

Dualoy 3000/L Dualoy 3000/LCX

Definition of Terms

- BxS** - Bell (female) x spigot (male) tapered joint.
- Bond Line** - Area where two surfaces are bonded together with adhesive.
- Closed Secondary Containment Piping System** - A secondary piping system with ends normally closed at the tank and sump with a minimum rated pressure of 50 psig (3.50 MPa).
- Cocked Joint** - Appearance of BxS joint that is improperly aligned.
- Cool Weather Conditions** - Below 65°F (18°C).
- Cure Time** - Time for a joint to completely cure after it is bonded.
- Damaged Pipe** - Pipe that has been affected by excessive impact, external or bending loads.
- Glue Line** - See bond line.
- Improperly Cured Joint** - Joint that is not cured due to poor adhesive mixing or inadequate heating in cool weather.
- Joint Backout** - A spigot that backs out of a bell due to incomplete lock up or movement at the other end of the pipe.
- Lock Up** - Spigot is fully engaged with the bell until there is resistance to pivot action in the joint.
- Machined Surface** - Area of pipe or fitting that is machined to remove the surface gloss so that it may be bonded.
- Matched Taper** - The matching tapers on a BxS or T.A.B. joint.
- Mechanical Locking** - See lock up.
- Open Secondary Containment Piping System** - A secondary piping system with ends normally open at the sump and a minimum rated pressure of 5 psig (0.035 MPa).
- Pot Life** - Time allowed to make bonds with adhesive after mixing.
- T.A.B. - Threaded and Bonded** - Tapered joint with shallow threads to prevent joint back out.

Installation Statement

It is strongly recommended the installer to be properly trained. Fiber Glass systems offers several types of certification training classes and/or installation job startups.

Pipe Products

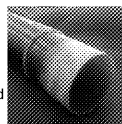
Dualoy 3000/L Pipe

Epoxy pipe is similar to Red Thread IIA incorporating a resin-rich liner. UL/JLC Primary pipe is available in 2-6" (50-150 mm) primary pipe sizes and 3-6" (80-150 mm) containment pipe sizes. Bonded bell x spigot is the joining method for the primary pipe. Two-piece clamshell fittings are used on the containment pipe. Pipe comes in designated lengths up to 40 feet (12.2 m).



Dualoy 3000/LCX Pipe

Epoxy pipe where the containment on the pipe is coaxial and an integral part of the piping. The primary pipe incorporates the same liner as 3000/L. Primary bonding is done by bell x spigot joints and secondary containment utilizes the same clamshell fitting concepts as Red Thread IIA and Dualoy 3000/L pipe. Pipe is available in designated lengths up to 40 feet (12.2 m).



Listings and Approvals

Red Thread IIA, Dualoy 3000/L and Dualoy 3000/LCX piping is Listed in the United States with Underwriters Laboratories for nonmetallic underground piping for motor fuels (MV), concentrated fuels (CF), high blend fuels (HB) and aviation (AvGas) and marine fuels (AM). The piping is also Listed with Underwriters Laboratories Canada (ULC) for the same fuel categories. The pipe has been third party tested and approved for Diesel Exhaust Fluid (DEF), Ethanol Blends, and Biodiesel Blends.

Installation Instructions

Primary Piping

Proper installation is the key to achieving a highly reliable, adhesive bonded, matching taper, bell x spigot joint.

Matching taper angles on spigot x bell ends make it possible to lock up a joint by wedging the spigot into the bell so that it takes significant force to separate them. Proper lock up is essential.

A very thin line of adhesive (called the bond line or glue line) between the two matching tapered surfaces is necessary to achieve optimum joint strength.

Proper installation results in joint strength equivalent to or stronger than the piping systems.

To achieve the most reliable piping system, it is essential that the installation crew be familiar with the joining techniques in this manual.

Joining Systems

The adhesive bonded, tapered bell x spigot joint is the primary joining method for 2"-6" (50-150 mm) pipe-to-fittings. When combined with the adhesive, the mechanical locking action promotes positive makeup of the joint and prevents back out during adhesive curing.

