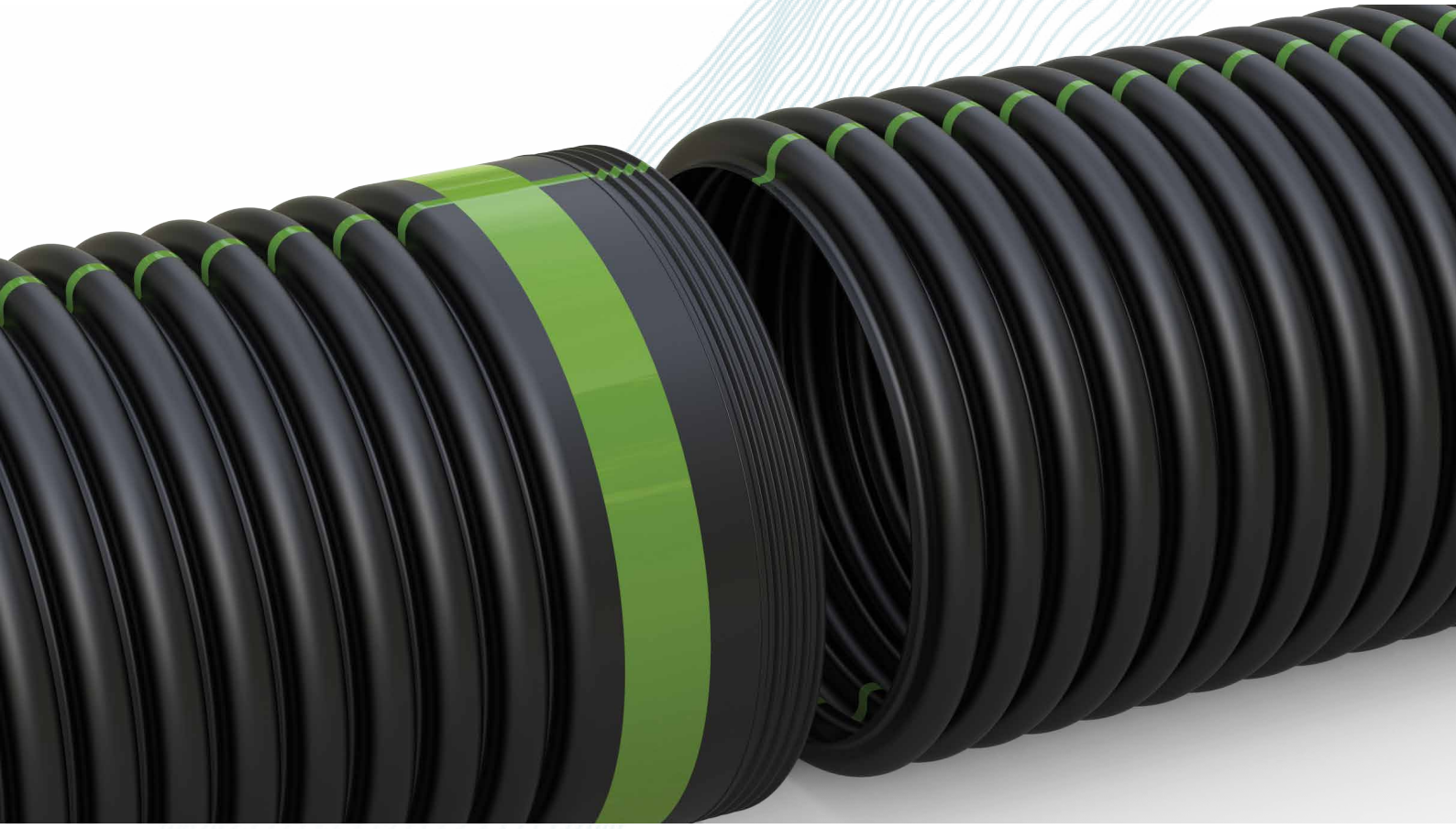
spelstormwater
joy in water

Installation Manual

SPELFlow ADS Pipe®



spel.com.au

OVERVIEW OF INSTALLATION CONSIDERATIONS

Installation of ADS pipe is in most respects very much like that of any quality pipe installation. The strength of a pipe system shall be considered a combination of the pipe itself and the backfill envelope. Proper construction maximises the drainage capabilities designed into the pipe by maintaining alignment and load-carrying ability.

