

# ***CORRUGATED HDPE PIPE INSTALLATION GUIDE***



The Most **Advanced** Name in Drainage Systems®



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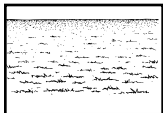
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## Job Site Handling and Receiving

### Receiving Recommendations

Our distributors and customer service personnel make service and customer satisfaction their highest priority. If your order is incorrect, contact your distributor or our customer service personnel.

- Direct driver to a smooth, flat area, free of rocks and debris.
- Examine load quantities and quality immediately after unloading. Inspect pipe carefully for possible damage from transportation or unloading.
- Note damaged or missing items on delivery receipt.
- Shortages and damaged material are not automatically reshipped. Reorder replacement material.
- Do not dispose of damaged items. Check with driver for proper return method. If driver is unsure, contact our customer service personnel.

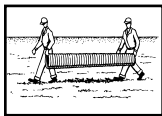


### Handling Recommendations

To avoid damage to the pipe and fittings the following handling recommendations should be followed:

- OSHA safety requirements.
- Do not drop pipe.
- 18" (450mm) and smaller pipe can be moved by hand. Larger pipe requires a backhoe with a nylon sling.

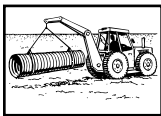
- Lift 36" (900mm) and larger diameter pipe with a sling at two points, spaced approximately 10 feet (3m) apart. Smaller diameters can use one lift point. Refer to Table 1 for recommended handling methods.



≤18" (450mm)



24"-30" (600-750mm)



≥36" (900mm)

- Contractor assistance is required to unload palletized pipe.
- Do not use a loading boom or forklift directly on or inside pipe.

**Table 1:**

| Recommended Handling Method for Pipe |                             |                  |
|--------------------------------------|-----------------------------|------------------|
| Diameter in. (mm)                    | Approx. Weight lb/ft (kg/m) | Handling Method* |
| 4 (100)                              | 0.44 (0.65)                 | Labor            |
| 6 (150)                              | 0.85 (1.26)                 | Labor            |
| 8 (200)                              | 1.5 (2.23)                  | Labor            |
| 10 (250)                             | 2.1 (3.13)                  | Labor            |
| 12 (300)                             | 3.2 (4.76)                  | Labor            |
| 15 (375)                             | 4.6 (6.85)                  | Labor            |
| 18 (450)                             | 6.4 (9.52)                  | Labor            |
| 24 (600)                             | 11.0 (16.37)                | Sling (1 point)  |
| 30 (750)                             | 15.4 (22.92)                | Sling (1 point)  |
| 36 (900)                             | 19.8 (29.47)                | Sling (2 points) |
| 42 (1050)                            | 26.4 (39.29)                | Sling (2 points) |
| 48 (1200)                            | 31.3 (46.58)                | Sling (2 points) |
| 54 (1350)                            | 34.6 (51.5)                 | Sling (2 points) |
| 60 (1500)                            | 45.2 (67.27)                | Sling (2 points) |

\*Recommended handling methods are based on two laborers per pipe length, neither of which is carrying more than 100 lb. (45kg).

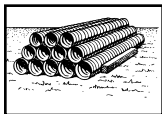
## Job Site Pipe Storage

### Storage Recommendations

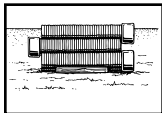
To ensure that your delivered pipe products do not become damaged during job site storage, follow these simple guidelines:

- Non-palletized pipe may be temporarily stockpiled on a flat, clear area.
- Use securing timbers (or blocks) to ensure the stockpile does not collapse.
- Failure to block pipe may result in stack collapsing, pipe damage, or personal injury.

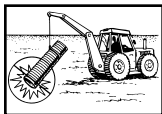
- Stack pipe no higher than approximately 6 feet (1.8m).



- While supporting lengths of pipe evenly, alternate bells for each row of pipe.

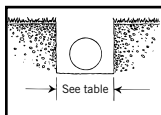


- To prevent damage to the bell or spigot when moving pipe sections, do not drag or strike pipe ends against anything.



## Trench Construction

- Information provided in this pocket installation guide is intended as a quick reference only and does not supersede requirements specified on project plans.
- The trench or ditch should be wide enough to place and compact backfill around the entire pipe.
- Refer to Table 2 for recommended minimum trench widths. The design engineer may modify the trench width based on site specific conditions.