The T.A.B. joint is the primary joining method for pipe-to-couplings on Red Thread IIA. Red Thread IIA pipe is supplied with T.A.B. spigot x T.A.B. spigot ends. Fittings are manufactured to accept either a tapered spigot or T.A.B. spigot end of the pipe. T.A.B. couplings can also accept either a tapered spigot or T.A.B. spigot end of the pipe.

Tapers can be made in the field with tools designed for this purpose. Bells cannot be field made. When a belled end is needed, a sleeve coupling is required.

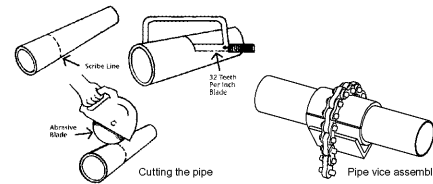


Cutting and Tapering Pipe

Cutting

Cut pipe with one of the tools mentioned in equipment list.

When cutting, protect pipe from chain vise damage by placing rubber sections or sleeves (180° sections of pipe cut from the same size pipe being tapered) between the pipe and the chain vise.

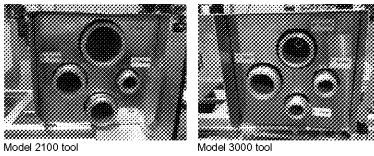


Cutting operations for fiberglass pipe can generate dust or cutting chips that are irritating to the skin, upper respiratory tract, and eyes. Because these materials are irritating, proper ventilation for the installation crew should be used to prevent exposure.

A nuisance dust breathing filter should be used when working in areas where dust will be present. Operators should wear heavy cotton clothing, including long-sleeve shirts that protect the skin from dust. Eye protection is required when operating tools.

Tapering

Proper tapering tolerances are set at the factory. However, it is recommended the tool settings be checked prior to tapering pipe. To compensate for wear of the grinding drum, the mandrels can be field adjusted. Refer to the tool operating instructions for field adjustment procedures.



Taper Lengths

The tapering tools will produce a field-made taper that inserts into the same bell to ±1/8" (3 mm) tolerance when compared to a factory-made tapered spigot. The angle for properly made field tapers for 2"-4" (50-100 mm) diameter pipe should be 134 degrees. All tapering tool settings should be checked at the beginning of each job.

Dualoy 3000/LCX Coaxial Pipe

Dualoy 3000/LCX pipe and fittings are manufactured from fiberglass reinforced, thermosetting, aromatic amine cured epoxy resins, as are Red Thread IIA and Dualoy 3000/L pipe. The containment jacket on the pipe is coaxial and in close proximity to the primary pipe, separated by a thin layer of glass beads. The two layers do not move relative to each other so the pipe handles, effectively, like a single piece. The containment over the fittings is made by applying matched two-piece clamshell fittings over the primary fitting connecting the pipe containment jackets. The primary pipe and fittings are joined using the same strong reliable bonded joint as in Dualoy 3000/L single wall piping.

Installation of Dualoy 3000/LCX pipe follows the same basic principles as that of Red Thread IIA and Dualoy 3000/L piping, as defined in this booklet. The same primary fittings are used for Red Thread IIA, Dualoy 3000/L and 3000/LCX pipe and the same cutting and tapering instructions apply. There is an added note that when tapering the primary pipe of Dualoy 3000/LCX pipe, care needs to be taken not to damage the secondary jacket.

Cutting

Use a fine-blade hacksaw, radial cut-off saw or circular saw with abrasive wheel to cut pipe in the field. The cut end must be square to within 3/16" (5 mm). Hold pipe securely for all cutting and tapering. When using a pipe vise, always wrap the pipe with a protective material such as 1/4" (6 mm) thick rubber pad. Take care not to damage or over-heat the pipe when tightening the vise.

Jacket Removal

Remove containment with jacketing tool as shown in Figures 3.1 and 3.2. The jacket cutting tool is used to quickly remove the containment layer from the end of the pipe to expose the primary where field joints are needed. The tool provides a square finished edge to the containment. The tool consists of a pneumatic grinder equipped with a diamond coated cut off wheel. It is adjustable to allow it to be set at the desired depth to cut through the containment without any risk of cutting into the primary pipe. The jacket cutting tool can either be clamped into a vise or can be hand operated if the pipe is clamped into a pipe vise.

