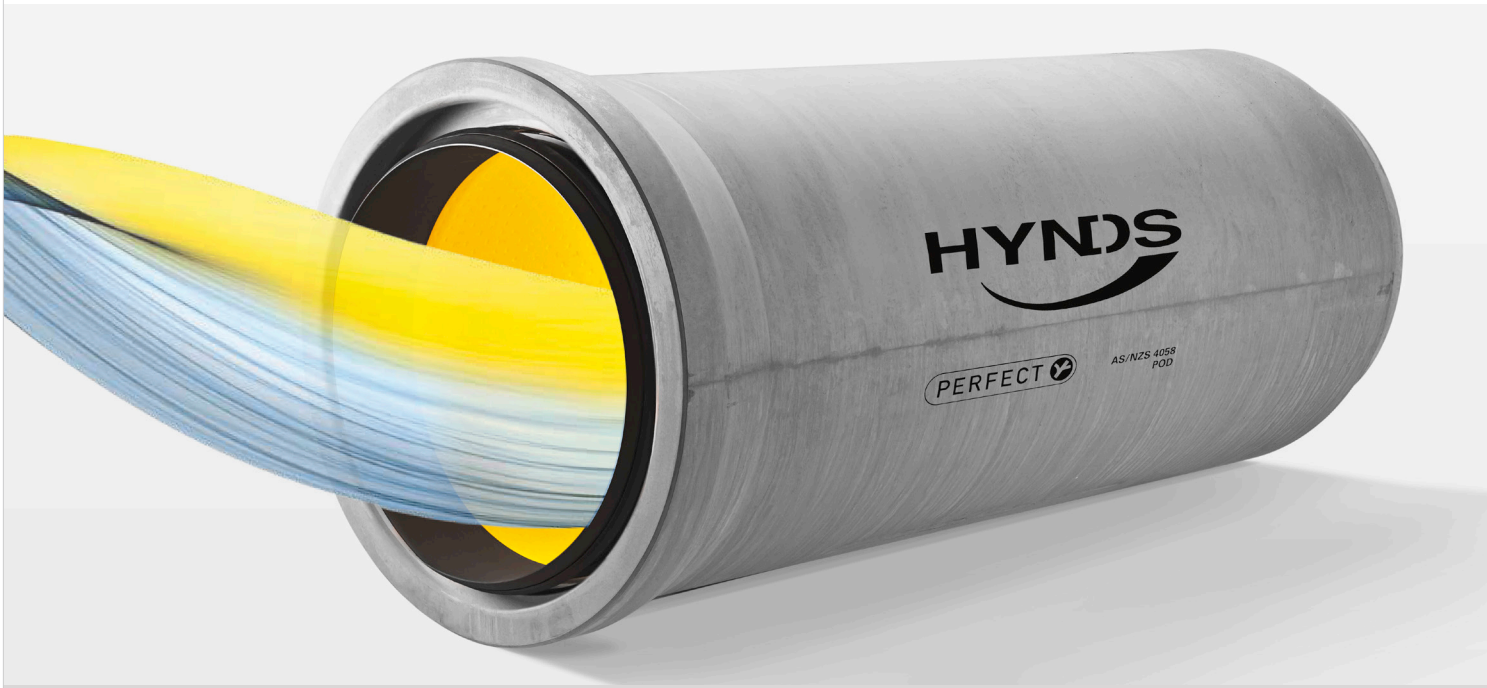
PERFECT® Pipe

Technical Guide D1.17

Manufactured at our state of the art world leading concrete manufacturing plant in Pokeno, **the PERFECT® Pipe is the best of both worlds (Concrete and PE).**



Applications

- Wastewater & Industrial Waste
- Installation in a wide variety of applications

Product Attributes

- Resistant to H2S & chemical attack
- Extended service life
- Easy and quick installation

Approvals/Standards

- Designed and manufactured to AS/NZS 4058:2007 Precast Concrete Pipes
- Rubber rings manufactured to EN 681-1 Elastometric Seals for water and drainage applications.

Quality

- ISO 9001:2008 Quality Management Standard
- AS/NZS 4058 "S"Mark by Bureau Viritas
- British Standard "Kitemark" (Rubber Seals)
- CE-Marking (Rubber Seals)

We are the supply partner of choice for New Zealand's civil construction industry, specialising in water and infrastructure based solutions.

