iPLEX Pipelines

PVC PRESSURE SYSTEMS

SPECIFICATION AND INSTALLATION GUIDE

November 2025

The Iplex® vision is to be the leading manufacturer and supplier of plastic building materials in New Zealand.

CONTENTS

Iplex Apollo® Series 1

- Metric
- Manufactured in accordance with AS/NZS 4441 (Series 1)
- Available in PN6.3, PN10, PN12.5
- Increased impact strength and lighter in weight compared with Iplex® PVC-U pressure pipes of a similar size and pressure class
- Available in alternative colours to suit applications

Iplex Apollo® Blue Series 2

- Imperial
- Manufactured in accordance with AS/NZS 4441 (Series 2)
- Available in PN12.5 and PN16
- Increased impact strength and lighter in weight compared with Iplex® PVC-U pressure pipes of a similar size and pressure class
- Available in alternative colours to suit applications

Iplex White Rhino® Series 1

- Metric
- Manufactured in accordance with AS/NZS 4765 (Series 1)
- Available in PN6, PN9, PN12, PN15 subject to diameter
- Greater impact strength and hydraulic capacity compared with Iplex® PVC-U pressure pipes of a similar size and pressure class
- Solvent Cement Joint and Rubber Ring Joint options subject to diameter

Iplex Blue Rhino® Series 2

- Imperial
- Manufactured in accordance with AS/NZS 4765 (Series 2)
- Available in PN12, PN16 subject to diameter

Iplex Novakey® Series 1

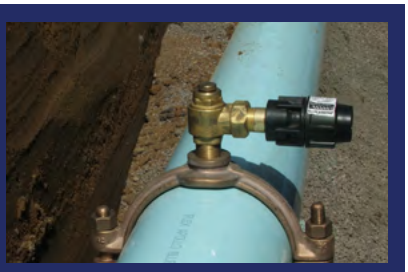
- Metric
- Manufactured in accordance with AS/NZS 1477 (Series One)
- Available in PN6, PN9, PN12, PN15 subject to diameter
- Solvent Cement Joint and Rubber Ring Joint options subject to diameter

Iplex Novakey® PVC-U Fittings

- Manufactured in accordance with AS/NZS 1477
- Compatible with Series 1 Iplex Apollo® PVC-O, Iplex White Rhino® PVC-M and Iplex Novakey® PVC

Ductile Iron Fittings & Mechanical Couplers

- Complying with AS/NZS 2280, & AS/NZS 4998 & AS/NZS 4158
- Used with Iplex Apollo® PVC-O, Iplex Rhino® PVC-M and Iplex Novakey® PVC-U pressure pipes



Service Lateral Connection Fittings

- Complying with AS/NZS 4793
- Used with Iplex Apollo® PVC-O, Iplex Rhino® PVC-M and Iplex Novakey® PVC-U pressure pipes.

CONTENTS

Storage and Handling

- Store pipes on flat ground and if possible leave in their original crates or packs
- Avoid careless mishandling that could lead to pipe damage
- It is recommended that pipes be covered if being stored outside for more than 24 months

Installation, Bedding and Backfill

Consult the Ipex Pipeline Percy guidelines

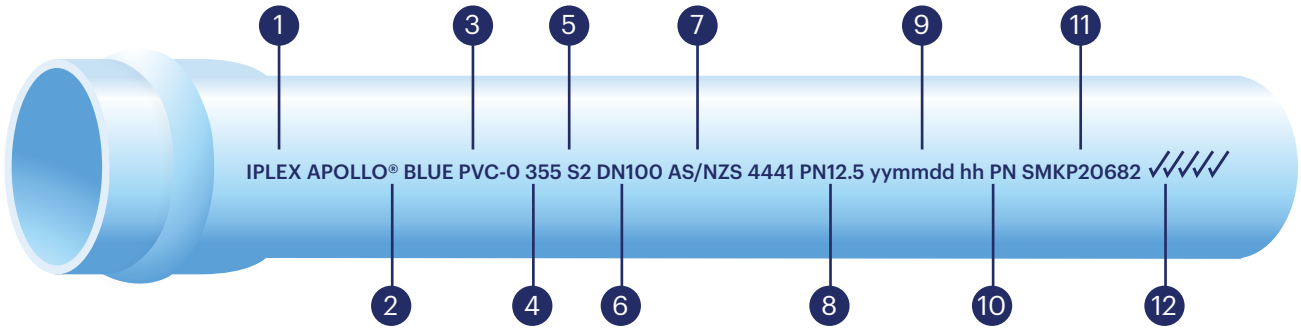
- 'How I Install PVC Pipes'
- 'How I Solvent Cement Joint PVC Pipes'
- 'How I Field Test PVC Pipes'

For more information on best practice installation refer to www.iplex.co.nz/iplex-resources/

Seismic Applications

- Iplex® Rubber Ring Jointed PVC pipes assist in delivering resilient performance in NZ seismic events

UNDERSTANDING PIPE CODES -EXAMPLE



1. Company Name
2. Brand Name
3. Classification (PVC Type)
4. Design Material Class
5. Dimensional Series
6. Nominal Size
7. Manufacturing Standard
8. Pressure/PN Rating
9. Date and Hour of Manufacture
10. Location of Manufacture (PN = Palmerston North)
11. 3rd Party Certification Licence
12. 3rd Party Certification Body Logo

PN TO PSI CONVERSION

Iplex® typically measure the pressure ratings of pipelines in Pressure Nominal (PN) or Bar. The table below shows the PN pressure ratings of the Iplex® PVC pipes identified in this guide and their corresponding Pounds per Square Inch (PSI) rating.

PN/BAR PRESSURE RATING	PSI PRESSURE RATING
PN6	87.0
PN6.3	91.4
PN9	130.5
PN10	145.0
PN12	174.0
PN12.5	181.3
PN15	217.6
PN16	232.1
PN18	261.1
PN20	290.1

IPLEX® PVC-O

IPLEX APOLLO®
PVC-O PRESSURE PIPE

Iplex Apollo® PVC-O is a biaxially orientated PVC pressure pipe for use in water and waste water infrastructure pipelines.

Iplex Apollo® PVC-O offers increased impact strength and greater hydraulic capacity, when compared with Iplex® PVC-U pressure pipes of the same OD size and similar pressure classes.

Iplex Apollo® PVC-O pipes are also lighter in weight compared with Iplex® PVC-U or PVC-M of the same OD size and similar pressure class, which allows for efficiencies in the cost of transportation, handling and installation.

Product Codes:

- Series 1: Z880 (Metric)
- Series 2: 1880 (Imperial)

Specification

Iplex® manufactures PVC-O using two patented processes known as biaxial extrusion and super socketing. Iplex® PVC-O pipes are available in two dimensional series:

Series 1 (Metric) – Iplex Apollo® is manufactured in accordance with AS/NZS 4441 'Orientated PVC (PVC-O) Pipes for pressure applications for Series 1, coloured white.

(StandardsMark Licence number SMKP20682)

Series 2 (Imperial) – Iplex Apollo® Blue is manufactured in accordance with AS/NZS 4441 'Orientated PVC (PVC-O) Pipes for pressure applications for Series 2, coloured blue.

(StandardsMark Licence number SMKP20682)

Iplex® have the ability to produce PVC-O in other colours such as: cream (wastewater), purple (recycled water).

Iplex Apollo® Blue PVC-O Series 1 pressure pipe used water distribution in a residential subdivision near Martinborough, South Wairarapa District.

IPLEX APOLLO®
PVC-O PRESSURE PIPE

Applications

Iplex Apollo® PVC-O pressure pipes are suitable for a wide range of buried pipeline applications including:

- Major potable water supply trunk and reticulation mains
- Principal water mains
- Principal pressure sewer mains
- Industrial process lines
- Effluent pipelines for industrial and rural waste
- Irrigation and turf water systems

Iplex Apollo® Series 1 pipe is compatible with Iplex Novakey® PVC-U pressure fittings using solvent cement joints (SCJ). Refer to Section 5.

Installation

Installation methods for Iplex Apollo® pipes are the same as those used for Iplex® PVC-U and PVC-M pipes. Buried pipe installation should be in accordance with the following standards:

General Installation – AS/NZS 2032, "Installation of PVC Pipe Systems"

Buried Structural Design - AS/NZS 2566 Part 1 and Supplement 1 "Buried Flexible Pipelines – Structural Design"

Detailed Installation and Site Pressure Testing – AS/NZS 2566 Part 2 "Installation"

For more information on best practice installation of Iplex Apollo® PVC-O pipes, consult the Iplex® Pipeline Percy Installation guides;

- 'How I Install PVC Pipes'
- 'How I Solvent Cement Joint PVC Pipes'
- 'How I Field Test PVC Pipelines'

(refer to www.iplex.co.nz/iplex-resources/).

Iplex Apollo® Blue PVC-O Series 1 pressure pipe used on the Oamaru to Hampden Pipeline, Waitaki District.

IPLEX APOLLO®
KEY BENEFITS

FEATURES	BENEFITS
DIAMETERS Series 1 Diameters (metric) Series 2 Diameters (imperial)	Compatible OD size with all Series 1 PVC-U and PVC-M water mains in current use. Compatible OD size with all Series 2 PVC-U and PVC-M watermains in current use, and the majority of AC/CI/DI dimension water mains in use.
FITTINGS Iplex Apollo® PVC-O Series 1 or Series 2 pipe can be used with PVC-compatible socketed Ductile Iron fittings to AS/NZS 2880, unrestrained mechanical couplings to AS/NZS 4793 and tapping bands to AS/NZS 4998. Iplex Apollo® PVC-O Series 1 pipe can be used with Iplex® Series 1 PVC-U solvent cement joint pressure fittings.	The same fittings and jointing assembly methods apply for Iplex® PVC-O, Iplex® PVC-U and PVC-M pressure pipes, when in accordance with Iplex®'s published Guidelines, which simplifies fittings selection, acquisition and installation.
IMPACT STRENGTH Increased Impact strength, low temperature performance and tensile strength compared with Iplex® PVC-U pressure pipe (higher impact mass, and impact test is conducted at zero °C.	Improved resistance to accidental impact, or disturbance during handling, installation and in service.
INTERNAL DIAMETER Increased internal diameter, compared with equivalent Iplex® PVC-U and PVC-M pressure pipe.	Increased flow capacity compared with Iplex® PVC-U and PVC-M of the same Series, and equivalent or similar PN class and diameter.
RETAINED SEAL RING Factory fitted, EPDM jointing seal ring is "retained in the socket", with integral blue coloured polypropylene retaining element.	Eliminates potential seal ring displacement during joint assembly.
STRUCTURAL STIFFNESS Designed for buried installation.	Suitable for installation under roads by open cut trench methods, to AS/NZS 2032 and AS/NZS 2566.2.
DYNAMIC STRESSES (FATIGUE) Can be used in applications involving cyclical operating pressures.	Has predictable fatigue performance under cyclical operating pressures and Dynamic Stresses when designed according to PIPA Technical guideline - POP - 101 - PVC Press.
INDUSTRY CONSTRUCTION CODES & STANDARDS	PVC-O is nominated for Principal Water Main Systems or Principal Sewerage Pressure Pipeline Systems in relevant WSAA Codes (WSA 03 AND WSA 02). PVC-O to AS/NZ 4441 is an Acceptable Pipe Material and Standard for Pressure Water Supply or Wastewater / Pressure Sewer Rising main, in NZS 4404:2010.
LIGHT WEIGHT PIPE Iplex Apollo® is lighter in weight than Iplex® PVC-U or PVC-M of the same OD size and similar pressure class.	Potential efficiencies in the cost of transportation, handling on site and installation.

SECTION 1
IPLEX® PVC-O

Iplex Apollo® Blue PVC-O Series 2 pressure pipe used on the Oamaru to Hampden Pipeline, Waitaki District.

