

Instructions for Epoxy/470 T-Miter 1"-12"

Introduction

These instructions will illustrate the process to be followed when adding a "branch" or offshoot pipe to an existing primary pipe, (known as the "run" pipe). This branch pipe will normally be smaller than, or equal in diameter to, the pipe to which it is being attached.

Safety Precautions

The resin, adhesive, catalyst and fiberglass you will be using are either irritating to the skin, highly flammable, or a very strong oxidizing agent. It is critical to your safety that your work area be isolated from any source of open flame, and that smoking not be allowed in the vicinity of the work. The catalyst for the 470 component contains methyl ethyl ketone peroxide (MEKP), which is a strong oxidizing agent and can cause serious chemical burns if introduced into the eyes or left on exposed skin for relatively short periods of time. Always wear impermeable gloves and chemical splash eye protection when working with any of the components in this kit.

SHOULD EYE CONTACT OCCUR, IMMEDIATELY FLUSH WITH WATER FOR AT LEAST 10 MINUTES, and call your physician for further instructions. Wash any skin areas affected immediately with soap and water.

MSDS sheets for any component in this kit are available on request from the factory.

List of Materials: 1" - 12" T-miter Kits

- 1 piece of Surface veil and 2 pieces of chopped strand mat (the 'liner') for the Branch
- 1 piece of Surface veil and 2 pieces of chopped strand mat (the 'liner') for the Run.
- Mat, Fab mat and Cover mat (the structure) for the Branch (See Table 2)
- Mat, Fab mat and Cover mat (the structure) for the Run (See Table 2)
- WELDFAST 440 adhesive.
- Epoxy resin and catalyst for "liner" portion of the T-miter.
- DOW 470 resin and catalyst for the structural and cover mat portion of the T-miter.
- Instruction Sheets
- Resin mixing containers
- Mixing sticks.
- Rollers.
- Gloves.

Additional Instructions

Before a T-miter is started, make sure all tools and supplies are on hand.

Refer to weld kit Instructions for specific adhesive kit details. It will be helpful to have, in addition to the materials provided in the kit; sanding equipment, a heat gun, or other source of heat not utilizing an open flame, a work table, some cardboard sheets upon which to saturate the glass with resin, and some solvent to clean tools and gloves. Refer to weld kit Instructions for specific adhesive details.

Storage of T-miter Kits

Do not store T-miter kit resin at temperatures above 90° F. Maximum storage life for the resin is three months at 90° F and five months at 80° F. Storing resin at temperatures below 40° F is recommended.

If refrigerated, the resin should be allowed to slowly rise to room temperature for several hours prior to usage.

DO NOT REFRIGERATE THE FIBERGLASS, as condensate may wet the glass and inhibit the bond of the resin.

Field Weld Environment:

Surfaces to be field welded must be thoroughly sanded, clean, dry, oil-free, and in the right temperature range to ensure a proper bond.

Field Weld procedures are based on temperature ranges of 60°F to 90°F. For field welds where conditions exceed these ranges, follow the cold weather or hot weather Installation tips. The recommended temperature limits of the resin, adhesive and surfaces to be field welded must be maintained in order to assure proper curing of the T-Miter joint. All bonding surfaces and materials for field welds must remain completely dry and at temperatures above 60°F. (See Table 1).

Note: Air temperature is not the only factor affecting cure times.

Example: When the air temperature is 60°F and a pipe is exposed to direct sunlight, surface temperatures of the pipe may approach 100°F or higher. Conversely, at 60°F, a pipe exposed to a cold wind and no sunlight will affect adhesives as if conditions were colder.

Cold Weather Installation Tips (Below 60°F)

The curing time for field welds is directly related to the temperature. Colder temperatures can result in uncured T-miter joints.

The following steps are recommended when applying a T-miter joint in cold weather:

1. Field weld kits should be placed in a warm room for 6 to 12 hours before application so they reach temperatures of 70°F to 80°F. **THE RESIN, ADHESIVE AND CATALYST SHOULD NOT BE APPLIED AT TEMPERATURES IN EXCESS OF 100°F.**
2. Fabricate piping sub-assemblies in an inside area when possible. A small portable heated shelter can also be used.
3. Warm the pipe ends and fittings before joint assembly.
4. Use a heat gun or space heater to start joint cure. Hold the nozzle of the gun 8" to 12" away from the joint and slowly rotate the heat over the joint until a tack-free surface is obtained.
5. Use a heat blankets or a space heater to cure the joint according to the Cure Times Chart, Table 1. To accelerate cure times in cold weather use up to 22 ml of catalyst per quart of resin (470).

