

VYLON[®] **SLIPLINER** **PIPE**

INSTALLATION **GUIDE**



www.primeconduit.com

Vylon Pipe

VYLON® SLIPLINER PIPE UNLOADING/ HANDLING AND ASSEMBLY CHECKLIST

- Count and inspect each pipe shipment upon arrival. Discrepancies and/or damage should be noted on the Shipping Bill of Lading.
- In cases of damage, notify the carrier and file the claim per the carrier's procedures.
- To avoid damage, do not drop the pipe or roll it off the truck. Unload the pipe with care.
- Use only nylon straps when handling pipe.
- Do not drag the pipe on the ground.
- Handle the pipe with care.
- Inspect the barrel for damage.
- Use 8 foot long extended forks to unload Vylon® Slipliner Pipe. (Note: Maximum fork thickness should not exceed 2".)
- Prior to assembly, remove the foam inserted inside the grooved end, then clean and lubricate both the gasket and routed groove.
- Assembly Method: Use a push ring inserted into the female end of the pipe to assemble pipe joints and when pushing pipe. The previously installed pipe joint protruding from the host pipe must be restrained to assemble the following joint. Pipe joints can be restrained with hold-down clamps, air bags in the annular space, or with a cable attached to the leading piece of pipe.
- When the Vylon® Slipliner Pipe joint is properly assembled, a gap between the pipe ends is normal.
- Follow safe trenching, confined space, and installation practices.
- All Vylon® Pipe products are manufactured with a tolerance of +/- 1" on length and no more than 5% of the pipe will have a tolerance of +1" to -3". If an exact run length is required it is recommended that each piece be measured.

Call your local Vylon® Pipe sales engineer or agent for further assistance.

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INTRODUCTION

This guide is written specifically for installers and those who supervise the unloading, handling, installation, and testing of Vylon® Slipliner Pipe. This guide is based on the experience of Vylon® Pipe on projects that utilized Vylon® Slipliner Pipe. As every project is unique, these instructions DO NOT cover every situation, but should be used as a tool in planning for pipe installation. Careful attention to the project specifications and Vylon® Pipe's installation recommendations will aid the installer in completing a successful project.

1. ONE YEAR LIMITED WARRANTY

Vylon® Pipe warrants that our products are manufactured in accordance with the applicable material specifications and are free from defects using our specifications as a standard. The limit of our liability for failure of any of our products to meet the foregoing warranty or for any breach of any other warranty, expressed or implied, shall be to supply an equivalent amount of products returned to us and found to be defective by us. Every claim under this warranty shall be deemed waived unless received in writing by Vylon® Pipe within thirty (30) days of the date the defect was discovered or should have been discovered and within one year of the date of shipment from our factory. Defective goods may be returned to the seller only upon permission and definite instructions from the seller. **Vylon® Pipe shall not be liable for any incidental or consequential damages caused by breach of this warranty. This exclusion shall be applied whether such damages are sought based on breach of warranty, breach of contract, negligence, strict liability in tort, or any other legal theory. This warranty does not apply to claims for personal injury by a third party. This warranty does not cover damages in shipment. Claims for damage in shipment should be made to the carrier in accordance with the terms of the shipping agreement. The physical properties of Vylon® Pipe products represent typical average values obtained in accordance with ASTM testing methods and are subject to normal manufacturing tolerances. This warranty is in lieu of all other warranties, whether expressed, implied or oral, including the implied warranty of merchantability, and implied warranty of fitness for a particular purpose, and any implied warranties otherwise arising from a course of dealing or trade.**

The technical data presented herein is reliable, however, no guarantee is made or liability assumed.

2. INSPECTION WHEN RECEIVED

Each pipe shipment should be inspected with care upon arrival by the owner, contractor, or field representative. **It is the responsibility of the consignee to make certain that there has been no loss or damage in transit.** The shipment should be checked against the bill of lading. Any discrepancy or damage should be reported to the carrier with appropriate notations made on the delivery receipt. File a claim with the carrier as Vylon® Pipe is not responsible for damage in transit.



INSPECTION CHECKLIST

- Upon arrival of each pipe shipment, walk around the entire shipment to inspect that it has arrived intact and undamaged.
- If the shipment has shifted, check to see that the gaskets have not been damaged. Also inspect the grooved end of the pipe. Carefully inspect each piece (interior and exterior) as it is unloaded.
- Check the total quantities of each item delivered against the Bill of Lading (diameter and quantity of pipe, lubricant, etc.)
- **Any damaged or missing items must be noted on the shipping Bill of Lading.**
- **If damage exists, notify the carrier immediately and file the claim in accordance with the carrier's procedures.**
- Retain the damaged material. Please follow the carrier's procedures for replacement.
- Replacement of damaged material and shortages are not automatically shipped. Please order through a local Vylon® Pipe sales engineer, representative, or distributor.

