

Technical Note

TN 5.23_C Pipe Repair Methods - N-12® and HP Storm

Introduction

ADS N-12 and HP Storm pipes, made from high-density polyethylene or polypropylene resins, are widely recognized for their reliability and effectiveness in stormwater drainage and storage systems. As with all construction materials, plastic pipes may occasionally require repair due to inadequate installation, accidental damage, or unforeseen site conditions. This technical note outlines the products and procedures available to contractors for repairing damaged sections or joints of ADS pipes in the field.

Repair Options

A key factor in choosing a repair method is the required joint performance. Watertight repairs, meeting ASTM D3212 standards, are typically used in applications where minimal leakage into or out of the pipe is required. Soil-tight repairs can be used when watertight performance is not necessary or where infiltration/exfiltration into the stormwater pipe is not a primary concern.

Another factor in selecting a repair method is the installation method of the repair itself. External repairs require exposing the damaged area and potentially replacing the section. Internal repairs typically require access from a nearby manhole and specialized equipment and techniques to complete the repair. Internal repairs generally consist of using a flexible cylindrical gasket sleeve which expands into the inner walls of the pipe. The feasibility of internal repairs depends on multiple factors, including the extent of the damaged section as well as the diameter of the pipe in question.

Repairs may at times need to occur because the structural capacity of the pipe has been exceeded or potentially compromised due to damage. The removal and replacement of the pipe is, in many cases, the best course of action. However, there can be instances where removal of the pipe is not a viable option (deep installation, little to no working area, etc.) which may require an insitu structural repair. These repairs will typically require an Engineer of Record (EOR) to review and ensure that the repair will adequately shed loading, including overburden and live loading, away from the pipe and to the structural capacity of the repair.

The repair options addressed below are separated into categories for Internal v. External repair, as well as ST or WT joint performance. During any pipe repair, backfill should be confirmed to be placed and compacted per project specifications to provide proper support for the pipe and repair.

Table 1: Pipe Repair Matrix

Installation Method	Repair Method	Soil Tight (ST)	Water Tight (WT) (Per ASTM D3212*)	Structural Repair
External	Snap/Split Coupler	✓		
	Bell-Bell Coupler		✓	
	PVC Slip Coupling		✓	
	Mastic Coupler		✓ (per manufacturer)	
	Concrete Collar/ Encasement	✓	✓ (using waterstop gaskets)	✓
	Flexible Coupler		✓	
Internal**	Joint Seal		✓	
	Chemical Grout/ Sealing		✓	
	Extrusion Welding		✓	
	Cured In Place Pipe (CIPP) Liner		✓	✓

* - ASTM D3212 Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals

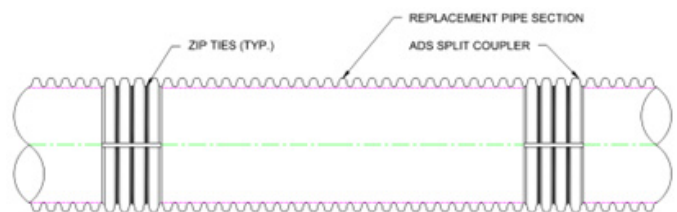
** - Internal repairs may slightly restrict the inside diameter of the pipe. This should be considered when assessing the risk of debris obstruction and required hydraulic performance.

