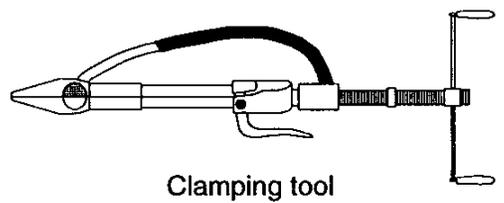
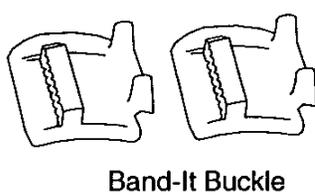
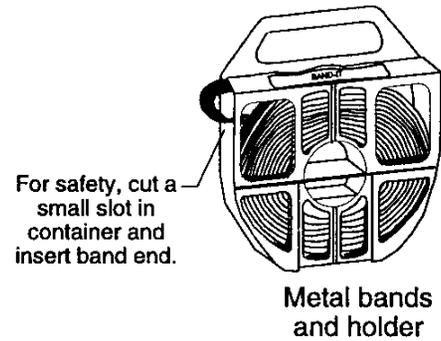
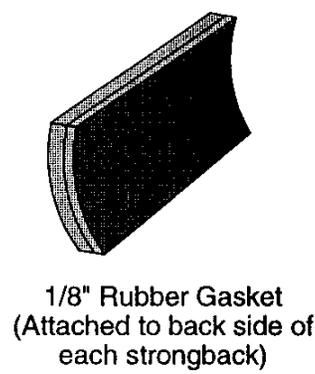
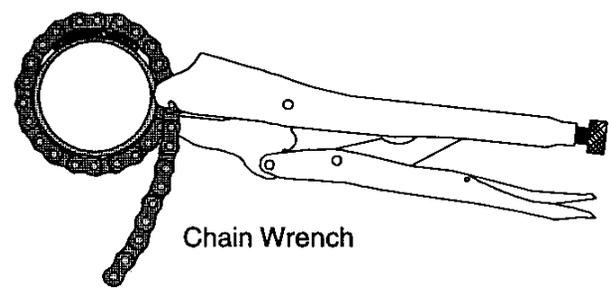
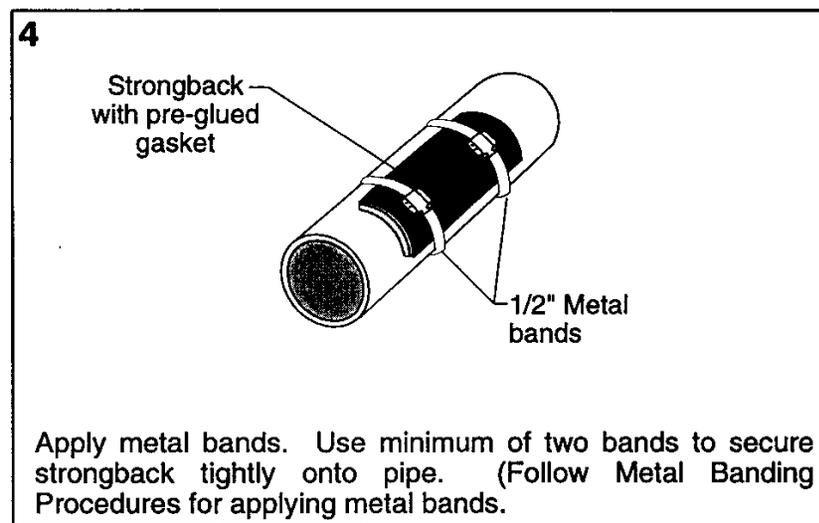
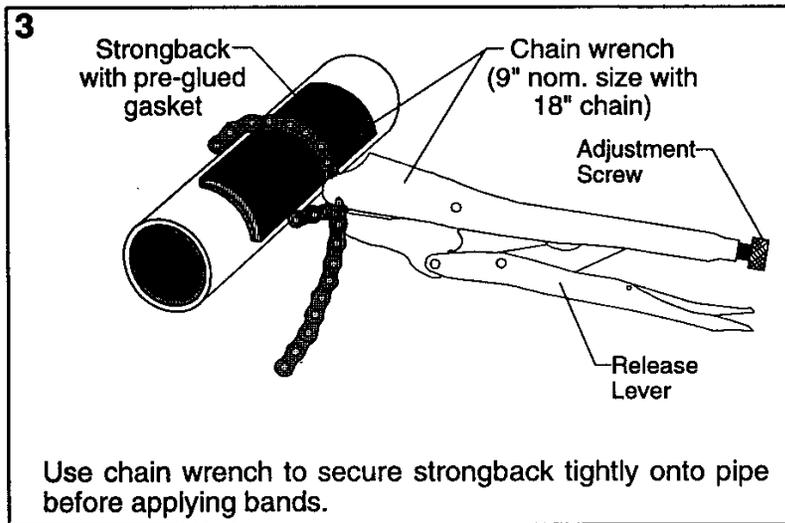
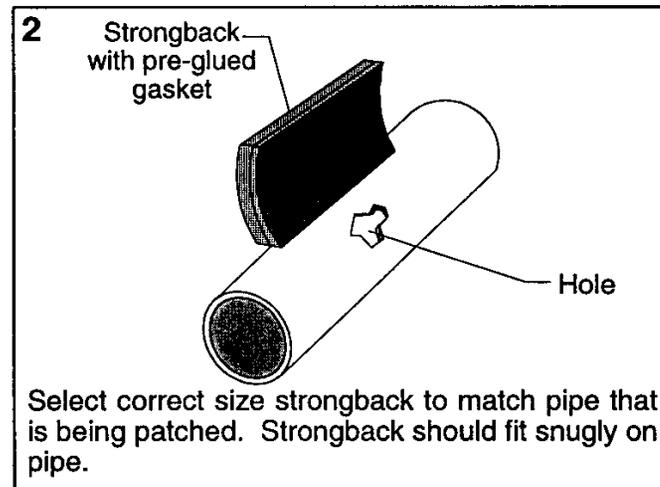
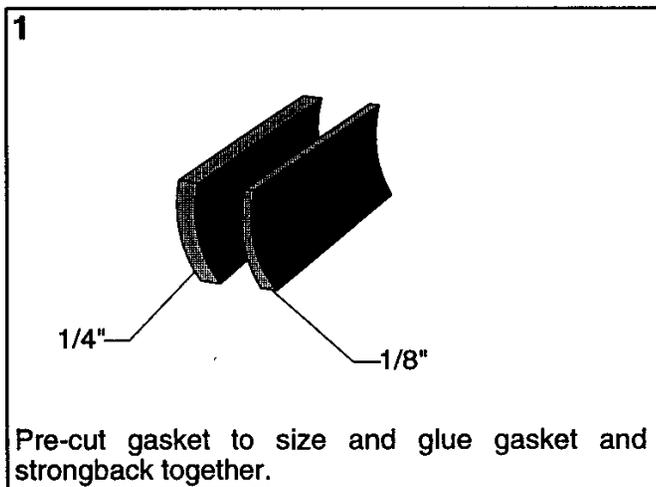


**DAMAGE CONTROL LAYOUT SKETCHES**  
**SECTION 11 - PIPE PATCHING EVOLUTION**

<b>SKETCH NO.</b>	<b>TITLE OF SKETCH</b>	<b>SHEET NO.</b>
001	Pipe Patching Equipment	11-2
002	Band-it Isolated Pipe	11-3
003	Band-it Patch on Pressurized Pipe (Sheet 1 of 2)	11-4
	Band-it Patch on Pressurized Pipe (Sheet 2 of 2)	11-5
004	Metal Bending Procedures for Band-it Patch (Sheet 1 of 2)	11-6
	Metal Bending Procedures for Band-it Patch (Sheet 1 of 2)	11-7
005	Emergency Water Activated Repair Patch (EWARP)	11-8
006	Jubilee Pipe Patch	11-9
007	Soft Patch on Low-Pressure Pipe Line	11-10
008	Clamp Patch	11-11
009	Flange Pipe Patch	11-12
010	Simple Pipe Patch	11-13
011	Elbow Pipe Patch Using Plastic Pipe Patching Kit	11-14
012	Severed Pipe Patch	11-15
013	Compound Pipe Patch	11-16



