

GLAS MESH PRODUCTS:

SPECIFICATIONS, PROPERTIES AND USES

"We wrote the book about FRP corrosion control, insulating and anti-wear products for gas utilities and other industries."

610-696-9220
Fax 610-344-7519

P.O. Box 1718
West Chester, PA 19380

www.glasmesh.com



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FRP PRODUCTS SPEC./TECH. BULLETIN

a single source for standardized corrosion control and anti-wear products for metal and plastic piping

GLAS MESH FRP ROLL-ON SHIELDS • FRP INSULATION SPACERS • FRP CASING INSULATORS
• FRP PIPE SADDLES • FRP FLATTIES

BACKGROUND

Having been a fiberglass reinforced plastic (FRP) manufacturer and fabricator since 1965, Glas Mesh Company set as objectives (1) the development and marketing of several new and standardized FRP products for use by industry corrosion control engineers and technicians, and (2) insulating products suitable for the prevention of electrical contact shorts on buried and exposed pipelines or mains. Until recently, companies simply used whatever they happened to have on the job site. After a comprehensive development program, Glas Mesh Company designed and began fabricating a line of corrosion and abrasion control products specifically shaped for piping and particularly useful to the gas, oil and chemical industries. These new FRP products are standardized, work effectively and are economical to use. They are also immediately available from stock.

The first of Glas Mesh Company's line of FRP products was the highly successful Roll-On Shield which stops corrosive and electrolytic wear of ferrous metal suspended or overhead pipe mains effectively and economically. FRP Roll-On Shields also eliminate or materially reduce hot or cold energy loss on thermally insulated pipe mains and serve to control abrasion and wear on plastic piping systems. Roll-On Shields are pre-shaped 240° peripherally.

Today Glas Mesh Company provides a complete line of FRP corrosion and abrasion control products: FRP Insulation Spacers, FRP Roll-On Shields, FRP Pipe Saddles, FRP Casing Insulators, and FRP Flatties. All are pre-formed and fabricated for specific functional uses.

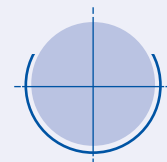
WHY FRP?

When considering the advantages of modern plastics (light weight, ease of handling and installation, high dielectric strength, no corrosion problems), and their disadvantages (cold flow, cold temperature embrittlement, heat distortion, low abrasion resistance, relatively low compressive strength), it becomes obvious that fiberglass reinforced plastic (FRP) provides all the physical advantages and properties while eliminating or materially reducing the disadvantages of the non-reinforced plastics.

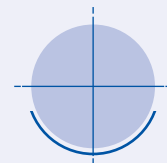
FRP's properties of light weight, ease of handling and installing, high dielectric strength, corrosion resistance with great compressive strength combine to make it the state-of-the-art material for Glas Mesh FRP abrasion control and electrical insulation products. Glas Mesh FRP products will not cold flow under pressure nor become brittle in cold temperatures, will not soften nor distort from heat, and they have excellent abrasion resistant properties.

Glas Mesh products are fabricated from a precision manufactured, filament-wound, ultraviolet protected, FRP epoxy with integral epoxy liner and exterior coating. FRP products' inside diameters approximate the outside diameters of the carrier pipes, thus assuring close fit and requiring minimum clearance during installation. Glas Mesh products meet all known industry-recommended specifications and properties.

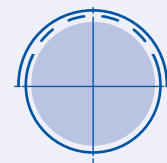
See inside for detailed descriptions and specifications for FRP corrosion control and anti-wear products.



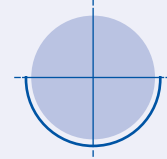
FRP ROLL-ON
SHIELDS
240 PC*



FRP INSULATION
SPACERS
120 PC*



FRP CASING
INSULATORS
220 & 240 pc*



FRP PIPE
SADDLES
180 pc*

FRP FLATTIES
1 ft sq
4 thicknesses



1/16"



1/8"



1/4"

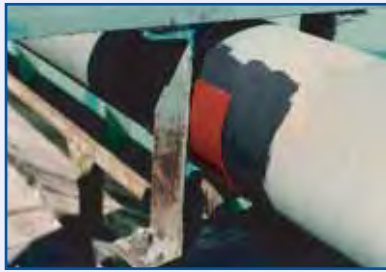


1/2"

*peripheral circumference

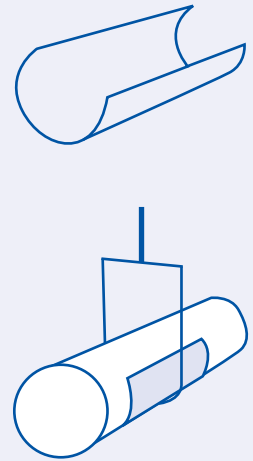
FRP PIPE SADDLES — type no. 180

Non-corrosive, non-conductive 180° pipe saddles fabricated from high quality FRP. Applications: Substitute for, or use in place of, metal saddles where electrical insulation is desirable, and is ideal for pipes exposed to corrosive environments. Protects pipe insulation and plastic pipe systems from abrasive wear at overhead hangers and supports. May be banded, cemented or taped in place. Special lengths can be made available.



Saddle Nos.	For Pipe Diams. (Nominal)	Saddle Length
1	1"	6"
1½	1½"	6"
2	2"	6"
3	3"	6"
4	4"	6"
6	6"	9"
8	8"	12"
10	10"	12"
12	12"	12"
14	14"	12"
16	16"	12"

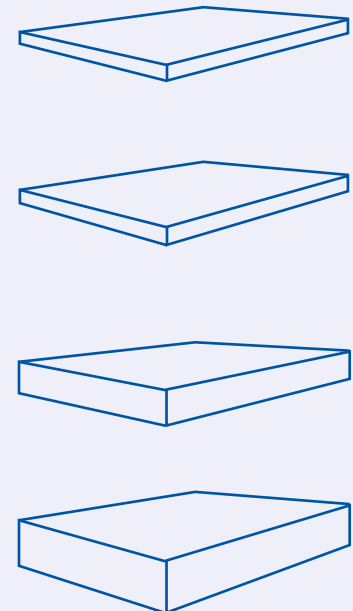
18" - 36" ALSO AVAILABLE



FRP FLATTIES — type nos. 12-12 1/16", 1/8", 1/4", 1/2"

FRP FLATTIES are made of a select combination of random glass mat reinforcements saturated with polyester resins combined with suitable fillers. These composites are cured and compressed under moderate pressure to form smooth, dense laminates. Flatties have numerous applications in the natural gas distribution and transmissions and liquid pipeline industries. They are available in 12" x 12" squares or economical larger sized sheets. We will be glad to quote prices on specific thicknesses or non-standard sizes, thicknesses or widths.

Dimensions may vary slightly because some material is lost during fabrication.



NOTE: All Glas Mesh FRP pipe products can be custom fabricated and sized to fit your own requirements and specifications. Please call or write our FRP design staff.

(not to scale)

GLAS MESH FRP PRODUCTS: SPECIFICATIONS, PROPERTIES AND USES

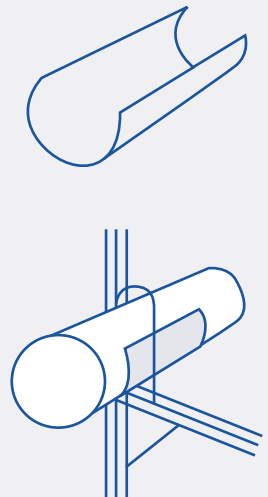
FRP ROLL-ON SHIELDS — type no. 240

A non-conductive, pre-shaped 240° peripheral snap-on pipe saddle. Applications: Used by utilities for electrical isolation and abrasion control of mains and by industry for load distribution, energy conservation, and insulation protection at hangers and supports of overhead and pylon-supported pipe mains. Also, employed for abrasion control on plastic pipe systems and wrapped cables. FRP Roll-On Shields will never corrode or deteriorate, physically or chemically, and are easily installed. Snaps on carrier pipe and slides into place without tools, banding or welding. Special lengths can be made available.

Shield Nos.	Fit Pipe Diams. (Nominal)	Shield Length
2	2"	6"
3	3"	6"
4	4"	6"
6	6"	9"
8	8"	12"
10	10"	12"
12	12"	12"
16	16"	12"

18" - 36" ALSO AVAILABLE

Unique 240° design used with clevis or roller hangers ensures electrical insulation, eliminates abrasion and wear of pipe coating or jacketing due to vibration and movement of carrier pipe on support hanger. Roll-On Shield maintains the integrity of existing cathodic protection systems.

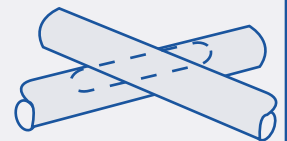


FRP INSULATION SPACER — type no. 120

An extremely strong, non-conductive fiberglass reinforced plastic insulation spacer. Applications: Used by utilities to prevent and/or correct electrical shorts caused when buried steel mains contact each other or are in close proximity. Peripheral circumference of 120° minimizes shielding effect on cathodic protection systems.



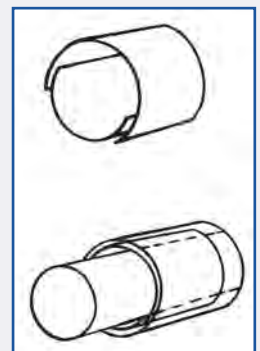
Spacer Nos.	For Pipe Diams. (Nominal)	Wall Thickness	Spacer Length
2	2"	.08"	12"
3	3"	.09"	12"
4	4"	.09"	12"
6	6"	.12"	12"
8	8"	.15"	12"
10	10"	.17"	12"
12	12"	.19"	12"
16	16"	.25"	12"
18	18"	.25"	12"
20	20"	.25"	12"
24	24"	.25"	12"
30	30"	.25"	12"
36	36"	.25"	12"



FRP CASTING INSULATOR — type nos. 220-240

Application: Provides an extremely tough, inexpensive casing insulator that electrically isolates a gas carrier main from a steel casing, and provides excellent abrasion control. The two pieces snap together surrounding the carrier pipe and separating it from the casing. No tools, banding or welding are required. Ideal for retrofits where original or existing spacer or insulator has been damaged, deteriorated or failed. Special lengths can be made available.

Insul. Sizes	For Pipe Diams. (Nominal)	Insulator Length (Standard)
2	2"	6"
3	3"	6"
4	4"	6"
6	6"	6"
8	8"	6"
10	10"	6"
12	12"	6"
16	16"	6"





CALL OR WRITE TODAY FOR PRICE, DELIVERY AND TECHNICAL
INFORMATION. PROMPT AND COURTEOUS RESPONSE GUARANTEED.

*"We wrote the book about FRP
corrosion control, insulating and anti-wear products
for gas utilities and other industries."*



GLAS MESH COMPANY®
P.O. Box 1718
West Chester, PA 19380
610-696-9220 • Fax 610-344-7519
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FRP Roll-On Shields™

FRP Roll-On Shields stop electrolytic wear of suspended or overhead pipe mains effectively and economically. Roll-On Shields also provide coated mains with abrasion protection and desirable weight distribution at each roller hanger or support.

General Description:

Roll-On Shields are a fiberglass reinforced plastic, $\frac{2}{3}$ circular, pre-shaped method of electrical isolation for suspended pipe mains. They also are a means of abrasion control on coated pipes and are generally adaptable to any hanger or support.

Are These Your Problems?

Pipe mains, particularly those suspended at bridge crossings, have had consistent problems with vibration and movement causing the hangers to chafe or abrade through the main pipe coating. Resultant wear electrically grounds pipe to the supporting structure causing electrolytic corrosion and wearing action.

The inevitable point loading that takes place against the supports also creates a "cold flow" problem for the pipe coatings.

The Solution...

The application and use of FRP Roll-On Shields at each pipeline hanger and support. They are an inexpensive, quick and easy method for dealing with and preventing these problems.



The placement of FRP Roll-On Shields between a coated main and its hanger or support provides electrical isolation as well as desirable weight distribution and a high degree of abrasion resistance. Without this protection, the cold flow of the coating combined with the thermal expansion and contraction of the pipe would result in holidays at each support assembly.

Please see other side for more important information about the FRP Roll-On Shields.

Marketed by:
Glas Mesh Company
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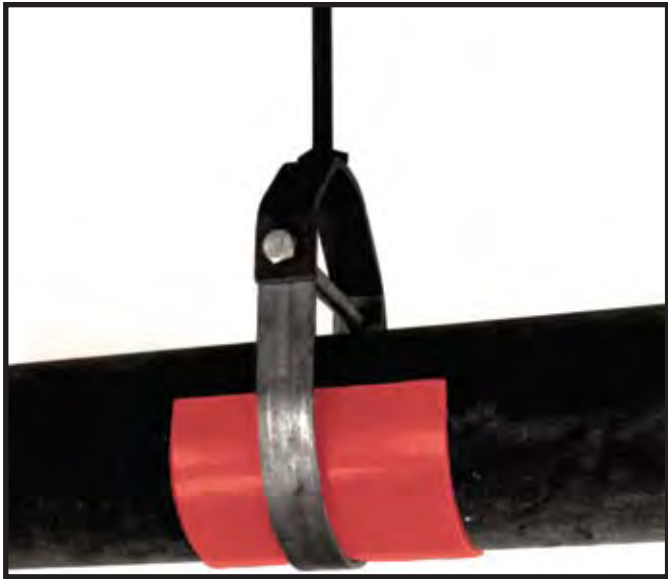
Advantages and Benefits of FRP Roll-On Shields:

- Easy to Install - Simply snap on and slide into place.
- The shields can be installed as an electrical insulator between buried steel pipes that are run parallel or may touch each other.
- No tools, banding, welding or adhesives are required.
- Hanger disassembly not required on existing pipelines.
- 240° peripheral grip holds FRP Roll-On Shield in place even when clear of supporting structures.
- Roll-On Shields are durable, flexible and light weight for ease of handling, installation or storage. Their flexibility automatically compensates for most pipeline diameter variations including coating and coverings.
- Easily installed on existing pipelines; ideally suited for new construction.
- Significantly less expensive than insulated rollers.

Roll-On Shields

Application Instructions:

1. With two hands, simply snap the shield onto the pipe at desired location and slide into place.
2. Be sure shield is centered on the hanger to allow for any pipeline movement.
3. Observe all necessary safety precautions when working at high elevations.
4. Epi-SEAL® Epoxy Seam Sealer is sometimes used to seal the corresponding surfaces of Roll-On Shields and uncoated mains.



FRP Roll-On Shield's unique 240° peripheral design is shown on insulated pipe with clevis hanger.

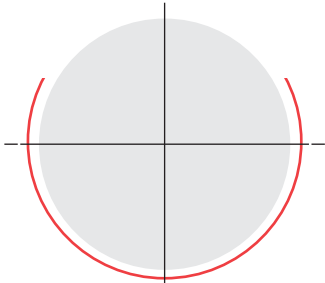
Roll-On Shield Sizes*

Shield Nos.	Fit Pipe Diams. (Nominal)	Shield Length
2	2"	6"
4	4"	6"
6	6"	9"
8	8"	12"
10	10"	12"
12	12"	12"
16	16"	12"
18	18"	12"
20	20"	12"
24	24"	12"
30	30"	12"
36	36"	12"
*42	*42"	12"
*48	*48"	12"

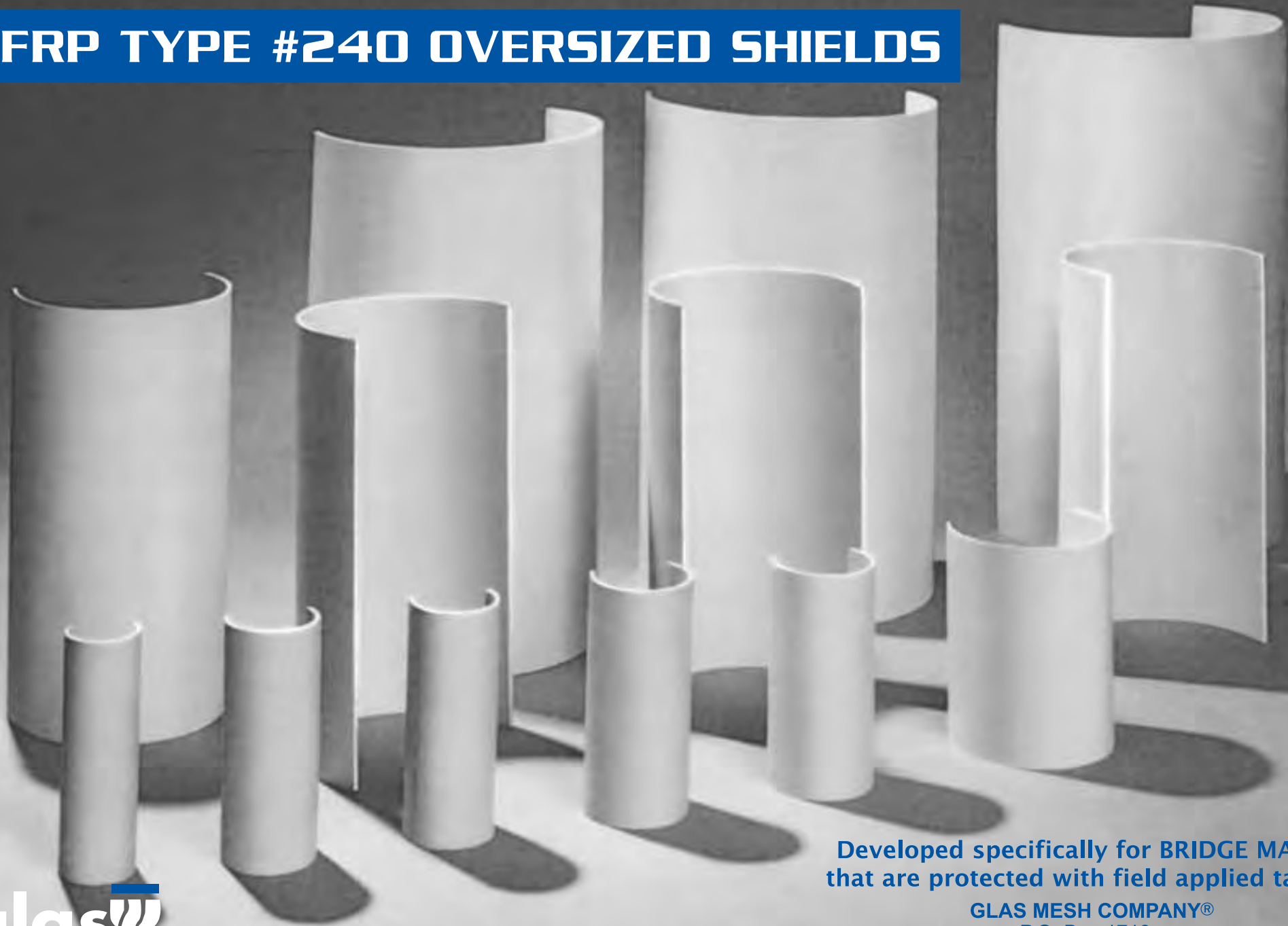
* Special Order

Custom lengths and thicknesses available on a quote basis.

NOTE: Please see separate insert sheet for current FRP Roll-On Shield specifications, physical properties and dimensional data.



FRP TYPE #240 OVERSIZED SHIELDS



Developed specifically for BRIDGE MAINS
that are protected with field applied tapes.

GLAS MESH COMPANY®

P.O. Box 1718

West Chester, PA 19380

610-696-9220 • Fax 610-344-7519

www.glasmesh.com

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mesh
co.**

SPECIFICATIONS:

FRP TYPE #240 (OS) SHIELD & FRP TYPE #180 (OS) SADDLE

SIZE	SPECIAL ID/INCHES	WALL THICKNESS/INCHES	SHIELD/SADDLE LENGTHS/INCHES	COLOR
2	2.6	.125	6	Gray
3	3.7	.125	6	Gray
4	4.7	.125	6	Gray
6	6.8	.125	9	Gray
8	8.8	.125	12	Gray
10	11	.125	12	Gray
12	13	.25	12	Gray

LENGTHS CAN BE MODIFIED FOR ALL SIZES IN SMALL OR LARGE QUANTITIES.

PROBLEM:

When a bridge main is retrofitted with protective tape the result is a significant increase to the pipe's outside diameter. Because of this the standard shields and saddle (Red Color) may be difficult to install without damaging the tape. The **OVERSIZED SHIELDS** and **SADDLES** (Gray Color) are made with an **INSIDE DIAMETER** that compensates for the **INCREASED OUTSIDE DIAMETER** of the main pipe. This modification makes the shields ideal for use over hand applied tapes.

DESCRIPTION:

TYPE #240 (OS) SHIELDS & TYPE #180 (OS) SADDLES are fabricated from a hand layed up ultra-violet protected, salt tolerant, fiberglass reinforced vinylester resin. Preselected reinforcements are laminated over specially modified molds to a uniform thickness. Sub-zero temperatures will not affect properties.

NON-CONDUCTIVE PIPE ROLLERS

PREVENT THE PASSING OF CURRENT FROM THE PIPELINE TO BRIDGE STRUCTURE, REBARS, ETC.



Can be used in conjunction with
FRP Type #240 Roll-On Shields™

- Maintain same support strength of pipe hanger system
- Eliminate chafing and rusting pipe caused by iron rolls
- Eliminate electrical grounding of the pipeline to the bridge
- Eliminate insulating joints at each end of bridge, and include the suspended line as part of the cathodically protected pipeline, i.e., continuity of cathodic protection.
- Absorb vibration from traffic of other sources, saving wear and tear on pipe hanger parts.
- Highest specification polyurethane compound is cast around an integral steel sleeve to form a full length bearing for the axle.
- Direct replacement for cast iron roll.

LB&A, Inc.

A "Utility Service" Company

PO Box 540

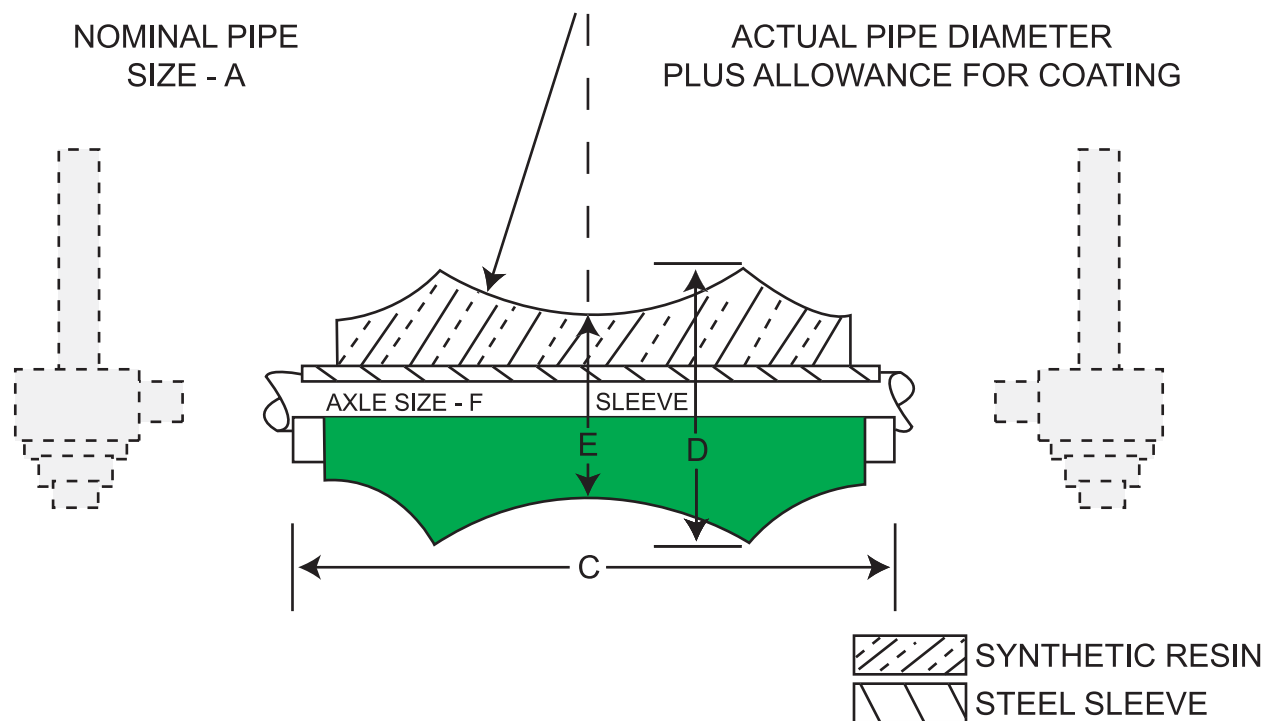
Westtown, PA 19395-9982

610.696.9220 • 610.344.7519

www.ncroll.com

NON-CONDUCTIVE PIPE ROLLER DIMENSIONS

HANGER MOUNTED MODEL

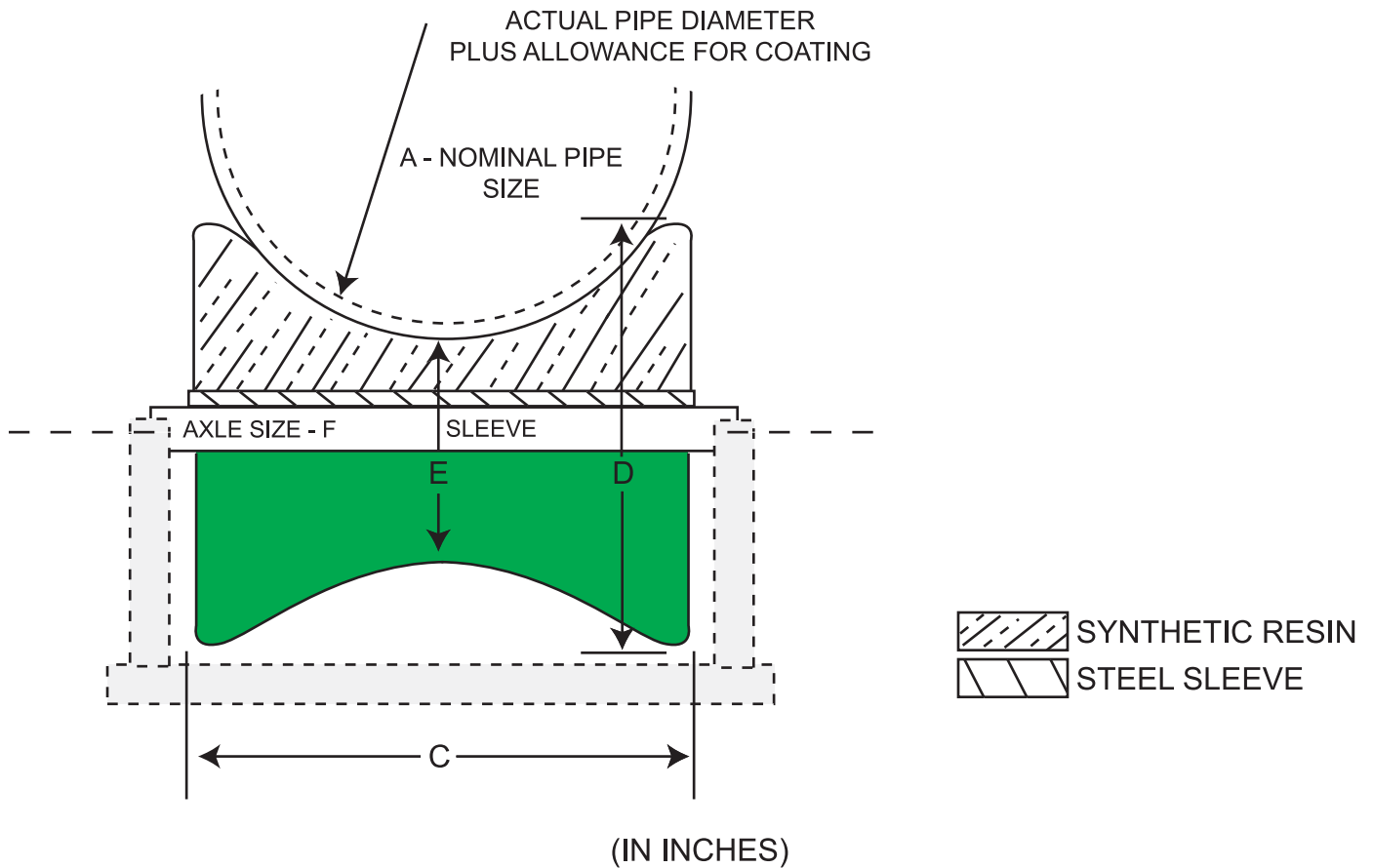


HANGER RODS, NUTS, SOCKETS AND
AXLE ARE DESCRIBED IN OUR PIPE HANGER CATALOG
(IN INCHES)

MODEL NUMBER	NOMINAL PIPE SIZE - A	C	D	E	F
2 H	2	2 ⁵ / ₈	1 ¹ / ₄	¹³ / ₁₆	³ / ₈
2 1/2 H*	2 1/2	3 ¹ / ₄	1 ¹ / ₂	⁷ / ₈	¹ / ₂
3 H	3	3 ³ / ₄	1 ⁵ / ₈	⁷ / ₈	¹ / ₂
4 H	4	4 ³ / ₄	2	1 ¹ / ₂	¹ / ₂
5 H	5	5 ¹³ / ₁₆	2 ³ / ₈	1 ¹ / ₂	⁵ / ₈
6 H	6	6 ⁷ / ₈	2 ³ / ₄	1 ³ / ₄	³ / ₄
8 H	8	8 ⁷ / ₈	3 ¹ / ₈	2 ¹ / ₈	⁷ / ₈
10 H	10	11	3 ⁵ / ₈	2 ¹ / ₈	⁷ / ₈
12 H	12	12 ¹ / ₂	4	2 ¹ / ₈	1
14 H	14	14 ¹ / ₂	4 ¹ / ₂	2 ¹ / ₂	1 ¹ / ₈
16 H	16	16 ¹ / ₄	5	2 ⁵ / ₈	1 ¹ / ₄
18 H	18	18 ³ / ₈	5 ⁹ / ₁₆	2 ³ / ₄	1 ¹ / ₄
20 H	20	20 ¹ / ₄	5 ³ / ₄	3 ¹ / ₂	1 ¹ / ₄
24 H	24	24 ¹ / ₄	7 ¹ / ₁₆	4 ¹ / ₈	1 ¹ / ₂
LARGER SIZES ON SPECIAL ORDER					

*SPECIAL ORDER

NON-CONDUCTIVE PIPE ROLLER DIMENSIONS STAND MOUNTED MODEL



MODEL NUMBER	NOMINAL PIPE SIZE - A	C	D	E	F
2 S	2	2 ⁵ / ₈	2	13/ ₁₆	1/2
3 S	3	2 ⁵ / ₈	2 ¹ / ₈	1 ¹ / ₈	1/2
4 S	4	3 ³ / ₄	2 ⁹ / ₁₆	1 ¹ / ₈	1/2
5 S	5	3 ³ / ₄	2 ³ / ₈	1 ¹ / ₈	1/2
6 S	6	3 ³ / ₄	2	1 ¹ / ₈	1/2
8 S	8	6	3 ³ / ₈	1 ³ / ₈	3/4
10 S	10	6	3 ¹ / ₈	1 ⁵ / ₈	3/4
12 S	12	8	3 ⁷ / ₈	2 ³ / ₄	7/8
14 S	14	9 ¹ / ₈	4	2 ³ / ₄	7/8
16 S	16	9	3 ⁷ / ₈	1 ³ / ₄	1 ¹ / ₈
18 S	18	9	4	1 ¹⁵ / ₁₆	1 ¹ / ₈
20 S	20	9	4	1 ⁷ / ₈	1 ¹ / ₈
24 S	24	10	4 ⁷ / ₁₆	2 ¹ / ₄	1 ¹ / ₄
SPECIAL ORDER ROLLERS AVAILABLE ON QUOTE BASES.					

