

Fabrication Instructions for Epoxy/470 T-Miter 14"-72" Piping

INTRODUCTION: The following instructions cover large diameter piping and illustrate the process to follow when adding a "branch" (offshoot pipe) to an existing primary pipe (run pipe). The branch pipe typically is smaller than, or equal in diameter to, the pipe to which it is being attached.

SAFETY PRECAUTIONS: The resin, adhesive, catalyst and fiberglass used in the preparation and bonding process are flammable. It is critical that the work area is isolated from an open flame and smoking is not allowed in the vicinity. The methyl ethyl ketone peroxide is an oxidizing agent and can cause serious chemical burns if eye contact is made and can be irritating to the skin if exposed. Always wear impermeable gloves and chemical splash eye protection when working with any of the components in the kit.

SHOULD EYE CONTACT OCCUR, IMMEDIATELY FLUSH WITH WATER FOR AT LEAST 10 MINUTES and contact your physician for further instructions. Wash any skin areas affected with soap and water immediately. Material Safety Data Sheets for the kit components are available from the factory.

LIST OF MATERIALS:

- A. Four narrow pieces of surface veil and eight narrow pieces of chipped strand mat (the liner).
- B. Fabmat Structural Glass quantities per Table 2.
- C. Four larger pieces of chopped strand mat, size dependent on kit size.
- D. ZC-275 adhesive, sufficient to join and fillet the desired size of T-Miter.
- E. Epoxy resin and catalyst for liner portion of the T-miter.
- F. DOW 470 resin and catalyst for the structural and cover mat / finish coat portion of the T-miter.
- G. Instruction Sheet
- H. Resin mixing containers
- I. Mixing sticks
- J. Rollers
- K. Gloves
- L. Clean rags or paper towels.

ADDITIONAL INSTRUCTIONS:

Before beginning a T-Miter, make sure all tools and supplies are on hand. Refer to Weld Kit Instructions for specific Adhesive

Kit Details.

Additional items beneficial in the process:

1. Cutting equipment: Circular, band, or jigsaw type electric or pneumatic saws with grit edged aluminum oxide, carborunum or diamond blades. **DO NOT** use toothed blades as they may damage the corrosion barrier.
2. Sanding equipment: Disc, drum or belt sanders with 36-60 grit sanding media.
3. Heat gun or other source of heat that does not utilize and open flame.
4. A work surface protected by cardboard, heavy paper, or aluminum foil.
5. Cardboard sheets for saturating the glass with resin,
6. Solvent to clean tools and glove.

STORAGE OF T-MITER KITS

Do not store FGS Smith Fibercast 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. Store the fiberglass in a clean, dry place.

FIELD WELD ENVIRONMENT

Surfaces to be field welded must be thoroughly sanded, clean, dry, oil free and in the correct 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 and hot weather installation tips. The recommended temperature limits of the resin, adhesives, and surfaces to be field welded must be maintained in order to ensure proper curing of the T-Miter joints.

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. For 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.

INSTALLATION TIPS

Cold Weather - 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 should be used 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 into 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 FGS Smith Fibercast heat blankets or a space heater to cure the joint according to the Cure Times Chart, Table 1.
6. To accelerate cure times in cold weather, use up to 22 ml of catalyst per quart or resin.

Hot Weather - Above 90°F

Hot weather conditions 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.
2. Avoid direct sunlight on the joining surfaces of the resin, adhesive, catalyze 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.

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SITE EQUIPMENT

Each T-Miter Kit contains the correct amount of materials for the size of joint 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 60 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. Layout table for fiberglass
6. Extra cardboard, heavy paper or aluminum foil to use as a cover for the layout table
7. Space heater, FGS heat gun or heat blanket may be required.

TOOLS FOR CUTTING PIPE

FGS Smith Fibercast pipe should be at least 55°F before cutting and may be cut with several acceptable tools, as follows:

1. Circular power saw with an aluminum oxide abrasive blade, 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.

CUTTING OF PIPE

Measure the pipe allowing for fitting dimensions and contour on the cut end of the T-miter.

Scribe a cutting guide around the pipe with a contour marker or other method which assures a proper fit.

Hold the pipe firm but avoid crushing the wall or creating point loading.

Saw the branch and the main or run pipe smoothly with the correct tools.

The resin enriched inner surface of the pipe may be damaged if sawed coarsely or the wrong tools are used.

Trial fit the cut pipe to ensure a close fit of the branch to the main pipe with minimal gaps.

