SEWERMAX® POLYPROPYLENE PIPES AND FITTINGS

INSTALLATION

SewerMAX® are flexible pipes designed for controlled deflection under vertical soil loads. These loads are then transferred to the soil in the side support zone. The Australian Standard AS/NZS 2566.2 "Buried flexible pipelines -Part 2 Installation" provides detailed information on appropriate methods for ensuring the side support zone in particular is correctly constructed.

The most critical aspect for the successful installation of these pipes is the selection and compaction of the embedment, i.e. the material in contact with the pipe. Embedment material should be of a granular nature, which is readily compactable. Crushed rock, aggregate and graded sand are commonly used but occasionally native soils, (eg. beach and mallee sand) may also be suitable provided they are free flowing and readily compacted. Appendices G and H of AS/NZS 2566.2 provide extensive guidance on the selection and use of a wide range of embedment materials. For best results when using SewerMAX®, the maximum particle size of the pipe embedment should be limited to 5 mm for all sizes up to and including ON 375 and 10 mm for DN450 and larger.

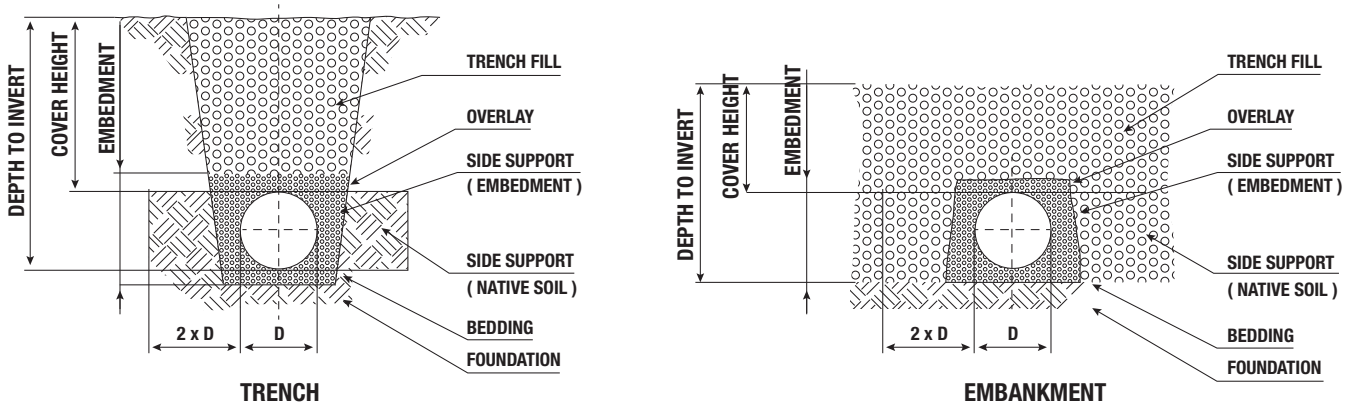

Figure 1.0: Buried Pipeline Terminology

EXCAVATION AND ASSOCIATED WORKS

Trench Excavation

Excavate the trench to the line and grade specified. The trench width must be sufficient to permit compaction of the pipe embedment materials with suitable equipment. The minimum pipe trench width required is typically equal to pipe OD + 300mm and OD + 600mm depending on the pipe diameter - see Section 3.2.3 for further information. The trench bottom should be even and free of soil clods and rocks.

Foundation

The native soil in the foundation zone should be carefully excavated to grade permitting the pipeline to be correctly aligned and allowing for bedding material with a minimum thickness of 100 mm beneath the pipe. If the bearing capacity of the foundation soil is thought to be less than 50 KPa it will need to be replaced with a mattress of embedment material. In this situation geotechnical advice should be obtained.

