

**RIB LOC SERIES 2000
STORMWATER DRAINAGE PIPE**

Design and Installation Guide

Rib Loc Series 2000 Stormwater Drainage Pipe

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Important Disclaimer:

This publication aims to offer general advice to experienced pipeline designers and installers. It should not be used as the sole source of information. Reference should also be made to relevant Codes, Standards and other published material. Appropriate professional advice should also be sought relating to the particular circumstances of any project.

Introduction to Rib Loc

Rib Loc is an Australian Company well known in the plastic piping industry for its innovation and resourcefulness.

The success of the Company is based on its development of a unique process for producing plastic pipes and tubes. First patented in 1978 the Rib Loc system comprises an extruded plastic profile which is spirally wound using specially developed machinery into a continuous pipe of exceptionally high strength to weight ratio.

Applications for products made by this process include storm drains and culverts, formwork for circular columns, ventilation ducts and relining of sewers.

Today Rib Loc products are available through licensees, franchisees and distributors in over 30 countries around the world.

Introduction to Series 2000

Plastic pipes have, in the last 20 years, taken over from traditional pipes in many different applications. Once water, sewage, gas, telephone and electrical cables were only carried in iron, steel or concrete pipes, but today uPVC and polyethylene pipes have largely taken over. The ease of installation, durability and chemical resistance of plastic pipes have been major factors in their rapidly growing acceptance.

Rib Loc Series 2000 extends the advantages of plastic into the larger diameter stormwater pipe market. Rib Loc Series 2000 can be described as high density polyethylene stormwater pipe, stiffened with externally wound galvanised steel profiled strip. The steel is encased in a further layer of polyethylene, totally isolating it from the soil environment.

Developed in Australia, Series 2000 offers the advantages of plastic, in that polyethylene is a tough, abrasion and corrosion resistant material. However, by utilising steel enhancement it offers greater rigidity than most types of plastic pipe. This means it is easier to install, retaining its shape under installation conditions.

A major benefit of Series 2000 pipe is that some 40% of its high density polyethylene composition is recycled material sourced from post consumer waste. Thus the use of Series 2000 has the potential to increase the viability of a major facet of the recycling industry.



Pipeline Components

Rib Loc Series 2000 is high density polyethylene stormwater pipe, reinforced with externally wound galvanised steel profiled strip. The steel is encased in a layer of polyethylene and is totally isolated from the environment.

Pipes are manufactured in internal diameters ranging from 225mm to over 2000mm. The amount of steel reinforcing varies according to pipe diameter, to ensure pipes of all sizes have adequate stiffness to allow easy installation.

High Density Polyethylene

HDPE pipe has a long history of use in Australia.

Most commonly it has been used in the mining and farming industries, where it has proven suitable for use under arduous conditions. More recently it has been used for carrying water and gas under pressure, where the pipes are subjected to high stresses.

Polyethylene is tough, has high strain capabilities, is chemically inert in all naturally occurring soils and is extremely abrasion resistant. Series 2000 pipes comprise a mixture of virgin and recycled HDPE.

Rib Loc Series 2000 is resistant to degradation through UV exposure because of the addition of carbon black UV inhibitor.

The smoothness of polyethylene means less wall friction than with traditional pipes, so flow capacity is greater for corresponding diameters.

Encapsulated Galvanised Steel Reinforcement

The profiled mild steel reinforcement is galvanised, cold rolled, skin passed, commercial drawing quality, (with a surface suitable for exposed applications). Which is then totally encapsulated with polyethylene.

Jointing

Series 2000 pipes are supplied with a spigotted joiner in one end. Pipes are joined by running a bead of jointing compound around the exposed face of this joiner before inserting it into the plain end of the next pipe. The jointing compound contains SBR (synthetic rubber) and other compounds which aid adhesion to polyethylene. It is supplied in tubes suitable for use in a caulking gun

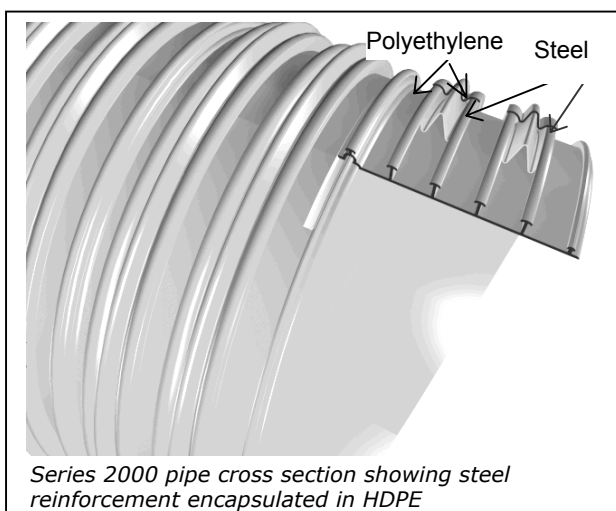
For man-entry sized pipes internal welding of the polyethylene joiner provides a secure alternative.

Wall Configurations

Rib Loc Series 2000 is specified according to the configuration of steel in the wall. In smaller sizes the pipe is stiffened by a helix of the smaller steel (V2) profile. In the larger sized pipes the larger (V6) steel profile is used.

Rubber Ring Joint

The Rib Loc Series 2000 Range has been developed so that it can be easily installed using conventional pipelaying techniques.



Series 2000 pipe cross section showing steel reinforcement encapsulated in HDPE

The development of a spigot and socket joining system has resulted in the pipes being suitable for use in pressure applications, withstanding 40pkpa long term.

Larger diameter pipes can be welded at the joints. Embedment and backfill material and compaction should be to the Engineer's Specification.

Slotted Pipe

Rib Loc Series 2000 can be provided in slotted configuration in sizes 225mm and larger for use as sub-soil drainage pipe. Slots approximately 8mm x 1.5mm in size, run uniformly around the pipe, providing a slotted area conforming with Australian Standards.

