KURIMOTO

Seismic Resilient Ductile Iron Pipe

Technical Guide W1.8

SRDIP joint has many seismic resilient features
Compression, Extension, Angular Deflection and Joint Separation Prevention.

Applications

- Active Fault Line Crossings.
- Liquefaction Prone Ground and Subsidence.
- Soft weak ground.
- Pipelines crossing bridge abutments.
- Water and waste water pipelines.
- Pipelines connected to critical service supply hubs: Hospitals, Civil Defence headquarters, Government Buildings etc.

Standards

- JIS G 5526: Ductile iron pipes.
- JIS G 5527: Ductile iron fittings.
- JIS G 5528: Epoxy-powder coating for interior of ductile iron pipes and fittings.
- JWWA G 112: Epoxy-powder coating for interior of ductile iron pipes and fittings for water supply.
- JWWA G 113: Ductile iron pipes for water supply
- JWWA G 114 : Ductile Iron fittings for water supply
- ISO 16134 Earthquake and Subsidence Resistant design of ductile iron pipelines - Table 2 Classification of pipeline components
- Flange drillings to AS4087 for water Works Purposes (PCD only) available upon special order request

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

HYNDSwater

SRDIP rubber ring jointed pipeline systems can perform in a wide range of New Zealand ground conditions. The joint design has been proven worldwide when installed in high risk seismically active locations including in Japan.

Seismic Resilience

- Proven to be damage free after natural disasters.
- SRDIP has many seismic resilient features - extension, contraction and joint separation prevention.
- 6-8 degrees angular deflection during an event.

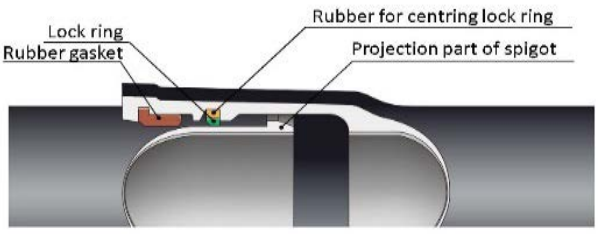
Corrosion Resilience

- Lower life cycle cost.
- The special external coating can provide a minimum of 100-year life expectancy without PE sleeving installed (Design Conditions Apply – Refer to the guidelines provided within AWWA C105 – 10 Polyethylene encasement for Ductile Iron Pipe systems).

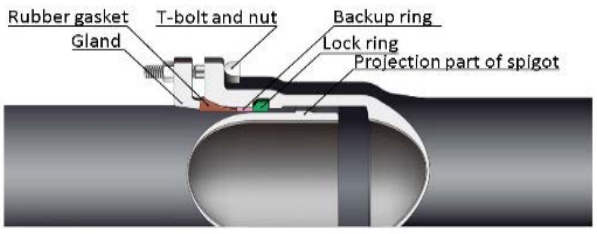
Improved Productivity

- Increased productivity and reduced construction failures.
- SRDIP eliminates any need for installation of concrete anchor thrust blocks.

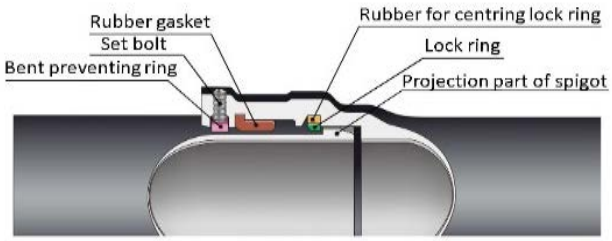
Type NS Pipe (DN75-450)



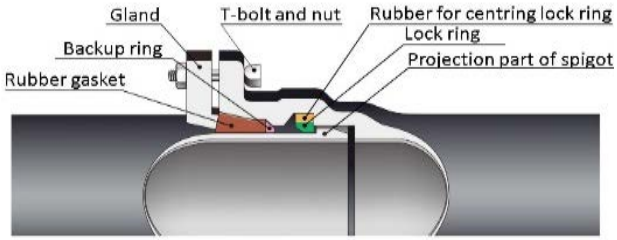
Type NS Pipe (DN500-1000)



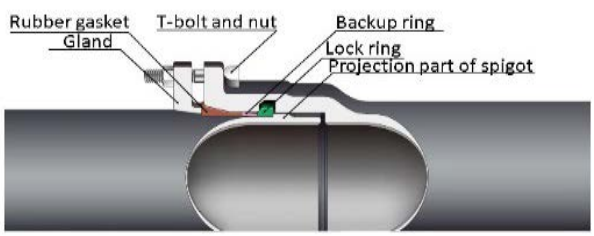
Type NS Fitting (DN75-250)