*SPECIAL ORDER

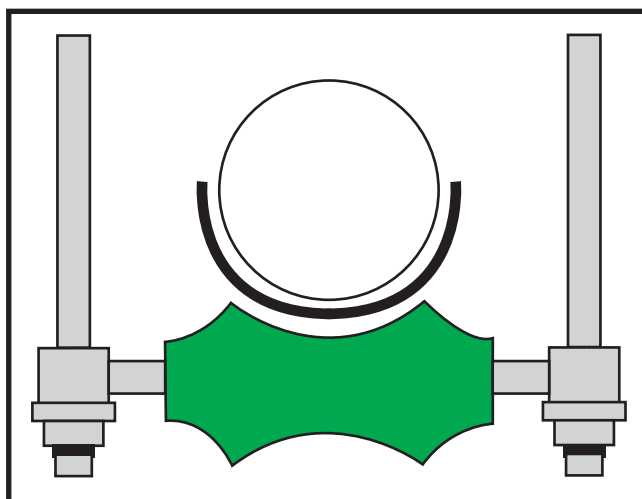
PHYSICAL PROPERTIES LIST

We list below the key properties of the casting compound we use in our NON-CONDUCTIVE PIPE ROLLERS. We suggest that you accept no less a standard of excellence in order to have long term durability, weatherability and performance.

A roller that has cold flowed under the load placed upon it (time, temperature and weight) will develop a flat spot and cease to roll. A bound roller will pull the whole support system out of line, first in one direction and then in the other, resulting in metal fatigue and ultimate failure. A small economy in the price of your rollers can cost a thousand times the "saving" in a failed support system.

CUSTOM COMPOUNDED POLYETHER TYPE POLYURETHANE

Hardness, Shore A	98
Tensile Modulus, psi at 100%	2542
Tensile Strength, psi	6764
Elongation, %	247
Die C Tear, pli	477
Spit Tear, pli	130
Compression Set, Method B, %	21
Bashore Resilience, %	39
Compression Modulus, psi: at 5%	500
at 10%	850
at 15%	1175
at 20%	1600
at 25%	2125



LB&A, Inc.

A "Utility Service" Company

BRIDGE CROSSINGS

RECOMMENDED MATERIAL SPECIFICATIONS FOR MAINS SUPPORTED FROM BRIDGES

NEW CONSTRUCTION & MAINTENANCE / RETROFITTING

PRITEC®/ FRP type #240 Roll-On Shields™

PRITEC® coatings is factory applied high density polyethylene/butyl rubber combination that is ultraviolet resistant, and impervious to most biological, chemical and environmental contaminants. PRITEC's tough surface makes it exceptionally compatible with FRP ROLL-ON SHIELDS.

- #1) FRP type #240 Roll-On Shields over PRITEC® coated main.



TC H35 Gray® / FRP Shields

Tapecoat H35 Gray® is composed of a specifically formulated multipolymer alloy film with a synthetic elastomeric adhesive. The tape is very suitable for above ground application and works well with FRP Type #240 Shields. Keeps water from collecting between pipe and shields. Applicable for both new construction, maintenance, and/or retrofitting.

- #2) FRP oversized type #240 shield over 35 mill tape.



Petrolatum Tape / FRP Shields

Petrolatum type tapes are ideal for use over painted or bare steel mains. These tapes require minimum surface preparation and repel moisture. Petrolatum tapes can be successfully installed under conditions not possible for traditional tapes. Ideal for new or existing installations.

- #3) FRP shields over Envirotape



FBE / Sprayed On Coatings Non-Conductive Rollers

Non-Conductive Rollers are used in lieu of FRP Shields with any thin barrier coating. The urethane based rollers are used as a direct replacement for cast iron rolls. They isolate the main from the bridge, are non-abrasive and will not trap moisture between the pipe and support.

#4) Non-Conductive Roller with FBE coating



Tapes / FRP Shields Non-Conductive Rollers

Thick barrier coatings used with Non-Conductive Rollers also need FRP Shields to distribute the weight of the pipe against the Roller. Without this protection the tape is subject to cold flow.

#5) FRP Shield & NC Roller over Pritec



MATERIAL SELECTION AND SPECIFICATION CRITERIA:

Pipe mains supported from bridges have distinctly different material requirements than those buried underground.

NEW CONSTRUCTION:

- Coatings should be ultraviolet stable, road salt resistant and compounded for above grade installations.
- In order to preserve the integrity of the coating, a means of weight distribution, abrasion control and electrical isolation must be provided at each hanger or support. (See illustration #1.)

MAINTENANCE / RETROFITTING:

- With most bridge structures it is generally necessary to isolate the pipe from its supports for at least 180° of its circumference.

When a main is being retrofitted for electrical isolation it is not uncommon to find contacts on the side as well as the bottom of the pipe. Some hanger assemblies may require 360° of protection.

- The material used to isolate the pipe should be **non-conductive, abrasion and cold flow resistant, ultraviolet stable, demonstrate no cold temperature embrittlement and fit securely on the pipe.**
- In most climates, on painted and bare pipe, it is probably desirable to seal the shield and pipe interface from possible moisture entrapment. (See illustrations #4 and #5.)

Product information on the material illustrated is available from Glas Mesh Co. or local representatives.

GLAS MESH COMPANY®
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www.glasmesh.com

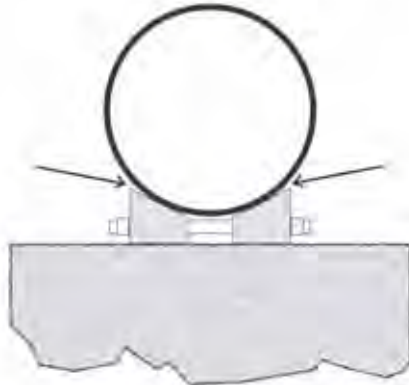
FRP SPACERS & PIPE CHOCKS/SHIMS



Metal to metal contact

Moisture collects where the pipe rests on the support

Moisture drains and collects at the bottom of the pipe and normal seasonal expansion and contraction of the pipe abrades the paint at the contact exposing the steel surface.



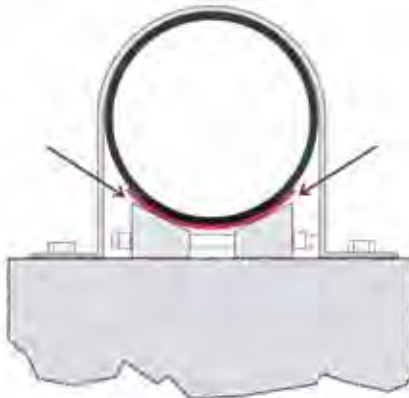
Pipe Chocks eliminate metal to metal contact.

Allows moisture to drain from the bottom of the pipe.

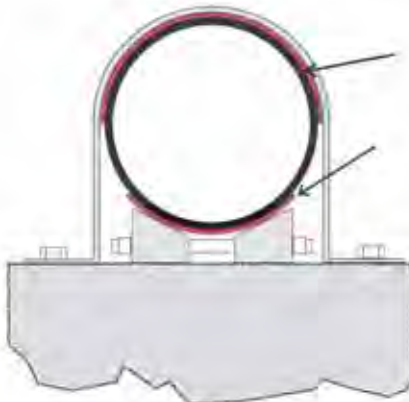
Provides access for inspection & maintenance.

Creates two possible sites where organic matter (grass clippings, leaves, pine needles, etc.) and moisture can collect. Normal seasonal expansion & contraction may still abrade the coating and expose the steel surface to the elements.

Regulations require a labor intensive periodic removal of the supports and hold down straps for inspection purposes.



The FRP Type# 120 Spacers and Epoxy Seam Sealer eliminates abrasion and prevents potential development of crevice corrosion sites. Organic materials and moisture that collect between the chocks and FRP Spacers cannot make contact with the pipe's surface.



FRP Type # 120 Spacers & FRP Type# 180 Saddles along with Epoxy Seam Sealer bonds and seals the pipe's surface from the atmosphere and eliminates the need to physically remove the chocks and straps during inspection.

FRP TYPE #120 SPACERS™

FOR PREVENTING OR CORRECTING CONTACT SHORTS

FRP Spacers are an extremely strong non-conductive fiberglass reinforced plastic material. They are used by utilities and pipeline companies to prevent or correct electrical contact shorts caused when buried steel mains contact each other or are in close proximity. The 120° peripheral circumference minimizes any possible shielding effect on the pipe's cathodic protection systems.

Locating and correcting just one contact short is an expensive, time consuming proposition. Once the contact has been cleared it is a false economy to use a plastic or rubber material that does not have the necessary physical properties to prevent the contact from re-establishing itself.

ADVANTAGES OF FRP SPACERS OVER NON-REINFORCED PLASTICS

For most applications FRP Spacers offer superior physical properties over other plastics and rubber. (PVC, polyethylene, neoprene, etc.)

Many times the compressive strength of other non-conductive materials. This is critical because of the point loading nature of contact shorts.

FRP Spacers will not "cold flow" like PVC, polyethylene or neoprene.

Fiberglass reinforcement enables the Spacers to tolerate significant loading while at the same time providing substantial abrasion resistance.

Unlike other plastics, FRP Spacers will not become brittle in cold temperatures nor will they soften or distort from heat.



DON'T BURY A MISTAKE
SPECIFY FRP TYPE #120 SPACERS

GLAS MESH COMPANY®
P.O. Box 1718
West Chester, PA 19380
610-696-9220 • Fax 610-344-7519
www.glasmesh.com

TYPICAL FRP & POLYETHYLENE PHYSICAL PROPERTIES

Properties	ASTM Test Number	*FRP Spacers	HDPE
Tensile Strength	D695	12,000-25,000 psi	2800-5500 psi
Flexural Strength	D790	19,000 psi	3200 psi
Compressive Strength	D695	24,000-40,000 psi	2400 psi
Dielectric Strength	D-149-61	350-500 Volt/mil	450-500 Volt/mil
Volumetric Resistivity	D257	ohms/cm 10^{13} - 10^{15}	ohms/cm 10^{16}
Effects of Sunlight	N/A	Fading - Maintains Physical properties	Embrittlement
Distortion Temperature	N/A	220°F - 266°F (93°C - 130°C)	150°F - 170°F (65°C - 77°C)

* physical properties vary depending on type of manufacture



Type Number	For Pipe Diameter	Approx. Wall Thickness	Standard Lengths
120	2"	.08"	12"
120	3"	.09"	12"
120	4"	.09"	12"
120	6"	.125"	12"
120	8"	.125"	12"
120	10"	.187"	12"
120	12"	.187"	12"
120	14"	.25"	12"
120	16"	.25"	12"
120	18"	.25"	12"
120	20"	.25"	12"
120	24"	.25"	12"
120	30"	.25"	12"
120	36"	.25"	12"



Standard sizes generally available off the shelf. FRP Spacers can be custom fabricated to your specifications.

FRP SPACERS / EPOXY SEAM SEALER

PREVENT / CORRECT CREVICE CORROSION



Crevice corrosion is a common problem on exposed steel pipes at compressor stations, pumping stations, refineries, etc. Generally the most severe areas of corrosion occur precisely where the pipe contacts its support. This contact point is a natural collection site for moisture. Moisture plus poor drainage creates an ideal corrosive environment.

Left unchecked, corrosive pitting will eventually require replacement of the affected pipe. **Replacement is always many times the cost of preventive or corrective maintenance.**

FRP Type #60 Spacers used with Epoxy Seam Sealer is a cost effective, long term solution to above grade crevice corrosion. The Seam Sealer is used to bond and seal the inside surface of the FRP Spacer to the corresponding pipe surface.



Once in place the FRP Spacer provides protection on just that small inaccessible section of pipe that needs it most.



At times FRP Spacers are used with FRP Flatties as a replacement for or an alternate to graphite slide plates.

It is extremely important to use fiberglass reinforced (FRP) plastic because its high compressive strength enables it to tolerate the point loading that would cause a non-reinforced plastic material to "cold flow" and fail. A minimum 15,000 psi compressive strength (ASTM D695) is recommended.

All of the FRP materials can be modified to meet specific needs. For a complete products catalog contact:

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co.**
FRP / S / ESS • 3/08



**TYPE #120 Spacer & Seam Sealer
With Coated U-Bolts**

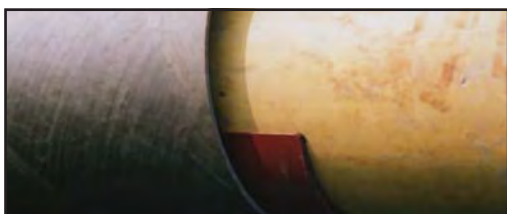


**TYPE #120 Spacer & Type #180 Saddle
Prior To Painting and Installation
Of Hold Down Strap**



TYPE #180 Saddles With Hold Down Straps

FRP TYPE #120 SPACERS & FRP TYPE #220/240 CASING INSULATORS PREVENT OR CORRECT METAL-TO-METAL CONTACT SHORTS BETWEEN CARRIER PIPE AND CASING



Closeup view, type #120 FRP spacer for correcting or preventing contact shorts.



Type #220-240 FRP casing insulator for undersized casings.

Once buried, the compressive forces exerted on a carrier pipe and its casing can become tremendous. What consistently results are undesired metal-to-metal contacts. Typical back filling practices create, over time, tremendous loading on the carrier pipe where it enters and exits the casing.

A contributing factor to many of these casing shorts is the failure of the plastic casing insulators due to "cold flow". It is a fact of science and a hard reality that non-reinforced plastics such as polyethylene, PVC, neoprene rubber, etc., will definitely cold flow under pressure.

Glas Mesh Company's fiberglass reinforced plastics (FRP) offer a material that has superior physical and compressive strength properties.

ADVANTAGES

Type #120 FRP Insulation Spacers

Type #220-240 FRP Casing Insulators

- will never cold flow or become brittle
- offer superior compressive and dielectric strengths combined with high abrasion resistance
- available immediately, off the shelf
- easy to install, no tools required

APPLICATIONS

- used to prevent contact shorts caused by soil settlement on casings
- used for correcting and eliminating casing shorts
- perfect for use with undersized casings
- used to protect coated or wrapped pipe mains that pass through bridge abutments or multi-port tunnels

PHYSICAL SPECIFICATIONS AND SIZES

Type #120 FRP Spacers

Size #*	For Pipe Diameters	Length
2	2"	12"
3	3"	12"
4	4"	12"
6	6"	12"
8	8"	12"
10	10"	12"
12	12"	12"
16	16"	12"
18	18"	12"
20	20"	12"
24	24"	12"
30	30"	12"
36	36"	12"

Type #220-240 FRP Casing Insulators

Size #*	For Pipe Diameters	Length
2	2"	6"
3	3"	6"
4	4"	6"
6	6"	6"
8	8"	6"
10	10"	6"
12	12"	6"
16	16"	6"

*Standard sizes, available immediately. FRP spacers and casing insulators can be custom fabricated to your specifications.



Call or write for complete technical information and prices

GLAS MESH COMPANY®

P.O. Box 1718

West Chester, PA 19380

610-696-9220 • Fax 610-344-7519

www.glasmesh.com

Fiberglass Reinforced FRP Flatties



Isolate valves from supports.



Prevent or correct underground contacts between mains.

FRP FLATTIES have numerous applications in the natural gas distribution and transmission, and liquid pipeline industries:

- Eliminate or correct above or below ground metal-to-metal electrical contacts, particularly on underground steel mains.
- Custom fitting as non-corrosive, non-conductive spacers or shims.
- A standard product for spacing, isolating or protecting pipes and valves from their supports.
- FLATTIES provide ideal protection for coated tank bottoms.
- FLATTIES tolerate “point loading” and are very resistant to “cold flow”. They will not become brittle at cold temperatures. (Non-reinforced materials such as polyethylene, PVC, neoprene rubber, etc. are very susceptible to cold flow and embrittlement.

Glas Mesh FRP FLATTIES can be custom fabricated and sized to fit your requirements and specifications.

FRP FLATTIES are made of a select combination of random glass mat reinforcements saturated with polyester resins combined with suitable fillers. These composites are cured and compressed under moderate pressure to form smooth dense laminates.

FRP FLATTIES are available off the shelf in 1/16”, 1/8”, 1/4” and 1/2” thicknesses. Standard sized include:

12” x 12” square	6” x 12”
3’ x 6’ sheets	4’ x 8’



1/4” FRP FLATTIE being used to prevent contact between gas main and bridge support.

STANDARD FRP FLATTIES

TECHNICAL INFORMATION

PHYSICAL PROPERTIES	ASTM TEST METHOD	VALUES
Tensile Strength - psi	D638	10,000
Flexural Strength - psi	D790	23,000
Compressive Strength - psi	D695	30,000
Impact Strength		
Izod Edgewise - ft. lbs./in. notch	D256	8.0
Shear Strength - psi	D732	14,000
Dielectric Strength - Perpendicular to Lamination, Short Time - VPM in Oil	D149	350
Dielectric Constant @ 60 Hz	DS150	4.80
Dielectric Constant @ 1 Hz	D150	4.30
Arc Resistance - seconds	D495	150

Please call or write.
 We will be glad to quote on
 specific thicknesses or non-standard sizes,
 thicknesses or widths.
 Materials available on a blanket
 or as needed basis.

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POLYETHYLENE PIPE SUPPORTS

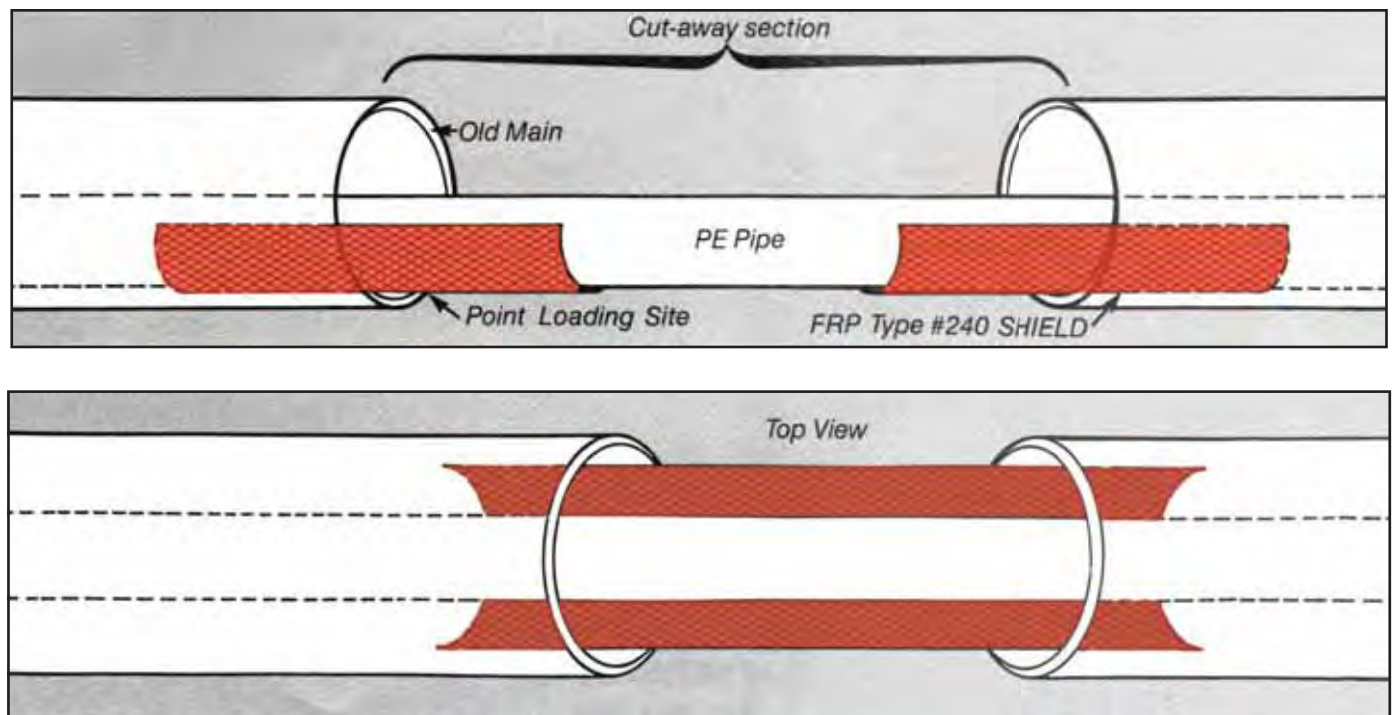
Other than third party damage, CRACK GROWTH is the most common type of polyethylene pipe failure. SHEAR installations and excessive bending due to external pressure are two potential causes of pipe failure. INADEQUATE SUPPORT and/or protection wherever a PE pipe is INSERTED into an old steel or cast iron pipe can, over time, develop a POINT LOADING contact precisely where the plastic pipe enters and exits the metal main. Downward pressure from SOIL COMPACTION may cause the PE to COLD FLOW and gradually develop a shear crack failure.

It has always been standard practice to protect inserted polyethylene services with a plastic split sleeve prior to backfilling. This type of precaution for the larger plastic mains will contribute to the long term integrity of the system.

Glas Mesh FRP Type #240 SHIELDS and FRP Type #180 SADDLES provide a superior means and material for supporting or protecting PE pipe at any insertion.



FRP Type #240 Shield provides superior shear crack protection as well as desirable weight distribution and abrasion control.



FRP #180 BRIDGE SADDLE is used as a strong, light-weight, and non corrosive bridging material for continuous support between insertion opening.

INSERTION SHIELD SPECIFICATIONS

Type #240 Shield Size	Fits Plastic Pipe Diameter	Shield Length
2	2"	12"
3	3"	12"
4	4"	12"
6	6"	12"

Lengths can be easily modified to meet specific requirements. Shields available up to 16" diameter.

BRIDGE SADDLE SPECIFICATIONS

Type #180 Bridge Saddle Size	Used with PE Pipe Diameter
3	2"
4	3"
6	4"
8	6"

SADDLE LENGTHS: Lengths based on gap between old main plus 6" penetration into each opening.

U-Bolt Coat

DESCRIPTION

U-Bolt Coat is a seamless, vulcanized, polyolefin material that is applied to a standard hot dipped, galvanized zinc plated or stainless steel u-bolt. They effectively control crevice corrosion on above ground piping by eliminating any possible metal to metal contact between the top and sides of the pipe. These coated u-bolts are also used with **FRP Half Rounds** to help control crevice corrosion on the bottom of a painted pipe. U-Bolt Coat type u-bolts can also help reduce vibrations and noise levels. The polyolefin coating is durable and displays excellent resistance to UV rays, heat, cold, abrasion and electrolysis.

APPLICATIONS

U-Bolt Coat type u-bolts are ideal for use on piping found in refineries, compressor stations, pumping stations, and chemical plants. They are particularly useful as non-load bearing guides on bridge mains. These coated u-bolts offer a superior long-term service life for most industrial, commercial and marine environments.

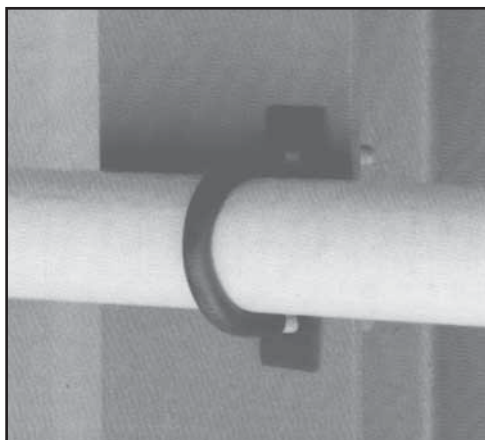
INSTALLATION

The u-bolt size and coating thickness has been taken into consideration in order to ensure a good fit over the pipe. U-BOLT COAT type u-bolts come complete with four special hot dipped galvanized hex nuts. FRP Half Rounds or FRP Flatties are frequently used in conjunction with the u-bolts. The coated u-bolts are designed to be used on bare or painted steel pipe. Thick barrier coatings and/or FRP Shields and FRP Saddles will affect proper sizing.

AVAILABILITY

- Hot dipped galvanized long tangent u-bolts ranging in size from 3/4" to 24" are standard items.
- Larger sizes and non-standard u-bolts are available on a quote basis.

