

Pinnacle[®] Rubber Ring Joint Box Culvert System

Technical Guide D8.5

Hynds Pinnacle Rubber Ring Joint Box Culvert system uses the innovative Tylox[®] SuperSeal[™] pre-lubricated gasket to simplify the construction process, providing a fast, reliable and cost-effective Rubber Ring Jointed Box Culverts & Box Chamber solution.



11.24 | DRAINAGE | D8.5 PINNACLE® RUBBER RING JOINT BOX CULVERT SYSTEM

Applications

- Pedestrian tunnels
- Stormwater culverts
- Stock Underpass for Rural Highway crossings
- Retention tanks
- Water & Wastewater Storage
- Pump chamber

Product Attributes

- Large range of strengths and opening sizes
- Modular sections for easier delivery, handling and installation
- Pre lubricated Rubber Ring / Gasket
- Ability to add precast items such as Headwalls, Wingwalls, End Wall Panels and Flanged Base
- HDPE Lined options for added Durability and Sealing

Quality

- ISO 9001:2015 Quality Management Standard

Approvals/Standards

- Purpose designed for various load configurations up to HN-HO-72
- NZS 3101, Concrete Structures Standard
- NZS3109, Concrete Construction

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

Hynds Rubber Ring Joint (RRJ) Box Culvert System uses pre-lubricated gasket that offers fast reliable Joint between units providing clients and specifiers a unique solution when specifying and installing Box Culverts and Box Chambers.

This system is also available with an HDPE liner cast onto the internal Culvert walls during manufacturing process adding additional scope and durability to the systems applications.



FIG. 1 Socket end of RRJ Box Culvert with cast in HDPE Liner & End Wall

Design

- Designed for below ground installation
- Purpose designed for various load configurations LD20, HD60 and HN:HO-72
- Options to design to NZS 3106 2006 (but consult with Hynds representative first)
- If there is a requirement for a partially buried tank, this needs to be reviewed on a case-by-case basis. Customer would need to allow engagement of a suitably qualified Consulting Engineer to carry out site foundation design and stability checks that can be supplied to Hynds for incorporation into a design review.

Design Considerations

- It is important to discuss design requirements with Hynds Precast Engineers early in the design phase of the project.

Items for consideration

- Durability requirements
- Direction of traffic travelling over structure
- Depth of fill on top of culvert
- Presence of ground water
- Concrete finish as per NZS3114 F3 is standard
- Alignment of inlet and outlet pipework to match up with standard hole positions

Wingwall Options

Hynds supplies wingwall panels with fixing holes, brackets and dressing sets so that the panels can be fixed to the box culvert. These panels have reinforcing starter bars protruding at the bottom of the panel. The bars are fixed to the base reinforcing mat, and the base is then poured in-situ on site by the contractor. Design of the in-situ apron to support wingwalls and applied loads is the responsibility of the Site / Consulting Engineer.

Headwall Options

Hynds will supply the end units of the conduit structure with suitable headwalls as part of the box culvert unit if requested.

End Walls, Flanged Bases & Lids

Hynds can design & manufacture options to various configuration and design requirements.

Discuss your needs with our Precast Engineers.

Culvert Dimensions

- Hynds Box Culvert Systems are made to order.
- Standard RRJ Box Culvert units are typically available in the sizes as per Table 1. Refer to Hynds for customized sizes outside this designated range

