

STORMWATER

Stormwater Pipes

Rocla® RRJ Pipes

Rocla® rubber ring joint (RRJ) pipes provide a flexible and watertight seal that allows for ground movement after installation.

RRJ pipes are manufactured with a wide range of diameters and jointing systems. Pipes are generally available in strength classes 2, 3 and 4. Higher class pipes up to class 12 are available on order.

Pipes have an effective laying length of 2.44m.

Design Software

PipeClass software (available from the Rocla website) allows selection of the appropriate class of pipe for a given installation, based on AS4058 and AS3725. It takes into account installation and bedding conditions, in-service live loads (including AS5100 loads) and includes an extensive library of construction loads.

Aggressive Environments

The information given relates to applications in normal ground conditions. Some aggressive soils and marine environments may need to be assessed for additional protection (see AS4058, Appendix E).

Hydraulic Design

The CPAA publication "Hydraulics of Precast Conduits" (available from the Rocla website) assists designers with the hydraulic design of concrete pipes and box culverts.

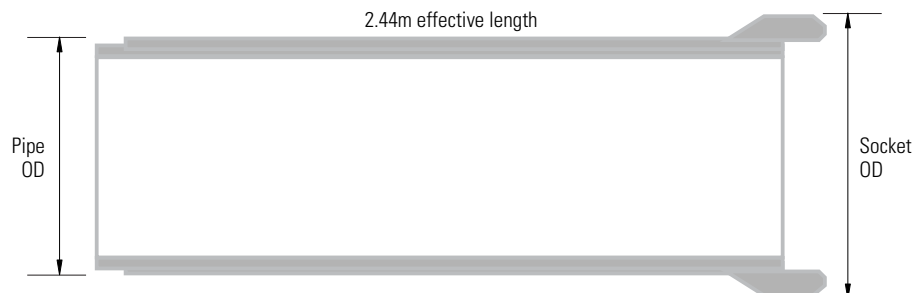
Rocla® RRJ Pipe - Standard dimensions

Internal Diameter (mm)

Nom. ID (mm)	Pipe OD (mm)	Socket OD (mm)	Socket Depth ¹ (mm)	Deflection ² (deg)	Radius ² (m)	Class 2	Class 3	Class 4
225	287	375	68 (102)	2.2 (3.9)	64 (36)	229	229	229
300	363	451	68 (114)	1.6 (3.8)	89 (36)	305	305	293
375	445	543	72 (127)	1.3 (3.4)	107 (41)	381	369	369
450	538	647	90 (127)	1.5 (2.9)	94 (49)	457	457	445
525	621	736	90 (121)	1.1 (2.3)	128 (61)	533	533	519
600	702	831	94 (140)	0.4 (2.4)	325 (58)	610	596	596
675	789	926	96 (140)	0.5 (2.1)	279 (67)	686	674	674
750	870	1017	100 (140)	0.7 (1.8)	199 (77)	762	750	750
825	946	1086	140	1.6	86	838	826	818
900	1043	1194	140	1.4	98	914	914	902
1050	1194	1353	162	1.5	95	1067	1049	1029
1200	1365	1543	168	1.4	103	1219	1199	1175
1350	1524	1708	175	1.2	121	1372	1340	1314
1500	1689	1886	191	1.1	126	1524	1494	1462
1650	1854	2064	191	1.0	145	1676	1638	1606
1800	2019	2242	191	0.8	166	1829	1791	1753
1950	2210	2360	150	0.5	279	1980	1936	1900
2100	2400	2550	150	0.3	437	2160	2134	2096
2250	2579	2705	159	0.5	279	2299	2299	2239
2550	2810	2985	159	0.4	350	2553	2487	2457
3000 ⁴	3310	3310	145	0.2	700	3000	-	-

Notes:

- Numbers in parentheses refer to Rocla® "long joint" pipe sockets. Long joints must be specified at time of ordering.
- Recommended permissible deflection and pipeline radius, allowing for reasonable laying and settlement errors.
- Pipes 1950mm diameter and above use sliding rubber ring joints. Contact Rocla for details.
- 3000mm diameter pipe utilises an in-wall rubber ring joint that provides a flush barrel over the entire length.



