd.

Dualoy 3000/LCX

Listed in the United States with Underwriters Laboratories for nonmetallic underground piping for motor vehicle (MV), high blend (HB), concentrated (CT) and aviation and marine (A&M) under File MH9162. Dualoy 3000/LCX pipe and fittings are also Listed with Underwriters Laboratories of Canada for Petroleum Products and Oxygenated Fuels (File CMH715). Underwriters Laboratories has also approved Dualoy 3000/L-A and Dualoy 3000/LCX for use with MTBE fluids.



RED THREAD IIA PIPE SYSTEMS

Red Thread IIA piping systems are made of fiberglass reinforced, aromatic amine cured, rigid, thermosetting epoxy resin. The pipe is manufactured using the classical reciprocal filament winding process where fibers are wound around a steel mandrel under controlled tension at a prescribed angle, optimized for stresses caused by pressure. Most fittings are made in matched-die compression molds where the pre-impregnated (pre-preg) fiberglass bands are chopped and placed in the mold cavities where heat and pressure are applied to form the consolidated part. Fittings can also be made by the filament winding process, where efficiency and practicality make this possible.

Pipe and fittings are bonded together using a two-part adhesive, specially formulated for strength, fuel resistance and ease of handling, including the ability to mix, apply and cure at ambient temperatures above the minimum.

Joining Methods

The primary method of joining pipe-to-pipe is with a T. A. B. (threaded and bonded) coupling. Matching, low profile threads on the pipe and in the coupling allow a mechanical fit of the components while the adhesive cures, assuring a tight make-up.

Pipe-to-fittings bonds are made with matching tapers that “lock” together as they are joined with either an axial force or a slight twist while a “push” is being applied by hand (for 2-inch pipe only). Pipe with T. A. B. threads can also be bonded into smooth, tapered ends of fittings using the same method.

Complete joining instructions are available, along with a comprehensive set of tools to perform the installation procedures.

Secondary Containment

Where secondary containment is needed, Red Thread IIA provides a true pipe-in-a-pipe system. Containment pipe is identical to the primary pipe. Sections are joined together with matching two-piece clamshells that are bonded and bolted together. One half of the clamshell fitting is pre-fitted with female threaded fasteners to make assembly fast and easy from one side of the fitting.



Old vs. New - Pipe in the foreground was installed in 1973 and removed 27 years later when the station closed.

DUALOY™ 3000/LCX PIPE SYSTEMS

The Dualoy 3000/LCX product was developed on the technology used for the Dualoy 3000/L system. The addition of the “CX” to the product name indicated the product is of coaxial construction. The common term in the marketplace for the product is “LCX” and that will be used here, also.

To build this product, first the Dualoy 3000/L primary pipe is made on a proprietary continuous process. Adhesive-backed tape is used to carry size-graded glass beads and is wrapped over the primary pipe. Another layer of adhesive-backed tape is then wound over it to form a complete, dry, porous layer, which is then over-wrapped with the containment layer (or jacket) of fiberglass and resin.

Benefits of LCX

First installed in 1995, the LCX product has since gained in popularity and market share. In addition to having the benefits of fiberglass compared to other materials, the unique coaxial construction has other practical and theoretical benefits. Some of these benefits are obvious, while others are less so, but probably more significant. Both pipe walls are together, making it easier to carry and requiring fewer trips into the ditch.

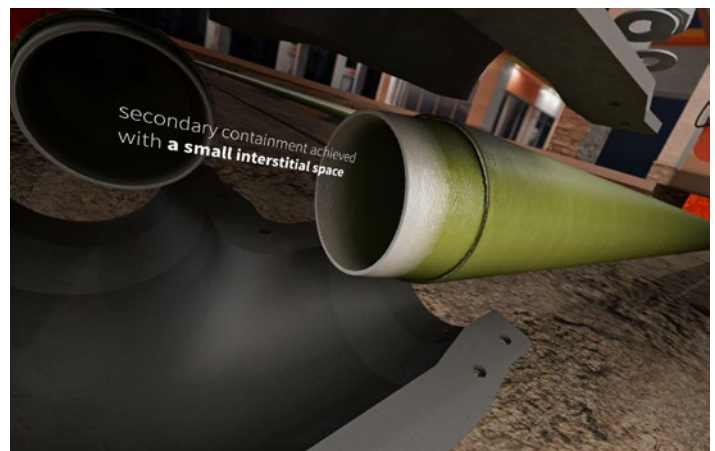
- No measuring is required for containment pipe, cutting down on potential mistakes and waste.
- The pipe is compact, allowing less trenching, backfill and haul-off, as well as taking less warehouse space for inventory.
- Fittings design makes series lay-out easy and allows cross-overs for parallel systems to be made to the same dimensions as a single-wall system.
- The two pipe layers do not move relative to each other. This causes each one to support the other and enhance the strength of the pipe and the joints.