HYNDS PIPE SYSTEMS

Introduction

The PERFECT® range of PE Lined Concrete Pipe is a brand-new range of Concrete Pipe from our state-of-the-art, world leading concrete manufacturing site in Pokeno, Auckland.

PERFECT® Pipe is manufactured using a highly automated process utilising the latest European manufacturing technology. Each pipe has a unique product marking allowing for product traceability after production and delivery to site and this range also includes in-line vacuum testing of the full pipe length. This state-of-the-art process helps ensure that a high-quality pipe is produced consistently, with smooth surface finishes and precision dimensional accuracy especially around the Joint profile.

The new PERFECT® range incorporates a joint profile specifically designed to accommodate a pre-lubricated elastomeric seal, which is extensively used in Europe and elsewhere in the world. This joint is specially designed to make joining quicker with the push fit PERFECT® connector, to seal liner pipe joints.

Our PERFECT® range of Concrete Pipe is generally only supplied to North Island Projects but can be shipped to South Island projects where required.

Some advantages of the PERFECT® Pipe include:

Increased durability

Resistant to H_2SO_4 making it perfect for sewers.

Service Life

More than 100 years thanks to the corrosion resistance and high abrasion resistance of the HDPE liners and the robustness of concrete pipes.

Completely Leakproof

The interior **PERFECT Connector** provides for a tight seal and flexibility from pipe to pipe.

Versatile and Individual

The in-wall and butt joint versions are suitable for use in both open construction and pipe jacking.

Reliable

The internal diameter remains unchanged, as the liner is well anchored to the concrete pipe wall.

Corrosion resistance

HDPE can withstand a chemical strain of pH 1–pH 14.

Pull-out and abrasion resistance

The liner maintains a true connection with the concrete pipe via anchors on the back. The abrasion-resistant lining is designed to have an operational life of more than 100 years.

Pluggable and Efficient

The pipe-to-pipe connection is sealed via the connector. This means that plastic welding is avoided at the construction site and a faster installation rate can be achieved, with reduced health and safety issues.

Joint Types

The PERFECT® range of Concrete Pipe comes with one of three joint types depending on the size and application for the pipe.

Belled Socket Joint (BSJ)

Belled Socket Joint Pipe (previously known as Rolling Rubber Ring Joint (RRJ) or Collared Pipe) is typically used for small to medium pipe where the wall thickness of the pipe is insufficient to accommodate the joint profile. A projecting collar is provided which extends outside the outer surface of the pipe barrel.

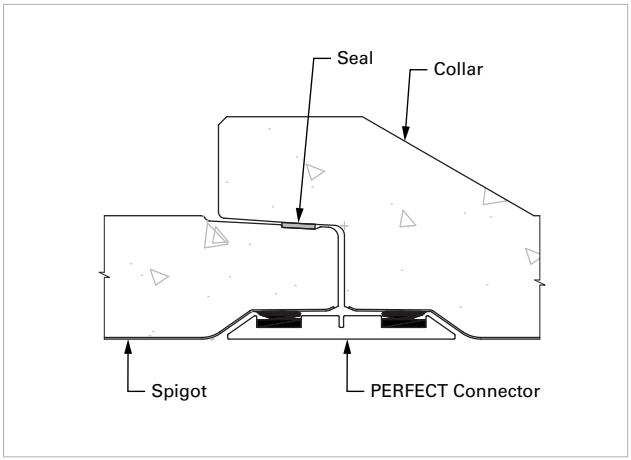


FIG. 1 BSJ Joint Profile

In-Wall Joint (IWJ)

In-Wall Joint pipe (previously known as Skid Ring Joint (SRJ) pipe) is typically used for larger diameter pipes, or medium diameter pipes that have sufficient wall thickness to accommodate the joint profile. In-Wall Joint profiles are used widely in NZ for trenchless installations.