SEWERMAX® POLYPROPYLENE PIPES AND FITTINGS

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Unstable and wet ground conditions

Wet and/or unstable soil conditions will require precautions to maintain firm and permanent side support for the pipes once installed. Where groundwater is present there may be a risk of the fine soil particles migrating across the interface between the native and embedment soils. It is recommended in this situation that the embedment material should be fully enveloped with geotextile material. Details of soil gradings where this can occur are given in AS/NZS 2566.2.

Pipe installation should be carried out in a trench free of water. Where there is a continuing high rate of ground water inflow, it may be necessary to facilitate drainage of the trench by the use of a porous layer of bedding material in the foundation zone. Generally this will be a coarse granular material, which will need to be fully encapsulated in a geo-textile fabric. It is sometimes described as a drainage mattress.

Trench shields

If possible, trench shields or soil boxes should be a close fit against the excavated trench walls and the bottom edges kept above the top of the pipe. If for safety reasons they must extend to the bottom of the trench, compaction of the embedment material after the shields are lifted is necessary to eliminate any voids that may otherwise develop (see Figures 2.1a and 2.1b).

Soil boxes used in open excavations are prone to accumulate loose debrts between the box and the trench wall, As this poor quality material can adversely affect the available side support, it is good practice to place high quality embedment material to form part of the side support zone as soon as possible. This will exclude any debris or material which may slough from the trench wall (see Figure 2.2)