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 branch pipe, as the branch pipe must set on top of the run pipe. 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.

If the run or branch piping is larger than 24" diameter, the corrosion barrier portion of the T-miter will be placed on the inside of the pipe and may require the fabricator to be inside the pipe as well. Ensure that proper and safe ventilation is in use; provide cartridge respirators with solvent/vapor control cartridges or forced air mask systems. If the liner is to be installed on the inside of the joint, sand the inside of the run and branch pipe back approximately 3" from the cut portions of the piping.

BONDING BRANCH PIPE TO 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, sealing the exposed glass fibers. Repeat the same procedure for the branch pipe - Coat the end of the branch pipe that mates to the run pipe. Put the branch piece in place.



Check for squareness and correct alignment. Build up a fillet between the run pipe and the branch pipe. The size of the joint determines if more than one adhesive kit is required for this step. The purpose of the fillet is to give a smooth radius for the glass lay-up.



Smooth out any adhesive at the inside seam of the joint. Allow the adhesive joining to set up prior to application of the glass overlay. For cure time of the adhesive, refer again to the adhesive instructions.

LAYUP SURFACE PREPARATION

Remove the glass from your kit. Correct sanding of the exterior surfaces is dependent on sanding an area that is slightly larger than the widest piece of glass in the kit. During the sanding process, the fillet that was created on the outside of the joint should be smoothed and faired into the branch and run to provide a smooth transition for the glass to lay over. The inside of the joint should also be sanded where the two pipe meet if an inside liner is to be installed.



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

MIXING EPOXY RESIN FOR LINER

The liner is applied using the epoxy resin and catalyst supplied with the kit. Before applying the liner portion of the T-Miter, heat the Part 'A' epoxy to approximately 120°F. Do not heat the Part 'B' epoxy. 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 Part 'A' has reached approximately 120°F the procedure is as follows:

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 (approximately 1-2 minutes).

Assure enough resin components are heated to finish the entire liner.

APPLYING EPOXY LINER

Wet the inside or outside sanded area of the run and branch pipe with catalyzed epoxy resin, depending on the liner being on the inside or on the outside of the joint.



1. Apply the surface veil (glass with the finest consistency) and the chopped strand mat.
2. It is easier to saturate the various pieces for an outside liner on the work table and then apply them to the work, staggering the

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seams as the various pieces are wet out entirely and carefully smooth into place with gloves or roller.



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 always will be applied this way regardless of size. Sizes of the glass pieces and resin quantities will vary, depending on pipe sizes.

NOTE: If the structural portion of the T-miter cannot be made within 48 hours after the completion of the liner, sand the surface of the liner 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 470-B resin components to wet out the fabmat (a combination material consisting of a mat layer on one side and a layer of woven roving on the other side.) The following procedure should now be followed:

1. Add 470 Part B to the Part A, according to the instructions in Table 1 and mix thoroughly. Wet out the surface of the joined pipe in the area to be covered.
2. Place the first piece of the narrowest width fabmat on a cardboard working surface, which has also been pre-wet with catalyzed resin. The mat side should be down. Apply catalyzed resin to the roving side of the fabmat then turn it over and apply more catalyzed resin to the mat side. Work the resin in, but do not "work" the fabmat for a long period on the table. Pick the satu-

rated fabmat up and center it over the joint between the two pipes, with the mat side against the pipe. Work out as much air as you can with the roller or your gloves after each application of fabmat.

3. Repeat this step with each of the four pieces to be used to create the first layer completely around the joint. Continue applying layers of fabmat according to the sequence shown in Table 2 until all the pieces of fabmat have been applied, or until the applied material reaches about 1/4" of thickness. The seams in each layer should be staggered so that they do not line up with the same seam in the layer below. Always place the mat side down and never place two layers of roving without a mat in between. On very large t-miters the application of fabmat should be staged, and the resin should be allowed to gel and exotherm after each 1/4" of thickness has been applied. This keeps the joint from exotherming all at once and generating massive amounts of heat, which could cause delamination of the layers. If the joint is staged, application of further layers of material can resume once the previous application has cooled. (If more than 24 hours pass before lay-up continues, the surface must be sanded again before lay-up can proceed.)

4. When all layers of fabmat have been applied, carefully apply the cover mat portion of the t-miter which covers and smooths the last layer of exposed woven roving. Work out all air and smooth out any strands or bumps.