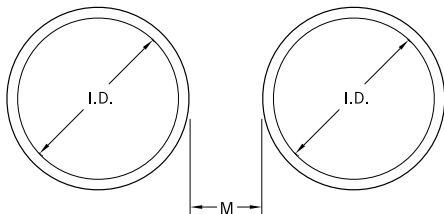
**Table 2:**

| Minimum Trench Widths  |                      |
|------------------------|----------------------|
| Pipe Diameter in. (mm) | Trench Width in. (m) |
| 4 - 8 (100 - 200)      | *                    |
| 10 (250)               | 28 (0.7)             |
| 12 (300)               | 30 (0.8)             |
| 15 (375)               | 34 (0.9)             |
| 18 (450)               | 39 (1.0)             |
| 24 (600)               | 48 (1.2)             |
| 30 (750)               | 56 (1.4)             |
| 36 (900)               | 64 (1.6)             |
| 42 (1050)              | 72 (1.8)             |
| 48 (1200)              | 80 (2.0)             |
| 54 (1350)              | 88 (2.2)             |
| 60 (1500)              | 96 (2.4)             |

*\*Usually dependent on smallest bucket size available.*

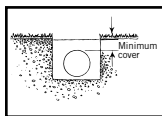
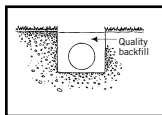
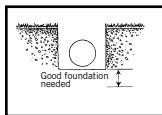
- For parallel pipe installations, allow space between pipes for proper compaction. Refer to Figure 1 for minimum pipe spacing.  
\*Spacing will differ for retention/detention systems due to the intended use of this product.

## Figure 1: Parallel Pipe Installation



UP TO 24" (600MM) I.D.: M=12" (300MM)  
MORE THAN 24" (600MM) I.D.: M=1/2 I.D.

- Trench or ditch bottoms containing bedrock, soft muck or refuse, or other material unable to provide long-term uniform pipe support are **unacceptable**.
- All unsuitable foundation shall be excavated before pipe installation proceeds.
- Where rock or unyielding or soft foundation is present, the design engineer shall be contacted to determine the extent of excavation required.
- If native soil can migrate into backfill, use synthetic fabric (geotextile) to separate native soil from backfill.



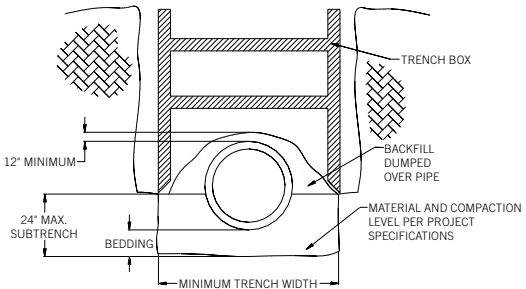
## Trench Boxes

Trench boxes provide a safe work area to install pipe in deep trenches or in soils that have insufficient stability. **Always** follow OSHA requirements when using a trench box.

The length of the trench box should be suitable for the pipe length. Nominal length for dual wall HDPE pipe is 20 ft. (6m) although shorter lengths can be supplied.

The most effective way to maintain a sound system is to provide a 'subtrench' within which to place the pipe and backfill. The subtrench shall not be greater than 24" above the bottom on the trench as shown in Figure 2. Backfill and compact according to the design specifications within the subtrench. The trench box can be pulled along the top edge of the subtrench without affecting the backfill in the pipe embedment zone.

**Figure 2: Subtrench Installation**



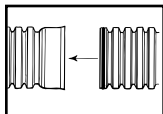
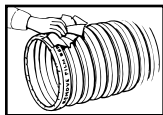
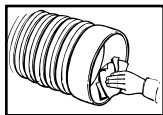
In installations not involving a subtrench, dragging a trench box should only be done if it does not damage the pipe or disrupt the backfill; otherwise, the box should be lifted vertically into its new position, again taking great care not to disturb the pipe or backfill.

## Bell & Spigot Joint Assembly

For pipe with a bell-and-spigot connection, it is imperative that the joint be assembled properly to ensure that the product performs to expectations. The steps that must be followed to obtain a quality joint are provided below. Failure to follow these instructions may cause the joint quality to be severely compromised.

- Lower pipe into trench by hand, or use nylon straps and excavating equipment.
- Begin by inspecting the bell and remove any foreign matter.
- Use a clean rag or brush to lubricate bell of pipe lubricant.
- Clean spigot end of pipe.
- Remove protective wrap from gasket.
- Using clean rag or brush, lubricate exposed gasket with pipe lubricant.
- Do not allow lubricated section to touch dirt or backfill. Foreign matter could adhere to surface and compromise joint integrity.
- Place spigot into bell and align.

