

# Instructions for T-Miter Connection with Vinyl Ester Resin

## INTRODUCTION

Read these instructions completely and follow all of the procedures carefully. Please contact your local NOV Fiber Glass Systems authorized distributor if you have questions.

## SAFETY PRECAUTION

The resin, adhesive and catalyst used in making the installation are **HIGHLY FLAMMABLE**. It is critical to personal safety that the work area is isolated from any source of open flames. Fumes from these materials are also **FLAMMABLE** and can travel or build up in poorly ventilated areas.

The catalyst contains METHYL ETHYL KETONE PEROXIDE (MEKP). MEKP is strong oxidizing agent and proper safety measures should be taken when using products containing MEKP.

1. Wear chemical splash goggles for eye protection when using the resin, adhesive or catalyst. If eye contact should occur, flush immediately with water and call your physician.
2. Wear impermeable gloves to avoid skin contact with the resin, adhesive or catalyst. If direct contact should occur, wash immediately with soap and water.
3. Never cover a container of mixed resin and catalyst or adhesive and catalyst.
4. Material Safety Data Sheets (MSDS) are available at [www.fgsipipe.com](http://www.fgsipipe.com).

## CONTENTS OF T-MITER KITS

The contents of your field weld kit will vary according to the diameter and pressure ratings of the pipe. Please see the kit contents for a detailed listing of the contents.



## STORAGE OF T-MITER KITS

Do not store T-miter resin at temperatures above 90° F. Maximum storage life for the resin is three 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 condensation 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 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 weather or hot weather installation instructions.

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.

**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 Instructions (Below 60° F)

The cure 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 to reach temperatures to 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 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. Heat blankets or a space heater can be used to cure the joint according to the cure time chart on Page 4 after joint has gelled.
6. To accelerate cure times in cold weather use additional catalyst per Table 1.

## Hot Weather Installation Instructions (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 as shown in Table 1.
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 packs.

## 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 obtained prior to joint prep:

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 lay out table.
7. A space heater, heat gun or heat blanket may be required.

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**NOV** Fiber Glass Systems

## 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.
6. Hole saw with aluminum oxide blade.

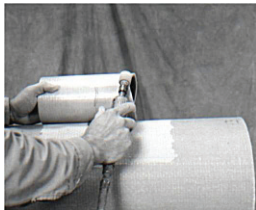
## STEPS FOR CUTTING THE PIPE

1. Measure the pipe allowing to allow for fitting dimensions.
2. Scribe a cutting guide around the pipe with a contour marker or other device to ensure a square cut.
3. Hold the pipe firmly. If chain vises or other mechanical holding devices are used, care should be taken to prevent crushing or point loading the pipe.
4. Saw the branch and main pipe as smoothly as possible. Coarse sawing can result in damage to the chemically resistant inner surface of the pipe.
5. Trial fit the pipe to ensure proper makeup with minimal gaps between the branch and main pipe.

## SURFACE PREPARATION

**Note:** It is essential that pipe and fitting surfaces be sanded, clean, dry and free of oil, grease and solvent contamination.

1. Dry fit the branch to the main pipe, lay the largest fiberglass branch and main pipe mats around the joint and mark 1/2" outside edges of mats for areas to be sanded. Prepare the pipe by sanding the bonding surfaces with 36 to 60 grit abrasive (See Site Equipment, Item 4). The sanded area should be completely roughened and extend 1/2" beyond the widest layer of fiberglass that will be applied.



2. Never sand more than two (2) hours before making the joint.
3. Wipe the sanded area with a clean, dry, lint-free cloth, and avoid touching the surface with bare hands or dirty gloves. Do not use solvents

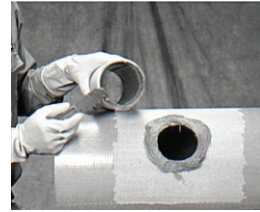
## INTERIOR SURFACE PREPARATION

For 24" and larger piping, use a die grinder to sand the interior surface of the pipe at least 3" from the joint ends. This will provide a proper bonding surface for applying the veil mat and resin to the interior surface of the pipe.