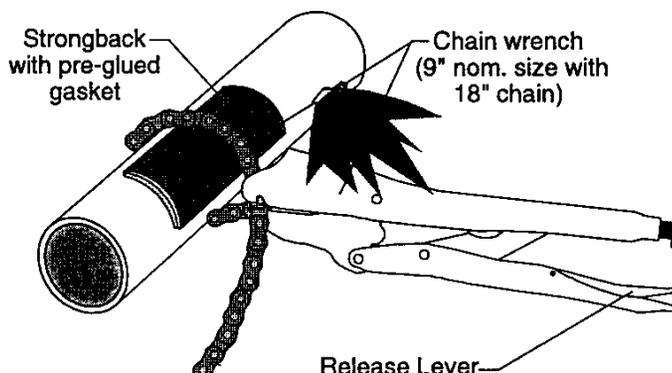
**PIPE PATCHING EVOLUTION - SKETCH #001**  
**Pipe Patching Equipment**



**PIPE PATCHING EVOLUTION - SKETCH #002**  
**Band-it Isolated Pipe**

**THIS IS A TWO-MAN OPERATION:**

**1**



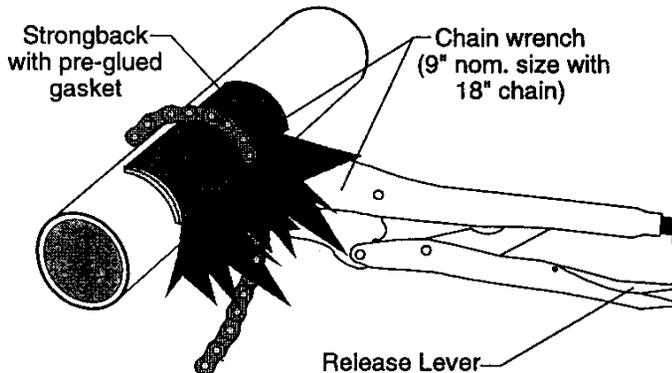
Strongback with pre-glued gasket

Chain wrench (9" nom. size with 18" chain)

Release Lever

1st man: Trial fit strongback, place offset and above the rupture.  
2nd man: Use chain wrench to tighten strongback. Without adjusting chain wrench, loosen chain with release

**2**



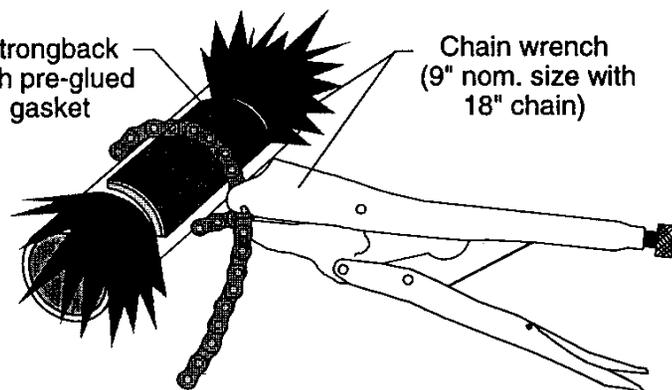
Strongback with pre-glued gasket

Chain wrench (9" nom. size with 18" chain)

Release Lever

1st man: Use two hands slide strongback over and above the rupture.  
2nd man: Hold chain wrench, centering strongback above the rupture. The chain will split the stream.

**3**

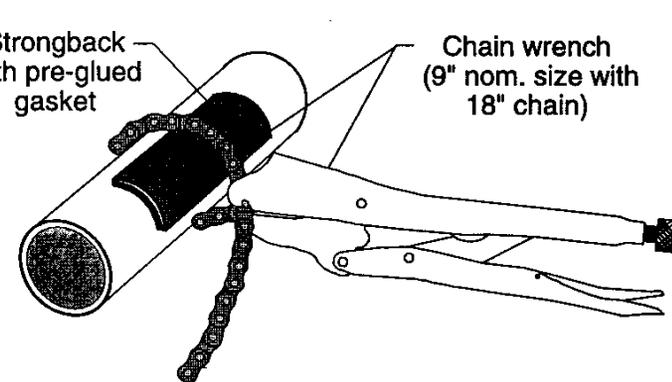


Strongback with pre-glued gasket

Chain wrench (9" nom. size with 18" chain)

1st man: Slide strongback down, centering over rupture.  
2nd man: Slide chain wrench down over strongback. Keep one hand with tight grip on wrench handle.

**4**

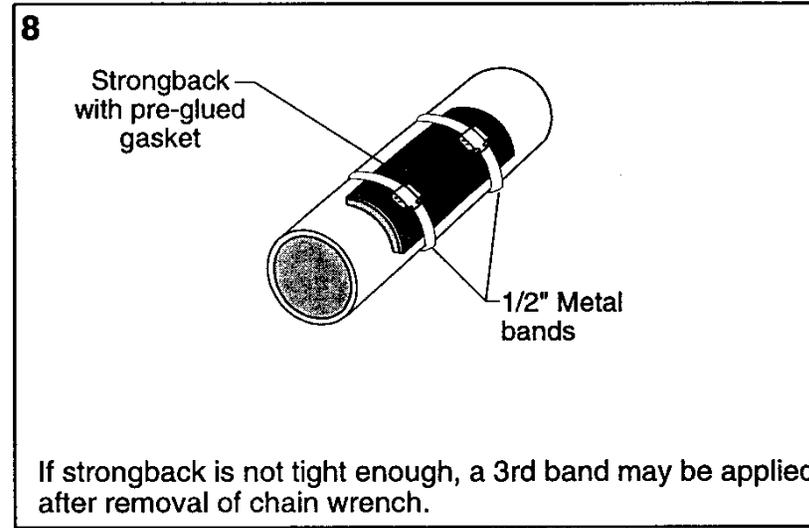
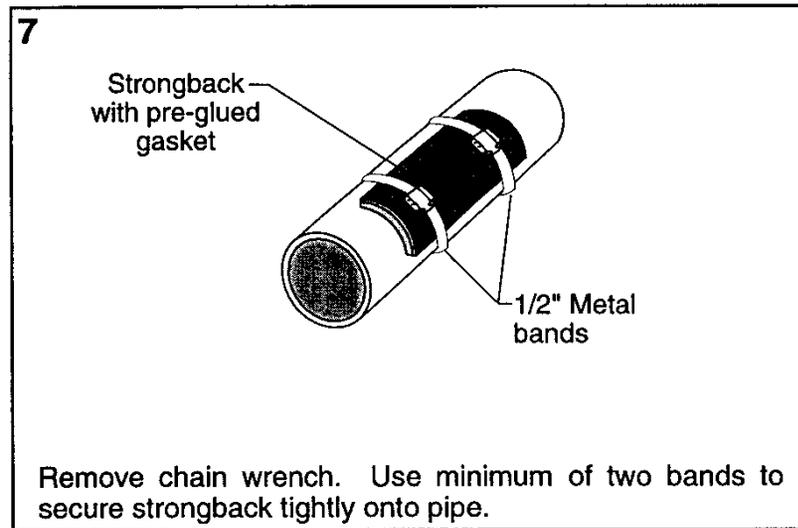
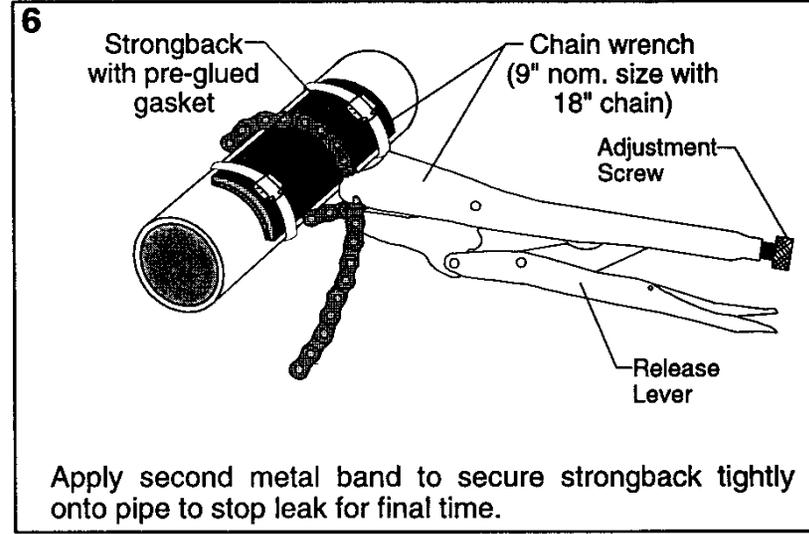
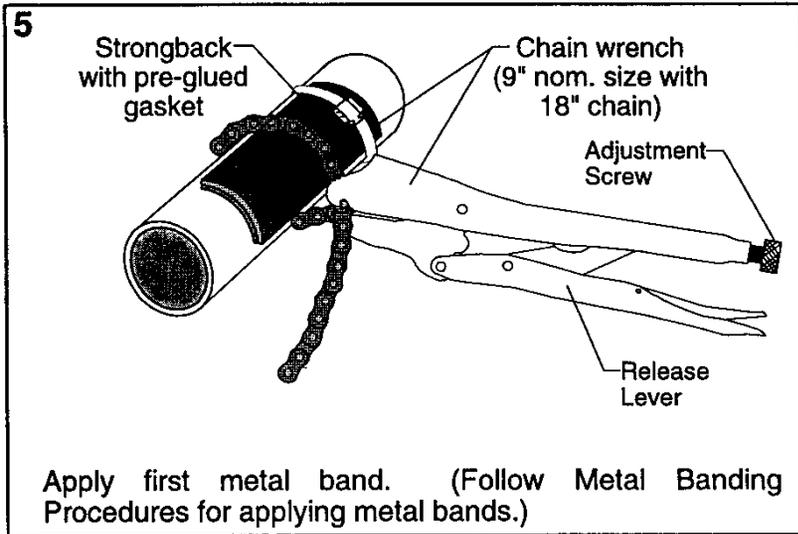


