



# USER MANUAL

THE ONLY  
RAPID REPAIR  
SYSTEM USED BY



US Army Corps  
of Engineers®

# RAPID PILE REPAIR KIT



**Compatible with Current Military Engineering Capabilities**



## DESCRIPTION

PileMedic® is a **high-strength Fiber Reinforced Polymer laminate** constructed with bidirectional glass fabrics providing strength in both longitudinal and transverse directions.

The laminate is wrapped around the column or pile and the overlapping portions are bonded together using QuakeBond 220UR (Underwater Resin). The annular space between the laminate and the host pile is filled with a non-shrink grout.



**Laminate gets Wrapped around Pile**

## USED FOR REPAIR AND STRENGTHENING OF:

- ▼ UNDERWATER PILES
- ▼ BRIDGE PIERS
- ▼ COLUMNS
- ▼ POLES

## APPLICABLE TO ALL MATERIALS:

- ▼ CONCRETE
- ▼ TIMBER
- ▼ STEEL



**Diver Secures Laminate with Zip Ties**

## ADVANTAGES

**One Size Fits All** - A roll of laminate can be cut in the field to fit any shape or size pile.  
**Axial and Flexural Strength** - PileMedic® laminates are reinforcing sheets, like steel plates. They have the equivalent strength of a #4 rebar spaced every 2.5 inches.  
**Confinement Pressure**—No bolted or glued seams that become the weak point under loading.  
**Long Lifespan**—Made of composite materials that will not corrode.  
**Ease of Installation** - Minimal training and equipment needed for rapid installations.  
**Full Restoration of Pile Capacity** - Full capacity is reached within 24 hours.

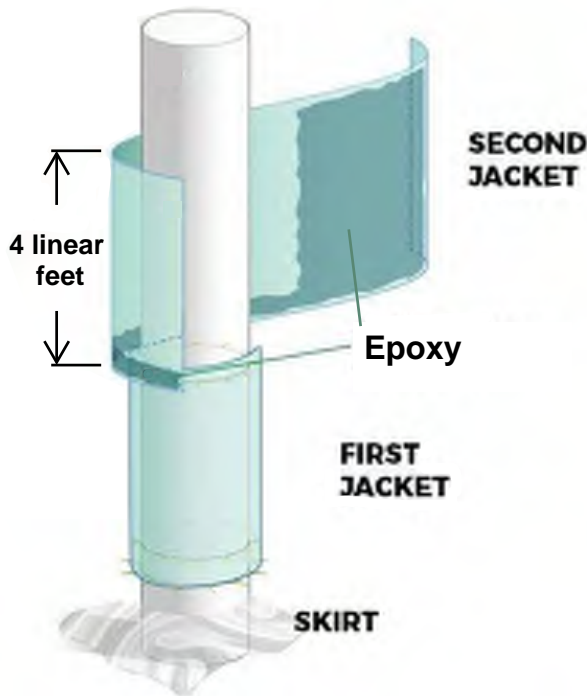
# RAPID PILE REPAIR KIT



Compatible with Current Military Engineering Capabilities

**A five man crew can repair 40 Linear Feet of pile in 8 hours! - Independent Assessor**

- 1) Clean Pile—use water blasting or scraper
- 2) Install Spacers and Skirt on Pile—type and number explained in kit manual
- 3) Measure, Cut & Coat Jacket—jacket gets a thin layer of epoxy
- 4) Wrap and Strap Jacket in Place—zip ties hold jacket while epoxy cures
- 5) Fill Annular Space—set grout plug and fill the inside of jacket.



## 1 Pile Repair Kit -

58" X 42" X 45" and 1700lbs

**One kit repairs 200 linear feet of pile**  
(based off a 25 inch diameter pile, grout not included)

PileMedic® Laminates - 3000sqft  
Epoxy & Static Mixers - 130 cartridges  
Underwater Grout Additive - good for 1yd<sup>3</sup> of grout  
Foam & Skirts