*Note: Always push spigot end into bell, not bell end onto spigot.*

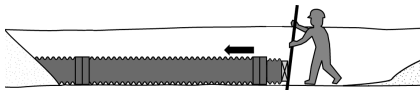


Assemble joint using one of the following methods. (For smaller diameters, pipe may be joined manually.)

- For all methods, ensure bell and spigot are adequately “homed” for proper installation and tight joining seal. If no homing mark is present, measure the depth of the bell and use a crayon or other material to place a homing mark on appropriate corrugation of the spigot end.
- Installation stubs, mentioned in the assembly instructions, can be purchased or made following the information on page 15.

### Bar & Block Method

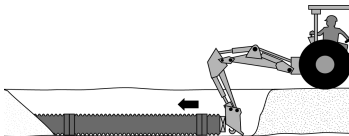
- Place installation stub into bell end of pipe.
- Place wooden block horizontally across end of installation stub.
- With a bar, push against wooden block until pipe is fully inserted into bell.



*NOTE: This method requires use of installation stub.  
DO NOT push directly against pipe.*

## Backhoe Method

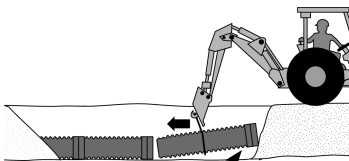
- Place installation stub into bell end of pipe.
- Place wooden block horizontally across installation stub.
- Carefully push back of backhoe bucket against block until pipe is fully inserted into bell.



*NOTE: This method requires use of installation stub. DO NOT push backhoe directly against pipe.*

## Backhoe and Sling Method

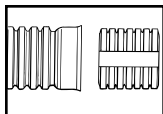
- Wrap nylon sling around pipe. Pipe 36" (900mm) or larger should be picked up at two points approximately 10' (3m) apart.
- Hook other end of nylon sling to backhoe bucket.
- Operator should carefully push strap tight toward bell of downstream pipe until spigot is fully inserted into bell.
- Ensure pipe slides squarely into bell to avoid misalignment.
- Keep pipe level.



*NOTE: Distance from bedding to bottom of pipe not to exceed 6" (150mm) for a 20' (6m) pipe.*

## Installation Stub Fabrication

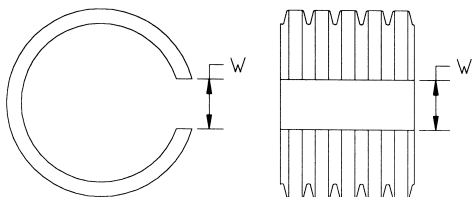
To push “home” bell-and-spigot pipe, an installation stub can be used to prevent accidental damage to the bell. Installation stubs are not required if the bell



is not pushed on directly. Installation stubs in all sizes are available from your distributor, or you can fabricate your own on site by following the proceeding steps:

- Cut a section of HDPE pipe five corrugations long in the center of the corrugation valley.
- Using a saw, remove a strip of pipe wall from the short stub of pipe (Figure 3). *Note: Strip width depends on pipe size. See Table 3 for recommended widths.*

**Figure 3: Installation Stub**



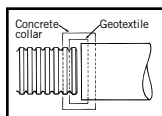
**Table 3:**

| Strip Width for Installation Stub |                |
|-----------------------------------|----------------|
| Diameter in. (mm)                 | Width in. (mm) |
| 4-6 (100-150)                     | 2 (51)         |
| 8 (200)                           | 2.5 (64)       |
| 10-12 (250-300)                   | 4 (102)        |
| 15 (375)                          | 5 (127)        |
| 18 (450)                          | 6 (152)        |
| 24 (600)                          | 7.5 (191)      |
| 30-42 (750-1050)                  | 10 (254)       |
| 48-60 (1200-1500)                 | 12 (305)       |

- To use stub, push on pipe walls to change O.D. of stub to I.D. of bell to be installed.

### Joining Different Pipe Types or Sizes

Drainage systems often involve connecting pipes of different materials or sizes. Options to make these transitions are often limited by the joint



quality required. One very common method of connecting different types of pipe of the same size, and in some cases different sizes, is through the use of a concrete collar. This generally provides a minimum silt-tight joint quality but the resulting quality ultimately depends on workmanship.

- A concrete collar is formed by butting the two pipe ends tightly together, wrapping the junction with a geotextile to keep out most soil and concrete, and then pouring a concrete collar that covers both pipe ends.

Another option may be using fittings or adapters specifically designed for this application. A selection of fittings designed to make the transition from one material directly to another is available. In other cases a fitting may need to be used in combination with another manufacturer's gasket or coupler to complete the transition. Transitions made in this manner may provide for a higher performance joint than a concrete collar.