Recommendations for backfill and installation for ADS products are based primarily on the requirements of AS/NZS 2566.2.

The elements regarding backfill that are addressed in this section are as follows:

BACKFILL MATERIAL SELECTION - A variety of materials can be used as structural backfill with the final decision, many times, based on what is most available locally. (Refer to page 4.)

BACKFILL COMPACTION - Compaction forces out air and moisture to provide a more stable structure. Minimum compaction levels are based on the material characteristics and the design load; some situations may require the use of mechanical compactor while others require simply tamping the material to eliminate voids.

BACKFILL STRUCTURE - An adequate quantity of structural backfill is necessary to ensure adequate support. Typical trench dimensions and the effect of the trench wall are discussed in this section.

In addition, this section discusses job-site handling, trench construction and pipe installation for ADS products, compaction methods, and several specialised installation considerations.

Federal and state regulations covering safety for construction are published in the WHS Regulations for the relevant state/territory where works are being carried out. These regulations define practices, which must be followed.

PRE-INSTALLATION STORAGE AND HANDLING

ADS Pipe requires no special care in handling however the following precautions should be preserved:

- Follow all applicable safety regulations when handling pipe.
- The pipe shall not be dropped from the delivery truck into an open trench, or onto uneven surfaces.
- Avoid dragging or striking the pipe against another pipe or object.
- Avoid dragging the pipe across the ground.
- Avoid any impact to the bell or spigot.
- Do not drive over the pipe prior to installation.
- Inspect the pipe and joining systems before installation.
- Care shall be taken to not over home the pipe during assembly.

One method commonly used is to secure the bottom lengths of pipe together side-by-side, or use stop blocks, and then place additional pipe on top. Where pipe is stock piled, the total pile height shall not exceed 1.8m and the pipe must be adequately restrained to prevent pile collapse. Do not walk on stock piled pipe.

Ambient temperature extremes do not affect the strength or handling characteristics of ADS pipe products. Additionally, hot weather, especially when coupled with direct sunlight, will raise the pipe temperature, but will not significantly affect handling or installation behaviour.

TRENCH EXCAVATION

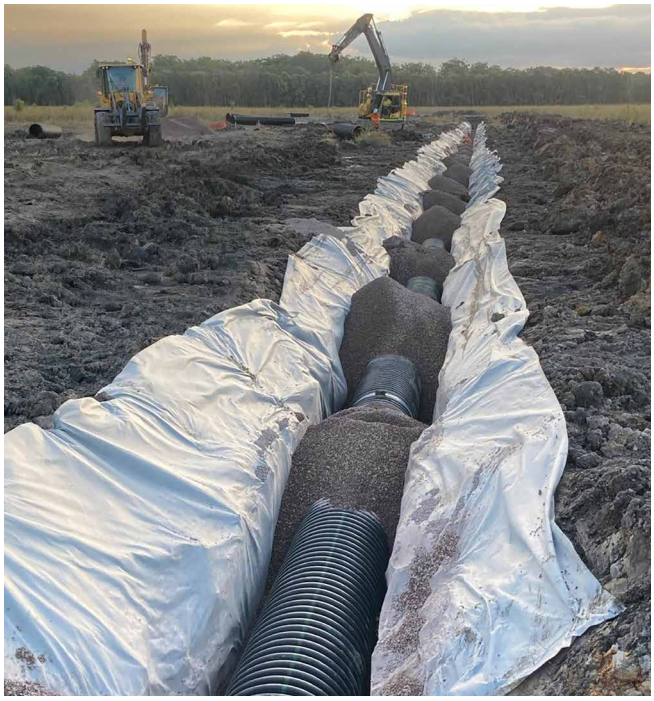
The width of the trench depends on the pipe diameter, backfill material, and the method of compaction. Trenches that are too narrow will not allow for proper pipe installation, whereas trenches that are overly wide are unnecessarily costly. As a practical matter, standard bucket sizes may also factor into the decision. The design engineer may modify the trench widths based on an evaluation of the competency of the in-situ materials, the quality and compaction level of the backfill, the design loads and the compaction equipment to be used. In lieu of the engineer's recommendations or governing agency specifications, the following trench widths are suggested in table 5-1.