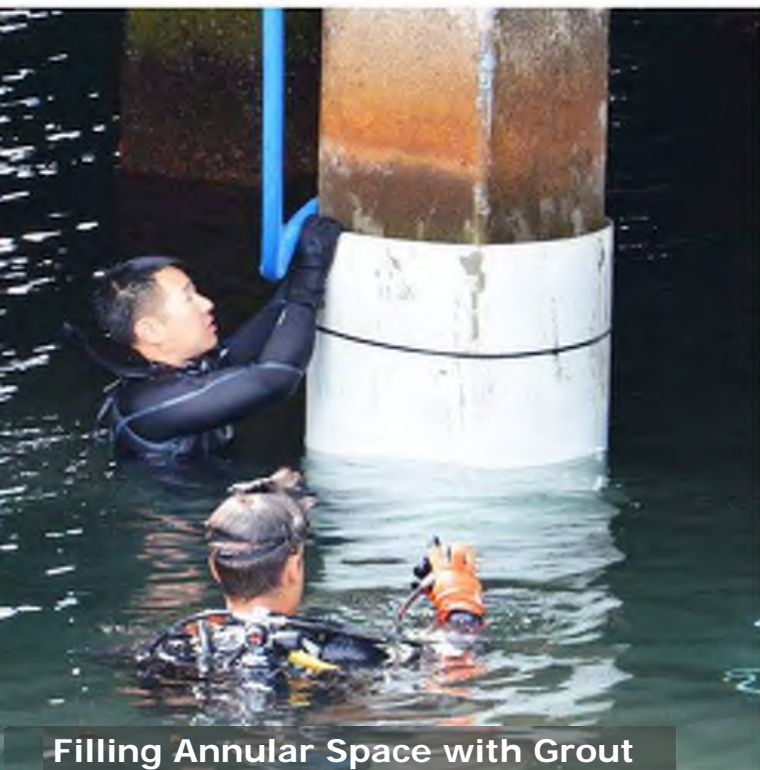
PileMedic Spacers - 1275 pcs  
Zip Ties, Nitrile Gloves & Putty  
Knives

## 2 Tool Kit -

Electric drills  
Heavy Duty Shrink Wrap  
1/2" drill bit kit  
Pneumatic cartridge gun  
Manual Cartridge gun  
Pneumatic drills

Pneumatic Oil  
Magnetic drill bits  
Zip Tie Tensioner  
Measuring tape  
Mixing paddle  
Measuring Cups

Mechanic Gloves  
Measuring Cups  
Nylon rope  
Gloves  
Shears  
String



[Click here for more product information and testing done by the U.S. Army Corps of Engineers](#)

[Click here to see the installation steps video](#)

**Contact PILEMEDIC at (520) 791-7000 or visit us at [www.pilemedic.com](http://www.pilemedic.com)**

# PileMedic® Step-by-Step Manual for Easy Installation

Refer to the **PileMedic® Installer's Reference Guide (Figure 1) & Cheat Sheet (Figure 2)** to calculate the appropriate zip tie assembly, skirt and jacket length for your specific pile types and sizes.

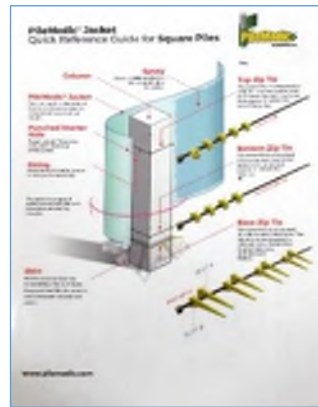


Figure 1

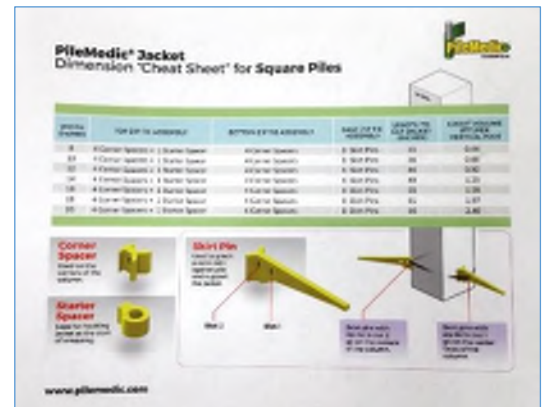


Figure 2

## Your PileMedic® Supply Pack includes the following materials:

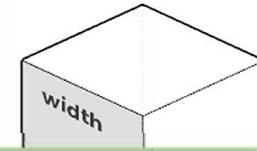
- Underwater Grout additive
- Foam
- Skirt
- Gloves
- QuakeBond® Epoxy Cartridges
- Static Mixers for the Cartridges
- Putty Knives
- Starter Spacers
- Skirt Pins
- All-in-One Spacers
- Zip Ties
- Roll of PileMedic® Jacket
- Epoxy Wipes

## Your PileMedic® Tool Box includes the following:

- A pneumatic cartridge gun
- A manual cartridge gun
- Electric drill
- Pneumatic Drill
- Shears
- Vise Grips
- Mixing Paddle
- Measuring Tape
- String
- Shrink Wrap
- Marker
- Duct Tape
- Magnetic Drill Bits
- Zip tie tensioner
- Screws
- Nylon Rope
- PileMedic Gripper