Identifying Marks

- White = Class 2
- Red = Class 3
- Yellow = Class 4
- Green = Class 5 or higher
- Blue = Special Pipe

Stormwater Pipes

Joining RRJ Pipes

Rocla® RRJ drainage pipes are provided with two standard types of elastomeric seals: rolling and sliding rubber rings.

Rolling Ring Joint

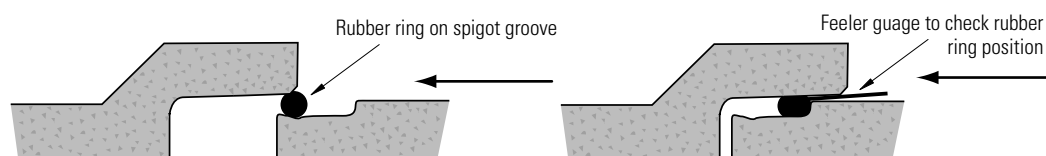
Pipes from 225mm to 1800mm diameter are supplied with a simple rolling rubber ring which is free to roll along the spigot surface as the joint is made.

Sliding Ring Joint

Larger diameter pipes utilise a sliding ring joint where the rubber ring is restrained in a groove formed on the pipe spigot. The joint is made by the socket surface sliding over the rubber ring, which is not free to roll. It is essential to apply a lubricant (available from Rocla) to the pipe socket before attempting to make the joint. Detailed instructions on sliding ring joints are available from Rocla.

RRJ Pipes - Installing a Rubber Ring

Spigots, sockets and rings must be clean and dry. The rubber ring is stretched evenly and located in the groove at the end of the spigot. It must be free of twists (rolling the ring along the spigot rebate helps to remove twists). The pipe is then aligned carefully so that the rubber ring touches the socket all the way around. The joint is made by pushing or pulling the pipe home. If the line is to be curved, the joint must be fully home before the pipe is aligned.



Rolling Rubber Ring Guidelines

- Keep rings in a secure, clean environment.
- Keep rings under cover if not being used within 72 hours of delivery.
- Only use rings provided by Rocla for the purchased pipe.
Other types of ring may be too large, making jointing difficult, or too small to effect a seal.
- Do not apply lubricant when using rolling rubber rings.
- Remove any dirt, dust or foreign matter from the spigot and socket before fitting the ring.
- Proper jointing cannot be made in a wet trench. Dewater the trench.
- Begin the joint by ensuring the ring is sitting in the groove on the spigot.
- Align pipes so the ring touches the socket all the way around, then push the pipe home.

Contact Rocla for advice and a demonstration.

Fitting a sliding rubber ring

Only large diameter pipes (1950mm and above) utilise sliding rubber ring joints. Jointing is simple if the correct technique is applied. Call Rocla for detailed instructions to ensure trouble-free installation of sliding rubber ring jointed pipes.

Stormwater Pipes

Flush Joint Drainage Pipes

Rocla® flush joint (interlocking) concrete pipes are ideal for installations where some infiltration or exfiltration of groundwater is of no concern. They are best suited to installations where excessive movement is not expected.

Flush joint drainage pipes are an economical option, particularly in installations that require a high level of compaction or the use of self-compacting embedment and trench material. The resulting soil pipe envelope is extremely stable, preventing pipe movement and surface subsidence. Unless the line were operating under pressure, rubber ring joints would not be required.

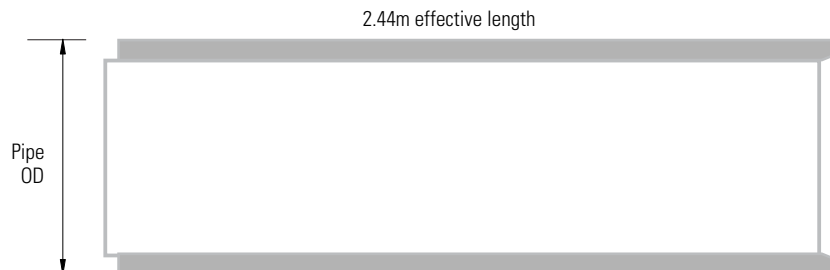
Hydraulic Design

The CPAA publication "Hydraulics of Precast Conduits" (available from the Rocla website) assists designers with the hydraulic design of concrete pipes and box culverts.

