Hyspec Spun Rubber Ring Joint Concrete Pipes

Technical Guide D1.1

The Hyspec Spun Rubber Ring Joint (RRJ) pipe system can perform in a wide range of New Zealand conditions, making it one of the most versatile pipeline systems available.

Applications

Stormwater and sewer pipelines

High loading installations under highways and deep embankments.

Product Attributes

Strong and durable

Customisable for climate-resilient infrastructure

Rubber ring hydraulic joint

Approvals/Standards

Designed and manufactured to AS/NZS 4058:2007 Precast Concrete Pipes

Routine factory testing ensures compliance with the standard

Rubber rings are manufactured in accordance with AS 1646:2000. Elastomeric Seals for Waterwork Purposes

Sustainability

Available in Hynds LC® low carbon concrete

Verifiable carbon footprint data available

Customisable for climate-resilient infrastructure

Quality/Environment/Health & Safety

ISO 9001:2015, ISO 14001:2015 and ISO 45001:2018

HYNDS PIPE SYSTEMS

The Hyspec Spun Rubber Ring Joint (RRJ) pipe system can perform in a wide range of New Zealand conditions, making it one of the most versatile pipeline systems available.

About Hyspec Spun Concrete Pipe Manufacture

- The thin-walled concrete pipe material has been proven in New Zealand since the 1930's.
- The centrifugal spinning process has the unique advantage of a reduction in the water/cement ratio and a dense concrete pipe without inducing excessive stresses into the reinforcing cage.
- A cement rich paste builds up around the reinforcing cage through the vibration used to place the concrete - ensuring close contact and a very alkaline environment to protect the reinforcing steel.
- The spinning process generates very high uniform and passive compaction forces up to x100 gravitational force.
- The compaction does not cause torsional stress or twist within the reinforcing cage, ensuring close contact between the concrete and reinforcing, thus eliminating voids.
- Hyspec spun pipes are cured inside steel moulds in controlled conditions. This eliminates relaxation stresses within the uncured pipe and ensures the integrity and durability of the pipe structure.

Design Specifications

- Sizes DN225-1800 diameter.
- Standard Hyspec Concrete Pipe is designed to suit a normal environment as defined in AS/NZS 4058:2007
- Marine grade pipe is designed to suit a marine environment as defined in AS/NZS 4058:2007
- Pipes with sacrificial layers or supplementary cementitious materials are also available for aggresive environments that require additional durability. Please contact the Hynds Technical Services department for further details.

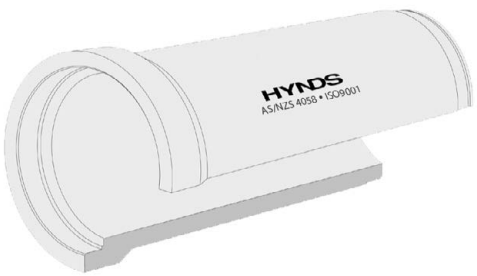

FIG. 1 Schematic elevation/cross section of Hyspec Spun Concrete Rubber Ring Joint Pipe

- Hyspec Spun RRJ Pipes are designed to offer a hydraulic seal throughout the pipeline up to an internal pressure of 60 kPa (6 metre head). The Hyspec joint is designed to allow this seal while maintaining a flexible joint.
- For pressures above this value, Hyspec spun pressure pipes can be specially manufactured.
- Fabricated bends and junctions available.

Strength Classes

- Hyspec Spun RRJ is available in three main strength classes, with Class 2 being the standard load strength and subsequent classes offering increased strength:
  - Class 2 (X) – Yellow marking
  - Class 3 (Y) – Blue marking
  - Class 4 (Z) – Red marking
- Higher class strengths are available for extreme high load conditions.

Availability

- Not all sizes of spun pipe are available in the North Island. Refer to the notes on Table 1.
- Small diameter vertically cast concrete pipe is manufactured in the North Island. Refer to product sheet D1.2 Hynds Hyspec VCT Rubber Ring Joint Concrete Pipes.
- For larger diameters from DN2000 - DN3000 please refer to product sheet D1.4 Hynds Skid Ring Joint Concrete Pipes.