Strongback with pre-glued gasket

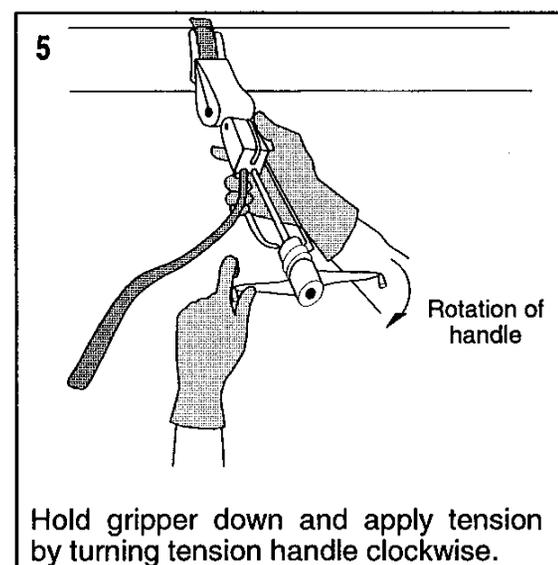
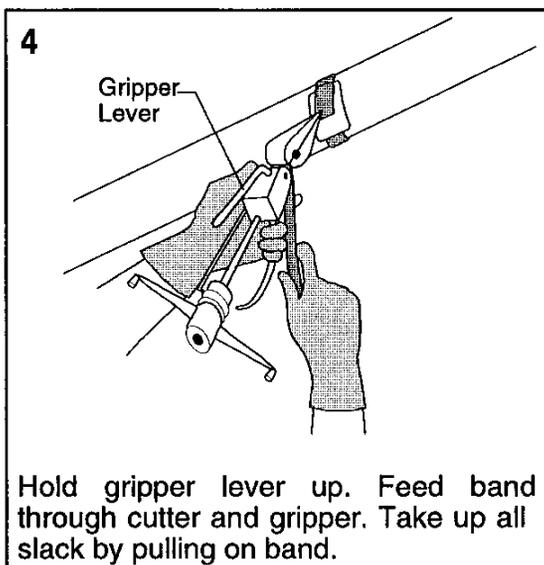
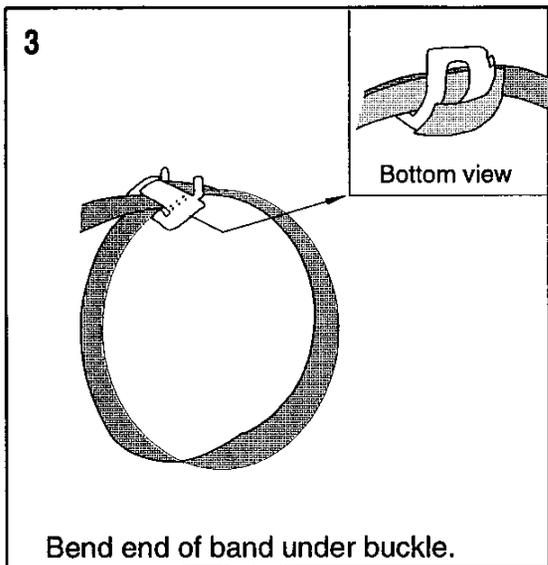
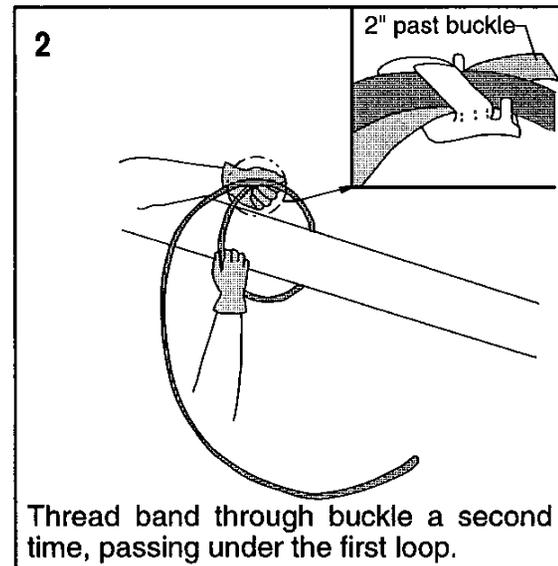
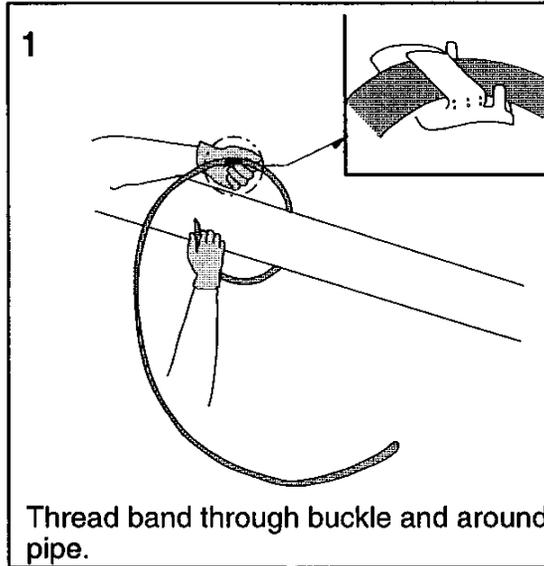
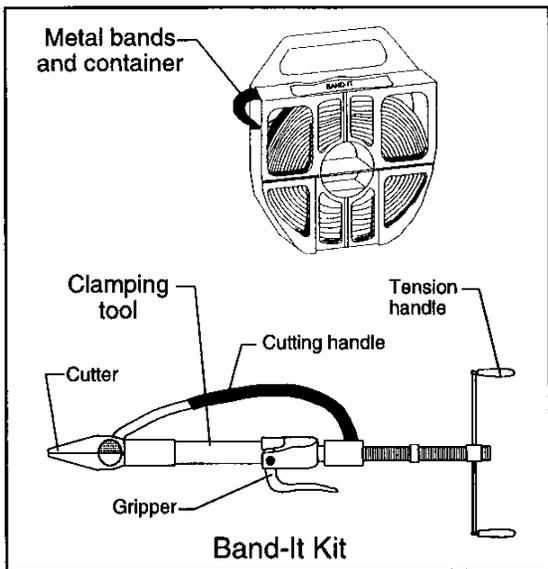
Chain wrench (9" nom. size with 18" chain)

2nd man: Clamp chain wrench to secure strongback tightly onto pipe to stop leak for final time.