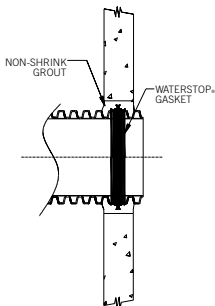
### **Manholes and Catch Basin/Connections**

Manholes or catch basins can be used at changes in pipe material, size, grade, direction and elevation. Manholes and catch basins can be more costly than other alternatives but also allow grade and directional changes in addition to changes in pipe material and size.

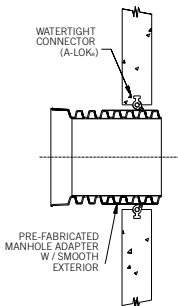
- Local regulations should be consulted to determine if manholes or catch basins are required at any or all pipe changes.
- Refer to Figure 4 for the acceptable methods of connecting HDPE pipe to manholes or basins.

## Figure 4:

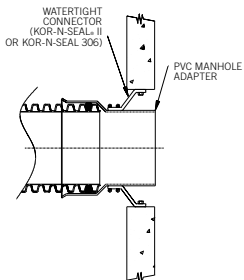
### Product Detail for Manhole Connections



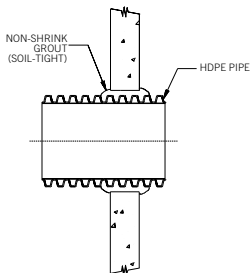
TYPE 1  
WATERTIGHT  
WATERSTOP GASKET AND  
NON-SHRINK GROUT



TYPE 2  
WATERTIGHT  
USING PRE-FABRICATED  
ADAPTER



TYPE 3  
WATERTIGHT  
USING PVC  
MANHOLE ADAPTER

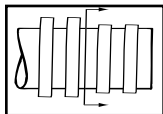


TYPE 4  
SOIL-TIGHT  
USING NON-SHRINK GROUT  
(GASKET OPTIONAL)

## Field Gasket Assembly

When standard lengths of HDPE pipe must be cut to fit in a field application, the following instructions will ensure proper performing joints:

- For reduced spigot pipe ONLY, reducing spigot must be removed.
- Using a saw, cut in the center of the valley of the first full corrugation.
- Trim remaining polyethylene burrs from saw cut. *Note: Failure to smoothly trim burrs may compromise joint integrity.*
- Wipe clean first valley from end of pipe. *This is where gasket will be placed.*
- Hold gasket with both hands so printing is facing you.
- With printing on gasket face-up and toward spigot end of pipe, slide gasket into first corrugation valley, starting at bottom. *Note: It is easier to pull gasket up to conform to valley.*
- Slide gasket into first corrugation valley by hand.
- Ensure printing on gasket is face-up and toward spigot end of pipe.



Gasket printing should be visible in this location when properly installed.

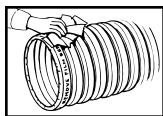


## Fittings Assembly

This section includes information necessary for:

1. Soil-tight belled fittings
2. Watertight fittings
3. Repair couplers
  - Cut pipe to desired length in the center of the corrugation valley before placing in trench.
  - Trim remaining polyethylene burrs from saw cut. *Note: Failure to smoothly trim burrs may compromise joint integrity.*
  - Excavate bedding from around spigot end where fitting shall be used. A bell hole will help prevent dirt and debris from contaminating joint during assembly.
  - Install gasket in accordance with gasket assembly procedure (page 19).
  - Measure the depth of the bell and use a crayon or other material to place a homing mark on appropriate corrugation of the spigot end.

- Using clean rag or brush, lubricate exposed gasket with pipe lubricant.



- Do not let lubricated section touch dirt or backfill, as foreign material could adhere to surface and compromise joint integrity.

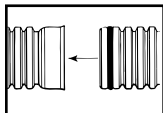
- Inspect fitting and remove any foreign matter.

- Align and center pipe.

- Lubricate inside of bell.

- Align fitting with pipe end.

- Use installation stub or blocking where required.



- Take care not to damage pipe or fittings.

- Ensure pipe is straight and bell reaches homing mark.

- Assemble other end of pipe or fitting as described in the pipe assembly section on page 12.

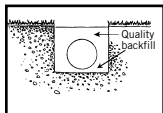
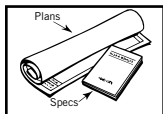
- Special care should be taken to replace and compact bedding material in bell hole to provide adequate support under the joint.

## Backfill Recommendations

HDPE pipe and a well-constructed backfill envelope work together to support soil and traffic loads. Correct installation will ensure long-term trouble-free service for all types of pipe systems.