Environmental Opportunities

The use of Rib Loc Series 2000 stormwater pipes has the potential to make viable a whole new facet of the recycling industry.

Currently only a minority of Councils collect polyethylene as part of their recycling schemes. The main reason is that there are limited applications for this type of recycled plastic.

Rib Loc has the capacity to use large quantities of this material in the manufacture of stormwater pipes.

Standards

Rib Loc Series 2000 is a flexible pipe as defined in Australian Standard AS2566.1:1998 "Buried Flexible Pipelines – Structural Design". Therefore Series 2000 pipelines can be designed using the procedure given in this Standard

Dimensions and Data

Size (Nom ID) (mm)	Pipe Class	OD (mm)	Stiffness (N/m/m)	Length (m)	Weight Per Metre (Kg)	Weight Per Pipe (Kg)
225	NS	255	2380	6	2.7	16
300	V2	335	6290	6	5.2	31
375	V2	410	4000	6	6.5	39
450	V2	485	3700	6	8.3	50
525	V2	560	3890	6	10.5	63
600	V2	635	3710	6	13.8	83
675	V2	710	3300	6	18.5	111
750	V2	785	3800	6	24.8	149
825	V6	875	5240	4	37.5	150
900	V6	950	4470	4	40.8	163
1050	V6	1100	3700	4	47.8	191
1200	V6	1250	2500	4	54.5	218
1350	V6	1400	2600	4	73.8	295
1550	V7	1630	3860	4	79.3	317
1650	V7	1730	3200	4	84.3	337
1780	V7	1860	3230	4	100.8	403
1950	V7	2030	2450	4	110.5	442
2250	V7	2330	1600	4	127.5	510

*Notes: 225 size has no steel enhancement
Stiffness is approximate when tested in accordance with ISO 9969*

Pipe Class Configurations:

Pipes are classified by the configuration of their reinforcement enhancement, as shown here.

No steel reinforcement (225mm and 300mm only)



V2: Narrow band of reinforcing steel



V6: Wide band of reinforcing steel



V7: Reinforcing Steel for large diameters



Fittings:

Rib Loc Series 2000 pipe comes with a full range of fabricated fittings.

Bends, reducers, tees etc are made from polyethylene then reinforced with profiled steel

Slope junctions are available which allow easy joining of PVC pipe at house connections.



The ease of fabrication of polyethylene fittings means that custom fittings can be made quickly and economically. Mitre and "lobster back" bends of any angle can be readily provided, and large diameter fittings can be custom made to function as manholes, pits etc

Special Applications

Detention Tanks

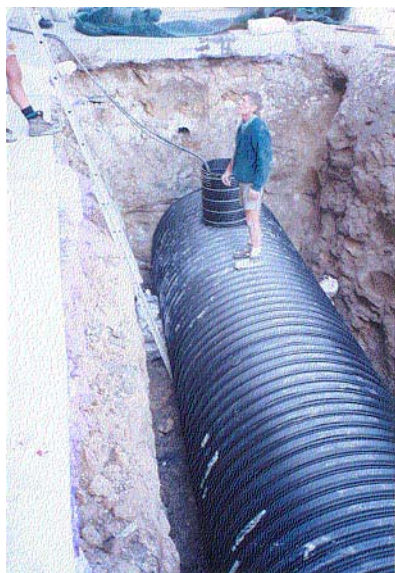
Rib Loc Series 2000 pipe can be manufactured in diameters up to 2000mm.

The ease of fabrication means that these pipes can be made to function as on-site detention tanks, custom built to project requirements.

While Series 2000 pipe of any size can be readily fabricated, the following sizes are most commonly used to form detention tanks:

Internal Diameter (mm)	Stiffness (N/m/m)	Weight per metre (kg)
1350mm x 4m	3500	70.7
1550mm x 4m	4250	81.2
1650mm x 4m	3850	86.5
1780mm x 4m	3520	103.4
1950mm x 4m	3200	113.2
2250mm x 4m	2850	130.7

Risers, blank ends and connection pieces can be easily manufactured in the factory.



The light weight and ease of handling of the component tank sections, even those with large diameters, means on site placement of the tanks is a relatively easy procedure.

Tanks can be manufactured as components in sizes, lengths and configurations which can be economically transported, then fitted together on site.

On-site polyethylene welding is a simple process, allowing final fabrication of the tanks, and the joining of tank sections

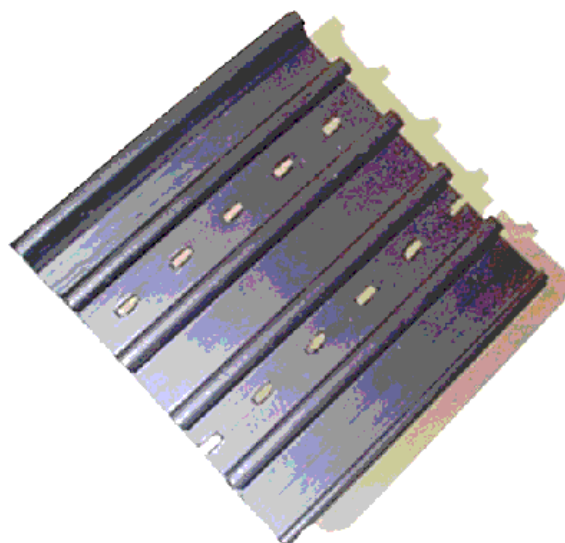
The inherent stiffness of the Rib Loc Series 2000 pipe, even at these large diameters, means that the tank holds its shape during bedding and backfilling, as long as reasonable care is taken during the operation.



Slotted Drainage Pipes

Rib Loc Series 2000 pipe can be provided in a slotted configuration.