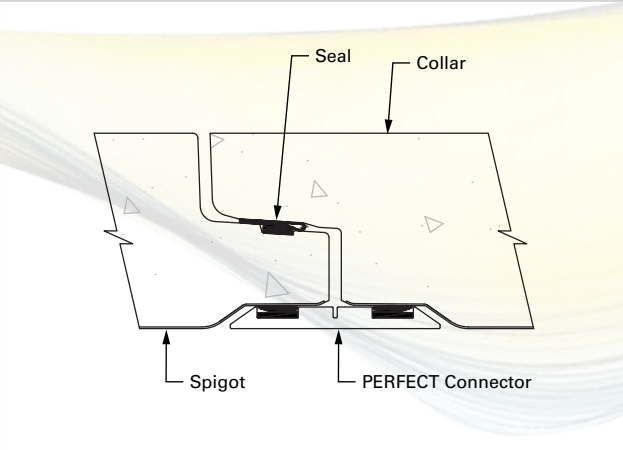


FIG. 2 IWJ Joint Profile

Butt Joint (BJ)

Butt-Joint pipe incorporates a double spigot in which the joint is made by the use of a rubber ring and a steel collar. Butt-Joint pipe is typically used for trenchless installations, but may also be used for open trench applications.

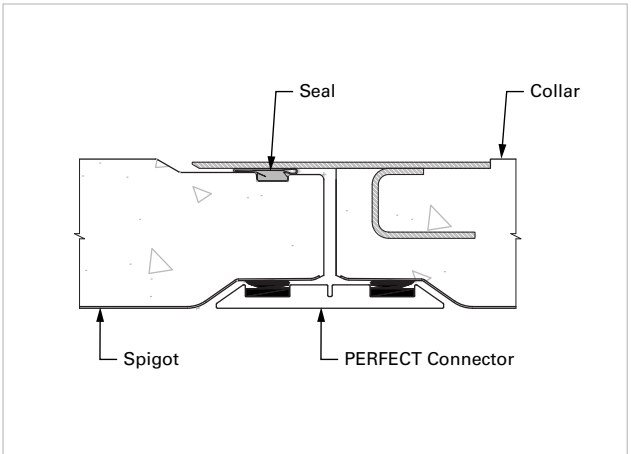


FIG. 3 BJ Joint Profile

Standard Range Specifications

Our PERFECT range pipes cover majority of everyday Wastewater applications. This range is generally made-to-order.

- Sizes DN700 – 1200mm
- Manufactured to AS/NZS 4058 requirements
- Designed to suit a 'normal' external environment as defined in AS/NZS 4058:2007
- Available in one main strength class, Class 4.
- Internal installed working pressure up to 50kPa (5 metre head) and factory tested to 90kPa (9 metre head).
- Standard effective length is 2500mm.

Other Made-to-Order or Custom Product Options

We recognise that every job is different and that our Standard Range of products may not be suitable for your installation. We have a number of product options ready that are also made-to-order to suit these installations and if required we will look at new solutions to meet your needs.

Below are options that fit within the above category.

Refer to our Concrete Pipe National Catalogue for more details.

Application	Hynds Options
Higher Strength Classes	Class 6 and higher are available made-to-order.
Marine - Marine environment as defined in AS/NZS 4058.	Marine - Marine grade options with additional cover as defined in AS/NZS 4058 are available in some sizes and classes. Refer to Technical Support Sheet D1.1A Marine Environment Options and the Concrete Pipe National Catalogue for more detailed information.
Acidic or Acid Sulfate Soil	Increase concrete cover internally and/or externally by 10mm to act as sacrificial layer or, HYDURA Concrete / 30% Fly Ash or both of the above. Refer to CPAA Technical Brief Concrete Pipe in Acid Sulfate Soil Conditions for recommendations.
Jacking Pipe	Refer to Technical Guide D1.16 Pinnacle® Concrete Jacking Pipe.
Internal Installed Watertightness	All of our Pinnacle® range pipes can offer a hydraulic seal up to an internal pressure of 50kPa. Pressure's greater than this require specific design as a pressure pipe.
Fabricated specials	Fabricated specials such as cut pipe, bends and offtakes are available. Some pipe diameters are available in larger/shorter lengths than the 2500mm nominal length. Alternatively other lengths can be fabricated by cutting and joining at the specified length. Other lengths can be fabricated by cutting and joining at the correct length. Fabricated bends can be made at a number of angles. Offtakes can also be made at a number of angles. Refer to the Concrete Pipe Junction Order Form.
Other diameters	Hynds can work together with parties to investigate and design a specific solution to fit the customers need.

PERFECT® Connector

FIG. 4 PERFECT® Connector

PERFECT Pipes biggest advantage is that its quick to install. The PERFECT Connector makes it possible to connect quickly, easily and, more importantly, in a watertight manner, which means that welding of the PE between joints is no longer required and there is no need to enter the pipe.