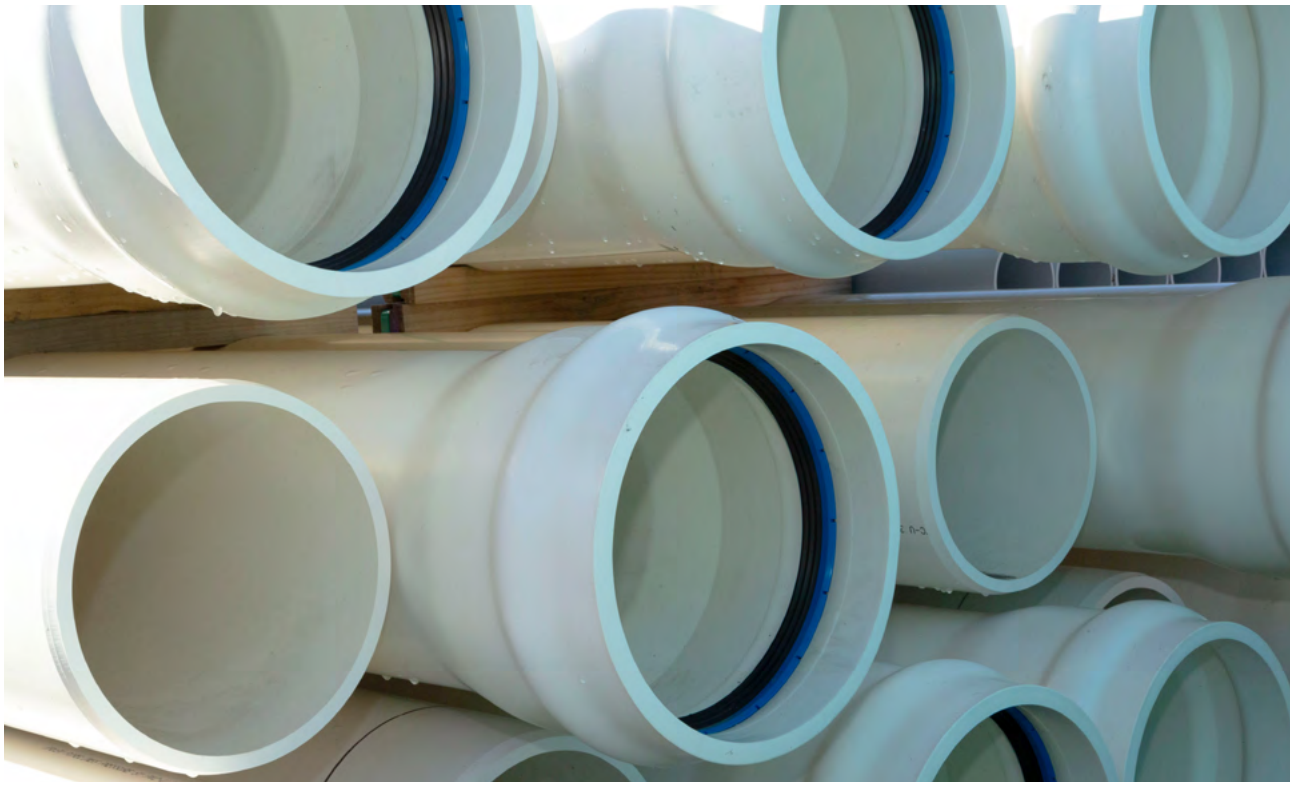
IPLEX APOLLO®
PVC-O SERIES 1 (METRIC) PRODUCT RANGE

IPLEX APOLLO® PVC-O (Metric) Series 1 Pressure Pipe Dimensions			
Class	PN6.3*	PN10	PN12.5
Pressure rating (MPa)	0.63 MPa	1.00 MPa	1.25 MPa
Approx rating (m head)	63m head	100m head	125m head
Design MRS (MPa)	-	31.5 MPa	40.0 MPa

Nom. Dia (mm)	Mean O.D. (mm)	Mean I.D. (mm)	Mean W.T. (mm)
100	114.25	108.2	3.0
150	160.25	151.6	4.3
200	225.35	213.5	5.9
300	315.50	299.1	8.2

Minimum order quantities may apply.

**PN6.3 is not included in AS/NZS 4441, Appendix ZZ, but has the mechanical performance capability of AS/NZS 4441.*



Iplex Apollo® Series 1 PVC-O pressure pipe.

IPLEX APOLLO® BLUE
PVC-O SERIES 2 (IMPERIAL) PRODUCT RANGE

IPLEX APOLLO® BLUE PVC-O (Imperial) Series 2 Pressure Pipe Dimensions		
Class	PN12.5	PN16
Pressure rating (MPa)	1.25 MPa	1.6 MPa
Approx rating (m head)	125m head	160m head
Design MRS MPa	35.5 MPa	45.0 MPa

Nom. Dia (mm)	Mean O.D. (mm)	Mean I.D. (mm)	Mean W.T. (mm)
100	121.90	114.5	3.7
150	177.40	166.8	5.3
200	232.25	218.4	6.9
250	286.25	269.4	8.4

Minimum order quantities may apply.

Iplex Apollo® Blue Series 2 PVC-O pressure pipe.

IPLEX® PVC-M

IPLEX RHINO®
PVC-M PRESSURE PIPE

Iplex Rhino® PVC-M is a tough, high-strength pressure pipe suitable for a wide variety of applications. PVC-M incorporates advanced technology which gives Iplex Rhino® PVC-M pipes higher impact resistance, greater ductility, lighter weight and an increase in hydraulic capacity when compared with Iplex® PVC-U pipe.

Iplex® offer two PVC-M solutions;

1) Iplex White Rhino® PVC-M Series 1 (White)

2) Iplex Blue Rhino® PVC-M Series 2 (Blue)

Iplex® can to produce PVC-M pipe in other colours such as cream (wastewater), purple (recycled water)

Iplex® Series 1 PVC-M pressure pipes can be configured in either a Solvent Cement Joint (SCJ) configuration or a Rubber Ring Joint (RRJ) configuration. This is dependent on both size and pressure class. Please consult the Iplex® Product Catalogue in the resources section on the Iplex® website for more information.

Product Codes:

- Series 1: 850 (Metric)
- Series 2: 1850 (Imperial)

Specification

Both Iplex White Rhino® Series 1 and Iplex Blue Rhino® Series 2 comply with the appropriate standard.

Series 1 (Metric) – Manufactured in accordance with AS/NZS 4765 Modified PVC (PVC-M) pipe for pressure applications for Series 1 pipe..

(StandardsMark Licence number SMK02570)

Series 2 (Imperial) – Manufactured in accordance with AS/NZS 4765 Modified PVC (PVC-M) pipes for pressure applications for Series 2 pipe C.I.O.D. (Cast Iron Outside Diameter Compatible).

(StandardsMark Licence number SMK02570)

Iplex White Rhino® Series 1 PVC-M pressure pipe.

IPLEX RHINO®
PVC-M PRESSURE PIPE

Applications

Iplex Rhino® PVC-M pipes may be used for:

- Urban potable water supply
- Pumped sewer rising mains
- Agricultural irrigation and rural water supply
- Industrial processing fluids
- Industrial effluent disposal
- Abrasive slurries in quarrying and mining
- Acids, alkalis and aggressive chemicals

Iplex White Rhino® Series One pipe is compatible with Iplex Novakey® PVC-U pressure fittings using solvent cement joints (SCJ). Refer Section 5.

Installation

Iplex Rhino® PVC-M pipes should be designed and installed in accordance with the following standards:

General Installation – AS/NZS 2032, "Installation of PVC Pipe Systems"

Buried Structural Design - AS/NZS 2566 Part 1 and supplement 1. "Buried Flexible Pipelines Structural Design"

Detailed Installation and Site Pressure Testing – AS/NZS 2566 Part 2 "Installation"

For more information on best practice installation of PVC-M pipes, consult the Iplex® Pipeline Percy Installation guides;

- 'How I Install PVC Pipes'
- 'How I Solvent Cement Joint PVC Pipes'
- 'How I Field Test PVC Pipelines'

(refer to www.iplex.co.nz/iplex-resources/).

Iplex White Rhino® Series 1 PVC-M pressure pipe, used for a wastewater bulk transmission main.

IPLEX WHITE RHINO®
PVC-M SERIES 1 (METRIC) PRODUCT RANGE

IPLEX WHITE RHINO® PVC-M Series 1 (Metric) Pressure Pipe Dimensions				
Class	PN6	PN9	PN12	PN15
Pressure rating (MPa)	(0.6 MPa)	(0.9 MPa)	(1.2 MPa)	(1.5 MPa)
Approx rating (m head)	PN12	90m head	120m head	150m head

Nom. Dia (mm)	Mean O.D. (mm)	Mean I.D. (mm)	Mean W.T. (mm)	Mean I.D. (mm)	Mean W.T. (mm)	Mean I.D. (mm)	Mean W.T. (mm)	Mean I.D. (mm)	Mean W.T. (mm)
100	114.3	108.3	3.0	107.5	3.4	105.5	4.4	103.5	5.4
125	140.2	133.3	3.5	131.8	4.2	129.4	5.4	127.2	6.5
150	160.3	152.3	4.0	150.9	4.7	148.3	6.3	145.5	7.4
175	200.3	190.5	4.9	188.7	5.8	185.3	7.5	181.9	9.2
200	225.3	214.3	5.5	212.5	6.4	208.5	8.4	204.7	10.3
225	250.4	238.2	6.1	236.2	7.1	232.0	9.2	226.6	11.9
250	280.4	-	-	264.6	7.9	259.8	10.3	255.0	12.7
300	315.5	-	-	297.9	8.8	292.3	11.6	-	-
375	400.5	-	-	378.1	11.2	371.3	14.6	-	-
450	500.5	-	-	472.9	13.8	464.3	18.1	-	-
575	630.5	-	-	596.1	17.2	-	-	-	-

Minimum order quantities may apply.

Iplex White Rhino® Series 1 PVC-M pressure pipe - Solvent Cement Joint.

Iplex White Rhino® Series 1 PVC-M pressure pipe - Rubber Ring Joint.

IPLEX BLUE RHINO®
PVC-M SERIES 2 (IMPERIAL) PRODUCT RANGE

IPLEX BLUE RHINO® PVC-M Series 2 (Imperial) Pressure Pipe Dimensions		
Class	PN12	PN16
Pressure rating (MPa)	(1.2 MPa)	(1.6 MPa)
Approx rating (m head)	120m head	160m head

Nom. Dia (mm)	Mean O.D. (mm)	Mean I.D. (mm)	Mean W.T. (mm)	Mean I.D. (mm)	Mean W.T. (mm)
100	121.9	112.5	4.7	109.7	6.1
150	177.3	164.1	6.6	159.9	8.7

Minimum order quantities may apply.

Iplex Blue Rhino® Series 2 PVC-M pressure pipe.

IPLEX® PVC-U

IPLEX NOVAKEY®
PVC-U PRESSURE PIPE

Iplex Novakey® PVC-U pressure pipes are manufactured from unplasticised polyvinyl chloride (PVC-U) polymer using the continuous extrusion process.

Iplex Novakey® PVC-U pressure pipes can be configured in either a Solvent Cement Joint (SCJ) configuration or a Rubber Ring Joint (RRJ) configuration. This is dependent on both size and pressure class. Refer to the Iplex® Product Catalogue at iplex.co.nz for more information.

Product Code:

- Series 1: Z800 or 800

Specification

Iplex® PVC-U is manufactured in accordance with AS/NZS 1477 PVC pipes & fittings for pressure applications for Series 1 pipe.

(StandardsMark Licence number SMK02569 and SMKP20181)

Applications

Iplex Novakey® PVC-U pressure pipes are suitable for a wide range of buried pipeline applications including:

- Urban potable water supply
- Pumped sewer rising mains
- Agricultural irrigation and rural water supply
- Industrial processing fluids
- Industrial effluent disposal
- Slurry lines
- Acids, alkalis and aggressive chemicals (refer Iplex® chemical resistance guidelines)

Iplex Novakey® Series One pipe is compatible with Iplex Novakey® PVC-U pressure fittings using solvent cement joints (SCJ), refer section 5.

Installation

Iplex Novakey® PVC-U should be installed in accordance with the following standards:

General Installation – AS/NZS 2032, "Installation of PVC Pipe Systems"

Buried Structural Design - AS/NZS 2566 Part 1 and supplement 1. "Buried Flexible Pipelines Structural Design"

Detailed Installation and Site Pressure Testing – AS/NZS 2566 Part 2 "Installation"

For more information on best practice installation of PVC-U pipes, consult the Iplex® Pipeline Percy Installation guides;

- 'How I Install PVC Pipes'
- 'How I Solvent Cement Joint PVC Pipes'
- 'How I Field Test PVC Pipelines'

(refer to www.iplex.co.nz/iplex-resources/).

Iplex Novakey® Series 1 PVC-U Solvent Cement Joint (SCJ) pressure pipe.

Iplex Novakey® Series 1 PVC-U Rubber Ring Joint (RRJ) pressure pipe.