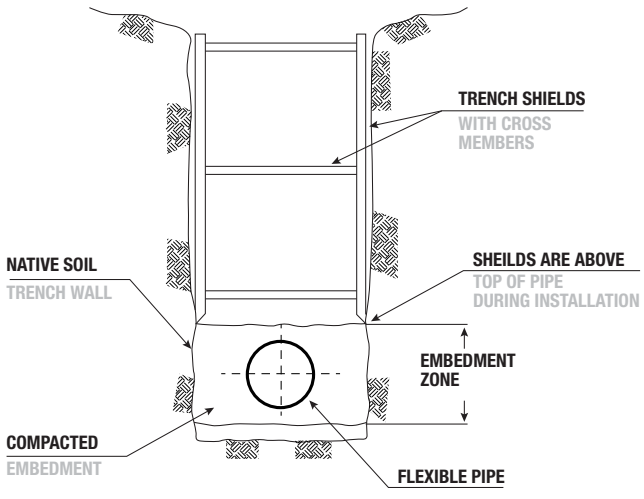

Figure 2.1a: Shields kept above side support zone

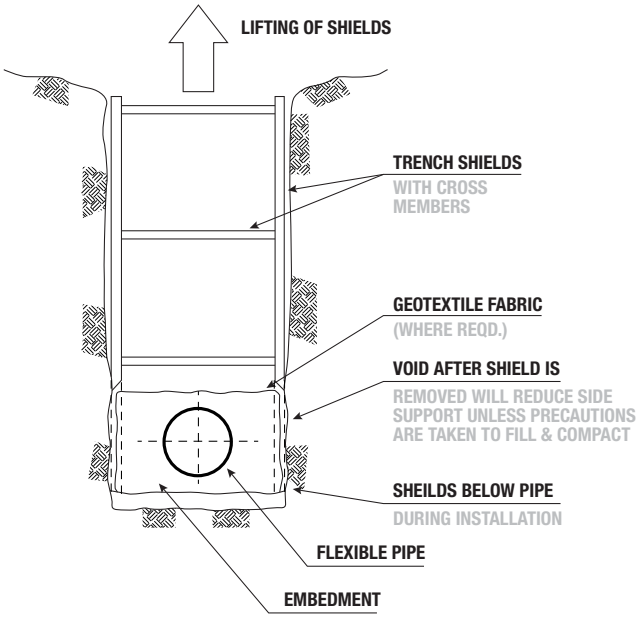

Figure 2.1b: Shields in side support zone

SEWERMAX® POLYPROPYLENE PIPES AND FITTINGS

INSTALLATION

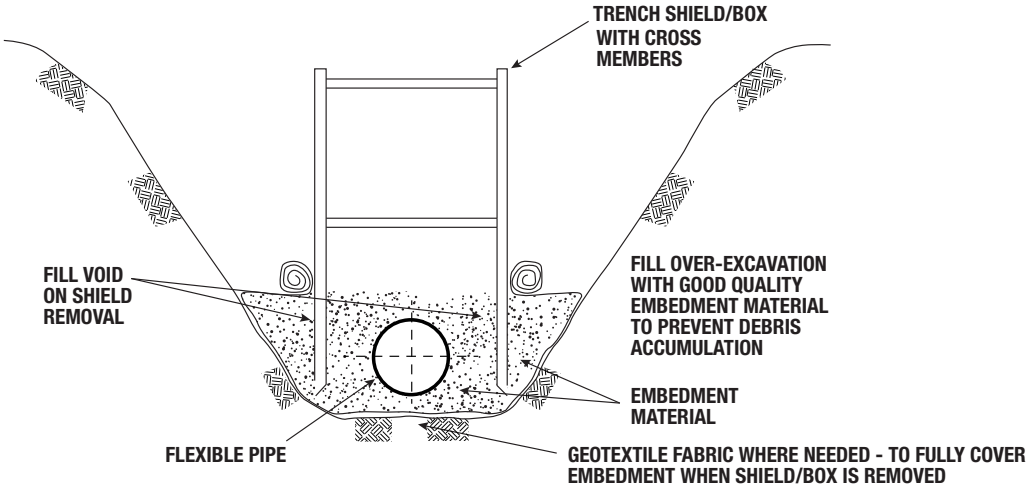

Figure 2.2: Shields in wide trench

PIPE LAYING

Bedding

The bedding material should be the same as the embedment used to completely surround the pipe. Its purpose is to provide uniform support and load distribution for the pipe barrel, the remaining embedment material and the backfill. A layer of granular material with a maximum particle size of up to 5mm for all sizes up to and including DN375 and 10 mm for DN450 and larger pipes should be placed and compacted to ensure a full 100mm clear thickness below the wall profile. A small depression should be formed under each socket to ensure that the pipe barrel is evenly supported along its whole length. When laid to the specified alignment the pipes should be on the centreline of the trench. If groundwater is present, the trench should be de-watered so that the pipes can be joined and installed in relatively dry conditions. In low strength soils, additional bedding material may be required as a replacement for unsatisfactory native material in the foundation zone.

Jointing of pipes

Once the trench and bedding has been prepared, pipes can be lowered into the trench with the aid of suitable slings or ropes. (Chains are not to be used). Manual handling and lifting is possible with most diameters of SewerMAX® pipes. Alternatively an excavator or backhoe can be used with a nylon sling at the pipe mid-point.

Figure 3: Pipes are light-weight and in most cases can be moved by hand.

SEWERMAX® POLYPROPYLENE PIPES AND FITTINGS

INSTALLATION

The following procedure is recommended when installing SewerMAX® rubber ring jointed pipes:

CLEAN THE PIPE Clean the pipe socket and spigot grooves, making sure both are free of foreign material. Install the rubber ring by stretching it over the spigot so that it sits in the second groove from the end of the pipe. Ensure the rubber ring is evenly fitted by running hands and fingers around its full circumference.

ORIENTATE THE PIPE Although pipes may show some out-ofroundness due to storage loads, this is usually minimal. Where it is present, it is advantageous to orientate the larger pipe diameter in the vertical plane. This will ease the jointing process and helps offset any deflection after backfilling.

APPLY JOINTING LUBRICANT Apply Iplex jointing lubricant liberally to the inside of the socket and lead-in flare. Avoid lubricating the ring itself to ensure it does not pick up dirt while the joint is being made. (Under no circumstances should mineral oils or greases be used, as these compounds will cause long-term degradation of the rubber seal. In an emergency common soap can be used).