3. UNLOADING

Pipe should be removed in units (bundles or crates) using mechanical equipment. Remove restraints that bind the units to the truck. **Do not cut the bands that hold each unit together.** Unload the units by rows using a forklift or front-end-loader equipped with fork extensions long enough to reach beyond the last pipe in the unit. 54" pipe should be unloaded as described in Section 15. Maximum fork thickness should not exceed 2". **Do not roll the pipe off the truck. Do not handle units with cables or chains or attach cables to unit frames for lifting.** Units should be stored on level ground. Vylon® Pipe dimensions, weights, and shipping quantities can be found in Tables 3 and 4 in Section 14.

4. COLD WEATHER HANDLING

As the temperature approaches and drops below freezing, the flexibility and impact resistance of any plastic pipe is reduced. **Extra care should be used in handling Vylon® Slipliner Pipe during cold weather.** Regardless of the temperature, handle Vylon® Slipliner Pipe with nylon slings.

5. STORAGE

Pipe should be stored in units on a flat base. Pipe that has been stored for extended periods of time may have reduced impact strength. Other physical properties such as tensile and flexural strength are unaffected by the prolonged storage. If the pipe is to be stored exposed to sunlight for more than twelve months, it should be covered with canvas or other material opaque to ultraviolet light. The cover should be light colored to limit heat build-up. Prior to using pipe that has been stored outdoors for extended periods, the rubber gaskets at the end of the pipe should be inspected for cracking. Surface crazing is cosmetic and does not impair the performance of the gaskets.



6. PRIOR TO SLIPLINING

1. **Field verify** the size of the existing pipe, ovality, alignment, or other dimensional constraints. Projects with severely deflected pipe or tight curves may not be suitable for sliplining.
2. Inspect the line using remote controlled television equipment. Watch closely for offset joints, articulated joints, and protruding laterals, etc. It is best to perform this inspection at times of lowest flow or control the flow to get the maximum amount of information about pipe condition. Cleaning the line just prior to videotaping will also aid in assessment.
3. Review the as-built drawing and compare to the video tapes verifying condition of the pipe, location of laterals, curves, offset joints, etc. Also use the drawings and video to select locations for insertion pits. Check the alignment of manholes if the project will allow for pushes through the manholes. If manholes were cast in place, make sure the channel or invert will not restrict the passage of the slipliner.
4. Monitor the flow in the line. This will help determine the optimum sliplining operation and whether flow control will be necessary.
5. **Clean the existing line thoroughly.** Not cleaning the host pipe can lead to debris collecting under the slipliner pipe causing the joints to skew or the pipe to become lodged. This may lead to additional insertion pits being required.
6. Fabricate insertion equipment for the longest straight push. The simple backhoe and push ring method is generally used for pushes less than 1,000 feet. The cable insertion

method may be more appropriate for pushes exceeding 1,000 feet (See Table 1, and Figure 1).

7. Dig the insertion pit and remove the top half of the existing pipe. The pipe assembly area of the insertion pit is called the cradle. **The cradle must be straight, level and smooth for easy joint assembly and insertion into the host pipe.** The length should be at least 5' longer than the slipliner pipe joint length. The pit width should be 2' wider than the existing pipe on each side.

If working from inside an existing structure, check the cradle area. Remove any invert, bench or other obstruction that may interfere with the sliplining.

8. Pull a test mandrel or proof piece through the pipe to verify that the liner pipe is properly sized and that the line is clean. The mandrel should be a full length piece of slipliner or equivalent. On larger projects or pushes, it is recommended that a mandrel made from steel be used. This mandrel is rolled to an outside diameter of 1" larger than the slipliner.
9. If necessary, fabricate a nose cone. This cone may help the pipe ride over small joint misalignments and other small obstructions.
10. A push ring is required for pipe installation. A lightweight push ring can be purchased from Vylon® Pipe. These rings are highly recommended over push rings made of steel or other materials. Metal rings tend to be both heavy and difficult to handle. Table 1 has the necessary dimensions to fabricate a push ring.



TABLE 1 PUSH RING DIMENSIONS

Nominal Pipe Size (in.)	Ring Thickness (in.)	Inside Diameter (in.)	Outside Diameter (in.)
21	.250	21.375	21.625
24	.250	24.125	24.375
27	.315	27.250	27.565
30	.405	30.250	30.655
36	.560	36.375	36.935
42	.625	42.563	43.188
48	.625	48.750	49.375
54	.700	54.880	55.580

Note: The table above contains the dimensions for push rings to be used with Vylon® Slipliner Pipe. The thicknesses shown on the table allow for a very close fit to the pipe groove; therefore, do not use thicker material or the ring may not fit. Thinner material may also cause problems with point loading inside the female end. After fabricating the ring, test fit the ring into the groove to assure proper sizing. The ring should be placed smoothly into the groove manually to assure that there are no tight spots.