The two layers are very close to each other, although totally separated. This narrow distance and low volume have benefits that may not be obvious:

- No backfill or debris can get between the layers. This, along with there being no movement between the layers prevents any abrasive wear that may cause damage later.
- If water would get between the layers (unlikely), the volume is insufficient to allow any damage to occur, should that water freeze and expand (crushing primary in other cases).

- Should a leak occur (also very unlikely), only a very small amount will be needed before it will travel to a detection point.
- During testing at installation, any communication between the two layers will be seen as it will cause a large change in the gauge pressure in the containment (because the volume of the containment is small relative to the primary – 15:1 for 2-inch pipe).
- If a leak needs to be located, the “soapy water” test can be used to inspect the whole system (joints, fittings and pipe) – soaping the cut end of the jacket will show any leaks in that primary pipe section.

Continuous monitoring can be done with any of the approved methods, Vacuum, Pressure or Hydrostatic, with the Hydrostatic method approved by the NWGLDE and the state of California Fiber Glass Systems has the fiberglass pipe to suit all services and product type preferences.



Dualoy 3000/LCX pipe

DUALOY™ 3000/L PIPE SYSTEMS

Like Red Thread IIA, Dualoy 3000/L piping systems are made of fiberglass reinforced, aromatic amine cured, rigid, thermosetting epoxy resin. This pipe is manufactured using a unique process where a continuous cylinder is generated with the fibers oriented more near the circumferential and axial directions than with the reciprocal process. Dualoy 3000/L also includes a resin-rich liner. Fittings are compression molded or filament wound, as is further described in the Red Thread IIA text.

Dualoy 3000/L Pipe and fittings are also bonded using a 2-part adhesive.

Joining Methods

All primary system bonds are made with matching tapers with the Dualoy 3000/L system. The same “lock” is made as they are joined with either an axial force or a slight twist while the force is being applied. Instructions and tools are also available.

Secondary Containment

Where secondary containment is needed, Dualoy 3000/L is very much the same as Red Thread IIA.



Dualoy Secondary Containment

ADHESIVES

Fiber Glass Systems offers two adhesive lines: Series 8000 and PSX. Both lines can be used on Red Thread IIA and Dualoy pipe. Series 8000 is typically used for bonding primary pipe and fittings. A thickening agent is offered for bonding secondary containment fittings, particularly in warmer weather. PSX-20 is typically used for bonding primary pipe and fittings, and PSX-34, with a higher viscosity, is typically used for bonding secondary containment fittings.

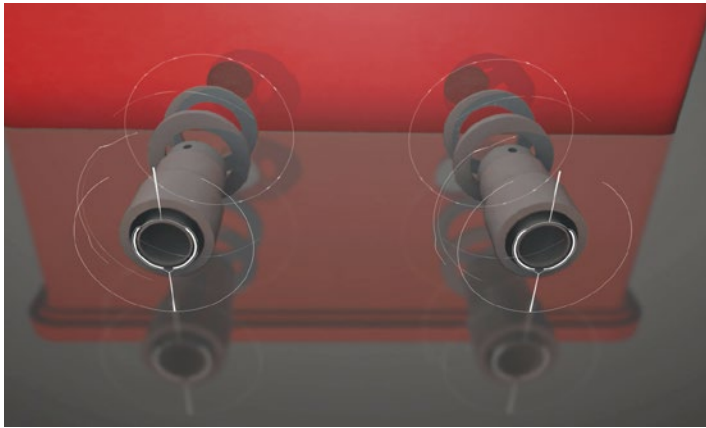


Adhesive Series 8000



Adhesive Series PSX

FIBERGLASS SUMP PENETRATION FITTINGS FOR PERMANENT SUMP BONDS



Bonded Sump Entry Fitting - Termination Style for double-containment systems. Works with 3"-over-2" and 4"-over-3" Red Thread IIA and Dualoy 3000/L; and 2" and 3" Dualoy 3000/LCX. A 30-year Water Intrusion Warranty is offered with this fitting.