# PileMedic® Jacket

## Dimension “Cheat Sheet” for Square Piles



WIDTH (inches)	TOP ZIP TIE ASSEMBLY	BOTTOM ZIP TIE ASSEMBLY	BASE ZIP TIE ASSEMBLY	LENGTH TO CUT JACKET (INCHES)	LENGTH TO CUT JACKET SKIRT (INCHES)
8	4 Corner Spacers + 1 Starter Spacer	4 Corner Spacers	8 Skirt Pins	85	40
10	4 Corner Spacers + 1 Starter Spacer	4 Corner Spacers	8 Skirt Pins	103	48
12	4 Corner Spacers + 1 Starter Spacer	4 Corner Spacers	8 Skirt Pins	121	56
14	4 Corner Spacers + 1 Starter Spacer	4 Corner Spacers	8 Skirt Pins	138	64
16	4 Corner Spacers + 1 Starter Spacer	4 Corner Spacers	8 Skirt Pins	156	72
18	4 Corner Spacers + 1 Starter Spacer	4 Corner Spacers	8 Skirt Pins	174	80
20	4 Corner Spacers + 1 Starter Spacer	4 Corner Spacers	8 Skirt Pins	191	88
22	4 Corner Spacers + 1 Starter Spacer	4 Corner Spacers	8 Skirt Pins	209	96
24	4 Corner Spacers + 1 Starter Spacer	4 Corner Spacers	8 Skirt Pins	227	104

### Corner Spacer

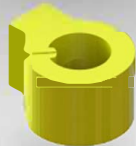
Used on the corners of the column.



\*All-in-One Spacer can be used instead

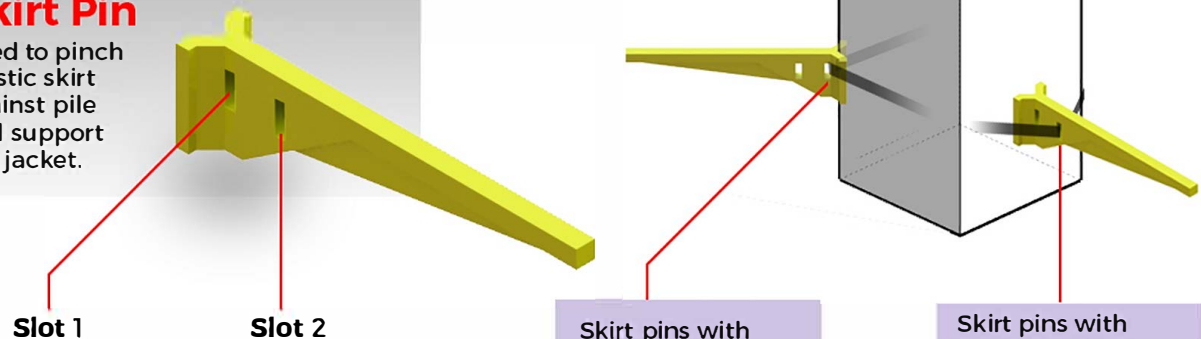
### Starter Spacer

Used for hooking jacket at the start of wrapping.



### Skirt Pin

Used to pinch plastic skirt against pile and support the jacket.



Skirt pins with zip tie in slot 1 go on the corners of the column.

Skirt pins with zip tie in slot 2 go on the center faces of the column.



