

# Pipe Repair Techniques

There are a variety of options available for the repair of HDPE pipe in the field. The method chosen depends primarily on the type of damage, degree of joint performance required and access to the pipe.

Generally a soil-tight HDPE pipe system will require a soil-tight repair and a watertight HDPE pipe system will require a watertight repair. The repaired joint should not become the weak point in the pipe system. If the pipe is still unburied or easily excavated, repairs can be carried out from the exterior. If the pipe is buried and excavation is not possible, an internal repair may be required.

**TABLE 1: Pipe Repair Matrix**

*Ref. Florida Department of Transportation*

Type of Damage	External Repair Method	Internal Repair Method
Excessive joint gap, rolled gasket or damaged joint	<ul style="list-style-type: none"> <li>• Mastic banding</li> <li>• Concrete collar</li> </ul>	<ul style="list-style-type: none"> <li>• Internal joint seal</li> <li>• Welding</li> <li>• Pressure injection of an acceptable flexible chemical grout</li> </ul>
Cracks	<ul style="list-style-type: none"> <li>• Mastic banding</li> <li>• Concrete collar</li> <li>• Split band coupler</li> <li>• Welding</li> </ul>	<ul style="list-style-type: none"> <li>• Internal joint seal</li> <li>• Welding</li> <li>• Mechanical repair sleeve</li> </ul>
Punctures or minor damage that does not exceed the width of a single corrugation	<ul style="list-style-type: none"> <li>• Mastic banding</li> <li>• Concrete collar</li> <li>• Split band coupler</li> <li>• Slip Coupler</li> </ul>	<ul style="list-style-type: none"> <li>• Internal joint seal</li> <li>• Welding</li> <li>• Pressure injection of an acceptable flexible chemical grout</li> <li>• Mechanical repair sleeve</li> </ul>

## External Repair Methods

### SOIL-TIGHT

#### Option 1: Split Band Coupler

An external split coupler (250mm to 900mm) can be used to achieve a **soil-tight** joint. These systems are suitable for non-traffic applications. Non-gasketed joining systems are intended for backfill conditions that are not saturated with suspended fines. If these conditions exist the pipe joints can be wrapped in a geotextile sock.



For damage greater than the width of a single corrugation, cut out the damaged area making cuts in the center of the corrugation valley. Cut the replacement pipe section to the desired length, trimming any

polyethylene burrs from the saw cut. Excavate bedding from under the existing pipe cut ends. Position the replacement pipe section. Lay the adjoining sections of pipe in the open split band coupler and wrap the coupler around the pipes. The coupler should engage at least two full corrugations on both pipe ends. Feed the nylon ties through the holes in the ends of the coupler and pull tight ensuring the pipe and inside of the coupler are free of debris. Carefully replace and compact bedding and backfill to provide proper support.

For cracks, joint defects and minor damage less than the width of a single corrugation excavate from under the existing pipe to a width greater than the band. Center the coupler over the damaged area and wrap the coupler around the pipe. Feed the nylon ties through the holes in the ends of the coupler and pull tight ensuring the pipe and inside of the coupler are free of debris. Carefully replace and compact bedding and backfill to provide proper support.

### Option 2: Concrete Collar

A concrete collar will provide a **soil-tight** connection and may be the more suitable option for traffic applications. Geotextile is wrapped around the repair area and then concrete is poured into a pre-made form. A greater level of joint performance can be achieved by using a gasket installed in the concrete collar.

For cracks, joint defects and minor damage excavate bedding from under the existing pipe to a width 0.3m (12 inches) greater than the damaged portion. Encase the damaged section of pipe with a concrete collar. Carefully replace and compact bedding and backfill to provide proper support for pipe and coupler. The foundation and bedding must be capable of handling the additional load associated with the weight of the concrete collar without excessive settling and the final backfill must be sufficiently compacted to minimize soil overburden loads.

### Option 3: Welding

Cracks with a gap less than 1/8" can be repaired using single bead extrusion weld. Joints, punctures, cracks or minor damaged sections larger than 1/8" in thickness should utilize HDPE sheet reinforcement, and sheet thickness should be at a minimum the same thickness as the pipe wall. Only an experienced welder knowledgeable in corrugated HDPE pipe repair should be allowed to repair the pipe.

### Option 4: Mastic Band (MarMac)

*MarMac* mastic bands are self-adhering rubberized mastic reinforced with geotextile fabric and a polyethylene outer cover. Four integrated steel compression bands wrap around the mastic band to form a positive seal. To repair damage greater than the width of one corrugation, cut out the damaged area of pipe making cuts in the center of the corrugation valley. Cut the replacement pipe section to the desired length trimming any polyethylene burrs from the saw cut. Excavate the bedding from under the existing pipe cut ends. Remove the protective peel-away paper from the back of the mastic band to expose the tacky mastic surface. Ensure that the pipe is clean and free from debris and wrap the mastic band around the entire circumference of the pipe to be repaired. Tighten the steel strap compression bands on the band to provide a positive seal. Carefully replace and compact bedding and backfill to provide proper support.

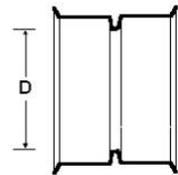


For cracks, joint defects and minor damage less than the width of one corrugation excavate from under the existing pipe to a width greater than the mastic bands. Center the coupler over the damaged area. Remove the protective peel-away paper from the back of the band to expose a tacky mastic surface. Ensure that the pipe is clean and free from debris. The band is then adhered to the entire circumference of the pipe. Straps on the band tighten to provide a positive seal. Carefully replace and compact bedding and backfill to provide proper support for pipe and coupler.