The polyethylene profile is slotted prior to being wound to form the pipe. Thus slotted pipes can be made to any standard diameter.



The even distribution of the holes around the pipe allows for even inflow or outflow of water, thus reducing the possibility of differential movement of the surrounding soil from uneven moisture content. The ribbed configuration combined with the small holes prevents large soil particles from entering the pipeline. In sandy conditions, geotextile fabric may be required.

Designing Series 2000 Pipelines

Hydraulic Design:

The following table shows the flow in Rib Loc Series 2000 pipes for pipes flowing full.

The table has been prepared using the Colebrook White Formula, using a flow coefficient of 0.015mm

V = flow velocity, metres/second

Q = flow, litres per second

Dia		Slope (metres per kilometre)														
		0.1	0.2	0.3	0.4	0.5	0.7	1	2	3	4	5	7	10	15	20
300	V	0.2	0.2	0.3	0.4	0.4	0.5	0.6	0.9	1.1	1.3	1.4	1.7	2.1	2.6	3.0
	Q	12	17	22	26	29	35	42	62	77	90	102	122	148	184	214
375	V	0.2	0.3	0.4	0.4	0.5	0.6	0.7	1.0	1.3	1.5	1.7	2.0	2.4	3.0	3.5
	Q	22	32	40	46	52	63	77	112	140	163	184	220	267	331	385
450	V	0.2	0.3	0.4	0.5	0.5	0.6	0.8	1.1	1.4	1.7	1.9	2.2	2.7	3.4	3.9
	Q	35	51	64	75	85	102	124	181	226	264	297	356	431	534	622
525	V	0.2	0.4	0.4	0.5	0.6	0.7	0.9	1.3	1.6	1.8	2.1	2.5	3.0	3.7	4.3
	Q	53	78	97	114	128	154	187	273	339	396	446	534	646	800	931
600	V	0.3	0.4	0.5	0.6	0.6	0.8	0.9	1.4	1.7	2.0	2.2	2.7	3.2	4.0	4.7
	Q	75	111	138	162	183	220	267	388	482	563	634	758	916	1135	1321
675	V	0.3	0.4	0.5	0.6	0.7	0.8	1.0	1.5	1.8	2.1	2.4	2.9	3.5	4.3	5.0
	Q	103	151	189	221	250	300	364	529	657	767	864	1030	1250	1540	1800
750	V	0.3	0.5	0.6	0.7	0.7	0.9	1.1	1.6	2.0	2.3	2.6	3.1	3.7	4.6	5.4
	Q	137	200	250	292	330	396	480	698	867	1010	1140	1360	1640	2030	2370
825	V	0.3	0.5	0.6	0.7	0.8	1.0	1.2	1.7	2.1	2.4	2.7	3.3	3.9	4.9	5.7
	Q	176	258	321	376	424	509	618	897	1110	1300	1460	1750	2110	2610	3030
900	V	0.3	0.5	0.6	0.7	0.8	1.0	1.2	1.8	2.2	2.6	2.9	3.4	4.2	5.1	6.0
	Q	222	324	405	473	534	641	777	1130	1400	1630	1840	2190	2650	3280	3810
1050	V	0.4	0.6	0.7	0.8	0.9	1.1	1.3	2.0	2.4	2.8	3.2	3.8	4.6	5.7	6.6
	Q	334	488	608	711	802	962	1170	1690	2100	2440	2750	3280	3960	4900	5690
1200	V	0.4	0.6	0.8	0.9	1.0	1.2	1.5	2.1	2.6	3.1	3.4	4.1	5.0	6.1	7.1
	Q	476	694	865	1010	1140	1370	1660	2400	2980	3460	3900	4650	5610	6940	8060

Structural Design

Rib Loc Series 2000 stormwater pipes are classified as flexible, meaning that under external load they can deflect without damage. In practice this deflection is resisted by the surrounding embedment affecting the flexible pipe in two ways:

- Passive support develops at the sides of the pipe, preventing further deflection
- As the pipe deflects, an arch mechanism develops in the embedment above the pipe, relieving it of a large proportion of its load

The effective strength developed by this pipe-soil system can be remarkably high. Flexible pipes have been in use for decades, often under heavy load conditions.

Flexible pipes are classified by 'stiffness', measured by the load required to cause a certain deflection. Rigid pipes are classified by 'strength' meaning the load required to cause cracking. Direct comparison between flexible and rigid pipes is therefore not straight forward.

Both rigid and flexible pipes require proper backfill, although the soil-pipe interaction differs.

A flexible pipe under load will deflect, transferring the load to the surrounding embedment, and cause an arch to form above the pipe, reducing the load on the pipe. The support provided by the embedment surrounding a flexible pipe is stable and permanent. Therefore designing a flexible pipeline to resist external loading requires consideration of the properties of the surrounding soil as well as the stiffness of the pipe.

Using Australian Standard AS2566

Australian Standard AS/NZS 2566.1: 1998 "Buried Flexible Pipelines. Part 1: Structural Design" covers flexible pipelines of all materials, whether plastic or metallic, and is applicable for designing Rib Loc Series 2000 pipelines.

In summary, the Standard bases the structural design of flexible pipelines on:

Pipe Material Characteristics:

Pipe stiffness and capacity of the pipe material to withstand stress and strain are the most important properties in determining a pipe’s response to loading.

For composite pipes such as Rib Loc Series 2000, the Standard allows pipe stiffness to be determined experimentally according to ISO 9969 or AS 3572. These values, expressed in units of N/m/m are given on page 3. These stiffness values are high compared to other types of plastic non-pressure pipes of similar diameters.

It has been Rib Loc’s experience that provided a pipe has a stiffness greater than 2500/m/m, contractors report no difficulty in maintaining its circular cross section during installation and compaction of the embedment material.