## Backfill Material Selection

- Provided the plans meet minimum recommendations as stated in Table 4, they should take precedence.
- Locally available materials may be acceptable for backfill use, but must meet one of the acceptable soil classifications outlined in Table 4.
- Class I materials can be dumped around pipe. Voids must be eliminated by knifing under and around pipe or by some other technique.
- Non-cohesive sand, sand/gravel mixes and other Class II and III materials must be compacted to a minimum of 85% and 90% standard Proctor density, respectively.
- Inorganic silts, and gravelly, sandy or silty clays, and other Class IV materials are not permitted.
- Flowable fill is another acceptable backfill material. Misalignment or flotation may occur unless added precautions are taken, such as anchoring the pipe or pouring the flowable fill in lifts.



**Table 4:**

### Acceptable Backfill Material and Compaction Requirements

| Description   | Soil Classifications |                      |                              | Minimum Standard Proctor Density % |
|---|----------------------|----------------------|------------------------------|------------------------------------|
|   | ASTM D2321           | ASTM D2487           | AASHTO M43                   |                                    |
| Graded or crushed, crushed stone, gravel  | Class I              | –                    | 5<br>56                      | Dumped                             |
| Well-graded sand, gravels and gravel/sand mixtures; poorly graded sand, gravels and gravel/sand mixtures; little or no fines  | Class II             | GW<br>GP<br>SW<br>SP | 57<br>6                      | 85%                                |
| Silty or clayey gravels, gravel/sand/silt or gravel and clay mixtures; silty or clayey sands, sand/clay or sand/silt mixtures | Class III            | GM<br>GC<br>SM<br>SC | Gravel and sand (<10% fines) | 90%                                |

\* Layer heights should not exceed 1/2 the pipe diameter. Layer heights may also need to be reduced to accommodate compaction method.

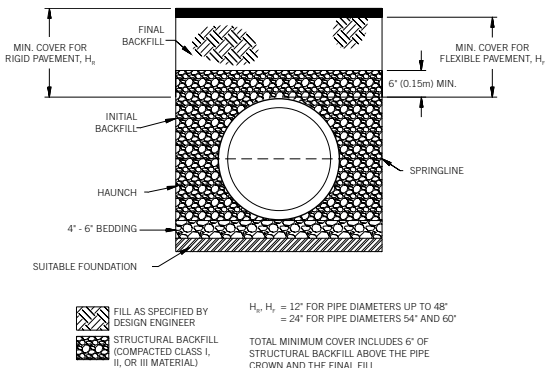
## Groundwater or Surface Runoff

When groundwater or surface runoff is present in the work area, dewater to maintain stability of native and imported materials. Maintain water level below pipe foundation to provide a stable trench bottom.

## Backfill Envelope Construction

- If native soil cannot carry load, import, compact and level adequate bedding material as in Figure 5.

Figure 5:



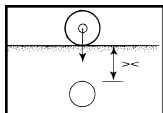
- Place and compact backfill in layers to meet requirements of Table 4 and project requirements. Note that the smaller pipes may require layer heights less than those indicated in the table.
- Avoid impacting pipe with compaction equipment.
- 4" - 48" (100-1200mm) single pipe runs receiving H-25 traffic requires final backfill 6" (0.15m) above initial backfill to provide at least 12" (0.3m) of cover.
- 54" (1350mm) and 60" (1500mm) single pipe runs receiving H-25 traffic require final backfill 18" (0.5m) above initial backfill to provide at least 24" (0.6m) of cover.
- Minimum cover may be reduced in areas with no or infrequent light traffic. These situations must first be reviewed by the pipe manufacturer.

### **Other Installation Considerations**

All unique situations cannot be anticipated; however, several common questions are answered in the following material.

## Construction and Paving Traffic

- Some construction vehicles, such as many types of paving equipment, are not as heavy as the design load.
- For situations with relatively light construction vehicles, the 12" (0.3m) and 24" (0.6m) minimum covers criteria discussed earlier can be decreased during the construction phase.
- Table 5 presents the surface applied loads and the corresponding minimum cover that can be permitted on a temporary basis. *These criteria should only be employed during construction; finished projects should always have a minimum cover of at least 12" (0.3m) for 4" - 48" (100-1200mm) diameters and minimum cover of at least 24" (0.6m) for 54" (1350mm) and 60" (1500mm) diameters.*