REFER TO SEPARATE SHEET FOR NON-STANDARD U-BOLT COAT DIMENSIONS



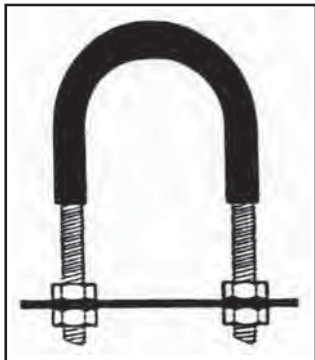
The top right picture is a typical example of accelerated corrosion occurring due to metal contact between the uncoated u-bolt and pipe. This interaction can be eliminated by utilizing U-Bolt Coat.

U-Bolt Coat

COATING TECHNICAL SPECIFICATIONS

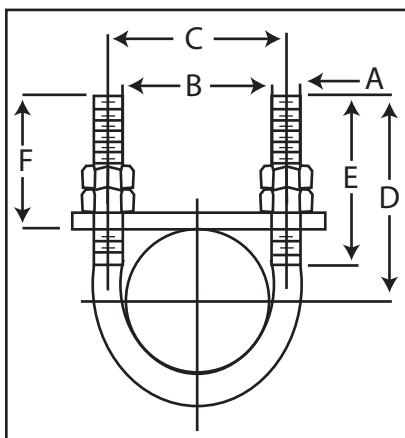
Physical Properties	Value	Test Method	Chemical Properties	Value	Test Method
Tensile Strength	1500 psi min.	ASTM D412	Water Absorption	0.2%	ASTM D570
Elongation	300% min.	ASTM D412	Corrosive Effect	Pass	ASTM 2671 Copper Rod
Heating Aging (168 hrs./121°C)			Fluid Resistance (24 hrs./25°C)		
Tensile	1500 psi min.	ASTM D2671	Hydraulic Fluid (Mil-H-5606C)		
Elongation	300% min.				
Heat Shock	No Cracks, Flow or Blisters	ASTM D2671	Tensile	90% Retained Min.	ASTM D412
			Elongation	90% Retained Min.	ASTM D412
Low Temp. Flexibility (4 hrs./-55°C)	No Cracking	ASTM D2671	Lubricating Oil (Mil-L-7808G)		
			Tensile	90% Retained Min.	ASTM D412
Specific Gravity	0.96	ASTM D792	Elongation	90% Retained Min.	ASTM D412
Temperature Limitation	200°F		Diesel Fuel (Mil-L-23699)		
			Tensile	90% Retained Min.	ASTM D412
			Elongation	90% Retained Min.	ASTM D412

When ordering be sure to account for coating and FRP Shield thickness if applicable.



STANDARD U-BOLT DIMENSIONS

PIPE SIZE	ROD SIZE A	WEIGHT W/NUTS (APPROX.)	B*	C	D	E	F
3/4	1/4	.12	1 1/8	1 3/8	2 3/4	2 3/8	2 7/32
1	1/4	.12	1 3/8	1 5/8	2 3/4	2 3/8	2 3/32
1 1/4	3/8	.28	1 11/16	2 1/16	2 7/8	2 3/8	2 1/32
1 1/2	3/8	.30	2	2 3/8	3	2 1/2	2 1/16
2	3/8	.33	2 7/16	2 13/16	3 1/4	2 1/2	2 1/16
2 1/2	1/2	.73	2 15/16	3 7/16	3 3/4	3	2 5/16
3	1/2	.78	3 9/16	4 1/16	4	3	2 1/4
3 1/2	1/2	.84	4 1/16	4 9/16	4 1/4	3	2 1/4
4	1/2	.90	4 9/16	5 1/16	4 1/2	3	2 1/4
5	1/2	1.0	5 5/8	6 1/8	5	3	2 7/32
6	5/8	1.97	6 3/4	7 3/8	6 1/8	3 3/4	2 13/16
8	5/8	2.33	8 3/4	9 3/8	7 1/8	3 3/4	2 13/16
10	3/4	4.91	10 7/8	11 5/8	8 3/8	4	3
12	7/8	7.73	12 7/8	13 3/4	9 5/8	4 1/4	3 1/4
14	7/8	8.28	14 1/8	15	10 1/4	4 1/4	3 1/4
16	7/8	9.15	16 1/8	17	11 1/4	4 1/4	3 1/4
18	1	13.48	18 1/8	19 1/8	12 5/8	4 3/4	3 5/8
20	1	14.57	20 1/8	21 1/8	13 5/8	4 3/4	3 5/8
24	1	16.8	24 1/8	25 1/8	15 5/8	4 3/4	3 5/8



*The Coating reduces B
1/8 (.125) to 3/16 (.187)
All dimensions in inches

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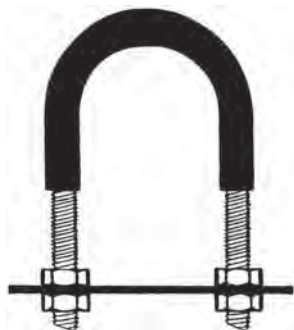
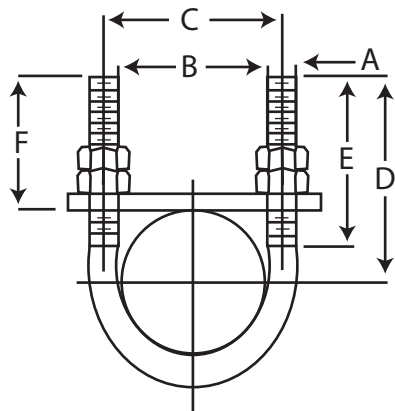
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U-BOLT-COAT SPECIALS

NON-STANDARD DIMENSIONS



QUANTITY

A _____ Inches

*B _____ Inches

C _____ Inches

D _____ Inches

E _____ Inches

All dimensions are in inches

*The coating reduces B min. 1/8" (.125) - max. 3/16" (.1875)

PIPE SIZE	ROD SIZE A	WEIGHT W/NUTS (APPROX.)	B	C	D	E	F
3/4	1/4	.12	1 1/8	1 3/8	2 3/4	2 3/8	2 7/32
1	1/4	.12	1 3/8	1 5/8	2 3/4	2 3/8	2 3/32
1 1/4	3/8	.28	1 11/16	2 1/16	2 7/8	2 3/8	2 1/32
1 1/2	3/8	.30	2	2 3/8	3	2 1/2	2 1/16
2	3/8	.33	2 7/16	2 13/16	3 1/4	2 1/2	2 1/16
2 1/2	1/2	.73	2 15/16	3 7/16	3 3/4	3	2 5/16
3	1/2	.78	3 9/16	4 1/16	4	3	2 1/4
3 1/2	1/2	.84	4 1/16	4 9/16	4 1/4	3	2 1/4
4	1/2	.90	4 9/16	5 1/16	4 1/2	3	2 1/4
5	1/2	1.0	5 5/8	6 1/8	5	3	2 7/32
6	5/8	1.97	6 3/4	7 3/8	6 1/8	3 3/4	2 13/16
8	5/8	2.33	8 3/4	9 3/8	7 1/8	3 3/4	2 13/16
10	3/4	4.91	10 7/8	11 5/8	8 3/8	4	3
12	7/8	7.73	12 7/8	13 3/4	9 5/8	4 1/4	3 1/4
14	7/8	8.28	14 1/8	15	10 1/4	4 1/4	3 1/4
16	7/8	9.15	16 1/8	17	11 1/4	4 1/4	3 1/4
18	1	13.48	18 1/8	19 1/8	12 5/8	4 3/4	3 5/8
20	1	14.57	20 1/8	21 1/8	13 5/8	4 3/4	3 5/8
24	1	16.8	24 1/8	25 1/8	15 5/8	4 3/4	3 5/8

FROM _____

COMPANY _____

PHONE _____

FAX _____

GLAS MESH COMPANY®

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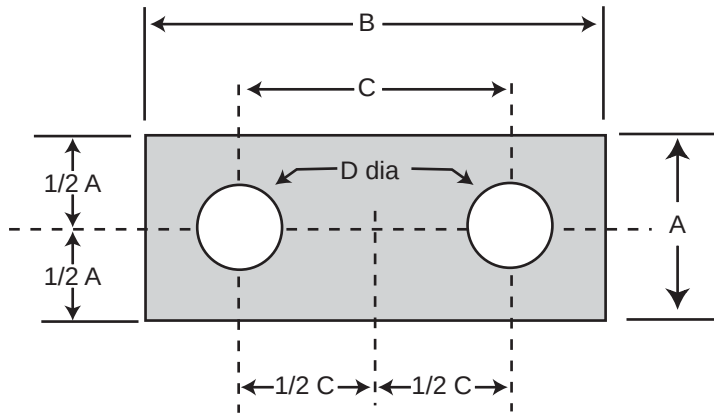
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U-BOLT / SP • 5/08

SPECIAL COATED U-BOLT FLAT PAD DIMENSIONS

NON-STANDARD DIMENSIONS



A _____

B _____

C _____

D _____

All dimensions are in inches

STANDARD FIBERGLASS PAD DIMENSIONS*

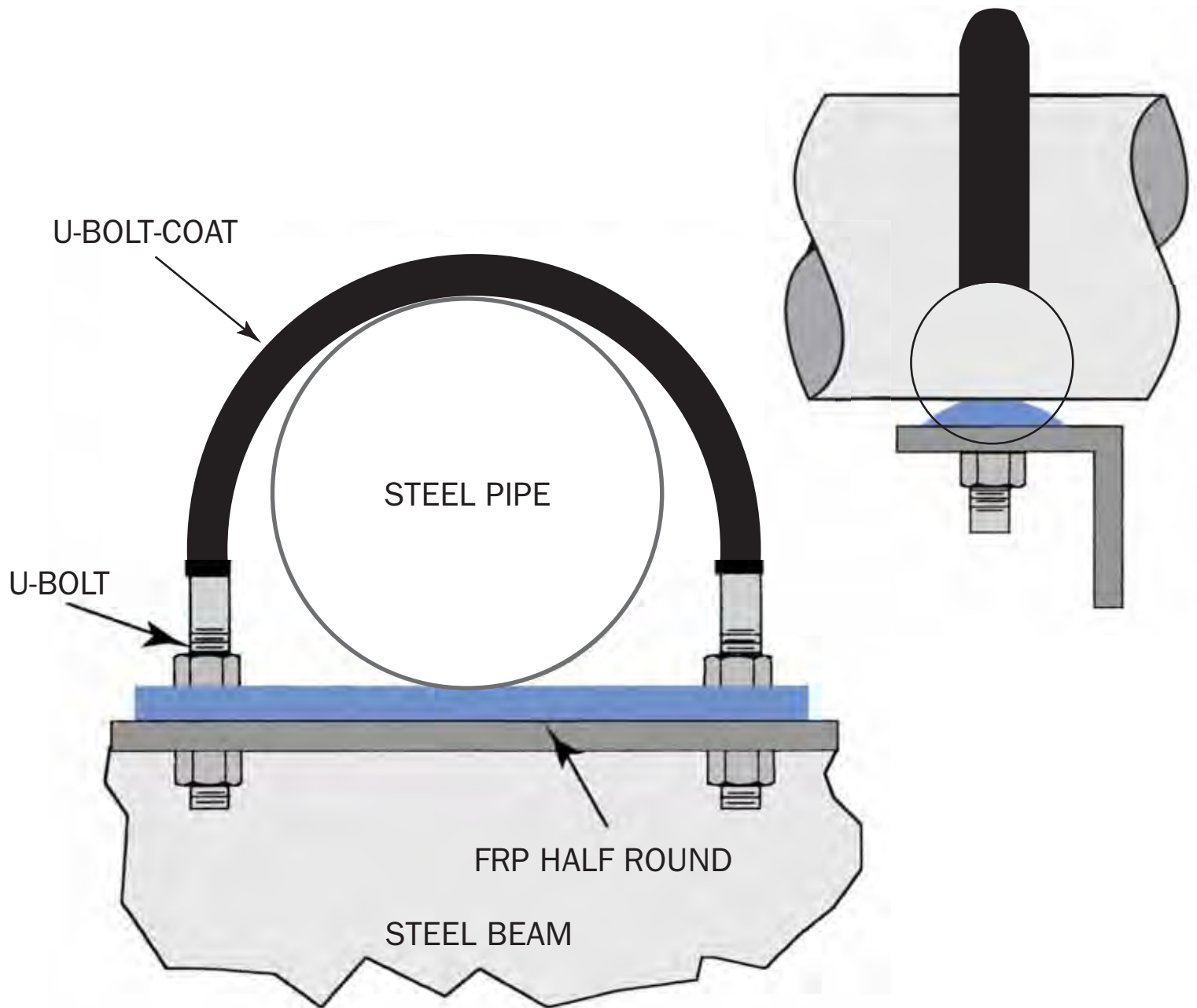
Pipe Size	Thickness	A	B	C	D
		Pad Width	Pad Length	Centerline Hole to Centerline	Hole Diameter
1/2	1/8	1	2 3/4	1 3/16	3/8
3/4	1/8	1	2 3/4	1 3/8	3/8
1	1/8	1	2 3/4	1 5/8	3/8
1 1/4	1/8	1 1/4	4 1/4	2 1/16	1/2
1 1/2	1/8	1 1/4	4 1/4	2 3/8	1/2
2	1/8	1 1/4	4 1/4	2 13/16	1/2
2 1/2	1/8	2	7 3/4	3 7/16	5/8
3	1/8	2	7 3/4	4 1/16	5/8
3 1/2	1/8	2	7 3/4	4 9/16	5/8
4	1/8	2	8 1/2	5 1/16	5/8
5	1/8	2	8 1/2	6 1/8	5/8
6	1/8	2 1/4	9 3/4	7 3/8	3/4
8	1/8	2 1/4	11 3/4	9 3/8	3/4
10	1/8	2 1/2	14 1/4	11 5/8	7/8
12	1/8	2 3/4	17 1/2	13 3/4	1

*Dimensions may vary slightly

Fiberglass (FRP) Half Rounds

Minimizes Pipe to Support Surface Contact
Helps Control Crevice Corrosion

FRP HALF ROUNDS / COATED U-BOLTS



ABOVE GRADE SUPPORT DETAIL

GLAS MESH COMPANY®
P.O. Box 1718
West Chester, PA 19380
610-696-9220 • Fax 610-344-7519
www.glasmesh.com

FRP HALF ROUNDS

DESCRIPTION

FRP HALF ROUNDS are a solid, reinforced pultruded material that is composed of various fiberglass reinforcements and polyester resin. Pre-selected reinforcements are drawn through a resin bath and pulled through a heated die that forms a strong dense laminate.

APPLICATION

FRP Half Rounds are generally used in conjunction with coated u-bolts or straps on above grade supports. These FRP solid half round pads minimize to pipe support surface contact. This characteristic **helps control crevice corrosion by allowing moisture to drain away from the bottom of pipe more efficiently.** A pipe resting on a flat surface is a natural collection site for moisture. Moisture plus poor drainage is an ideal corrosive environment.

ADVANTAGES

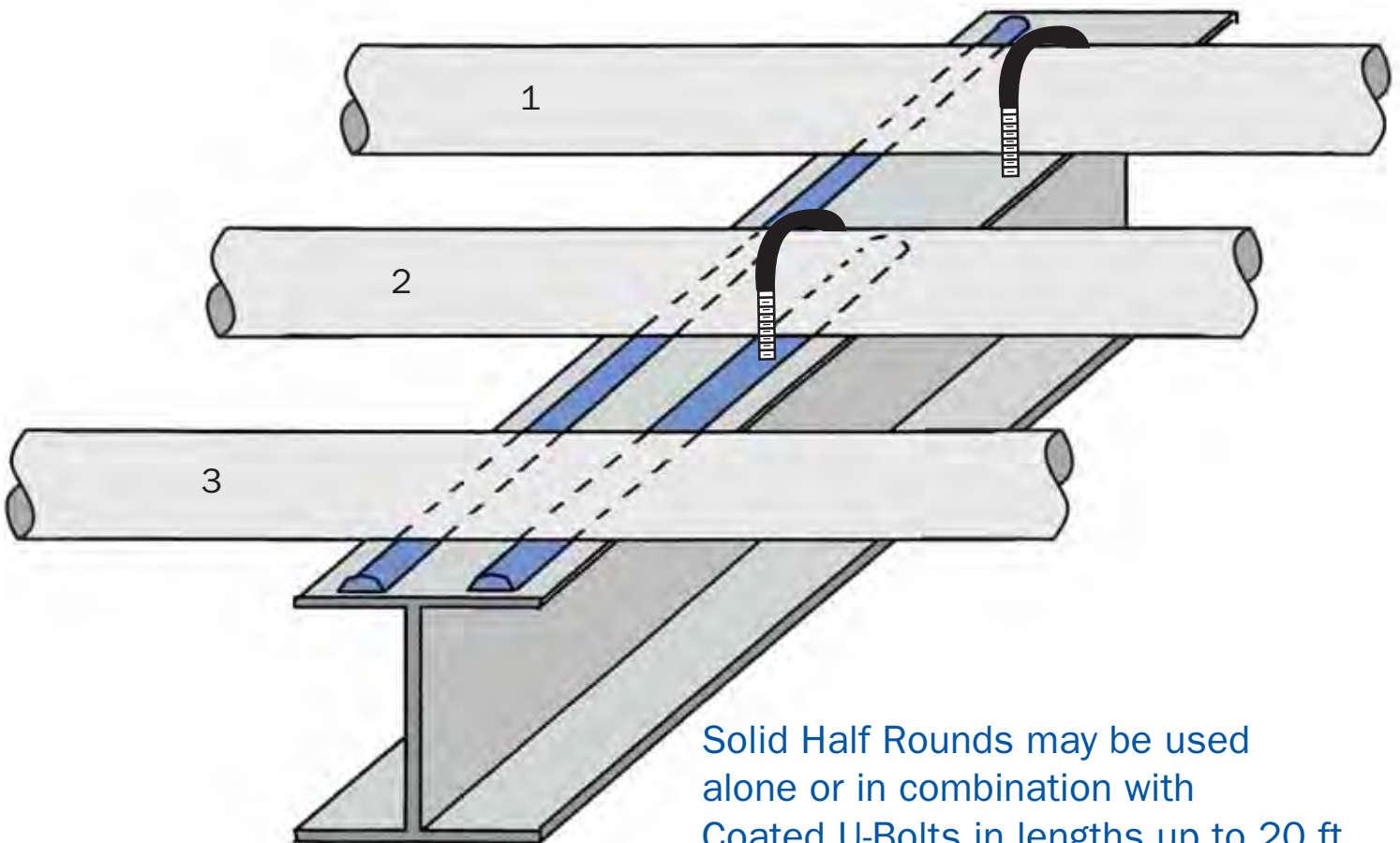
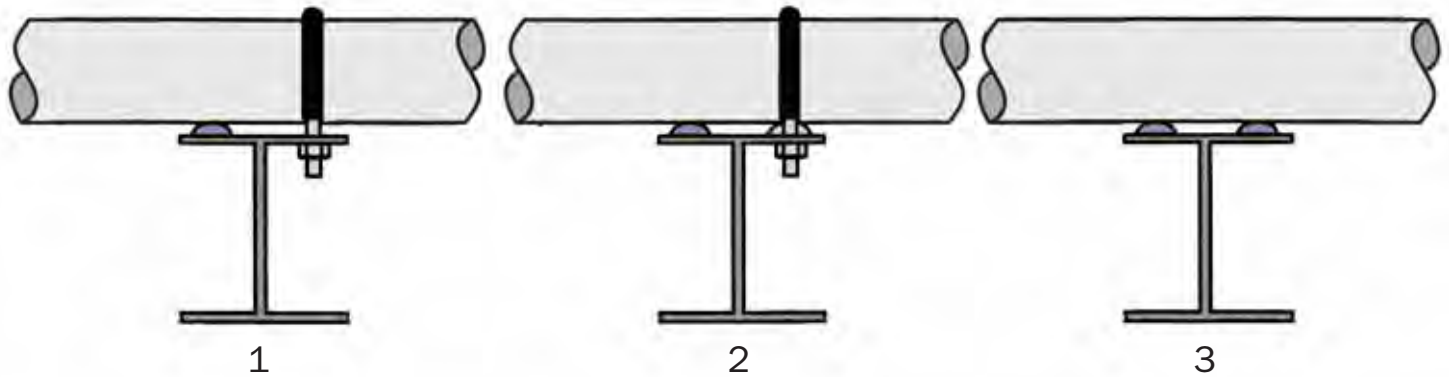
FRP Half Rounds offer superior physical properties when compared to non-reinforced plastics. They will not “cold flow” and have many times the compressive strength of other plastics. Unlike most non-conductive materials, FRP Half Rounds will not become brittle in the cold or soften from the heat.

Physical Properties	Unit	Half Rounds 70%-75% Fiberglass	Typical Plastic (HDPE)
Tensile Strength	psi	120,000	2800-5500
Tensile Modulus	psi x 10 ⁶	6.5	—
Flexural Strength	psi	120,000	3200
Flexural Modulus	psi x 10 ⁶	6.5	—
Compressive Strength	psi	70,000	2400
Izod Impact Strength	ft.-lbs./in.	40	8.0
Barcol Hardness	—	50	30
Water Absorption	Maximum %	.25	<1.01
Density	lbs./in. ³	.074	—
Specific Gravity	—	2.0	.941-.965
Coefficient of Thermal Expansion	in./in./°C	5.2 x 10 ⁻⁴	°C x 10 ⁵ 12-14
Effects of Sunlight	—	Maintains Physical Properties	Embrittlement

SOLID FRP HALF ROUNDS

HELPS CONTROL CREVICE CORROSION

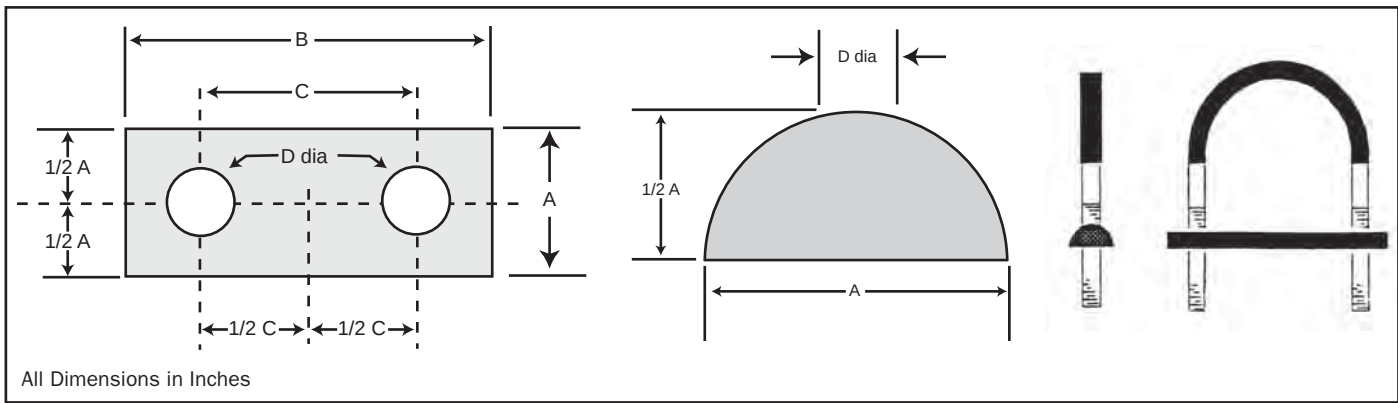
ENABLES MOISTURE TO DRAIN AWAY FROM THE PIPE/SUPPORT CONTACT



Solid Half Rounds may be used
alone or in combination with
Coated U-Bolts in lengths up to 20 ft.

GLAS MESH COMPANY®
P.O. Box 1718
West Chester, PA 19380
610-696-9220 • Fax 610-344-7519
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FRP HALF ROUND U-BOLT PAD DIMENSIONS



STANDARD FIBERGLASS HALF ROUND PAD DIMENSIONS*

Coated U-Bolt Size	Rod Size	Approx. Thickness	A	B	C	D
			Approx. Pad Width	Approx. Pad Length	Centerline Hole to Centerline	Hole Diameter
3/4	1/4	3/8	3/4	3	1 3/8	3/8
1	1/4	3/8	3/4	3	1 5/8	3/8
1 1/4	3/8	3/8	3/4	3	2 1/16	3/8
1 1/2	3/8	3/8	3/4	4 1/4	2 3/8	7/16
2	3/8	3/8	3/4	4 1/4	2 13/16	7/16
2 1/2	1/2	1/2	1	4 1/4	2 7/16	7/16
3	1/2	1/2	1	7 3/4	4 1/16	9/16
3 1/2	1/2	1/2	1	7 3/4	4 9/16	9/16
4	1/2	1/2	1	8	5 1/16	9/16
5	1/2	1/2	1	9	6 1/8	9/16
6	5/8	1/2	1	10	7 3/8	11/16
8	5/8	1/2	1	12	9 3/8	11/16
10	3/4	5/8	1 1/4	15	11 5/8	13/16
12	7/8	3/4	1 1/2	17	13 3/4	1
14	7/8	3/4	1 1/2	18	15	1
16	7/8	3/4	1 1/2	21	17	1
18	1	3/4	1 1/2	23	19 1/8	1
20	1	3/4	1 1/2	26	21 1/8	1
24	1	1	2	30	25 1/8	1 1/4

*Dimensions may vary slightly

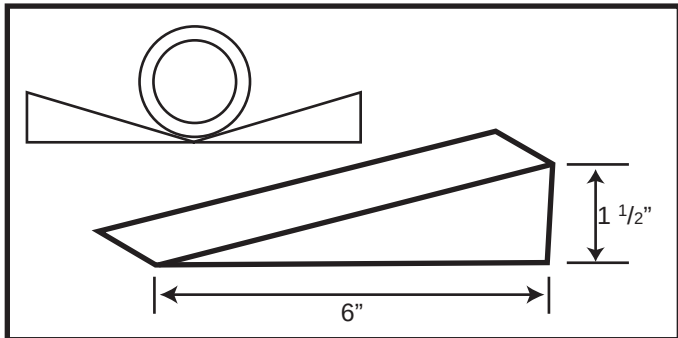
POLYWEDGE™

HDPE BLOCKING WEDGES

POLYWEDGES are fabricated from a high density polyethylene material specifically developed as a replacement for wood blocking wedges. POLYWEDGES will not break down or host the rot microorganisms that are known to cause corrosion on steel pipelines.

Microbiologically influenced corrosion (MIC) of steel gas pipelines is an ongoing Gas Research Institute project and is well documented in corrosion control literature. Bacteriologically generated corrosion cells on underground steel mains are frequently the result of long term contact with a wooden blocking wedge. The wood absorbs moisture and plays host to the organisms that cause the corrosion. By comparison POLYWEDGES offer vastly superior resistance to both moisture absorption and microorganism growth.

POLYWEDGES are packed 100 to a box in a standard 1 1/2" high, 1" wide, by 6" long size. With adequate volume POLYWEDGES can be fabricated to meet a particular specification.