LAY PIPES The normal convention is to lay pipes by starting from the down-stream end with the socket facing in the up-stream direction. After laying, pipes should be held in position to line and grade by placing sufficient embedment material over each pipe before joining the next one.

JOIN PIPES Insert the leading edge of the spigot into the socket mouth. It is essential that pipes be in a straight line before attempting to make the joint. Apply an even jointing force using a crowbar thrusting on a timber-bridging piece protecting the end of the pipe. Push home to the spigot witness mark.

ADD NEW WITNESS MARK Where pipes are cut on site for short length adjustments or connections to fittings, it is important to place a new witness mark at the end of the spigot at a distance.

PIPE SIDE SUPPORT & OVERLAY

Embedment - Haunching and side support

Generally material used in the embedment zone should be uniform selected non cohesive soils. Information regarding selection is given in Appendices G and H of AS/NZS 2566.2.

The embedment must be evenly compacted between the pipe and the surrounding native soil given that the complete side support zone extends horizontally beyond the pipe for a distance of approximately twice the pipe diameter at pipe depth. Care must be taken not to disturb the pipe alignment when compacting the embedment material.

Where trench shields or boxes are used, special care is necessary to fill any voids resulting from their removal and must be filled with the same compacted embedment material.

SEWERMAX® POLYPROPYLENE PIPES AND FITTINGS

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If there is a possibility of migration of fines between the embedment and native soil, geotextile fabric should be used at the interface to completely envelope the embedment including the bedding. Refer to section 4 of AS/NZS 2566.2 and Appendix J for further information.

Attention to the quality and degree of compaction of embedment material placed on each side of a SewerMAX® pipeline is fundamental to its structural integrity. Table 4.3 shows the default values given in AS/NZS 2566.2 for the appropriate degrees of relative compaction of the embedment bedding and side support zone.

Overlay

The embedment material should extend to a cover height of 150mm above the pipe. This provides protection from the placement of overburden material and the operation of compaction equipment.

MINIMUM RELATIVE COMPACTIONS (FROM AS/NZS 2566.2 TABLE 5.5)

SOIL TYPE	TEST METHOD	TRAFFICABLE AREAS		NON TRAFFICABLE AREAS	
		EMBEDMENT MATERIAL %	TRENCH / EMBEDMENT FILL MATERIAL %	EMBEDMENT MATERIAL %	TRENCH / EMBEDMENT FILL MATERIAL %
Cohesion-less	Density Index	70	70	60	Compaction to suit site requirements
Cohesive	Standard Dry Density Ratio, or Hilf Density Ratio	95	95	90	

TRENCH & EMBANKMENT FILL (above pipes)

Backfilling pipelines may involve the use of excavated material providing the thickness of the overlay is adequate. Care must be taken to avoid the inclusion of large stones, rocks or hard clumps that may cause point loading on the pipeline.

Overburden compaction using large vibrating power compactors should be avoided until there is an adequate height of fill over the pipes (Refer to Section 3.2.4). This will vary depending on the capacity of the machine but generally at least 0.5 metres is desirable.

Monitoring diametral deflections

Once the back filling operation is complete, the adequacy of the embedment and compaction and the use of correct backfilling techniques may be assessed by measuring the vertical deflection within the pipe. The deflection check described in Section 5.2 is useful in the initial construction period as this provides an opportunity for benchmarking appropriate compaction procedures.

Maximum allowable initial deflection values are given in AS/NZS 2566.2 for differing time intervals after completion of the fill operation e.g. the maximum allowable deflection at 24 hours is 3.5 % and maximum allowable deflection at 30 days is 5.0%.

Note: During compaction of backfill in the pipe embedment zone, an increase in the vertical diameter and decrease in the horizontal diameter may occur. This is not detrimental providing the magnitude of the horizontal diametral deformation does not exceed the prescribed allowable deflections. See Section 5.2 for test procedure.