IPLEX NOVAKEY®
PVC-U SERIES 1 PRODUCT RANGE

IPLEX NOVAKEY® PVC-U (Metric) Series 1 Pressure Pipe Dimensions				
Class	PN6	PN9	PN12	PN15
Pressure rating (MPa)	(0.6 MPa)	(0.9 MPa)	(1.2 MPa)	(1.5 MPa)
Approx rating (m head)	60m head	90m head	120m head	150m head

Nom. Dia (mm)	Mean O.D. (mm)	Mean I.D. (mm)	Mean W.T. (mm)	Mean I.D. (mm)	Mean W.T. (mm)	Mean I.D. (mm)	Mean W.T. (mm)	Mean I.D. (mm)	Mean W.T. (mm)
15	21.3	-	-	-	-	-	-	18.2	1.5
20	26.7	-	-	-	-	-	-	22.9	1.9
25	33.5	-	-	-	-	-	-	28.9	2.3
32	42.3	-	-	-	-	37.4	2.4	36.3	2.9
40	48.2	45.1	1.5	-	-	42.7	2.8	41.5	3.3
50	60.3	56.7	1.8	55.1	2.6	53.5	3.4	52.1	4.1
65	75.4	71.0	2.2	68.8	3.3	67.0	4.2	65.0	5.2
80	88.9	83.7	2.6	81.3	3.8	78.9	5.0	76.7	6.1
100	114.3	107.7	3.3	104.5	4.9	101.7	6.3	98.7	7.8
125	140.2	132.2	4.0	-	-	-	-	-	-
150	160.2	151.2	4.5	146.8	6.7	142.6	8.8	138.6	10.8
175	200.2	190.0	5.1	-	-	-	-	-	-
200	225.3	213.7	5.8	208.5	8.4	203.1	11.1	197.9	13.7
225	250.3	237.7	6.3	-	-	-	-	-	-
250	280.4	266.2	7.1	-	-	253.0	13.7	-	-
300	315.4	299.4	8.0	-	-	-	-	-	-
375	400.5	380.3	10.1	-	-	-	-	-	-
450	500.5	475.3	12.6	-	-	-	-	-	-
575	630.5	598.9	15.8	583.5	23.5	-	-	-	-

Minimum order quantities may apply.

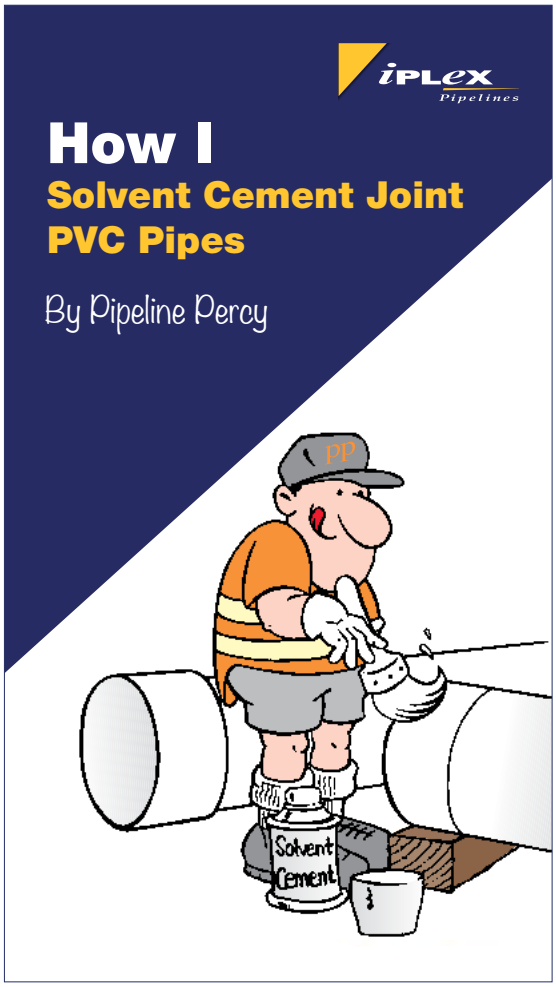
FITTINGS

IPLEX® PVC
PRESSURE FITTINGS FOR SOLVENT CEMENT JOINTING (SCJ)

Iplex Novakey® PVC-U Series 1 pressure fittings are suitable for use with Iplex Apollo® PVC-O Series 1, Iplex White Rhino® PVC-M Series 1 and Novakey® PVC-U pressure pipes.
Iplex Novakey® PVC-U pressure fittings comply with AS/NZS 1477 PVC pipes & fittings for pressure applications for Series 1 pipe, and are suitable to convey drinking water.
Series 2 PVC pipes are not joined with solvent cement only because suitable Series 2 SCJ style PVC fittings are not commonly available.
Note: *For a complete list of the Iplex Novakey® PVC-U pressure fittings refer to the Iplex® Product Catalogue at refer to www.iplex.co.nz/iplex-resources/*

Note: *Iplex®'s recommended best practice for solvent cement jointing PVC pipes and fittings, including the correct use of Iplex Novakey® cleaner primer with Iplex Novakey® solvent cement can be found in the 'Pipeline Percy - How I Solvent Cement Joint PVC Pipes' guide (refer to www. iplex.co.nz/iplex-resources/).*

Iplex Novakey® 800 Series 1 PVC-U pressure fittings



Iplex Novakey® 9100 Series PVC pressure solvent cement

Iplex Novakey® 9101 / 9101C Series purple PVC cleaner primer

IPLEX® PVC
DUCTILE IRON SOCKETED PRESSURE PIPE FITTINGS

Iplex® recommends the use of ductile iron socketed fittings manufactured to AS/NZS2280:2014 "Ductile Iron pipes and fittings", (Figure 4.1 & 4.2) and compliant with Table 3.1 "of this Standard – "..ductile fittings with plastics pipes", with compatible dimension Iplex® PVC pressure pipes.

Appropriate Series 1 "metric" OD transition seal rings can be used with some sizes of PVC compatible Series 2 ductile iron fittings, to allow use with Series 1 pipe OD sizes. Socket spacers may be required in some fitting brands with DN150 Series 1 pipe to centrally locate and support the pipe, in the socket. Iplex® recommends consultation with the fitting supplier for specific advice on the need for socket spacers.

Ductile iron fittings require suitable corrosion protection. Iplex® recommends all ductile iron fittings to be coated with a polymeric coating applied in accordance with AS/NZS4158 - "Thermal Bonded Polymeric Coatings" and fitted with stainless steel nuts, bolts and washers.

Figure 4.1 - Ductile iron bends, socketed or flanged

Ductile iron flange adaptors, socketed or plain ended

Figure 4.2 - Socketed Ductile Iron fittings should have a full circle pipe stop in the Socket, to butt the PVC pipe end against, when installing, to prevent over- insertion

Figure 4.3 - Re position the insertion witness mark on the pipe spigot as needed, to allow for full depth socket insertion

Assembly of Ductile Iron Socketed Fittings on PVC Pressure Pipes

Figure 4.4 - If cutting a pipe on site, cut the pipe square and handchamfer the pipe spigot, similar to a factory produced chamfer

Figure 4.5 - Lubricate the chamfered PVC-O pipe spigot, and fitting seal ring, with Iplex® Medlube

IPLEX® PVC
DUCTILE IRON SOCKETED PRESSURE PIPE FITTINGS

Figure 4.6 - Assemble the fitting onto the PVC pipe with a bar. Insert the pipe into the full length of the fitting socket

Figure 4.7 - Larger size ductile iron fittings may need extra mechanical help to assemble, such as here, with a lifting strop pulled by the excavator. DN250 socketed bend being assembled onto a DN250 Series 2 PN16 Iplex® PVC watermain near Richmond, Tasman District

IPLEX® PVC
MECHANICAL COUPLINGS & FLANGE ADAPTORS

Iplex® recommends the use of unrestrained "universal" mechanical couplings manufactured to AS/NZS 4998 “Unrestrained Mechanical Couplings” for Water Works Purposes, with compatible dimension Iplex® PVC pressure pipe. Various fitting brands which fully comply with this Standard can be used.

These "Universal" couplers differ from traditional "gibault" style couplers, as they typically allow connection between pipes of differing OD sizes (eg: Series 1 to Series 2) and between differing pipe materials (eg PVC to Ductile Iron / cast iron / asbestos cement / steel etc). The seal gaskets and barrel design are designed to accommodate some "rotation" or angular change of direction across the joint, which will vary with fitting brand and design and may be in the range 4 to 8 degrees.

Recommended assembly procedure

- Ensure all sliding components, including the central "barrel" and the seal gaskets, are thoroughly clean and freshly lubricated, with Iplex® Medlube pipe jointing lubricant, to ensure uniform compression during tightening.
- Apply witness marks to the pipe with a pencil or felt marker pen, to ensure correct "centralised" positioning of the coupler during tightening, and to allow for the required "end gap" of approximately 10mm between the pipe ends, which is taken up during tightening.
- Assemble the fitting onto the pipe, taking account of the fitting manufacturer's instructions for use specifically with PVC.
- Pre-tighten the bolts using a ratchet spanner.
- Then tighten the bolts using a torque-wrench, to the manufacturer’s recommended torque setting specifically for PVC pipe.
- The correct torque will vary with fitting brand and design and can be in the range 40 to 65 Nm **(do not overtighten)**

Figure 4.8 - "AVK" brand Series 603 PN16 Universal Flange adapters suitable for Appolo PVC-O, pressure pipe. The pressure rating (PN10/16) and range of allowed compatible pipe OD sizes is moulded on the end cap

Figure 4.9 - "AVK" brand Series 601 PN16 Universal Couplings for DN100 PVC-O, pressure pipe. The range of allowed compatible pipe OD sizes is moulded on the end cap

Figure 4.10 - Use of a torque wrench during final tightening of the bolts on an "AVK" brand Universal Coupling, installed on DN100 Series 1 Iplex Apollo® PVC-O pressure pipe

Figure 4.11 - Typical arrangement of "AVK" brand, Universal flange adapters, on a flange branched tee, with hydrant, and hydrant riser, installed onto DN250 Iplex® PVC pipe, Tasman District

IPLEX® PVC
SERVICE LATERAL CONNECTIONS

Iplex® recommends the use of PVC-compatible, full circle supported tapping bands with Iplex® PVC pressure pipes. These include Plasson Plassaddle Tapper mechanical tapping saddles, (Iplex® 2536 - Series 2), "Milnes" brand Gunmetal, Crevet Taptite, or other tapping bands manufactured to AS/NZS 4793 “Mechanical Tapping Bands for Water Works Purposes”. Either O or V type tapping band seals are suitable for use with Iplex® PVC pipes.

Note: Tapping band internal (ID) dimensions are always specific to either Series 1 (metric OD) pipe sizes or Series 2 (imperial CIOD pipe sizes), and are not interchangeable between the two Series. “Universal” tapping bands that use U-bolt support straps, without direct contact of the two halves when tightened, are not recommended for any type of Iplex® PVC pipe.

Tapping bands must be installed centrally positioned over the drilled service hole. This hole should be drilled using a fine-tooth hole saw. Bolt tightening torque should not exceed 20Nm.

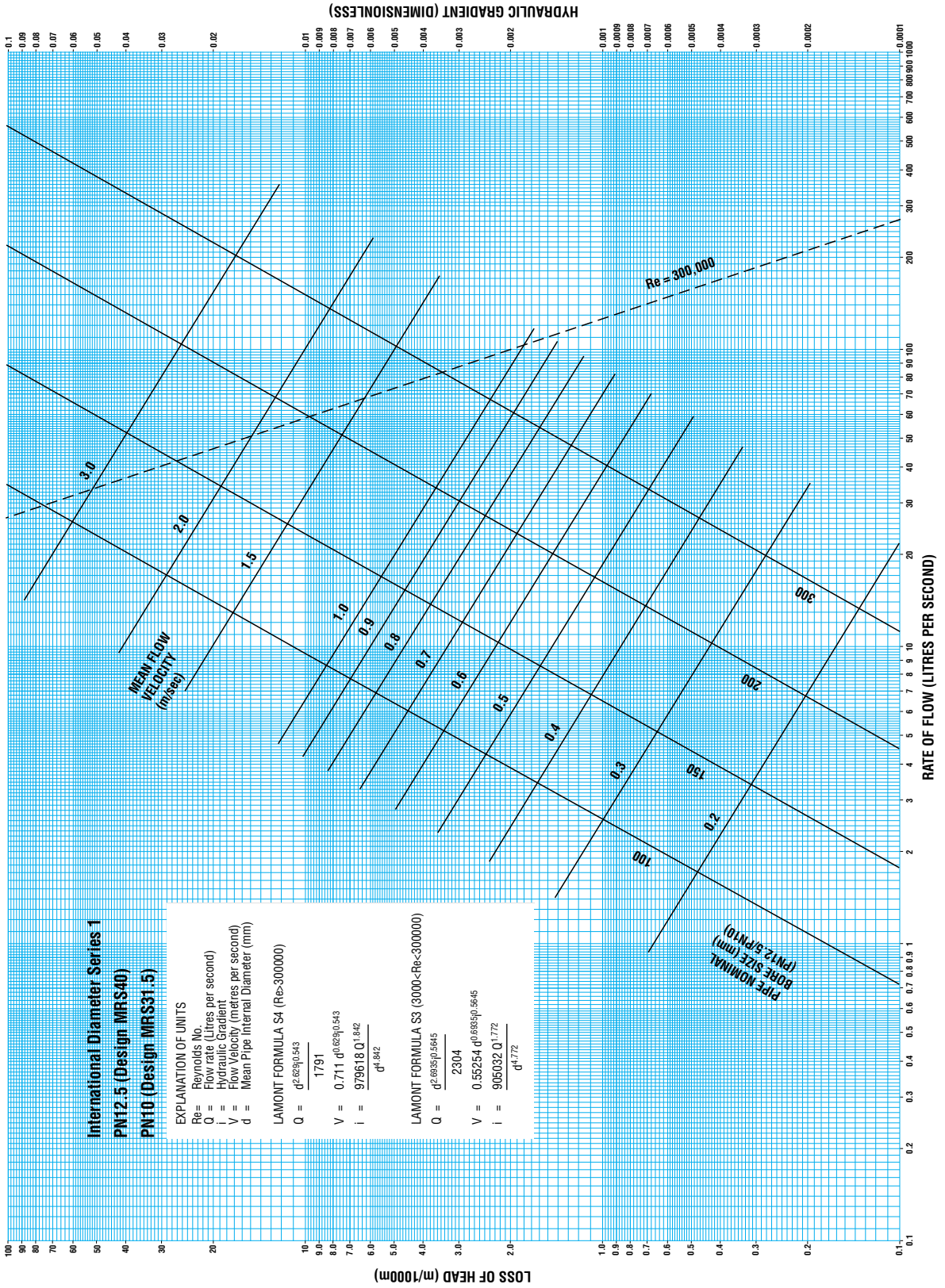
Figure 4.12 - Gunmetal tapping saddle with a Plasson "line 7" male threaded adapter,on white DN100 Series 1 Iplex® PVC water main, connecting to a DN50 Iplex Blueline® PE service lateral, and valve box, near Wanaka, Queenstown Lakes District