Hot Weather Installation Tips (Above 90°F)

Hot weather will reduce the working time of the mixed resin or adhesive. The following steps are recommended when fabricating in hot weather:

1. To increase pot life in hot weather, reduce catalyst to no less than 8 ml per quart of Resin (470).
2. Avoid direct sunlight on the joining surfaces, resin, adhesive, catalyst, and fiberglass.
3. Cool containers of resin, adhesive and catalyst in an ice chest with ice.
4. Plan and organize the job to reduce working time.
5. Site Equipment: Each T-miter kit contains the correct amount of materials for the size and number of joints specified on the kit.

In addition to the material supplied in each kit, the following items should be on hand:

1. Clean, dry rags or paper towels.
2. Impermeable gloves.
3. Chemical splash goggles.
4. Drum or disc sander, with 36 to 60 grit abrasive, 36 to 60 grit emery cloth may also be used for hand sanding. Do not use flapper wheels or belt sanders.
5. Lay-out table for fiberglass.
6. Extra cardboard, heavy paper, or aluminum foil, to use as a cover for the lay-out table.
7. A space heater, heat gun or heat blanket may be required.

Tools for Cutting Pipe

Pipe should be at least 55°F before cutting and may be cut with several acceptable tools, including:

1. Circular power saw with an aluminum oxide abrasive blade, a grit edged carbide blade, or a diamond blade. Do Not use toothed blades as they may damage the pipe corrosion barrier.
2. Band saw with 16-22 teeth/inch at speeds of 200' – 600' per minute.
3. Saber saw with grit edged carbide blade.
4. Chop saw with aluminum oxide blade.
5. Hack saw with 22-28 teeth per inch.

Surface Preparation

Prepare the branch pipe and run pipe for bonding. Mark the area to be cut on the run pipe. The hole in the run pipe should be equal in diameter to the inside diameter of the branch pipe, as the branch pipe must set on top of the run pipe

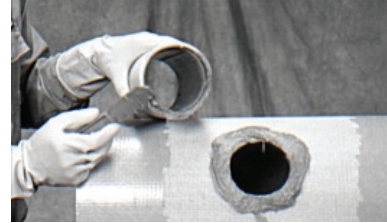
Cut the run pipe with grit edged aluminum oxide, carborundum or diamond blades. Do not use toothed blades as they may damage the corrosion barrier.

Shape the end of the branch pipe to fit the curvature of the run pipe closely. After shaping, measure the branch length needed and adjust the length of the branch pipe by cutting the other end as required. Sand the surface of both the branch and run pipe out to about 1" beyond where they will contact each other when assembled. Sand the surface of both the branch and run pipe until the resin-rich glaze is removed. (The bonding surface should have a dull finish with no shiny spots).



Bonding the Branch Pipe to the Run

Mix the adhesive according to the instructions supplied with the adhesive kit. After properly mixing the adhesive, coat the raw edges of the run pipe and the branch piece. The hole in the run pipe needs to have a thin coat of adhesive on the exposed cut edges (this seals the exposed glass fibers). Repeat the same procedure for the branch pipe: coat the end of the pipe which mates to the run pipe. Put the branch piece in place.



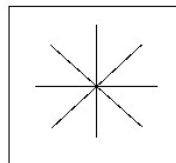
Check for correct alignment. Build up a fillet between the run pipe and the branch pipe. The purpose of the fillet is to give a smooth radius for the glass lay-up. Allow this adhesive joining to set up prior to application of the glass overlay. For cure time of the adhesive, refer again to the adhesive instructions.



Surface Preparation for Lay Up

Remove the glass from your kit, notice there are two different sizes and shapes of glass. There is glass for the 'run' and for the 'branch'. The 'run' glass is applied with most of it's area on the primary pipe, and the 'branch' glass is applied with half of it's area on the branch pipe, and half on the run pipe

Run Glass



Branch Glass



Note: On larger sizes, these pieces may be cut in half for easier installation.