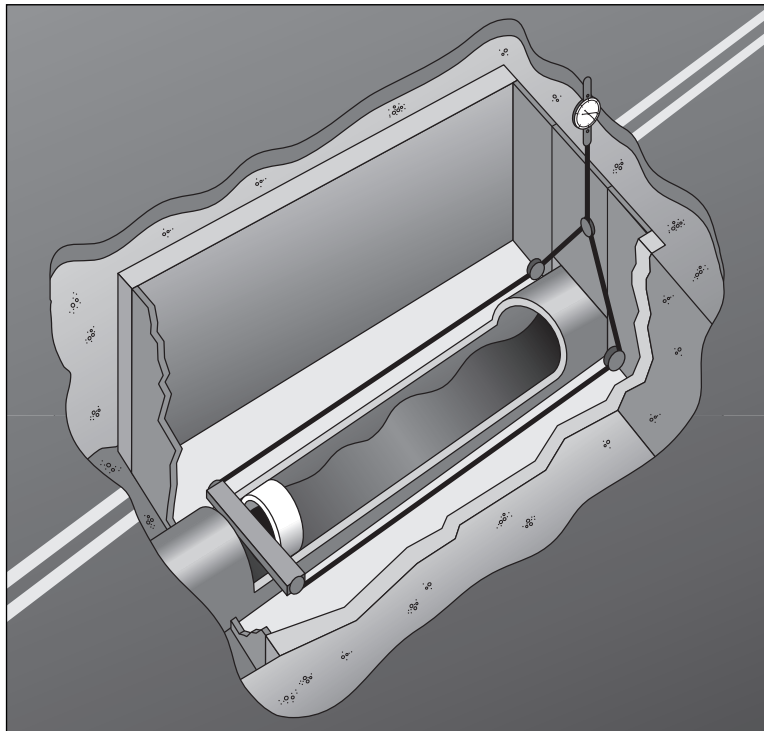


Figure 1

7. SLIPLINING

1. A final cleaning after pit construction and prior to sliplining is recommended.
2. Always lead with the gasketed end of the pipe, a field fabricated nose cone, or tapered plain pipe end.
3. Always lubricate both ends of the pipe prior to placing into the existing host pipe. Use the subaqueous lubricant supplied by Vylon® Pipe. If your project has both open cut and sliplining, the open cut lubricant is different from the slipliner lubricant and cannot be substituted.
4. Insert the first piece of pipe into the existing host pipe leaving approximately 2-3 feet protruding into the pit area.
5. To assemble the joints, the previously installed pipe must be restrained or anchored. An inflatable air bag system or pipe clamp are two recommended methods. Either of these methods are fast and easy.
 - The air bag is used by placing the bag between the outside of the slipliner and the inside diameter of existing host pipe (See Figure 2). The bag is placed approximately 2 feet from the end of the installed slipliner pipe, (this is where the existing pipe becomes a full circular cross section). After placement, inflate the bag with enough air pressure to prevent the previously installed slipliner pipe from moving during joint assembly. **Do not over inflate as this can cause the pipe to become oval and make assembly difficult.** If two bags are used, place one at ten o'clock and the other at two o'clock. With two air bags on separate valve systems, the bags can be used to aid in positioning the pipe. Contact a Vylon® Pipe representative for air bag sources.
 - A pipe clamp is a circular metal sleeve rolled to an inside diameter slightly larger than the slipliner outside diameter (See Figure 3). A binding device, usually a cam or lever, is attached to the rolled section of metal. When the binding device is activated, the rolled section of metal is reduced in diameter and grips the slipliner. In using a pipe clamp, care must be used to properly adjust the clamp to hold the pipe without causing deflection. **Overdeflection of the pipe will cause problems with alignment and assembly.**
6. For Vylon® Slipliner Pipe, align the joint and partially insert (stage) the nose of the gasket as far as possible manually (about $\frac{3}{8}$ ") into the groove. Place the push ring into the groove at the opposite end of the pipe and use mechanical assistance to finish joint assembly. A dimension table for push rings can be found in Table 1. After the joint is fully assembled, a space between the exterior walls of the joint exists.
7. Release the pipe restraint and push the liner pipe into the host pipe leaving approximately 2-3 feet protruding into the pit.
8. Place the next piece of pipe in the cradle and continue steps 3-5, until the entire segment to be sliplined is completed.

9. When pushing upstream against the flow, the slipliner pipe may be lifted off the invert by hydrodynamic forces. To prevent this, weight may need to be added to the front end of the first piece of slipliner pipe. Contact your Vylon® Pipe representative for more information.