5. Once the air has been worked out of the t-miter, continue to watch the joint until the resin sets up, as the resin may begin to drain or migrate from the top of the t-miter. If this occurs, use the roller to move the resin back into the area in question. (Draining is usually seen by the appearance of a whitish area in the glass.)

After all layers of fiberglass have been applied to the joint and the joint as gelled or semi-hardened and has been inspected for air bubbles or delamination, the finish coat can be applied. Mix the finish coat Part 'A' and 'B' in the same manner as the 470 resin mix. If less than one quart of finish coat needs to be applied, reduce the Part 'B' proportionally.

CURING THE JOINT

See Table 1 for recommended curing time. Curing without added heat at temperatures below 60°F is not recommended and will result in inadequate joint strength. The joint can be post cured at temperatures up to 250°F for maximum corrosion resistance and minimum wait time. 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 forced hot air heating or by other sources such as ovens, infrared heaters, salamanders, etc.

For post curing joints in sizes 14"-42", 250°F should be maintained for at least two hours. For post curing joints in sizes 48"-82", 250°F should be maintained for at least four hours.

TABLE 1 - CURE TIMES AND MIX RATIOS

Temperature Deg. F	Part 'A' Shel Life (Months)		Part 'B' Shel Life (Months)		Mix Ratio ml Part 'B' Per Qt. Part 'A'	Pot Life Minutes When Mixed	T-Miter Joints Recommended Cure Time (Hours)
	Epoxy	470*	Epoxy	470			
40-50	12	10	12	12	470	470	NR
50-60	12	10	12	12	NR	NR	NR
60-70	12	10	12	12	19	45	36
70-80	12	NR	12	12	17	35	24
80-90	12	NR	12	6	15	25	24
90-100	12	NR	12	6	10	15	24
Above 100	12	NR	NR	NR	8	NR	24

*Storage of 470 Resin above 75°F is not recommended. NR = Not Recommended

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	Pipe Size	14"	16"	18"	20"	24"	30"	36"	42"	48"	54"	60"	72"
T-Miter Pressure Rating (psi)	Fabmat Widths (in.)	Number of Layers of Reinforcement											
50	4	1	1	1	1	1	1	1	1	1	1	1	1
	6	1	1	1	1	1	1	1	1	1	1	1	1
	8	1	1	1	1	1	1	1	1	1	1	1	1
	10			1	1	1	1	1	1	1	1	1	1
	12				1	1	1	1	1	1	1	1	1
	14						1	1	1	1	1	1	1
	16							1	1	1	1	1	1
	18								1	1	1	1	1
	20									2	2	1	1
	22											2	2
	24												2
26													
75	4	1	1	1	1	1	1	1	1	1	1	1	1
	6	1	1	1	1	1	1	1	1	1	1	1	1
	8	1	1	1	1	1	1	1	1	1	1	1	1
	10	1	1	1	1	1	1	1	1	1	1	1	1
	12		1	1	2	1	1	1	1	1	1	1	1
	14						2	2	2	1	1	1	1
	16								2	1	1	1	1
	18									2	1	2	1
	20										1	2	1
	22										2	2	1
	24												2
26													
100	4	1	1	1	1	1	1	1	1	1			
	6	1	1	1	1	1	1	1	1	1			
	8	1	1	1	1	1	1	1	1	1			
	10	1	1	1	1	1	1	1	1	1			
	12	1	2	1	2	1	1	1	1	1			
	14				2	2	1	1	2	1			
	16						1	2	2	1			
	18						2	2	3	1			
	20									1			
	22									2			
	24										2		
26											3		
125	4	1	1	1	1	1	1						
	6	1	1	1	1	1	1						
	8	1	1	1	1	1	1						
	10	2	1	1	1	1	1						
	12	2	1	2	1	1	1						
	14		2	2	2	1	1						
	16					2	1						
	18						2						
	20						2						
	22							2					
	150	4	1	1	1	1	1	1					
6		1	1	1	1	1	1						
8		1	1	1	1	1	1						
10		1	1	1	1	1	1						
12		2	1	1	1	1	1						
14		2	2	1	1	1	1						
16			2	2	1	1	1						
18				2	2	1	1						
20						2	2						
22							2						
24								3					

Note: The fabmat in this table is too long as a unit and is cut into four equal lengths for ease of handling. Where number 'one' is indicated in the table, there will be four pieces of glass of the indicated width in the kit. Each piece will cover 90 degrees of the distance around the branch pipe and each layer should be staggered so that the seams overlap those in the layer below.