WARNING: POLYWEDGES are absolutely not suitable for relief of metal to metal contact shorts. Polyethylene materials do not have the necessary compressive strengths to tolerate the point loading that causes contact shorts. (Refer to Glas Mesh literature on FRP Type #120 Spacers)

TECHNICAL DATA

THERMAL

Distortion Temperature, °F	150-170
Resistance to Heat, Continuous °F	250
Recommended use, Temp °F Max	190
Specific Heat, cal/gm/°C	0.5 - 0.6
Linear Thermal Expansion, /°C x 10 ⁵	12-14
Thermal Conductivity, cal/sec/sq. cm/cm x 10 ⁴	8-10
Burning Rate	0.8 - 1.2 (in/min)

ELECTRICAL

Volume Resistivity, Ohm-cm	10 ¹⁶
Dielectric Strength, Short Time, 1/8" thick, V/mil	500-700
Dielectric Strength, Step-by-step, 1/8" thick, V/mil	450-500

PHYSICAL

Specific Gravity	0.941-0.965
Specific Volume, cu. in/lb	29
Water Absorption, 24 hrs., 1/8" thick	<1.01
Machinability	excellent
Effect of Sunlight	embrittlement

MECHANICAL

Tensile Strength, psi	2800-5500
Flexural Strength, psi	3200
Compressive Strength, psi	2400
Impact Strength, Izod, Ft. lbs/in - notch	8-8.0
Rockwell Hardness	D60-70 (Shore)
Elongation, %	15-400

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BONDING & SEALING FRP TO STEEL SUBSTRATES:

- CREVICE CORROSION MATERIAL SELECTION OVERVIEW
- EPOXY SEAM SEALER / FRP TYPE #60 SPACERS INSTRUCTIONS
- EPOXY SEAM SEALER PRODUCT INFORMATION
- DP 460 EPOXY EASY MIX & MANUAL APPLICATOR INSTRUCTIONS
- LIQUID BOND EPOXY SEAM SEALER & INSTRUCTIONS
- HIGH TEMPERATURE EPOXY ADHESIVE / SEALANT & INSTRUCTIONS
- 4991 TWO SIDED STRUCTURAL TAPE INFORMATION & INSTRUCTIONS
- MOLDABLE SEALANT / FRP SPACERS

CREVICE CORROSION

MATERIAL SELECTION OVERVIEW

EPOXY SEAM SEALER / FRP SPACER

The standard materials generally used to correct or prevent crevice corrosion on above grade pipes that rest on concrete or metal supports.

Installation Requirements: Dry grit blasted surface

Minimum Application Temperature: +50°F (10°C)

Maximum Service Temperature: 160°F (71°C)

MOLDABLE SEALANT / FRP SPACERS

Alternative to standard Seam Sealer. Also used when air and surface temperatures prevent the use of the Epoxy Seam Sealer. Should be painted over after installation to prevent exposed edges from drying out. Can be used on painted surfaces.

Installation Requirements: Dry clean surface

Minimum Application Temperature:
Above -10°F (-23°C)

Service Temperature Range:
-30°F to 150°F (-35°C to 66°C)

Alternative: 4991 Double Sided Structural Tape
(See 4991 Spec. Sheet)

Recommended for use with Type #60 and
Type #120 Spacers only.

PETROLATUM TAPE / FRP SPACERS

Used when the pipe surface cannot be prepared or is wet. Can be installed over painted surfaces. Does not bond, simply seals the Spacer to pipe interface.

Installation Requirements: Clean wet or dry
surface, requires primer

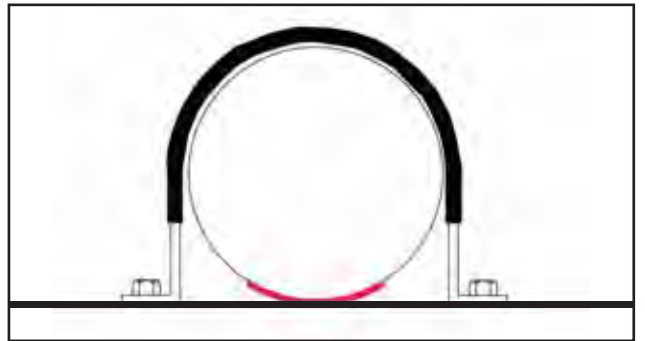
Minimum Application Temperature:
Above -10°F (-23°C)

Maximum Service Temperature: 150°F (66°C)

**WILL NOT TOLERATE
SHEAR TYPE APPLICATIONS**



**No mix alternative available. Refer to
DP-460 Epoxy & applicator**



**WILL NOT TOLERATE SHEAR TYPE
APPLICATIONS. Continuous pipe
movement requires roller support.
See non-conductive roller information.**



LIQUID BOND EPOXY SEAM SEALER

Available as an alternative when temperature and weather conditions prevent the use of the standard Seam Sealer. Liquid Bond Seam Sealer is primarily used when the surface is wet and/or the temperature is below 50°F (10°C).

Installation Requirements: Wet or dry grit blasted or power brushed surface

Minimum Application Temperature: +40°F (4°C)

Maximum Service Temperature: 165°F (74°C)



HI TEMP EPOXY / HT FRP SPACERS

Special high temperature resins allow the HT Epoxy & FRP Spacers to tolerate temperatures up to 325°F (163°C). Developed for use on exhaust and discharge lines.

Installation Requirements: Dry grit blasted surface

Minimum Application Temperature: 70°F (21°C)

Maximum Service Temperature: 325°F (163°C)

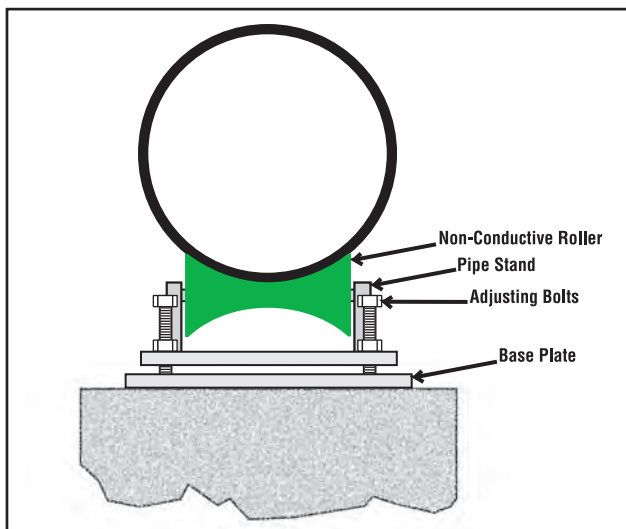
Pipe must be ambient temperature during application.



ADJUSTABLE PIPE ROLL STANDS

The polyurethane based Non-Conductive Rollers will not abrade the pipe's coating and allows moisture to drain away from the bottom of the pipe. **Non-Conductive Rollers are particularly useful on pipes that show significant expansion and contraction.**

Maximum Service Temperature: 190°F (88°C)



For complete information and installation recommendations contact:

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EPOXY SEAM SEALER / FRP SPACERS

Whenever it is deemed desirable to bond or seal the space between the inside surface of our FRP Shields and Spacers and the corresponding pipe surface, we suggest you use Epi-Seal® Epoxy SEAM-SEALER for this purpose.

Epi-Seal® SEAM SEALER is a filled, two part epoxy that is used for the repair and maintenance of steel tanks and structures.

Recommended Procedure:

- 1) Wire brush or grit blast the inside surface of the FRP Spacer and corresponding pipe surface.
- 2) A FRP Type #60 Spacer is used when the pipe rests on a flat surface.
- 3) Check that the surfaces are clean and dry, then mix and apply the SEAM SEALER to the prepared FRP Spacer and corresponding pipe surface.

For easier mixing in cool temperatures, warm SEAM-SEALER to approximately 100°F (38°C). Try to avoid applying SEAM SEALER at temperatures below 50°F (10°C).
- 4) Secure the FRP Spacer in place and trowel off any excess epoxy from around the edges. Depending on temperature, the epoxy will cure in three to five hours.
- 5) The weight of the pipe is usually sufficient to keep the FRP Spacer in place until the epoxy cures.

**REMEMBER: THE BETTER THE SURFACE PREPARATION
THE BETTER THE BOND!**



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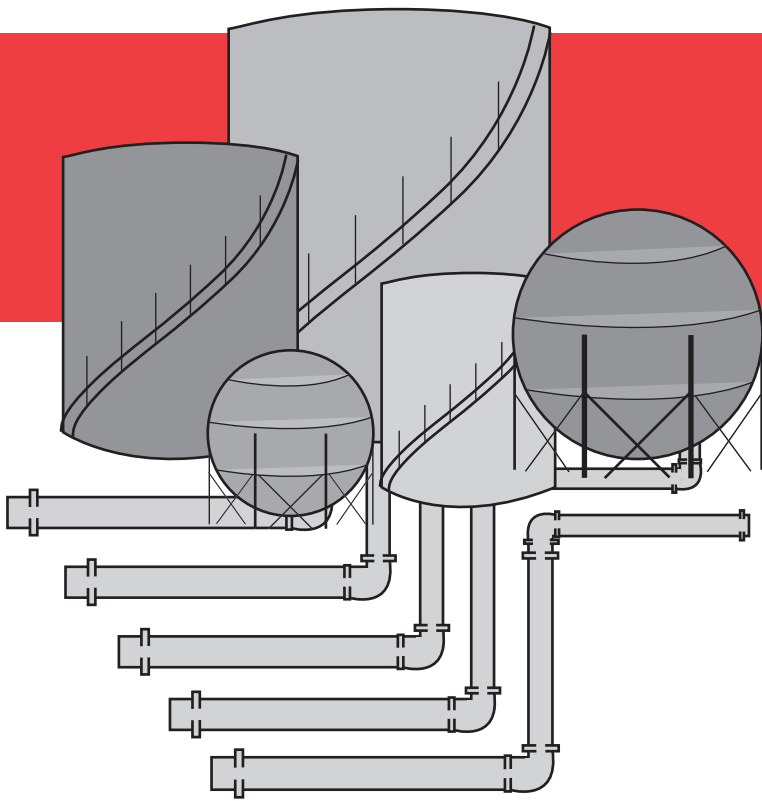
EPOXY SEAM SEALER/SPACER APPROXIMATE USAGE RATES IN POUNDS

SIZE	TYPE #60	TYPE #120
2		
3		
4		
6		
8	1/4 lb	1/2 lb
10	1/4 lb	1/2 lb
12	1/2 lb	1 lb
16	1/2 lb	1 lb
18	3/4 lb	1 1/2 lb
20	3/4 lb	1 1/2 lb
24	1 lb	2 lb
30	1 1/4 lb	2 1/2 lb
36	1 1/4 lb	2 1/2 lb

WARRANTY

This product has been designed for use by persons having practical skill and experience in the application of industrial epoxy materials. Before applying the user shall determine the suitability of this product for the intended use. Seller has no control over specific application of this product. The seller's sole warranty with respect to this product is that the product is of merchantable quality and the materials meet quality control standards, established by the manufacturer. Seller makes no other warranty, expressed or implied, and the seller disclaims all warranties except as set forth herein. Seller shall not be liable under any circumstances for consequential or incidental damages. Seller shall not be liable for any damage caused by storms, lightening, earthquakes, icing or other acts of nature. Seller's liability for breach of warranty hereunder is limited to the purchase price of the quantity of the seller's product proved to be defective.

Epi-Seal® Epoxy Seam Sealer



Epi-Seal Epoxy Seam Sealer, for the repair of leaking seams on welded, bolted, or riveted steel storage tanks.

Epi-Seal Epoxy Seam Sealer is a two component, reinforced epoxy resin system for high efficiency repairs on steel tanks, pipes and structures. Ideal for quickly repairing and making serviceable a wide range of leaking welded, bolted, or riveted steel storage tanks. Frequently used to fill corrosion pits on steel substrates prior to painting.

Widely used to bond and seal fiberglass spacers to steel piping.

(See [\(Epoxy Seam Sealer / FRP Spacers\)](#) literature.)

ADVANTAGES:

- Seals leaking seams and rivets or bolts permanently.
- Unaffected by fuel and crude oil, kerosene, gasoline, furnace oil, alkalis and mild acids.
- Extremely tough, yet "gives" with tank expansion and contraction.
- Excellent adhesion to clean, or sandblasted steel surfaces.
- Easy to mix and apply.
- Will not drip or sag on vertical or overhead surfaces.
- Cure can be accelerated by application of heat.

Available off the shelf in 1 lb. & 2 lb. kit sizes. Can be supplied in bulk.

PRODUCT DATA:

Color	(Base component white, curing agent black) mixed color - gray
Finish	Gloss
Vehicle Type	Epoxy resins and polyamide activators
Pigment Type	Chemical resistant pigments, fiberglass
Solvent Type	None
Flash Point, minimum	Non-flammable
% Solids by Volume	100%
Recommended Dry Film .	20 mils minimum (500 um) (per coat)
Coverage (theoretical)	6 sq. feet (0.5m) per pound at 20 mil build
Viscosity at 75°F. (24°C) .	Semi-paste
Average dry time at	To touch 4 hours. Recoat 75°F. (24°C) 8-10 hours
Recommended thinner ...	None normally required
Recommended use	Sealing of leaking seams on bolted or riveted tanks. To fill large gaps or crevices 1/8" to 1/4" (3-6mm) wide, add a small amount of silica sand to mixture to increase consistency.
Recommended primer	None required
Surface preparation	Blast cleaning recommended
Application	Short fibered brush, spatula, glove, etc.
Pot life	1 hour at 75°F. (24°C)- 1/2 hour at 95°F (35°C)
Caution	A minimum of 24 hours cure time at 75°F (24°C) must be allowed before filling tanks or subjecting to pressure. At least 48 hours at temperatures below 65°F (18°C)
Note	Do not use for heated tanks where metal temperature will exceed 160°F (71°C)

PHYSICAL PROPERTIES:

	24 hr. 72°F cure	7 day 72°F cure
Tensile Shear @ 76°F ASTM D1002	2,618 psi	2,892 psi
Tensile Strength ASTM D638	2,004 psi	3,661 psi
Flexural Strength ASTM D790	5,570 psi	5,518 psi
Compressive Yield Strength ... ASTM D695	2,400 psi	3,910 psi
Flexural Bond Strength Fed. Spec. MMM-A-1754 4.4.2	322 psi	274 psi
Elongation	1 1/2%	
Ratio by Weight -50 -50	Ratio by Volume -47 (Resin) -53 (Activator)	
Excellent Resistance to: Fresh/salt water, kerosene, gasoline, crude oil, alkalies, mild acids, solvents.		

APPLICATION INSTRUCTIONS

SURFACE PREPARATION:

1. The liquid level inside the tank to be repaired must be maintained below the leaking seams and rivets to be repaired. (Level should be maintained below repaired area for 48 hours minimum after application.
2. Sandblast to a commercial finish an area 2" to 3" on each side of the seam and a minimum of a 1" circle on the shell surface around each rivet. (For spot repairing of seams, sandblast 18" to 24" beyond each end of the leaking area.)
3. After sandblasting, there often appears some seepage of product entrapped between the plates. It is essential that this be wiped clean

using a solvent such as toluol, MEK, chloroethene, etc. (Any solvent which evaporates fast and leaves no film.)

Paint remover should never be used.

APPLICATION OF SEAM SEALER:

SEAM SEALER should be applied immediately following sandblasting - normally the area blasted in one scaffold drop. SEAM SEALER should not be applied at temperatures below 50°F or when surfaces are moist.

1. Brush away all residue from sandblasting with stiff painters duster.
2. Mix the SEAM SEALER in accordance with instructions appearing on cans. The pot life, or working time, of a mixed unit is approximately 1-1 1/2 hours at 75°F - longer at lower temperatures, shorter at higher temperatures.

To prevent waste and permit easy mixing, use a heavy duty can opener to remove the lips of the cans prior to combining the epoxy resin and hardener. For easier cool temperature mixing, warm the seam sealer to 100°-110°F.

3. Using a stiff short brush or gloved finger, apply SEAM SEALER along the seams with sufficient pressure to force it into space between plate edges. Build up a 1/4" fillet so that the material covers the edge of the overlapping plate. Spread or flare out almost one inch each side of seam.
4. Rivet heads should be completely coated with a minimum thickness of 1/8" and extending approximately 1" around the rivet. Application with a gloved finger is an easy way to apply to rivets.
5. Liquid level inside the tank should not be raised for 48 hours or more after application. If temperature is below 70°F, it is desirable to allow an additional 24 hours.

REMEMBER, THE BETTER THE SURFACE PREPARATION, THE BETTER THE BOND.

WARRANTY

This product has been designed for use by persons having practical skill and experience in the application of industrial epoxy materials. Before applying the user shall determine the suitability of this product for the intended use. Seller has no control over specific application of this product. The seller's sole warranty with respect to this product is that the product is of merchantable quality and the materials meet quality control standards, established by the manufacturer. Seller makes no other warranty, expressed or implied, and the seller disclaims all warranties except as set forth herein. Seller shall not be liable under any circumstances for consequential or incidental damages. Seller shall not be liable for any damage caused by storms, lightning, earthquakes, icing or other acts of nature. Seller's liability for breach of warranty hereunder is limited to the purchase price of the quantity of the seller's product proved to be defective.

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DP460 EPOXY ADHESIVE

Product Description:

DP460 is a 3M manufactured two-part epoxy adhesive that is packaged in a 35ml (1 1/4 fluid oz) or 200ml (8 fluid oz) self contained cartridge that eliminates any hand mixing requirements. The material is mixed and dispensed by utilizing a manual or pneumatic caulking gun type applicator. DP460 offers outstanding shear and peel adhesion, and very high levels of durability.

- Features:
- High Shear Strength
 - High Peel Strength
 - Outstanding Environmental Performance
 - Controlled Flow
 - 60 Minute Work Life
 - Easy Mixing

Typical Properties

Note: The following technical information and data should be considered representative or typical only and should not be used for specification purposes.

Product	DP460 Epoxy Adhesive / Sealant
Color	Off white
Mix Ratio (B:A) Volume (weight)	2:1 (2:0.96)
Work life, 73°F (23°C)	20 grams 60 minutes
Shore D Hardness	75-80
Coefficient of Thermal Expansion (in./in./°C)	Below Tg Above Tg
	59 x 10 ⁻⁶ 159 x 10 ⁻⁶
Dielectric Strength (ASTM D 149)	1100 volts / mil
Volume Resistivity (ASTM D 257)	2.4 x 10 ¹⁴ ohm-cm

Metals, Overlap Shear, Tested @ 73°F (23°C) (psi) (ASTM D 1002-72)	DP460 Epoxy Adhesive
Cold Rolled Steel	Oakite degrease (ASTM D 1002-72) MEK / abrade / MEK
	3500 2800
Stainless Steel	MEK / abrade / MEK
	4000
Galvanized Steel	Oakite degrease Hot dipped Electroplates
	2000 2100

Environmental Resistance

Measured by Overlap Shear Tested @ 73°F (23°C) (psi)² (ASTM D 1002-72)

Environment	Condition	Hot Dipped	Electroplated
73°F (23°C) / 50% RH	30 d	2200	2300
Distilled Water	30 d, i	2300	2300
Water Vapor	120°F (49°C) / 100% RH 30 d 200°F (93°C) / 100% RH 14 d	1900 1500	2000 1000
Antifreeze / H ₂ O (50/50)	180°F (82°C) 30 d, i	2000	1950
Isopropyl Alcohol	73°F (23°C) 30 d, i	2000	2200
Methyl Ethyl Ketone	73°F (23°C) 30 d, i	2000	2200
Trichloroethane	73°F (23°C) 30 d, i	2300	2300
Salt Spray (5%)	95°F (35°C) 30 d	1900	1500

d = days i = immersion

DP460

SEE SEPARATE SHEET FOR HANDLING & INSTALLATION INSTRUCTIONS

DP460 EPOXY ADHESIVE

Storage: Store product at 60-80°F (15-27°C) or refrigerate

Shelf Life: DP 460 has a shelf life of 15 months in the original containers

Precautionary Information: Refer to product label and MSDS for health and safety information before using this product. For additional health and safety information call 800-364-3577

APPROXIMATE USAGE RATE PER 35 ML or 200 ML CARTRIDGES
Number in () equals approximate minimum number of Spacers per cartridge

Pipe Size	Type #60 Spacer Number of Cartridges	Type #120 Spacer Number of Cartridges
2"	1 - 35 ml (6) 1 - 200 ml (30)	1 - 35 ml (3) 1 - 200 ml (15)
3"	1 - 35 ml (4) 1 - 200 ml (20)	1 - 35 ml (2) 1 - 200 ml (10)
4"	1 - 35 ml (3) 1 - 200 ml (15)	1 - 35 ml (1) 1 - 200 ml (7)
6"	1 - 35 ml (2) 1 - 200 ml (13)	1 - 35 ml (1) 1 - 200 ml (6)
8"	1 - 35 ml (1) 1 - 200 ml (10)	2 - 35 ml (1) 1 - 200 ml (5)
10"	1 - 35 ml (1) 1 - 200 ml (7)	2 - 35 ml (1) 1 - 200 ml (3)
12"	1 - 35 ml (1) 1 - 200 ml (6)	2 - 35 ml (1) 1 - 200 ml (3)
14"	1 - 35 ml (1) 1 - 200 ml (6)	2 - 35 ml (1) 1 - 200 ml (3)
16"	2 - 35 ml (1) 1 - 200 ml (5)	3 - 35 ml (1) 1 - 200 ml (2)
18"	2 - 35 ml (1) 1 - 200 ml (4)	3 - 35 ml (1) 1 - 200 ml (2)
20"	2 - 35 ml (1) 1 - 200 ml (4)	3 - 35 ml (1) 1 - 200 ml (2)
24"	3 - 35 ml (1) 1 - 200 ml (3)	4 - 35 ml (1) 1 - 200 ml (1)
30"	3 - 35 ml (1) 1 - 200 ml (2)	4 - 35 ml (1) 1 - 200 ml (1)
36"	3 - 35 ml (1) 1 - 200 ml (1)	5 - 35 ml (1) 1 - 200 ml (1)

WARRANTY

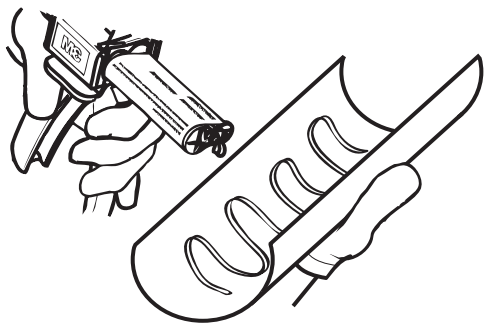
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APPLICATION INSTRUCTIONS DP-460 EPOXY / FRP SPACERS

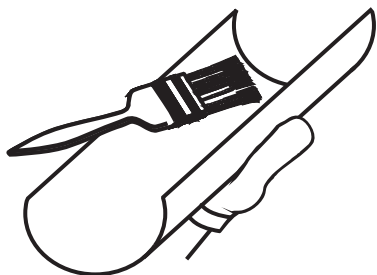
Refer to instruction sheet for properly loading cartridge onto manual applicator.

THE BETTER THE SURFACE PREPARATION THE BETTER THE BOND

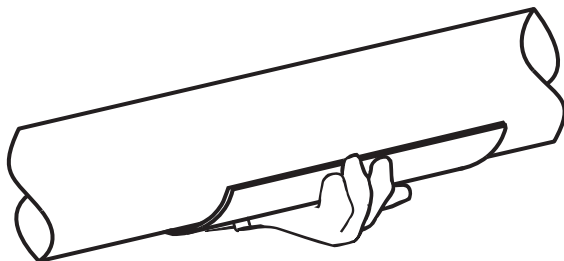


1. Verify the pipes surfaces has been grit blasted, wire brushed, or epoxy primed and is clean and dry. Roughen the inside surface of the FRP material with course emery cloth prior to applying the epoxy.

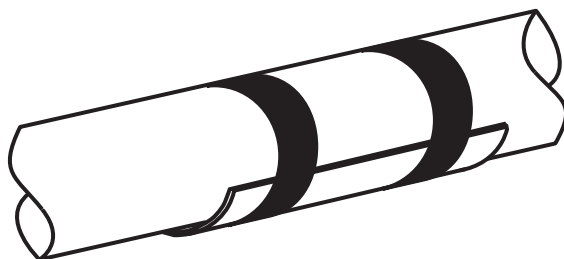
With gloved hands carefully apply the epoxy in an "S" type pattern onto the FRP.



2. Spread the material with a disposable brush so the entire inside surface of the FRP Spacer is covered. Spread evenly to prevent voids.



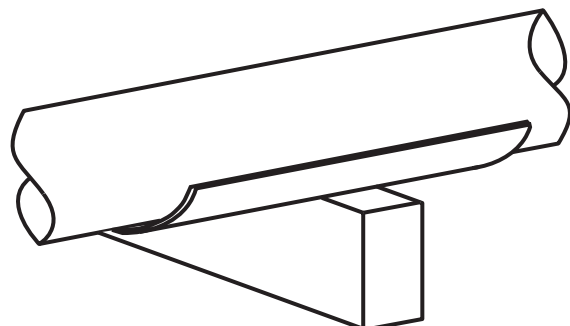
3. Position the Spacer onto the pipe so it will be centered on the support. Trowel off any excess epoxy from around the edges.



4. If the support has been removed secure the FRP Spacer until the epoxy cures.

Approximately 60 minutes @ 73°F (23°C)

Otherwise simply set back onto the support.



5. Once in place the unit can be painted to match the pipe.

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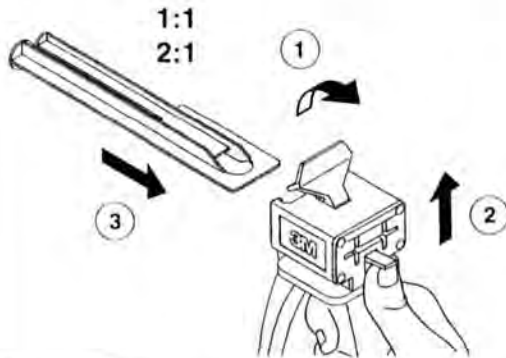
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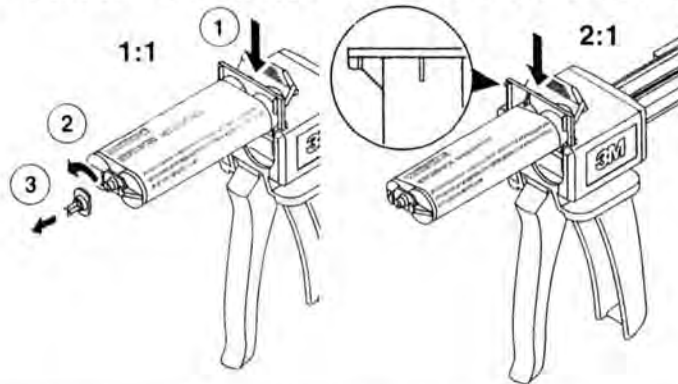
3M EPX™ Plus II Manual Applicator

Directions for Use: 1:1 and 2:1 Mix Ratio Products

1 Assemble Applicator



2 Load 3M™ Scotch-Weld™ Adhesive Duo-Pak Cartridge



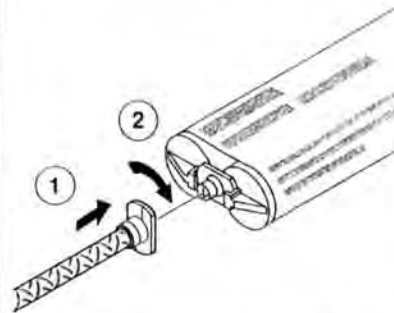
3 Dispense and Discard a Small Amount of Adhesive to Assure Correct Ratio



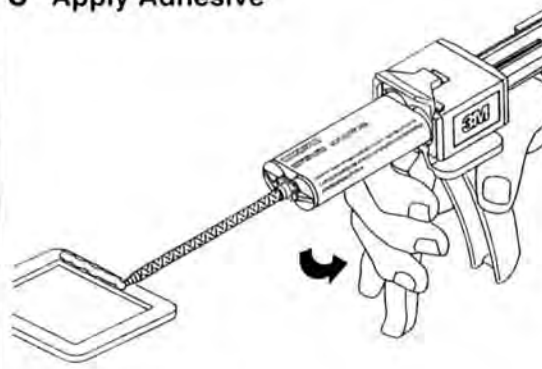
4 Cut for Desired Bead Size



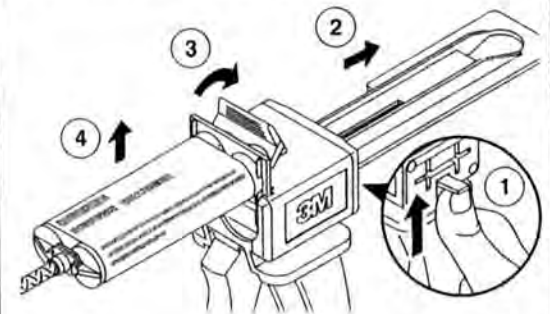
5 Attach Mixing Nozzle



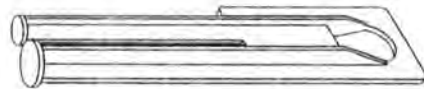
6 Apply Adhesive



7 Remove Cartridge



Plunger

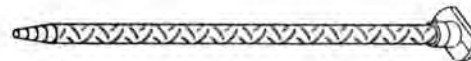


62-9170-9921-0 (2:1)



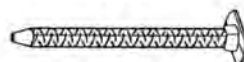
62-9170-9911-1 (1:1)

Mixing Nozzles

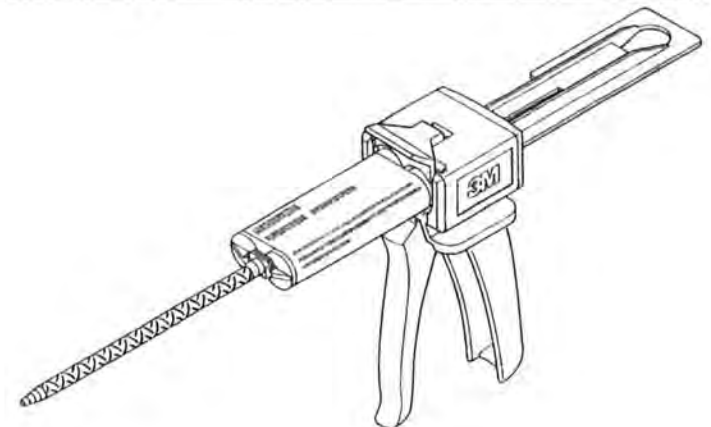


62-9742-9935-6

or



62-9171-9153-8



LIQUID BOND SEAM SEALER

Liquid Bond Seam Sealer is a surface tolerant brush able two-part epoxy developed for wet or dry steel and concrete substrates. This innovative epoxy can be applied on wet surfaces as low as 40°F (4°C).