Take the run piece of glass and slide it over the branch to use as a reference where you are going to sand. Use a pencil or magic marker to trace the outside edges of the run glass onto the pipe. Measure the width of the branch glass above the slit area. Mark the branch pipe 1/2" above this lay-up width of the branch glass. With your reference marks in place, sand the surface inside the reference marked area, and continue the sanding approximately 1/2" past your reference marks. The purpose of this is to be sure that you have enough area sanded for the lay-up. During this process, you will need to smooth out the surface of the hardened adhesive in the fillet area. Again, sand until the resin-rich glaze is removed.

Care must be taken to keep the sanded area clean of all contaminants miter fabrication.

Mixing Epoxy Resin for Liner

Before applying the 'liner' portion of the T-miter, it will be necessary to heat Epoxy Part 'A' to approximately 120° F. Do not heat the Epoxy Part 'B'. Heating the Part 'A' will thin the material enough to increase the workability and wet-out, but will still retain about a 20-minute pot life. Higher temperatures will decrease pot life and may cause problems with resin draining from the glass and excessive reaction rates.

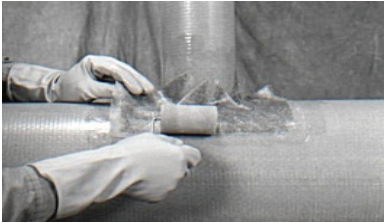
When the Part A has been brought to approximately 120° F:

1. Pour the pre-measured Part 'A' from the one quart can into the mixing cup.
2. Add the entire contents of the Part 'B' from the pint can.
3. Mix the components together with the supplied mixing sticks until the color is consistent (about 1 – 2 minutes).
4. Be sure to have enough resin components heated to finish the entire liner.

Applying Epoxy Liner

Wet the sanded area of the run and branch pipe with catalyzed epoxy resin:

1. Apply one (1) layer of surface veil (the glass with the finest consistency), 'run' piece first, then 'branch' piece. Ensure they are wet out entirely, and carefully smooth into place with gloves or roller. The 'run' glass should be applied with the slits pointing up and onto the branch pipe, while the 'branch' glass is positioned with the slit area down and overlapping onto the 'run' portion of the joint.



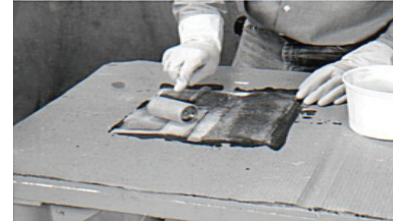
2. Apply 1 layer of chopped strand glass; run piece first, then branch piece. Repeat with a second layer. Work out any air trapped in the lamination, and add moderate heat until the resin sets up. Be careful not to heat the joint so hot that resin drains from the glass, or the lamination smokes and cracks as it sets up. If the material gets too hot and smokes and cracks, it will be necessary to sand the hardened material off from the pipe and begin again.

This completes the epoxy liner portion of the T-miter. The materials used in all sizes are the same, and will always be applied this way regardless of size. Sizes of the glass pieces and resin quantities will vary, depending upon pipe sizes. If the 470 structural portion cannot be applied within 48 hours from the completion of the liner portion, the surface of the liner will need to be sanded as described above before the application of the structure.

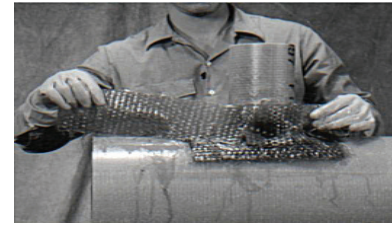
Applying Structural Overlay

The structural portion of the T-miter is applied as described above, using the 470 A and B resin components to wet out the fab mat (A combination material, with fiberglass mat on one side and a layer of woven roving on the other side). Follow the steps below to finish the T-miter application:

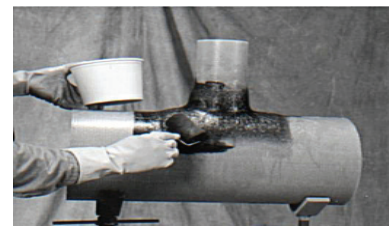
1. Again add the part 'B' to the part 'A', and mix thoroughly. Refer to TABLE 1 for the proper amounts of Part 'B' to use.
2. Wet out the surface of the joined pipe in the area to be covered. Then place the first piece of 'run' fab mat on a cardboard working surface, which has also been pre-wet with catalyzed resin. The mat side should be up. Apply catalyzed resin to the mat side of the fab mat, then turn it over and apply more catalyzed resin. Work the resin in, but do not 'work' the fab mat for a long period.