Figure 2



Figure 3

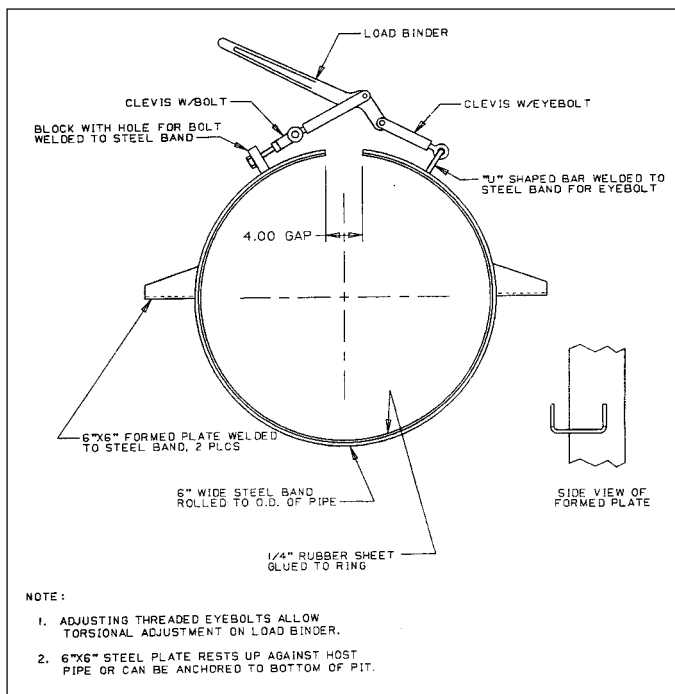


Figure 4

8. RECOMMENDATIONS

1. Use a load measuring device to monitor the amount of force being applied to the pipe if possible. The recommended maximum pushing load is 25,000 lbs. based on a 2 to 1 factor of safety. Applying too much load can damage the pipe. Curves, debris in the invert and offset joints can cause the force required for pipe insertion to increase.
2. Handle the pipe with care. Although the pipe is made of PVC, it can be broken and damaged. Care should be used, especially on the female end of Vylon® Slipliner Pipe when lowering pipe into the pit. If this end is damaged, detailed instructions on field routing can be found in Section 13.
3. Depending on the level of flow, Vylon® Slipliner Pipe can be neutrally buoyant. When placing the pipe in a cradle with flow, the pipe must be sunk. The best method is to place the upstream end of the pipe down first, allowing the flow to sink the pipe.
4. Use care when aligning the pipe and homing the joint. A smooth, consistent mechanical force against the Push Ring will yield the best results. Severe angles or offsets in the cradle area will make liner pipe assembly more difficult.
5. Vylon® Slipliner standard joints can be field cut and routed to make repairs or shorter lengths for pit closures. Detailed information on field routing can be found in Section 13. Use factory made special length pieces for projects or segments requiring many short lengths.
6. Immediately upon completing installation of pipe, pipe should be anchored to prevent movement.



9. BULKHEADS

The order of constructing the bulkheads and reconnecting the laterals may vary depending on job conditions.

Bulkheads are constructed at the manholes or the ends of the slipliner pipe. The bulkhead stops the flow from entering the annulus between the host pipe and the slipliner. The bulkhead also creates a seal to allow for annular space grouting. **The upstream bulkhead is built first, then the downstream bulkheads are constructed.**

A proper bulkhead must stop the flow and be capable of handling the pressure of the grouting operation. The following steps outline one approach to building a bulkhead:

1. Create a watertight seal using chemical grout if water is flowing in the annulus. If water is not present in the annulus, proceed to step 2. Typically, virgin dry Oakum (not oil soaked) is soaked in a chemical grout such as 3M 5600. The saturated Oakum is then placed in the invert between the host pipe and slipliner. Once the water in the annulus comes in contact with the saturated Oakum, the grout will start to foam. The foaming action will eventually stop the flow of water along the invert. This is a simplified explanation. Working with chemical grouts can be dangerous, therefore, please contact the grout supplier for more information.
2. After sealing along the invert, construct a structural bulkhead using a non-shrink hydraulic cement type grout. Typically, this bulkhead is a minimum of 6" - 8" thick.





10. LATERAL RECONNECTIONS

Lateral reconnections can be performed for all pipe diameters by using Fowler Inserta-Tee®.

Fowler Inserta-Tee is a three piece service connection that is compression-fit into the cored wall of the pipe. Inserta-Tee consists of a PVC hub, rubber sleeve, and stainless steel band. Inserta-Tee connections are available for 4", 6", 8", 10", 12", and 15" lateral sizes. The rubber sleeve has a self-fitting/sealing insert ring that aligns with the specified pipe. A sharp hole saw should be used to obtain the hole size specified by Fowler. An improperly sized hole will not seal. After the hole is cored, the exposed interior channels of the pipe do not have to be sealed. Follow the recommended Inserta-Tee installation instructions.