Bonded Sump Entry Fitting - Pass-thru Style for LCX. Works with 2" and 3" Dualoy 3000/LCX.

Bonded Single-Wall Sump Entry Fitting for 2" - 6" Red Thread IIA Installations.

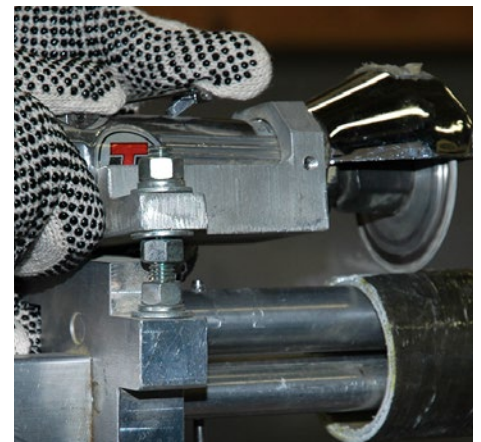
TOOLS AND EQUIPMENT



Model 2100 Tool - Tapers 2"-3" Red Thread IIA pipe, scarfs 3"-4" pipe. Taper mandrels are available for Dualoy 3000/L products.



Model 3000 Tool - Tapers and scarfs 2" and 3" Dualoy 3000/LCX pipe.



Jacket Cutter Tool - Cuts containment jacket from 2"-4" Dualoy 3000/LCX pipe

SOFTWARE

StationWare 3000 is a stand-alone CAD program that will provide a professional looking station lay-out drawing and a bill of materials for the site. Users can select a variety of products and configurations to meet specifications or find the most efficient and economical design.

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Sump/Entry Termination Fitting with Gasket



1. Determine entry hole location and cut entry hole in sump wall using dimensions in Table 1.
2. Place sump entry/termination fitting through hole with the threads on the inside of the sump wall. A maximum of 2° of offset is acceptable for a proper seal on a flat surface.

TABLE 1 - Fitting Dimensions

Size	A	B	C
In.	In.	In.	In.
3" x 2"	6.88	4.00	4.00
4" x 3"	6.88	4.00	5.00

For a rounded surface, no offset will be allowed; pipe must be perpendicular to the sump.

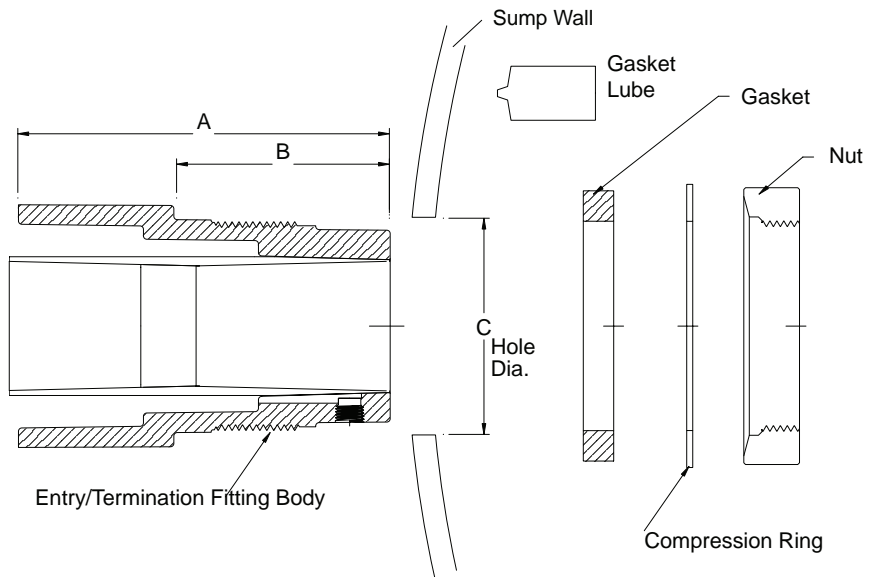
3. Locate 1/4" threaded outlet to the desired location.

If this fitting is used in an Open (Drainage) System, locate the 1/4" threaded outlet in the "South" position. Leave 1/4" plastic threaded outlet protector in place until 1/4" fitting installation.