External Couplers

Snap/Split Coupler

Performance: Soil Tight

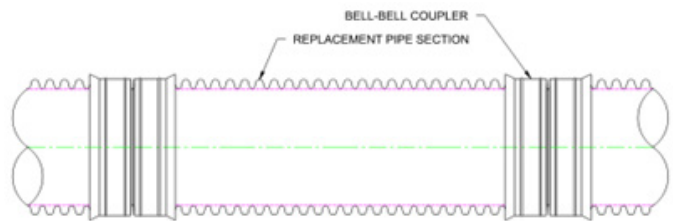
Snap couplers, 100 - 200 mm (4" - 8"), and split band couplers, 250 - 1500 mm (10" - 60"), will provide a soil tight repair regardless of gaskets. This repair method should be used only if the damaged area is in a non-trafficked green area, is cosmetic in nature and confined to a single corrugation. The coupler shall be centered around the damaged area of pipe and tightened down with the nylon straps. If the damaged area is large or significant, the damaged area is to be cut out and replaced with a new section of pipe. The replacement section is to be 'spliced' in place using snap or split band couplers. They are a convenient, low-cost repair alternative, and are typically used to repair thermoplastic pipe products with a corrugated exterior which require soil-tight performance.



Bell - Bell Coupler

Performance: Soil Tight, Water Tight (with gasket)

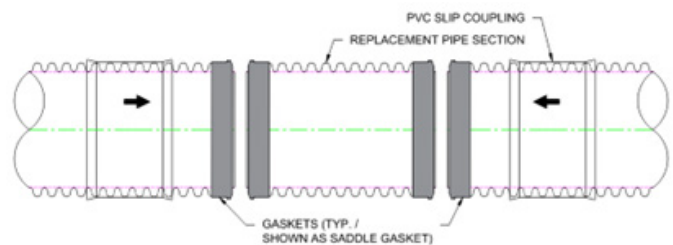
Bell-Bell Couplers, available in 300 - 1500 mm (12" - 60") for N-12 and 300 - 600 mm (12" - 24") for HP Storm, can provide a watertight external repair option when such a repair requires the removal and replacement of a pipe section. The provided gaskets are installed on either side of the repaired section, and the bell-bell coupler is then inserted into place. A bell-bell coupler inserts only to the depth of the bell, unlike a PVC repair sleeve which is oversized and can slide over one section of the repair. As such, this repair may not be suitable for sections with a confined or limited amount of room to make the repair.



PVC Slip Coupling

Performance: Water Tight

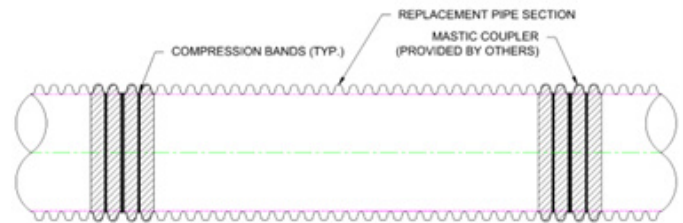
PVC Repair Sleeve connections are available in sizes from 100 - 600 mm (4" - 24") and can provide a water tight field testable repair, when installed correctly, in instances where a section of pipe needs removed due to damage. The repair utilizes an oversized PVC sleeve with gaskets to engage the outer pipe wall where the connection is being made. The provided gaskets are installed on either side of the repaired section and the sleeve slides over top the gaskets. Due to the gaskets used, this repair can only be used on dual wall pipe (smooth inner wall, corrugated outer wall exterior).



Mastic Coupler

Performance: Soil Tight, Water Tight

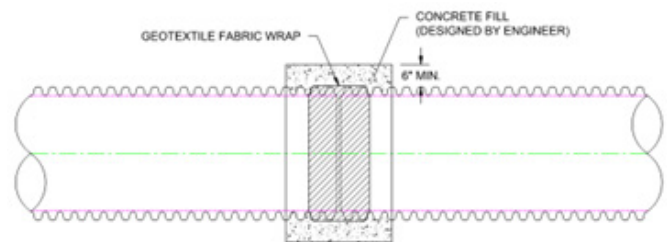
Mastic Couplers, such as the Polyseal Coupler provided by MarMac Manufacturing Company, generally consist of a mastic adhesive layer, a layer of woven fabric material, and clamps or ratcheting straps to secure the wrap in place. The coupler incorporates self-adhering rubberized bonding mastic and securing bands to insure a positive seal around the pipe. If the pipe itself is damaged, the damaged area will need to be removed and a new pipe section spliced in before installing a coupler around both ends. Mastic couplers typically require a minimum of two (2) corrugation from each of the pipes to be coupled together to be engaged in the coupler, with a sizing option available to have double wide couplers which require three (3) corrugations from each pipe to be engaged. Mastic pipe couplers are reasonably priced, especially when considering the quality of the finished repair, and are widely available ranging in sizes from 100 - 1500 mm (4" - 60"). Additional information regarding the post-installation performance of mastic couplers may be found with the manufacturer.