**Table 5:**

### Temporary Cover Requirements for Light Construction Traffic

| Type of Vehicle                   | Vehicular Load at Surface psi (kPa) | Temporary Minimum Cover, in. (mm) for: |                                       |
|-----------------------------------|-------------------------------------|--|---------------------------------------|
|                                   |                                     | 4" - 48" (100-1200mm) diameters        | 54" - 60" (1350 and 1500mm) diameters |
| Semi-tractor <sup>1</sup>         | 75 (517)                            | 9 (230)                                | 12 (300)                              |
| Loaded pick-up truck <sup>2</sup> | 50 (345)                            | 6 (150)                                | 9 (230)                               |
| Skid steer loader <sup>3</sup>    | 25 (172)                            | 3 (80)                                 | 6 (150)                               |

1. Based on typical 3-axel day-trip tractor without trailer.

2. Chevy® 3500 series, fully loaded.

3. Bobcat® T180 model skid steer loader.

- *Vehicles exceeding these criteria must not be permitted to drive over the installation.*
- Areas receiving heavy construction equipment traffic between 30 and 60 tons require at least 3 feet (0.9m) of cover. Higher loads require cover greater than 3 feet (0.9m), depending on the load.
- If sufficient cover is not provided, mound and compact material over pipe to provide minimum cover needed for load during construction.

### **Maximum Cover**

The maximum burial depth is highly influenced by the type of backfill installed around the pipe. Maximum cover limits for dual wall HDPE pipe are shown in Table 6 for a variety of backfill conditions. Greater cover heights may be possible but should be reviewed by the Application Engineering Department.

**Table 6:****Maximum Cover Dual Wall HDPE Pipe, ft (m)**

| Diameter<br>in (mm) | Class 1   | Class 2 |       |       |       |       | Class 3 |  |  |
|---------------------|-----------|---------|-------|-------|-------|-------|---------|--|--|
|                     | Compacted | 95%     | 90%   | 85%   | 95%   | 90%   | 85%     |  |  |
| 4 (100)             | 45        | 30      | 21    | 15    | 21    | 16    | 14      |  |  |
| 6 (150)             | (13.7)    | (9.1)   | (6.4) | (4.5) | (6.4) | (4.8) | (4.2)   |  |  |
| 8 (200)             | 45        | 29      | 20    | 14    | 21    | 15    | 13      |  |  |
| 10 (250)            | (13.7)    | (8.8)   | (6.0) | (4.2) | (6.4) | (4.5) | (3.9)   |  |  |
| 12 (300)            | 43        | 28      | 20    | 14    | 20    | 15    | 13      |  |  |
| 15 (375)            | (13.1)    | (8.5)   | (6.0) | (4.2) | (6.0) | (4.5) | (3.9)   |  |  |
| 18 (450)            | 34        | 23      | 16    | 11    | 17    | 12    | 10      |  |  |
| 24 (600)            | (10.4)    | (7.0)   | (4.8) | (3.3) | (5.1) | (3.6) | (3.0)   |  |  |
| 30 (750)            | 34        | 23      | 15    | 10    | 16    | 11    | 9       |  |  |
| 36 (900)            | (10.4)    | (7.0)   | (4.5) | (3.0) | (4.8) | (3.3) | (2.7)   |  |  |
| 42 (1050)           | 31        | 21      | 14    | 9     | 15    | 10    | 8       |  |  |
| 48 (1200)           | (9.4)     | (6.4)   | (4.2) | (2.7) | (4.5) | (3.0) | (2.4)   |  |  |
| 54 (1350)           |           |         |       |       |       |       |         |  |  |
| 60 (1500)           |           |         |       |       |       |       |         |  |  |

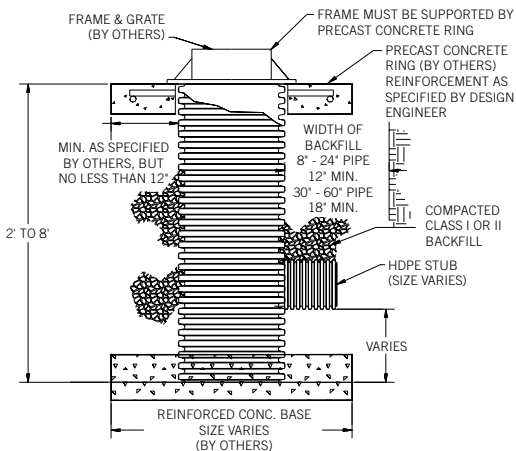
**Notes:**

- 1) Results based on calculations shown in the Structures section of the Drainage Handbook. Calculations assume no hydrostatic pressure and a density of 120 pcf (1926 kg/m<sup>3</sup>) for overburden material.
- 2) Installation assumed to be in accordance with ASTM D2321 and the installation section of the Drainage Handbook.
- 3) Backfill materials and compaction levels not shown in the table may also be acceptable. Contact the manufacturer for further detail.
- 4) Material must be adequately "knifed" into haunch and in between corrugations. Compaction and backfill material is assumed uniform throughout entire backfill zone.
- 5) Compaction levels shown are for standard Proctor density.
- 6) For projects where cover exceeds the maximum values listed above, contact the manufacturer for specific design considerations.