Materials such as polyethylene and steel have high strain capabilities. Design of pipelines manufactured from these materials is almost never limited by allowable stress or strain.

Embedment Characteristics:

The strength of support that the embedment provides for a flexible pipe depends on the embedment material and the degree of compaction

Both the embedment and the native soil need to be taken into account.

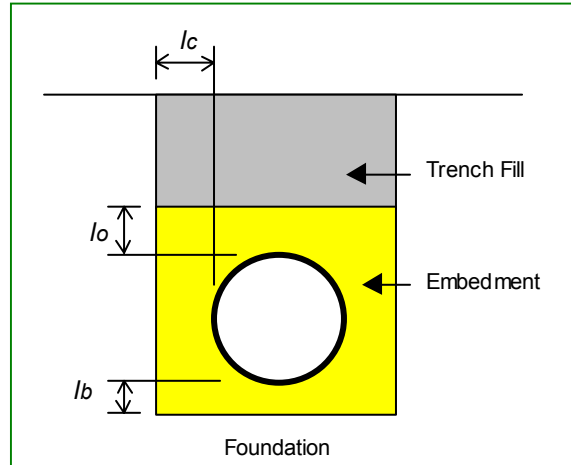
Table 3.2 of AS 2566 provides soil moduli to be used in design for various classes of native and embedment soil at varying degrees of compaction. A method is provided to allow calculation of the ‘combined soil modulus.’

In common with other types of pipe, whether flexible or rigid, gravel or coarse grained sand is the recommended embedment for Series 2000. It gives strong support and is easily compacted.

Trench geometry is given as follows:

Pipe Dia (mm)	Minimum Values		
	l_b	l_c	l_o
>225-300	100	150	150
>375-450	100	200	150
>525-900	150	300	150
>1050-1200	150	350	200

Where two or more pipes are laid side by side in a trench or under an embankment AS2566 states that the clear distance between the pipes shall be not less than l_c for the larger of adjacent pipes.



Design Loads

Loads generally considered in the design of buried flexible non-pressure pipes are:

- Trench fill
- Traffic load
- Hydrostatic load (for buckling calculation)

The soil load on the pipe is taken to be the weight of the column of soil acting on the projected area of the pipe – called the “prism load”. This is conservative as there is no reduction in the soil load due to trenching effects. Friction of the column of soil above the pipe, and the induced arching effect, both applicable to flexible pipe, are ignored.

Design

Three design criteria are considered:

- Pipe deflection
- Pipe strength
- Pipe buckling

Tables for design of Rib Loc Series 2000 pipelines in accordance with this Standard are on the following page.

Design of pipelines under roadways has been carried out using an additional consideration to ensure that the regular passage of vehicles will not lead to fatigue in the pavement due to deflection of the pipes.

The design tables are extremely conservative as they make no allowance for the mitigating effects of the pavement. A rigid pavement will spread any traffic load, so minimising the load impacting on the buried pipes. In practice, deflections in pavements over flexible pipes designed and installed in accordance with the Standard are no greater than elsewhere along the roadway.

INSTALLATION TABLES

All dimensions in millimetres



= Trench fill zone



= Embedment zone

Highway = 2 lanes W7/T44 load

Street = 1 lane W7/T44 load

Field = No traffic loading

Gravel = gravel or crushed rock, single size or graded

- Compacted to 95% dry density under roads

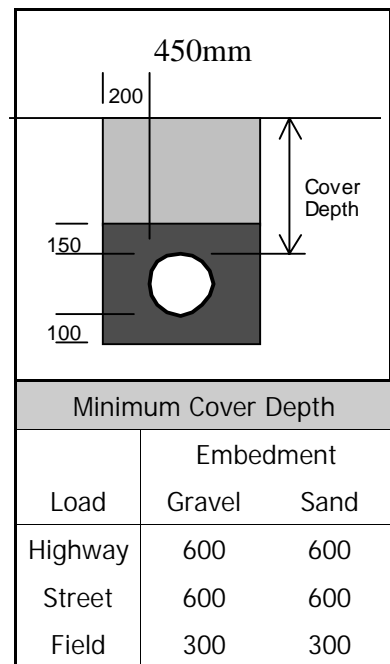
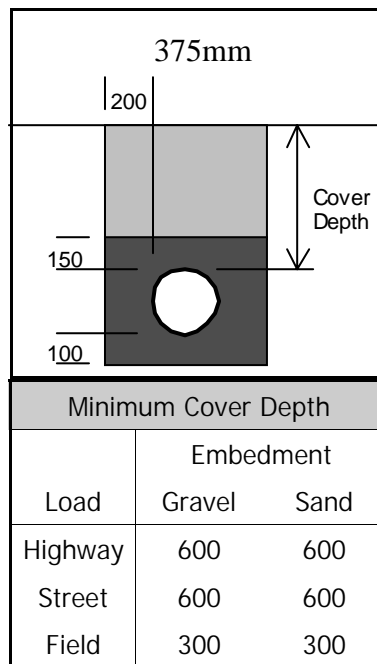
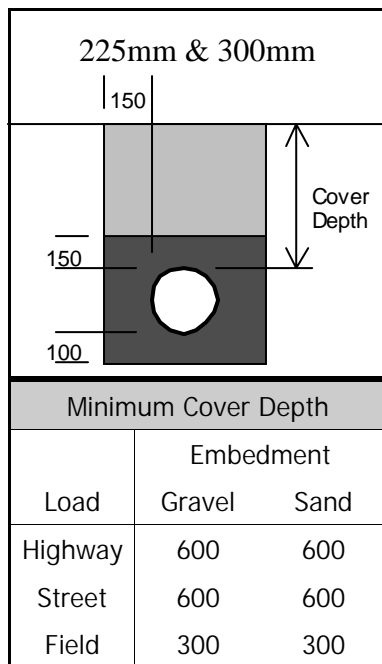
- Compacted to 90% dry density in fields