Examples of Rubber Ring Box Culvert uses

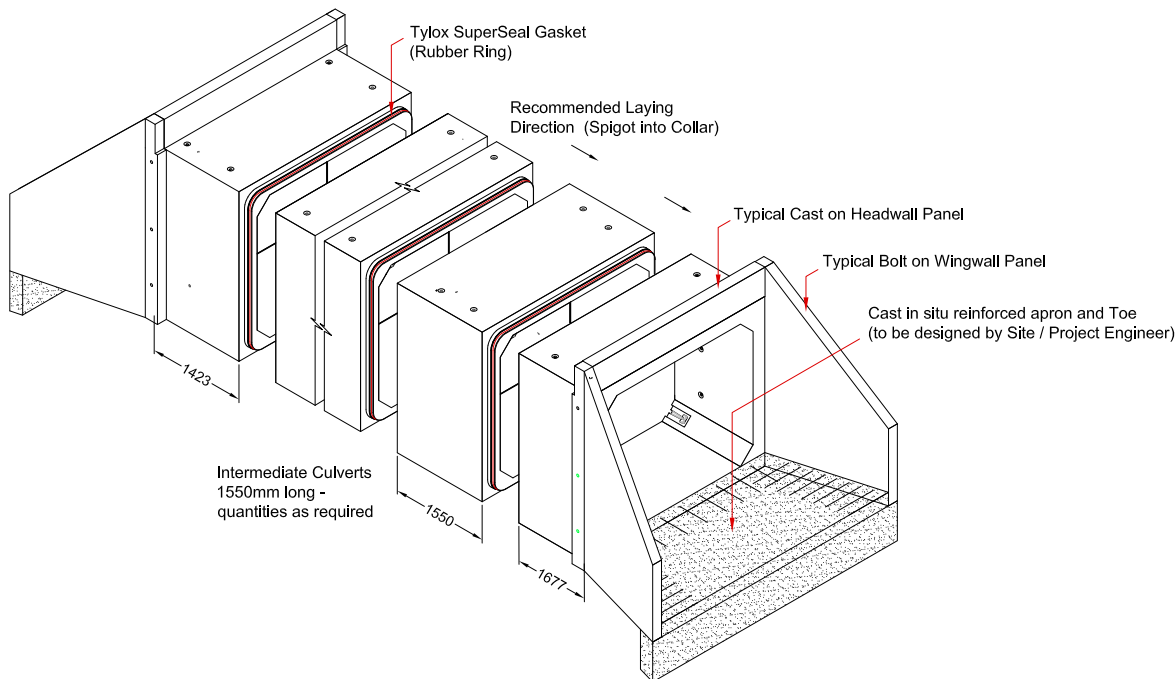


FIG. 2 Tunnel, Underpass & Stormwater Culverts

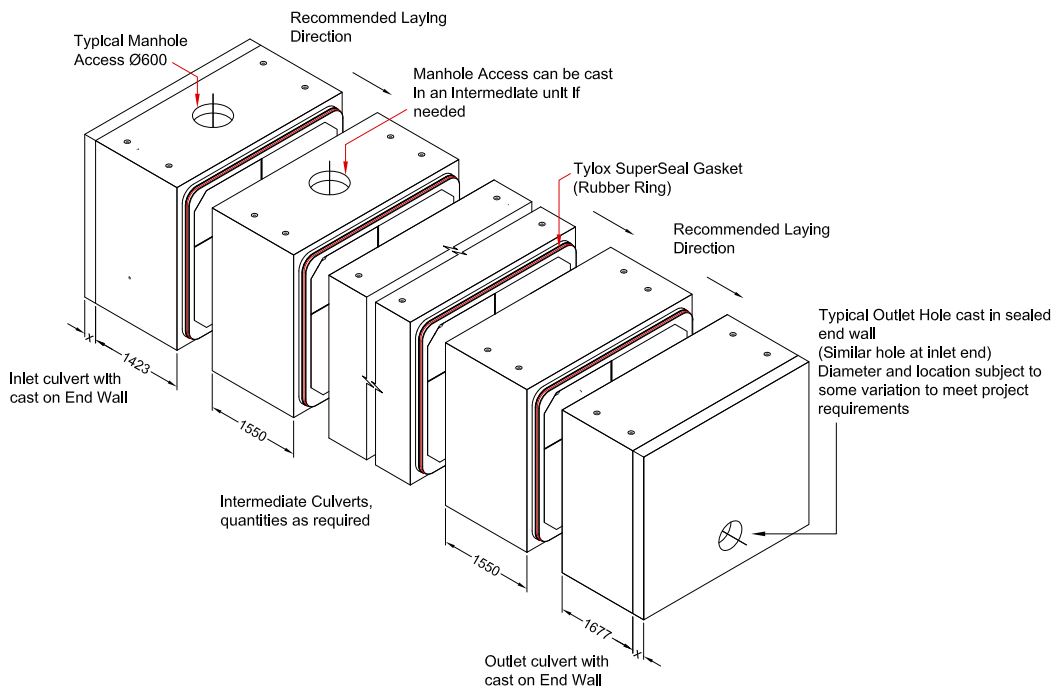


FIG. 3 Storage and Retention Tank

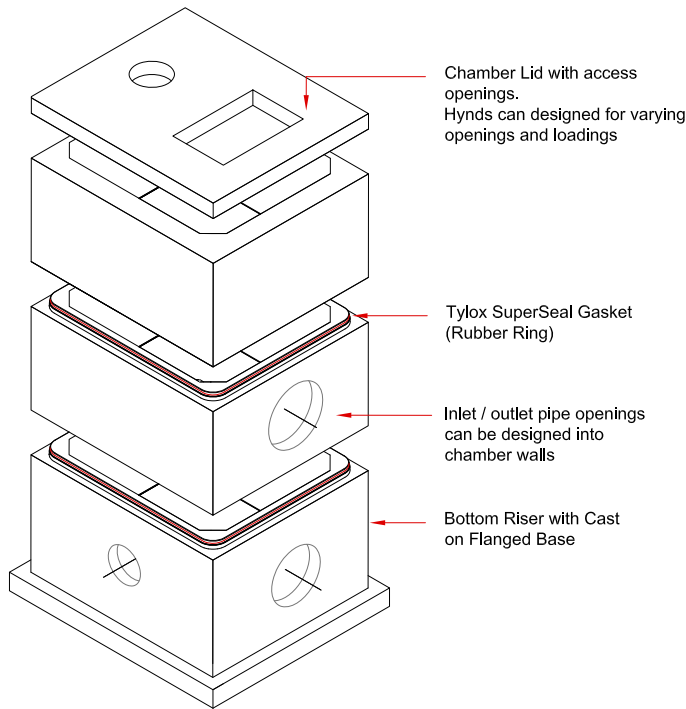


FIG. 4 Pump, Stormwater and Sewer Chambers

Basic Bedding Preparation

For Hynds Rubber Ring Joint Box Culverts a flat well levelled bedding directly under culverts is extremely critical

Uneven bedding will cause jointing issues and could damage the joint.

- Sufficient foundation support and backfill compaction is required to prevent settlement of the imported layers after Box Culvert installation.)
- The bedding must be able to support the full load of the installed culvert, its contents, and the loads above the culvert. For this reason, the box culvert should be laid on compacted granular hardfill to the specified line and gradient as per project specifications.
- Bedding design for box culverts should be undertaken by a local consulting engineer as local knowledge of ground conditions is important to ensure a successful installation. This must provide appropriate bearing capacity with no differential settlement. There is no allowance for differential settlement in the joint design or Dog Bone connection system.
- As a general guide, the compacted thickness of a basic bedding over the full width of the trench can vary between 150 to 250 mm (depending on culvert bearing loads) with compacted layers not exceeding 150 mm thick
- A concrete base may increase friction when pulling Culvert units together, installation methodology needs to be appropriately manage to minimise this effect on the culverts.
- Trench width for most installations should be equal to the external width of the culvert plus 600 mm

- Local soft spots in the trench must be excavated and the voids filled with well compacted hardfill to provide uniform support under the entire structure. This must also provide minimum an allowable bearing capacity.
- Failure to do so could result in differential settlement of the units at a later stage.

TABLE 1 Standard box sizes (other sizes made to order)

Height (mm)	Width (mm)				
	2000	2500	3000	3500	4000
1000	✓	✓	✓	✓	✓
1500	✓	✓	✓	✓	✓
2000	✓	✓	✓	✓	✓
2500		✓	✓	✓	✓
3000			✓	✓	✓

Larger sizes available by request

Alternate sizes are available on request – Standard unit length is 1550 mm. Lengths up to 2.4m available in 2.5m and 3.5m spans