TABLE 5-1
MINIMUM TRENCH WIDTHS

NOMINAL PIPE DIAMETER (mm)	MINIMUM TRENCH (M)	NOMINAL PIPE DIAMETER (mm)	MINIMUM TRENCH (M)
100	0.5	600	1.2
150	0.6	750	1.4
200	0.7	900	1.6
250	0.7	1050	1.8
300	0.8	1200	2.0
375	0.9	1350	2.2
450	1.0	1500	2.4

In very poor native soils (for example; peat, clay, or other highly expansive soils), a wider trench width with possibly filter fabric may be required. This wider trench width shall be based on an evaluation of the in-situ soil, and the design and construction loads.

The depth of the trench is dictated by the geography of the site and the pipe slope required. However, if an adequate foundation for the pipe is not available at the desired depth, additional excavation will be needed. Rock outcroppings, muck, and other unsuitable materials do not provide proper support. They shall be removed and replaced with suitable granular material. Refer also to Figure 5-1.



Trenching shall be completed in existing soils with sidewalls reasonably vertical to the top of the pipe. For positive projection embankment installations, the embankment material shall be placed and compacted to a minimum of 300mm above the pipe and the trench excavated into the embankment. When excavation depths or soil conditions require shoring or use of a trench box, the bottom of the shoring or trench box should be placed no lower than the top of the pipe. This prevents disruption of the backfill envelope when removing the shoring or trench box. Dragging the trench box shall only be done if it does not damage the pipe or disrupt the backfill, otherwise, the box shall be lifted vertically into its new position. If this practice cannot be followed, consideration should be given to leaving the shoring in place. When the trench box must be located below the top of the pipe, the most effective way to maintain a sound system is to provide a 'sub trench' within which to place the pipe and backfill. For safety, the bottom of the trench box should not be greater than 600mm above the bottom of the trench.

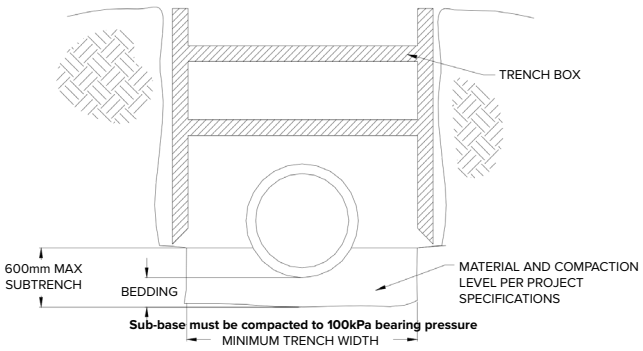
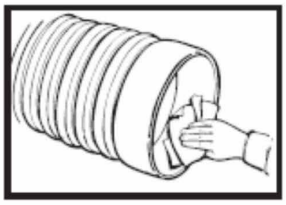
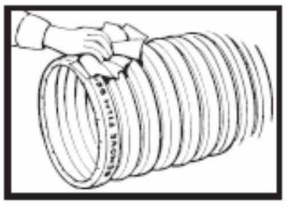


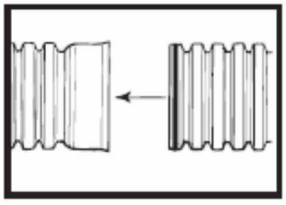
FIGURE 5-1
TYPICAL SUB TRENCH INSTALLATION

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.

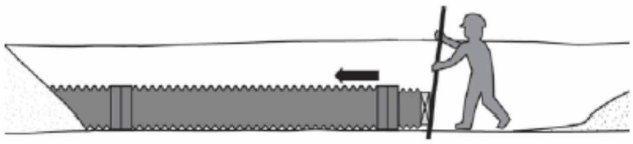
Note: It is recommended that one always lay pipe starting at the down stream end, pushing spigots into bells with the bells facing upstream. Always push spigot ends into bell, not bell end into spigot.

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. Care should be taken to not over home the pipe during assembly.
- Some high joint performance applications may require the joint to be held in place for a short time, immediately after insertion, to properly set the gasket.