Sand = Coarse sand with <12% fines

- Compacted to 95% dry density under roads

- Compacted to 90% dry density in fields

Trench Fill Material should be as approved by the local Council or Road Authority

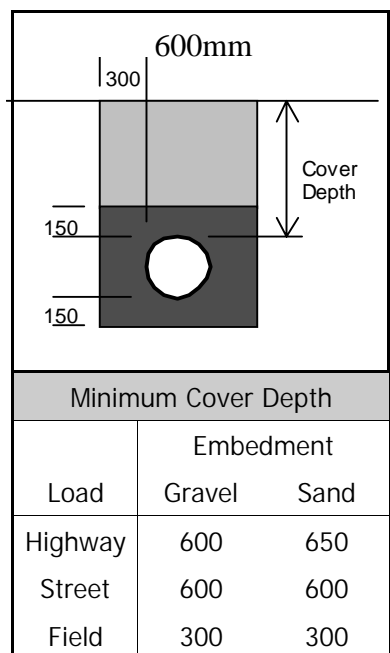
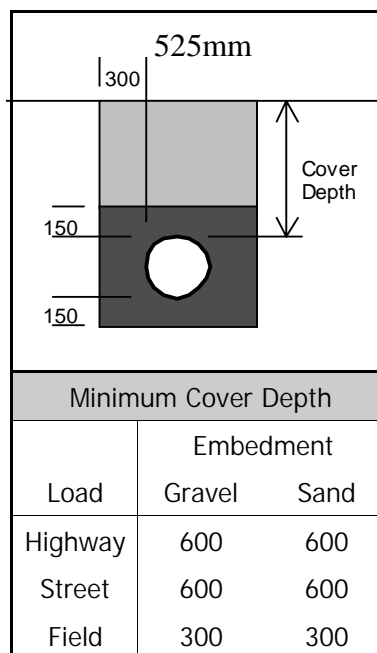


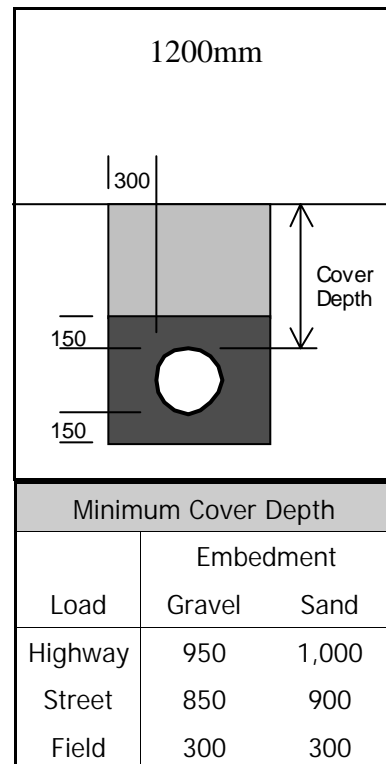
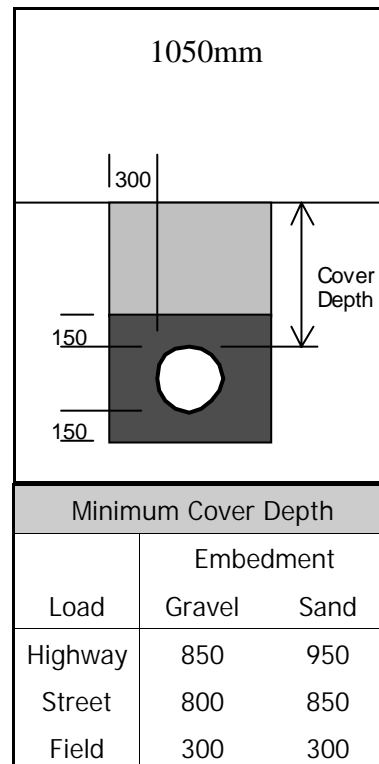
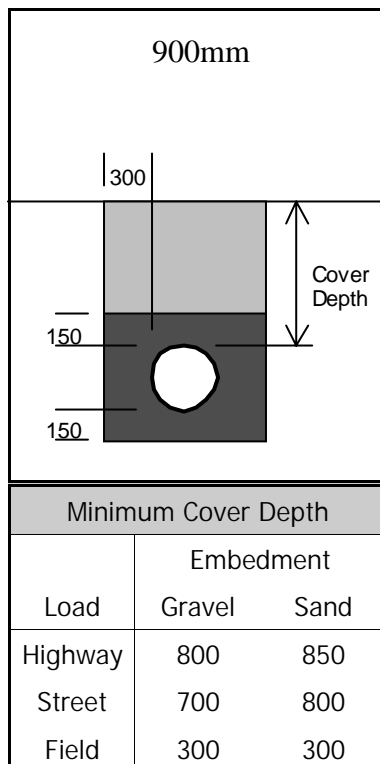
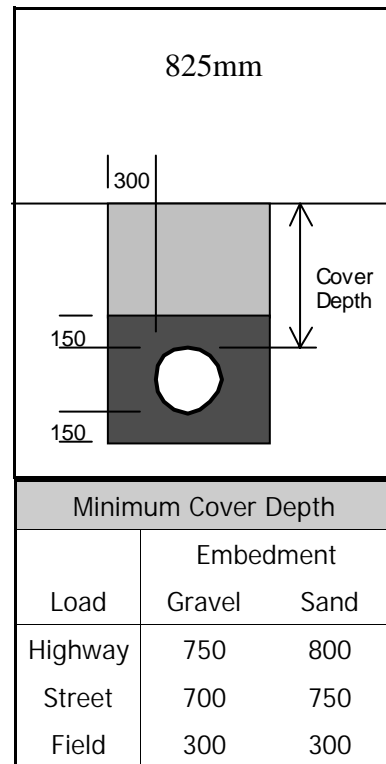
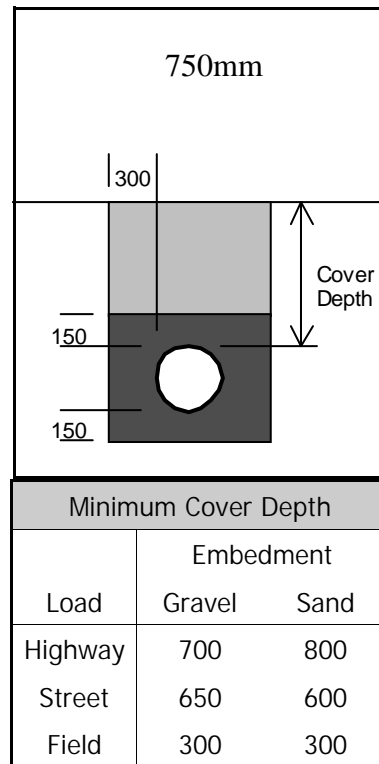
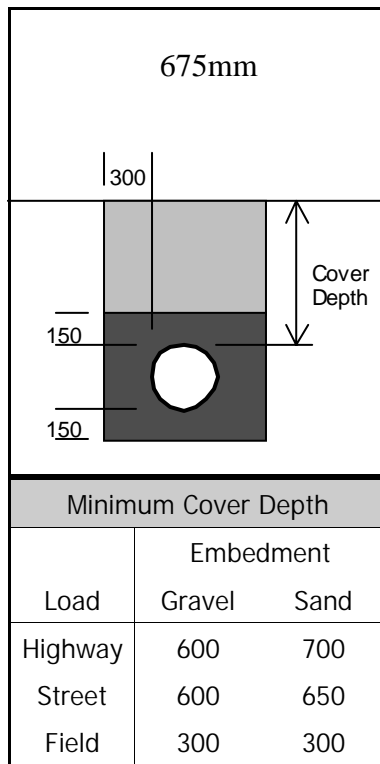
Notes on Design