The lining system composed of the PERFECT Liner and PERFECT Connector is sealed up permanently inside and out without reducing the cross-section. More importantly, this leads to a significant increase in the installation rate in the range of no-men-entry nominal diameter, while at the same time resulting in a reduction in installation costs.

PERFECT® Liner

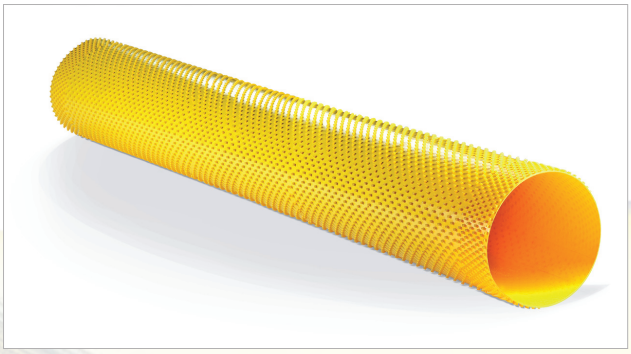


FIG. 5 PERFECT® Liner

The PERFECT Liner is made of high-density polyethylene (HDPE). This material is resistant to chemical attacks down to a ph-value of 1.0, and abrasion-resistant.

Multiple anchoring points are used to connect the liner tightly to the surrounding concrete pipe. The high anchor density locked to the pipe sections and the optimum anchor geometry developed for PERFECT Pipe facilitates a reliable connection right into the sleeve. In the area of the pipe connections, an increased number of anchors on the liner provide a reliable, permanent connection to the concrete pipe.

The pull-out resistance of each anchor is more than 250 N. This ensures the installed liner can withstand permanent groundwater pressure of at least 150kPa. Even strong temperature fluctuations will not cause the liner to separate from the surrounding concrete.

The standard liner is 1.65mm. Thicker liners are available for specific project requirements.

Along with notable characteristics such as high-pressure flushing durability and its superior pull out strength, the PERFECT pipe has high resistance to abrasion.

During the "Darmstädter Kipprinne" abrasion test, a moderate abrasion of only 0.22 mm was detected after 200,000 load cycles. This customary test simulates the actual load placed on a wastewater pipe over 100 years. The result clearly shows the high abrasion resistance of the PERFECT Liner.

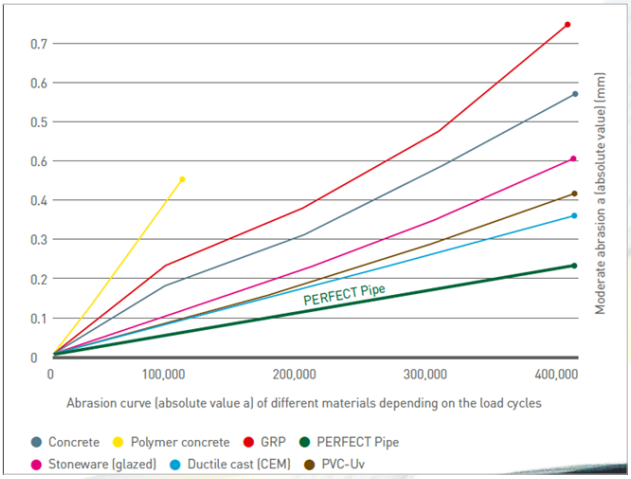


FIG. 6 Abrasion Curve

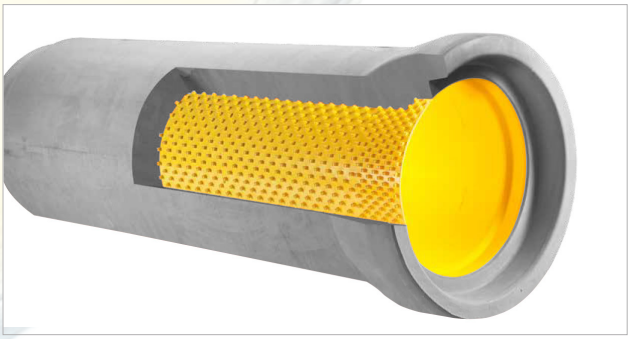


FIG. 7 Cut section showing liner anchor embedment

TABLE 1 Class 4 PERFECT® Pipe Geometry (IWJ)