11. GROUTING

1. Engineered annular grout should consist of Portland cement, pozzolanic flyash and additives. Sand or other aggregate should be avoided.
2. The recommended minimum 28 day compressive strength of the grout should be 300 psi per ASTM C495.
3. The grout mix should be designed to completely fill the annulus between the slipliner pipe and the existing host pipe.
4. The grade of the slipliner pipe should match the grade of the existing host pipe. Therefore, care must be taken to prevent floating the liner pipe during grouting.
5. Recommended grout pumping pressure should not exceed 5 psi.
6. To allow for a minimum 2 to 1 factor of safety against unconstrained buckling, the total grout pressure should not exceed 10 psi. Gauges used for grouting should be certified per ANSI B40, Grade 2A. Grouting pressure should be continuously monitored.
7. It is recommended that the slipliner pipe be filled with water to aid in preventing floatation as well as reducing any possible effects from the heat of hydration. In live sewers, a temporary weir may be used to partially back-up flow. Grouting in stages is another method of controlling both floatation and heat of hydration.
8. Since grouting is often performed by a subcontractor, it is recommended that the general contractor require the following from the subcontractor:
 - A. Grout Mix
 - B. Grout Density
 - C. Initial Grout Set Time
 - D. 24 Hour / 28 Day Compressive Strength
 - E. Method of Grouting
 - F. Maximum Injection Pressure
 - G. Total Grout Volume
 - H. Grout Stage Volumes
 - I. Bulkhead Designs
 - J. Floatation Calculations
 - K. Flow Control
 - L. Provisions for Service Connections
 - M. Vent Location Plan
 - N. Vent and Injection Pipe Diameters

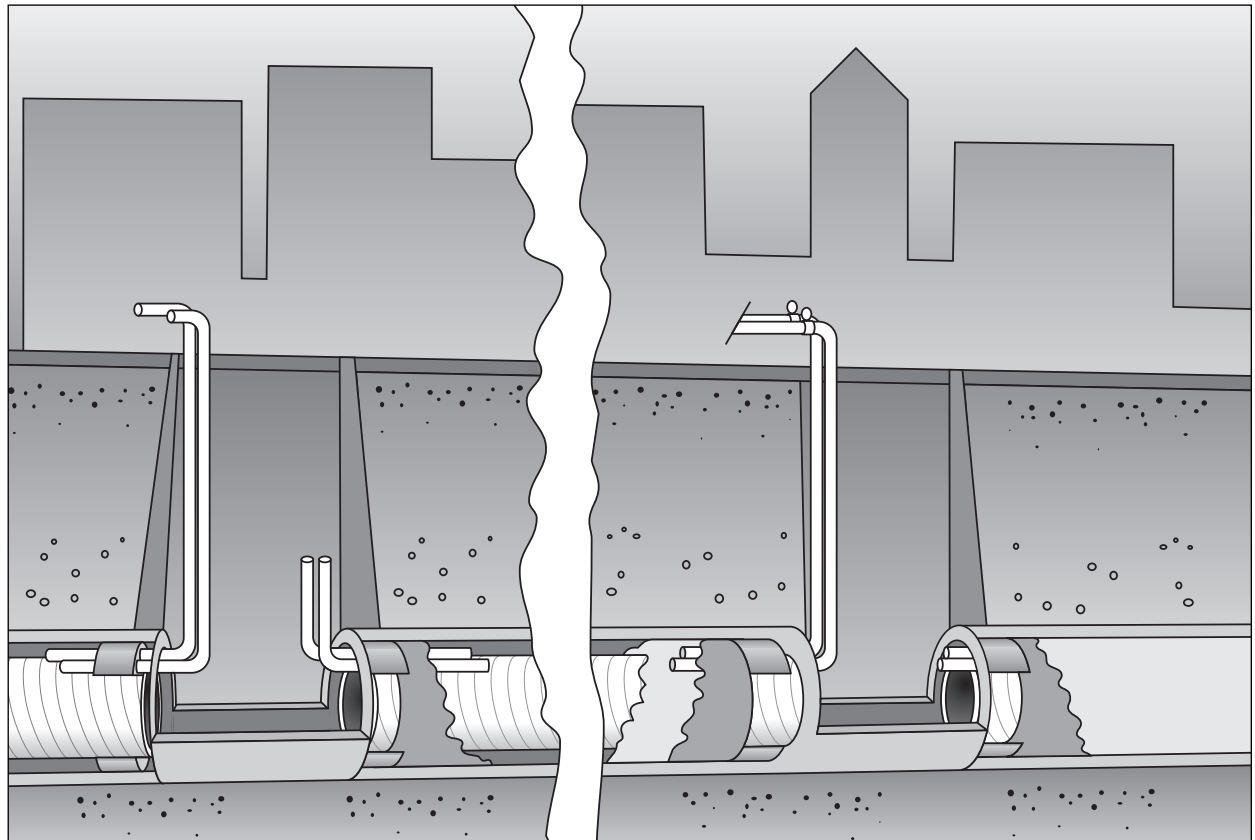


Figure 5

12. FIELD TESTING

After the sliplining is complete and the line is grouted, video inspection is usually performed. This inspection is to look for any possible leaks of either water or grout. By using video inspection in lieu of other testing methods, bypass pumping can be eliminated. Testing should be performed as detailed in the project specification.