These Tables have been prepared based on design to AS/NZS 2566.1: 1988 – Buried Flexible Pipelines, Part 1; Structural Design.

Calculated design pipe deflection due to W7 or T44 loading is less than 7mm. No allowance has been made for the load mitigating effects of the pavement.

This is a design method only. Actual road surface deflection of such installations has been found to be within the allowable values given in the "Source Book for Australian Roads", published by the Australian Road Research Board.





Pipe Handling and Installation

Unloading and Handling

An important advantage of Rib Loc Series 2000 stormwater pipe is its light weight, which makes handling easy and economical. Considerable savings can be made if pipes can be moved by hand, or by light lifting equipment in the case of larger pipes.

Reasonable care should be taken with unloading. Pipes are delivered with joiners fitted in one end and it is important that these and the pipes themselves are not damaged by improper handling. Pipes may be delivered singly or "nested" with smaller sizes inside larger ones.

Following are some suggestions for successful unloading and handling of pipe:

- By hand
- Rolled down planks off the side of the truck
- Forklift
- Backhoe or other lifting equipment with webbing or rope slings passed around the pipe

Not Recommended:

- lifting with chains or steel cables
- passing a sling or rope through the pipe

and, in particular, like all types of pipe, Rib Loc Series 2000 should not be dropped off the truck or dragged along the ground!



Storage

Pipes can be stored in stockpiles on flat, even ground, free of sharp rocks and objects which may cause damage. Being light weight, the pipes should be securely chocked to prevent them rolling around in high winds. Precautions should be taken to minimise the chance of theft or vandalism.

Rib Loc Series 2000 pipes comprise polyethylene which has carbon black added to provide UV resistance. Pipes can therefore be safely stored in direct sunlight.

Trenching

Trenches should be excavated to allow the pipe to be laid at the line, level and grade shown on the

construction drawings. The depth of the trench should allow for the correct depth of bedding beneath the pipe.

In good conditions the trench should be as narrow as practical, but should still leave enough space to allow compaction of the fill at the sides and under the haunches of the pipe. Trenches which are too wide need excessive embedment material and also increase the load on the pipe.

Installation Below Water Table

Ensure trench is dry during installation to ensure compaction of fill material.

Shaping the bottom of the trench to save on the quantity of embedment material required is acceptable.

The following Table gives recommended depth of bedding beneath the pipe, and recommended clearance between the pipe and the trench wall. The values have been taken from the Australian Standard AS2566:1998

Pipe Dia (mm)	Bed Depth (mm)	Pipe Clearance (mm)
225, 300	100	150
375, 450	100	200
525 - 900	150	300
1050 - 1200	150	350

The minimum trench width should be maintained at the level of the top of the pipe.

For deep trenches it may be necessary to slope or bench the trench sides, or use shoring in accordance with safety regulations.

Pipe Embedment

Flexible pipe systems depend for their strength on the support they get from the embedment around them. The stronger this embedment, the greater the load carrying capacity of the pipe. Strong embedment is obtained when hard material is densely compacted. Crushed rock, gravel, blue metal and coarse washed sand are recommended materials because of their strength. Clays which swell when water is added are weak materials and so are not recommended. The project specifications may stipulate the type of backfill to be used and the degree of compaction required.



The use of better quality material means less compaction effort is needed.

Generally materials commonly specified as bedding and haunch support for concrete pipes are suitable for use as embedment for Rib Loc Series 2000 pipes.

The Australian Standard AS2566.1 requires the same material to be used for bedding and side support for flexible pipes. Embedment material should be placed and compacted until it reaches the height above the pipe given in the following table.

Pipe Diameter (mm)	Height of Compacted Embedment above pipe (mm)
225 - 900	150
1050, 1200	200

(Source - AS2566:1998)

Best Material (Class I): Single size crushed rock, angular, sizes 5mm to 20mm.