Liquid Bond Seam Sealer is an environmentally friendly 100% solids material that can be applied when weather and/or temperature conditions would prohibit the use of our standard paste type *Epi-Seal* Epoxy Seam Sealer. **Liquid Bond Seam Sealer is generally used in conjunction with our FRP Spacers for the purpose of correcting or preventing crevice corrosion on above grade supports.**

Just like the original Seam Sealer, **Liquid Seam Sealer bonds and at the same time effectively seals the spacer-pipe interface.** This seal is critical in that it prevents moisture from accumulating between the FRP Spacer and steel pipe. The major difference is that Liquid Seam Sealer is applied by brush and can be used in temperature and weather conditions too hostile for our standard epoxy seam sealer. It is a recommended alternative.

PHYSICAL PROPERTIES

Liquid Bond is a unique modified amine cured 100% solids epoxy sealer / adhesive

TECH. DATA @ 20 MILS	ASTM TEST	VALUES
VOC	-----	0 lbs / gal (0kg/l)
Solids	-----	100% by volume
Coverages	-----	80 ft ² / gal (20 mils)
Color	-----	Gray
Pot Life @ 40°F	-----	Approx. 2 hours
Pot Life @ 70°F	-----	Approx. 90 minutes
Curing time @ 70°F	-----	4 to 8 hours
Application Temperature	-----	40°F - 120°F (4°C - 49°C)
Operating Temperature	-----	-40°F - 165°F (-40 to 74°C)
Thickness	-----	20 mils (.5 mm)
Weight per gallon	-----	12 lbs.
Resin	-----	13.4 lbs.
Hardener	-----	8.3 lbs.
Shore D Durometer	D2240	85 to 95
Impact psi	9 to 11	D2794
Taber Abrasion	D4060	185 to 225 mg / 1000 cys

See reverse side for handling and installation and instructions.

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GENERAL APPLICATION INSTRUCTIONS

Surface Preparation

Remove all contaminants that would impede bond. Remove rust, dirt, oil, grease, etc. This may include the use of high-pressure fresh water cleaning, suitable solvents or detergents to SSPC-SP-1, abrasive blast to SSPC-SP-6, or power brush clean to SSPC-SP-3. It is also desirable to roughen the inside surface of the FRP Spacer. This additional step provides an improved surface bonding profile.

Application

Environment: Use only when application and curing can proceed at temperatures above 40°F (4°C). The temperature of the surface and that of the epoxy must also be within these limits. Apply only on a clean surface.

Mixing:

1. Pour entire contents of hardener container into resin container and mix thoroughly for 2 - 4 minutes or until homogeneously mixed. Uniform gray color, no black or white streaks.

DO NOT ATTEMPT TO USE PARTIAL BATCHES. THE RATIO IS CRITICAL AND SET IN THE FACTORY TO EXACTING REQUIREMENTS.

Application:

1. Apply with a brush or roller to the pipe surface that will be accepting the FRP Spacer. Be sure the epoxy extends 1" to 2" beyond the edges of the FRP Spacer. If necessary the corresponding inside surface of spacer can also be coated prior to installation. This helps ensure the elimination of possible voids between the pipe-spacer interfaces.
2. Secure the FRP Spacer and let cure for 6 to 10 hours. The epoxy will harden in six hours @ 70°F. Final cure occurs in 7 days. Working time varies from approximately 2 hours @ 40°F to 90 minutes @ 70°F. Generally the weight of the pipe against the support is enough to keep the spacer in place during the cure period.

REMEMBER, EVEN ON A WET SUBSTRATES, THE BETTER THE SURFACE PREPARATION THE BETTER THE BOND.

WARRANTY

This product has been designed for use by persons having practical skill and experience in the application of industrial epoxy materials. Before applying the user shall determine the suitability of this product for the intended use. Seller has no control over specific application of this product. The seller's sole warranty with respect to this product is that the product is of merchantable quality and the materials meet quality control standards, established by the manufacturer. Seller makes no other warranty, expressed or implied, and the seller disclaims all warranties except as set forth herein. Seller shall not be liable under any circumstances for consequential or incidental damages. Seller shall not be liable for any damage caused by storms, lightening, earthquakes, icing or other acts of nature. Seller's liability for breach of warranty hereunder is limited to the purchase price of the quantity of the seller's product proved to be defective.

S5H13 Epoxy High Temperature Adhesive & Sealant

Description

S5H13 Epoxy Adhesive & Sealant is a high temperature special epoxy resin that after a simple ambient temperature cure can be used to bond steel, fiberglass, stainless steel, glass and ceramic materials. S5H13 is a smoothly brush able non-sag easy to apply past that will cure to handling strength over night at ambient temperatures. Produces bonds with excellent shear strength even after long term exposure to temperatures up to 325°F (163°C). Contains no solvents or volatiles. It is machine able and resistance to corrosion and most chemicals and solvents.

Applications

Used to bond and seal **HI-TEMP FRP SPACERS** to steel pipe for applications up to 325°F (163°C). Primarily used above grade to prevent or correct crevice corrosion that tends to occur at pipe to support contacts. Also used for performance bonding assembling, potting, sealing, coating and repairs.

Storage & Self Life

Shelf life is one year when stored below 90°F out of sunlight and in the original unopened containers.

Typical Physical Properties

Maximum Temperature	3250F (1630C)
Components	2 Black
Viscosity	Paste
Density gm / cc	1.9
Hardness Shore "D"	80
Tensile Strength psi	10,000
Thermal Conductivity Btu-in / hr Ft ² °F	13
Thermal Expansion x 10 ⁻⁵ / °C	6.4
Dielectric Strength volts / mil	500
Volume Resistivity ohm cm	10 ¹⁵
Heat Distortion °C	210
Elongation %	2
% (1000 hours @ 200°C)	0.5
Shrinkage % maximum	0.2
Moisture Absorption % 30 Days	0.2
Cure (hour @ room temperature)	16
Mix Ratio R/H	100/13 (13:1)

SEE APPLICATION INSTRUCTIONS ON REVERSE SIDE

GENERAL APPLICATION INSTRUCTIONS

Surface Preparation

Remove all contaminants that would impede bond. Remove rust, dirt, oil, grease, etc. This may include the use of high-pressure fresh water cleaning, suitable solvents or detergents to SSPC-SP-1, abrasive blast to SSPC-SP-6, or power brush clean to SSPC-SP-3. It is also desirable to roughen the inside surface of the FRP Spacer. This additional step provides an improved surface bonding profile.

Application

Environment: Use only when application and curing can proceed at temperatures at or above 70°F (21°C). The temperature of the surface and that of the epoxy must also be within these limits. Apply only on a clean surface.

Mixing:

1. Pour entire contents of hardener container into the resin container and mix thoroughly for 2 - 3 minutes or until homogeneously mixed. Uniform black color, no streaks.

DO NOT ATTEMPT TO USE PARTIAL BATCHES. THE RATIO IS CRITICAL AND SET IN THE FACTORY TO EXACTING REQUIREMENTS.

Application:

1. Apply with a brush or roller to the pipe surface that will be accepting the FRP Spacer. Be sure the epoxy extends 1" to 2" beyond the edges of the FRP Spacer. If necessary the corresponding inside surface of spacer can also be coated prior to installation. This helps ensure the elimination of possible voids between the pipe-spacer interfaces.
2. Secure the FRP Spacer and let cure overnight. The epoxy will harden in 16 hours @ 70°F. Working time varies from 20-30 minutes @ 70°F. Generally the weight of the pipe against the support is enough to keep the spacer in place during the cure period. However, it may be necessary to clamp the FRP Spacer in place overnight.

REMEMBER, THE BETTER THE SURFACE PREPARATION THE BETTER THE BOND.

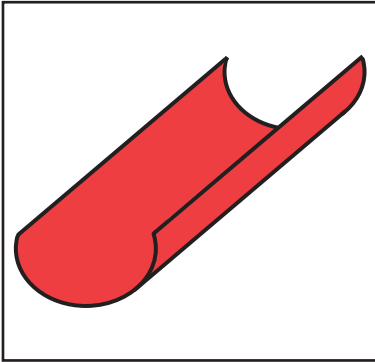
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WARRANTY

This product has been designed for use by persons having practical skill and experience in the application of industrial epoxy materials. Before applying the user shall determine the suitability of this product for the intended use. Seller has no control over specific application of this product. The seller's sole warranty with respect to this product is that the product is of merchantable quality and the materials meet quality control standards, established by the manufacturer. Seller makes no other warranty, expressed or implied, and the seller disclaims all warranties except as set forth herein. Seller shall not be liable under any circumstances for consequential or incidental damages. Seller shall not be liable for any damage caused by storms, lightning, earthquakes, icing or other acts of nature. Seller's liability for breach of warranty hereunder is limited to the purchase price of the quantity of the seller's product proved to be defective.

APPLICATION PROCEDURE

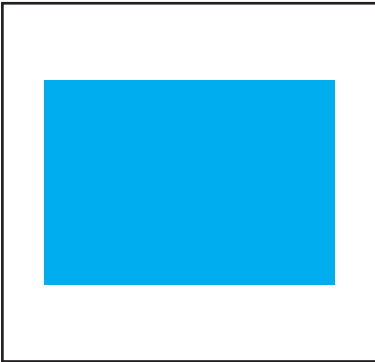
FRP SPACER / 4991 DOUBLE SIDED TAPE



1. Surface must be clean and dry. If necessary clean surface with a 50:50 mix of isopropyl alcohol & water.

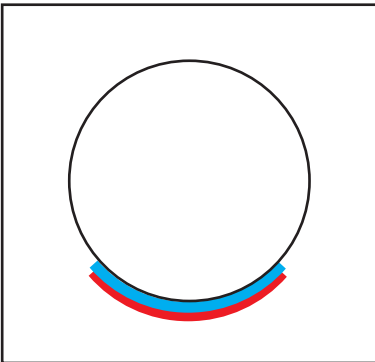
Normally the 4991 Tape is already installed on the inside surface of the FRP Spacer.

If not go to step 2, otherwise skip to step 3.



2. Cut the tape to size and apply to the inside surface of the Spacer. Tape should be applied so any seams run parallel to the Spacer.

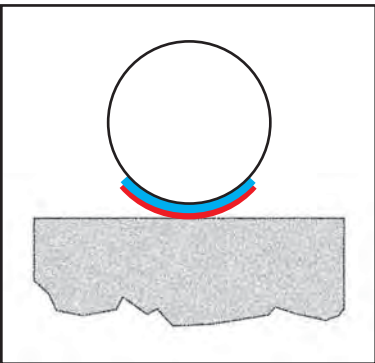
Trim any excess so edges are flush with the Spacer.



3. Remove the liner and center the FRP Spacer so it is centered on the support.

A minimum pressure of 15 psi must be applied to ensure an intimate contact with the FRP & steel substrates.

4. If desired paint to match.



5. The weight of the pipe is usually enough to keep the FRP Spacer in place.

Application Temperature: 60°F (15°C) to 100°F (38°C)

Service Temperature: -30°F to + 150°F (-35°C to + 66°C)

Not suitable for shear type applications

Continuous pipe movement requires a Non-Conductive Roller support.

4991 DOUBLE SIDED TAPE

Product Description: 4991 is a 3M double sided tape made with acrylic foam which is viscoelastic in nature. This gives the foam energy absorbing and stress relaxing properties. The acrylic chemistry provides outstanding durability performance and moisture resistance.

Features: Conformability, high tensile strength, moisture resistance, high shear and peel adhesion.

Typical Properties	4991 Double Sided Tape
Color	Gray
Thickness	.09" (2.3 mm)
Dynamic Adhesion Performance: 90° Peel Adhesion (ASTM D3330) Normal Tensile (ASTM D-897) Dynamic Overlap Shear (ASTM D-1002)	20 lb/in (350 N/100mm) 70 lb/in ² (480 kPa) 65 lb/in ² (450 kPa)
Dielectric Breakdown Strength (ASTM D 149) Dielectric Constant (ASTM D 150)	360 (in volts/mil) 2.29 @1 kHz 1.99 @1 MHz
Resistivity (ASTM D257): Volume Resistivity (in ohm-cm) Surface Resistivity (in ohms/square)	2.1 x 10 ¹⁴ 2.7 x 10 ¹⁴
Moisture Resistance: Steel/aluminum substrate room temp. 72 hr. submersion (water & salt water)	% adhesion retention Water 100% Salt Water 100%

Shelf Life: 24 months from date of manufacture when stored at 40°F to 100°F (40°C to 38°C) and 0-95% relative humidity. Optimum storage conditions 72°F (22°C) and 50% relative humidity.

Application Techniques: Most substrates are best prepared with a 50:50 mix of isopropyl alcohol and water.

Thermal Expansions/Contraction: Assuming good adhesion to substrate, tape can typically tolerate differential movement in the shear plane up to three times the thickness.

Temperature: Application range is 60°F (15°C) to 100°F (38°C)

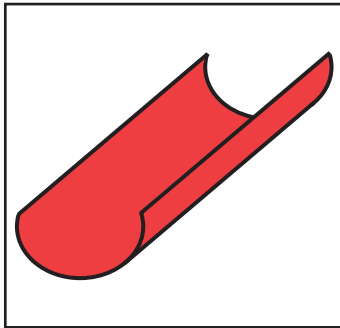
Bond Strength Time @ 70°F (21°C): 50% after 20 minutes - 90% after 24 hours 100% after 72 hrs. 4991 is designed for use on high and medium energy substrates including steel stainless, carbon steel, galvanized steel, aluminum, cooper, alkyd enamel, epoxy paint, polyurethane and powder coatings.

Technical information and data is representative or typical only and should not be used for specification purposes. Field evaluations should be conducted to verify suitability for any particular installation

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APPLICATION PROCEDURE

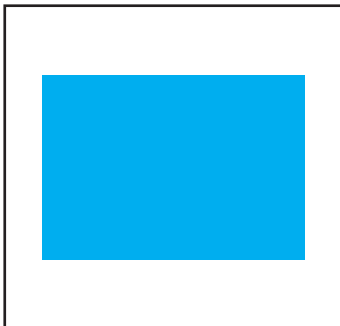
FRP SPACER / MOLDABLE SEALANT



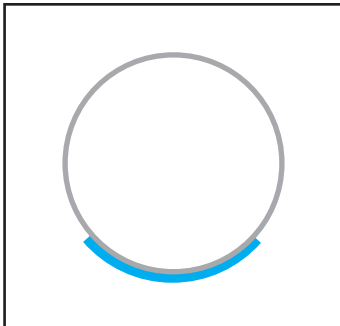
1. Surface must be clean and dry. If necessary remove oil and grease with suitable detergent. Remove rust, dirt, dust, etc. by wire brushing or grit blasting to a SSPC 6 commercial blast.

Not suitable for shear type applications

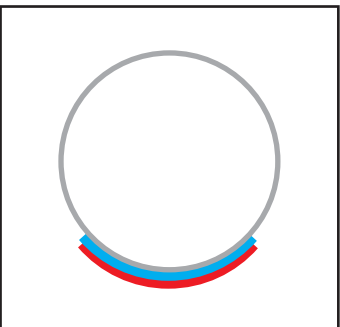
Significant pipe movement requires roller supports.



2. Cut to size so that 1/8" to 1/4" of the Moldable Sealant will extend beyond the edges of the FRP Spacer.



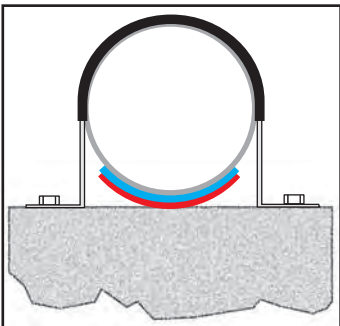
3. Remove release liner on one side and apply the Moldable Sealant to the section of pipe to be protected. Be sure all voids and crevasses have been filled.



4. Remove the remaining liner and center the FRP Spacer onto the Moldable Sealant. Be sure the sealant extends beyond the edges of the spacer.

5. Paint to match.

NOTE: Coating the assembly prevents the exposed edges of the sealant from gradually drying out.



6. The weight of the pipe is usually enough to keep the FRP Spacer in place.

Application Temperature: above -10°F (12°C)

Service Temperature: -30°F to + 150°F (-35°C to + 66°C)

MATERIAL REQUIREMENTS FOR MOLDABLE SEALANT

1 Roll Moldable Sealant = 6" wide x 50' long (25 sq/ft.)

PIPE SIZE	TYPE#	APPROX. MATERIAL REQUIREMENTS SQ/IN	APPROX. MATERIAL REQUIREMENTS SQ/FT
2"	60	15	.1
	120	30	.2
3"	60	22	.15
	120	44	.30
4"	60	29	.2
	120	58	.4
6"	60	42	.3
	120	84	.6
8"	60	54	.4
	120	108	.8
10"	60	68	.5
	120	136	1.0
12"	60	81	.6
	120	162	1.2
14"	60	88	.62
	120	176	1.24
16"	60	101	.7
	120	202	1.4
18"	60	114	.8
	120	228	1.6
20"	60	126	.9
	120	252	1.8
24"	60	151	1.0
	120	302	2.0
30"	60	189	1.3
	120	378	2.6
36"	60	227	1.6
	120	454	3.2

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TAPECOAT®

Product Data

MOLDABLE SEALANT

Water tight, conformable coating for protection of irregular surfaces

THE TAPECOAT COMPANY

A Division of TC Manufacturing Co., Inc.
P.O. Box 631, Evanston, Illinois 60204-0631, USA
1527 Lyons Street, Evanston, Illinois, 60201, USA
Telephone: 708-866-8500
Fax: 708-866-8596

Also available from:

GLAS MESH COMPANY®

P.O. Box 1718
West Chester, PA 19380
610-696-9220 • Fax 610-344-7519
www.glasmesh.com

Basic Use

Moldable sealant is a conformable water tight coating for irregular surfaces, such as bolt style mechanical couplings, bell and spigot joints saddle tees or leak clamps; as a sealant in vaults, on underground tracer wire and other low voltage manual wire connections, on anode wire connections, as an insulating adhesive with shrinkable tubing.

Composition

Moldable sealant is a 100% solids formulation of thermoplastic elastomeric and synthetic resins.

Technical Data

Service temp:	-30° to 150°F (-35° to 66°C)
Application temp:	Above -10°F (-12°C)
Total thickness:	60 mils (1.52 mm)
Adhesion:	165 oz/in width
Flexibility:	1/2" radius @ -20°F; No cracking
Dielectric Strength:	Exceeds 16 kV
Cathodic disbonding:	Pass (ASTM G-8)
Insulation resist.:	10 ⁶ megohms
Water absorption:	Less than .05%

Surface Preparation

Surface must be clean and dry. Moisture, dust, dirt, rust or other foreign matter should be removed by scraping or wire brushing. Remove oil and grease, etc. with suitable detergent. Optional cleaning method SSPC 6 Commercial Blast.

Application:

- **Priming:** TC Coldprime Primer has been developed specifically for use with Moldable Sealant. The coverage is approximately 400 square feet per gallon. Let TC Coldprime dry to a tacky consistency before applying Moldable Sealant.
- **Sealant Application:** Remove the release liner on one side of the moldable sealant and apply to the surface to be protected. Remove the remaining liner and use it as an aid in molding the sealant until all voids and crevasses have been filled. Liner may then be used as an overwrap for additional mechanical protection.

Technical Service

The Tapecoat Company sales and service representatives are located in all major metropolitan areas throughout the United States and Canada. Tapecoat agents are also strategically positioned around the world. In addition, laboratory facilities and complete technical services are available from the home office in Evanston, Illinois.

WARRANTY: This product has been designed for use by persons having practical skill and experience in application of industrial coatings. Before using, user shall determine the suitability of this product for his intended use. Since seller has no control over the specific application of this product, seller's sole warranty with respect to such product is that it is of merchantable quality and meets the quality control standards of The Tapecoat Company.

Seller makes no other warranty, express or implied, and seller disclaims all warranties except as set forth herein.

Seller shall not be liable under any circumstances for consequential or incidental damages. Seller's liability for breach of warranty hereunder is limited to the purchase price of the quantity of the seller's proved to be defective.

SECURING FRP TO POLYETHYLENE & LOW ENERGY SUBSTRATES

- DP 8010 STRUCTURAL PLASTIC ADHESIVE & MANUAL APPLICATOR
- 4952 TWO SIDED STRUCTURAL TAPE

DP-8010 STRUCTURAL ADHESIVE

Product Description:

DP-8010 is a 3M manufactured two part acrylic-based adhesive that is packaged in a 38ml (1.28 fluid oz) or 265ml (8.9 fluid oz) self contained cartridge that eliminates any hand mixing requirements. The material is mixed and dispensed by utilizing a manual or pneumatic caulking gun type applicator. DP-8010 can bond many low surface energy plastics including many grades of polyethylene.

Application: Used to bond FRP Spacers, Shields, & Saddles to polyethylene type pipe coatings, tapes and other low energy type substrates. Recommended for securing FRP Shields to Pritec coated bridge mains.

Typical Properties

Note: The following technical information and data should be considered representative or typical only and should not be used for specification purposes.

Product	DP-8010 Acrylic Adhesive
Color	Yellow
Mix Ratio (A:B) Volume (Weight)	1:10 (1:9.8)
Work life, 73°F (23°C)	10-12 minutes
Full Cure Time @ 73°F (23°C)	8-24 hours
Coefficient of Thermal Expansion (ppm/in./°C) ⁽²⁾	Below Tg 133 Above Tg 171
Mechanical Properties ⁽³⁾	
Strain at break	3%
Stress at break (MPa)	13
Modulus at 1% Strain (MPa)	483

(2) Tg and CTE determined by TMA -40°F -120°C at 5°C/min (after 2 heat cycles)

(3) Mechanical properties obtained using Sintech 5GL mechanical tester. Approximate dimensions of the specimen was 1.5 x 0.5 x 0.3 Elongation was determined by crosshead displacement. Crosshead velocity was 0.5/min

Overlap Shear Strength ⁽⁴⁾, Tested @ 75°F (24°C) ASTM D1002

Substrate ⁽⁵⁾	OLS (MPa)	Failure Mode
UHMWPE	5.2	Substrate yield
LDPE	2.4	Substrate yield
Black HDPE	5.9	Cohesive failure
Rigid PVC	10.9	Mixed cohesive / substrate
G-FRP	12.8	Mixed mode failure
Cold Rolled Steel / HDPE	5.8	Adhesive to CRS

(5) In many cases bond performance depends upon the specific grade of material used.

Environmental Exposure Tests ⁽⁶⁾

Overlap Shear Strength of HDPE Bonds

Condition	Time	Temp	OLS (MPa)	Failure Mode
Control	-	24°C (75°F)	10.6	Substrate
41°C/100%RH	14 days	41°C (106°F)	8.0	Cohesive
41°C/100%RH	30 days	41°C (106°F)	7.7	Cohesive
Water Soak	14 days	71°C (160°F)	8.2	Cohesive

(6) Environmental tests were conducted by immersing bonded coupons of extruded PP to extruded HDPE prepared in accordance to description in footnote 4.

SEE SEPARATE SHEET FOR HANDLING & INSTALLATION INSTRUCTIONS

DP 8010 STRUCTURAL ADHESIVE

Storage: For maximum shelf life, store product at 4°C (40°F) or below.

Shelf Life: DP-8010 has a shelf life of 6 months in the original containers.

Precautionary Information: Refer to product label and MSDS for health and safety information before using this product. For additional health and safety information call 800-364-3577

APPROXIMATE USAGE RATE PER 38 ML or 265 ML CARTRIDGES
Number in () equals approximate minimum number of Spacers per cartridge

Pipe Size	Type #60 Spacer Number of Cartridges	Type #120 Spacer Number of Cartridges
2"	1 - 35 ml (6) 1 - 200 ml (30)	1 - 35 ml (3) 1 - 200 ml (15)
3"	1 - 35 ml (4) 1 - 200 ml (20)	1 - 35 ml (2) 1 - 200 ml (10)
4"	1 - 35 ml (3) 1 - 200 ml (15)	1 - 35 ml (1) 1 - 200 ml (7)
6"	1 - 35 ml (2) 1 - 200 ml (13)	1 - 35 ml (1) 1 - 200 ml (6)
8"	1 - 35 ml (1) 1 - 200 ml (10)	2 - 35 ml (1) 1 - 200 ml (5)
10"	1 - 35 ml (1) 1 - 200 ml (7)	2 - 35 ml (1) 1 - 200 ml (3)
12"	1 - 35 ml (1) 1 - 200 ml (6)	2 - 35 ml (1) 1 - 200 ml (3)
14"	1 - 35 ml (1) 1 - 200 ml (6)	2 - 35 ml (1) 1 - 200 ml (3)
16"	2 - 35 ml (1) 1 - 200 ml (5)	3 - 35 ml (1) 1 - 200 ml (2)
18"	2 - 35 ml (1) 1 - 200 ml (4)	3 - 35 ml (1) 1 - 200 ml (2)
20"	2 - 35 ml (1) 1 - 200 ml (4)	3 - 35 ml (1) 1 - 200 ml (2)
24"	3 - 35 ml (1) 1 - 200 ml (3)	4 - 35 ml (1) 1 - 200 ml (1)
30"	3 - 35 ml (1) 1 - 200 ml (2)	4 - 35 ml (1) 1 - 200 ml (1)
36"	3 - 35 ml (1) 1 - 200 ml (1)	5 - 35 ml (1) 1 - 200 ml (1)

WARRANTY

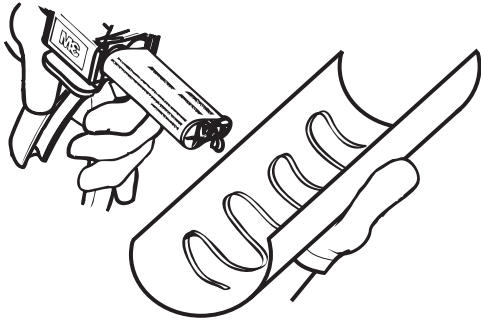
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APPLICATION INSTRUCTIONS DP-8010 / FRP SPACERS

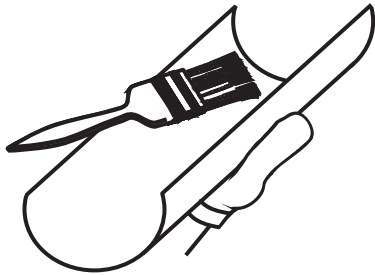
Refer to instruction sheet for properly loading cartridge onto manual applicator.