3. Pick the saturated fab mat up and place it down over, or around the branch pipe just as you did the liner. The Mat side should be down, against the previously applied liner. Work out as much air as you can with the roller after each application of fab mat.



4. Repeat this step, using a layer of branch glass. Continue applying alternating layers of run and branch fab mat until all the pieces of fab mat have been applied. (Refer to TABLE 2 for the proper quantities of structural fiberglass in each size T-miter kit). The seams in the branch glass should be staggered 90° apart in each successive layer. Always place the mat side down, and never place two layers of roving without a mat in between. TABLE 2 does not include the 5" wide veil and 2 pieces of 4" wide mat used to make the epoxy liner portion of the T-miter.)
5. Finish the lay-up portion of the T-miter by applying the cover mat in the same fashion. Once the air has been worked out of the T-miter, and the joint inspected, the finish coat can be applied.
6. Using the 'finish coat' Parts 'A' and 'B', mixed as in Table 1, (Reduce Part 'B' proportionately if using less than 1 quart of Part 'A'), paint or roll a layer of catalyzed finish-coat resin over the entire exterior surface of the T-miter lay-up



Curing the Joint

The Joint will cure on its own to a usable degree of hardness within 36 hours if the temperature is above 60° F. Curing without added heat at temperatures below 60° F is not recommended. The joint can be post-cured at temperatures up to 250° F for maximum corrosion resistance and minimum “wait” time. Refer to TABLE 1. If the fluid contents of the system will be above 120° F during normal operation, post-curing is always recommended. Post-curing can be accomplished by heat blanket or gun, (both available from your NOV Fiber Glass Systems distributor), or other sources, such as ovens, salamanders, etc..

Hydrostatic Testing

NOV Fiber Glass Systems piping systems should be hydrostatically tested prior to being put into service. Avoid water hammer during testing to prevent serious damage to the piping system. All anchors, guides, and supports must be in place prior to testing the line.

Hydrostatically test the line as follows:

1. Water should be introduced at the lowest point in the test section and the air bled off through partially open valves or loose flanges at all the highest points. Slowly introduce water into the system to prevent water hammer. Slowly close the bleed points when all the air has been forced from the system.
2. Bring the system gradually up to the test pressure. Test pressure should not be more than 1½ times the working pressure of the piping system, and must never exceed 1½ times the rated operating pressure of the lowest rated component in the system.
3. When testing is completed open all of the high point bleeds before draining the piping through the fill lines. This will prevent vacuum collapse of the pipe.

Compressed Air / Gas Testing

Compressed air or gas testing of the piping systems is not recommended. When air or compressed gas is used for testing, tremendous amounts of energy can be stored in the system. If a failure occurs, the energy may be released catastrophically, which may result in property damage and personal injury.

When system contamination or fluid weight prevents the use of hydrostatic testing, use compressed air or gas testing with extreme caution. To reduce the risk of air testing, pressurize the system to no more than 15 psig.

When pressuring the system with compressed air or gas, the area surrounding the piping must be cleared of personnel to prevent possible injury. Hold the pressure for one hour; then reduce the pressure to ½ the original pressure. Personnel may then enter the area to perform “soap testing” of all the joints. If compressed air or gas testing is used, NOV Fiber Glass Systems will not be responsible for any resulting injury to personnel or damage to property, including the piping system.