Figure 4.13 - Gunmetal tapping saddle and Under Pressure Tapping ferrule with a Plasson "line 7" male threaded adapter, for an air release point, on a twin, DN150 Series 2 PN16 Iplex® PVC pipe, near Oakura, Taranaki District

HYDRAULIC DESIGN

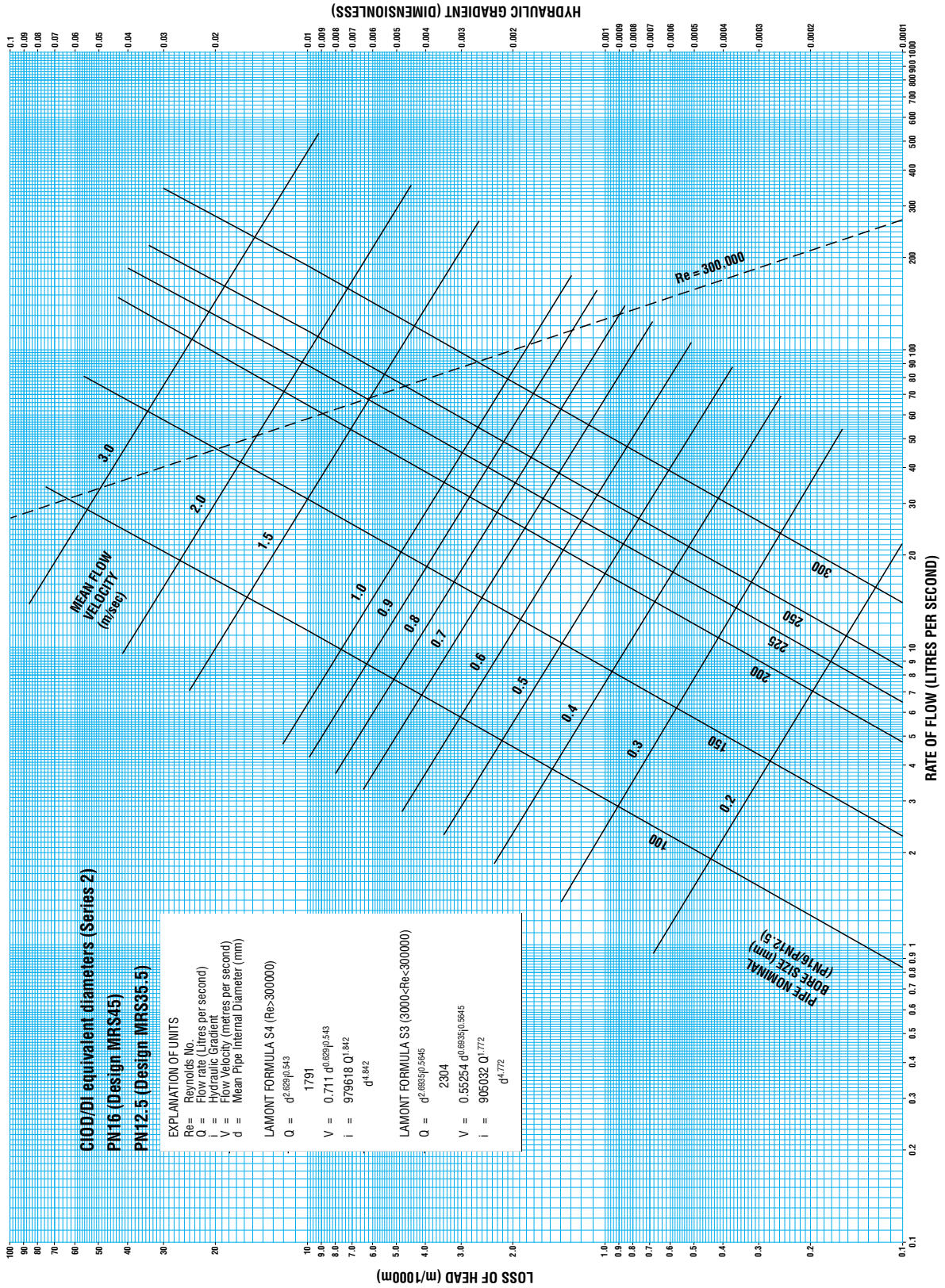
IPLEX APOLLO® PVC-O (SERIES 1) FLOW CHART

Figure 5.1 Apollo® PVC-O Series 1 Flow Chart



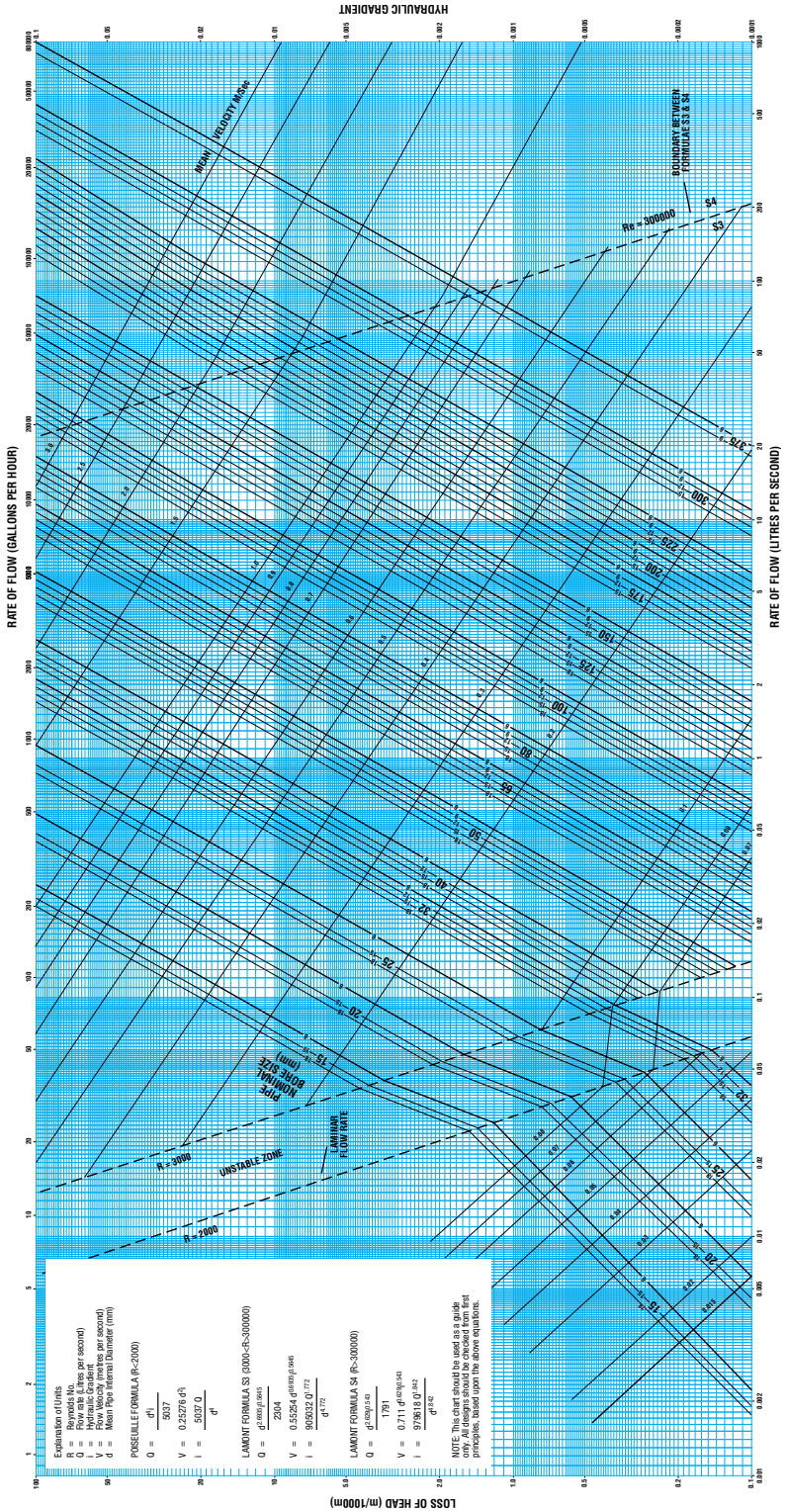
IPLEX APOLLO® BLUE PVC-O (SERIES 2) FLOW CHART