13. INSTRUCTIONS FOR FIELD MODIFICATIONS OF VYLON® SLIPLINER PIPE

Field modifications of Vylon® Slipliner Pipe can be performed in a safe and efficient manner, when proper equipment and precautions are followed. Although this document addresses some of the safety concerns, not all items are covered. Use common sense. Please follow the equipment manufacturer's safety precautions. Appropriate eye and body protection should be used when cutting and routing Vylon® Slipliner Pipe.

MATERIALS

The following materials are required to field modify 32" - 54" Vylon® Slipliner Pipe. This equipment has been used successfully to field modify pipe. Vylon® Pipe has, for purchase, a field router kit that contains the following items:

Quantity	Part Name
1	Guide Plate
4	Guide Pins
4	Tee Nuts
4	Socket Cap Screw (1/2" x 6" Size 13 Coarse Thread)
4	Socket Cap Screw (1/2" x 1" Size 18 Coarse Thread)

The contractor must supply the following items or equal:

Quantity	Part Name	Part Number	Vendor
1	3 1/4 HP Porter Cable Router (Mfg. Model No. 7538)	2AC00	Grainger
1	1/2" Bit, 2" Cutting length	4AFFO	Grainger

Note: The guide plate hole pattern fits the designated Porter-Cable router. Should another router be used, the hole pattern for attaching the guide plate to the router will need to be adjusted to fit.

DIRECTIONS FOR ASSEMBLY

1. The guide plate should be bolted securely to the router base.
2. One pair of guide pins should be located in the slots on either side of the router, reference Figures 5 & 6 for pin locations for each pipe size.
3. The pins should be adjusted so that two pins are tight against the inner wall of the pipe and two pins should be tight against the outer wall. In addition, the pins should be adjusted so that the router bit will remove the rib without cutting into the outer wall (see Figure 7). **With the router power off**, check and readjust the pins so that the router will go completely around the end of the pipe without binding.
4. Tighten all pins and ensure that the plate is secure.

DIRECTIONS FOR PIPE PREPARATION

1. It is important that the pipe is cut square. In order to accomplish this, make enough marks around the circumference of the pipe to draw a true line or use a pipe tape. **Do not follow the spiral weld.**
2. Cut the pipe with either an abrasive disk or other power saw.
3. File or grind any ridges or bumps on the cut surface to allow the router guide plate to smoothly slide against the edges.

DIRECTIONS FOR ROUTING

1. Routing is easier to perform if the pipe is in a vertical position. This position may create additional safety concerns, therefore, perform a thorough analysis to determine the safest position for the pipe during routing. Place the router on the end of the pipe and adjust the plunge depth stop to 2".
2. Start the router and slowly plunge the bit through the ribs. Once the router is fully plunged, lock the plunge mechanism.
3. **Slowly start moving the router around the pipe. Patience is key. Movement of the router should be slow and steady. Jerking the router or trying to cut quickly could result in bit or pipe breakage and/or possible injury to the operator. Let the router do the work.**
4. If the router is difficult to move, it is normally due to the guideplate trying to slide along a rough cut edge. This can be overcome by slightly lifting the router off of the cut edge until the obstruction is passed.

5. After completing the routing, clean the shavings out of the new groove and ensure that all of the rib has been removed from the outer wall.
6. Adjust the router so that the bit will now remove any remaining rib without cutting into the inner wall, see Figure 8. Route the remaining rib as performed on the first pass.
7. After cleaning the groove, check for areas where the wall may be thin or for any obstruction in the groove. Small obstructions can be removed with additional passes of the router. After all the rib is removed, check the groove width for proper sizing. The dimensions of the groove are given below.
8. If an error was made during the routing, the pipe can be cut again and rerouted.

Note: Field routing will not have the lockdown feature of Vylon® Slipliner Pipe. Field routing should only be used for closure pieces or other areas where a locking joint is not required.

TABLE 2
VYLON® SLIPLINER DIMENSIONS

Nominal Diameter (in.)	Profile Height (in.)	Wall Thickness (in.)	Groove Width (in.)	Groove Depth (in.)
32"	1.150	0.150	0.875	2.00
33"	1.150	0.150	0.875	2.00
36"	1.150	0.150	0.875	2.00
38"	1.350	0.180	0.910	2.00
39"	1.350	0.180	0.910	2.00
42"	1.350	0.180	0.910	2.00
48"	1.535	0.210	1.015	2.00
54"	1.730	0.250	1.200	2.50