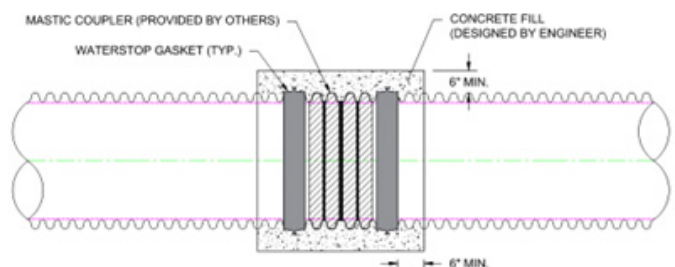
Concrete Collar/Encasement

Performance: Soil Tight, Water Tight (with gasket), Structural Repair

Concrete Collars can provide a soil-tight or water-tight testable repair depending on your project needs and leakage requirements. Installing a concrete collar involves building a form around the area to be repaired and encasing it in concrete. A MarMac Polyseal Pipe Coupler is wrapped around the repair area or joint prior to pouring the collar to keep the concrete from seeping into the pipe. Typically, approximately 150 mm (6") is excavated beneath the pipe to allow for proper application of the Polyseal coupler and concrete encasement. If the pipe itself is damaged, the damaged area shall be removed and a replacement pipe section spliced in prior to pouring the collar.



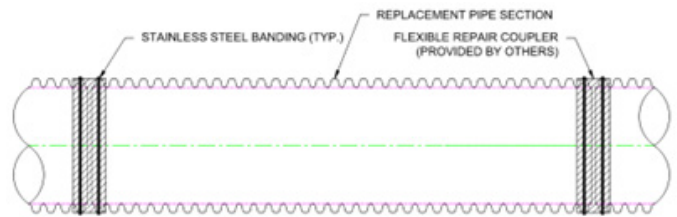
To create a water-tight testable repair, a waterstop gasket is installed outside of the Polyseal coupler towards the outside edge of the concrete collar prior to pouring concrete into the form. Concrete encasement of pipe can also serve as structural repair, provided the condition of the pipe allows for proper installation of the concrete. A registered engineer should be contacted regarding the mix and reinforcement design of any encasement, and encasement should be designed to shed load away from the damaged section of pipe.



Flexible Repair Coupler

Performance: Water Tight

Flexible Repair Couplers can provide a water tight field testable repair when installed per the manufacturer's recommendations. Repair couplers meeting ASTM C1173 ("Standard Specification for Flexible Transition Couplings for Underground Piping Systems") may be used for this repair application. Examples of couplers meeting this standard are provided by Mission Rubber Company LLC and Fernco®. The couplers are installed by removing the damaged section of thermoplastic pipe, replacing it with a new section of pipe and installing the coupler over the new joint. This process is similar to the Slip Coupler and Bell-Bell Coupler repairs above. The coupler's stainless steel bands are then tightened to the manufacturer's recommendations to engage the coupler to the outside of the pipe. Couplers may also include a metal shield piece to cover the center portion of the coupler, which will also need to be tightened per the manufacturer's instructions. Contact the manufacturer for available sizes.



Internal Repairs

Internal Joint Seal

Performance: Water Tight

Internal Joint Seals typically will consist of a rubber cylindrical seal and stainless steel bands and are intended for use at joints where there is leakage or excess joint gap. The rubber seal is inserted into the pipe and is positioned over the desired joint. A torque wrench is then used to expand the bands so that the rubber seal interacts with the inner wall of the pipe. An example of this type of repair is an NPC Internal Joint Seal, manufactured by Trelleborg.