Flush Joint Pipes - Standard dimensions

Nom. ID (mm)	Pipe OD (mm)	Max. Internal Diameter.		
		Class 2	Class 3	Class 4
225	279	229	229	229
300	362	304	304	292
375	445	381	369	369
450	533	457	457	445
525	616	534	534	520
600	699	611	597	597
675	787	685	673	673
750	870	762	750	750
825	946	838	826	818
900	1029	915	901	889
1050	1194	1066	1048	1028
1200	1359	1219	1193	1169
1350	1524	1372	1340	1314
1500	1689	1523	1493	1461
1650	1854	1676	1638	1606
1800	2019	1829	1791	1753
1950	2184	1980	1936	1900
2100	2336	2132	2066	2036
2250	2578	2330	2290	2250
2400	2660	2400	2360	2320
2700	2980	2700	2650	2600
3000	3310	3000	–	–

Notes: Dimensions are indicative only.



Stormwater Pipes

Joining Flush Joint Pipes

Flush joint pipes have an interlocking joint to ensure ease of alignment of the pipeline. The annular space in the joint is filled with mortar to prevent ingress of backfill material. Alternatively, a sandband joint can be used.

Mortar joints

In making mortar joints, the annular space provided must be well filled. A generous shoulder should be applied, the inside of the pipe wiped smooth and the freshly made joint should be protected from movement and too-rapid drying.

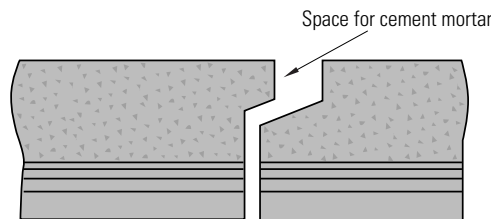
Sandband for flush joints

Sandbands are purpose-designed to prevent infiltration of soil particles. They are manufactured from natural rubber to prescribed hardness and dimensions.

Sandband sizes

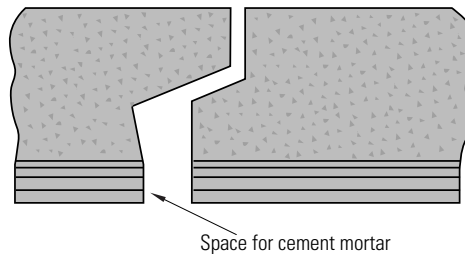
Use 145mm-wide sandbands on pipes from 225mm to 1050mm diameter. Use 225mm-wide sandbands on pipes 1200mm diameter or larger.

Flush Joint Pipes - Mortar joint



External flush joint

For pipes up to 525mm diameter

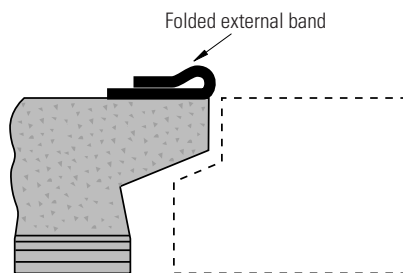


Internal flush joint

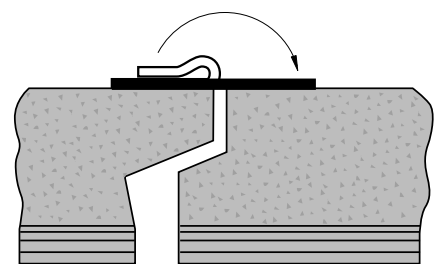
For pipes 600mm diameter and larger

Flush Joint Pipes - Sandband joint

As with rolling rubber ring joints, the rubber bands should be kept free of contaminants and stored under cover to protect them from ultraviolet damage. Fit half the width of the band over the end of the pipe and fold back the other half. Line up the other pipe. Push the joint home and "flip" the folded band over the joint.