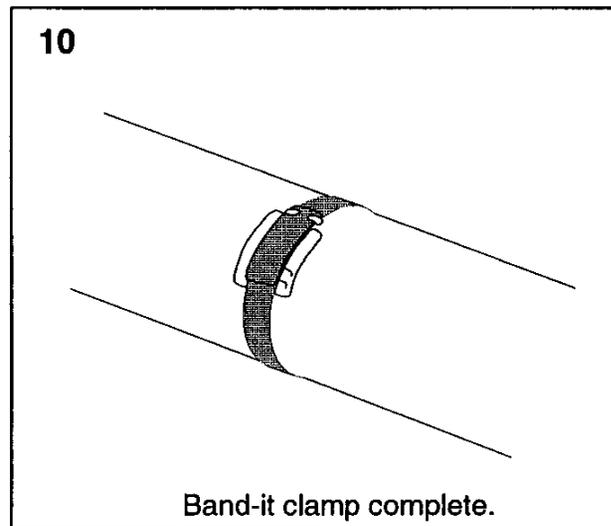
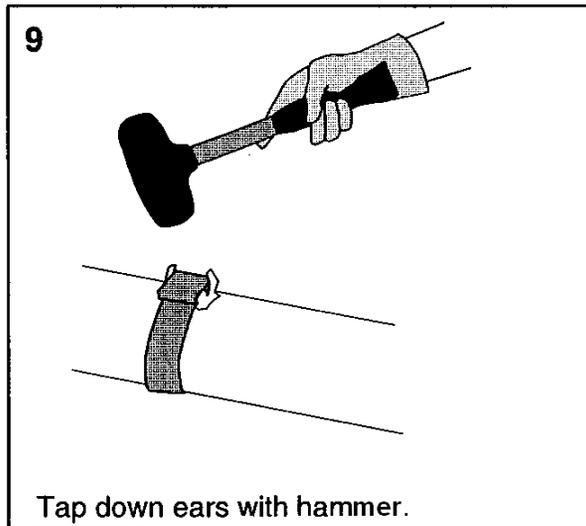
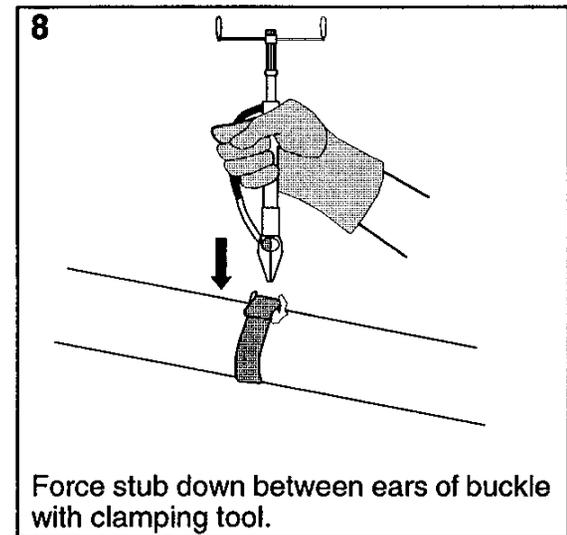
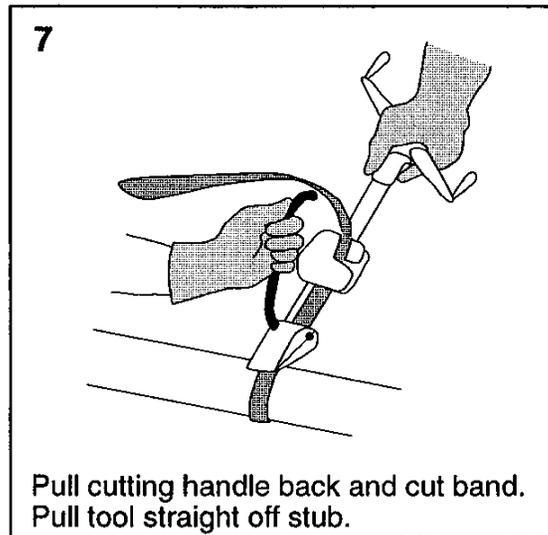
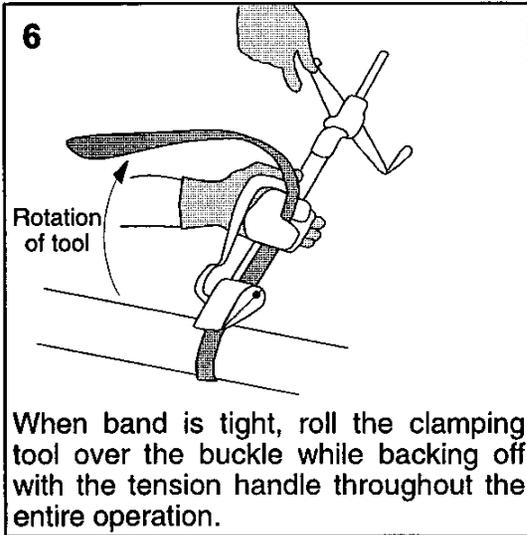
**PIPE PATCHING EVOLUTION - SKETCH #003**  
**Band-it Patch on Pressurized Pipe (Sheet 1 of 2)**



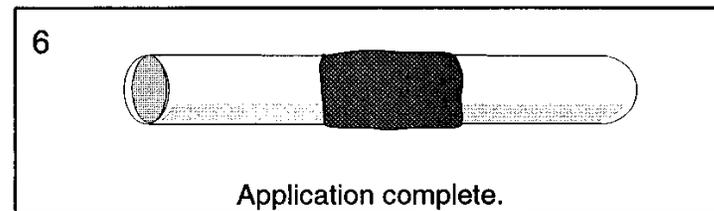
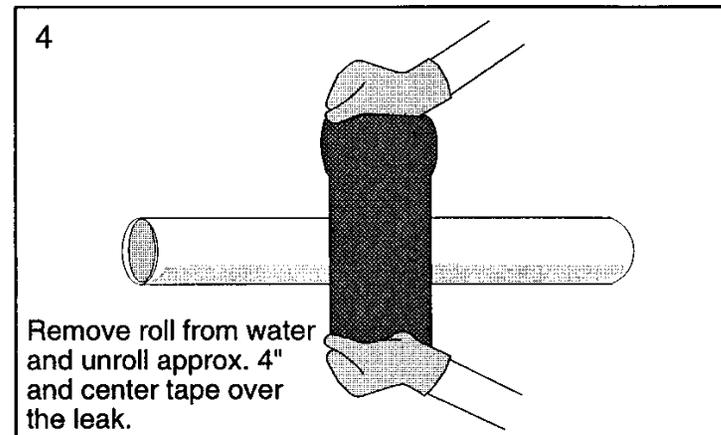
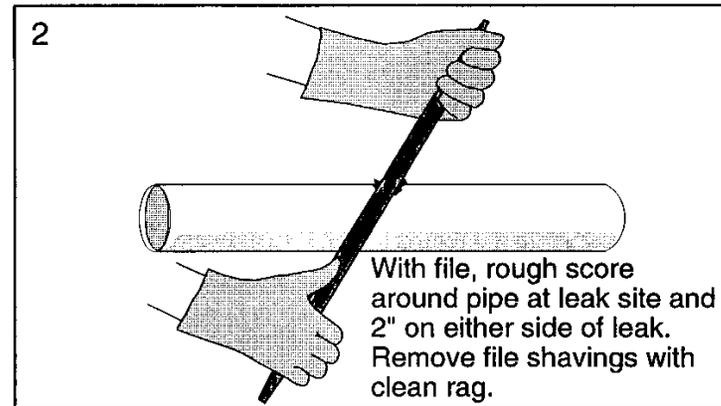
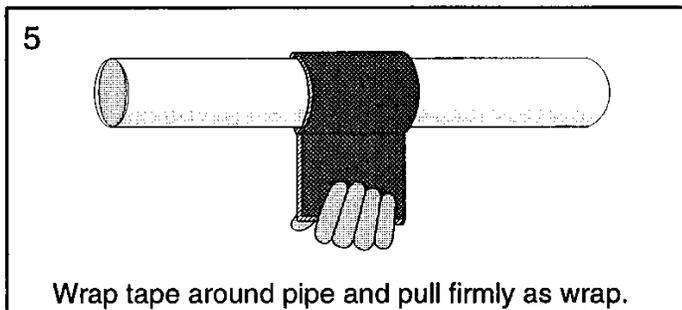
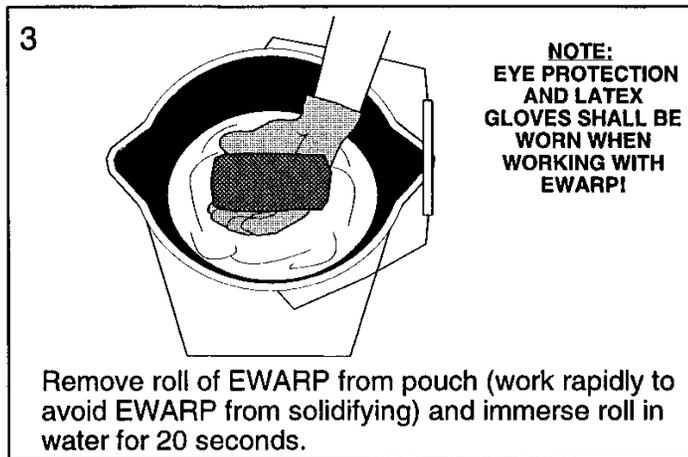
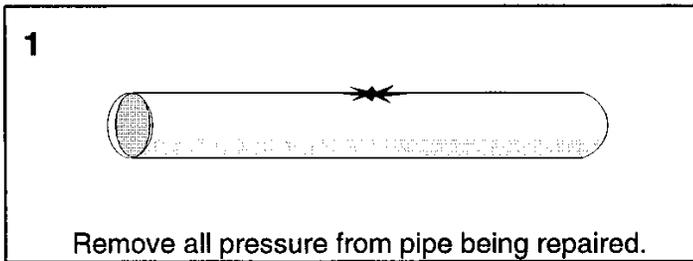
**PIPE PATCHING EVOLUTION - SKETCH #003**  
**Band-it Patch on Pressurized Pipe (Sheet 2 of 2)**