# PileMedic® Jacket

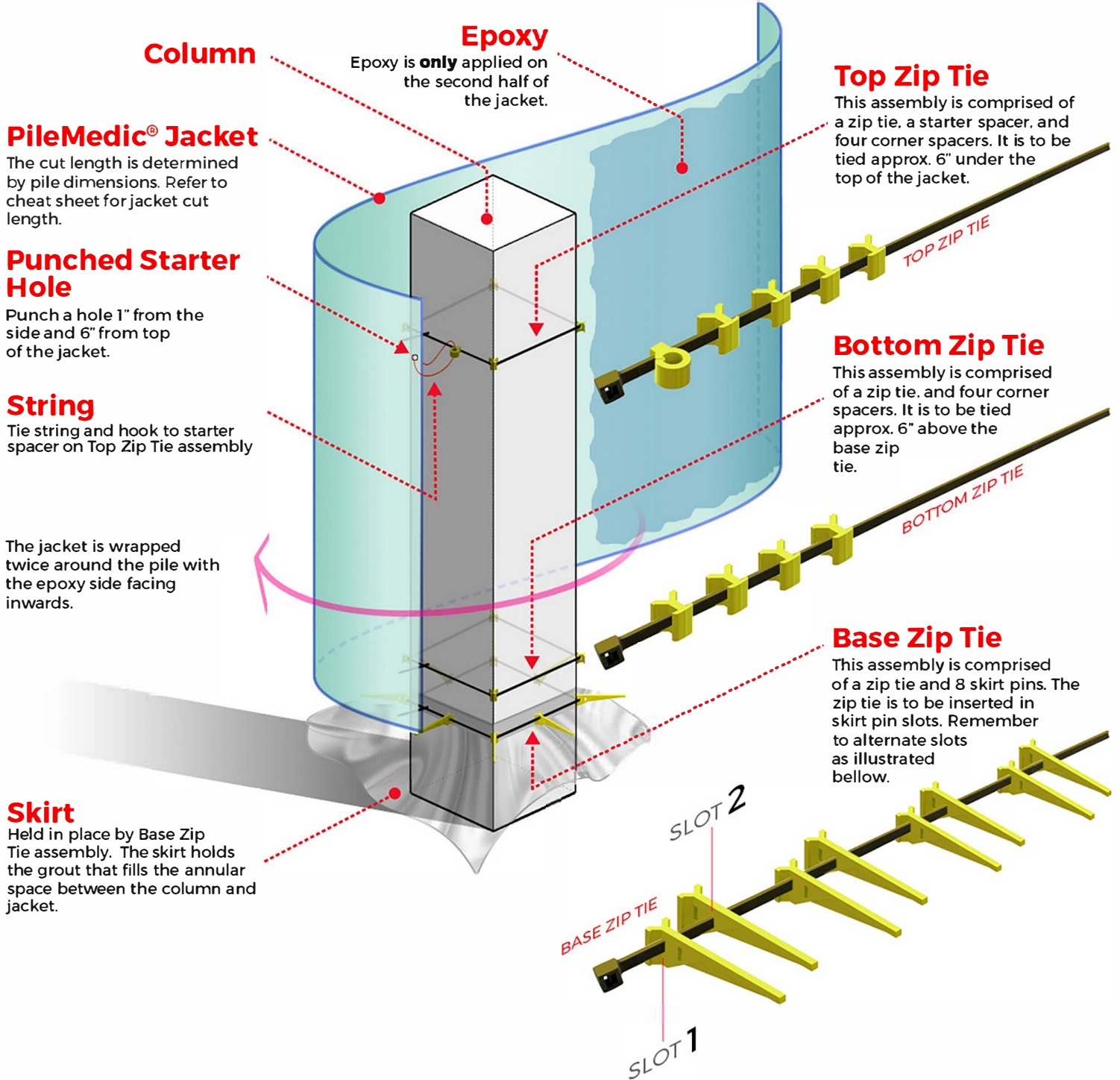
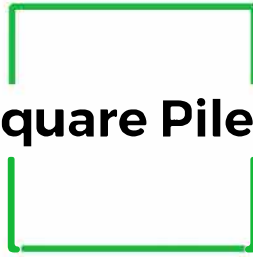
## Grout Volume “Cheat Sheet” for Square Piles



Width (inches)	GROUT VOLUME (ft³) NEEDED FOR ANNULAR SPACE PER VERTICAL FOOT	GROUT VOLUME (ft³) NEEDED FOR PILE LOSS PER VERTICAL FOOT			
		25% LOSS	50% LOSS	75% LOSS	100% LOSS
8	0.38	0.11	0.22	0.33	0.44
10	0.55	0.17	0.35	0.52	0.69
12	0.75	0.25	0.50	0.75	1.00
14	0.98	0.34	0.68	1.02	1.36
16	1.25	0.44	0.89	1.33	1.78
18	1.54	0.56	1.13	1.69	2.25
20	1.87	0.69	1.39	2.08	2.78
22	2.23	0.84	1.68	2.52	3.36
24	2.62	1.00	2.00	3.00	4.00

# PileMedic® Jacket

## Quick Reference Guide for Square Piles



**Column**

**Epoxy**

Epoxy is **only** applied on the second half of the jacket.

**Top Zip Tie**

This assembly is comprised of a zip tie, a starter spacer, and four corner spacers. It is to be tied approx. 6" under the top of the jacket.

**PileMedic® Jacket**

The cut length is determined by pile dimensions. Refer to cheat sheet for jacket cut length.

**Punched Starter Hole**

Punch a hole 1" from the side and 6" from top of the jacket.

**String**

Tie string and hook to starter spacer on Top Zip Tie assembly

**Bottom Zip Tie**

This assembly is comprised of a zip tie, and four corner spacers. It is to be tied approx. 6" above the base zip tie.

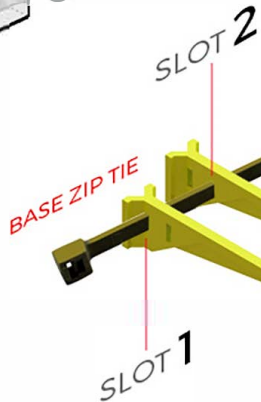
The jacket is wrapped twice around the pile with the epoxy side facing inwards.

**Base Zip Tie**

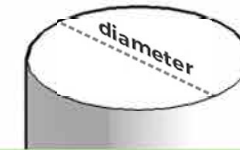
This assembly is comprised of a zip tie and 8 skirt pins. The zip tie is to be inserted in skirt pin slots. Remember to alternate slots as illustrated below.

**Skirt**

Held in place by Base Zip Tie assembly. The skirt holds the grout that fills the annular space between the column and jacket.