Type NS Fitting (DN300-450)



Type NS Fitting (DN500-1000)

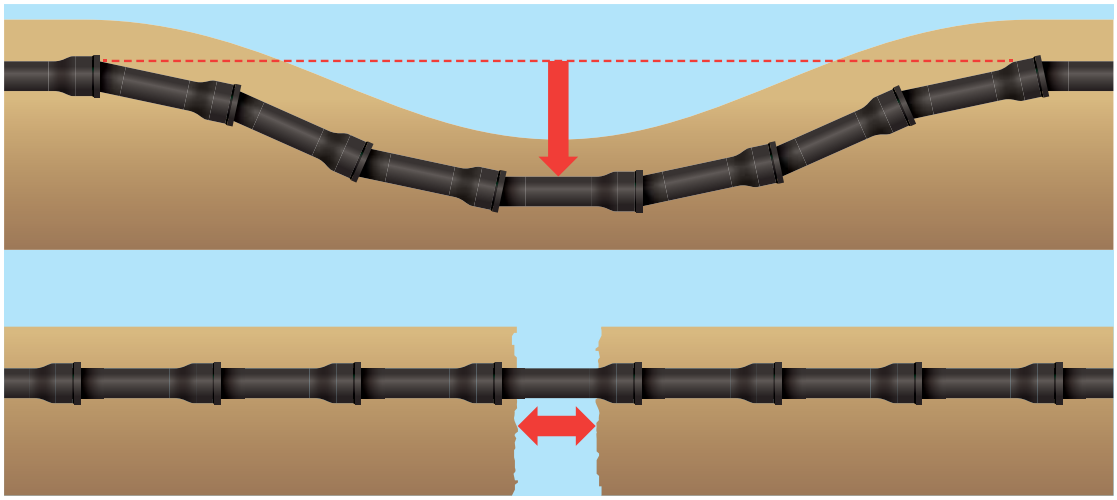


Seismic Resilience

Joint Features

- **Separation prevention**: 3 x DN(kN)*
  DN is Nominal size (in mm)
- **Flexibility:** 6-8 degrees (maximum angular deflection)
- **Extension and compression:** ± 1% of pipe length

Joint flexibility enables pipelines to follow subsidence during earthquakes. Extension and contraction of the pipes enables the pipeline to follow crack movement during earthquakes.



Damage caused during natural disasters

SRDIP has never failed in service during any disasters

FIG. 1 Example of joint separation.

FIG. 2 SRDIP will remain in operation during seismic events.

FIG. 3 SRDIP pipe remaining in tact during the 2011 Japan Earthquake

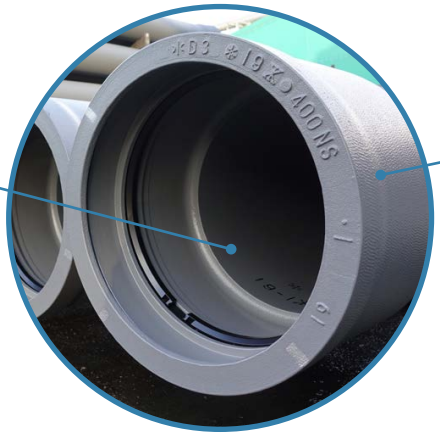
FIG. 4 SRDIP pipe remaining in tact during the 2011 Japan Earthquake

Corrosion Resilience

Iron Thickness + *Lining Process* + *External Coating* = *Over 100 Years Asset Life*

Internal Coating

- Fusion Bonded Epoxy Powder Coating



External Coating

- Triple layer Kzinc epoxy coating (Al-Si-Mn)

Coating Process	Material & Coating thickness
Pipe: Oven baked spray applciation Fitting: Electrostatic spray	Fusion bonded epoxy powder Minimum 0.3mm

	Mortar Lining	Fusion Bonded Epoxy Powder Coating
Water Resilience and Chemical Resistance	○	⊙
Water Quality and Sanitation	○	⊙
Smoother Internal Surface - Increased Flow	100%	110~120%

SRDIP can supply safe and secure potable water due to the oven baked internal FBE powder lining.