## Vertical Installations

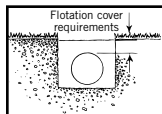
- HDPE pipe is sometimes installed vertically for use as catch basins or manholes, meter pits, and similar applications.
- Backfill should extend a minimum of 12" (0.3m) completely around the vertical structure.
- Backfill material recommendations are identical to those for a horizontal installation; compaction levels and maximum lift requirements must be strictly followed (refer to Table 4 for material selection).
- Height of the vertical structure must not exceed 8' (2.4m), unless the Application Engineering Department reviews the design.
- If traffic will be driving over a vertical structure, a concrete collar similar to that shown in Figure 6 shall be used to transfer the load into the ground.
- Cast iron frames holding grates or lids must be seated on a concrete collar or similar structure so that the weight of the frame and grate or lid is transferred into the ground, *not* to the vertical pipe.
- There may also be other product performance limits depending on the application. Contact Application Engineering for further information.

**Figure 6: Vertical Riser**



## Flotation

- Table 7 shows minimum cover heights for various HDPE pipe sizes to prevent flotation.



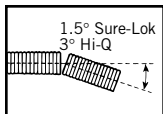
**Table 7:**

| <b>Required Minimum Cover* to Prevent Flotation</b> |                                      |                                   |
|---|--------------------------------------|-----------------------------------|
|   | <b>Nominal Diameter<br/>in. (mm)</b> | <b>Minimum Cover<br/>in. (mm)</b> |
| Dual<br>Wall<br>HDPE                                | 4 (100)                              | 3 (77)                            |
|   | 6 (150)                              | 4 (102)                           |
|   | 8 (200)                              | 5 (127)                           |
|   | 10 (250)                             | 7 (178)                           |
|   | 12 (300)                             | 9 (368)                           |
|   | 15 (375)                             | 11 (457)                          |
|   | 18 (450)                             | 13 (559)                          |
|   | 24 (600)                             | 17 (711)                          |
|   | 30 (750)                             | 22 (914)                          |
|   | 36 (900)                             | 25 (1067)                         |
|   | 42 (1050)                            | 29 (1219)                         |
|   | 48 (1200)                            | 33 (1372)                         |
| 60 (1500)   | 40 (1702)                            |                                   |
| Single<br>Wall<br>HDPE                              | 3 (75)                               | 2 (50)                            |
|   | 4 (100)                              | 3 (77)                            |
|   | 6 (150)                              | 4 (102)                           |
|   | 8 (200)                              | 6 (152)                           |
|   | 10 (250)                             | 7 (178)                           |
|   | 12 (300)                             | 9 (368)                           |
|   | 15 (375)                             | 11 (457)                          |
|   | 18 (450)                             | 13 (559)                          |
|   | 24 (600)                             | 17 (711)                          |

*\*Based on the pipe being completely empty, water table at the ground surface, soil density of 130 pcf (2083 kg/m<sup>3</sup>), and a soil friction angle appropriate for most sand/gravel mixtures. The average of the inside and outside diameters was used to determine soil and water displacement.*

## Bending Radius

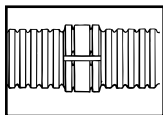
A curved pipe alignment is sometimes desired in drainage systems so that they can be installed around buildings or utilities without the use of fittings. HDPE pipe can be angled slightly at the joints to create this curvature. Coupling bands allow approximately 3 degrees of angular misalignment at each joint, while each bell-and-spigot joint can accommodate 1-1.5 degrees and remain at its specified joint quality. Additional information can be obtained through your Sales Representative or the Application Engineering Department.



## Soil-tight Repair Methods

### Option 1: Split Band Coupler

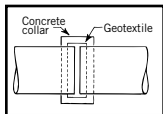
For repairs of 4" - 30" (100-750mm) pipe with a damaged area less than 10% of the diameter of pipe in a non-trafficked area, use a split band coupler as described in the following steps:



- Center split band coupler around damaged section of pipe.
- Wrap the coupler around the pipe and tighten nylon straps.
- Carefully replace and compact bedding and backfill to provide proper support for pipe and coupler.