## SEALING AND SECURING THE PIPE ENDS

The Weldfast CL-200 adhesive included in this kit is used to coat the ends of the branch pipe, the hole in the main pipe and to stabilize the joint to prevent movement before applying the layers of fiberglass reinforcement. Mix according to the instructions in the Weldfast kit.

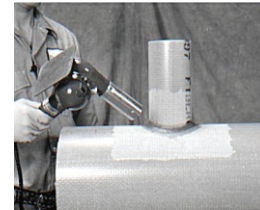
Apply a thin layer of mixed weldfast to the outside of the cut opening edge of the main pipe for the branch pipe to sit on, the hole in the main pipe and to cut the edge of the branch pipe.



Place the adhesive end of the branch pipe onto the open cut edge of the main pipe.



Use the wooden stirring stick to smooth the adhesive and make a small 45° bevel/fillet all along the edge of the joint. Make both the inside and outside as smooth as possible to reduce sanding. Cure the Weldfast adhesive according to the instructions. Heat may be applied to accelerate cure times.



Sand and smooth the hardened fillet and joint interior with 36 to 60 grit abrasive.

## MIXING THE LAY-UP RESIN

1. Measure the recommended amount of catalyst, using the measuring beaker. See the Cure Times Chart on Page 4.
2. Pour the measured catalyst into one quart of resin, and stir until completely blended. When the resin is properly blended, the color will be a consistent green and will start to foam.

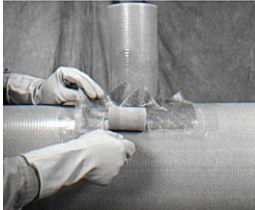
Use the standard mix of catalyzed resin is as shown in Table 1. After the first quart of resin is mixed and a layer of fiberglass has been applied, it may be necessary to adjust the working time. If more time is required, use less catalyst in each quart of resin. This will normally increase the pot life and the curing time. If a faster cure time is required, use additional catalyst for each quart of resin. This will shorten the pot life and the cure time.

## CORROSION BARRIER (Smaller than 24")

If an inside weld cannot be made, a corrosion barrier must be made on the exterior joining surfaces of the piping using the following procedure:



1. Wet the sanded surface of the piping exterior with a light coat of catalyzed resin.
2. Arranging the materials on the flat surface or table top, pre wet two layers of fiberglass mat and one layer of veil. Be sure the veil is the top layer.
3. Apply the pre wet layers centering the glass over the joint. Be sure the veil is against the pipe.



### INSIDE JOINT WELD (24" and Larger)

Inside joint welds are very important to the structural integrity of the pipe. When possible, always make inside joint welds when joining large diameter T-miter piping using the following procedure:

1. In addition to the standard sanding of the bonding surfaces, also sand to remove the remaining "lip" of excess adhesive and any uneven edges of the cut edge of the pipe. Wipe dust away with a clean, dry cloth.
2. Wet the sanded surface of the piping interior with a light coat of catalyzed resin.
3. Arrange the materials on a flat surface or table top. Pre wet two layers of fiberglass mat and one layer of veil. Be sure the veil is the top layer.
4. Apply the pre wet layers, centering the glass over the joint. The mat goes against the pipe wall with the veil exposed to the fluid stream.

### APPLYING FIBERGLASS TO OUTSIDE JOINT WELD

The sanded pipe surface must be pre-wet with catalyzed resin prior to starting the lay up.

#### Applying the Reinforcement

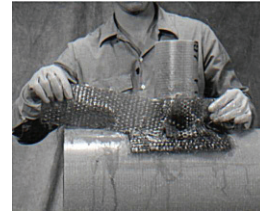
The reinforcement is pre-wet and applied the same way as the liner. Always start with the run fab mat and follow with the branch mat for each of the three layers of reinforcement. Apply the mat side toward the pipe.