THE BETTER THE SURFACE PREPARATION THE BETTER THE BOND

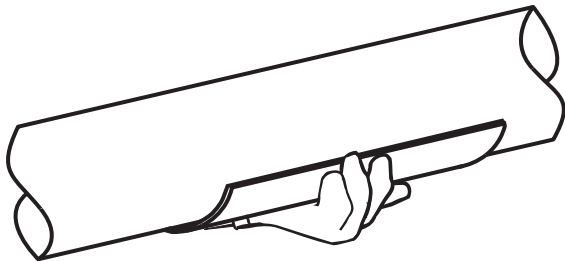


1. Verify the coated surface is clean and dry. Wipe with isopropyl alcohol to remove contaminants and moisture. Roughen the inside surface of the FRP material with coarse emery cloth prior to applying the adhesive.

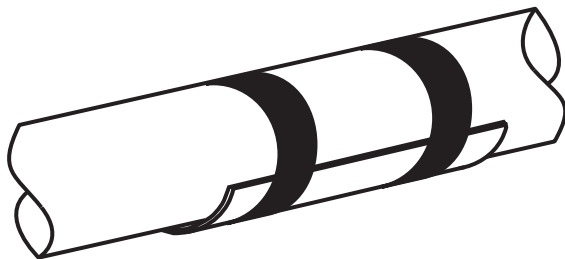
With gloved hands carefully apply the epoxy in an “S” type pattern onto the FRP.



2. Spread the material with a disposable brush so the entire inside surface of the FRP Spacer is covered. Spread evenly to prevent voids.



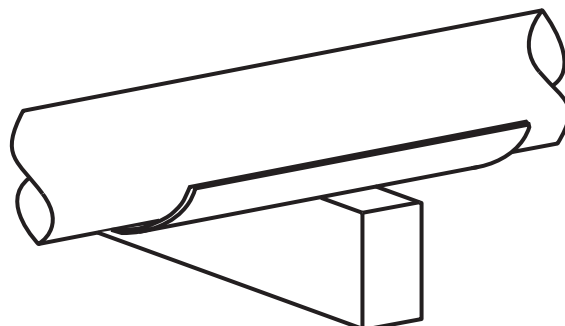
3. Position the Spacer onto the pipe so it will be centered on the support. Trowel off any excess adhesive from around the edges.



4. If the support has been removed secure the FRP Spacer until the adhesive cures.

8-24 hours @ 73°F (23°C)

Otherwise simply set back onto the support.



5. Once in place the unit can be painted to match the pipe.

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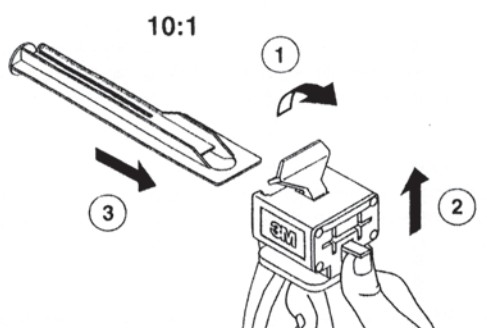
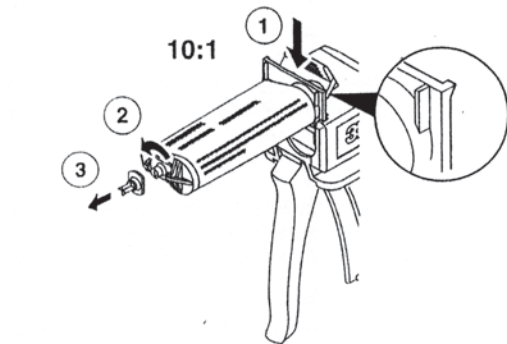
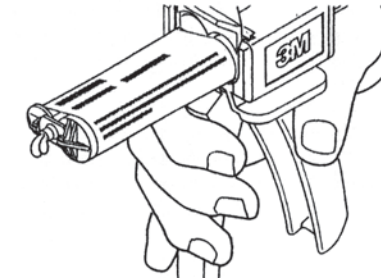
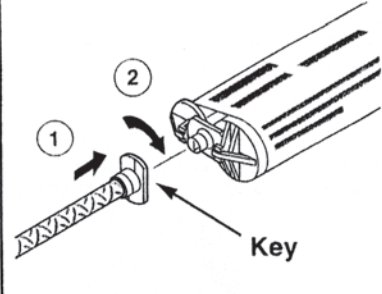
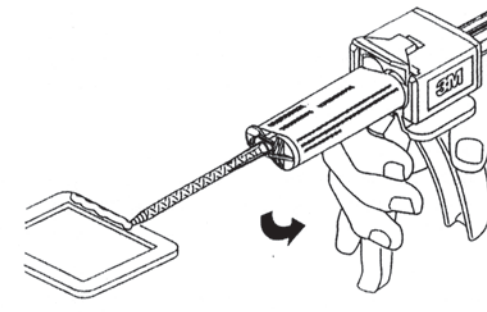
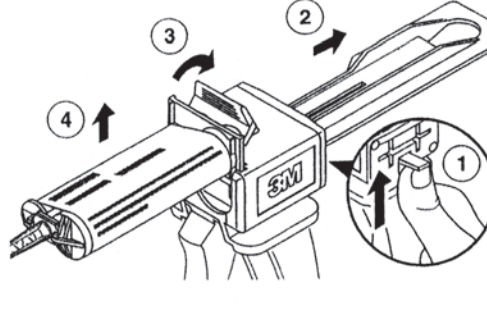
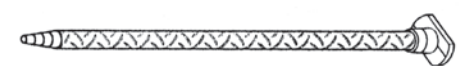
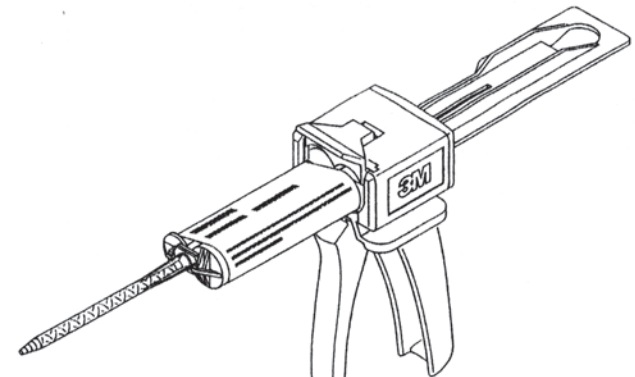
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3M EPX™ Plus II Applicator Plunger 10:1

Converting EPX Plus II Applicator

For Use With 10:1 3M™ Scotch-Weld™ Duo-Pak Products

Directions for Use: 10:1 Plunger

1 Assemble Applicator 	2 Load Duo-Pak Adhesive Cartridge 	3 Dispense and Discard a Small Amount of Adhesive to Assure Correct Ratio 	
4 Cut for Bead Size 	5 Attach Mixing Nozzle 	6 Apply Adhesive 	7 Remove Cartridge 
Plunger  10:1 - 62-9170-9910-3	Mixing Nozzle  62-9164-9930-4		

4952 DOUBLE SIDED TAPE

APPLICATIONS:

4952 is suggested whenever a FRP Shield, Saddle or Spacer needs to be secured to a polyethylene based pipe coating like Pritec and H-35 Gray.

The 4952 Double Sided Tape was developed for use on low energy substrates like polyethylene, polypropylene, silicone, PVA, powder paint and polystyrene.

To help secure a FRP Type #240 Shield or FRP Type #180 Saddle to a bridge main, simply place one 2" strip the bottom length of the Shield or Saddle. Remove the liner, center on the pipe and push or snap into place.



6" Type #240 Shield w/4952



6" Type #120 Spacer w/4952

TAPE APPLIED TO THE BOTTOM CENTER

The purpose of the tape is to keep the FRP material in its proper position on the pipe when protecting low energy coatings.

Application Techniques: Most substrates are best prepared with a 50:50 mix of isopropyl alcohol and water to ensure the surface is clean and dry.

Temperature: Application range is 50°F (10°C) to 100°F (38°C)

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4952 DOUBLE SIDED TAPE

Product Description: 4952 is a 3M double sided tape made with acrylic foam which is viscoelastic in nature. This gives the foam energy absorbing and stress relaxing properties. Utilizes a low surface energy adhesive on a firm foam. Provides outstanding durability performance and moisture resistance.

Features: Conformability, high tensile strength, moisture resistance, high shear and peel adhesion.
Used to bond FRP Shields, Spacers to Pritec & other polyethylene substrates.

Typical Properties	4952 Double Sided Tape
Color	White
Thickness	.045" (1.1 mm)
Dynamic Adhesion Performance: 90° Peel Adhesion (ASTM D3330) Normal Tensile (ASTM D-897) Dynamic Overlap Shear (ASTM D-1002)	25 lb/in (440 N/100mm) 80 lb/in ² (550 kPa) 80 lb/in ² (550 kPa)
Static Shear (ASTM D3654) Grams that 1/2" will hold 10,000 minutes (7 days) @ 72°F (22°C) @ 15°F (66°C)	1500 g/.5 in ² (6.6 lb/in ²) 500 g/.5 in ² (2.2 lb/in ²)
Temperature Tolerance Short Term °F (°C) Minutes, Hours Long Term °F (°C) Days, Weeks	200 (93) 100 g/static load 160 (71) maximum 250 g/static load per 0.5 in ² in static load for 7 days
Moisture Resistance: Steel/aluminum substrate room temp. 72 hr. submersion (water & salt water)	% adhesion retention Water 100% Salt Water 100%

Shelf Life: 24 months from date of manufacture when stored at 40°F to 100°F (40°C to 38°C) and 0-95% relative humidity. Optimum storage conditions 72°F (22°C) and 50% relative humidity.

Application Techniques: Most substrates are best prepared with a 50:50 mix of isopropyl alcohol and water.

Thermal Expansions/Contraction: Assuming good adhesion to substrate, tape can typically tolerate differential movement in the shear plane up to three times the thickness.

Temperature: Application range is 50°F (10°C) to 100°F (38°C)

Bond Strength Time @ 70°F (21°C): 50% after 20 minutes - 90% after 24 hours 100% after 72 hrs. 4952 is designed for use on high and medium energy substrates including steel stainless, carbon steel, galvanized steel, aluminum, cooper, alkyd enamel, epoxy paint, polyurethane and powder coatings.

Technical information and data is representative or typical only and should not be used for specification purposes. Field evaluations should be conducted to verify suitability for any particular installation

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GLAS MESH COMPANY SPECIFICATION SHEET

MATERIAL DATA

A filament wound ultra violet protected fiberglass reinforced epoxy with integral epoxy liner and exterior coating. Sub-zero temperatures will not affect physical properties. Typical glass content by weight is 70% - 75%.

DIMENSIONAL DATA

Nominal Size (inches)	Nominal OD (inches)	Nominal ID (inches)	Nominal Wall Thickness (inches)	Nominal Weight (lbs/ft)
2	2.46 - 2.48	2.3	.08 - .09	.5
3	3.66 - 3.68	3.5	.08 - .09	.7
4	4.68 - 4.70	4.5	.09 - .10	1.0

PHYSICAL PROPERTIES

Property	Units	Value	ASTM Test
Specific Gravity	Dimension less	1.81	D792
Density	lb/cu in	.068 - .082 lb/in ³	D792
Thermal Conductivity	BTU/hr/ft ² in/ ⁰ F	1.92 - 2.20	D177
Thermal Coefficient of Linear Expansion	10 ⁻⁵ in/in/ ⁰ F	0.69 (2-4 in)	D696
Barcol Hardness	-----	75	----

MECHANICAL PROPERTIES

Property	Units	Value	ASTM Test
Tensile Strength	psi	50,000	D2105
Tensile Modulus	10 ⁶ psi	4.5	D2105
Compressive Strength	psi	40,000	D695
Flexural Strength	psi	50,000	D790
Shear Strength	psi	20,000	----

ELECTRICAL PROPERTIES

Property	Units	Value	ASTM Test
Dielectric Strength (short time perpendicular)	Volt/mil	400- 500	D149-61
Dielectric Strength (short time step by step)	10 ⁸ meg ohms	350 -420	D149-61
Insulation Resistance	10 ⁸ meg ohms	@23 ⁰ C	D257-61
Dielectric Constant	60 cps	4.7	D150-64T
Dielectric Constant	1 Mc	4.5	D150-64T

GLAS MESH COMPANY SPECIFICATION SHEET

MATERIAL DATA

A hand layed-up fiberglass reinforced polyester resin with integral liner and exterior coating. Reinforcements include 1 ½ oz. Mat and 24 oz. Woven roving. Sub-zero temperatures will not affect physical properties. Highly pigmented and gel coated for long term durability and ultra-violet resistance.

DIMENSIONAL DATA

Nominal Size (inches)	Nominal OD (inches)	Nominal ID (inches)	*Nominal Wall Thickness (inches)	Nominal Weight (lbs/ft)
¾	1.25	1.0	.125	.1
1	1.55	1.3	.125	.2
1 ½	2.15	1.9	.125	.3
6	6.85	6.6	.125	1.7
8	8.85	8.6	.125	3.3
10	11.12	10.75	.187	4.7
12	13.12	12.75	.187	6.3
14	14.5	14	.25	7.4
16	16.50	16	.25	10.6
18	18.50	18	.25	13.7
20	20.50	20	.25	17.5
24	24.50	24	.25	21
30	30.50	30	.25	25
36	36.50	36	.25	30
42	42.50	42	.25	35

*Wall thickness can vary .0625

PHYSICAL PROPERTIES

Property	Units	Value	ASTM Test
Specific Gravity	lb/cu/in	.005	D792
Density	lb/cu in	.055	D792
Thermal Conductivity	BTU/hr/ft ² in/ ⁰ F	1.5	D177
Coefficient of Thermal Expansion	10 ⁻⁵ in/in/ ⁰ F	15-19 x 10 ⁻⁴	D696

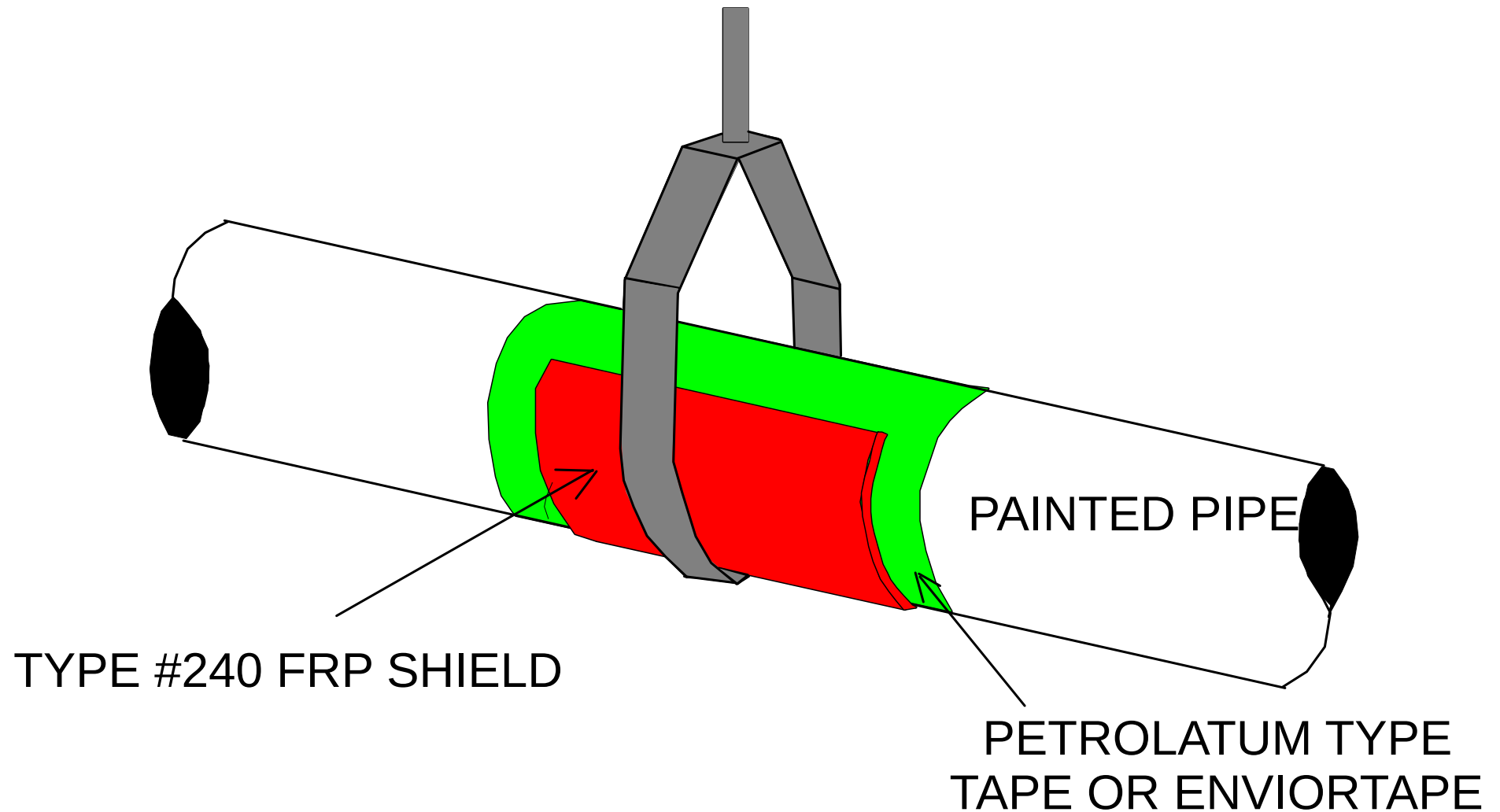
MECHANICAL PROPERTIES

Property	Units	Value	ASTM Test
Ultimate Tensile	psi	12,000	D638
Compressive Strength	psi	24,000	D695
Flexural Modulus	psi	800,000 – 900,000	D790
Flexural Strength	psi	19,000 – 20,000	D790

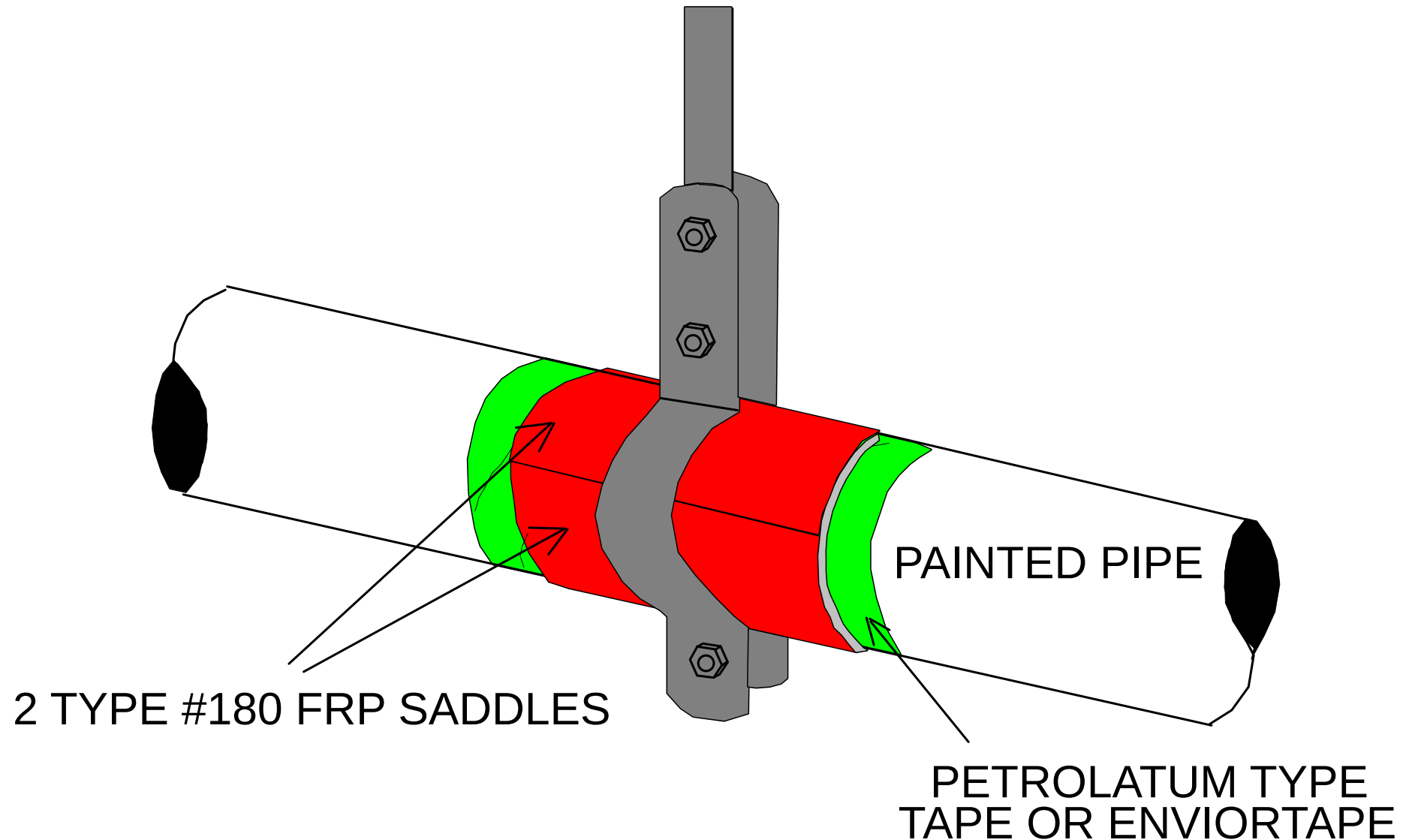
ELECTRICAL PROPERTIES

Property	Units	Value	ASTM Test
Dielectric Strength (perpendicular to lamination)	VMP in Oil	350	D149
Volumetric Resistivity	Ohms/cm	10 ¹³ - 10 ¹⁵	D257