BAR & BLOCK METHOD

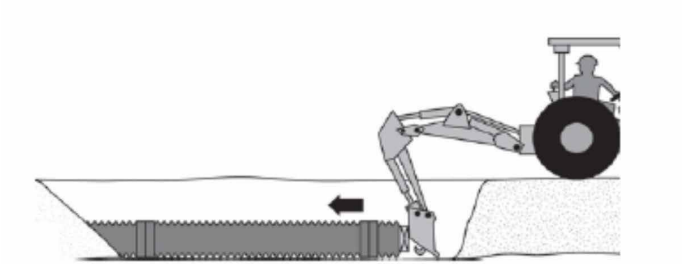
- Place installation stub into bell end of pipe.
- Place wooden block horizontally across end of installation stub.
- With a bar, push against wooden block until pipe is fully inserted into bell.



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.

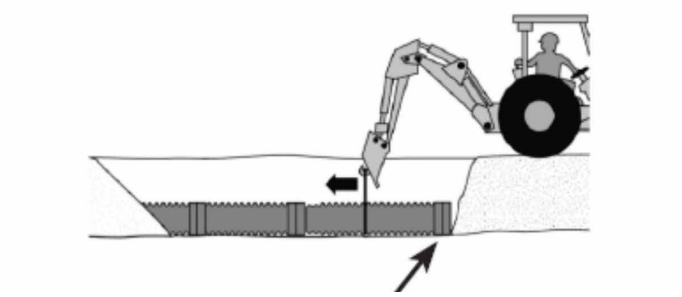


NOTE: This method requires use of installation stub. DO NOT push backhoe directly against pipe.

BACKHOE AND SLING METHOD

Wrap nylon sling around pipe. Pipe 900mm or larger should be picked up at two points approximately 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 150mm for up to 6m pipe.

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.

BACKFILL MATERIAL

Material selection is the first and most important step to creating a structurally sound backfill envelope. In general, backfill material should be of an aggregate nature, able to be compacted, if necessary, into a structurally sound structure.

Backfill offers passive resistance, termed the “modulus of soil reaction”. The modulus of soil reaction is determined by a combination of the material and the amount of compaction. The type of material (sand, gravel, clay, etc.) and compaction level (standard Proctor density) determine overall strength of the backfill.

Backfill material shall be:

1. **A crushed granular rock/stone 10-20mm with no fines. All aggregate should conform to AS2758.1 Dry rodded density shall be not less than 1500kg/m^3.**
2. **Free draining single washed sand compacted with no more than a handheld compacting device in 150-200mm layers compacted to 85%.**
3. **Cement stabilised sand 6-10% cement, moisture content of 10% and unconfined compression strength of 1.7Mpa according to table L2 of AS/NZS 2566.2.**

No mixtures, clays, organic matter shall be accommodated.

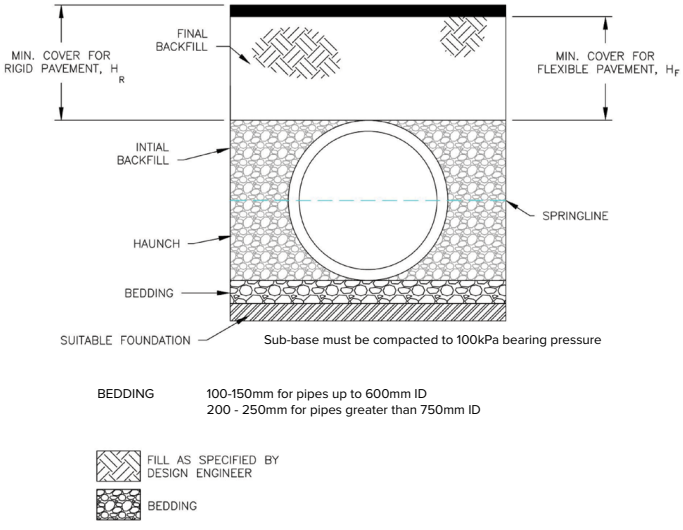


FIGURE 2
TYPICAL BACKFILL STRUCTURE

BACKFILL PLACEMENT

Stormwater drainage lines are sometimes placed on foundations that settle and shift in a non-uniform manner. Fortunately, flexible pipe can accommodate many of these changes without detrimental effects. The best construction practices, however, involve placing the pipe on a firm foundation for maximum performance and structural integrity throughout the design life.