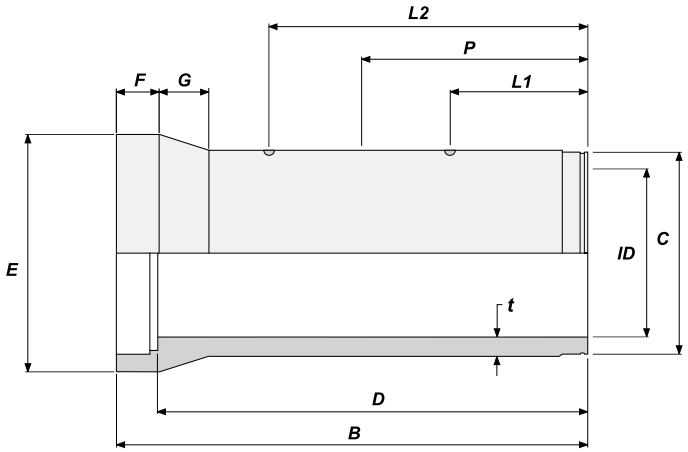

FIG. 2 Pipe dimensions

TABLE 1 Hyspec Spun Rubber Ring Joint Pipe Range

Nominal Pipe Diameter	Ref.	225	300	375	450	525	600	675	750	825	900	1050	1200	1350	1600	1800
Internal Diameter[1]	ID	222	302	380	457	533	610	686	762	838	914	1067	1219	1372	1590	1830
Wall Thickness[1]	t	30	33	32	39	41	45	47	51	53	63	76	76	76	82	88
Weight of Pipe[2] (kg)		124	237	293	431	540	663	779	945	1070	1394	1934	2228	2486	3269	4061
Overall Length	B	1870	2575	2580	2575	2590	2530	2530	2550	2555	2580	2597	2597	2603	2621	2621
Barrel Diameter	C	282	367	444	534	614	699	779	864	944	1039	1218	1371	1524	1753	2005
Barrel Length	D	1800	2495	2495	2490	2500	2435	2435	2432	2428	2440	2430	2430	2430	2428	2426
Nominal Laying Gap	X	5	5	5	5	5	5	5	8	8	8	10	10	10	12	12
Effective Length[3]		1805	2500	2500	2495	2505	2440	2440	2440	2436	2448	2440	2440	2440	2440	2438
Collar Diameter	E	370	450	540	640	730	820	910	1000	1085	1200	1390	1543	1695	1989	2255
Collar Length	F	70	77	80	115	135	135	135	145	145	170	170	170	170	195	200
Bell Length	G	90	90	95	115	135	135	135	155	145	150	150	150	150	200	250
Point of Balance	P	1325	1325	1335	1340	1360	1325	1330	–	–	–	–	–	–	–	–
Lifting Anchor Position 1	L1	–	–	–	–	–	700	700	700	700	700	700	700	800	800	800
Lifting Anchor Position 2	L2	–	–	–	–	–	1900	1900	1900	1900	1900	1900	1900	2000	2000	2000
Swiftlift Lifting Clutch		–	–	–	–	–	1.3	1.3	1.3	1.3	1.3	2.5	2.5	2.5	2.5	5.0

Note:

1. *Internal diameter and wall thickness values given are for Class 2. Dimensions rounded up to nearest whole number.*
2. *Weights in kg are based on a spun concrete density of 2550 kg/m³.*
3. *Effective length values given include nominal laying gap.* All dimensions are in mm. Refer Fig. 3 & Fig.4

- *For short length spun pipes, refer to Hynds Product Sheet D1.9 Hyspec Spun Rubber Ring Joint (RRJ) Shorts.*
- *Pipe dimensions vary according to the factory of production hence some stated dimensions are averaged. Exact dimensional information is available from the Hynds Technical Services Department.*
- *225 – 600 Ø available in South Island only. For North Island supply please refer to D1.2 VCT Concrete Pipe Product Sheet*
- *675 - 1800 Ø available nationwide.*
- *225 Ø is only available in Class 4.*

Installation

- Refer to AS/NZS 3725 Design for installation of buried concrete pipe, for details on calculation of vertical working loads, and pipe installation options and procedures.
- Small variations occur within the internal diameter of spun concrete pipe. Place the laser level in the collar rather than the pipe barrel to reduce any affects.
- Joint gaps between the pipes ensure that the pipes are able to deflect without damage. Nominal joint gaps are detailed in Table 1.
- Where the pipe is to be deflected, it is essential that the joint gap is reduced to a minimum before the pipe is deflected within the recommended limits.
- All vertical and horizontal deflections should be within the recommended range. Refer to Table 2.