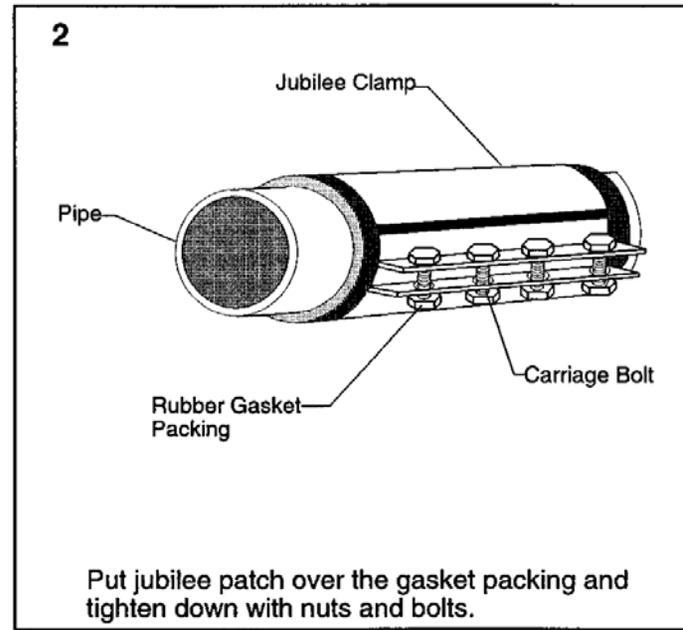
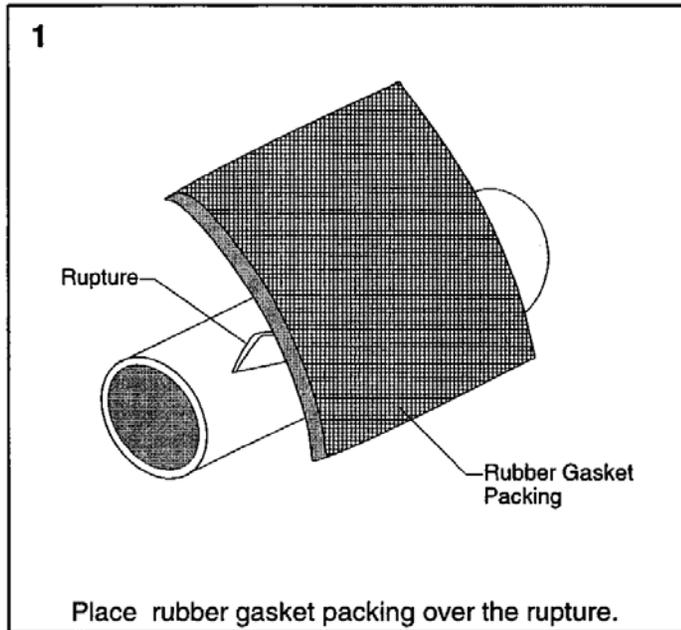
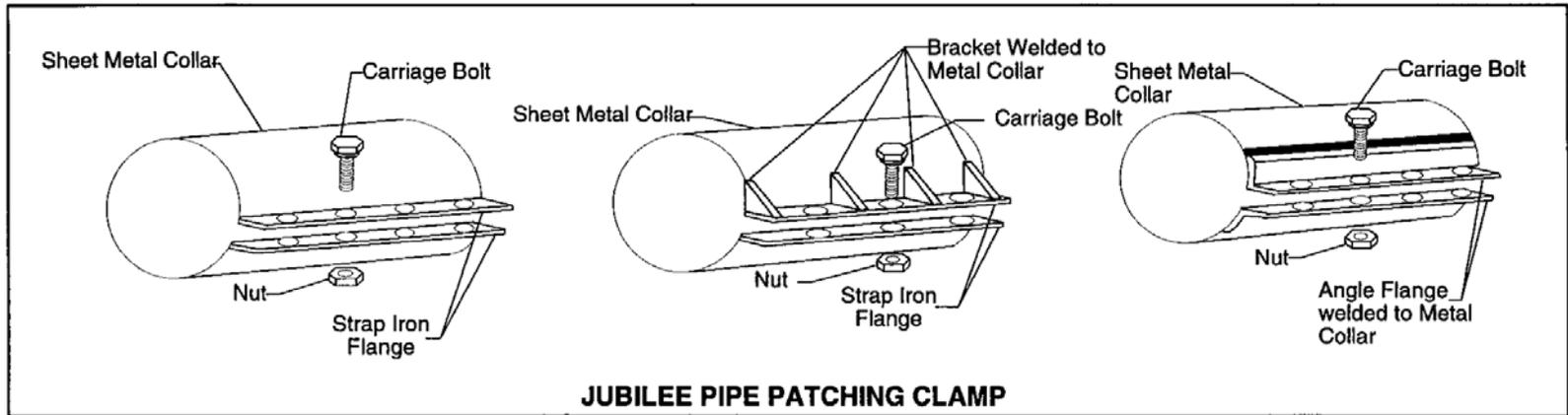
**PIPE PATCHING EVOLUTION - SKETCH #004**  
**Metal Bending Procedures for Band-it Patch (Sheet 1 of 2)**