Remove the containment by activating the grinder and inserting the end of the pipe into the housing (single size tool) or onto the guide rods (universal tool). Periodically check guide rods of universal jacket cutter for nick, burrs, grooves, etc. that could damage the inner liner of the pipe. Remove the tool prior to use.

Push the pipe into (or onto) the tool to cut a longitudinal groove in the containment.

When the end of the pipe reaches the pin, rotate the pipe (or tool), cutting the containment circumferentially.

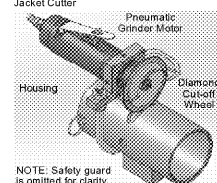
When cutting the jacket of a pipe to be used with a termination sleeve, a longer cut of jacket is needed to allow enough room to bond the primary pipe to both the termination sleeve and a primary fitting. Minimum dimensions are shown in the Table 3.1.

Rotate back to the starting position and remove the pipe from the tool, letting the rotating grinding wheel track back through the cut made when the pipe was put in/on the tool.

Physically remove the containment layer by prying it open slightly and pulling it off the primary. Use care to avoid damage to the primary pipe during this operation.

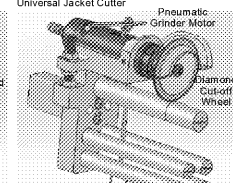
NOTE: The cut off wheel will gradually wear and need adjustment to cut at the proper depth. To adjust, set the depth so that the wheel cuts just to the tape layer (outer edge of the layer of glass beads) and not into the layer of glass beads. This will minimize wear on the wheel.

Figure 3.1 Jacket Cutter



NOTE: Safety guard is omitted for clarity

Figure 3.2 Universal Jacket Cutter



NOTE: Pin and rods are adjustable for 2", 3" and 4" sizes. Pin must be in proper position for size to give correct depth of cut. For more details, see tool instructions.

Table 3.1

Containment Jacket Removal Dimensions

Pipe Size	Containment removed to bond into a fitting		Containment removed to use termination sleeve	
	in	mm	in	mm
2	50	2.75	70	4.50
3	80	2.75	70	4.50
4	100	3.50	91	5.75*

*Adjust grinder motor position by loosening set screw, move motor 1/4" (32 mm) then tighten set screw. Adjust when finished making termination cuts.

Tapering and Scarfing With Power Tools

The 3000 series power tool is recommended for Dualoy 3000/LCX pipe. It is specifically designed by NOV Fiber Glass Systems to taper the primary pipe and scarf the containment pipe. Tools are available from other manufacturers but they only taper the primary pipe. They are not designed to provide a powered scarf to the containment pipe. Pipe tapered with these tools should be periodically checked against a factory taper for taper length and taper angle. The correct mandrel must be used for Dualoy pipe. Refer to tool instructions for proper procedures.

Tapering and Scarfing With Manual Tools

For situations where electricity isn't available, use the Ratchet Pro Taper Maker fitted with the special blade designed for Dualoy 3000/LCX primary tapers. Scarfing must be done with 60 to 80 grit Emery cloth or sandpaper, when done manually.

Piping System Layout - Sump Penetration Fitting Installation

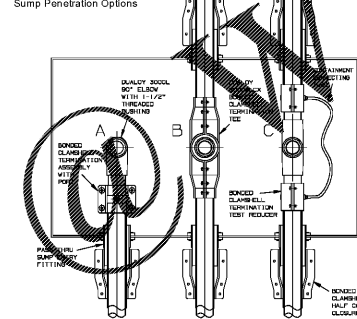
Dualoy 3000/LCX was designed with the idea that fiberglass pipe could be installed through the sumps in series. In order to achieve this, sump penetration fittings are used to allow the pipe to pass through the sumps to the next sump.

- Typical sump penetration detail for a system piped in parallel or at last sump of a system piped in series.
- Typical sump penetration detail for a system piped in series and utilizing termination tees.
- Typical sump penetration detail for a system piped in series using termination sleeves and jumper hose.

NOTE: Low test pressure needed if connecting tube is pressurized.

NOTE: 24 inch (600 mm) minimum width recommended on dispenser sumps to facilitate installations.