TABLE 2 Hyspec Spun Rubber Ring Joint Pipe Performance Chart

	Hyspec Spun Pipe Diameter	225	300	375	450	525	600	675	750	825	900	1050	1200	1350	1600	1800
Recommended	Offset (mm)	45	35	30	25	25	22	20	20	20	20	20	20	20	18	15
	Offset (Degrees)	1.19	0.92	0.76	0.64	0.57	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.47	0.4
	Centreline Radius (m)	120	155	189	220	220	245	274	274	274	274	274	274	274	290	340
Maximum	Offset (mm)	90	70	60	50	50	44	40	40	40	40	40	40	40	36	30
	Offset (Degrees)	2.4	2.0	1.5	1.3	1.3	1.1	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.9	0.8
	Centreline Radius (m)	60	70	94	110	110	122	137	137	137	137	137	137	137	145	170

Notes:

- *Assuming that pipes are installed with the nominal laying gap given in Table 1, the allowable deflections are defined by the amount of concrete to concrete overlap remaining after the tabulated offset. Refer to figures 2 and 4.*
- *The recommended offset uses 50% of the initial joint overlap. This allows a safety factor for further draw while in service.*
- *The maximum offset uses 100% of the initial joint overlap. Maximum deflected or undeflected joint gap approx 2–2.5 x nominal gap.*
- *Offsets greater than those tabulated may be achieved with negative overlaps, but these will fall outside the joint philosophy described. In particular, radial shear protection is reduced.*

Joint Configuration

- The sealing performance of the Hyspec Spun RRJ pipe joint permits a flexible pipeline with hydraulic integrity.
- There are a wide range of ever changing ground conditions which, when combined with superimposed loads, can cause original pipeline alignment to alter significantly:
  - Changes in the character of the bedding and compaction conditions may cause differential settlement and movement in any buried pipeline.
  - Movement between pipes can also occur from traffic and construction loads, backfilling, marine conditions or inadequate bearing capacity.
- To maintain the desired pipeline performance, the Hyspec spun pipe joint utilises a rolling "O" ring seal to meet the necessary flexure characteristics. This ring is capable of exerting a minimum of 200 kPa seal pressure.
- The joint system has been designed to allow:
  - Angular rotation of adjacent pipe lengths to accommodate axial bending;
  - Telescopic action of adjacent pipe lengths to accommodate a maximum axial movement (joint draw) of twice the nominal laying gap.
  - Resistance against excessive radial shear which could lead to seal failure and possible root penetration.
- For values of offset angles and deflections corresponding to each pipe size, refer to Table 2.
- The recommended angular rotation of a pipe is the amount of joint deflection which is accommodated within half of the concrete to concrete overlap "Y" (refer to Figure 4).
- The maximum angular rotation of a pipe is the amount of joint deflection when the concrete to concrete overlap is zero.
- These deflection conditions assume that each individual pipe is jointed with the correct overlay gap "Y" (refer to Figure 4) and then deflected horizontally by the tabulated amount detailed in Table 2.