Nominal Diameter	Barrel Internal Diameter	Barrel External Diameter	Overall Length	Barrel Length	Wall Thickness	Mass (kg)	Swiftlift Clutch Size (Tonnes)	Hynds Product Code	PERFECT® Connector	Rubber Ring Code
-	A	B	C	D	t	-	-	-	-	-
700	700	1080	3073	2945	190	3855	5	PC0700IWJC4LM	99CONNECTOR700	RS0700IWJ
900	900	1280	3073	2945	190	4828	5	PC0900IWJC4LM	99CONNECTOR900	RS0900IWJ
Other diameters available on request										

Notes:

1. All diameters and lengths are in millimetres.

2. Joint gap not required.

3. Geometry shown is for Class 4 pipe only. Geometry for other classes can be provided on request.

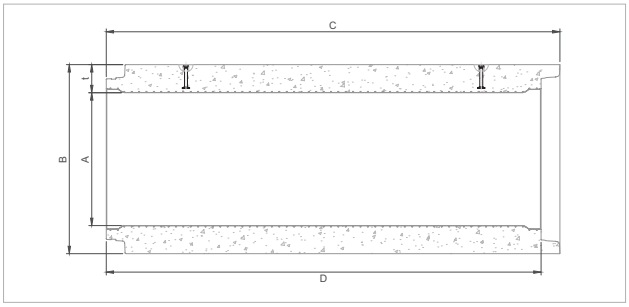


FIG. 8 . PERFECT® IWJ Pipe Geometry

TABLE 2 Class 4 PERFECT® Pipe Geometry (BSJ)

Nominal Diameter	Barrel Internal Diameter	Barrel External Diameter	Overall Length	Barrel Length	Wall Thick-ness	Mass (kg)	Swiftlift Clutch Size (Tonnes)	Hynds Product Code	PERFECT® Connector	Rubber Ring Code
-	A	B	C	D	t	-	-	-	-	-
1000	1000	1220	3074	2957	110	2970	5	PC1000BSJC4LM	99CONNECTOR1000	99LOADRING1000
1200	1200	1440	3080	2957	120	4018	5	PC1200BSJC4LM	99CONNECTOR1200	99LOADRING1200
Other diameters available on request										

Notes:

1. All diameters and lengths are in millimetres.

2. Joint gap not required.

3. Geometry shown is for Class 4 pipe only. Geometry for other classes can be provided on request.

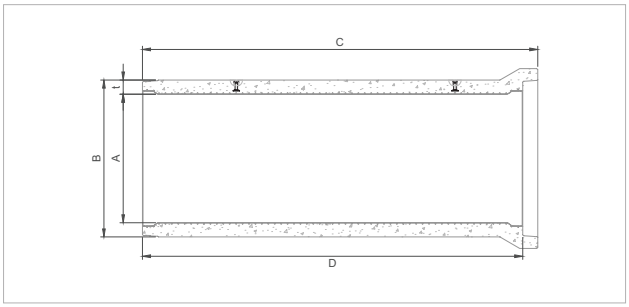


FIG. 9 . PERFECT® BSJ Pipe Geometry

TABLE 3 Class 4 PERFECT® Jacking Pipe Geometry (IWJ)

Nominal Diameter	Barrel Internal Diameter	Barrel External Diameter	Overall Length	Barrel Length	Wall Thickness	Mass (kg)	Swiftlift Clutch Size (Tonnes)	Hynds Product Code	PERFECT® Connector	Rubber Ring Code
-	A	B	C	D	t	-	-	-	-	-
700	700	1080	TBC	TBC	190	2655	5	PC070020JIC4LM	99CONNECTOR700	RS0700IWJ
700	700	1080	3073	2945	190	3855	5	PC070030JIC4LM	99CONNECTOR700	RS0700IWJ
900	900	TBC	TBC	TBC	190	3245	5	PC090020JIC4LM	99CONNECTOR900	RS0900IWJ
900	900	1280	3073	2945	190	4830	5	PC090030JIC4LM	99CONNECTOR900	RS0900IWJ
Other diameters available on request										

Notes:

1. All diameters and lengths are in millimetres.

2. Joint gap not required.

3. Geometry shown is for Class 4 pipe only. Geometry for other classes can be provided on request.

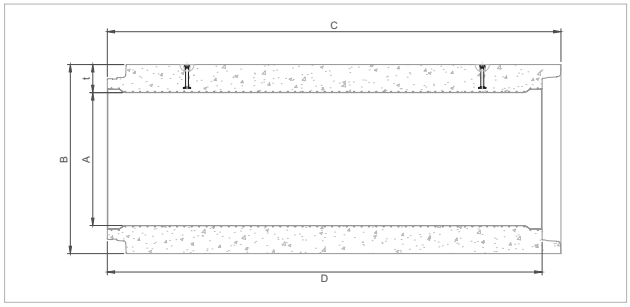


FIG. 10 PERFECT® IWJ Jacking Pipe Geometry

TABLE 4 Class 4 PERFECT® BJ Jacking Pipe Geometry

Nominal Diameter	Barrel Internal Diameter	Barrel External Diameter	Overall Length	Barrel Length	Wall Thickness	Mass (kg)	Swiftlift Clutch Size (Tonnes)	Hynds Product Code	PERFECT® Connector	Rubber Ring Code
-	A	B	C	D	t	-	-	-	-	-
1200	1200	1490	2940	3080	145	4650	5	PC120030JBC4LM	99CONNECTOR1200	RS1200BJ
Other diameters available on request										

Notes:

1. All diameters and lengths are in millimetres.

2. Joint gap not required.

3. Geometry shown is for Class 4 pipe only. Geometry for other classes can be provided on request.

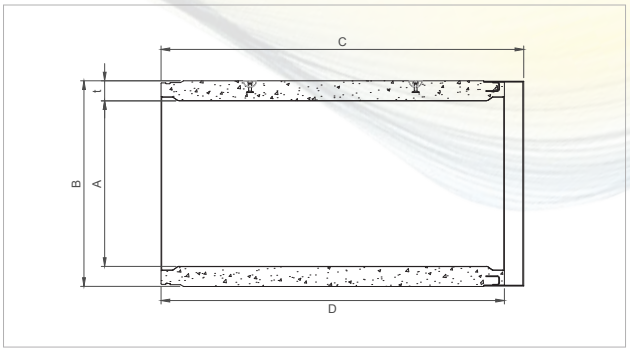


FIG. 11 PERFECT® BJ Jacking Pipe Geometry

Joint Assembly

PERFECT® Pipe is installed using the PERFECT® Connector. The rubber ring is installed as normal on the spigot end of pipe.

Below is an example of a BSJ pipe connection using the PERFECT Connector.

1. Position the PERFECT connector on the end of the receiving pipe and align the next pipe to the connector.

2. Push the next pipe into the connector attached to the receiving pipe.

3. Ensure the pipe is connected evenly all around the joint.

Storage of Pipe

- Some pipes have elliptical steel reinforcing cages. These pipes are marked with the word "TOP" adjacent to the lifting anchors. All pipes marked with "TOP" must be transported and stored with this marking in the 12 o'clock position.
- When storing pipes horizontally ensure pipes are adequately supported to prevent point loading, particular care needs to be taken with BSJ pipes.
- Single layer stacking is recommended, however where pipes are required to be stored in layers it is recommended to have dunnage in between the layers to prevent concrete to concrete contact.
- Rubber rings should be stored in a cool dry place away from oil, grease and direct sunlight.

Storage of Rubber Rings

- The storage temperature should be below 25°C and preferably below 15°C.
- The seals should be protected from light, in particular, strong sunlight and artificial light with a high ultra-violet content.
- The seals should not be stored in a room with any equipment capable of generating ozone, eg. mercury vapour lamps, high voltage electrical equipment, which may give rise to electrical sparks or silent electrical discharges.
- The seals should be stored in a relaxed condition free from tension, compression or other deformation. For instance, they should not be suspended from any part of the circumference.
- The seals should be maintained in a clean condition.

Lifting & Handling

All PERFECT® pipes incorporate Swiftlift lifting anchors for safe lifting and must be used with the correct lifting clutch.