Figure 3.3 Sump Penetration Options



Jump-overs and Crossovers

Assemblies for crossing lines can be made in one of two ways. For lines where the tee and 45° elbow need to be very close (a jump-over), the clamshell fittings can be cut at the beginning of the tapered portion on the branch of the tee and one leg of the elbow. A piece of single wall pipe of the next larger size can be used to connect the clamshell fittings (see Figure 3.4 for Jump-Over). For lines where there is sufficient distance between the tee and 45° elbow to allow for the full clamshell fittings, the crossover can be made by simply bonding the fittings and clamshells to a piece of standard coaxial pipe (see Figure 3.4 for Cross-Over).

Jump-over assembly made with next larger size single-wall containment pipe and clamshell fittings cut at start of taper to allow minimum length as summarized in Tables 3.2 and 3.3.

Figure 3.4 Jump-Over / Cross-Over

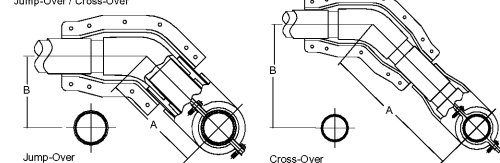


Table 3.2 Jump-Over / Cross-Over Minimum Lengths (A)

Pipe Size	Minimum Lengths (A)		Cross-Over	
	in	mm	in	mm
2	50	7 1/2	190	12 5/8
3	80	9 3/4	250	14 3/4
4	100	10 1/4	260	16 1/2

Table 3.3

Jump-Over / Cross-Over Minimum Lengths (B)

Pipe Size	Minimum Lengths (B)		Cross-Over	
	in	mm	in	mm
2	50	5 1/4	135	9
3	80	6 7/8	175	10 1/2
4	100	4 1/4	185	11 5/8

Reducers

The Dualoy 3000/LCX Coaxial Piping System can be reduced from 3" to 2" (80-50 mm), 4" to 3" (100-80 mm) and 4" to 2" (100-50 mm). See Figure 3.5.

Mark the "X" Dimension on the outside of smaller secondary prior to bonding primary.

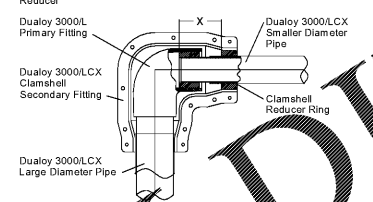
- Sand bonding surface of jacket.
- Apply adhesive and place clamshell reducer ring in place on smaller pipe containment layer. Allow adhesive to cure.
- After all primary bonding, curing and testing is complete, bond clamshell containment fitting in place on larger secondary pipe / clamshell reducer ring.

Table 3.4

Dualoy 3000/LCX Reductions

Reducer	(X)
3" to 2"	3 3/4
4" to 3"	4 1/4
4" to 2"	4 1/4

Figure 3.5 Reducer



Place the containment half-shells around the primary fitting. Use the half with the pre-inserted nut on the bottom half to allow easier access to the bolt heads when tightening. Once in place insert and begin threading each bolt into the pre-inserted nut hand. Nut driver or a single hand-held power tool, such as a cordless drill, can be used to assemble the bolts. If a power tool is used to tighten the bolts, confirm tightness of each bolt with a nut driver. Tighten bolts evenly in staggered sequence started with inner radius.

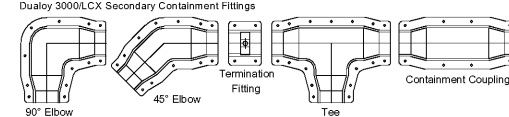
NOTE: The recommended maximum bolt torque is 8 ft-lb.

Bonding Containment Piping

Joint Preparation:

Inspect all sealing surfaces to ensure they are free of any foreign material such as dirt, sand, or adhesive. Inspect all bonding surfaces to ensure there are no cuts, scratches, or nicks which could prevent the joint from sealing properly.

Figure 3.6 Dualoy 3000/LCX Secondary Containment Fittings



Terminating a Containment Fitting Inside the Sump

The means of terminating the containment on the branch leg of a tee (series layout) or the downstream leg of an elbow (parallel layout) or last sump of a series layout) is done with a bonded termination adapter. The adapter is bonded to the exterior of the primary fitting leg to be terminated, prior to the clamshell containment fitting being placed on the assembly.

- Lightly sand the outside surface of the leg of the primary fitting on which the termination is to be bonded.

Abrade the inner surface of the termination adapter also, to provide a fresh surface to which to bond.