In some cases it may be necessary to perform subsurface evaluations of the soil conditions where muck, rock, or other unsuitable conditions are suspected. Zones of soft material, such as muck, allow the pipe to settle, potentially affecting the structural integrity and hydraulic characteristics of the system. Rock and rock protrusions apply point loads where they contact the pipe that can affect the hydraulics or structural integrity of the system. It is recommended that unsuitable foundation material be excavated and removed before installation of the pipe proceeds. Where a rock or unyielding or soft foundation is present, the design engineer or a geotechnical engineer shall be consulted to determine the extent to which the undesirable material is to be excavated.

FOUNDATION/SUB-BASE

It must be noted that the Foundation or sub-base must be compacted to 100kPa bearing pressure prior to installing any bedding material. If the foundation is unstable material that cannot be compacted, a 150mm layer must be removed and replaced with a suitable foundation/subbase material of Cement stabilised sand 6-10% cement, moisture content of 10 % and unconfined compression strength of 1.7Mpa, and cured prior to installing a bedding layer.

BEDDING

The bedding layer must be between 100-150mm for pipes up to 600mm ID and 200-250mm layer for all pipe sizes greater than 750mm ID. Refer to Figure 2
The bedding material shall be either:

1. A crushed granular rock/stone 10-20mm with no fines. All aggregate shall conform to AS2758.1 Dry rodded density shall be not less than 1500kg/m3.
2. Free draining single washed sand compacted to 90-95%.
3. Cement stabilized sand 6-10% cement, moisture content of 10% and unconfined compression strength of 1.7Mpa according to table L2 of AS/NZS 2566.2.

Note: Where using open-graded material in any fill zone, additional precaution must be taken to reduce or eliminate the risk of migration of fines from adjacent material. Precautionary steps could include the use of geotextile between the varying fill materials, gradation selection to prevent the migration of fines, or other precautionary measures.

HAUNCH BACKFILL

The next layer of backfill, the haunching, is the most important since it is this layer that provides the pipe with support against the soil and traffic loadings. Haunching shall be placed in trench and compacted in accordance with product specific guidelines listed in backfill material listed on page 4 to achieve required depth of fill. Construction of each lift should be repeated up to the spring line.

INITIAL BACKFILL

Initial backfill extends from the spring line to the crown of the pipe. This area of the backfill anchors the pipe and ensures that loads are distributed as evenly as possible into the haunching. The same material used in the haunching shall be used for the initial backfill. Using the same material throughout the embedment zone is recommended for all SPEL Flow ADS Pipe.

When using a material that requires compaction it is important not to use mechanical compaction equipment directly on the pipe itself. Tamp to achieve the specified compaction, or shovel into the area, eliminating voids, if the material doesn't require mechanical compaction. Construction of each lift should be repeated until the initial backfill zone is completed.

Cement stabilised sand can be used throughout the pipe zone as an alternative to compacted granular material, however special precautions are necessary for a successful installation. Cement stabilised sand may cause the pipe to float or misalign. Therefore the pipe will need to be weighted with sandbags/cured concrete blocks or held with some type of anchoring system. Cement stabilised sand may also be poured in layers that are allowed to cure before the next layer is poured to help reduce the tendency for the pipe to float. As with any backfill material, proper installation of the fill around the pipe is critical to the structural performance of the pipe.

MINIMUM COVER

For traffic applications total minimum cover is 300mm for single run applications for 100mm-1200mm diameters pipes. For 1350mm and 1500mm diameter pipe total minimum cover is 600mm for single run applications.

Total minimum cover is measured from top of pipe to the bottom of subgrade level for flexible pavement or to base of rigid pavement.

Should heavy machinery be required for road preparation, mounding of additional backfill may be required over the pipe.

When no pavement will be installed, but vehicle traffic is expected (e.g. gravel driveway), a total minimum cover of 500mm for 100-1200mm diameters and 800mm for 1350mm and 1500mm diameters is recommended to minimise rutting.

If the ground surface is a green space or a landscape area, with no expected heavy vehicle loads, minimum cover shall be 300mm from top of pipe to ground surface for all diameters.

COMPACTION

The level of compaction will vary depending on the material and installation requirements. Crushed stone or similar materials are usually not compacted, but do require care during installation to eliminate large voids in the backfill envelope. Using a shovel to 'slice' or 'knife' the material under and around the pipe is sufficient.

MECHANICAL COMPACTION EQUIPMENT

Hand Tampers and Hand-Held Power Tampers: Compaction of the haunch layer may require a small tamping mechanism to obtain the specified compaction in a confined area. A hand-held pole or two-by-four can be used to compact the haunching. Tampers for horizontal layers shall not weigh more than 89N and the tamping face shall be limited to an area no larger than 150mm by 150mm.