Step 1 Fit half of the width of the band over the end of the pipe and fold back the remaining half



Step 2 Line up the other pipe. Home the joint and simply 'flip' the folded band over the joint



Stormwater Pipes

Jacking Pipe

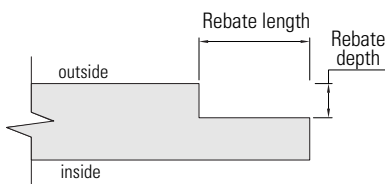
Rocla manufactures a range of steel-reinforced concrete jacking pipes for installations where conventional excavation and backfill methods are not feasible.

The most common jacking pipe is the standard butt joint jacking pipe. Steel bands, fabricated from mild steel or nominated material, can be provided. Packers made of plywood act as a cushion between the pipe sections, preventing localized stress concentrations and ensuring uniform distribution of the jacking force around the periphery of the pipe.

Steel bands and packers are generally supplied by the contractor.

If the outside of the pipe is to be coated with a lubricant, such as bentonite, to reduce frictional resistance, special "bentonite holes" can be provided in the walls of jacking pipes to pump the bentonite into the external space.

Jacking pipes can also be provided with rubber ring joints and cast-in steel guide bands.



Jacking Pipe Joint Rebate

The maximum jacking force in the table refers to the maximum allowable force to be applied to the pipe during jacking operations and is unrelated to pipe class. This force is used to determine maximum jacking distance and must be checked against specific soil and project conditions to ensure it is appropriate.

Butt Joint Jacking Pipe – General details

Nominal Size (mm)	Pipe ID Class 4 (mm)	Pipe OD (mm)	Butt Joint End Rebates		Steel Joint Band Size			Maximum Jacking Force (tonne)
			Length (mm)	Depth (mm)	Width (mm)	Thickness (mm)	ID (-0/+2) (mm)	
225	229	279	75	6	130	5	271	20
300	292	362	75	6	130	5	354	45
375	369	445	75	6	130	5	437	60
450	445	533	75	6	130	5	525	85
525	520	616	75	6	130	5	608	110
600	597	699	75	10	130	5	683	125
675	673	787	75	10	130	5	771	160
750	750	870	75	10	130	5	854	190
825	818	946	75	10	130	5	930	225
900	889	1029	90	10	150	6	1013	270
1050	1028	1194	90	10	150	6	1178	385
1200	1169	1359	90	10	150	6	1343	510
1350	1314	1524	90	10	150	6	1508	640
1500	1461	1689	90	12	150	8	1671	765
1650	1606	1854	90	12	150	8	1836	920
1800	1753	2019	90	12	150	8	2001	1090
1950	1900	2184	90	12	150	8	2166	1270
2100	2036	2336	90	12	150	8	2318	1440



Stormwater Pipes

Splay Pipes

Flush joint pipes can be manufactured with an angle at one end (single splay end) or both ends (double splay ends). Double splay ends are preferred because of their symmetry and ease of laying.



Splay Pipes – Ordering

Splay ends are manufactured to order and are generally only available on flush joint pipes. The maximum splay angle at each end is 5 degrees. Minimum information required when ordering splayed pipes is:

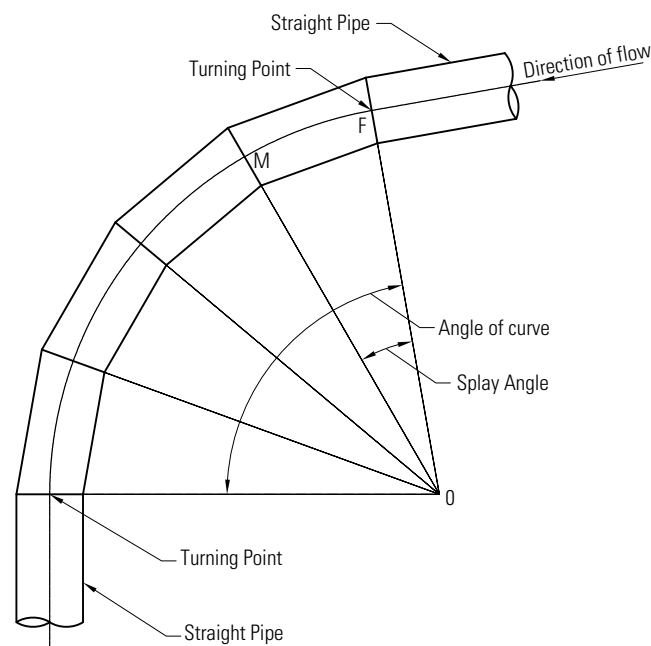
- Diameter of pipe
- Class of pipe
- Radius of curve
- Angle of curve (intersection angle)
- Length of arc
- Splay direction