Cut the tapered end portion of the containment fitting leg which is to be terminated. Abrade the inner surface of the shortened leg of the containment fitting to prepare it for later bonding.

Apply a moderate coating of adhesive to outer surface of the primary fitting and the inner surface of the termination adapter. Keep the outer surface of the adapter dry and free of adhesive.

Fit the adapter onto the primary fitting.

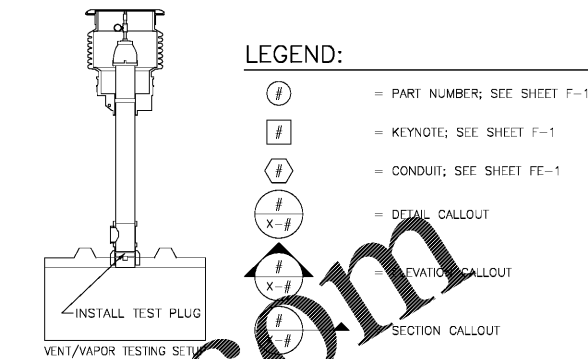
Dry fit tapered Dualoy 3000/LCX pipe leg(s) into the bell ends of the primary fitting which is not terminated, if this procedure is done prior to bonding the primary fitting into the system (recommended).

Place the clamshell containment fitting over the primary fitting-adapter assembly and hold in place with bolts while the adhesive cures. This will assure proper alignment of the adapter for final assembly. Care should be taken to assure adhesive does not touch the clamshell fitting at this point as it is to be removed when the adhesive between the primary fitting and the adapter is cured.

Once the adhesive has cured, remove the bolts and the clamshell fitting. If this procedure was done prior to bonding the primary fitting into the system, install according to standard procedures.

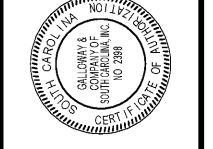
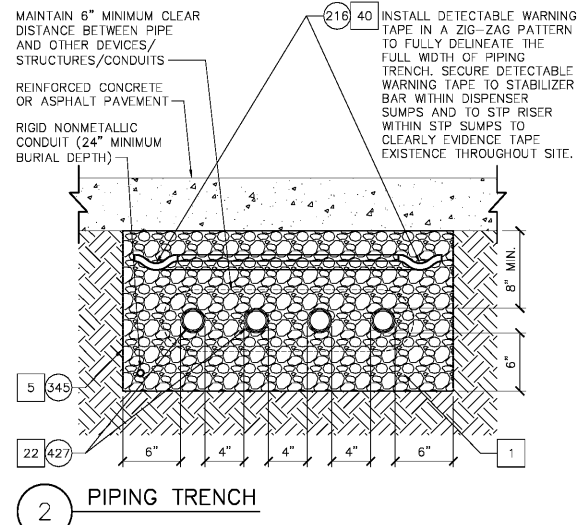
Use the prepared clamshell fitting to close the containment system when primary testing and inspection is done.

NOTE: TYPICAL DETAIL SHOWN. REFER TO SHEET F-5 FOR FITTING PART NUMBERS REQUIRED AT EACH PIPING JUMP/CROSS-OVER LOCATION.



VENT AND VAPOR TESTING SET PIPING AND SUMP TEST PROCEDURES:

- SECONDARY CONTAINMENT PIPING:**
 - REMOVE THE STEMS FROM THE SCHRADER FITTINGS. ASSEMBLE THE JUMPER HOSES TO CONNECT TO THE SCHRADER FITTINGS. ASSEMBLE TEST RIG FOR GAUGING IN THE TANK SUMP.
 - INTRODUCE AIR TO THE SYSTEM AND PRESSURIZE THE SECONDARY CONTAINMENT PIPING TO A GAUGE PRESSURE OF 7 PSI. ALLOW TO STAND FOR SIXTY MINUTES. IF PRESSURE LOSS IS LESS THAN 0.5 PSI DURING THIS TIME, THE CONTAINMENT CAN BE CONSIDERED TIGHT. THE TEST APPARATUS AND PRESSURE SHALL BE LEFT ACTIVE FOR THE DURATION OF CONSTRUCTION.
 - AFTER CONSTRUCTION IS COMPLETE, BLEED THE TEST AIR PRESSURE FROM THE SECONDARY CONTAINMENT. LOOSEN THE TEST CUFF AT THE TANK SUMP TO ALLOW DRAINAGE FROM THE SECONDARY CONTAINMENT. REMOVE THE TESTING RIG. LEAVE THE JUMPER HOSES ASSEMBLED IN THE DISPENSER SUMPS.
- PRIMARY PRODUCT PIPING:**
 - AFTER PRODUCT PIPING IS ENTIRELY COMPLETE, ASSEMBLE GAUGING RIG AT A CONVENIENT SHEAR VALVE TEST PORT. CLOSE ALL SHEAR VALVES IN THE PIPING BEING TESTED. TIGHTEN DOWN THE CHECK VALVE IN THE SUBMERSIBLE PUMP.
 - INTRODUCE AIR TO THE SYSTEM AND PRESSURIZE THE PRODUCT PIPING TO A GAUGE PRESSURE OF 60 PSI, ALLOW TO STAND FOR SIXTY MINUTES. IF PRESSURE LOSS IS LESS THAN 0.5 PSI DURING THIS TIME, THE PRODUCT PIPING CAN BE CONSIDERED TIGHT. LEAVE THE TEST AIR ON THE SYSTEM UNTIL BACKFILL AND PAVING OPERATIONS ARE COMPLETE. CHECK FOR PRESSURE MAINTAINED THROUGHOUT CONSTRUCTION, TO AVOID BURYING ANY LEAKS.
 - BLEED OFF THE AIR AFTER THE PAVING IS COMPLETE. OPEN SHEAR VALVES AND OPERATE SUBMERSIBLE PUMPS TO FILL PRODUCT PIPING AFTER DISPENSER WIRING CHECK-OUT IS SATISFACTORY, PURGING AIR FROM THE LINES AND DISPENSERS.
 - ON PRODUCT PRECISION TESTING CLOSE SHEAR VALVES AND CONDUCT PIPING AS PER NFPA 30, SECTION 3.6.
- VENT PIPING:**
 - DISCONNECT THE VENT PIPING FROM THE TANK BY INSTALLING A TEST PLUG. REMOVE FILL ADAPTOR AND DROP TUBE FROM THE FILL PIPE. THREAD A 4" X 2" REDUCER ONTO THE FILL PIPE AND THREAD A 10' LENGTH OF 2" PIPE ONTO THE REDUCER AS A TEMPORARY VENT DURING TESTING. PLACE NECESSARY CONES AND BARRICADES AROUND THE TEMPORARY VENT.
 - CAP THE PERMANENT VENT RISERS AT THE TOP. IF STAGE II PIPING IS INSTALLED, DISCONNECT FROM THE DISPENSER AND PLUG THE 1" SHEAR VALVE.
 - INTRODUCE AIR TO THE SYSTEM AND PRESSURIZE THE VENT PIPING TO A GAUGE PRESSURE OF 10 PSI; ALLOW TO STAND FOR SIXTY MINUTES. IF PRESSURE LOSS IS LESS THAN 0.5 PSI DURING THIS TIME, THE VENT PIPING CAN BE CONSIDERED TIGHT.
- CONTAINMENT SUMPS:**
 - IF GROUND WATER IS ABOVE THE LEVEL OF ANY SUMP PENETRATIONS, THE SUMPS MUST BE DETERMINED TO BE REMAINING DRY BEFORE BEGINNING HYDROSTATIC TESTING OF THEM FROM THE INSIDE.
 - AFTER ALL PIPING AND CONDUITS HAVE BEEN INSTALLED INTO THE SUMPS AND BEFORE THE DISPENSERS ARE INSTALLED, AND WITH THE SECONDARY CONTAINMENT TEST CUFFS STILL INSTALLED, FILL ALL OF THE SUMPS TO THE BRIM WITH WATER. COVER THE TANK SUMP.
 - OBSERVE THE LEVEL OF WATER AFTER 24 HOURS. IF THE LEVEL OF WATER HAS REMAINED WITHIN ONE HALF INCH OF ITS INITIAL LEVEL DURING THIS PERIOD, THE SUMPS MAY BE CONSIDERED TIGHT.
 - COMPLETELY REMOVE THE TESTING WATER AND ALL DEBRIS FROM THE SUMPS.



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