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SEWERMAX® POLYPROPYLENE PIPES AND FITTINGS

INSTALLATION

BORE CASING

When SewerMAX® pipe is installed under roadways, casing may be required to prevent damage to structures due to soil erosion or settlement in the pipe zone caused by line failure or leakage. Casing is also required to accommodate regulations or requirements imposed by the public or private owners of property in which the pipe is installed, and where open excavation would be impossible or prohibitively expensive.

When SewerMAX® pipe is installed in casings; skids should be used to prevent damage to the pipe and socket joints during installation. Skids should properly position the pipe in the casing. A typical skid arrangement for SewerMAX® pipe shown below.

Grouting

Where it is necessary to pressure grout an annulus between the pipe and enveloping conduit, for example where SewerMAX® pipe has been used to reline a deteriorated sewer, it is important to ensure that the grout is introduced into the annulus as evenly as possible. The pipe must be properly chocked to resist flotation, deformation and bending. In addition the hydrostatic grout pressure should not exceed 70 KPa to ensure there is an adequate factor of safety against buckling instability. If necessary the effect of grout pressures can be nearly halved by filling the pipeline with water. Alternatively it may be possible to stage the grouting process in two or three lifts, allowing the grout to solidify in the annulus below the spring-line before the top section is filled. This method is illustrated in Appendix K of AS/NZS 2566.2.

Pipe/Concrete interface

DN (MM)	H (MM)
255	45
300	53
375	61
450	65
525	77
600	46

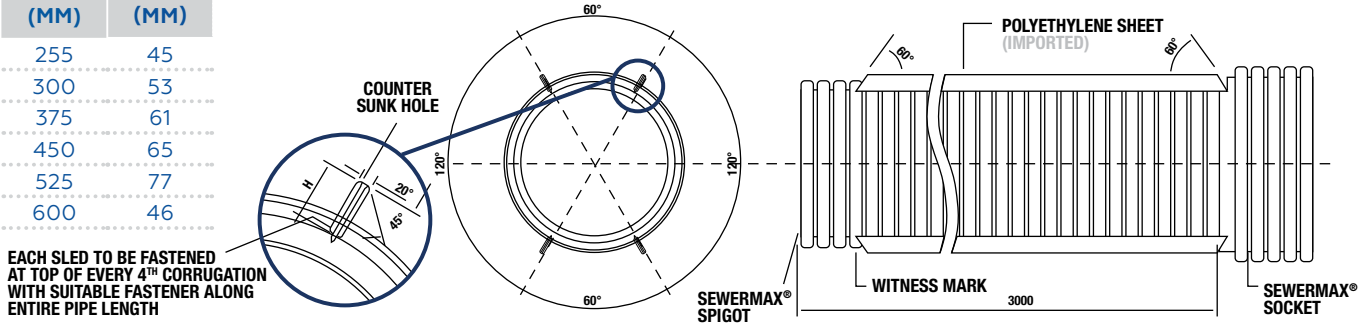

Figure 4: Typical skid arrangement for SewerMAX® pipe

Skids should extend for the full length of the pipe, with the exception of the socket and spigot (up to the witness mark) required for joint assembly. Skids must provide sufficient height to permit clearance between the socket and casing wall. Casings are normally sized to provide an inside diameter which is at least 50mm greater than the maximum outside diameter of the pipe socket, or skids.

Skids can be fabricated from Polyethylene sheet and should be fastened securely to the pipe. Alternatively wooden skids can also be used with suitable strapping. Use approved tJipe lubricant between the skids and casing for ease of installation. Upon completion of pipe insertion, grouting of the void in accordance with design requirements can be accomplished.

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SEWERMAX® POLYPROPYLENE PIPES AND FITTINGS

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SewerMAX® pipes can be directly embedded into concrete maintenance holes, pits or other concrete structures. If a watertight seal is required as tn the case of sewerage installations, an approved hydrophilic rubber compound in strip form should be used. The following procedure outlines the steps to be followed when using the Hydrotite Water Seal with SewerMAX® pipes connecting into concrete manholes.