Splay Pipes – Installation

The curve of the pipeline in the upstream direction also determines the splay direction. The drawing below depicts a right-hand splayed pipeline.

To ensure the splay pipes fit the curved section of the pipeline exactly, it is essential that the first splay pipe be installed with one end at the very start of the curve (the turning point).

Advice on laying out and installing single ended splays can be obtained from Rocla.



Typical Double Splay Pipe Arrangement

Stormwater Pipes

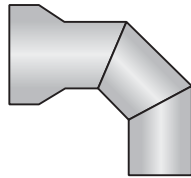
Pipeline Fittings

Junctions, bends, tees, splays, reducers and other fittings can be manufactured from standard steel-reinforced concrete pipe sections and therefore share the same properties as the pipeline.

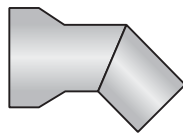
Other types of fittings, as well as fittings for larger diameter pipes, can be manufactured on request.



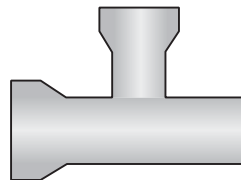
Large diameter bend



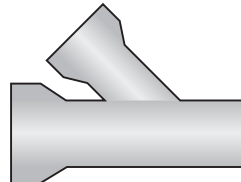
Double mitre 90-degree bend



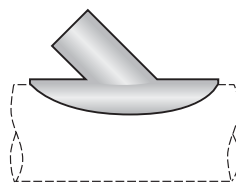
Single mitre 45-degree bend



Square junction



Slope junction



Saddle slope junction

Concrete mainline inlet for PVC branch.
Saddle is fixed over prepared entry position using epoxy resin.
Contact Rocla for details.



Single Mitre Bend



Double Mitre Bend



Slope Junction

Stormwater Pipes

Handling and Installation

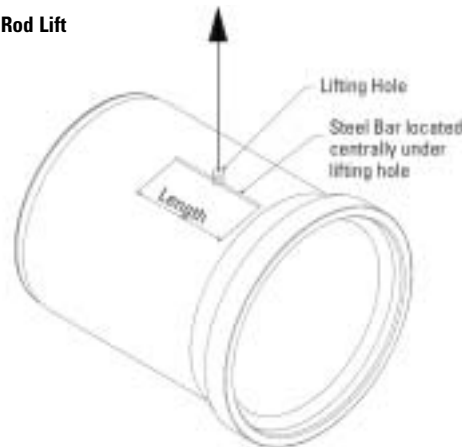
Installation should be carried out to the project specification. Refer to AS3725 Loads on buried concrete pipes, or contact Rocla for advice on appropriate embedment specifications.

PipeClass software (available from the Rocla website) includes bedding specification details based on AS3725 which can be printed in PDF format or downloaded in RTF format for inclusion in project specifications.