Layer	Coating Process	Material & Coating thickness
1	Thermal Spraying alloy	Zn Alloy (Al-Si-Mn) Not less than 200mg/m²
2	Sealing treatment	Silica compound sealing agent Not less than 50g/m²
3	Synthetic Resin coating	Synthetic Resin Not less than 80μm

Zn alloy *(Al - Si - Mn)* coating of SRDIP has a higher corrosion resilience than bitumen coating.

Traditional Bitumen Coating
- Rust *(7 days)*

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Zn Alloy Coating
- No Rust *(59 days later)*

Enhanced Asset Life

Using oven baked fusion bonded epoxy powder *(FBE)* lining combined with triple layer Kzinc coating *(Al-Si-Mn)* corrosion resistance improves durability resulting in longer asset life.

Improved Productivity

- No concrete anchor blocks at bends required.
- No PE sleeves required
  (under most conditions - 95% of Japan).

TABLE 1 Joining Time: Pipe-joint

Nominal Size	Average Time (mins)
75	4.2
100	4.9
150	4.9
200	5.4
250	5.9
300	7.0
400	7.5
450	8.6
500	15.5
600	16.0*
700	18.5*
800	23.0*
900	23.5*
1000	24.0

Source: Japan Ductile Iron Pipe Association (JDPA) *except for DN600~900 estimated by Kurimoto.

TABLE 2 Joining Time: Fitting-joint

Nominal Size	Average Time (mins)
100	6.4
200	7.0
300	13.4
400	13.8
450	14.1
500	15.5
600	16.0*
700	18.5*
800	23.0*
900	23.5*
1000	24.0

FIG. 6 An example of DN375 x 11 degree bend showing: 1. Type NS Mechanical Bend, Tee Bolts and Gland plate. 2. Type NS mechanical bend socket installed into Type NS Pipe Socket.

FIG. 7 Type NS pipe joint being made using special tools.

FIG. 8 Quality assurance check with an installed pipe-joint measuring the pipes gasket position to the first witness mark.

FIG. 9 Typical handing, jointing and workmanship quality checks of DN400 Kurimoto SRDIP installed at Cleat Street Porirua City.

TABLE 3 **Laying Length** (Refer to FIG.2)

Nominal Pipe Size	**D2** (mm)	**D5** (mm)	**Bending angle**		**Z, Y Extension & Contraction** (mm)	**Laying Length** (mm)	**L** (mm)	**S** (mm)	
			Allowable	Maximum				Allowable	Maximum
75	93.0	161	4°00'	8°00'	±42	4167	4000	279	557
100	118.0	190	4°00'	8°00'	±41	4172	4000	279	557
150	169.0	242	4°00'	8°00'	±54	5195	5000	349	696
200	220.0	294	4°00'	8°00'	±52	5195	5000	349	696
250	271.6	346	4°00'	8°00'	±50	5195	5000	349	696
300	322.8	408	3°00'	6°00'	±60	5531	5300	277	554
350	374.0	465	3°00'	6°00'	±60	5540	5300	277	554
400	425.6	521	3°00'	6°00'	±60	5542	5300	277	554
450	476.8	572	3°00'	6°00'	±60	5543	5300	277	554
500	528.0	700	3°20'	7°00'	±60	5520	5300	308	646
600	630.8	804	2°50'	7°00'	±60	5520	5300	262	646
700	733.0	930	2°30'	7°00'	±60	5557	5300	231	646
800	836.0	1039	2°10'	7°00'	±60	5565	5300	200	646
900	939.0	1164	2°00'	7°00'	±60	5565	5300	185	646
1000	1041.0	1273	1°50'	7°00'	±60	5568	5300	170	646
1100	1144.0	1318	1°40'	7°00'	±61	5560	5300	154	646
1200	1246.0	1420	1°30'	7°00'	±62	5560	5300	139	646
1350	1400.0	1574	1°30'	6°30'	±60	5570	5300	139	600
1500	1554.0	1728	1°30'	5°50'	±60	5580	5300	139	539
1600	1650.0	1830	1°30'	5°00'	±50	5285	5000	131	436
1650	1701.0	1881	1°30'	4°50'	±50	5285	5000	131	421
1800	1848.0	2028	1°30'	4°40'	±50	5290	5000	131	407
2000	2061.0	2241	1°30'	4°20'	±50	5295	5000	131	378
2100	2164.0	2344	1°30'	4°10'	±51	5310	5000	131	363
2200	2280.0	2460	1°30'	4°00'	±50	5310	5000	131	349
2400	2458.0	2638	1°30'	3°50'	±50	4310	4000	105	267
2600	2684.0	2874	1°30'	3°40'	±50	4330	4000	105	256