## Option 2: Concrete Collar

For repairs of 4" - 60" (100-1500mm) pipe with a damaged area less than 25% the diameter of pipe, use a concrete collar as described in the following steps:



- Excavate area beneath damaged section of pipe about 6" (0.15m).
- Wrap the damaged area with a geotextile to completely cover the area to be repaired.
- Strut or brace damaged section as necessary.
- Encase damaged section of pipe with a concrete collar.
- Carefully replace bedding and backfill to provide proper support for pipe.

## Option 3: Mastic Banding

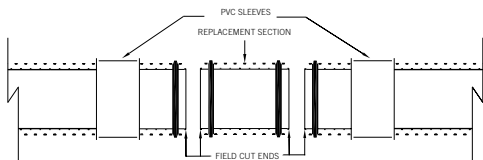
Typically with external sealing of 4" - 60" (100-1500mm) pipe, a mastic material is used to wrap a small section of pipe. The use of the Mar-Mac<sup>®</sup> Polyseal Pipe Coupler by Mar-Mac<sup>®</sup> Construction Products, Inc., or a comparable equal is recommended. This band is a self-adhering rubberized mastic that wraps around the damaged section or joint. A protective peelable paper is removed from the back of the band to expose a tacky mastic surface. The band is then adhered to the entire circumference of the pipe. Straps on the band tighten to provide a positive seal.

*Note: Mar-Mac bands shall be installed in accordance with manufacturer's recommendations.*

## Watertight Repair Methods

### Option 1: PVC Slip Coupling

For repairs of 12" - 24" (300-600mm) pipe, a PVC slip coupling is recommended. The PVC slip coupling is typically used when a damaged section of pipe is cut and removed in an existing line. Couplings provide a bell-bell connection to join the existing pipe to a replacement section of pipe or other end of the existing pipe. Installation of PVC slip coupling should follow recommendations listed on page 20.



### Option 2: Chemical Grouting

For repairs of 4" - 60" (100-1500mm) pipe with improperly assembled joints, chemical grouting can be considered an optional repair method. Chemical grout creates a waterproof collar around leaking pipes and joints.

### Option 3: Internal Sealing

For repairs of 18" - 60" (450-1500mm) pipe with a damaged area on the interior, a repair with internal sealing methods may be used. Internal mechanical sealing is usually comprised of a metal band with a rubber gasket, which expands to conform to the inner wall of the pipe. The feasibility of this repair method depends on the size of the damaged section or joint and available access into the pipe.

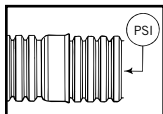
### Recommendations for In-Field Testing

Normally, a visual inspection is all that is necessary to identify proper line and excessive deflection. If it is determined that additional in-field testing is necessary, the following criteria or methods should be used:



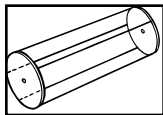
### Leakage Testing (where applicable):

After watertight HDPE pipe has been installed, sections of pipe may be tested for leakage. When required, pipe shall be tested by water infiltration or water exfiltration. The test method must be in accordance with ASTM F2487.



## Deflection Testing:

If considered necessary, pipe deflection can be tested within 30 days of installation by pulling a mandrel through the installed pipe. Testing 10% of the overall project should provide a reasonable indication of installation quality. Table 8 lists the inside diameters that result from common testing limits of 5% and 7.5% deflection. Mandrel tests yield only pass/fail results and can provide misleading results. Before excavating, further investigate to make sure the problem is not being caused by foreign material in the pipe, a slightly offset joint, or some other similar situation.



**Table 8:****Recommended Mandrel Settings**

| <b>Nominal<br/>Inside<br/>Diameter</b> | <b>Base Inside<br/>Diameter<br/>with 5%<br/>Deflection</b> | <b>Base Inside<br/>Diameter<br/>with 7.5%<br/>Deflection</b> |
|--|--|--|
| <b>in. (mm)</b>                        | <b>(in.)</b>   | <b>(in.)</b>   |
| 4 (100)                                | 3.61   | 3.52   |
| 6 (150)                                | 5.42   | 5.28   |
| 8 (200)                                | 7.23   | 7.04   |
| 10 (250)                               | 9.04   | 8.80   |
| 12 (300)                               | 10.84  | 10.56  |
| 15 (375)                               | 13.56  | 13.20  |
| 18 (450)                               | 16.27  | 15.84  |
| 24 (600)                               | 21.69  | 21.12  |
| 30 (750)                               | 27.11  | 26.40  |
| 36 (900)                               | 32.53  | 31.68  |
| 42 (1050)                              | 37.95  | 36.96  |
| 48 (1200)                              | 43.38  | 42.24  |
| 54 (1350)                              | 48.80  | 47.51  |
| 60 (1500)                              | 54.22  | 52.79  |

*\*These measurements include allowable manufacturing tolerances.*

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