OTHER INSTALLATION CONSIDERATIONS

GROUNDWATER

Excessive groundwater hinders proper placement and compaction of bedding and backfill. ADS thermoplastic pipe will float in standing water; therefore, it is imperative that a dry trench be provided. In order to insure a stable trench bottom, the water level in the trench shall remain below the bedding during the installation procedure. It may be necessary to provide sump pumps, well points, deep wells, geofabrics, underdrains or a diversion ditch to insure a dry trench. The project engineer shall be consulted to determine appropriate dewatering methods given specific project conditions.

FLOTATION

During installation when the pipe has not yet been covered over with soil, flotation potential increases. If conditions on a specific project differ greatly from these and flotation is believed to be a valid consideration, the team at SPEL Stormwater are available to help determine a solution to the problem.

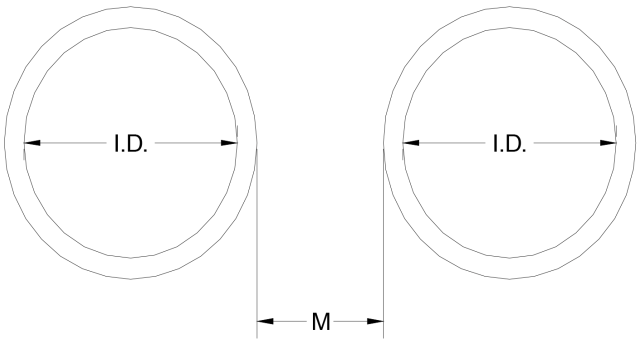
MINIMUM COVER REQUIRED TO PREVENT FLOTATION

DIAMETER (mm)	COVER DUAL WALL (mm)
100	77
150	102
200	127
250	178
300	229
375	280
450	330
600	432
750	559
900	635
1050	737
1200	838
1500	1016

PARALLEL PIPE INSTALLATIONS

Pipes can be installed parallel when the capacity supplied by one of the pipes is not sufficient, such as in a relief situation.

A minimum amount of backfill is needed to provide adequate side support and a minimum spacing is also needed to compact the fill properly to develop this support. Generally, accepted minimum spacings are shown in Figure 5-6. These recommendations assume there are no fittings connecting the two adjacent runs; if fittings are used, spacing recommendations will differ.



Up to 600mm dia. 300mm spacing, over 600mm dia. 1/2 of the pipe I.D (inside dia.)

FIGURE 5-6
MINIMUM PIPE SPACING

STEEP SLOPE INSTALLATIONS

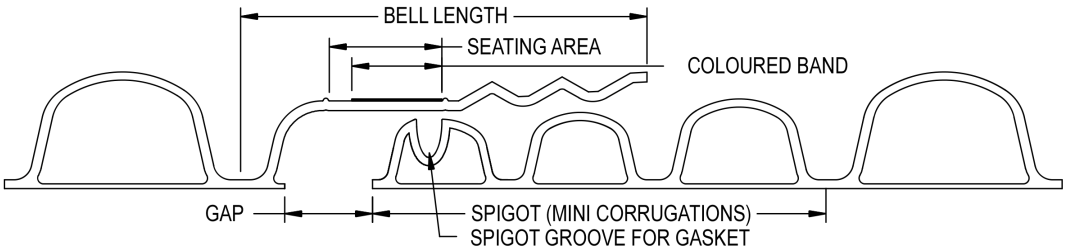
In applications where a steep slope is necessary, generally slopes equal to or greater than 12%, precaution must be taken to ensure the application conditions will not adversely affect the pipe structure or flow characteristics. One design consideration should be proper venting. The pipe must be properly vented to ensure negative pressure does not form inside the pipe. Venting can be provided along the pipe slope, at the head of the slope, or by designing the flow in the slope to not flow more than 75% full in peak design flow conditions. Next, thrust blocks must be used at all fittings and grade changes. Change in flow direction can cause excessive force against the pipe wall; therefore thrust blocks must be used to dissipate this energy. Thrust blocks should be constructed as designed and specified by the project engineer for the specific project conditions. Finally, consideration must be given to pipe slippage along the slope. Pipe slippage can result in slope failure of the surrounding soil, structural damage of the pipe wall, or compromising of joint quality for the overall system. Pipe should be restrained through the use of concrete blocks or pipe anchors.