Other Recommended Materials (Class II): Coarse sand, blue metal or gravel with little or no fines, grades GW, GP, SP

Not Recommended:

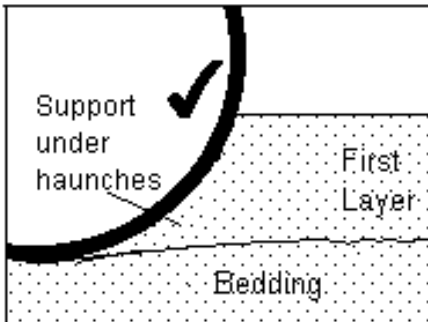
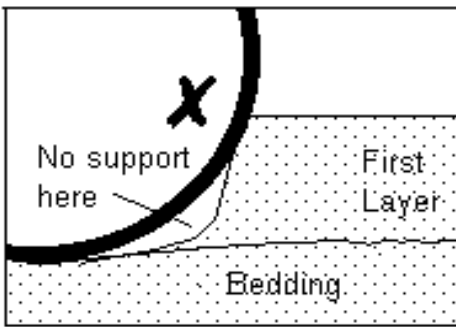
- Fine grained soils. While these may be suitable where the pipe is only lightly loaded, compaction requires considerable effort and must be carried out at the optimum moisture content. This material does not provide sufficient strength in deep trenches, under dynamic loads or where the pipe is beneath the water table.

- Heavy clay or organic soil. These materials do not provide sufficient strength to adequately support the pipeline.
- “Brickies sand”, which has a high clay content and reacts with water, and fine sand which is difficult to compact



The following methods of achieving adequate embedment strength are offered as guidelines only. They are applicable to the recommended embedment materials and have been found, from experience to be generally suitable. They may need to be adapted to suit actual site conditions, materials used, and equipment available.

1. Put down bedding to specified thickness. Simply dumping and levelling this material generally achieves the required compaction.
2. Place the pipe and “wriggle” it to assist the ribs to key into the bedding
3. Place the uncompacted embedment material to the springline of the pipe *or* to a thickness of 300mm, whichever is least. Material should be placed evenly on each side of the pipe so it maintains its line. Ensure material is placed under the pipe haunches.
4. Compact the material by the following methods:
 - *single sized aggregate, blue metal or gravel:* spearing or driving a fork, shovel or crowbar the full depth of the layer (taking care not to damage the pipe). Two passes with a vibrating plate is usually adequate with gravel or blue metal, but is unnecessary with single sized aggregate.
 - *Coarse washed sand:* compact by
 - vibration plate,
 - vibratory rammer
 - watering
5. Compaction under the pipe haunches is vital. The material must be compacted right to the undisturbed trench wall.
6. Continue filling and compacting in this manner in layers of maximum thickness of 300mm



Note on Compaction by Flooding

Compaction by flooding is sometimes used with sand. Flooding compacts material by dragging it downwards and filling any voids with sand as the water drains away. It is essential that water will drain away or there is a danger that the pipe will float. Slotted agricultural drainage pipe can be put in the trench (not against the pipe) to assist.

Running water down the sides of the pipe assists in compacting material under the haunches and against the pipe wall.

Geotextile Fabric

In very silty or soft clay soils, particularly where groundwater is present, it is essential to prevent the intrusion of fine material into the pipe backfill causing loss of foundation or side support. In these situations geotextile fabric should be laid in the excavated trench so that it fully encases the pipe bedding and embedment around the pipe.

Joining

Rib Loc Series 2000 pipes are supplied with a double spigotted jointing collar welded into one end. Tubes of synthetic rubber based jointing sealant are also supplied.

Joining of the pipe is by:

- Run the jointing sealant in a zigzag pattern on the outside of the collar of the next pipe to be joined.
- Inserting the jointing collar into the plain end of the previously laid pipe
- Pushing on the plain end of the pipe to fully force home the jointing collar.



The jointing collar should be at the *downstream* end of the pipe. So if construction starts from the downstream end of the pipeline, the jointing collar is always inserted into the previously laid pipe.

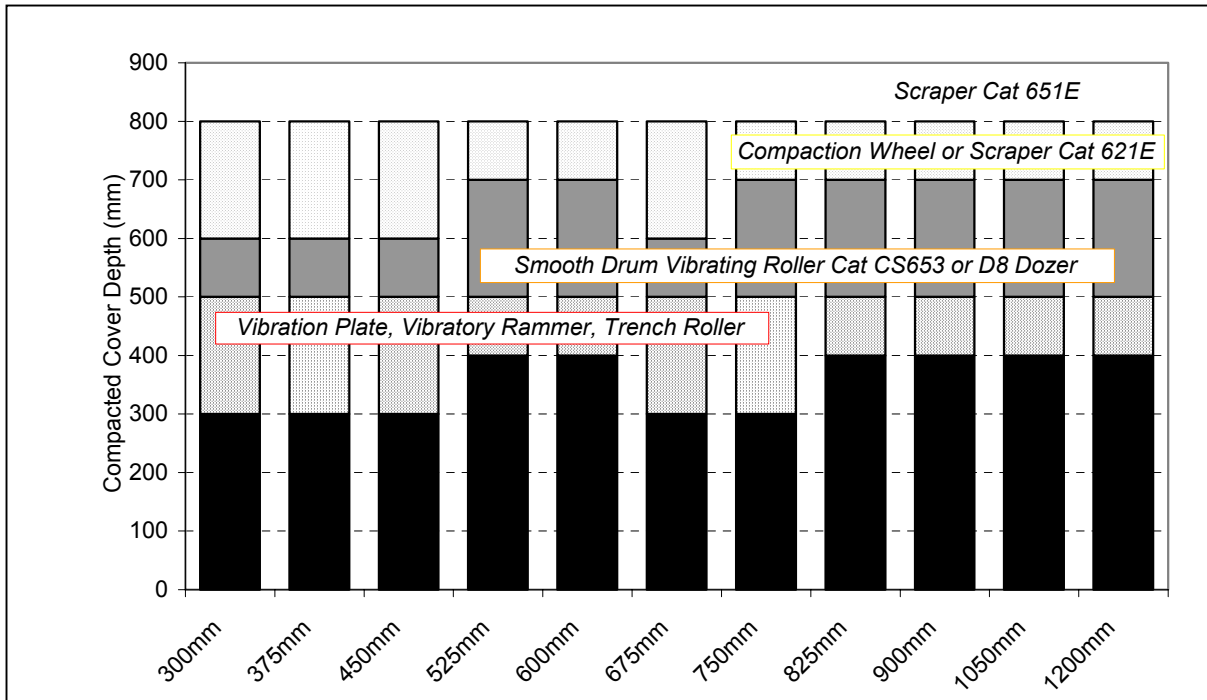
Do not push the pipes together by levering on the collar. This may cause distortion, and make joining of the next pipe difficult