# PileMedic® Jacket Dimension “Cheat Sheet” for Circular Piles



Diameter (inches)	TOP ZIP TIE ASSEMBLY	BOTTOM ZIP TIE ASSEMBLY	BASE ZIP TIE ASSEMBLY	LENGTH TO CUT JACKET (INCHES)	LENGTH TO CUT JACKET SKIRT (INCHES)
8	4 Omega's + 1 Starter Spacer	4 Omega Spacers	4 Skirt Pins	77	33
10	5 Omega's + 1 Starter Spacer	5 Omega Spacers	5 Skirt Pins	90	39
12	6 Omega's + 1 Starter Spacer	6 Omega Spacers	6 Skirt Pins	102	46
14	7 Omega's + 1 Starter Spacer	7 Omega Spacers	7 Skirt Pins	115	52
16	8 Omega's + 1 Starter Spacer	8 Omega Spacers	8 Skirt Pins	127	58
18	9 Omega's + 1 Starter Spacer	9 Omega Spacers	9 Skirt Pins	140	65
20	10 Omega's + 1 Starter Spacer	10 Omega Spacers	10 Skirt Pins	152	71
22	11 Omega's + 1 Starter Spacer	11 Omega Spacers	11 Skirt Pins	165	77
24	12 Omega's + 1 Starter Spacer	12 Omega Spacers	12 Skirt Pins	178	83

## Omega Spacer

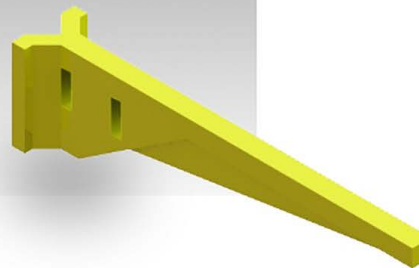
Used on zip tie assemblies for circular piles.



\*All-in-One Spacer can be used instead

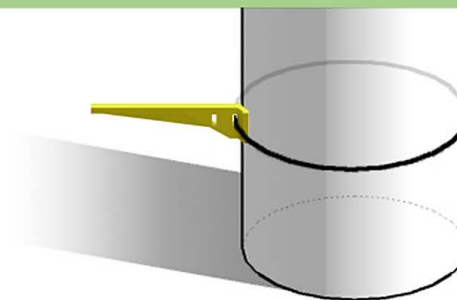
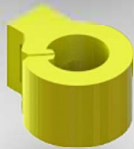
## Skirt Pin

Used to pinch plastic skirt against pile and to support the jacket.



## Starter Spacer

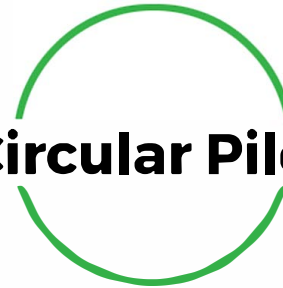
Used for hooking jacket at the start of wrapping.





# PileMedic® Jacket

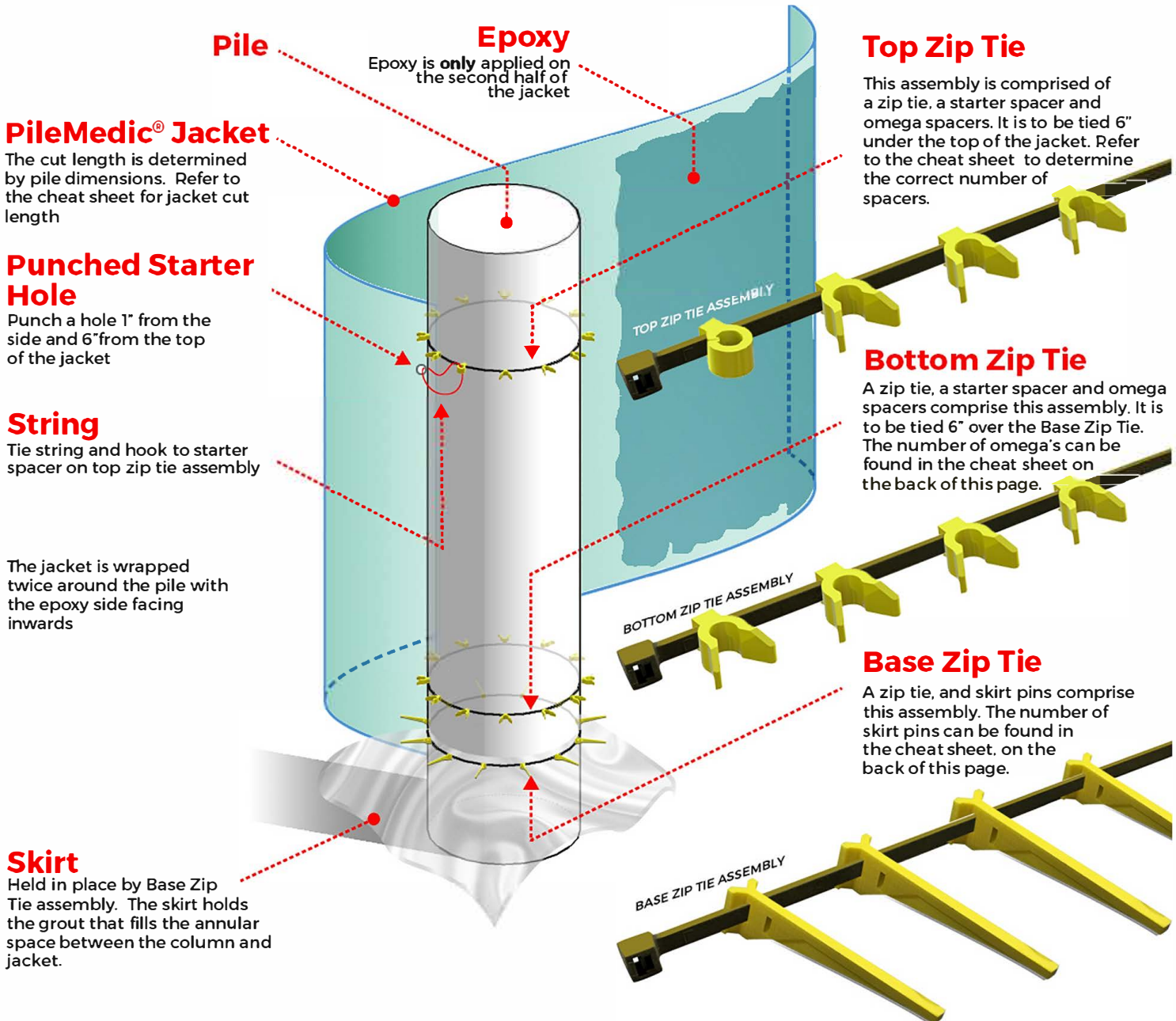
## Grout Volume “Cheat Sheet” for Circular Piles