Cutting pipe to length



Routing in vertical position



Routing in horizontal position



Field inserting gasketed ring

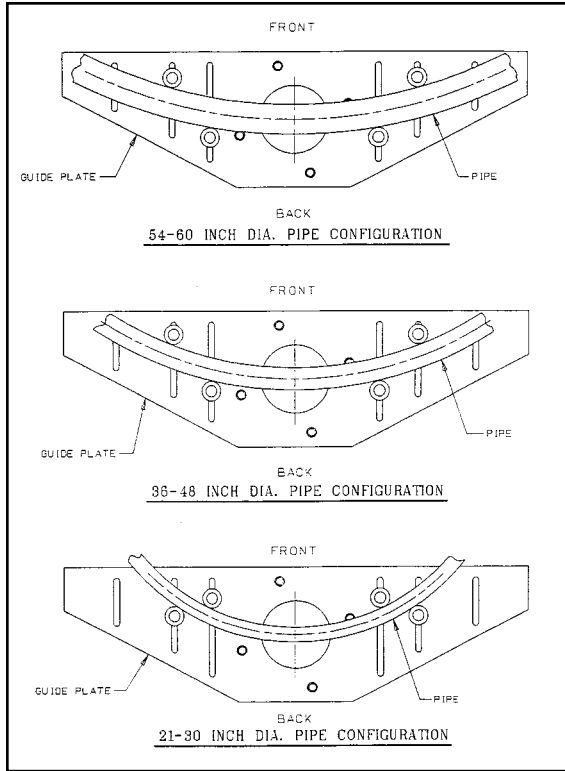


Figure 5

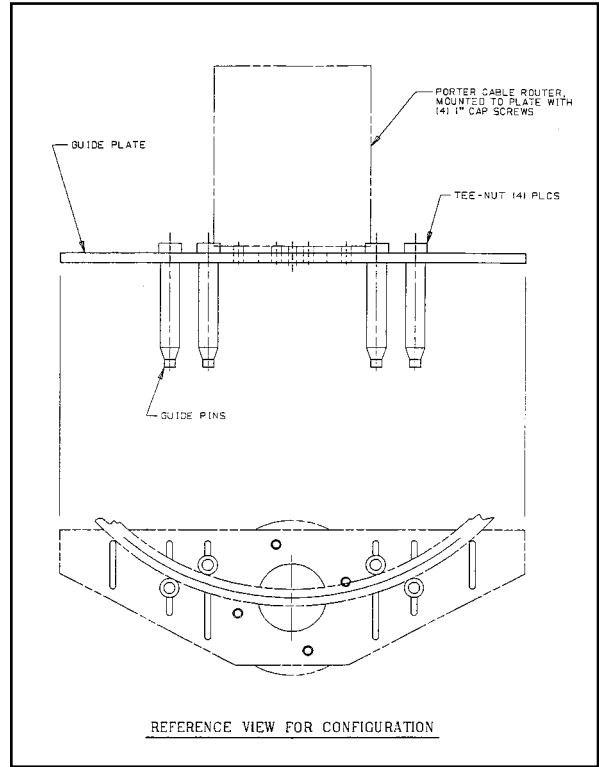


Figure 6

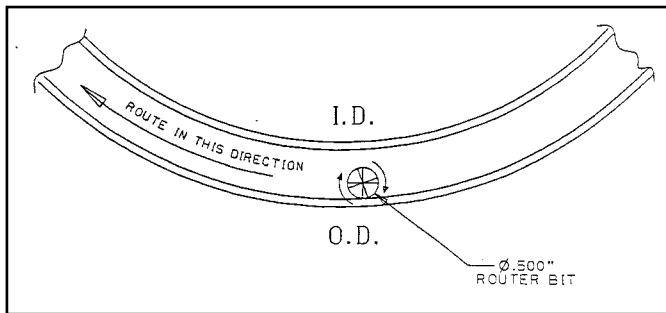


Figure 7

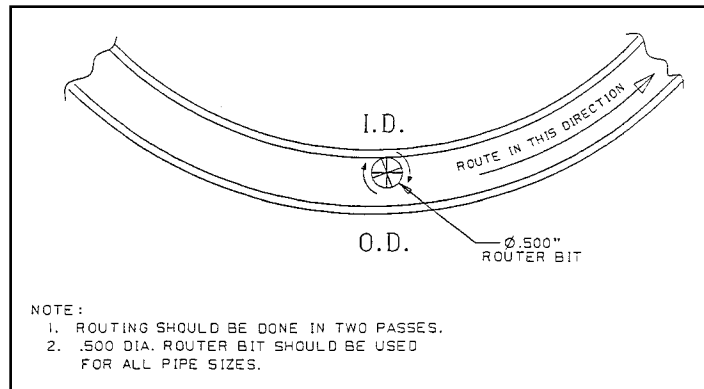


Figure 8

14. TABLES OF DIMENSIONS

**TABLE 3
VYLON® PIPE DIAMETER DIMENSIONS**

Size	Nominal O.D.	Maximum O.D.	I.D.	Min. Inner Wall Thickness	Y Min. Profile Ht.
21"	22.110	22.330	20.75	0.080	0.680
24"	25.040	25.070	23.50	0.100	0.770
27"	28.232	28.252	26.50	0.115	0.866
30"	31.430	31.440	29.50	0.125	0.965
32"	33.800	33.895	31.50	0.150	1.150
33"	34.800	34.895	32.50	0.150	1.150
36"	37.800	37.850	35.50	0.150	1.150
38"	40.200	40.285	37.50	0.180	1.350
39"	41.200	41.300	38.50	0.180	1.350
42"	44.200	44.250	41.50	0.180	1.350
48"	50.570	50.620	47.50	0.210	1.535
54"	56.960	57.060	53.50	0.250	1.730