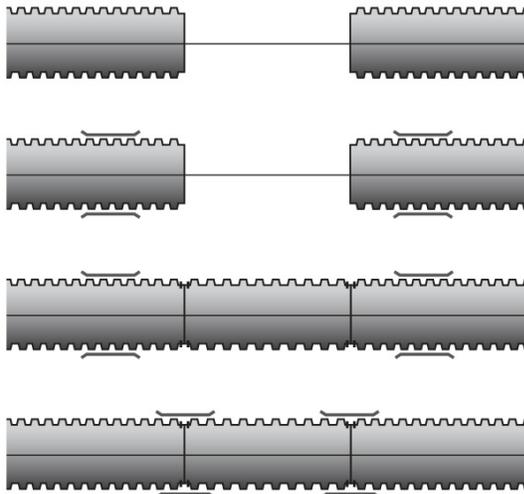
## Watertight Repair Methods

### Option 1: Repair Coupler (Slip Coupler)

If the pipe is unburied or easily excavated, Armtec manufactures a **watertight** HDPE repair coupler with two belled end sections. To install, cut out the damaged pipe area making cuts in the center of the corrugation valley. Cut the replacement pipe section to the desired length trimming any polyethylene burrs from the saw cut. Excavate the bedding from under the existing pipe cut ends. Position the couplers on either end of the pipe. Place gaskets on the first corrugation of each end to be connected. Insert the replacement pipe section. Slide the repair coupler across the joints and lock into place (**Figure 1**) ensuring the pipe and inside of the coupler are free of debris. Carefully replace and compact bedding and backfill to provide proper support.



**Figure 1:** Repair of damaged HDPE pipe



1. Cut out the damaged section of pipe.
2. Slide a repair coupler onto each section of pipe.
3. Cut the replacement pipe section to the exact width and position gaskets on the first corrugation of the existing pipe and replacement pipe.
4. Slide repair couplers over the gaskets and lock into place.

### Option 2: Large Diameter Slip Couplers

Large diameter split couplers are available from a variety of manufacturers including *Fernco*. They are made of PVC with stainless steel bands. To install, cut out the damaged pipe area making cuts in the center of the corrugation valley. Cut the replacement pipe section to the desired length trimming any polyethylene burrs from the saw cut. Excavate the bedding from under the existing pipe cut ends. Position the couplers on either end of the pipe. Insert the replacement pipe section. Slide the repair

coupler across the joints and tighten the stainless steel bands according to the manufacturer's instructions. Carefully replace and compact bedding and backfill to provide proper support. With proper installation these couplers will provide a watertight joint.

## Internal Repair Methods

### Option 1: Internal Joint Seal

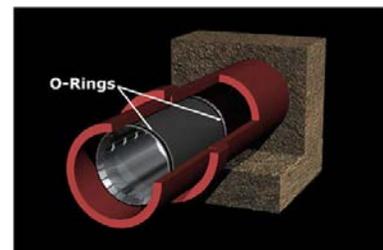
When external access to the damaged pipe section is restricted, an internal repair may be required. Most internal mechanical repair products on the market are comprised of a flexible gasket sleeve and stainless steel bands which fit inside the pipe and expand to conform to the inner pipe wall.

Remove the damaged section of pipe and splice in a new section of pipe. Insert the EPDM (ethylene propylene diene monomer) rubber seal into the pipe and position across the joints, holding in place with stainless steel bands. Torque the steel bands to expand the rubber seal. Alternatively, if the area is accessible and damage is minor (does not exceed the width of a single corrugation) splicing is not required. Ensure the area is clean and free of debris. Mark the pipe on either side of the damaged section in several places to ensure proper alignment. The location of the marks will depend on the size of the seal. Move the seal into place over the center of the damaged section. Tighten the internal expanding metal bands. Note that once installed, an internal mechanical seal will slightly reduce the inside diameter of the pipe. In order to achieve a **watertight** joint, proper installation is required. Refer to the manufacturer's installation guide for complete instructions.

### Option 2: Mechanical Repair Sleeve

This repair system is comprised of a stainless steel structural core, which uses a mechanical lock to hold it against the interior of the host pipe. The core is either surrounded by a gasket or uses two o-ring type gaskets on each end, depending on the application. Limit straps prevent the sleeve from expanding beyond a preset diameter and damaging the host pipe.

Gaskets are placed on the sleeve on site before the sleeve is installed. Monitored by a closed circuit TV (CCTV) camera, the sleeve is positioned over the damaged area in the sewer. The air plug is then inflated to expand the sleeve until the locks engage. The air plug is then deflated and withdrawn. Ensure that the locking mechanisms are placed at the crown of the pipe to minimize trapping debris.



*Ref. Florida Department of Transportation*

### Option 3: Pressure injection of an acceptable flexible chemical grout

Chemical activated grout creates a collar around leaking pipe and joints. Grouting chemicals are forced into the joint and the surrounding soil where they activate sealing the joint. To install, equipment containing the grout is inserted into the pipe and positioned over the joint. The grout is forced through the joint from the inside of the pipe and then gels when it comes in contact with the soil to form a waterproof collar.