TABLE 2 Gasket Codes

Gasket code	BXC culvert code				
RGSBXC3000	BX2010L1SM	-	-	-	-
RGSBXC3500	BX2015L1SM	BX2510L1SM	-	-	-
RGSBXC4000	BX2020L1SM	BX2515L1SM	BX3010L1SM	-	-
RGSBXC4500	-	BX2520L1SM	BX3015L1SM	BX3510L1SM	-
RGSBXC5000	-	BX2525L1SM	BX3020L1SM	BX3515L1SM	BX4010L1SM
RGSBXC5500	-	-	BX3025L1SM	BX3520L1SM	BX4015L1SM
RGSBXC6000	-	-	BX3030L1SM	BX3525L1SM	BX4020L1SM
RGSBXC6500	-	-	-	BX3530L1SM	BX4025L1SM
RGSBXC7000	-	-	-	-	BX4030L1SM

L1 units (400-1000mm cover) only shown for simplicity
L2 units (1001-2300mm cover) use the same gaskets

Installation

Culvert and wingwall units are delivered to site by our trucks. Culvert installation should be done by an experienced contractor who understands the necessity of jointing, bedding and backfilling the structure properly as well as the highway safety requirements applicable to such an installation.



Handling

- Box culvert units are normally supplied with swiftlift anchors cast into the top of each unit. Appropriately rated chains and lifting beam must be used when handling the units.

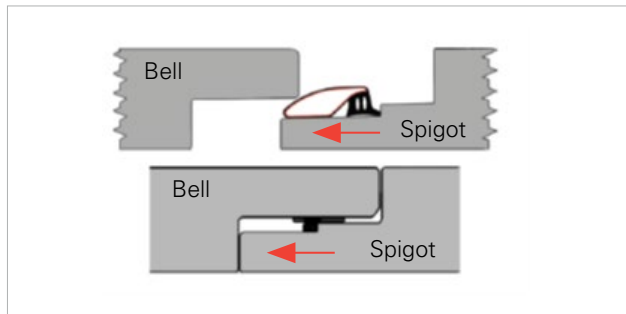


FIG. 5

- Lifting anchor positioning and lifting equipment specifications can be provided on request.

Jointing

- Hynds Pinnacle® Rubber Ring Joint Box Culvert system is manufactured with a collar (Bell) and spigot which together with the Dog Bone connector locates and locks adjacent units together.
- Other jointing arrangements such as ducting for post tensioning, or tie rods are available on request.
- The box culvert spigot centres on the bell due to the forces generated as the tube rolls into the annular space during the homing process (See Fig.5)

General Procedures for Gasket Installation are as below:

- Ensure spigot is free of dirt, debris, cracks, chips, or other defects.
- Stretch gasket around spigot, with nose against step. Ensure gasket splice is placed in middle of bottom span of the joint.
- Equalize the gasket tension around the perimeter of the spigot by pulling the gasket towards all four corners, away from the sides and spans. Roll gasket up onto step of spigot.
- Apply adhesive (*Ados F2 or similar approved*) in a 25mm wide strip of glue next to the step on entire flat portion of bottom span (see Fig.5), and centre part of sides and top for a minimum length of 1/8th of the height or span. e.g. 4000mm span, apply 500mm strip of adhesive.
 - Do not glue corners.
 - Roll gasket back into place while ensuring gasket rolling tube does not touch glue.
- To prevent sagging on bottom span, use a long board and clamp the gasket body to spigot until glue has set. (See Fig.6 & 7)

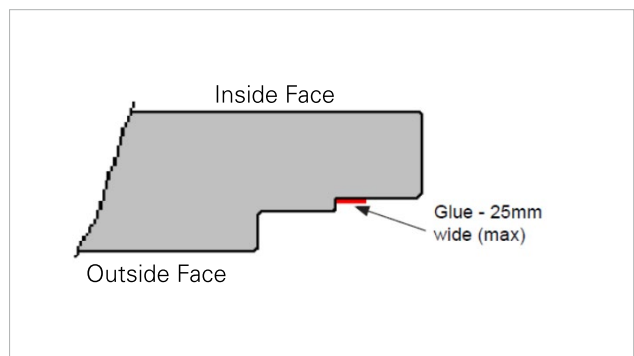


FIG. 6



FIG. 7

Laying

General

- Box culvert units should be inspected before laying to ensure that the jointing surfaces are clean, and gaskets are seated as shown in Installation Step 1 Visual Installation steps
- A box culvert line is laid from the downstream end with the sockets facing upstream to receive the spigot end of the next culvert unit
- Units are lowered carefully onto well prepared levelled base, aligning the spigot with the socket of the unit already laid.
- Loose surface bedding material must not enter the joint space between the units –particularly along the bottom – during positioning of the unit. Ensure gasket is free of contaminants.
- If any adjustment of level is necessary, remove the box culvert, adjust the surface layer of the bedding and place again. Do not use local packers to adjust the level.
- Hynds Box Culverts as standard are manufactured with our exclusive Dog Bone Connector System. Recommended practise is as follow:

Laying Process

1. Place first Downstream box culvert into required position.
2. Using a crane, position the second culvert as close as possible to the previously installed culvert, and whilst being supported by the crane pull the culverts together with levered chain blocks attached to the internal swiftlifts each side of Culvert as shown in Visual Installation Steps, Step 3
Use one set of Levered Chain Blocks attached to swiftlifts on each side of culvert, lever equally to pull culvert into homed position, it is critical to make sure all four sides come together evenly.
Note: DO NOT use the dog-bone connectors or Tie Rods to pull the culverts together
3. As the units are coming together always check gasket is rolling correctly and has not locally “pinched or bulged”. If this has occurred, remove the units and start the process again.
4. The units are designed to have an internal joint gap (minimum 5mm). Do not pull the units together flush, this may damage the joint. Hynds recommends using 7mm shims evenly placed around inside of culvert joint to ensure correct joint gap is achieved
5. Line up two half Dog-Bone connector recesses and place threaded rod connecting set in groove. 1x threaded rod, washers & 2x nuts per recess.
Tighten nuts equally at each end using a socket wrench to Snug Tight.
Do not over tighten, maximum torque, Ø16mm; 100Nm (standard use). Ø20mm; 125Nm & Ø24mm; 150Nm.
6. Grout fill Dog Bone pockets with Fosroc Combextra GP, Sika grout 212 or equivalent epoxy.

- **Visual Installation Steps** for additional information at end of this document.

Dog Bone Connector Jointing System:

Hynds Box Culverts are manufactured with our exclusive Dog Bone Connector System, the ideal solution for tying together culvert sections. This system combined with the pre-installed rubber gasket joint allows a fast and accurate installation.

When required Hynds Box Culverts can be manufactured with a duct in each corner.

The units can then be post tensioned on-site using Reid Bar, Strand, or other similar system.

For this the recommended practise is to insert the tie rods / Strand as the first unit is placed, push or pull through subsequent units as they are installed.

Backfilling

- Backfilling should commence as soon as possible after the box culverts have been laid.
- Fill the trench to the level of the top of the culvert working evenly on each side.
- Use selected backfill material, well compacted in layers not exceeding 200 mm thickness.
- Do not use heavy vibratory equipment.
- Continue to fill the culvert conduit in well compacted layers.
- Do not run heavy rollers or construction equipment over the culvert conduit without checking beforehand that the units are designed to withstand these loads.
- Temporary works checks for construction traffic are not included and should be carried out by the Contractor's Engineers.

Visual Installation Steps:



1. Place first culvert into required position with the down stream end first.



2. Place the next culvert as close as possible to desired position. Maintain weight on the crane. *(Alternative rigging maybe required in some cases).*



3. Connect lever chain blocks to swiftlifts
Use a Shims placed evenly around inside joint of culverts to ensure correct joint gap on inside of culvert (*no less than 5mm*) Joint gap on outside will be larger. Check the outside and above that the gasket has not pinched.

Note: Ensure the correct capacity Lever Chain blocks are used with respect to the weight of the units.



4. Line up two half dog-bone connector recesses. Place threaded rod connecting set in groove. Tighten nuts equally at each end, using a socket wrench to Snug tight condition. Do not exceed maximum torque Grout fill Dog Bone recess pockets.

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The logo for Hynds Pipe Systems features the word "HYNDS" in a large, bold, white sans-serif font. Below it, the words "PIPE SYSTEMS" are written in a smaller, white sans-serif font. A yellow curved line, resembling a stylized pipe or a smile, is positioned at the bottom of the logo.