Diameter (inches)	GROUT VOLUME (ft <sup>3</sup> ) NEEDED FOR ANNULAR SPACE PER VERTICAL FOOT	GROUT VOLUME (ft <sup>3</sup> ) NEEDED FOR PILE LOSS PER VERTICAL FOOT			
		25% LOSS	50% LOSS	75% LOSS	100% LOSS
8	0.31	0.09	0.17	0.26	0.35
10	0.38	0.14	0.27	0.41	0.55
12	0.44	0.20	0.39	0.59	0.79
14	0.51	0.27	0.53	0.80	1.07
16	0.57	0.35	0.70	1.05	1.40
18	0.64	0.44	0.88	1.32	1.77
20	0.70	0.55	1.09	1.64	2.18
22	0.77	0.66	1.32	1.98	2.64
24	0.83	0.79	1.57	2.36	3.14

# PileMedic® Jacket

## Quick Reference Guide for Circular Piles



**Pile**

**Epoxy**

Epoxy is **only** applied on the second half of the jacket

**PileMedic® Jacket**

The cut length is determined by pile dimensions. Refer to the cheat sheet for jacket cut length

**Punched Starter Hole**

Punch a hole 1" from the side and 6" from the top of the jacket

**String**

Tie string and hook to starter spacer on top zip tie assembly

The jacket is wrapped twice around the pile with the epoxy side facing inwards

**Skirt**

Held in place by Base Zip Tie assembly. The skirt holds the grout that fills the annular space between the column and jacket.

**Top Zip Tie**

This assembly is comprised of a zip tie, a starter spacer and omega spacers. It is to be tied 6" under the top of the jacket. Refer to the cheat sheet to determine the correct number of spacers.

**Bottom Zip Tie**

A zip tie, a starter spacer and omega spacers comprise this assembly. It is to be tied 6" over the Base Zip Tie. The number of omega's can be found in the cheat sheet on the back of this page.

**Base Zip Tie**

A zip tie, and skirt pins comprise this assembly. The number of skirt pins can be found in the cheat sheet, on the back of this page.

# Labor Resource Loading

Delegated responsibilities for a five-man crew are broken out below. Every job is different so use the breakdown below as a guide.

Dive Team	Responsibilities
Underwater Diver	Puts zip ties and skirt on pile Receives epoxied jacket Screws 4" overlap for multiple jacket heights Rotates Jacket around Pile Secures Bottom Seal or Skirt
Surface Diver	Feeds zip ties to Underwater Diver Assembles zip tie for rope assembly Holds Jackets at appropriate elevation Rotates jacket around pile and clamps jacket plies together
Jacket Team	Responsibilities
Jacket Man	Measure, Cut and Coat Jacket Delivers jacket to divers
Runner	Gets Zip ties ready Helps with grout bags Helps deliver jacket to divers in water Assists Grout team with water needs Helps with grout hose
Grout Team	Responsibilities
Mixer Man	Mixes Grout & Operates Pump



# Installing Base, Top, and Bottom Zip Tie Assemblies

The appropriate type and number of spacers can be found in your PileMedic® Installers Cheat Sheet.

Please ensure you are wearing appropriate safety gear during this installation.