Compressed air or gas testing is done entirely at the discretion and complete risk of the customer or contractor

Cure Times and Mix Ratios

Temperature (Degrees F)	Part “A” Self Life (Months)		Part “B” Shelf Life (Months)		Mix Ratio ml Part “B” per Quart “A” (470)	Pot Life (minutes) When Mixed (470)	T-miter Joints Recommended Cure Time (hours)
	Epoxy	470*	Epoxy	470			
40-50	12	10	12	12	N/R	N/R	N/R
50-60	12	10	12	12	N/R	N/R	N/R
60-70	12	10	12	12	19	45	36
70-80	12	N/R	12	12	17	35	24
80-90	12	N/R	12	6	15	25	24
90-100	12	N/R	N/R	6	10	15	24
Above 100	12	N/R	N/R	N/R	8	N/R	

Note: N/R = Not Recommended *Storage of 470 Resin above 75° F in not recommended

Table 2**1"-12" T-Miter Structural Material Quantities**

Branch Pipe Size (In.)	Kit Contents	Pressure Rating (Psi)									
		50 psi		75 psi		100 psi		125 psi		150 psi	
		Run	Branch	Run	Branch	Run	Branch	Run	Branch	Run	Branch
1	Material	1V 3M 2FM	1V 6M	1V 3M 2FM	1V 6M	1V 3M 2FM	1V 6M	1V 3M 2FM	1V 6M	1V 3M 2FM	1V 6M
	Size	8 x 8	4 x 5	8 x 8	4 x 5	8 x 8	4 x 5	8 x 8	4 x 5	8 x 8	4 x 5
1 ½	Material	1V 3M 2FM	1V 7M	1V 3M 2FM	1V 7M	1V 3M 2FM	1V 7M	1V 3M 2FM	1V 7M	1V 3M 2FM	1V 7M
	Size	8 x 8	4 x 6	8 x 8	4 x 6	8 x 8	4 x 6	8 x 8	4 x 6	8 x 8	4 x 6
2	Material	1V 3M 2FM	1V 7M	1V 3M 2FM	1V 7M	1V 3M 2FM	1V 7M	1V 3M 2FM	1V 7M	1V 3M 2FM	1V 7M
	Size	8 x 8	4 x 8	8 x 8	4 x 8	8 x 8	4 x 8	8 x 8	4 x 8	8 x 8	4 x 8
3	Material	1V 3M 3FM	1V 7M	1V 3M 3FM	1V 7M	1V 3M 3FM	1V 7M	1V 3M 3FM	1V 7M	1V 3M 3FM	1V 7M
	Size	10 x 10	4 x 12	10 x 10	4 x 12	10 x 10	4 x 12	12 x 12	6 x 12	12 x 12	6 x 12
4	Material	1V 3M 3FM	1V 7M	1V 3M 3FM	1V 7M	1V 3M 3FM	1V 7M	1V 3M 3FM	1V 7M	1V 3M 3FM	1V 7M
	Size	10 x 10	4 x 17	10 x 10	4 x 17	12 x 12	6 x 17	12 x 12	6 x 17	12 x 12	6 x 17
6	Material	1V 3M 3FM	1V 3M 3FM	1V 3M 3FM	1V 3M 3FM	1V 3M 3FM	1V 3M 3FM	1V 3M 5FM	1V 3M 5FM	1V 3M 5FM	1V 3M 5FM
	Size	12 x 12	4 x 25	14 x 14	6 x 25	14 x 14	6 x 25	18 x 18	8 x 27	18 x 18	8 x 27
8	Material	1V 3M 3FM	1V 3M 3FM	1V 3M 3FM	1V 3M 3FM	1V 3M 5FM	1V 3M 5FM	1V 3M 5FM	1V 3M 5FM	1V 3M 6FM	1V 3M 6FM
	Size	16 x 16	6 x 32	16 x 16	6 x 32	20 x 20	6 x 33	20 x 20	8 x 33	22 x 22	6 x 34
10	Material	1V 3M 3FM	1V 3M 3FM	1V 3M 4FM	1V 3M 4FM	1V 3M 5FM	1V 3M 5FM	1V 3M 6FM	1V 3M 6FM	1V 3M 7FM	1V 3M 7FM
	Size	18 x 18	6 x 40	20 x 20	6 x 40	22 x 22	8 x 40	24 x 24	8 x 41	26 x 26	10 x 41
12	Material	1V 3M 3FM	1V 3M 3FM	1V 3M 5FM	1V 3M 5FM	1V 3M 6FM	1V 3M 6FM	1V 3M 7FM	1V 3M 7FM	1V 3M 9FM	1V 3M 9FM
	Size	20 x 20	6 x 45	24 x 24	8 x 46	26 x 26	10 x 48	28 x 28	10 x 48	32 x 32	12 x 49

Note: V = Surmat or glass veil, M = Chopped strand mat, FM = Fab mat

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