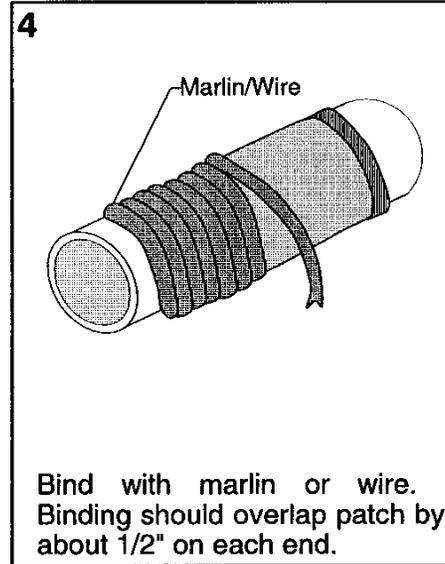
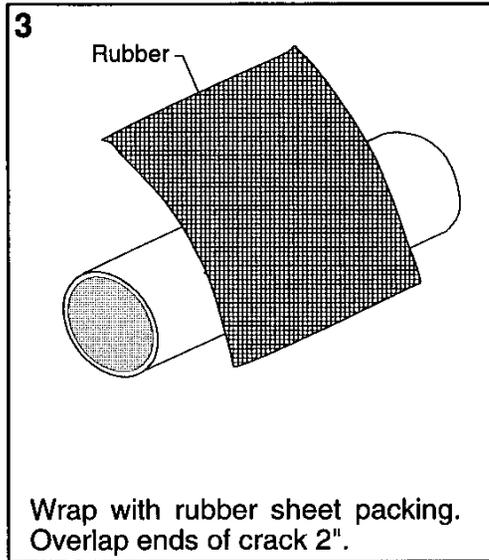
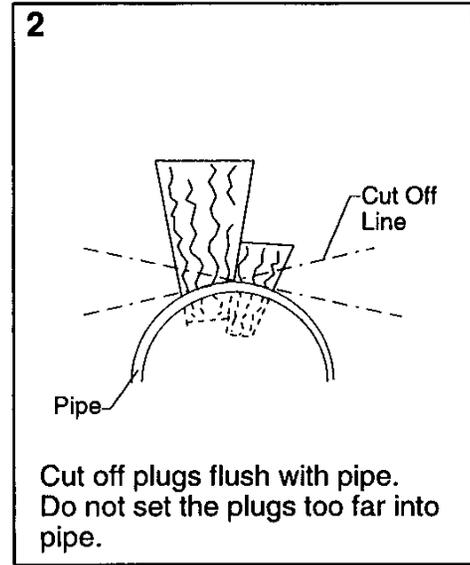
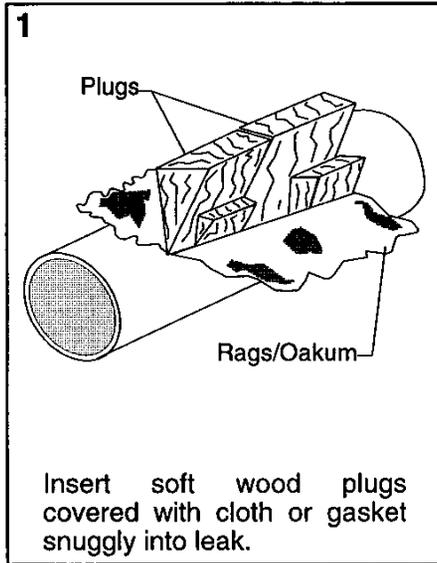
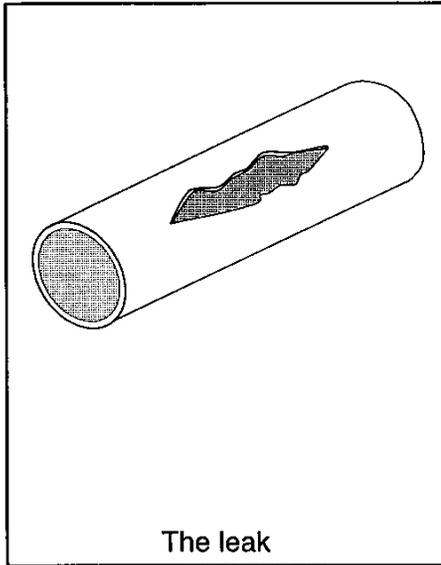
**PIPE PATCHING EVOLUTION - SKETCH #004**  
**Metal Bending Procedures for Band-it Patch (Sheet 2 of 2)**



**PIPE PATCHING EVOLUTION - SKETCH #005  
Emergency Water Activated Repair Patch (EWARP)**

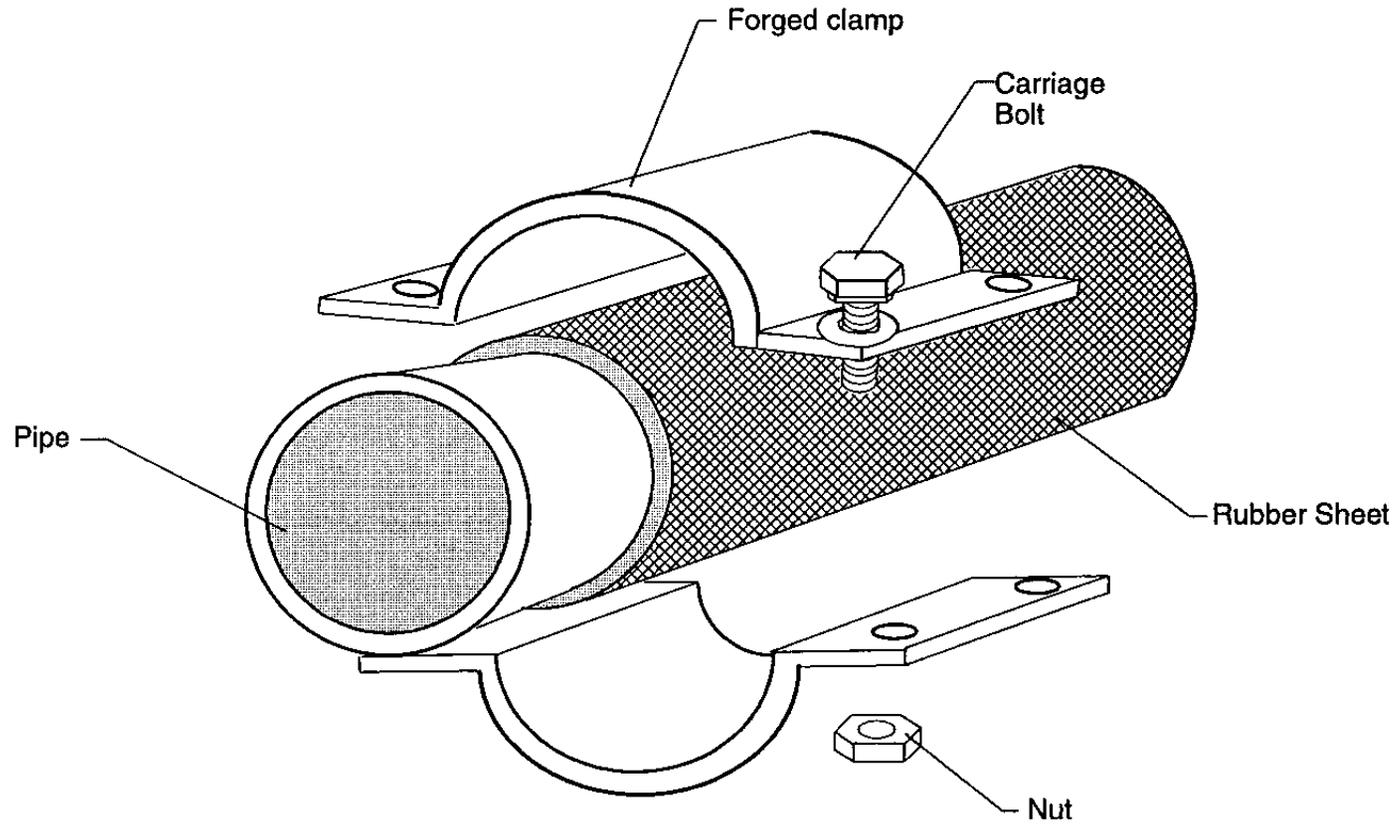


**PIPE PATCHING EVOLUTION - SKETCH #006**  
**Jubilee Pipe Patch**

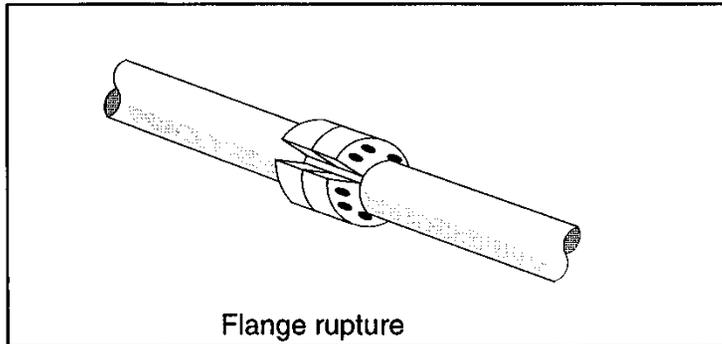


**PIPE PATCHING EVOLUTION - SKETCH #007**  
**Soft Patch on Low-Pressure Pipe Line**

Note: Make clamps to allow for thickness of gasket.