- 1) Measure, Cut and Wrap skirt around the pile followed by the base zip tie assembly (Figure 3). The base zip tie assembly serves to pinch the skirt as tightly against the pile as possible. Shift the skirt pins around the pile to their appropriate positions, and let skirt hang down around the base spacers (Figure 4). For square columns, make sure the Skirt pins with Slot 2 go on the center of the column, and Skirt pins with Slot 1 go on the corners of the column (Figure 5).



Figure 3

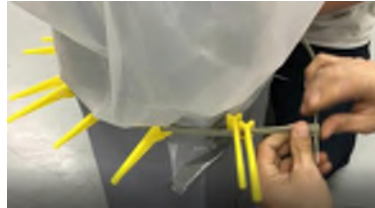


Figure 4

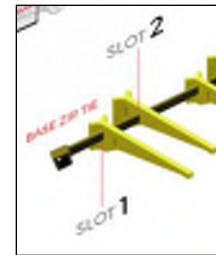


Figure 5

- 2) The top zip tie assembly begins with a starter spacer (Figure 6). This starter spacer is the anchor point for the jacket as you wrap the jacket around the pile. (Refer to Installer's Cheat Sheet for the number and type of spacers required).

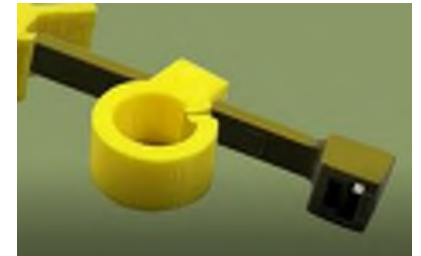


Figure 6

- 3) Assemble the bottom zip tie assembly (Figures 7 and 8). (Refer to Installer's Cheat Sheet for the number and type of spacers required).



Figure 7. Bottom zip tie assembly for round piles.

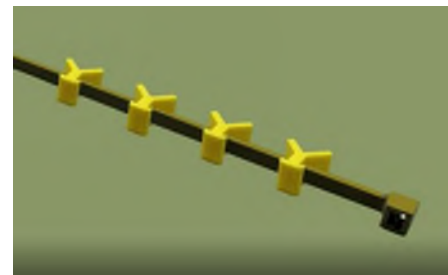


Figure 8. Bottom zip tie assembly for square columns.

# Installation of the PileMedic® Jacket



Figure 9

1) Measure, Mark and Cut the Jacket (*Figure 9*) Please refer to the PileMedic® Installers Cheat Sheet to determine the length of jacket and what materials will be needed for your specific pile size.

*\*If your pile size is not located on the cheat sheet, use the following calculation to determine the jacket length:*

*Circular Piles: [Pile Diameter(in)+3]\*(3.14\*2)+8 = jacket length (in)*

*Square Piles: [Pile Width(in)\*1.41+1]\*(3.14\*2)+8 = jacket length (in)*



Figure 10

2) Punch a small hole in the top corner of the jacket, and tie a loop through the hole (*Figure 10*). This loop will be used to anchor the top corner of the jacket to the pile.

3) Unscrew the cap of the **QuakeBond®** cartridge and screw the static mixer nozzle onto the cartridge. Load the cartridge into the manual or pneumatic dispenser. Dispense mixed epoxy on only **HALF** the jacket, and be sure it is on the jacket half that is **opposite** of the hole that was punched earlier. Spread mixed epoxy with a putty knife (*Figure 11*). The coat of epoxy should be about as thick as a credit card (or approximately 30 mils).



Figure 11

Attach the PileMedic Gripper to the end of the jacket allowing the installer to get a tight grip on the jacket while it is wrapped around the pile (*Figure 12*).



Figure 12

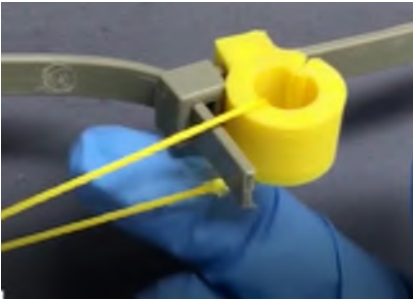


Figure 13

**4)** Secure the string into the starter spacer, then wrap the jacket around the pile allowing the epoxy to stick to the inside layer of the jacket (*Figure 13*).



Figure 14

**5)** Wrap a few zip ties around the jacket to hold it in place during cure. Shove pieces of foam between the jacket and pile to fill the bottom of the annular space (*Figure 14*).