How much jointing adhesive to use:

Pipe Size	Joints per Tube	Pipe Size	Joints per Tube
225/300	5	525	2
375	4	600	2
450	3	750	1

For man-entry sized pipes, jointing can be assisted by a person inside the pipe locating the joiner internally as the pipes are pushed together. This can be assisted by using "shoe horns" such as screw-drivers or pieces of shaped sheet metal.

Welding of joints is recommended for man-entry sized pipes. Polyethylene welding is a straight forward process which can be easily learned. Rib Loc should be contacted for advice on welding procedures.



Final Backfilling

The material above the pipe supports the ground surface making sure it does not subside. This is particularly important under roads and footpaths as, if not done properly, potholes may form. It also protects the pipe from point loads.

Unless specified otherwise, material taken from the trench is suitable for backfilling from 150mm above the pipe. The fill material should be free from rocks, hard lumps and debris.

In heavy loading conditions, such as under a road, the local Authority may have specified requirements for backfilling. Generally these will be the same as those applicable to concrete pipes.

Using Compaction Equipment Over the Pipe

The construction equipment noted in the above chart can be used over Series 2000 pipes embedded in adequately compacted crushed rock, gravel, or coarse sand provided the compacted depth of cover is at least that shown in the chart. (Assumes native soil modulus >7MPa, embedment soil modulus >5MPa)

For example, compaction of road base above a 375mm diameter Rib Loc Series 2000 pipe with a smooth drum vibrating roller is acceptable provided the pipe is covered by at least 500mm of compacted fill.

Deflection of the Series 2000 pipe will be less than the allowable values given in the Australian Standard AS2566.1

Pipe Cutting

Rib Loc Series 2000 pipe can be easily cut with any of the following tools:

- quick cut or demolition saw
- angle grinder
- hacksaw
- jigsaw
- circular saw with metal cutting blade

To ensure the cut is straight (not following the spirals) a length of insulation tape can be wrapped around the pipe and used as a cutting guide.



Steep Slopes

Where the slope of the pipeline exceeds 15%, concrete anchor blocks should be cast around the pipe to adequately restrain it. These blocks should key into the solid walls and base of the trench.

Connection to Pits, Access Chambers

When connecting Series 2000 to a rigid structure such as a concrete manhole, the pipe should be either cast in-situ into the concrete wall, or securely mortared. The T-shaped ribs of the pipe act as “weep flanges” to provide restraint and prevent longitudinal movement.

Experience has shown that short lengths of “rocker pipe” are *not* required with HDPE pipe. (Refer Sydney Water Board: *Recommended Installation of Large Diameter Flexible Plastic Pipes for Non - Pressure Applications: March 1989*)

Forces due to any differential settlement are accommodated by the flexibility and strain characteristics of polyethylene, which are superior to those for uPVC. Any stresses induced in the pipe by differential settlement diminish over time because of the stress relaxation properties of polyethylene.

Installation in Common Trenches

When two or more pipes are installed in a common trench a minimum spacing is needed between pipes to allow the fill to be compacted and provide adequate support.

Australian Standard AS2566 “Buried Flexible Pipelines” provides values for the minimum clear distances between pipes laid in common trenches. These values are given in the following Table. Where the pipes are of different sizes, the value given for the larger pipe is applicable.

Pipe Diameter (mm)	Distance Between Pipes (mm)
225, 300	150
375, 450	200
525 - 900	300
1050, 1200	350

Installing Pipes on a Curve

Generally pipes should be laid straight between pits, headwalls etc. However, the flexibility of polyethylene allows the pipes to be laid curved, so long as undue force is not applied. Bending should take place in the barrel of the pipe rather than at the joint.

Bending of pipes larger than 375mm diameter is not recommended. Pipe should not be bent to a radius tighter than 130 times its diameter.

The following table can be used as a guide:

Pipe Size	225	300	375
Bend Radius	30m	40m	50m

Preventing the Pipe from Floating

During and after installation it is important to ensure that the pipe is prevented from floating in waterlogged trenches. The following depth of compacted fill is necessary to ensure this does not occur:

Pipe Diameter (mm)	Depth (mm)
225 - 450	200
525, 600	250
750	350
900	400
1050	450
1200	500

Product Testing

The design information provided in this manual has been verified through testing, both in-house and through independent testing laboratories.

Testing has focussed on the materials used in the manufacture of Series 2000 pipes as well as the finished product.

Materials testing has included:

Environmental stress crack resistance testing of HDPE material used in the manufacture of the pipes

Testing of the mechanical properties of the HDPE material

Product testing has included:

Parallel plate stiffness testing at Civiltest, University of Adelaide

Soil box simulation testing at:

Utah State University

Techsearch, University of South Australia



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