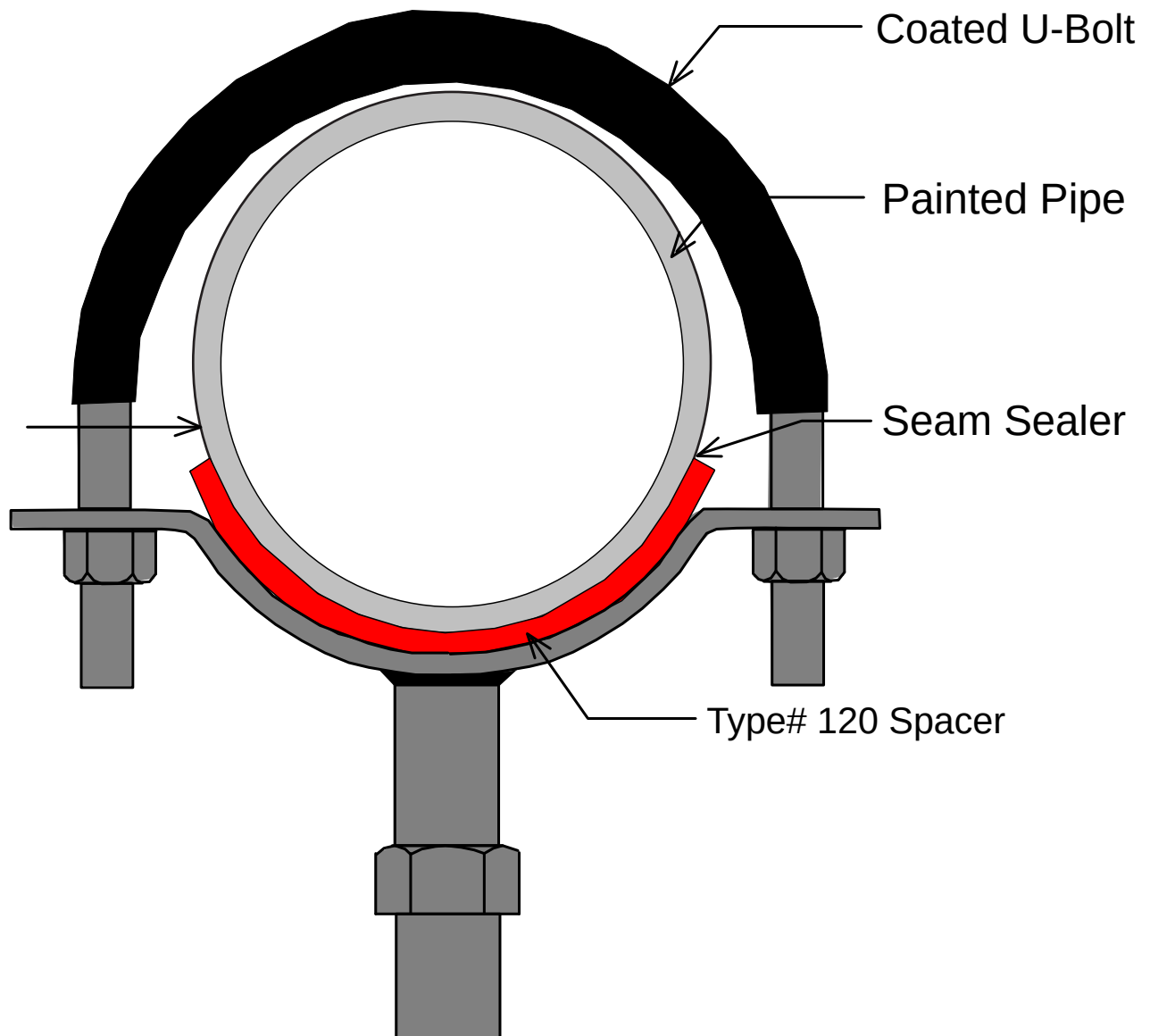
RECOMMENDED MATERIALS FOR ABOVE GRADE THIN BARRIER COATINGS



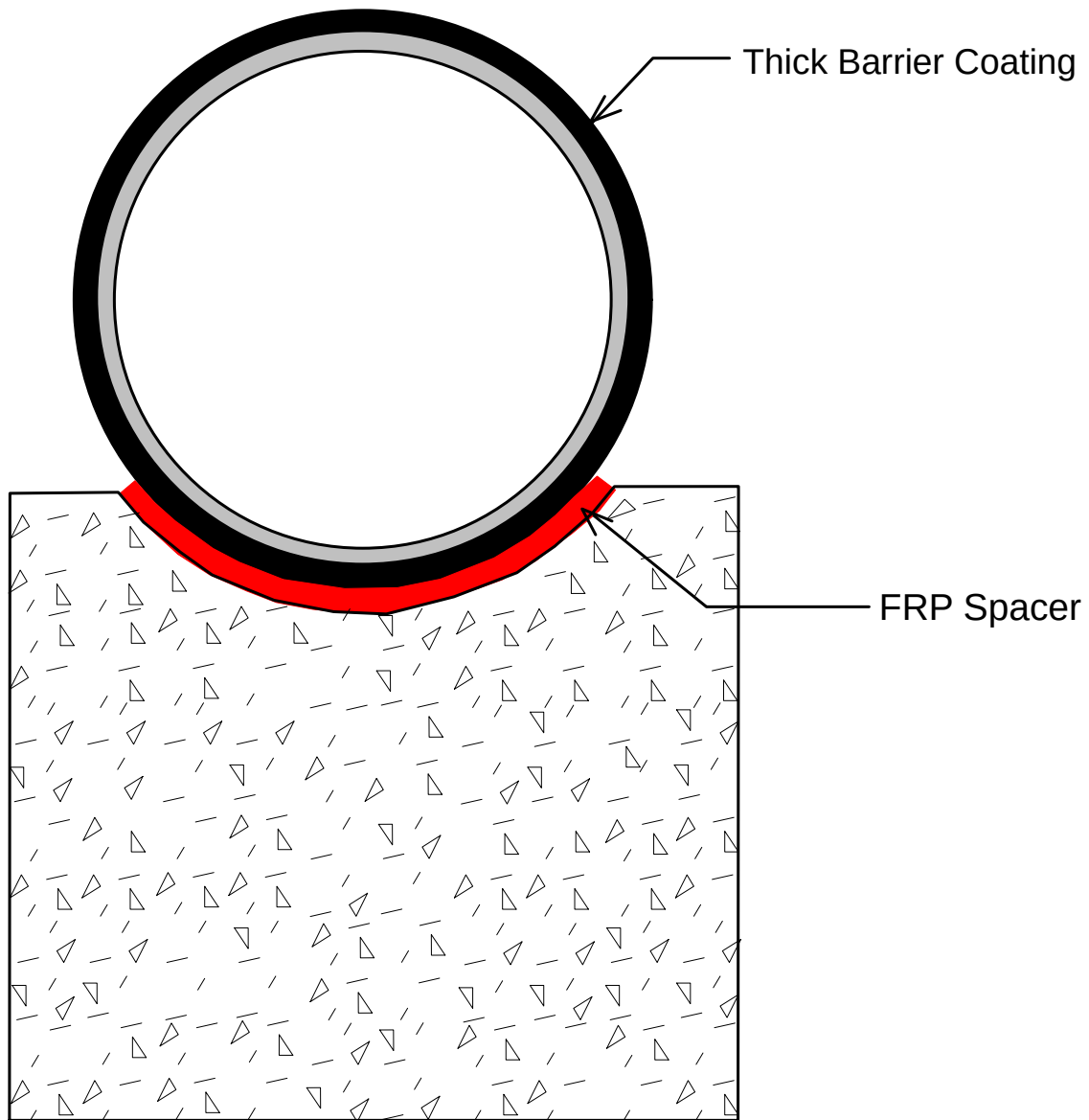
Clamp Type Hanger Material Selections



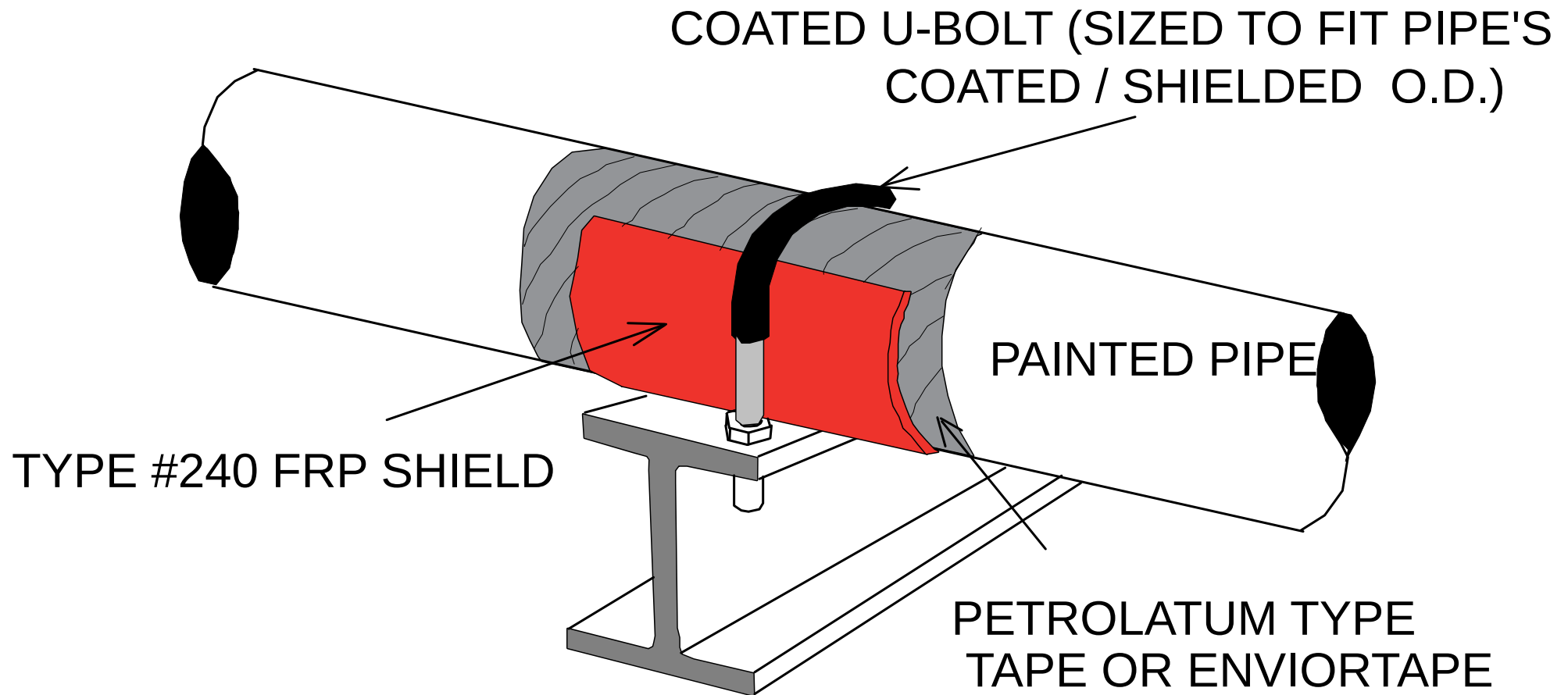
Pipe Support with U-Bolt



Concrete Saddle Support

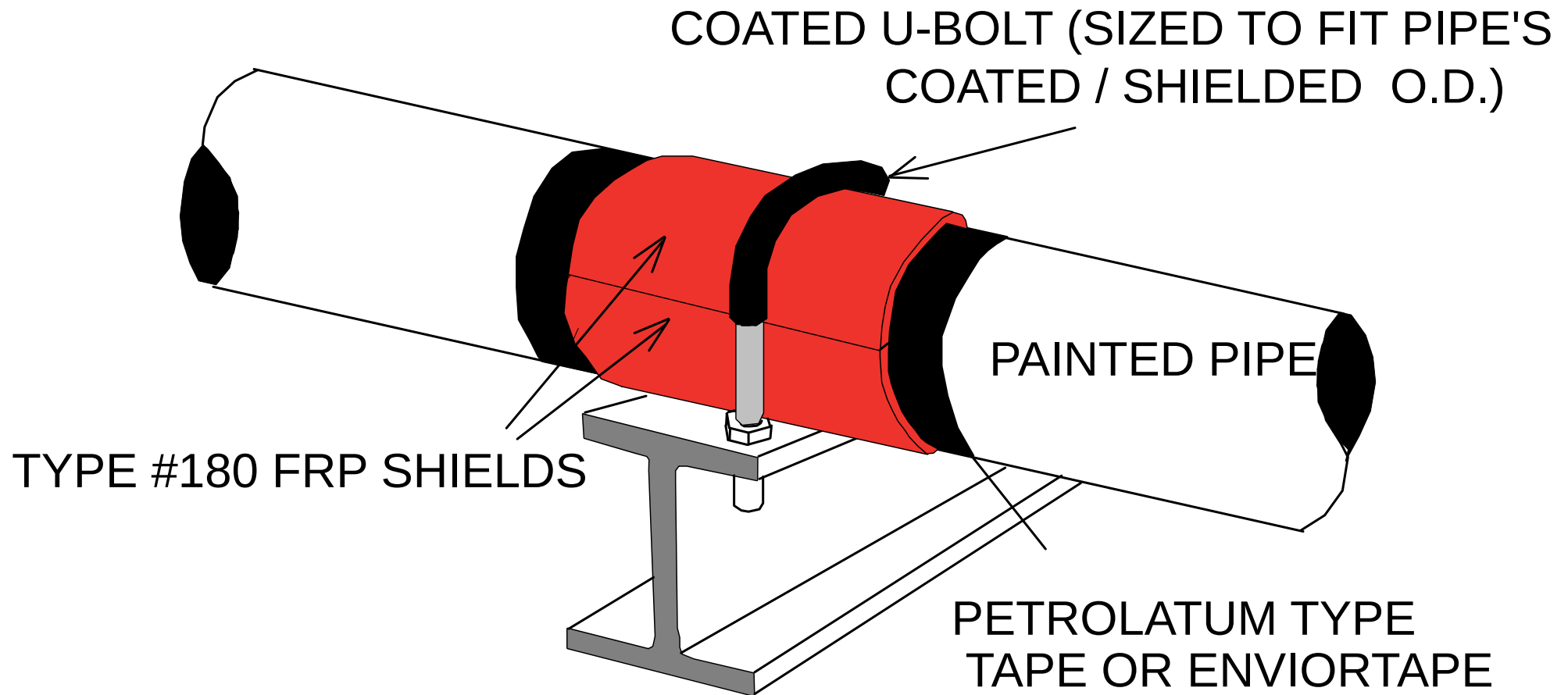


PRODUCTS PIPELINE SUPPORT DETAIL

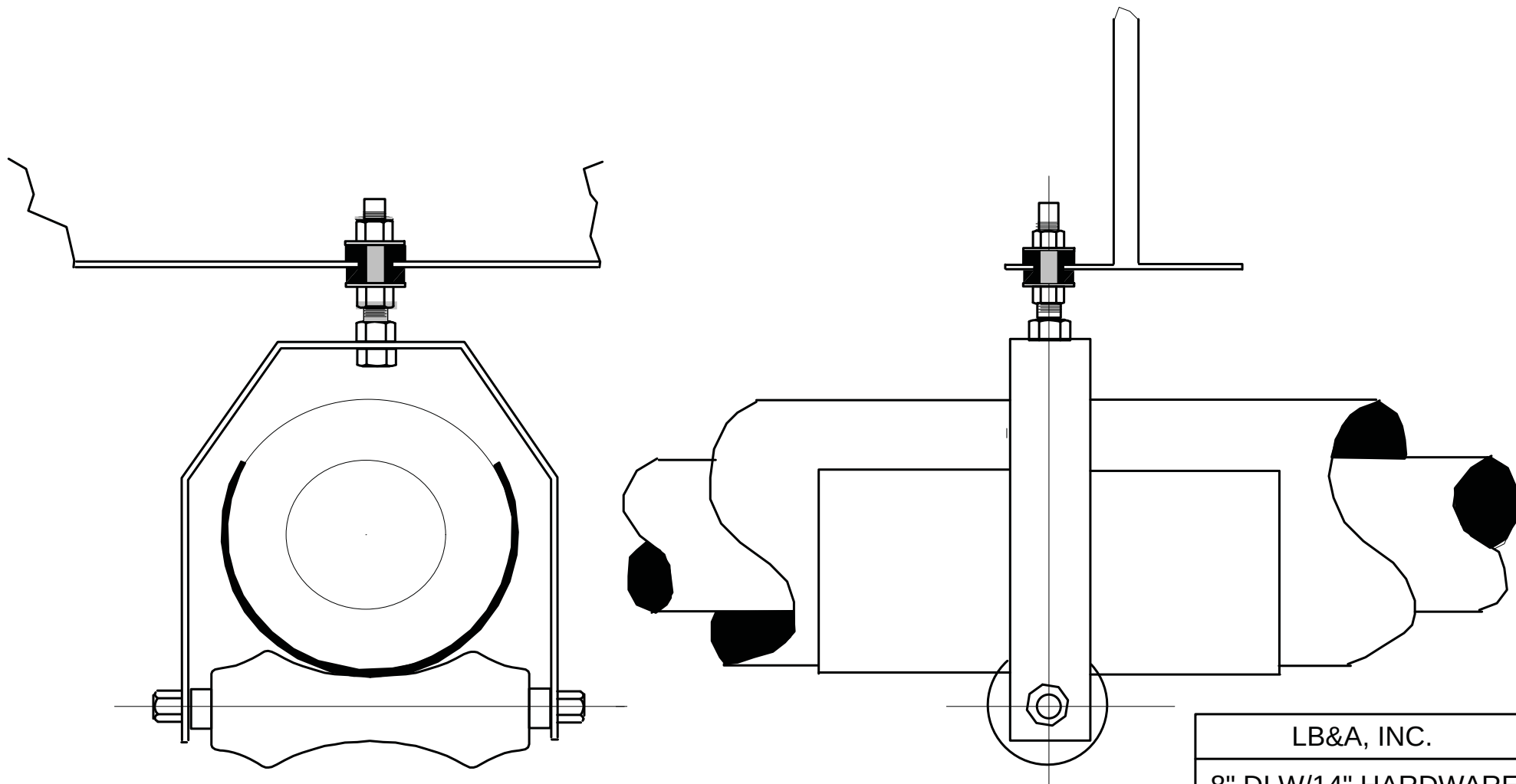


GLAS MESH CO.	
PIPELINE SUPPORT	
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DRAWN BY CED	DWG NO. GARY4a

PRODUCTS PIPELINE SUPPORT DETAIL

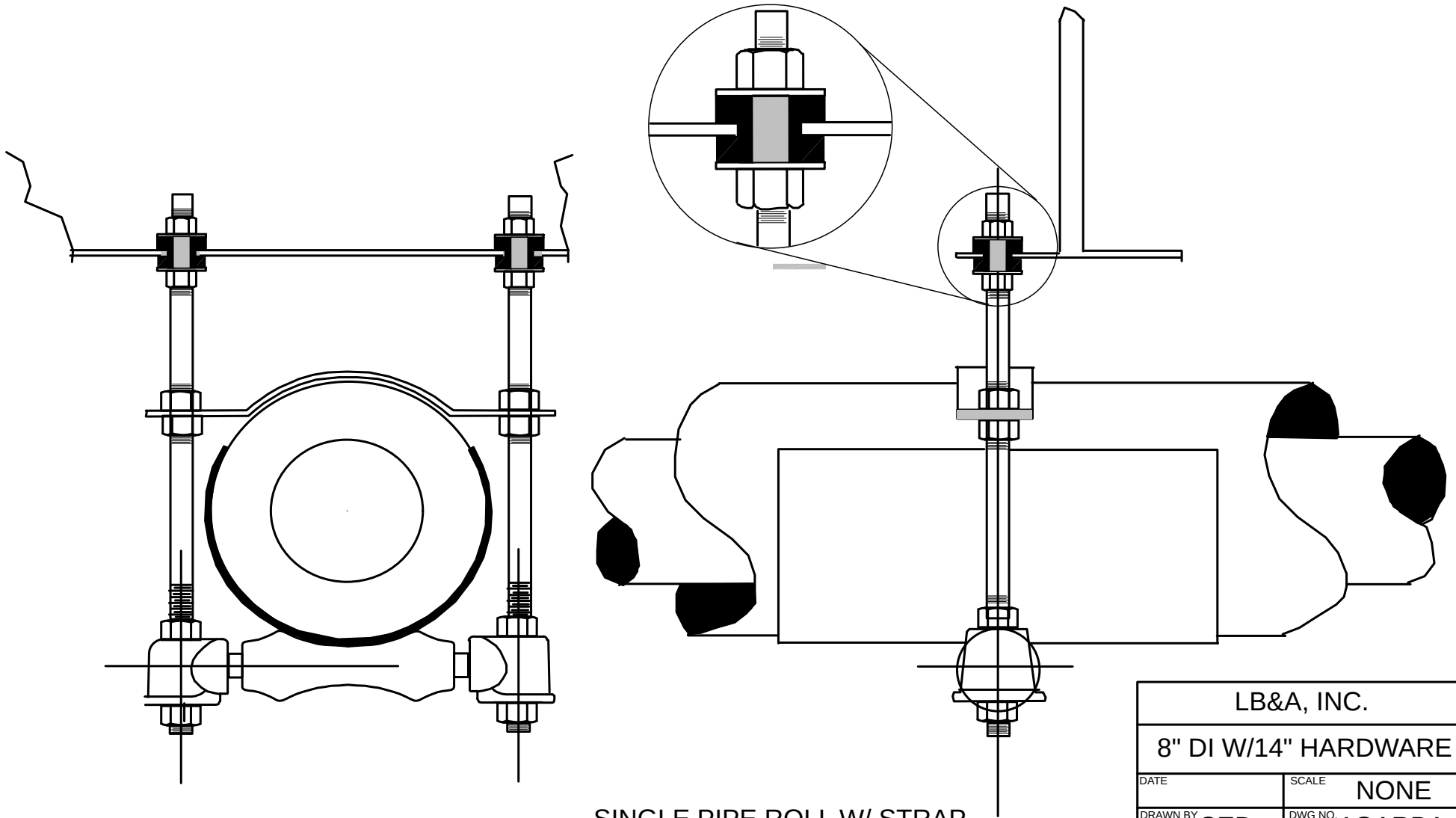


GLAS MESH CO.	
PIPELINE SUPPORT	
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DRAWN BY CED	DWG NO. GAR4180



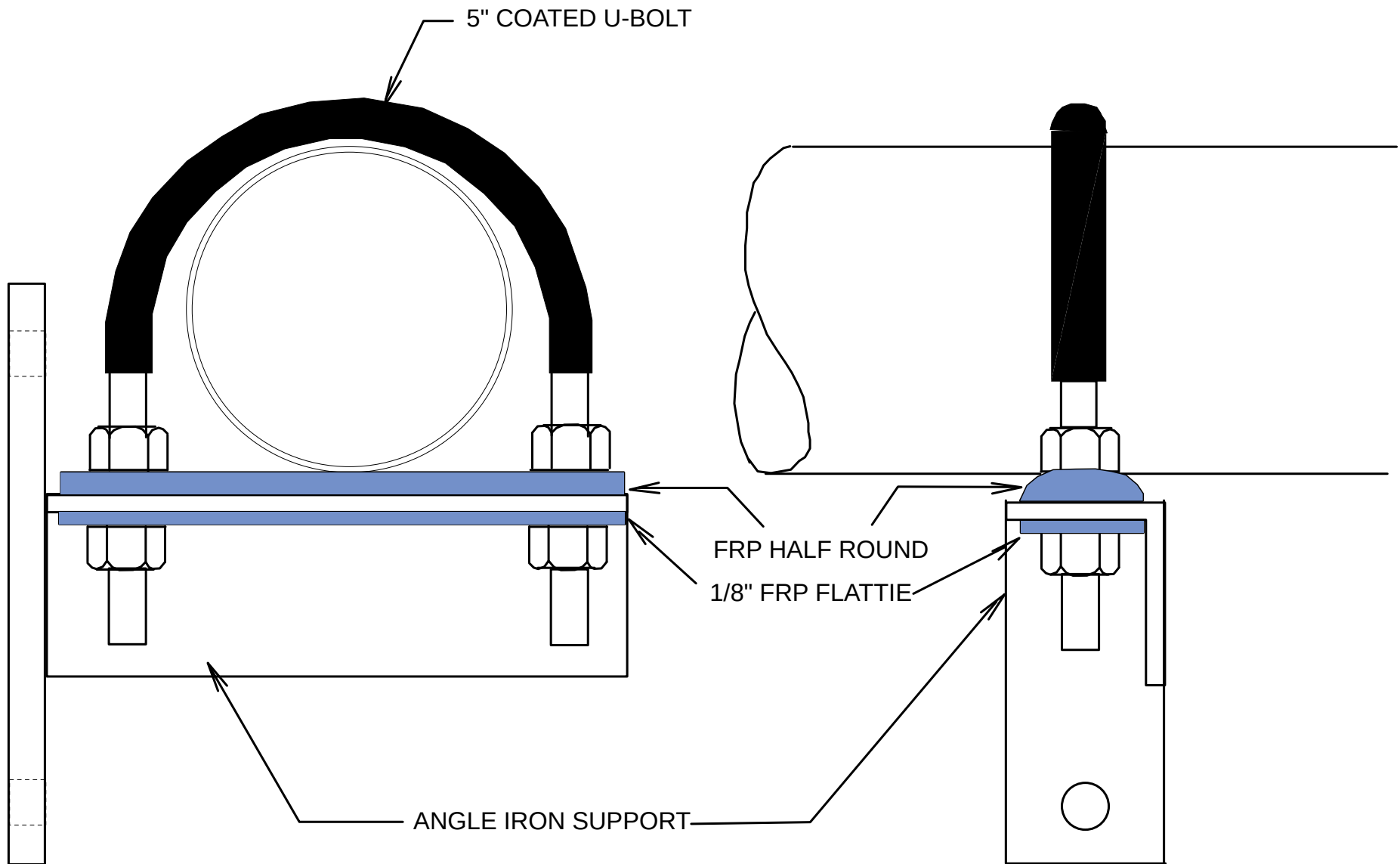
CLEVIS HANGER
W/ INSULATING BUSHING

LB&A, INC.	
8" DI W/14" HARDWARE	
DATE 11/10/01	SCALE NONE
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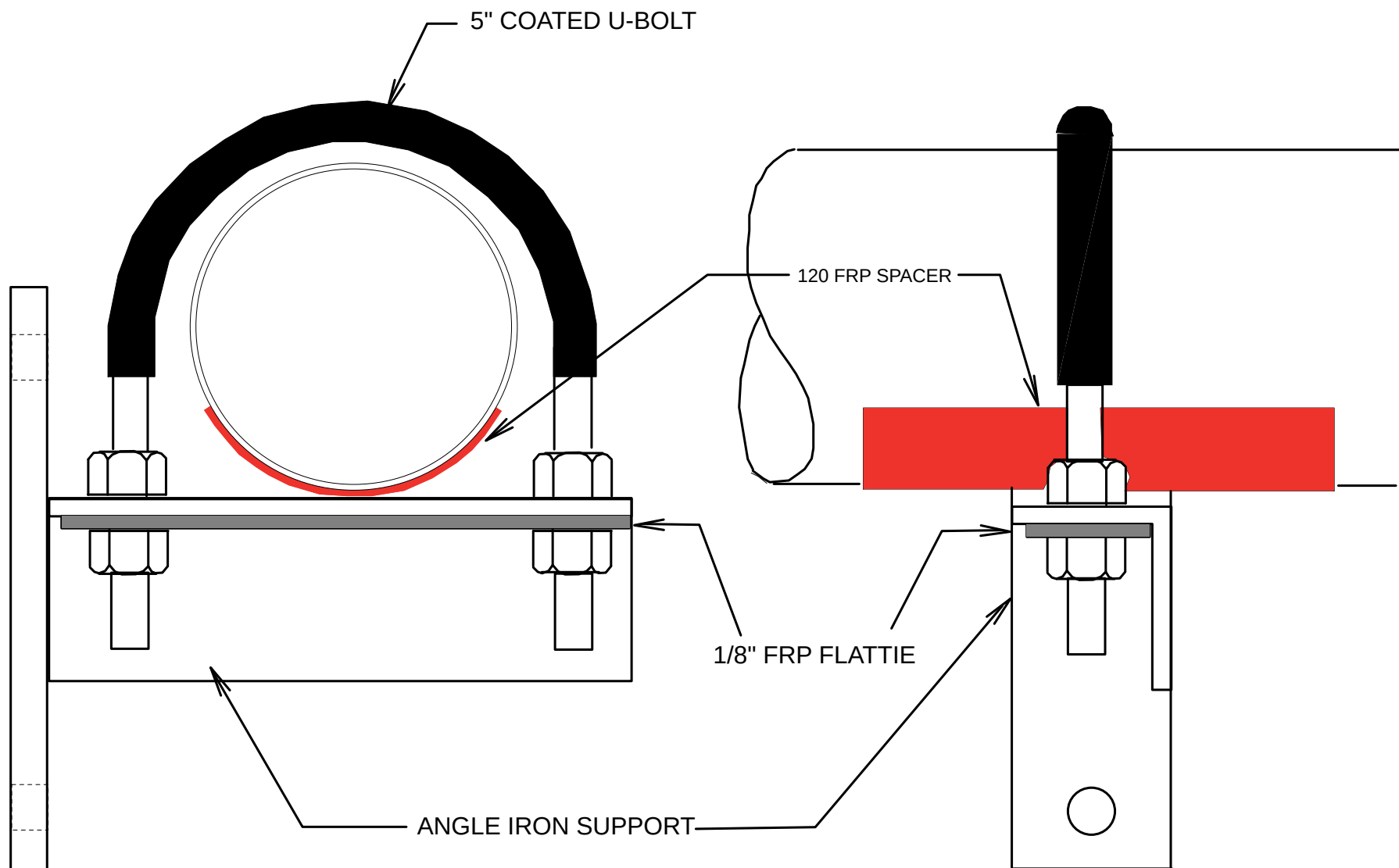


SINGLE PIPE ROLL W/ STRAP
W/ INSULATING BUSHINGS

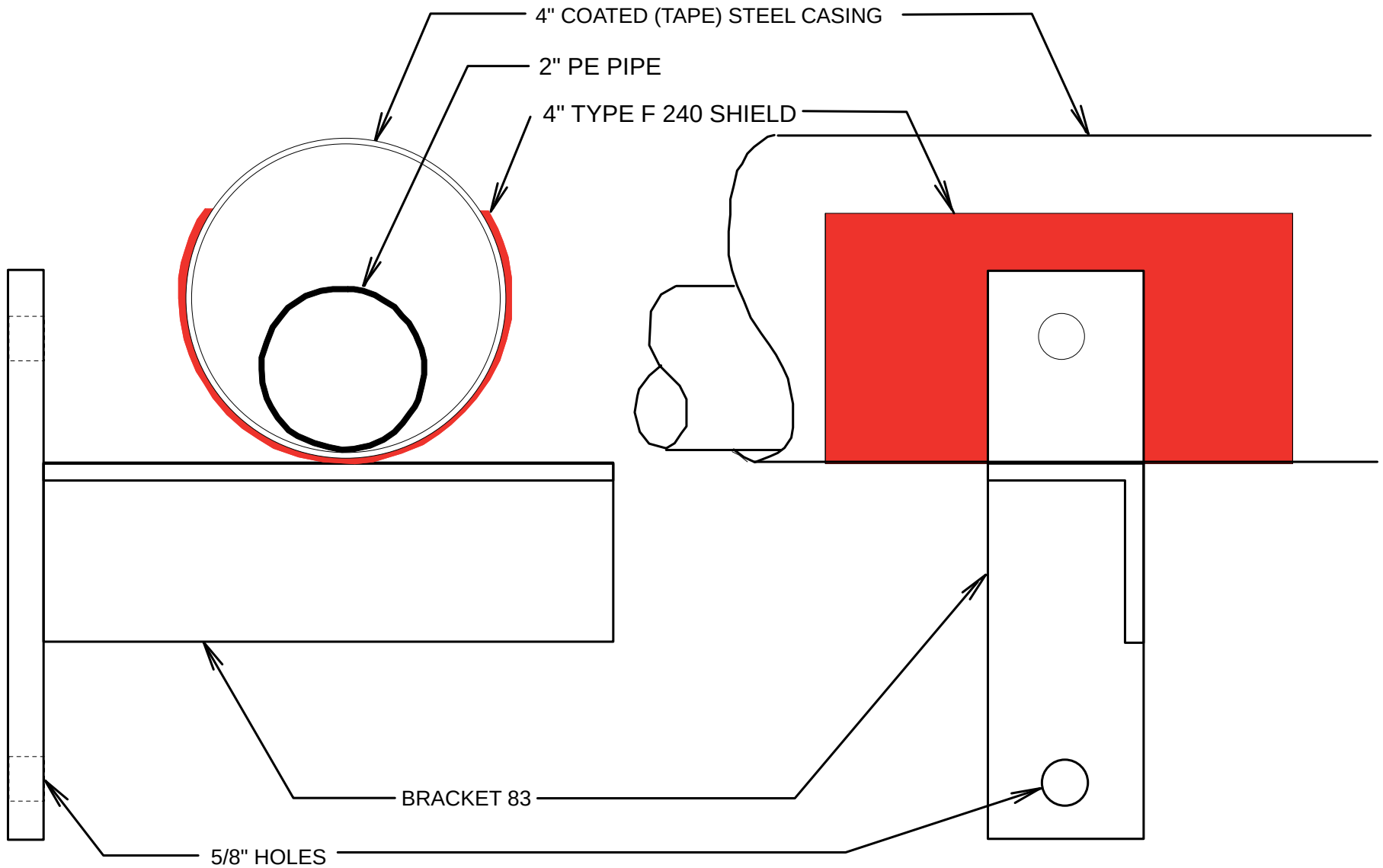
LB&A, INC.	
8" DI W/14" HARDWARE	
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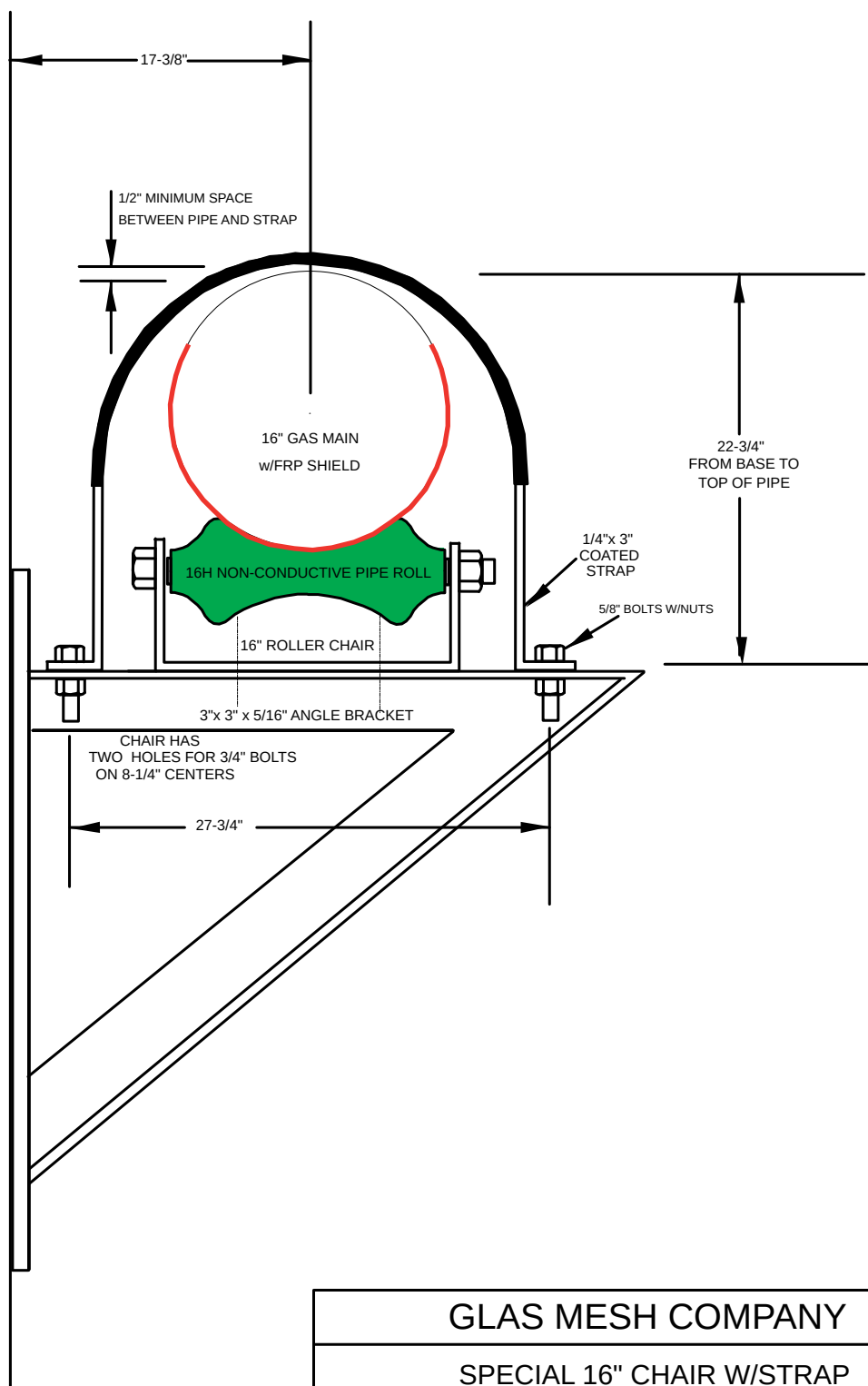
LB&A, INC.			
ANGLE IRON SUPPORT W/PIPE, U-BOLT & HALF RND			
DATE	SCALE		NONE
DRAWN BY	CED	DWG NO.	BR83D