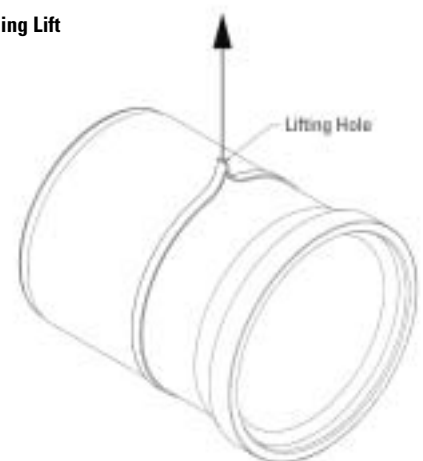
Handling and Installation Guidelines

- Unless specifically requested at the time of order, Rocla® drainage pipes are supplied with a bung hole for handling. Drainage pipes are not meant to operate as pressure pipes; therefore, the inclusion of bung holes in even rubber ring joint pipes will not affect performance.
- Elliptical reinforcement cages are generally used to provide economical and practical reinforcement at locations of greatest tensile stress. It is essential that pipes are installed in the correct orientation, with the bung hole positioned at the obvert of the pipe. Elliptically reinforced pipes are marked with the word "Top" to assist in pipe orientation.
- Care should be taken when handling pipes on site and during installation. Rocla® steel reinforced concrete pipe has great inherent strength but, like any material, is subject to impact damage.
- Ensure pipes cannot accidentally roll while being stored on site.
- Ensure safe working load of all lifting gear is adequate.
- Check that joints are clean and free of debris

Rod Lift



Sling Lift



Pipe Lifting Guidelines

Where a lifting hole is provided, use an approved pipe lifting bar of suitable safe working load to lift the pipe. Where specialist lifting equipment is not available, the following is recommended.

Steel lifting bar should comply with AS/NZ4671 (Grade D500N). Bar should extend an equal distance either side of the hole and its full length should remain in contact with the soffit of the pipe during lifting.

Where lifting holes are not provided, pipes should be lifted using a belly sling located to ensure the pipe remains horizontal during lifting.

Pipe Diameter (mm)	Bar Length (mm)	Bar Diameter (mm)
225-525	400	16
675-750	500	20
825-1500	750	24
1650-1800	1000	24
1950-2500	1250	32
2700-3000	1500	32

Irrigation/Pressure Pipes

Rocla® Pressure Pipe

Rocla® pressure pipes are designed to provide a watertight seal under internal pressure and are ideal for irrigation pipelines. Pipes and fittings are available in a range of diameters from 225mm to 1800mm and all joints are sealed with rubber rings to ensure a watertight seal.

A range of fittings is available to suit irrigation applications. Material choice is dependent on specified test pressure. Call Rocla for details.

Testing

Where pressure pipes are specified, Rocla policy is to hydrostatically pressure-test every pipe to the pressure nominated for the project.

Field testing should only be carried out to verify that the pipes have been properly jointed during installation. Further information is as available from the CPAA publication "Field Testing of Concrete Pipelines and Joints" (available from the Rocla website).

Pressure Pipe – General details

Nom. ID	Pipe OD	Socket OD	Permissible Joint Deflection	Radius of Permissible Deflection*	Test Pressure (kPa)								
					90	200	300	400	500	600	750	1000	
					Working Pressure (kPa)								
(mm)	(mm)	(mm)	(deg)	(m)	75	165	250	330	400	500	625	800	
225	287	375	2.17	65									
300	363	451	2.42	58									
375	445	540	2.28	61									
450	533	641	1.93	72									
525	615	730	1.50	93									
600	698	826	1.69	83									
675	787	921	1.44	97									
750	870	1016	1.26	111									
825	946	1086	1.11	126									
900	1042	1194	1.01	115									
1050	1195	1353	1.07	131									
1200	1365	1543	1.01	139									
1350	1524	1708	0.85	165									
1500	1690	1886	0.82	170									
1650	1854	2064	0.70	199									
1800	2019	2242	0.64	232									

- Standard Design
- Special Design, ID supplied on request

- Notes:*
- Pressure pipes have no lifting hole.
 - Test pressure is hydrostatic pressure to which pipes are factory tested in accordance with AS4058.
 - Test pressure is derived by applying a factor of 1.2 to the working pressure as defined in AS4058.
 - For gravity irrigation lines the lengths and velocities are generally small and the likelihood of water-hammer is remote. The required working pressure capacity may be taken as the static head.
 - For gravity pumped lines the required working pressure capacity is the static head plus pipe friction plus fitting losses plus water-hammer, if applicable. When no better values are available, water-hammer may be estimated at 1.3 times the static head plus friction head.
 - For other issues such as thrust blocks refer to the "Hydraulic Design Manual" published by the CPAA.