**TABLE 4
VYLON® PIPE WEIGHTS AND SHIPPING QUANTITIES**

Size	Weight Per Ft.	Weight Per Joint	Truckload #Joints/Footage(LF)	#Joints Per Bundle	*Length of Extended for Needed (Ft.)
21"	15	225	48 / 720	2	6
24"	20	300	36 / 540	2	6
27"	23	345	36 / 405	3	6
30"	29	435	27 / 405	3	6
32"	36	540	18 / 270	2	6
33"	37	555	18 / 270	2	6
36"	46	690	12 / 180	2	6
38"	51	765	12 / 180	2	6
39"	53	795	12 / 180	2	6
42"	60	900	12 / 180	2	8
48"	81	1215	6 / 90	2	8
**54"	114	1710	4 / 60	2	8

* Maximum fork thickness should not exceed 2"

** Fork Lengths 8'

15. UNLOADING 54" PIPE

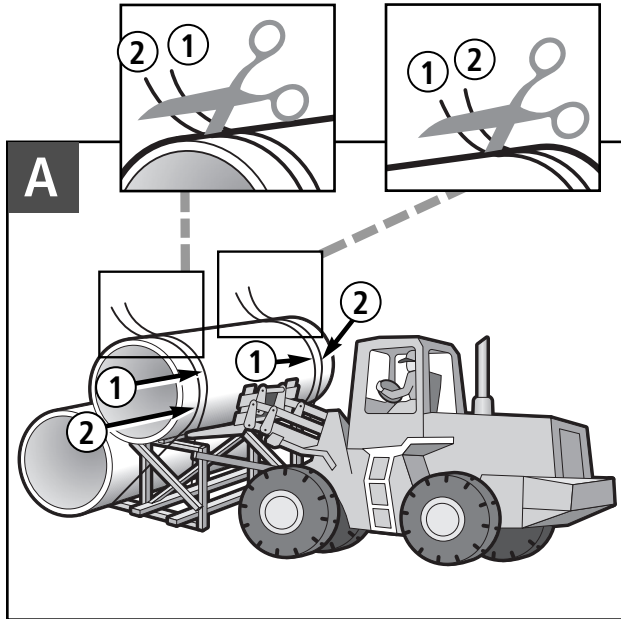
54" VYLON® PIPE

IMPORTANT:

Unload from truck in **BUNDLES ONLY**. Remove from trailer bed and place on firm, level ground **BEFORE** cutting any plastic **BANDING**.

Fork length MIN: 96 inches (or 8 feet);

Thickness MAX: 3.25 inches to unload bundles from trailers



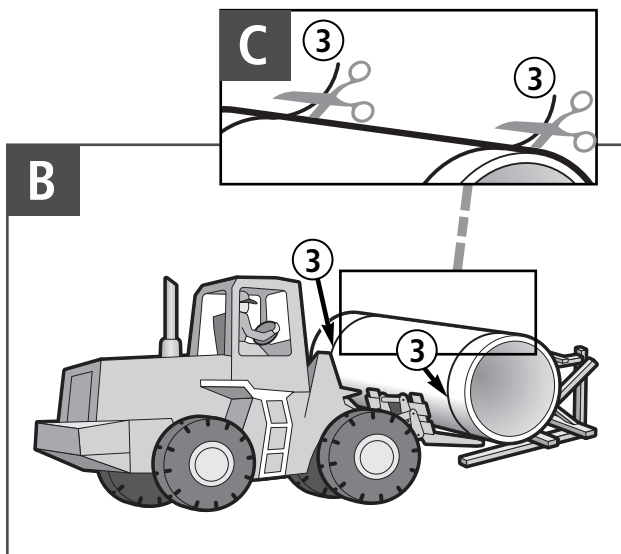
UN-BANDING INSTRUCTION STEPS:

Step A. CUT bands labeled #1 and #2 **ONLY** from the crate side of the bundle. (Fork lift length MIN: 32 inches, MAX: 60 inches) **See drawing A.**

UNLOAD top pipe from support **crate side** of bundle. (Fork lift length MIN.: 32 inches, MAX: 60 inches)

Step B. Next, **POSITION** forks under pipe. **See drawing B.**

Step C. CUT bands labeled #3. **See drawing C.**



Vylon Pipe