Rotate the split in the fab mat 90° from the previous placement, thereby staggering the locations of the splits.

**Note:** Fab mat for large T-miters is cut in quarters. Start with the smallest size of fab mat. On a table or flat surface, pre wet the woven roving slide with catalyzed resin. Flip it over to the mat side and add more resin. To make the fab mat contour to the bend of the joint, pick up the pre wet layer of fiberglass and wad it up slightly to break it down. Then straighten it out, center it over the joint and apply.

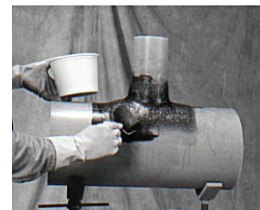
The final reinforcement cover mat should overlap all fab mat layers, by approximately 1/2". Pat into place, and roll down to finish. With the roller, smooth off any runs of resin to reduce the grinding time later.

Before the resin gels, it will run out of the uppermost areas, leaving them lighter in color. Use the roller to roll the resin back up into these areas. If possible, rotate large pipe so that the branch is pointing down, allowing the resin to run back onto the branch.



### MIXING AND APPLYING THE FINISH COAT

After all the layers of fiberglass have been applied to the joint and the joint has gelled or semi-hardened, apply a final coat of catalyzed resin using the 3" paint roller or brush. This finish coating is in a separate container marked Finish Coat Resin. This resin should be catalyzed using the same procedure as for the standard lay-up resin. If less than one quart of finish coat resin is required, reduce the recommended amounts of catalyst proportionately.



Application of the finish coat resin is critical to developing a chemical resistant piping surface and joint.

### JOINT CURING

Before moving or pressurizing the piping system, the joint must be cured (see Cure Time Chart, page 4). The minimum required cure time is 36 hours at 60° F. Inadequate joint strength will result if the catalyzed resin is cured at temperatures less than 60° F. Cure temperatures up to 200° F will accelerate cure time to two hours and increase joint strength. Heat curing is highly recommended for piping systems carrying fluids at temperatures above 120° F.

### HYDROSTATIC TESTING

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

Hydrostatically test the line as follows:

1. Water should be introduced at the lowest point in the test section and the air bleed off through partially open valves or loose flanges at all high points. Slowly introduce water into the system to prevent water hammer. Close the bleed points slowly when all the air has been forced from the system.
2. Bring the system gradually to the test pressure. Test pressure should not be more than 1 1/2 times the working pressure of the pipe system and must never exceed 1 1/2 times the operating pressure of the lowest rated component in the system.
3. When testing is completed, open all 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 NOV Fiber Glass Systems' piping 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. If compressed air or gas 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, contractor and user.

## VE T-Miter Shelf Life

Table 1

Temperature (Degrees)	Part "B" Catalyst Per Quart of Resin		Pot Life (Minutes)	Gel Times (Minutes)	Butt Weld Joints Cure Time (Hours)
40-50	N/R	N/R	N/R	N/R	N/R
50-60	N/R	N/R	N/R	N/R	N/R
60-70	16 ml	17 ml	20-40	25-45	36 Hrs
70-80	16 ml	17 ml	20-40	25-45	24 Hrs
80-90	16 ml	17 ml	15-35	18-38	24 Hrs
90-100	13 ml	10 ml	8-15	10-18	24 Hrs
*200 Heat Cure					1"-42" = 2 Hrs 48"-72" = 4 Hrs

\*Heat blanket, heat gun or other heat source N/R = Not Recommended

Table 2

Temperature (Degrees)	Part "A" Shelf Life (Months)	Part "B" Shelf Life (Months)
40-50	6	12
50-60	5	12
60-70	3-4	12
70-80	3-4	12
80-90	2-3	9
90-100	1-2	4

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