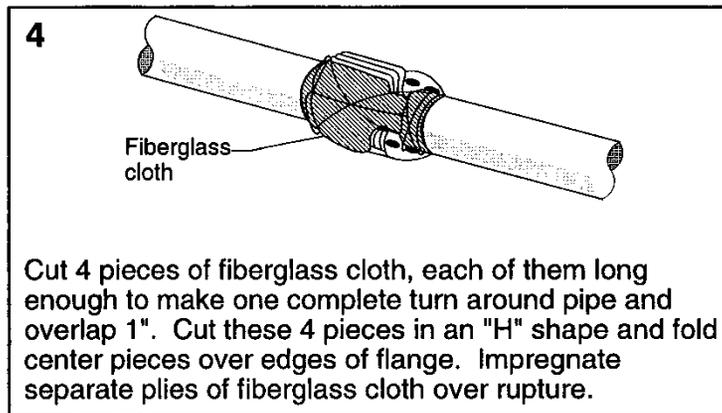
**PIPE PATCHING EVOLUTION - SKETCH #008**  
**Clamp Patch**



Flange rupture

## 2 HARDENER AND RESIN APPLICATION

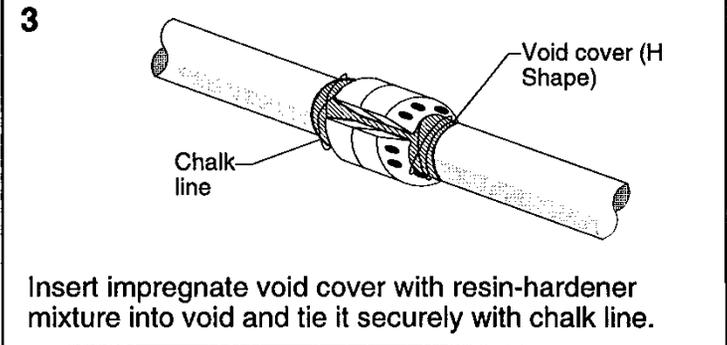
1. Put on eye shields and gloves. Then open liquid resin can and liquid hardener can.
2. Add hardener to resin can and mix for 2 minutes or until it is a uniform gray color.
3. Cut void cover into "H" shape and coat both sides of void cover with resin-hardener mixture.



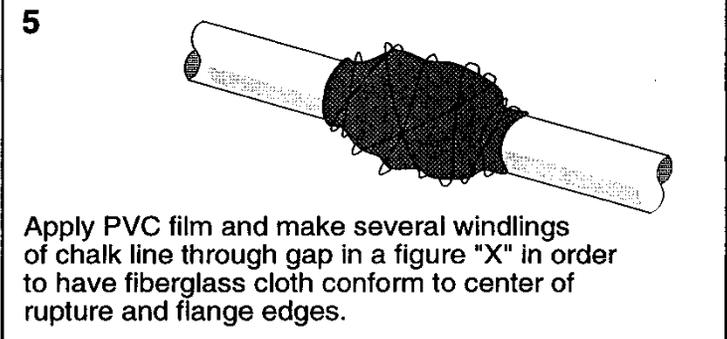
Cut 4 pieces of fiberglass cloth, each of them long enough to make one complete turn around pipe and overlap 1". Cut these 4 pieces in an "H" shape and fold center pieces over edges of flange. Impregnate separate plies of fiberglass cloth over rupture.

## 1 PREPARATION

1. Secure pipe area.
2. Remove lagging and clean damaged section.
3. Make sure pipe surface is clean.
4. Where practical, simplify rupture by bending or removing irregular projections.
5. Determine amount of materials needed. Allow patch to extend at least 4-5" on either side of rupture.



Insert impregnate void cover with resin-hardener mixture into void and tie it securely with chalk line.



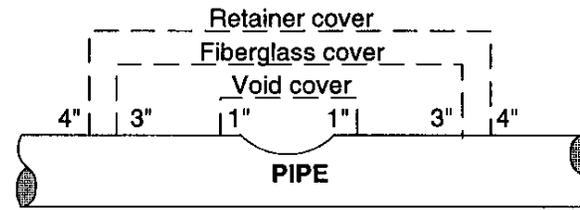
Apply PVC film and make several windings of chalk line through gap in a figure "X" in order to have fiberglass cloth conform to center of rupture and flange edges.

## PIPE PATCHING EVOLUTION - SKETCH #009 Flange Pipe Patch

### 1 PREPARATION

1. Secure pipe area.
2. Remove lagging and clean damaged section.
3. Make sure pipe surface is clean.
4. Where practical, simplify rupture by bending or removing irregular projections.

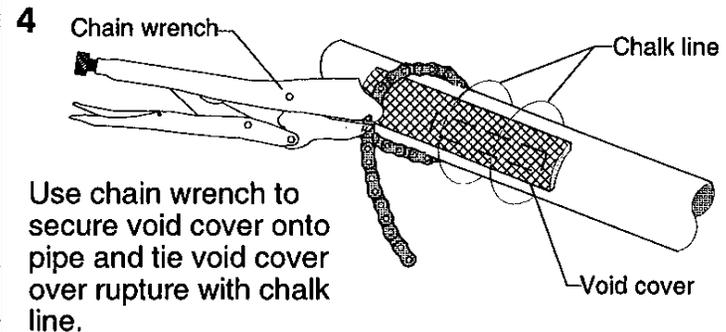
### 2 RELATIVE POSITIONS OF PATCH MATERIALS



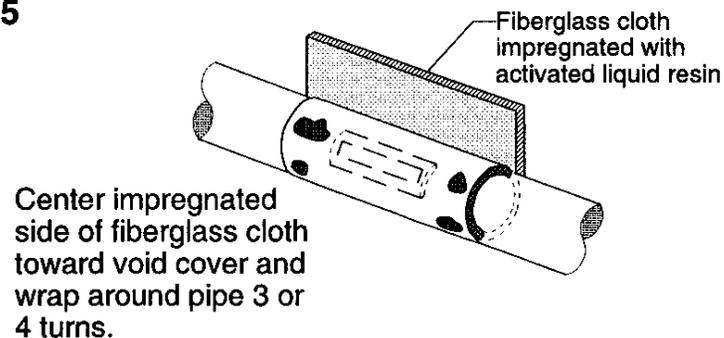
Determine amount of materials needed.

### 3 HARDENER AND RESIN APPLICATION

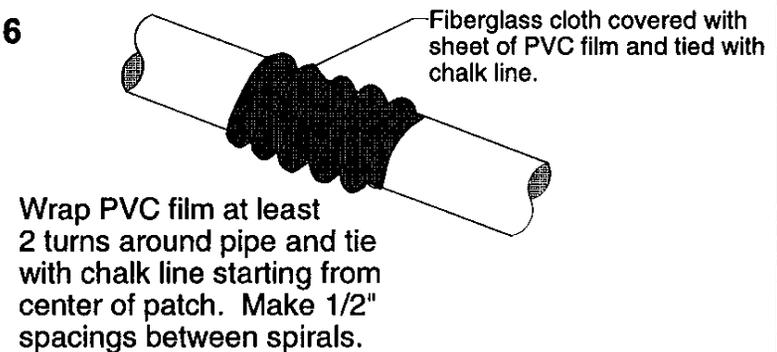
1. Put on eye shields and gloves. Then open liquid resin can and liquid hardener can.
2. Add hardener to resin can and mix for 2 minutes or until it is a uniform gray color.
3. Coat both sides of void cover with resin-hardener mixture.



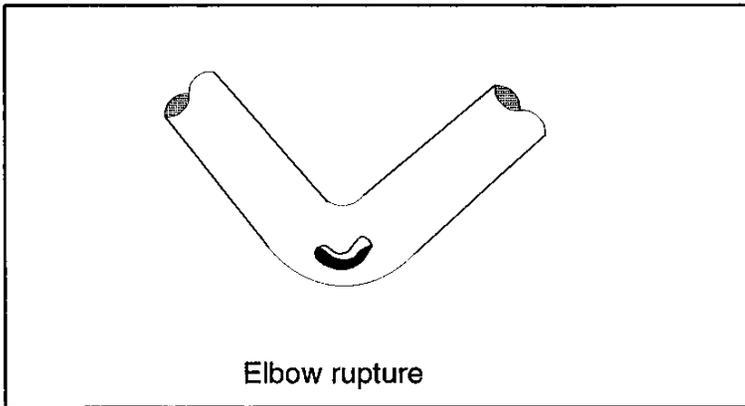
### 5



### 6



PIPE PATCHING EVOLUTION - SKETCH #010  
Simple Pipe Patch



**2 HARDENER AND RESIN APPLICATION**

1. Put on eye shields and gloves. Then open liquid resin can and liquid hardener can.
2. Add hardener to resin can and mix for 2 minutes or until it is a uniform gray color.
3. Coat both sides of void cover with resin-hardener mixture.

**4**

Fiberglass cloth

Wrap impregnated fiberglass cloth around pipe and shape cloth to contour of pipe.

**1 PREPARATION**

1. Secure pipe area.
2. Remove lagging and clean damaged section.
3. Make sure pipe surface is clean.
4. Where practical, simplify rupture by bending or removing irregular projections.
5. Determine amount of materials needed. Allow patch to extend at least 4-5" on either side of rupture.