Note: Standard work practices should be observed when using the adhesives or similar substances.

CLEAN SURFACE Prior to fixing the Hydrotite seal to the SewerMAX® pipe, ensure the contact surface is free of dust, grime or any foreign matter.

SELECT RIB Select the rib nominated for the pipe diameter that will give approximately 75mm of cover (min 50mm) to the Hydrotite when encased in the concrete wall.

FIX HYDROTITE Lightly roughen the pipe surface where the Hydrotite is to be affixed with some fine sandpaper. Remove the protective tape from the self adhesive backing on the Hydrotite and fix the Hydrotite around the circumference of the preprepared rib on the pipe. Start with the centre of the pipe and work around until you are approximately ¾ around the rib.

APPLY LOCTITE Apply a thin film of Loctite adhesive to each end of the Hydrotite and, stretching the two ends, butt them together then hold for approximately 30 seconds, until adhesive sets. Lower the Hydrotite to the rib surface.

PRESS TO SECURE With the heel of the hand press the Hydrotite firmly onto the surface of the pipe rib. Place pipe end with the Hydrotite seal into the pit ready for concrete to be placed around the joint. Before concrete is poured it should be positioned in the pipe/concrete interface zone at a minimum distance of 75 mm inside the formwork to ensure all potential water paths are intercepted.

INSTALL Place pipe end with the Hydrotite seal into the pit ready for concrete to be placed around the joint. Before concrete is poured it should be positioned in the pipe /concrete interface zone at a minimum distance of 75 mm inside the formwork to ensure all potential water paths are intercepted.

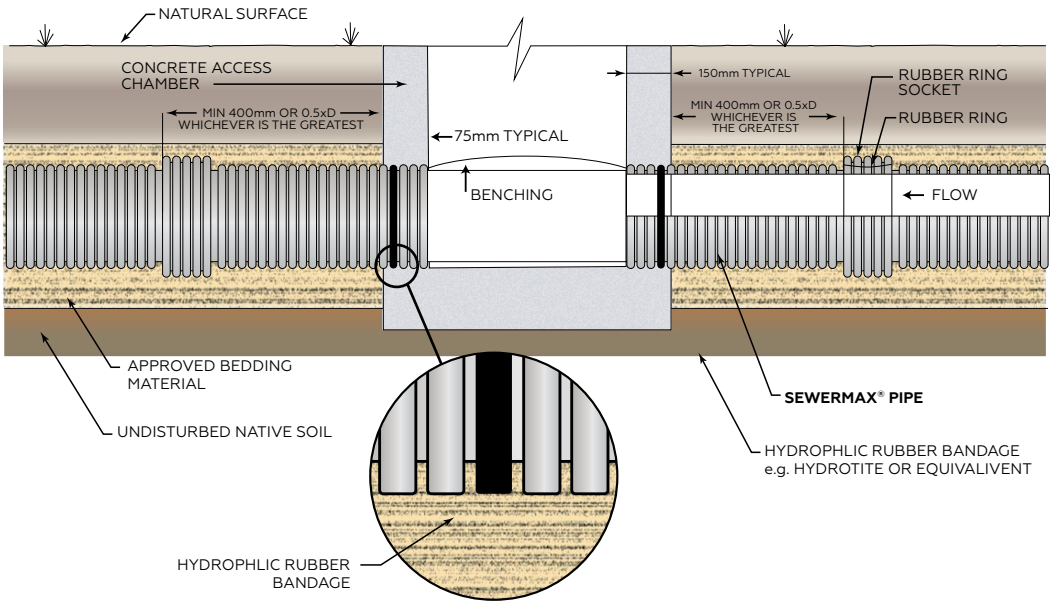
Note: *Standard work practices should be observed when using the adhesives or similar substances.*

SEWERMAX® POLYPROPYLENE PIPES AND FITTINGS

INSTALLATION

RIB SELECTION FOR PLACEMENT OF HYDROTITE SEAL.