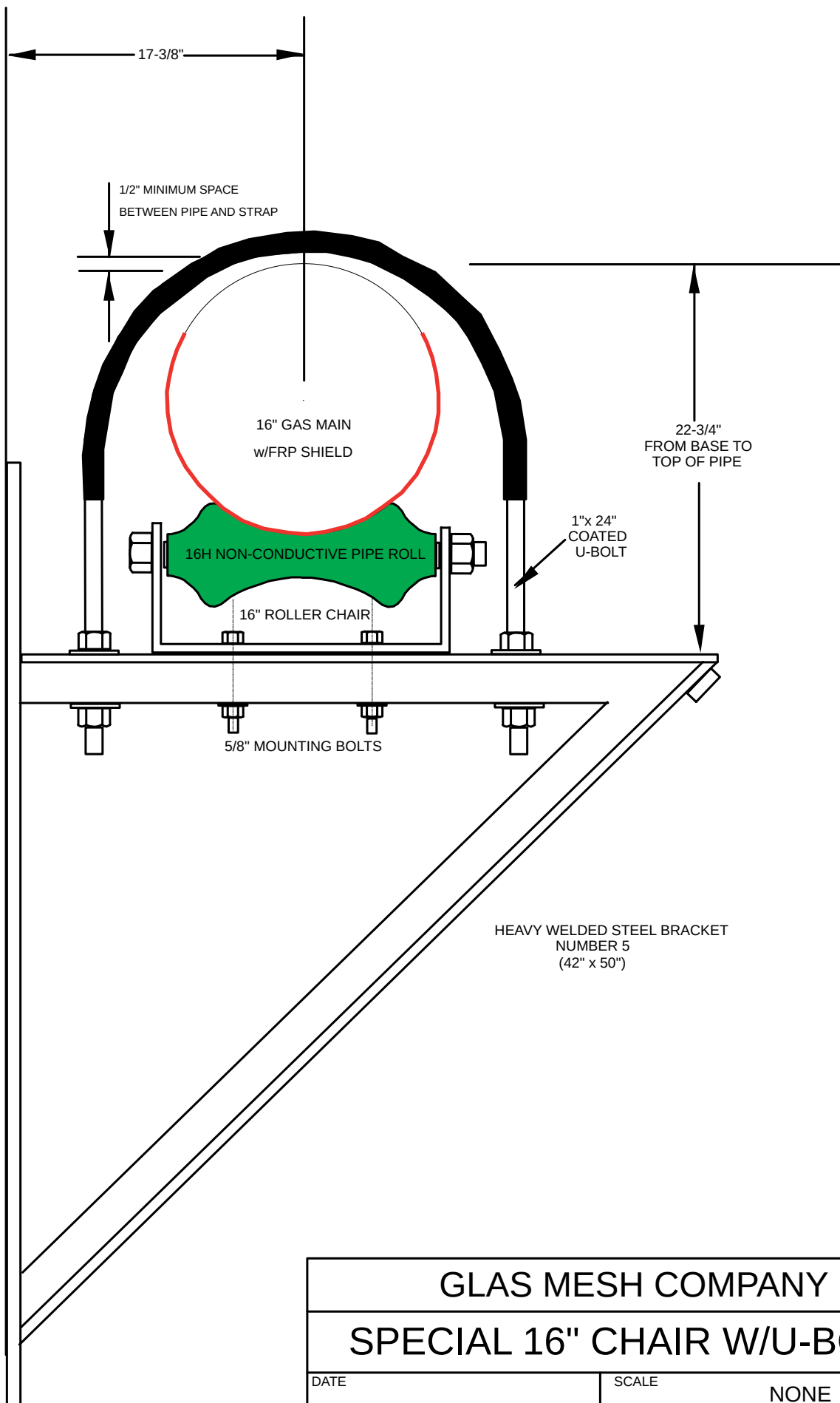
LB&A, INC.			
ANGLE IRON SUPPORT W/PIPE,U-BOLT&120 SPACER			
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DRAWN BY	CED		DWG NO.
			BR83E



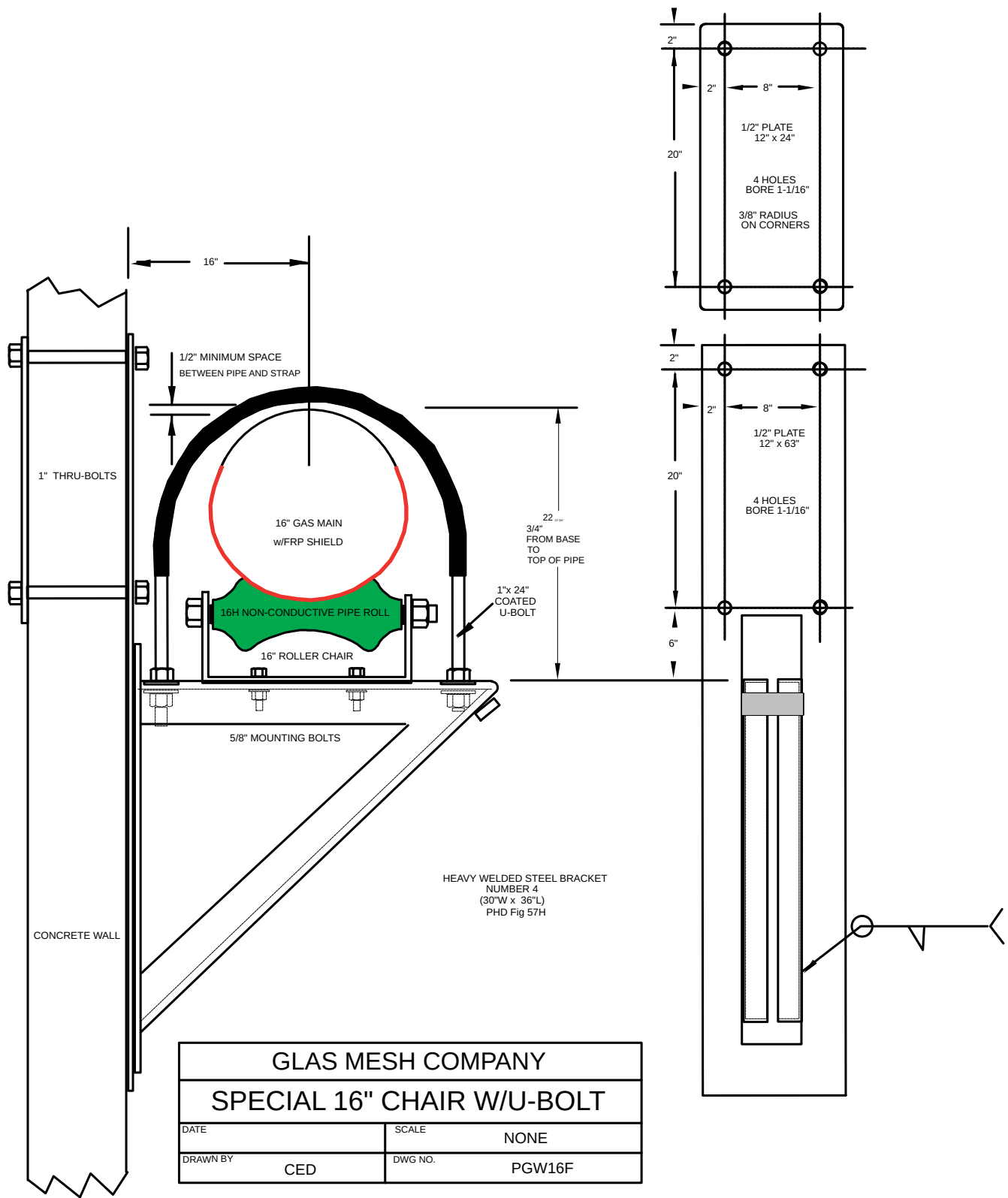
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BRACKET #83 W/4" CASING			
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CED	BR83A1		

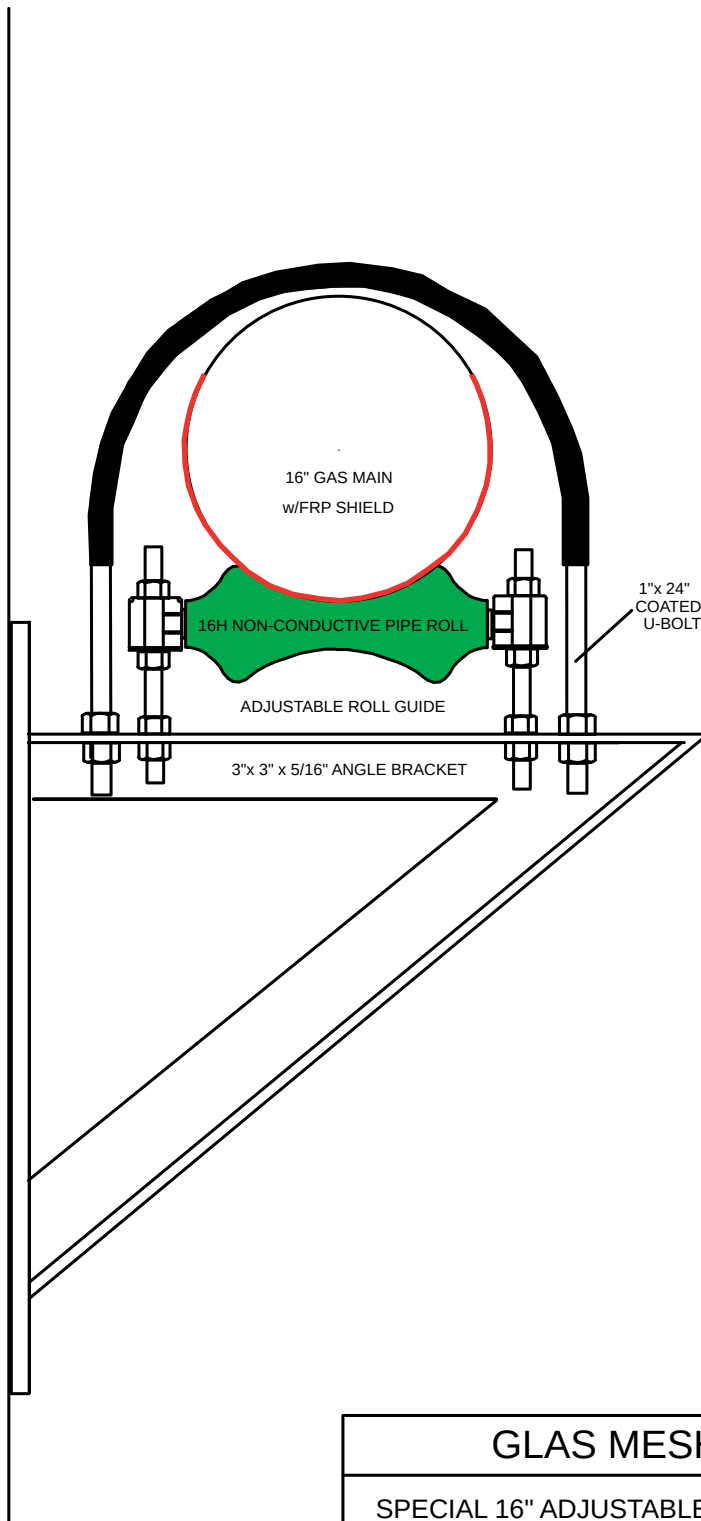


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SPECIAL 16" CHAIR W/STRAP	
DATE	SCALE NONE
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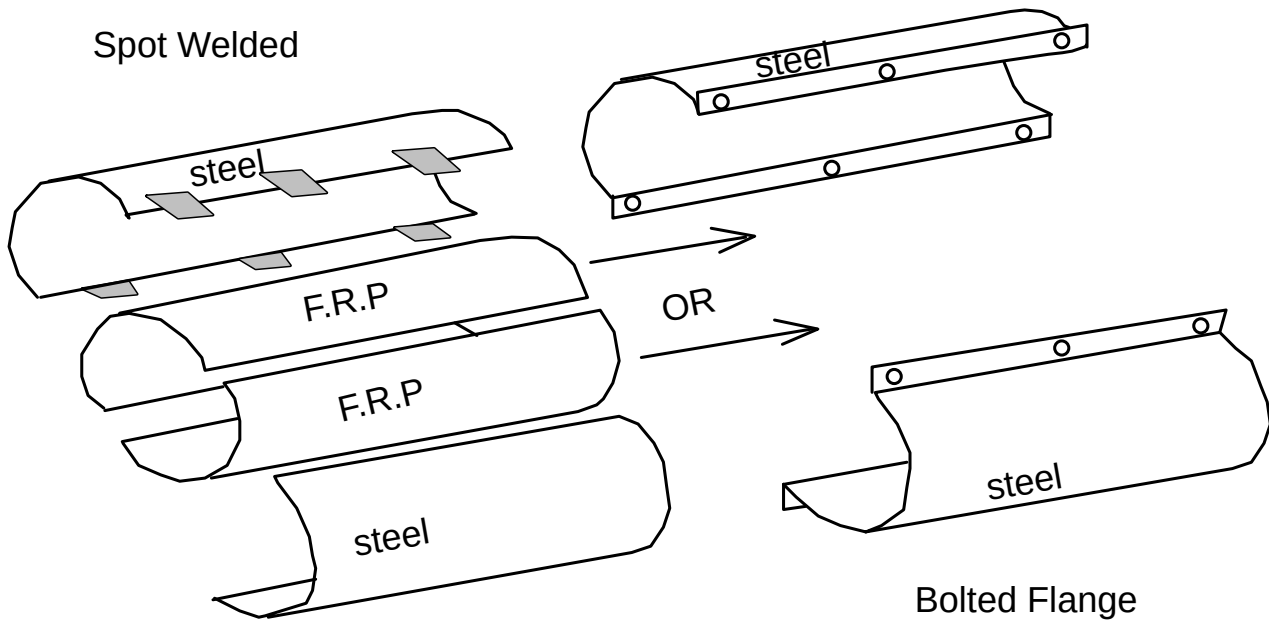
GLAS MESH COMPANY		
SPECIAL 16" CHAIR W/U-BOLT		
DATE	SCALE	NONE
DRAWN BY CED	DWG NO.	PGW16Da



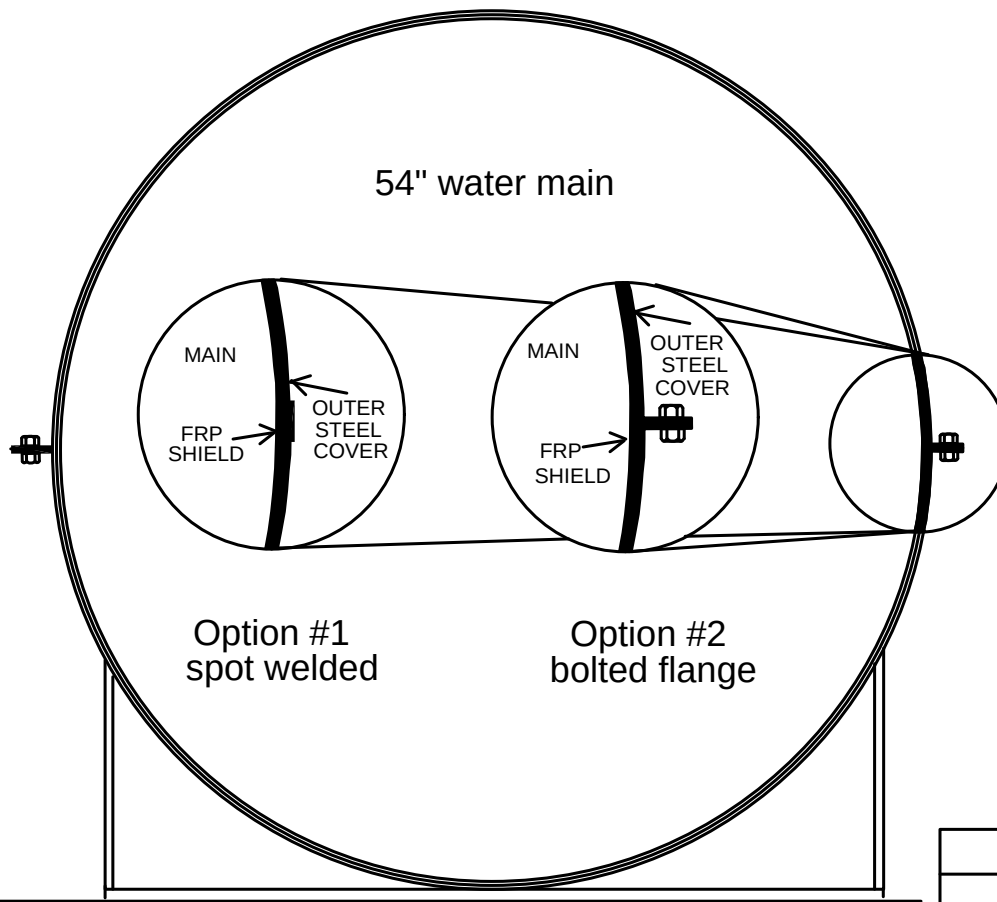


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SPECIAL 16" ADJUSTABLE ROLL SUPPORT W/U-BOLT	
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Spot Welded



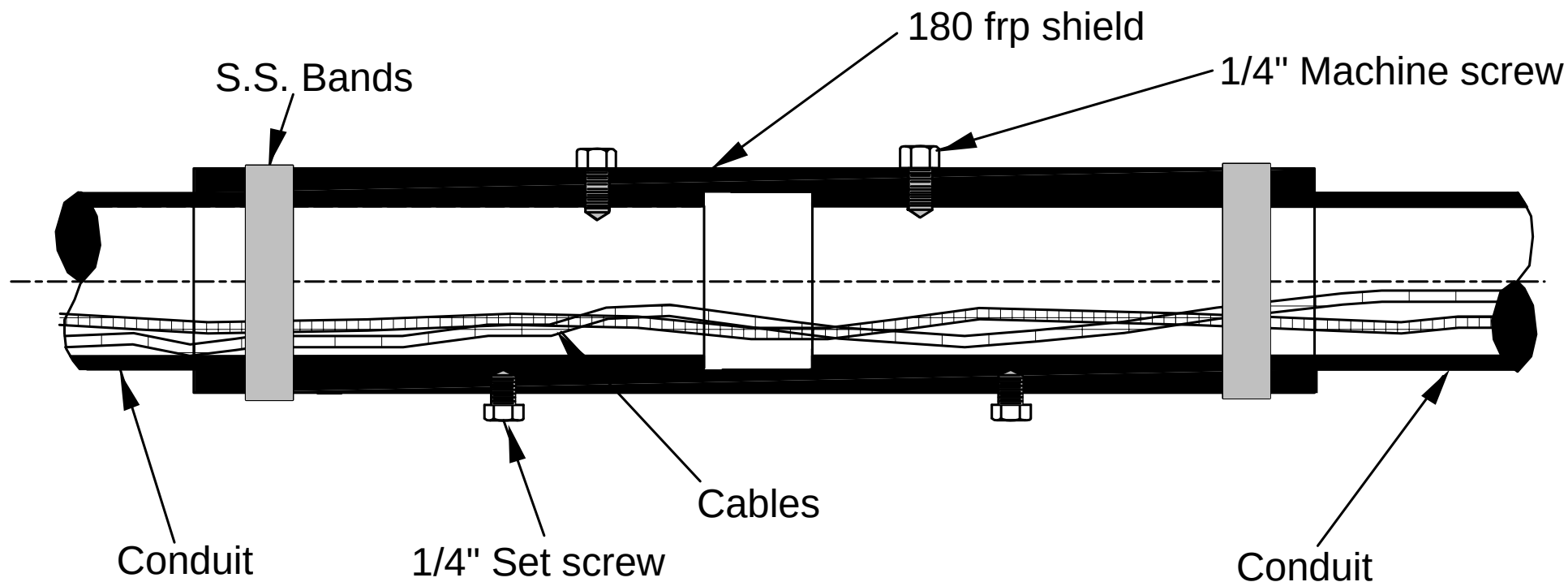
54" water main



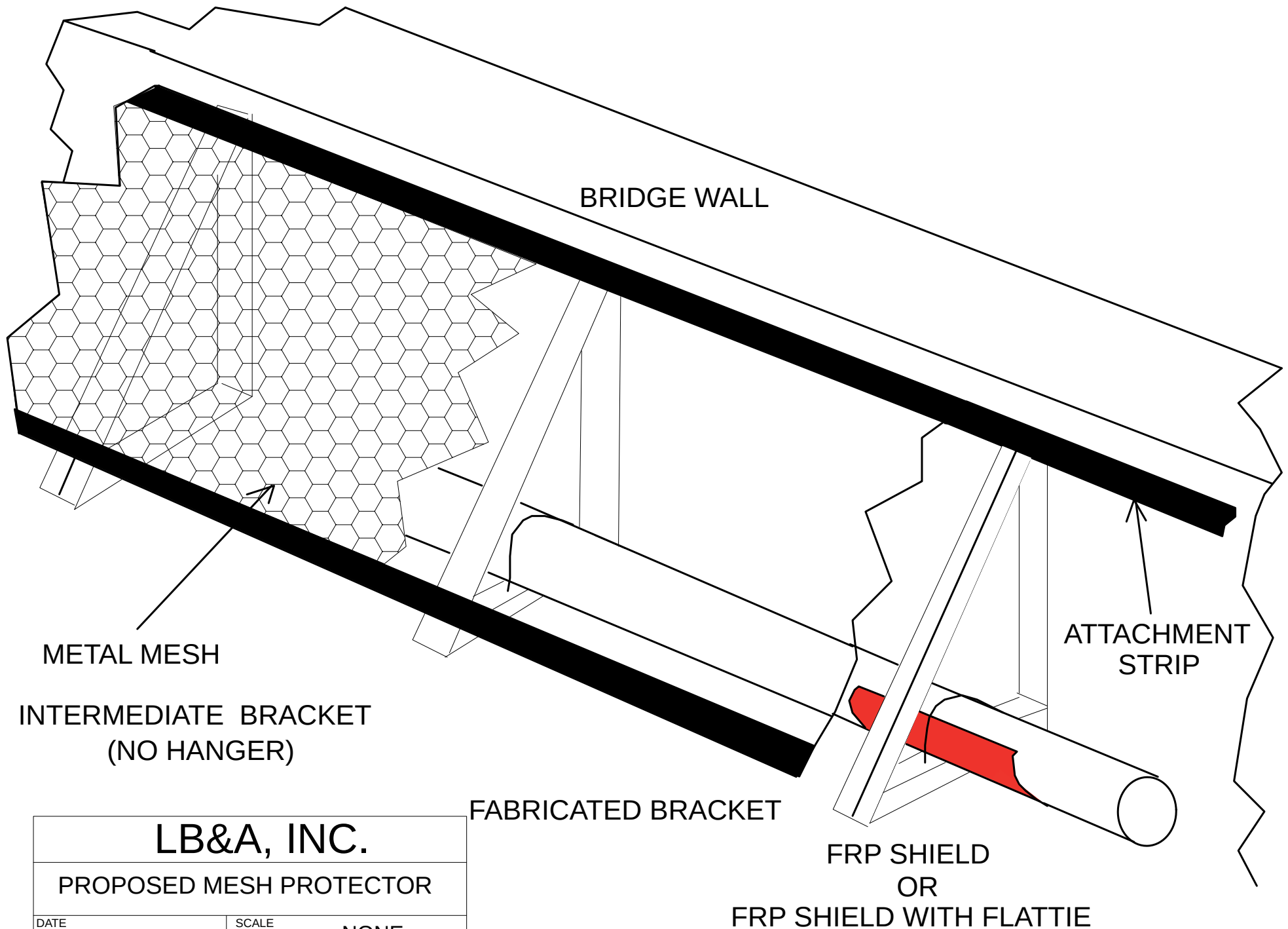
Option #1
spot welded

Option #2
bolted flange

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54" FRP SADDLE	
DATE	SCALE NONE
DRAWN BY CED	DWG NO. SADSUP1a



Glas Mesh			
Conduit Isolator			
DATE	1/25/96	SCALE	NONE
DRAWN BY	CED	DWG NO.	ISOL2



LB&A, INC.

PROPOSED MESH PROTECTOR

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