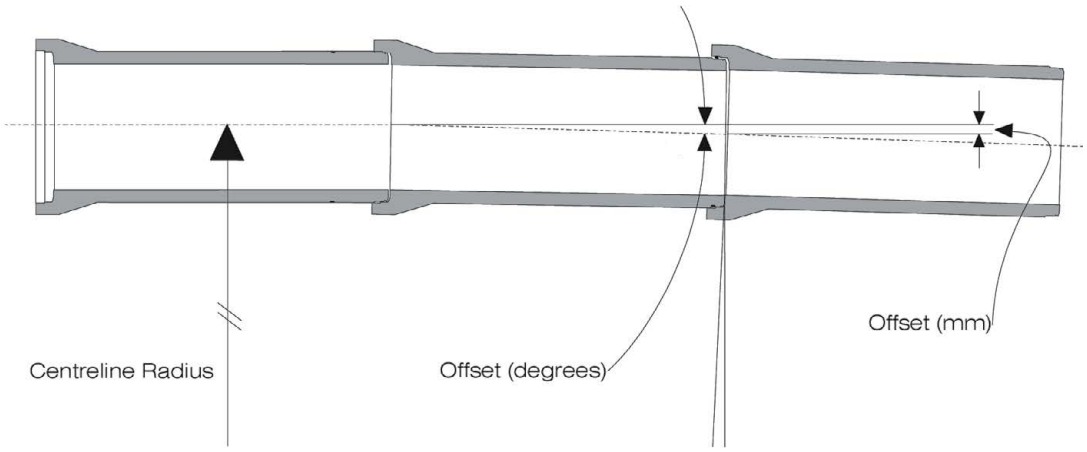

FIG. 3 Hyspec spun pipe joint flexure.

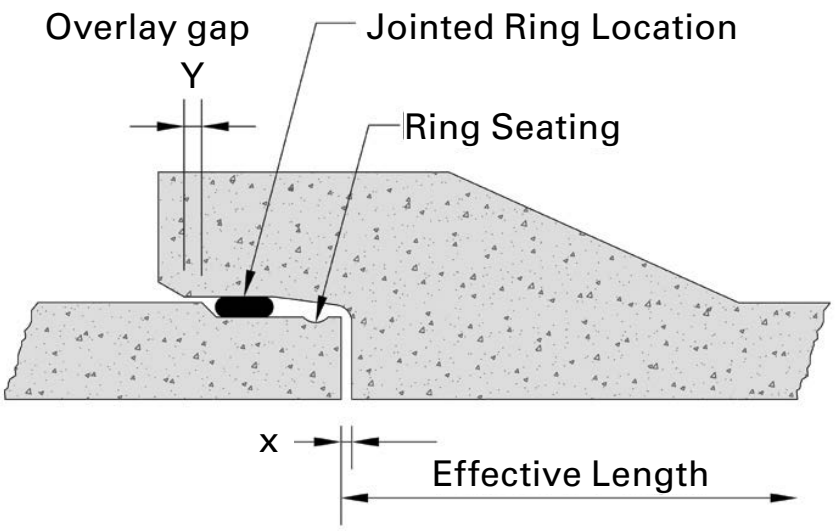

FIG. 4 Section through Hyspec rolling ring joint. Non flexure condition.

Lifting & Handling

- Hyspec Spun RRJ pipes are manufactured in convenient lengths to allow efficient delivery and off-loading on site.
- Hyspec Spun RRJ pipes have elliptical reinforcing cages and lifting anchors installed for pipes of 600 mm diameter and greater. These pipes are marked with the word "TOP" adjacent to the lifting anchors.
- All Hyspec Spun RRJ Pipes marked with "TOP" must be transported and stored with this marking in the 12 o'clock position.
- Appropriate lifting equipment and methods must be used to ensure that individual anchors are not overloaded.

All Hynds Hyspec Spun RRJ pipes incorporate feature certified concrete lifting anchor systems, designed and tested to guarantee safe and secure handling.

Hynds Pipe Systems has designed and manufactured Hynds Hyspec Spun RRJ 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
3. All Hynds concrete lifting anchor systems are engineered in accordance with Haeussler specifications, ensuring full compatibility with Reid, Deha, CLS, and Ancon lifting clutches, as well as recess formers, across corresponding load ranges.

- 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 Hyspec Spun RRJ 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.

Note: *Lifting anchors are designed for lifting the pipes using an excavator arm or similar. They are not designed for dynamic loads arising from transportation of the pipes over uneven ground while the load is suspended.*

Branches Nationwide *Support Office & Technical Services 0800 93 7473*

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