Hynds Pipe Systems has designed and manufactured PERFECT® Concrete Pipes with a minimum dynamic factor of 1.2. This dynamic factor requires that all the following conditions are observed when lifting, moving or placing the pipes:

1. Lifting with mobile plant *(such as an excavator or similar)* where equipment is specifically exempt from the requirements of the PECPR Regulations 1999, subject to the conditions outlined in the New Zealand Gazette, No. 104, September 2015 and
2. Lifting, travelling and placing over rough or uneven ground where anchor failure is not anticipated to cause harm or injury, by adopting procedures such as:
   a. Transporting the element as close as practical to ground level (300mm recommended.)
   b. Establishing and maintaining exclusion zones
   c. Transporting only precast concrete elements that are unlikely to topple if they were to hit the ground
   d. Inspecting lifting anchors both after transportation and before final lifting into place

Refer to "Safe work with precast concrete - Handling, transportation and erection of precast concrete elements" published by Worksafe New Zealand (October 2018)

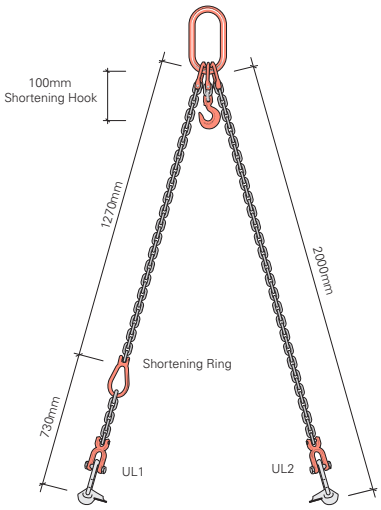
Shock loads resulting from travelling with suspended pipes over rough terrain and uneven ground may exceed design, dynamic and safety factors of the lifting systems. It is essential that care is taken during lifting and transporting as additional stresses could result in anchor failure.

Correct on Site Handling & Jointing of Pipes

The Sling

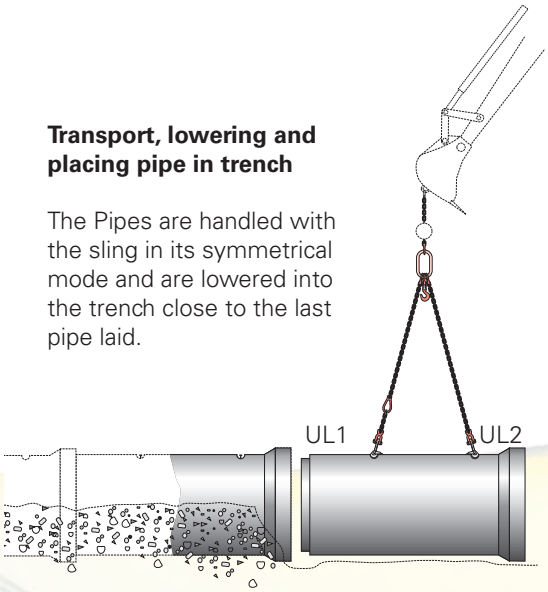
The sling is made up as a two-legged chain sling with two swiftlift lifting clutches and a shortening hook to enable one chain leg to be shortened.

Refer to "Reids Safe Lifting & Propping of Precast/Tiltup Concrete Panels & Pipes" document.



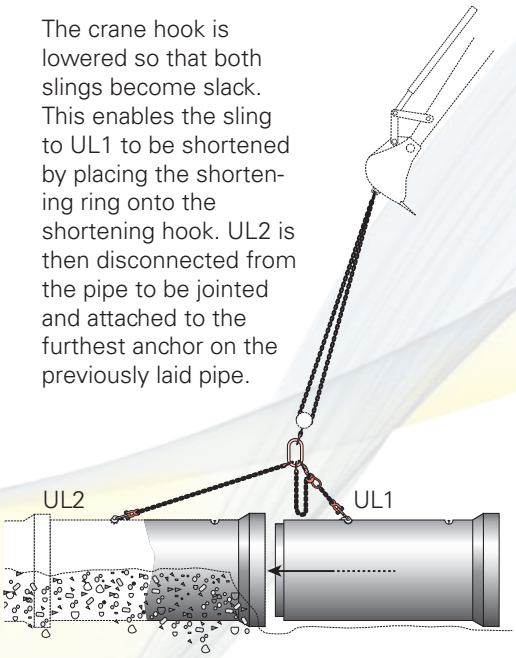
Transport, lowering and placing pipe in trench

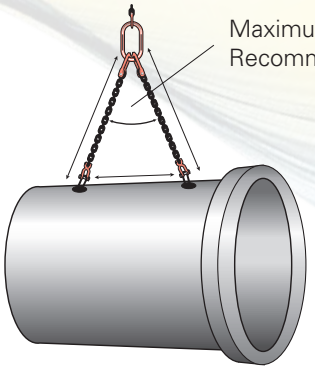
The Pipes are handled with the sling in its symmetrical mode and are lowered into the trench close to the last pipe laid.