Internal joint seals are not designed to repair damaged pipe, and an alternate repair method must be used. This seal may provide a field testable watertight joint when installed based on the manufacturer's recommendations. Contact the manufacturer for additional questions regarding available sizes as well as specific testing requirements.

Chemical Grout/Sealing

Performance: Water Tight

Chemical grouts and seals provide a cost-effective internal repair and leakage, with the benefit of not restricting the inner diameter like other internal repairs. The grout is injected through the joint into the surrounding subgrade where it creates a soil around the joint from the outside of the pipe. The type of grout necessary for the repair depends on the subgrade groundwater conditions the repair will be made in. In areas which will remain dry most of the year, or have dry-wet cycles of groundwater, a hydrophobic grout should be used. In areas which will remain within the groundwater table and have limited to not dry-wet cycles, a hydrophilic grout should be used. All chemical grouting and sealing work should be performed in accordance with the latest version of ASTM F2304 - "Standard Practice for Rehabilitation of Sewers Using Chemical Grouting".

Companies such as Avanti International, Strata-Tech Inc, Carylton manufacture and/or install chemical grouts and sealants and should be contacted to determine what product and installation method is needed for the specific repair.

Extrusion Welding

Performance: Water Tight

Extrusion welding is the process of using material of the same type as the pipe (either HPDE or PP), to weld joints together to create a water-tight repair. This weld can be done by either using a flat stock piece of material and welding it in place such that it spans the joint, or by welding material directly at the joint. This method of repair requires that the work area be clean and free of debris and water to ensure best results, and should only be performed by contractors who have experience in thermoplastic field-welding.

Cured-In-Place Pipe (CIPP) Liner

Performance: Water Tight, Structural Repair

Cured-In-Place Pipe (CIPP) liner is a repair technology which uses a liner, typically a felt material, soaked in an epoxy resin. The liner is then either pushed through the pipe, typically by water or air pressure, or pulled through the sewer by a winch at an access point downstream. Once in position, the liner is either filled with air or water to press the liner against the host pipe's inner diameter. The curing of the liner is typically done using steam, however some resin blends allow for heated water, ambient temperature, or use of UV light to begin the curing process of the liner. After curing, excess liner and service laterals are cut and removed to restore service.

CIPP lining can also be done in shorter, "partial", lengths as to only line the effective area. This method typically uses remote-controlled equipment and bladders to move the liner into place, and will use an ambient temperature reacting resin to cure the liner into place.

CIPP liners are suitable for both non-structural issues such as excessive joint gap and leakage, as well as cases where the pipe in question has a structural issue such as a crack or missing section as liners. There are, however, potential limitations for using a CIPP liner to repair structural damage. In these cases, an external point repair may be required to remediate the affected area prior to any lining of the sewer in question.

Depending on the project specifics, the resin used, amount of resin used, liner material, and curing type can vary to provide the best solution possible. Due to the temperatures at which operating would occur, curing CIPP liners using steam is not a suggested method with ADS products. Heated water curing is acceptable, with water temperatures typically reaching up to 82 °C (180°F). Water curing also helps reduce the changes of temperature spikes during the curing process which may occur when using steam. UV light or ambient temperature curing are advisable due to not requiring the heating of the pipe, but may come with chemical and equipment limitations.

ADS recommends contacting a local liner supplier or contractor to determine the liner qualities necessary to perform the repair required. For additional information regarding the design of CIPP liners, consult the latest version of ASTM F1216 – "Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Inversion of Curing of a Resin-Impregnated Tube".

Contact Us

Contact the local Regional Engineer or Applications Engineering Department for assistance with other unique conditions or for contact information regarding any companies or repair methods listed in this technical note.

Note: Thermoplastic pipe products are solely intended for the conveyance of fluids. Access into this product for maintenance, inspection, repair, or other reason should be done in strict accordance with OSHA regulations and recommendations for confined space entry.



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