PIPE DIAMETER (DN)	RIB NO.	TYPICAL MINIMUM WALL THICKNESS OF CONCRETE STRUCTURES
225	3	150 mm
300	3	150 mm
375	2	150 mm
450	2	150 mm
525	2	150 mm
600	2	200 mm



SEWERMAX® JUNCTIONS

A standard range of SewerMAX® junctions is available for lateral side connections, providing a leak tight sewer system. Junctions can be manufactured from PVC materials with socket ends suitable for rubber ring jointing to SewerMAX® pipes. The branch-off takes are normally at 45° to the main body with sockets suitable for connection with most materials. For e.g SewerMAX®, PVC.

The method for connecting to existing sewer mains is given in Iplex Pipelines Drawing No IMWS-103. "Minor Works Sewer, Post Installation of SewerMAX® Junction for Incoming Connections" and is similar to the methods shown in the "Sewerage Code of Australia WSA 02-2002".

Alternatively where a cut-in is not appropriate, a stainless steel Junction can be used eliminating the need for cutting in a new junction. Refer to Iplex Pipelines drawing No IMWS-101 "Minor Works Sewer, Post Installation Stainless Steel Junction with SewerMAX pipe".

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SEWERMAX® POLYPROPYLENE PIPES AND FITTINGS

INSTALLATION

REPAIR METHODS

If a SewerMAX® pipe is damaged after installation one of the following repair methods may be used. The condition of the damaged pipe will determine which method should be adopted.

MINOR REPAIRS

If the damage is limited to a minor hole in the pipe wall, then it may be repaired by using a repair clamp.

The repair clamp may be wrapped around the pipe at the point of damage with minimal disturbance to the pipeline. The gasket is preformed to match the external pipe wall profile and provides a watertight seal. The condition of the damaged area is critical when making the repair. The pipe surface profiles must be clean and free of dirt and mud. The procedure for installation is as follows:

1. LOOSEN CLAMP

Loosen all nuts on the clamp, but do not remove from the studs. Slide the locking plate towards the nuts and open the clamp.

2. POSITION CLAMP

Position the clamp centrally over the damaged area ensuring that no foreign matter will be trapped between the mating surfaces. Special attention should be paid to cleaning the grooves in the pipe profile,.

3. WRAP CLAMP

Wrap the clamp around the pipe and bring both ends together by using the locking washer plate.

4. LOCK CLAMP

Lock into place and squeeze the lugs together while tightening the nuts by hand. Prior to tightening the nuts with a wrench ensure the damaged area is correctly centred under the clamp.

5. TIGHTEN NUTS

Tighten the nuts to the required torque as indicated by the installation instructions for the clamp.
Compact the specified embedment material in the embedment zone and backfill the remainder of the excavation to the required standard of compaction.

6. COMPACT AREA

Compact the specified embedment material in the embedment zone and backfill the remainder of the excavation to the required standard of compaction.

MAJOR REPAIRS

f the pipe is severely damaged then the damaged section will have to be removed and replaced with a new pipe section of the same length. The pipe ends can be rejoined using two jointing clamps The jointing clamp is comprised of a stainless steel shell with a smooth rubber sleeve and utilises two SewerMAX® sealing rings to make the connection. The installation procedure Is as follows:

1. Locate and expose the whole length of the damaged pipe.
2. Remove the damaged section only by cutting with a hand saw or circular saw
3. Clean and trim intact pipe ends leaving these ends smooth and square.
4. Cut a length of replacernent pipe to suit the distance between the prepared ends less the length of a single profile.
5. Fit the SewerMAX® rubber rings on each pipe spigot end.
   These rings should be placed in the second groove away from each pipe end.
6. Fit the clamps symmetrically over each
7. Join and tighten the bolts to the torque as labelled.