Figure 5.2 Apollo® Blue PVC-O Series 2 Flow Chart



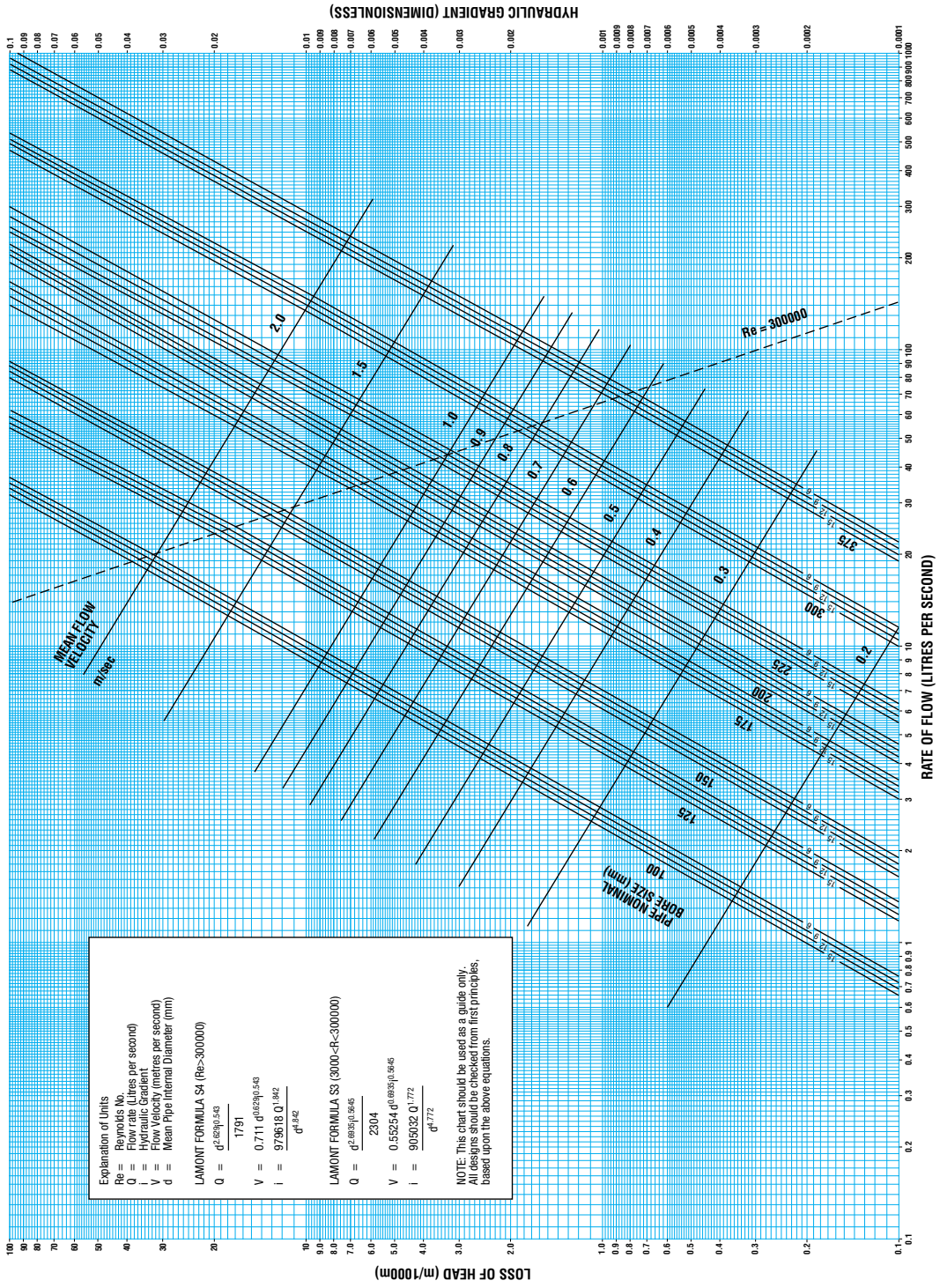
IPLEX NOVAKEY® PVC-U
FLOW CHART

Figure 5.3 Novakey® PVC-U Series 1 Flow Chart



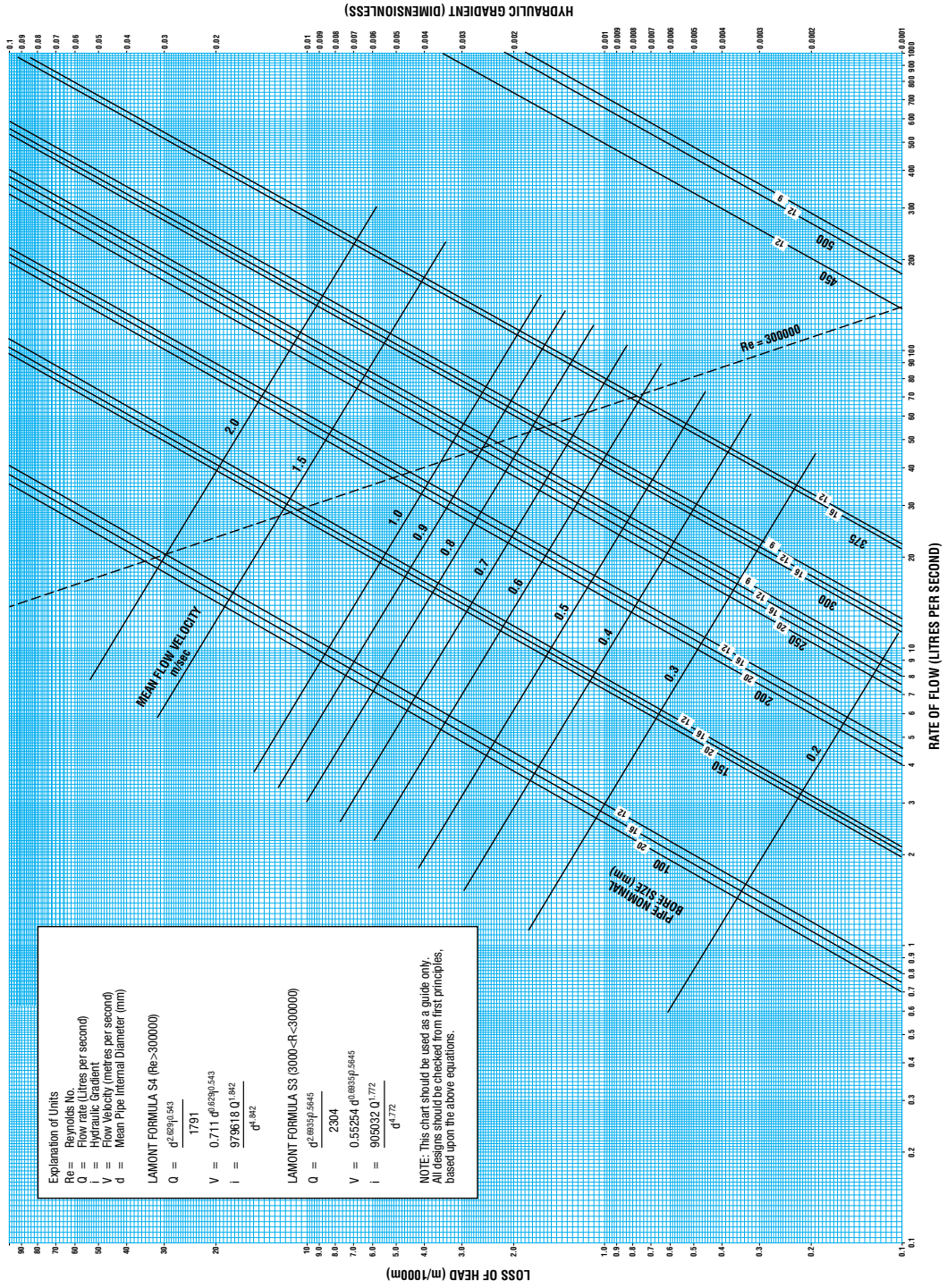
IPLEX WHITE RHINO® (SERIES 1) PVC-M
FLOW CHART

Figure 5.4 White Rhino® PVC-M Series 1 Flow Chart



IPLEX BLUE RHINO® (SERIES 2) PVC-M
FLOW CHART

Figure 5.5 Blue Rhino® Series 2 Flow Chart



IPLEX APOLLO® PVC-O DYNAMIC STRESSES (FATIGUE)

Surge and Fatigue design

Iplex® PVC pressure pipelines can be designed to provide long term performance under dynamic stresses (fatigue) involving cyclic operating pressures, **subject to design in accordance with PIPA Industry Guideline POP101 - PVC Pressure Pipes Design for Dynamic Stresses.**

The designer should take account of the frequency of pressure fluctuations during the life of the pipeline, (ie: number of pressure cycles and the amplitude of each pressure variation). (Figure 5.6)

The amplitude of the pressure change between the maximum and minimum steady state operating pressures plus water hammer effects, when divided by the fatigue cycle factor given in the table below should not exceed the nominal class (PN) pressure rating of the pipe.

In practice the pressure changes in drinking water reticulation systems are seldom of sufficient amplitude and frequency for fatigue to affect pipe class selection, but these pressure changes can be an important consideration for sewer rising mains (Figure 5.7 where frequent pump starts/stops may occur.

The frequency is defined as the number of combined pump start and stop cycles. If an allowance is considered necessary for attenuation of water hammer oscillations, the frequency can then be taken as twice the number of start/stop cycles. (It can be shown mathematically that this is appropriate for the exponential decay typical of pressure surge oscillations.)

Note: Designers are stongly recommended to refer to PIPA Industry Guideline POP101 - PVC Pressure Pipes Design for Dynamic Stresses for more complete information - www.pipa.com.au

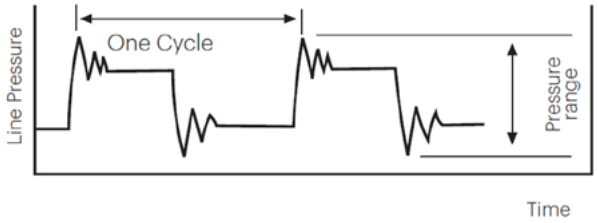


Figure 5.6 Pressure Cycle

Figure 5.7 - DN150 S2 PN16 Iplex Apollo® PVC-O pipe used for a pressure sewer rising main - New Plymouth City, Taranaki

Fatigue load factors for different PVC materials

TOTAL CYCLES	APPROX. NO. CYCLES / DAY FOR 100Y LIFE	FATIGUE CYCLE FACTORS, *f*		
		PVC-U	PVC-M	PVC-O
26,400	1	1	1	1
100,000	3	1	0.67	0.75
200,000	5.5	0.81	0.54	0.66
500,000	14	0.62	0.41	0.56
1,000,000	27	0.50	0.33	0.49
2,500,000	68	0.38	0.25	0.41
5,000,000	137	0.38	0.25	0.41
10,000,000	274	0.38	0.25	0.41

IPLEX APOLLO® PVC-O FATIGUE APPLICATIONS

Selection of PVC-O Pipe Pressure Class and Water Hammer Effects

To select the appropriate pipe class for fatigue loading, the following procedure should be adopted:

1. Estimate the likely pressure range, P, i.e., the maximum pressure minus the minimum pressure.
2. Estimate the frequency or the number of cycles per day that are expected to occur.
3. Determine the required service life and calculate the total number of cycles which will occur in the pipe lifetime.
4. Using the fatigue load factors table on the previous page, find the fatigue cycle factor, ***f***, for PVC-O and the number of cycles.
5. Divide the pressure range by the fatigue cycle factor to obtain an equivalent operating pressure.
6. Use the equivalent operating pressure to determine the class of pipe required.
7. A graphical method for selecting pipe class is shown in Figure 8.10.
8. Refer also to PIPA POP 101 - PVC *Pressure Pipes Design for Dynamic Stresses*.

Water hammer surges and cyclical effects

Water hammer and pressure surge effects in pipes are directly influenced by the Celerity (the speed that the pressure waves travel in the pipe), and the short term Modulus of Elasticity (E) of the pipe material. Water hammer effects are considerably reduced in Iplex Apollo® PVC-O pipe when compared with ductile iron and steel pipe, owing to the much lower Modulus of Elasticity of PVC-O. Typical values of Celerities for PVC-O compared with Ductile iron are shown in the table below.

For more information please contact the Iplex® Technical Services Team on freephone: 0800 800 262.

Water hammer celerity comparison (at 20°C)

MATERIAL	APPROXIMATE CELERITY (M/S)
PVC-O	340
DI	1150

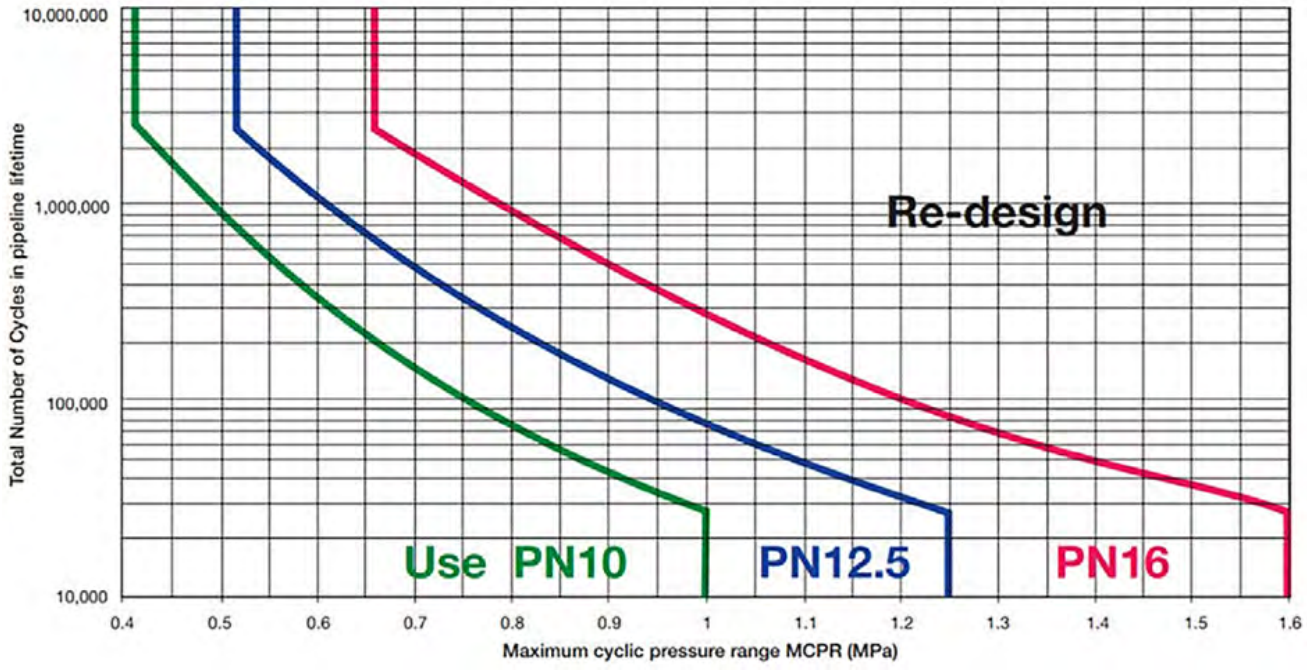


Figure 5.8 Selection of PVC-O Pressure Class Fatigue Applications

IPLEX® PVC PRESSURE PIPELINES
DYNAMIC STRESSES (FATIGUE)

Selection of PVC-M Pressure Class Fatigue Applications
(PIPA POP 101 - PVC Pressure Pipes - Design for Dynamic Stresses)