4. Lube gasket with the provided lubricant and place over the threads and against the sump wall.
5. Place compression ring next to gasket.
6. Thread nut onto fitting hand tight. **Do not tighten until system completion.**

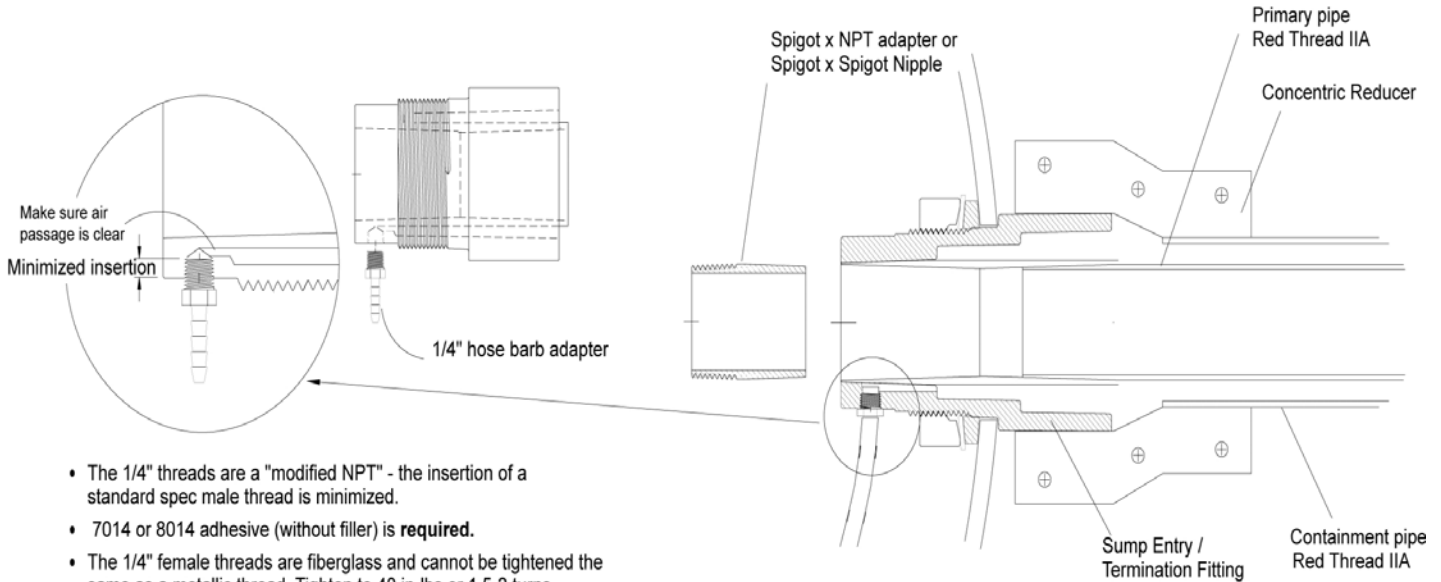
7. Remove 1/4" plastic threaded outlet protector. **Apply adhesive only** to the 1/4" fitting and screw into 1/4" threaded outlet. Tighten to 40 in.-lbs. or 1 1/2-2 turns past hand tight. After installing fitting, be sure the interstitial space is free from excess adhesive. Install a short hose and blow excess adhesive through air passage. **NOTE:** Verify with testing company or monitoring manufacturer if a larger thread is needed for their equipment. After the port fitting is installed, do not remove.
8. Connect only flexible tubing or hoses to the port fitting. **NOTE:** Tubing or hoses must be rated to full vacuum.

9. Tighten nut for gasket seal at sump locations prior sump test.



Maximum Acceptable Sump Wall Thickness "T"			
Fitting Size	Round 42" Sump	Round 48" Sump	Flat Dispenser
	"T"	"T"	"T"
3" x 2"	3/8"	3/8"	1/2"
4" x 3"	5/16"	3/8"	1/2"

TERMINATION EXAMPLE using
SUMP ENTRY/TERMINATION FITTINGS



- The 1/4" threads are a "modified NPT" - the insertion of a standard spec male thread is minimized.
- 7014 or 8014 adhesive (without filler) is **required**.
- The 1/4" female threads are fiberglass and cannot be tightened the same as a metallic thread. Tighten to 40 in-lbs or 1.5-2 turns.
- After installing a 1/4" NPT fitting, the passageway to the piping interstitial space should be cleared with air pressure to insure that it is free of thread sealant and/or adhesive.

Use concentric reducer to connect the sump entry/termination fitting to secondary containment pipe; **DO NOT USE clamshell termination fittings with this style fitting.**

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