**3**

Void cover

Slit edges of void cover 2" to 3" at each end to conform to contour of pipe and secure with chalk line.

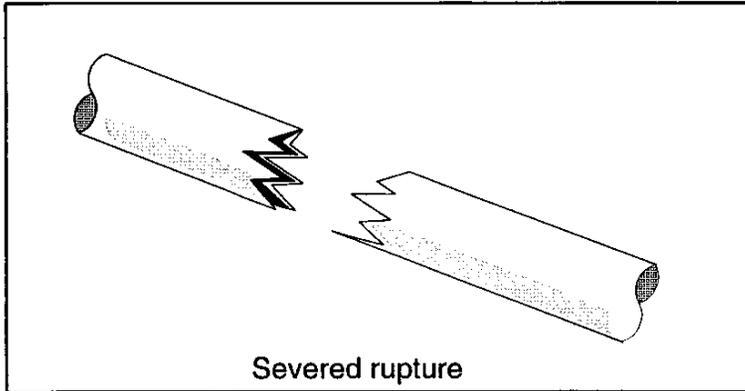
**5**

Chalk line

Fiberglass cloth covered with PVC film

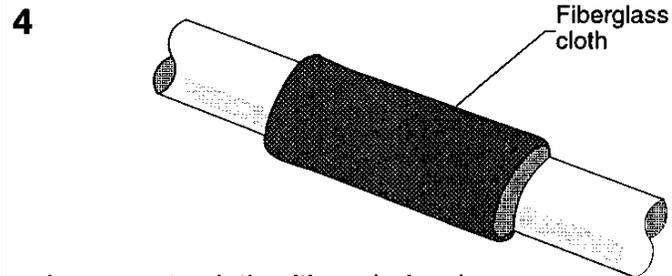
Apply PVC film at least 2 turns around pipe and tie with chalk line starting from center.

**PIPE PATCHING EVOLUTION - SKETCH #011**  
**Elbow Pipe Patch Using Plastic Pipe Patching Kit**



## 2 HARDENER AND RESIN APPLICATION

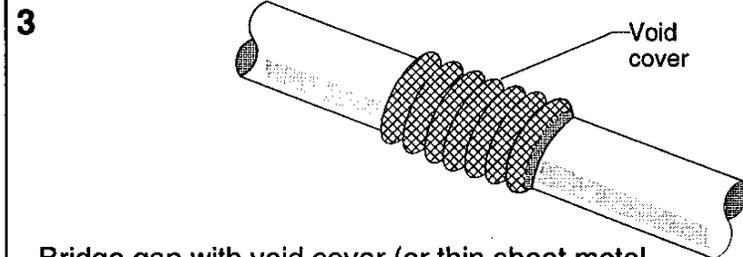
1. Put on eye shields and gloves. Then open liquid resin can and liquid hardener can.
2. Add hardener to resin can and mix for 2 minutes or until it is a uniform gray color.
3. Coat both sides of void cover with resin-hardener mixture.



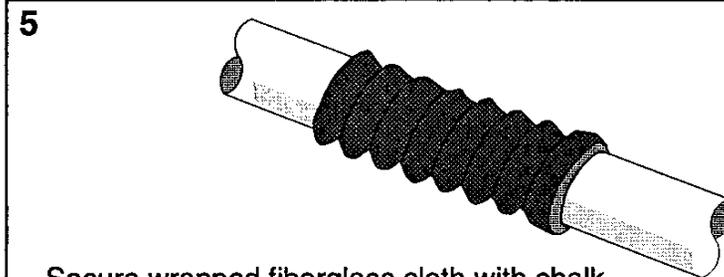
Impregnate cloth with resin-hardener mixture and wrap cloth around bridge material.

## 1 PREPARATION

1. Secure pipe area.
2. Remove lagging and clean damaged section.
3. Make sure pipe surface is clean.
4. Where practical, simplify rupture by bending or removing irregular projections.
5. Determine amount of materials needed. Allow patch to extend at least 4-5" on either side of rupture.

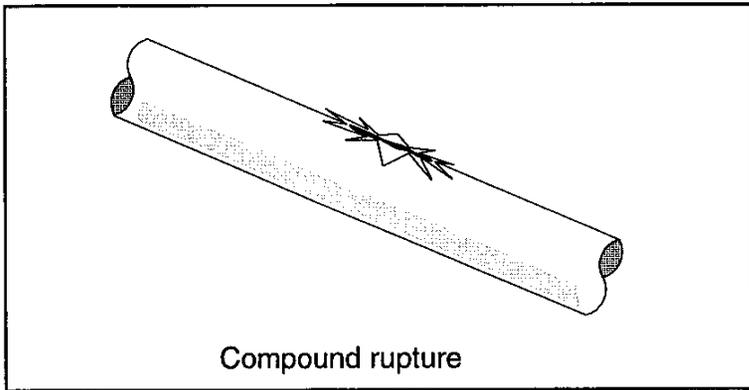


Bridge gap with void cover (or thin sheet metal where gap exceed 4"). Void cover should be long enough to provide one complete turn around pipe with possible overlap of about 2". Secure void



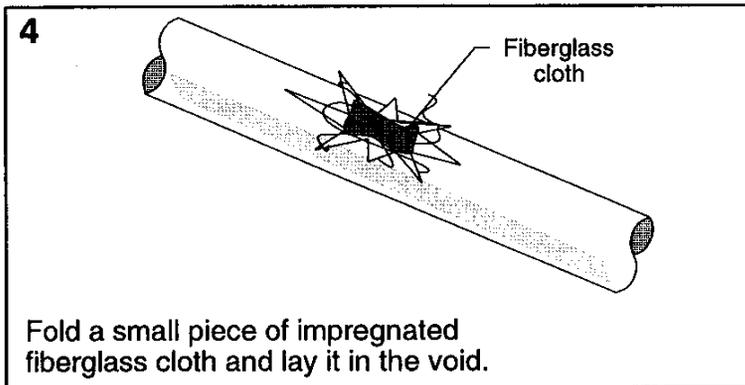
Secure wrapped fiberglass cloth with chalk line starting from center.

### PIPE PATCHING EVOLUTION - SKETCH #012 Severed Pipe Patch



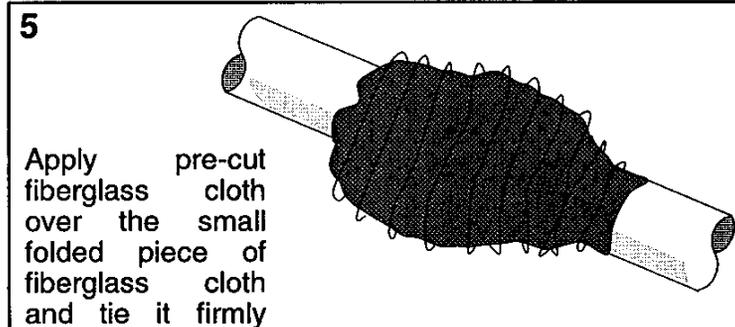
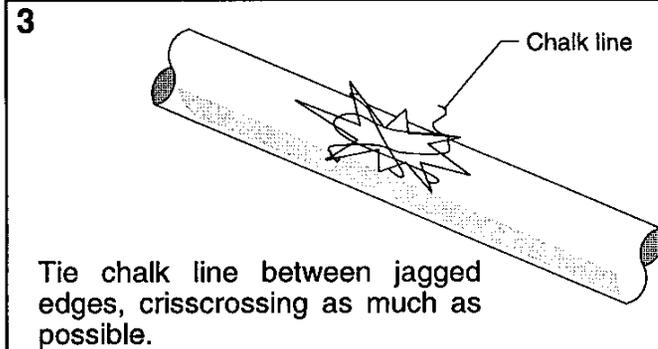
## 2 HARDENER AND RESIN APPLICATION

1. Put on eye shields and gloves. Then open liquid resin can and liquid hardener can.
2. Add hardener to resin can and mix for 2 minutes or until it is a uniform gray color.



## 1 PREPARATION

1. Secure pipe area.
2. Remove lagging and clean damaged section.
3. Make sure pipe surface is clean.
4. Where practical, simplify rupture by bending or removing irregular projections.
5. Determine amount of materials needed. Allow patch to extend at least 4-5" on either side of rupture.



### PIPE PATCHING EVOLUTION - SKETCH #013 Compound Pipe Patch