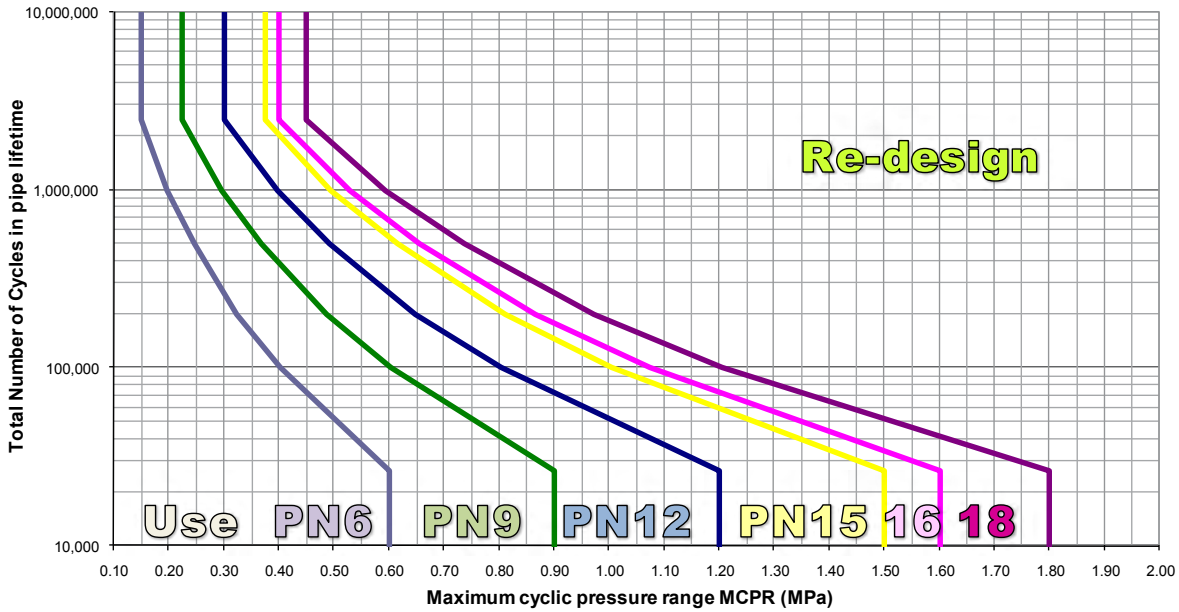


Figure 5.9 Selection of PVC-M Pressure Class Fatigue Applications

Selection of PVC-U Pressure Class Fatigue Applications
(PIPA POP 101 - PVC Pressure Pipes - Design for Dynamic Stresses)

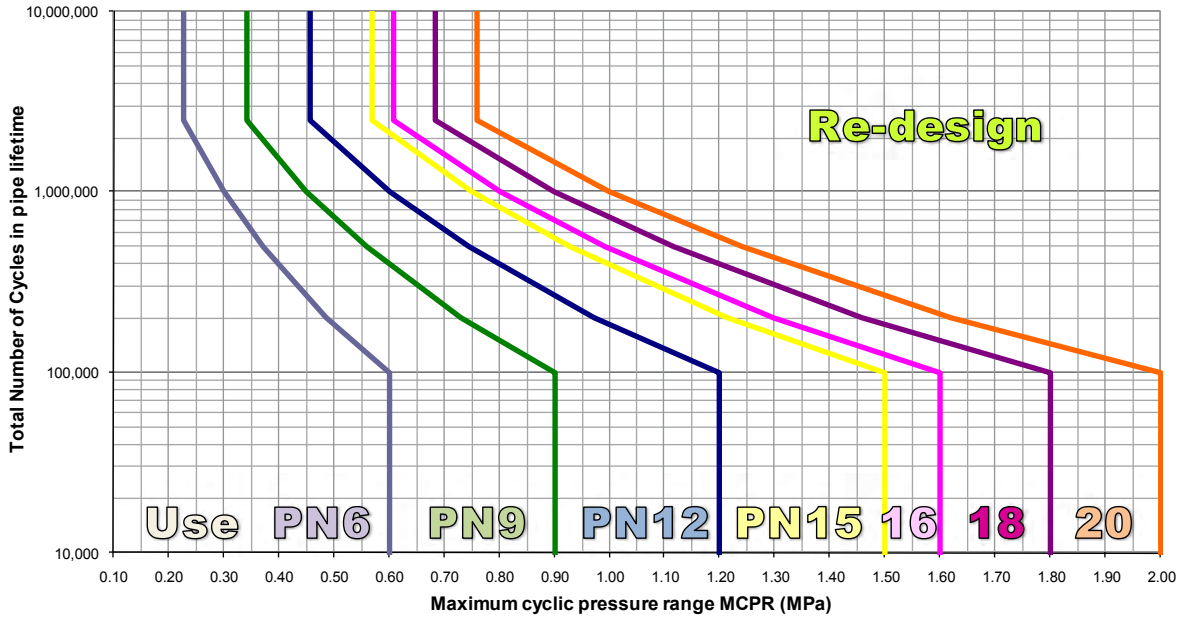


Figure 5.10 Selection of PVC-U Pressure Class Fatigue Applications

IPLEX APOLLO® PVC-O
TEMPERATURE CONDITIONS & THERMAL RE-RATING

Low Temperature Applications

Iplex® PVC pipes for service temperatures above 20°C, provision must be pressure-rerated in accordance wit the table opposite. These rerating factors are the same as for PVC-M or PVC-U.

Low Temperature Applications

Iplex® PVC-U and PVC-M pipes have reduced mechanical performance at low temperatures below 5°C, and should not be used in any service application below 5°C.

When compared with Iplex® PVC-U or PVC-M pipe, Apollo® PVC-O pipe has improved mechanical impact performance in low temperature applications, (Figure 5.11).

Negative Pressure Effects

Calculated using Timoshenko's relationship, and allowing for Poisson's effect.

Where

$$P_{CR} = \frac{2.E}{1-\upsilon^2} \times \left[\frac{t}{D-t}\right]^3$$

P_{CR} = critical buckling pressure (MPa)

E = short term Flexural Ring Modulus

υ = Poissons Ratio = 0.38

D = Pipe Outside Diameter (mm)

t = Pipe wall section (mm)

Thermal re-rating factors

MAXIMUM SERVICE TEMPERATURE (°C)	MULTIPLICATION FACTOR FOR PRESSURE RE-RATING
20	1.00
25	0.94
30	0.87
35	0.78
40	0.70
45	0.64
50	0.58

Figure 5.11 - Installing DN100 S1 PN12.5 Iplex Apollo® PVC-O pipes in sub-zero winter conditions, for a reticulation Water Main, Wanaka, Queenstown Lakes District

STRUCTURAL DESIGN

IPLEX® PVC
FLEXIBLE PIPE STRUCTURAL DESIGN

Iplex® PVC pressure pipes are "flexible" pipes, which means they are designed to de-form or deflect diametrically within small specified limits without structural damage. Iplex® PVC-O pipes have been used for many underground applications under roads, such as Figure 6.1.

The external soil and live loadings above flexible pipes may cause a normal slight decrease in the vertical diameter and an associated slight increase in the horizontal diameter of the pipe. The horizontal movement of the pipe walls in the soil material at the sides develops a passive resistance within the soil to support the external load. That is, the pipeline is influenced by the soil type, density of bedding and surrounding fill, and height of water table. The higher the effective soil modulus at pipe depth, the less the pipe will deflect.

Short term deflections of up to 5% and long term deflections of up to 7.5% are allowable (Ref AS/NZS 2566.2) and will not affect the performance or pressure rating of the pipe. Contact Iplex NZ for further details or refer to AS/NZS 2566.1 "Buried flexible pipelines Part 1 Structural design" . Iplex NZ has developed design software, based upon this Standard which covers all its PVC pipeline materials.

Figure 6.1 - Iplex Apollo® PVC-O, DN150 S2 PN12.5 installed under SH 54, Feilding Town Centre, Manawatu District

Minimum cover heights -AS/NZS 2566

For areas with no traffic loading, a minimum cover height of 450mm to the top of the pipe may be adopted. Under sealed roadways the minimum cover height should be 600mm and under unsealed roadways, 750mm.

Pipe embedment material should have a minimum compaction Density Index of 65% or standard dry density compaction of 90%. After pipes are laid and centred in the trench, the embedment material should be compacted in 200-300mm layers (Figure 6.2) to the specified density. The embedment should continue 80mm to 150mm above the pipe to provide protection from the backfill.

Figure 6.2 - Trench with temporary red index marks on the trench wall to guide backfilling and compaction in 300mm layers

Figure 6.3 - Concrete thrust block with vertical tie bars, supporting an in-line flanged connection between Iplex Apollo® PVC-O and PE pressure pipe at a river crossing, Waitaki District

IPLEX® PVC
THRUST BLOCK DESIGN FOR FITTINGS

For rubber ring jointed PVC pressure pipeline systems, provision must be made to support hydrostatic thrusting forces at changes of size or direction e.g, bends, tees, reducers, valves and closed ends.

In buried installations, fittings are usually restrained by blocks of concrete cast in-situ. These thrust blocks are formed against solid undisturbed ground, (Figure 6.3, 6.5 & 6.6) and sized to distribute the applied force from the fitting into a safe soil pressure I concrete interface. The support required to resist the hydrostatic forces will depend on the pipe diameter, peak operating pressure or test pressure, soil type, fitting type / configuration / angle, and depth. (Refer to Table 6.1 & 6.2)

Where bends are in the vertical plane, in convex position and close to the surface, the mass of a concrete anchor block alone may need to be the restraining force.

AS/NZS 2566.2 and AS/NZS 2032 specify the use of thrust blocks for all in-line gate valves.

Figure 6.4 - Concrete thrust block supporting a three-way valve assembly, on a PVC transmission water main, Timaru City

Figure 6.5 - Installing a concrete thrust block on a DN100, 45 Deg Ductile iron bend, fitted to Iplex Apollo® PVC-O PN12.5 pipe, Southland District

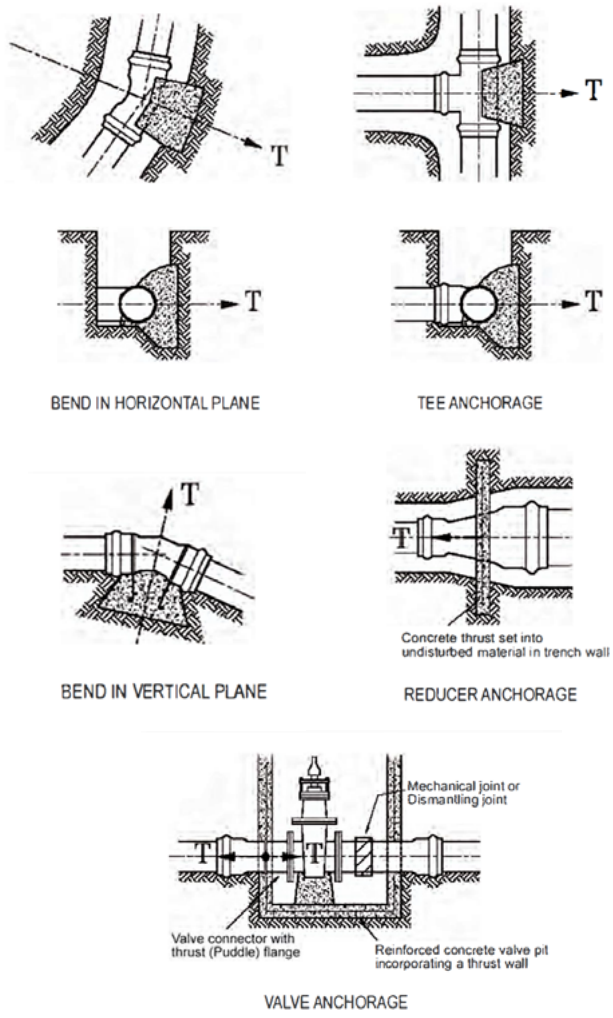


Figure 10.6 - Typical thrust block arrangements (Reference: ASINZS 2566)

Note: Ensure all thrust blocks are in place and fully cured before applying any pressure, including test pressure, to the pipe.

IPLEX® PVC
STRUCTURAL DESIGN & THRUST SUPPORT

Table 6.1 Example (Series 2 pipe OD) of hydrostatic forces (kN) on rubber ring jointed fittings per 10 metres of hydrostatic head

PIPE DN	PIPE OD	BEND 90°	BEND 45°	BEND 22½°	BEND 11¼°	TEE/ CLOSED END/VALVE
100	122	1.62	0.88	0.45	0.22	1.15
150	177	3.41	1.85	0.94	0.47	2.41
200	232	5.86	3.18	1.61	0.81	4.14
250	286	8.91	4.83	2.45	1.23	6.30

Note: For concentric reducers the resultant thrust will be the difference between the "closed end" forces for the two pipe sizes.