Note: Twelve percent grade is listed for reference purposes only, additional design consideration may be necessary for slopes less than 12% where slope stabilisation, negative pressure, or water hammer, may be of concern.

MAXIMUM BURIAL DEPTH CHART

INSIDE DIAMETER ID (mm)	BURIAL DEPTH GRAVEL (M)	BURIAL DEPTH SAND (M)
100	5.5	11.3
150	6.1	13.4
200	4.6	10
250	5.5	11.6
300	5.2	10.7
375	5.2	11.6
450	5.2	11.6
600	4	8.5
750	4	8.5
900	3.7	8
1050	3.4	7
1200	3.4	7.6
1350	3	7
1500	3	7

JOINT GAP REFERENCE TABLE



PIPE SIZE (MM)	STRAIGHT ALIGNMENT GAP* (mm)
100	25
150	25
200	25
250	25
300	46
375	46
450	46

PIPE SIZE (MM)	STRAIGHT ALIGNMENT GAP* (mm)
600	46
750	36
900	48
1050	43
1200	53
1350	43
1500	58

*The straight alignment gaps are listed as guidelines for visual inspection purposes. These gaps represent a situation where the gasket remains in the intended sealing area and should perform to the intended AS/NZS 2566.2 standard. This gap is not ideal and should be minimised as much as possible.

Installation Manual

SPELFlow ADS Pipe®

NSW HEAD OFFICE 100 Silverwater Rd, Silverwater NSW 2128 PO Box 7138, Silverwater NSW 1811 P: +61 2 8705 0255 P: 1300 773 500 E: nsw.sales@spel.com.au	**QLD MAIN OFFICE** 130 Sandstone Pl, Parkinson QLD 4115 P: +61 7 3271 6960 P: 1300 773 500 I E: qld.sales@spel.com.au **QLD SUNSHINE COAST BRANCH** 19-27 Fred Chaplin Circuit, Bells Creek, QLD 4551 P: 1300 773 500 I E: qld.sales@spel.com.au	**VIC & TAS OFFICE** 897 Wellington Rd Rowville VIC 3178 P: +61 3 5274 1336 P: 1800 810 139 I E: sales@spel.com.au **VIC GEELONG BRANCH** 70 Technology Close, Corio, P: +61 3 5274 1336 P: 1800 810 139 I E: sales@spel.com.au
SA OFFICE 9 Hampden Road, Mount Barker SA 5251 P: 1300 773 500 E: sales@spel.com.au	**WA OFFICE** 2 Modal Crescent Canning Vale WA 6155 P: +61 8 9350 1000 P: 1800 335 550 E: sales@spel.com.au	**NZ OFFICE AUCKLAND** 100 Montgomerie Road Airport Oaks P: +64 9 276 9045 E: sales@spel.com.au
NZ OFFICE WANGANUI 43 Heads Road Wanganu New Zealand P: +64 6 349 0088 I E: sales@spel.com.au	**NZ OFFICE WELLINGTON** 41 Raiha St Porirua Wellington New Zealand P: +64 4 239 6006 I E: sales@spel.com.au	**PHILIPPINES OFFICE METRO MANILA** Unit 2210 Lumiere Residences Pasig Boulevard, Pasig City P: +61 2 8705 0255 P: 1300 773 500 E: sales@spel.com.au
SINGAPORE OFFICE 512 Chai Chee Lane, #06-04 Bedok Industrial Estate, Singapore 469028 P: +61 2 8705 0255 P: 1300 773 500 I E: sales@spel.com.au	**UK OFFICE UNITED KINGDOM** Lancaster Rd Shrewsbury SY1 3NQ UK P: +44 (0)1743 445200 I E: sales@spel.com.au	**USA OFFICE CLEVELAND** 4548 Industrial Parkway Cleveland, Ohio 44135 P: +61 2 8705 0255 P: 1300 773 500 E: sales@spel.com.au

We believe clean water is a right not a privilege and we work to ensure a joy in water experience for you with your children and grandchildren.

spelstormwater
joy in water

100 Silverwater Rd, Silverwater NSW 2128 Australia
Phone: (02) 8705 0255
Email: sales@spel.com.au
spel.com.au