Figure 15

**6)** Lift the skirt up along the jacket and tightly secure with a zip tie (*Figure 15*).

# Installing Multiple Jacket Heights

- 1) Cut nylon rope to twice the length of the pile repair height. Attach one end of the nylon rope to the top of the pile via a screw (timber pile) or zip tie (concrete pile). Attach a vise grip to the other end of the rope and let it hang down along the pile.
- 2) Wrap the first jacket around the pile and rope. Retrieve the rope and use it to hold the first jacket from sliding down the pile until the second jacket gets attached with a screw to the first jacket (*Figure 16*).
- 3) Apply additional epoxy along the length of the jacket that will be overlapped to the first jacket.
- 4) Screw the bottom corner of the second jacket to the first jacket and wrap the jacket around the pile. Make sure the jackets overlap around 4" vertically.
- 5) Wrap a zip tie around the overlapped seam between the two jackets.
- 6) Lower the rope and jackets and attach additional jackets as needed.
- 7) Remove rope from pile before filling with grout.

- ***It is highly recommended to install multiple height jackets and pour a small grout plug on the first day. Then on the following day fill the remaining portion of the jackets with grout. This will allow the grout and epoxy to cure and prevent leakage during pour.***

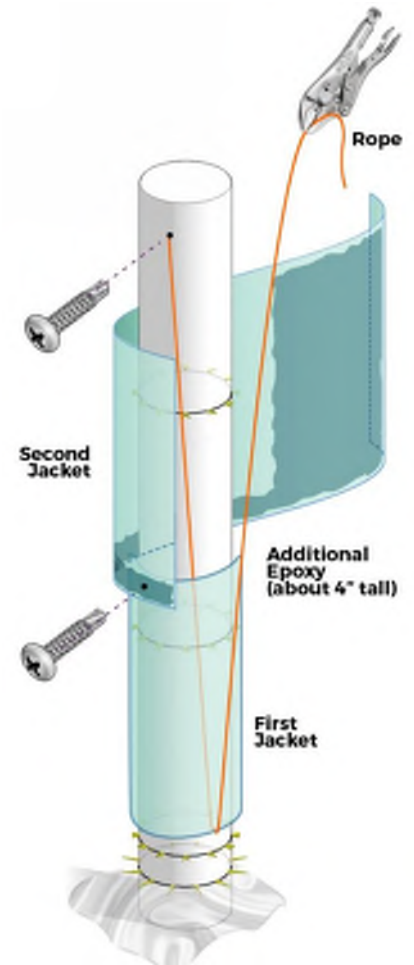


Figure 16

# Installing the Grout

Mix a Non-Shrink grout and pour it into the space between the pile and the PileMedic® jacket. Be sure to mix the grout according to manufacturer's recommendations. For applications below water level, you will need to use the **tremie grout placement method**.

For tremie grouting, place the end of the grout hose on the inside of the jacket, making sure it runs all the way to the bottom. Pump the grout until the inside level of grout is approximately six inches above the hose nozzle (*Figure 17*). Continue pumping while lifting the nozzle of the hose at the same rate, until the entire annular space between the pile and the jacket is filled. The water inside the jacket will turn grey during this process, so make sure you feel for sand when the grout level reaches the top of the annular space to make sure it is completely filled with grout.



Figure 17

# Installation Troubleshooting

## Grout is leaking from seams of jacket

Wrap shrink wrap tightly around the seam between the two jackets.

## Grout is leaking from the base of the pile when being poured

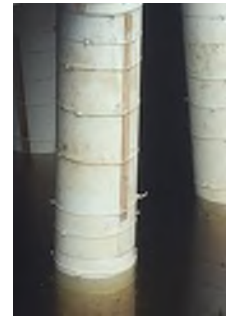
The foam and skirt were not installed correctly. If it is a slow leak, wait for grout to set up and form a plug (grout shoe) before continuing to fill the rest of the annular space of the pile. If the leak is fast, insert additional foam into the bottom of the pile, and add a small amount of grout inside the pile till the grout sets up forming a plug.

## Top jacket is sliding down over bottom jacket

The top jacket wasn't wrapped as tightly as the bottom jacket. Drill a few screws into the jackets where they should overlap and this will prevent them from sliding over each other.

## Seam of jacket lifted slightly after installation

Lightly sand area underneath the lifted seam and apply a bead of epoxy underneath the seam. Place a paint stick or thin board on the seam and tighten with zip ties (*Figure 18*). This will tightly push the seam against the jacket until the epoxy cures.



*Figure 18*

# Unique Installation Situations

## Pile has total section loss over a large height

Attach spacer assemblies to the solid sections of the pile above and below the section loss. Wrap the pile at the top location and tighten with zip ties. Slide the jacket down the pile about four feet. Wrap the next section of jacket around the top of the pile, and screw the two jackets together where they overlap and continue to slide the jackets down the pile. Repeat until the jackets reach the bottom zip tie assembly. A diver will be needed to slide the jackets over the bottom zip tie assembly and position correctly.

## Cross bracing is attached to pile

Remove cross bracing and reattach to pile after installation has been completed.

## Pile is butted up against another pile or wall

Slide jacket through the tight space, and continue to pull jacket through the space while tucking it around and into the tight space again. Twist wrapped jacket around pile until fully wrapped (*Figure 19*).



*Figure 19*