Table 6.2 Typical soil bearing capacities (kPa) (apply minimum factor of safety 1.1)

SOIL GROUP DESCRIPTION (AS /NZS 2566.1)	MINIMUM SOIL COVER ABOVE CENTRE LINE OF THRUST BLOCK (M)			
	0.75	1.0	1.25	1.50
GW, SW	57	76	95	114
GP, SP	48	64	80	97
GM, SM	48	64	80	96
GC, SC	79	92	105	119
CL	74	85	95	106
ML	69	81	93	106
OH	0	0	0	0

Thrust blocks must be configured to distribute the hydrostatic force in to a 'wall' of undisturbed soil, which is approximately perpendicular to the imposed load.

The equation for this calculation is:

A= (T/b) x f

Where,

A = Thrust bearing area perpendicular to force (m^2)

T = hydrostatic thrust (kN)

b = soil bearing capacity (kPa)

f = factor of safety (in the order of 1.1 to 1.5)

Example:

Question: A DN250 S2 Iplex® PVC pipeline has a maximum operating head (include field test heads) of 120 metres. What is the minimum thrust bearing area **A** for a thrust block for a 90° ductile iron bend buried with 1 metre cover to the centre-line in a type SC soil?

Solution: From Table 10.1, the hydrostatic thrust 'T ' is 8.91 kN x 12 = 106.9 kN. From Table 10.2, 'b' = 92 kPa.

Therefore:

A= (106.9 / 92) x 1.1 = **1.27 m²**

HANDLING & INSTALLATION

IPLEX® PVC
HANDLING & STORAGE

Iplex® recommends careful pipe handling, to prevent un necessary damage. Pipes and fittings must be lifted, (Figure 7.1 & 7.2) not dropped or thrown onto hard surfaces or impacted by sharp objects, which can gouge or score the pipe. Storage areas should be flat and free of large stones, or rubbish. (Figure 7.3)

Pipe should be stored in the original crates, or on timber dunnage, (Figure 7.2 and 7.3) and stack heights limited to 2.5 m approximately for long-term storage. In direct hot sunlight, pipes may bow slightly due to uneven heating of individual pipe lengths. Bowed pipe may be straightened by rotating 1800 in the sun.

Iplex® PVC pressure pipes can be stored outside for up to 24 months, but for longer term storage, pipes should be protected from direct sunlight, either under cover (Figure 7.4) or with hessian or canvas covers to allow adequate cooling air circulation.

Do not use plastic sheet covers which may heat and damage the pipes.

Socketed pipes should be stacked in layers with sockets "topped and tailed" in the stack and protruding, (Figure 7.3) to avoid distortion.

Mechanical lifting equipment should only use suitable polymer lifting slings (not chains) with dual position lifting points. (Refer Figure 7.2)

When unloading pipes alongside excavated trenches, pipes should be placed on the opposite side of the trench from excavated material.

Figure 7.2 - Mechanical lifting, using two point suspension, and polymer slings, of DN300 Series 1 PN12.5 Iplex Apollo® PVC-O pipe in bulk crates, Timaru City

Figure 7.3 - Temporary storage of DN150 Series 1 Iplex Apollo® PVC-O pipe, in original factory crates on a flat site, near Oamaru, Waitaki District

Figure 7.1 - Handling and unloading of DN150 PN12.5 Iplex Apollo® PVC-O pipe, preventing abrasion damage from the truck deck or by impacting the road surface. - Feilding, Manawatu District

Figure 7.4 - Long term storage, under secure cover for PVC pressure pipe, - Apia, Western Samoa

IPLEX® PVC
CUTTING & CHAMFERING

PVC-O pipes can be cut on site using a fine-toothed handsaw or power driven circular abrasive masonry blade (Figure 7.5 & 7.6). Ensure the cut is made square. Apply a 15° chamfer to the cut section, similar to the factory produced chamfer, (Figure 7.9) before attempting to join the pipes. **Do not remove more than 50% of the pipe wall thickness and ensure the chamfer is evenly formed**, with no sharp edges, which could damage the seal.

Figure 7.5 - Cutting pipe with power-driven masonry blade

Figure 7.6 - Chamfering pipe with power-driven masonry blade

Figure 7.7 - Cutting pipe with power-driven masonry blade

Figure 7.8 - Chamfering pipe with hand file

Figure 7.9 - Hand- chamfered Iplex Apollo® PVC-O pipe spigot

IPLEX® PVC ELASTOMERIC SEAL JOINTING

Socket Cleaning

- Ensure the inside of all pipes, sockets and fittings are completely free of any debris, dirt, grit, and water before joint assembly begins. (Figure 7.10 & 7.11)
- Protect the clean socket from entry of dirt and grit , before joint assembly. (Figure 7.12)

Figure 7.10 - Carefully clear away any dirt from the socket mouth

Figure 7.11 - Totally clean socket, ready for jointing

Figure 7.12 - Protect the clean socket from entry of dirt and grit , before joint assembly

Elastomeric Seal Jointing Method (Factory installed, Anger-lock™ Seal Rings)

1. Do not attempt to remove the Anger-lock™ seal on site. It is locked in place at the factory and is designed to be not dislodged by accident or removed by the installer. Thoroughly wipe out, dry and clean the pipe socket and seal in place. (Figure 7.14) Be sure to remove any dirt behind the seal flap, and from inside the pipe.
2. Ensure the pipe spigot is correctly chamfered and has a clearly visible witness mark at the correct insertion depth. (Figure 7.15) Make the witness mark using a soft pencil, crayon or waterproof felt pen.
3. Apply Iplex® Medlube jointing lubricant with a brush to the pipe seal and to the spigot, fully covering the pipe circumference, including the pipe chamfer, up to the witness mark. (Figure 7.16). Clear a small space under the socket (Figure 7.14) to ensure the lubricated spigot does not touch the trench or pick up any dirt -this will damage the joint performance.
4. Ensure the pipe spigot and socket are axially aligned with one another. (Figure 7.17) If joint deflection is required do not deflect until after joint assembly is completed. Insert the pipe spigot into the pipe socket (Figure 7.18) and pust in until **the witness mark remains just visible**. (Figure 7.21) Re-adjust correctly to the witness mark after assembly if necessary. In this position, clearance is automatically provided to allow for normal thermal expansion and contraction, seismic resilience and axial rotation. Jointing may be assisted by using a crowbar and protective wooden block across the pipe end. (Figure 7.19)
5. **Do not use a moving excavator bucket to assist with joint assembly** as this may damage the seal ring.
6. The pipe socket should be restrained with bedding or with a jointing fork during joint assembly, (Figure 7.20) to ensure joints assembled previously, are not pushed past their witness mark as the next joint is made.

Elastomeric Seal Jointing Method (Z JointSeal Ring)

Z Joint seal rings are used in some smaller pipe sizes, which can be hand fitted on-site.

1. Thoroughly wipe out, dry and clean the empty pipe socket.
2. Be sure the pipe spigot is correctly chamfered and has a clearly visible witness mark at the correct insertion depth. Ensure that the Z ring is dry and clean. Be sure there is no lubricant in the empty socket.
3. With the fingers, form a heart shaped fold in the seal to reduce the ring diameter then place it in the ring groove. Install with the flap facing into the socket. Smooth firmly round the seal until it seats positively in the ring groove.

IPLEX® PVC INSTALLATION

Figure 7.14 - Thoroughly clean seal ring and socket interior. Clear a small space under the socket to ensure the lubricated spigot does not touch the trench or pick up any dirt

Figure 7.15 - Check witness mark

Figure 7.16 - Apply Medlube lubricant to both the seal and the spigot with a clean brush

Figure 7.17 - Align the lubricated spiot with the socket mouth

Figure 7.18 - Insert aligned lubricated spigot into socket

Figure 7.19 - Push pipe spigot into the socket through the seal ring using a bar, and wood block to protect the pipe end. DO NOT INSERT PAST THE WITNESS MARK

Figure 7.20 - Positioning of pipe jointing fork

Figure 7.21 - Push joint home until witness mark remains just visible

IPLEX® PVC JOINTING LUBRICANT

Jointing lubricant for Anger-lock™ elastomeric seal joints

Iplex® Medlube is a lubricant for potable water pressure applications where a bactericidal feature is necessary.

Table 7.1 Average number of joints per litre of Iplex® Medlube (estimate only)

NOMINAL PIPE DIAMETER	NOMINAL PIPE DIAMETER APPROX NO. OF JOINTS PER LITRE
100	70
150	50
200	40
225	35
250	30
300	25

Jointing "clearance holes" should be locally excavated in the bedding for pipe sockets to ensure the pipes are evenly supported along their full length. (Figure 7.14)

Bedding aggregate in direct contact with the pipe should be compactable material **not exceeding 20mm size** (eg AP 20 or GAP 20) and generally comply with AS/NZS 2566 and AS/NZS 2032. Bedding should be evenly distributed, to fully surround the pipe (Figure 7.22 & 7.25) and be thoroughly compacted beside the pipe (Figure 7.23) before placing backfill above the pipe.

Mechanical couplings and flanged joints, should be left exposed if possible until the pipeline is pressure tested. Ensure that all thrust blocks are in place and fully cured before field pressure testing. Pipe should not be left uncovered. Pipe flotation may occur, in the event of rainfall and water pooling in trench unless it is backfilled with compacted fill to a height of at least 1.5 x diameters above the pipe.

The method of placing the remainder of the trench backfill will depend on whether the pipeline is located in an area with no traffic loading or under a roadway.

In a roadway it is normal practice to continue backfilling and compacting in 300mm layers, with suitable backfill material up to pavement level. Heavy mechanical compaction of trench fill should not commence without at least 300mm of compacted backfill covering the pipeline.

Figure 7.22 - Typical placement and "blinding": of granular bedding and surround material

Figure 7.23 - Side compaction of granular bedding and surround material with a trench shield - the side compaction zone is below the shield, directly against the trench wall

IPLEX® PVC INSTALLATION

Figure 7.24 - Trench bottom in stoney ground, evenly cut to grade and depth before placing the bedding aggregate. Waitaki District

Figure 7.25 - Placing the selected size imported bedding aggregate, fully surounding the pipe, Waitaki District

Figure 7.26 - Showing correct position of pipe, fully surrounded by selected size imported bedding aggregate, with all other larger size "as dug" aggregate, above the bedding , totally excluded from direct contact with the pipe, Waitaki District

The correct sequence of backfill actions includes placement and compaction of the bedding, under the pipe and secondly, beside and surrounding the pipe barrel, BEFORE placement and compaction of trench backfill above the bedding zone.

(Refer this picture of a DN200 S2 PN16 Iplex Apollo® PVC-O trunk watermain, being installed south of Oamaru, for the correct installation sequence with PVC pipe).

Bedding placement and compaction UNDER the pipe

Bedding placement and compaction BESIDE the pipe

Bedding placement and compaction ABOVE the pipe

Trench backfill placement and compaction in layers, ABOVE the bedding zone

Installation of PVC pipe in very stony ground, with carefully selected and placed bedding and surround material to protect the pipe from point loading.

IPLEX® PVC
INSTALLING PIPE ON A CURVED ALIGNMENT

The tolerances on the PVC-O socket shape and rubber ring can allow up to approximately 1° to 1.5° deflection, when assembled to the witness mark.

In addition, Iplex® PVC pipes are flexible enough to allow limited curvature along the pipe length between the joints.

Iplex® PVC-U & PVC-M pipes

The minimum recommended radius of curvature for Iplex® PVC-U and PVC-M pipes is 300 x pipe OD.

Iplex® PVC-O Pipes

The minimum recommended radius of curvature for Iplex Apollo® PVC-O is 200 x pipe OD.

Pipes should always be joined in a straight line before changing to the curved construction alignment required. Curved alignment should be even along the pipeline length. (Figure 7.27, 7.28, 7.29 & 7.30)

Do not drill holes into any PVC pipe or install tapping bands with a drilled hole, on any curved sections of pipeline.

Where the required pipeline radius of curvature is less than recommended above, Ductile Iron "Universal" mechanical couplings (Section 4) or Ductile Iron bends (Section 4) may be used.

PVC Expansion and contraction

A 6-metre length of PVC pipe will expand or contract approximately 4.8 mm for each 10°C rise or fall in temperature. Slight temporary thermal distortion or bending can occur in pipes laying in direct sunlight. When one side of the pipe is hotter than the other it may develop a slightly bent shape. which may make jointing difficult. Common practice is to rotate pipes 180°, to offset any uneven temperatures within the pipe. Plastic pipe will contract as it cools, after laying in hot weather. Seal ring joint systems can allow for thermal movement of the pipeline, providing they are not inserted past the witness mark.