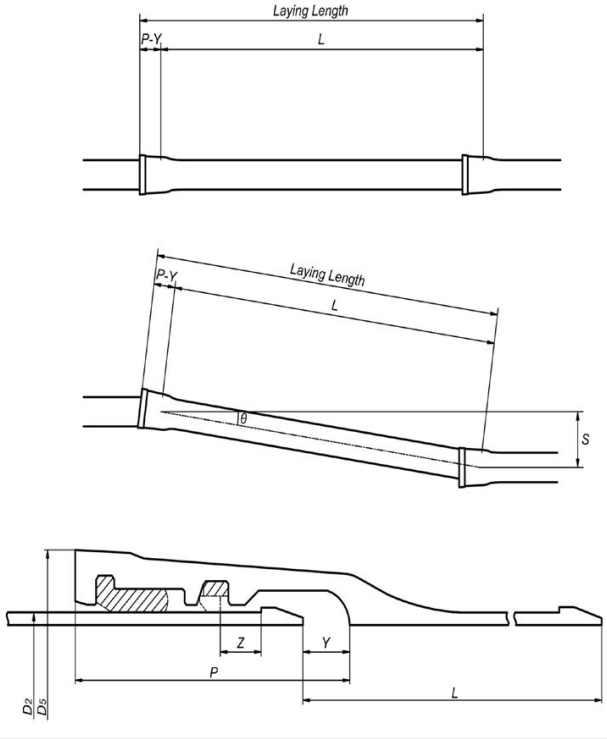

FIG. 10 Laying Length

Jacking Pipe

Kurimoto SRDIP pipes can be inserted into a host pipe or casing. Once the casing has been installed pipes are connected and the pipe casters are assembled onto the pipe barrel preventing pipe-joints from over-contracting. The assembly work can be completed at depth from a launch pit, the receiving pit receives the pipe-string as illustrated in Figure 11.

Features

- Easy and secure
- Speedy
- Rollable
- Curveable

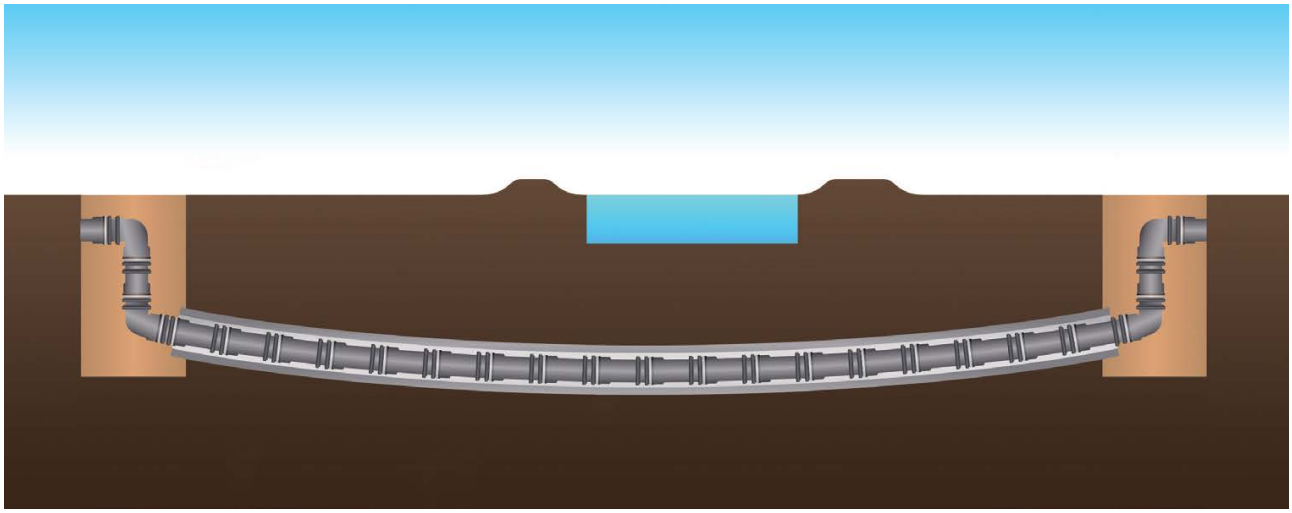

FIG. 11 Case study using curved Jacking Pipe method to cross under a river.

FIG. 12 Work in progress.

FIG. 13 Where casters are set.

FIG. 14 Kurimoto Ductile Iron Pipe installation in Wellington