Jointing the pipes

The crane hook is lowered so that both slings become slack. This enables the sling to UL1 to be shortened by placing the shortening ring onto the shortening hook. UL2 is then disconnected from the pipe to be jointed and attached to the furthest anchor on the previously laid pipe.



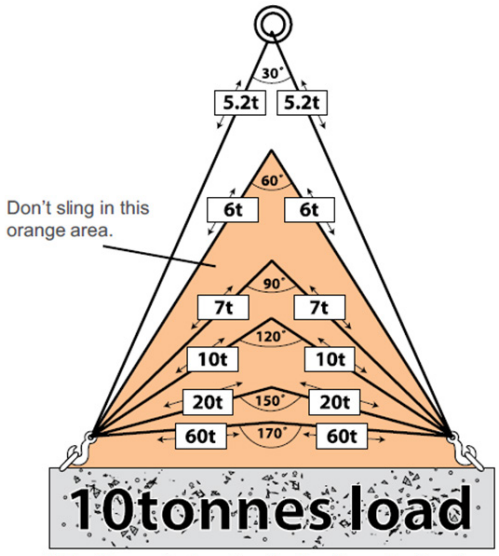


Never make chain length shorter than the distance between two anchors.

Effective Rigging and Sling Angles

The larger the sling angle the higher the load on the chains. For example at an included angle of 170° the load on each sling is six times the weight of the actual load being lifted. Do not put more than the recommended safe working load on equipment. PERFECT® concrete pipes are fitted with Swiftlift™ inserts, thus providing safe lifting when slung in the correct manner. However, care still needs to be taken when lifting the Hynds concrete pipes, especially over uneven surfaces as shock loading may exceed the designed safety factor.

Please note: An insert with a nominal clutch size rating stamped on the head does not necessarily have the same safe working load limit because of the various insert lengths available.



Note: Always aim to make sling length greater than the distance between two anchors.

Pipe Installation

AS/NZS 3725:2007 Design for installation of buried concrete pipes defines pipe installation options and procedures for determining the class of pipe required."PipeClass" is a software package that enables the designer to design a pipeline installation for AS/NZS 3725:2007. This is available free of charge from the Concrete Pipe Association of Australasia (CPAA).

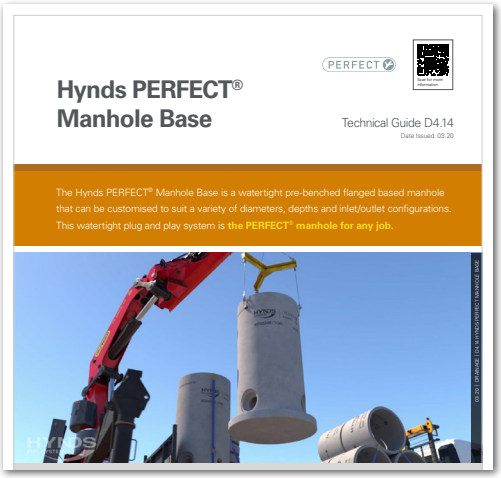
Concrete pipe is generally installed following the steps below:

1. Excavate trench and remove backfill
2. Prepare bed zone
3. Dig recess out of the bed zone for the socket
4. Carefully lift the pipe and apply the rubber ring
5. Carefully place pipe in trench
6. Align the pipe
7. Push the pipe home
8. Place fill into haunch zone
9. Compact fill evenly on each side

More information on installation can be found on the CPAA (Concrete Pipe Association) website under Resources www.cpaa.asn.au

The CPAA provide Installer Training for Laying Concrete Pipe. For training dates and locations please contact your local Hynds Pipe Systems Branch.

Also see



- D1.14 Pinnacle Series Concrete Pipes
- D4.12 Pinnacle Manhole System
- D4.14 Hynds PERFECT Manhole Base
- D4.15 Hynds Pinnacle Manhole Steps
- CPAA Engineering Guideline - Performance Testing of Non-Pressure Concrete Stormwater Pipes
- CPAA Technical Brief - Concrete Pipe in Acid Sulphate Soil Conditions

Branches Nationwide *Support Office & Technical Services 09 274 0316*