Figure 7.27 - DN300 Iplex Apollo® PVC-O Series 1 PN12.5 watermain in 6m lengths, following a curved road allignment, Westland District

Figure 7.28 - DN300 Iplex Apollo® PVC-O Series 1 PN10 watermain in 6m lengths, on a curved allignment, Hawkes Bay District

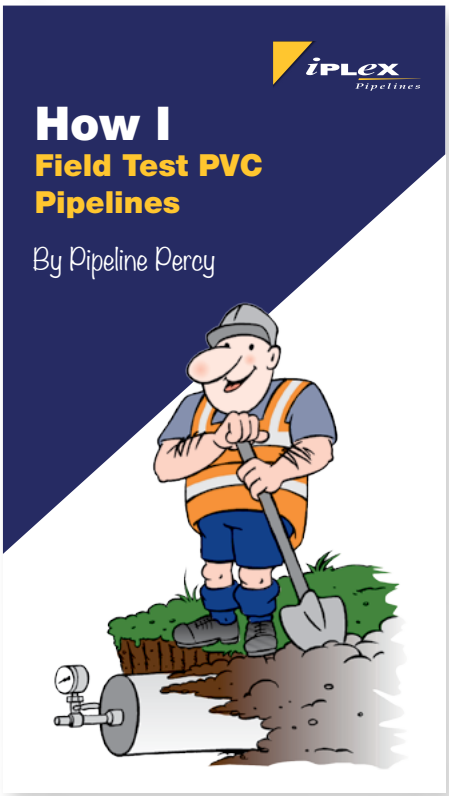
Figure 7.29 - DN150 Iplex Apollo® PVC-O Series 1 PN10 watermain, in 6m lengths, on a curved allignment, Hawkes Bay District

Figure 7.30 - DN100 Iplex Apollo® PVC-O Series 1 PN12.5 waste water transmission main, in 6m lengths, on a curved allignment, Gisborne District

Construction of Apollo® PVC-O watermain in a regional highway, Waikato District.

IPLEX APOLLO® PVC-O
FIELD TESTING PVC PIPELINES

The relevant test procedures and methods of NZS 4404:2010 - Land development and Subdivision Infrastructure, Appendix C, or of AS/NZS 2566.2 "Buried flexible pipelines, Part 2: Installation" are recommended for Iplex® PVC-O, pressure pipes. The test pressure should not be less than the maximum design pressure and must not exceed 1.25 x the PN pressure class rating of the pipe, at any point along the pipeline. Refer also to the Iplex® PVC field test guidelines at www.iplex.co.nz - Resources - How to Guides



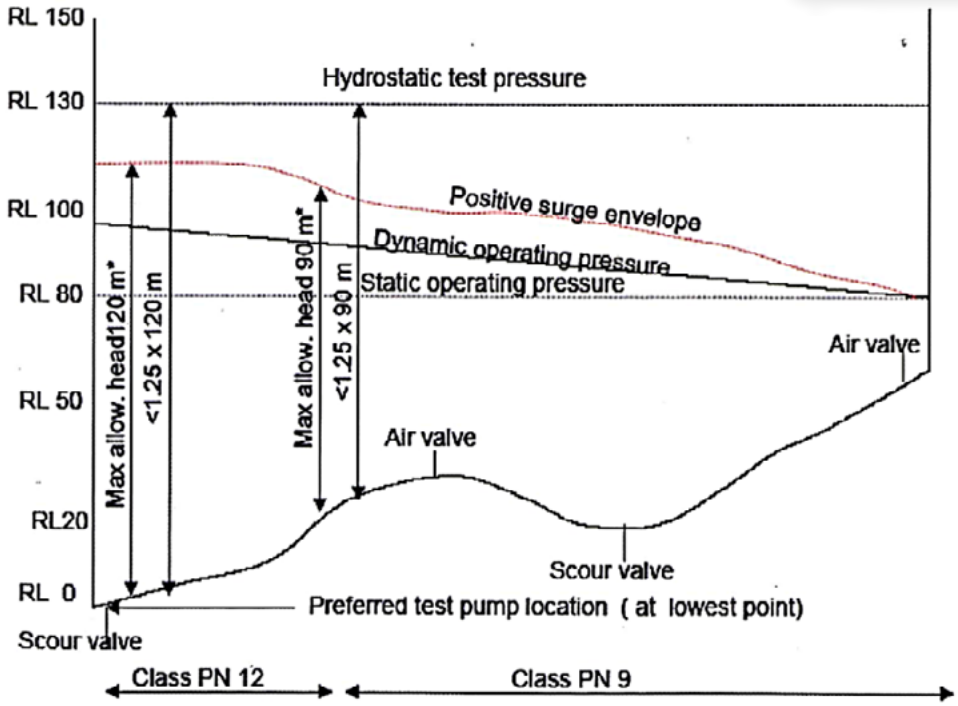


Figure 7.31 - Longitudinal section of pipeline for determining appropriate hydrostatic test pressures

IPLEX APOLLO® PVC-O
PRESSURE TESTING EQUIPMENT

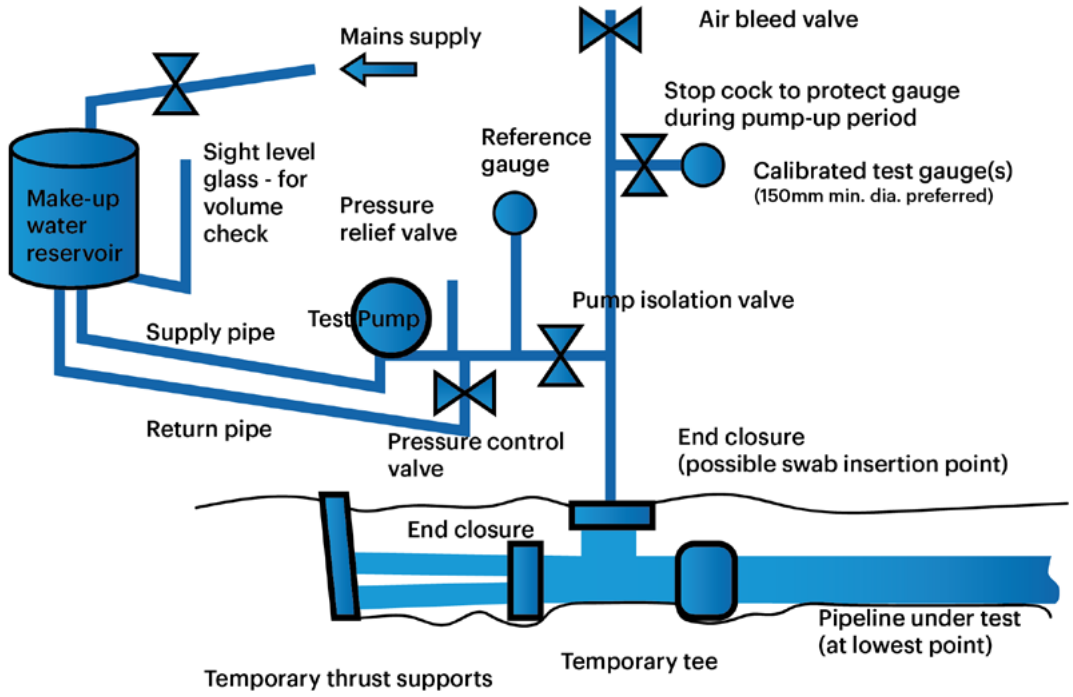


Figure 12.2 - Typical arrangement of pressure test equipment

WARNING:
High pressure air testing is never to used for safety reasons, as the energy stored by compressed air can be destructive and life threatening if released accidentally.

SEISMIC PERFORMANCE

IPLEX® PVC SEISMIC PERFORMANCE

The major Canterbury area earthquake sequence of 2010 to 2012 severely tested buried pipes in the region. PVC pressure pipes and fittings systems with rubber ring joints were generally found to perform well when compared with other non plastic pipe materials, and continue as a solution for new development projects, in the Canterbury region. Iplex® PVC pipes with rubber ring joints have delivered resilient performance in New Zealand seismic events, including the Christchurch (2011,) and Kaikoura (2016) events.

Refer:

- Iplex® NZ website - Resources / Case Studies

Contact Iplex® Pipelines for more information on pipeline seismic performance.

Iplex Apollo® PVC-O DN200 PN12.5, pressure sewer main, installed in Charles St, Kaiapoi, October 2010, which endured the February 2011 Christchurch Earthquake sequence, and all following aftershocks undamaged.

Iplex Apollo® Blue PVC-O PVC-O DN150 PN16 pressure watermain, installed in Kelburn Parade , Wellington City, in 2011, specifically to improve seismic resilience in the area, which endured the November 2016 Kaikoura/ Culverden Earthquake sequence, undamaged.

Iplex Novakey® DN450 PVC-U pressure sewer rising main, laid near Belfast, Christchurch in 2005, which endured the 2011 Canterbury earthquake sequences, undamaged.

Iplex® PVC-U DN450 sewer main installed in Te Anau 2001, to replace a earthquake damaged concrete pipeline, and which has endured all earthquakes in the area since, undamaged.

QUALITY MANAGEMENT

IPLEX®
QUALITY MANAGEMENT SYSTEMS

Quality Assurance

Supplying products of consistently high quality is at the forefront of what we do at Iplex®, and central to our customer promise that Iplex® product quality meets or exceeds standards claimed.

All Iplex® manufacturing plants operate under a strict ISO 9001 Quality Management System (QMS). External certifying bodies carry out regular audits to provide third-party certification of the Company's QMS. Continued third-party product certification of Iplex® plastic pipeline products to relevant Australian & New Zealand standards, is also provided by these bodies.

The Iplex® laboratory is an IANZ accredited facility, providing added assurance that any measurement and testing is carried out professionally and in a technically reliable manner in accordance with international standards.

APPLICABLE STANDARD	LICENCE TYPE	LICENCE NUMBER	CONFORMITY ASSESSMENT BODY
ISO 9001:2015	QMS Accreditation	QEC4169	SAI Global
ISO/IEC 17025:2017	IANZ Accreditation	NUMBER 61	IANZ
BEST ENVIRONMENTAL PRACTICE-PVC	BEP-PVC	SPROD40057	SAI Global
AS/NZS 1254:2010	StandardsMark™	SMKP20126 & SMKP20180	SAI Global
AS/NZS 1260:2017	StandardsMark™	SMKP20184, SMKP20185 & SMK1305	SAI Global
AS/NZS 1260:2017	WaterMark	WM 26953	SAI Global
AS/NZS 1477:2017	StandardsMark™	SMK02569 & SMKP20181	SAI Global
AS/NZS 1477:2017	WaterMark	WM 26954	SAI Global
AS/NZS 4130:2018	StandardsMark™	SMKP20400	SAI Global
AS/NZS 4130:2018	ISO Type 5	AMI 74891	Approval Mark International
AS/NZS 4441:2017	StandardsMark™	SMKP20682	SAI Global
AS/NZS 4765:2017	StandardsMark™	SMK02570	SAI Global
AS/NZS 61386.21:2015	S-Mark	LIC 2901 & LIC 2910	Bureau Veritas

IPLEX® PIPELINES NZ
THE COMPANY

Iplex® is one of New Zealand's leading manufacturers and suppliers of plastic pipeline systems. Iplex® provides products and services throughout New Zealand and to export markets around the Pacific and other international markets. Iplex® has manufacturing operations in Palmerston North, Christchurch and Ashburton, as well as access to the Iplex® Australian network.

Iplex® New Zealand have been manufacturing plastic pipelines in New Zealand since 1962.

Plumbing: The Iplex® plumbing sector covers pipes and fittings used within the property boundary. This includes reticulation of potable and non-potable water, sanitary plumbing, wastewater, drainage and gas reticulation. Iplex® have the capabilities of supplying drain, waste and vent pipes and fittings, rainwater systems, traps and accessories.

Civil: Iplex® provides a wide range of solutions for wastewater, drainage and potable water pipeline projects. Manufacturing both PE (Polyethylene) & PVC (Polyvinylchloride) for both pressure and non-pressure (gravity fed) pipeline systems including civil infrastructure, drainage systems and roading systems.

Iplex® also services the following industry sectors:

Energy and Communications: an important sector for Iplex® NZ and there is a wide range of conduits, ducts and fittings available for new development and maintenance projects. The range covers electrical, communication and gas.

Rural: Iplex® also service the rural market providing pipes and fittings for rural use. Iplex® provide systems for irrigation, stock water, land drainage, culverts and farm dairy effluent.

Iplex Pipelines manufacturing plant and distribution hub in Palmerston North, New Zealand.

IPLEX® PVC PRESSURE SYSTEMS DESIGN AND INSTALLATION GUIDE, NOVEMBER 2025

LIMITATIONS

The information contained in this document is current as at November 2025 and is based on data available to Iplex® Pipelines NZ Ltd at the time of publication

All photographic images are intended to provide a general impression only, and should not be relied upon as an accurate example of Iplex® Pipelines NZ Ltd products, installed in accordance with this document or the referenced compliance documents.

This publication replaces all previous editions of the Iplex® PVC Pressure Systems Design & Installation Guide. Iplex® Pipelines NZ Ltd reserves the right to change the information contained in this document without prior notice. It is your responsibility to ensure that you have the most up to date information available. You can call toll free on 0800 800 262 or visit www.iplex.co.nz to obtain current information.

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TRADEMARKS

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