PVC-O PRESSURE PIPE

Apollo™

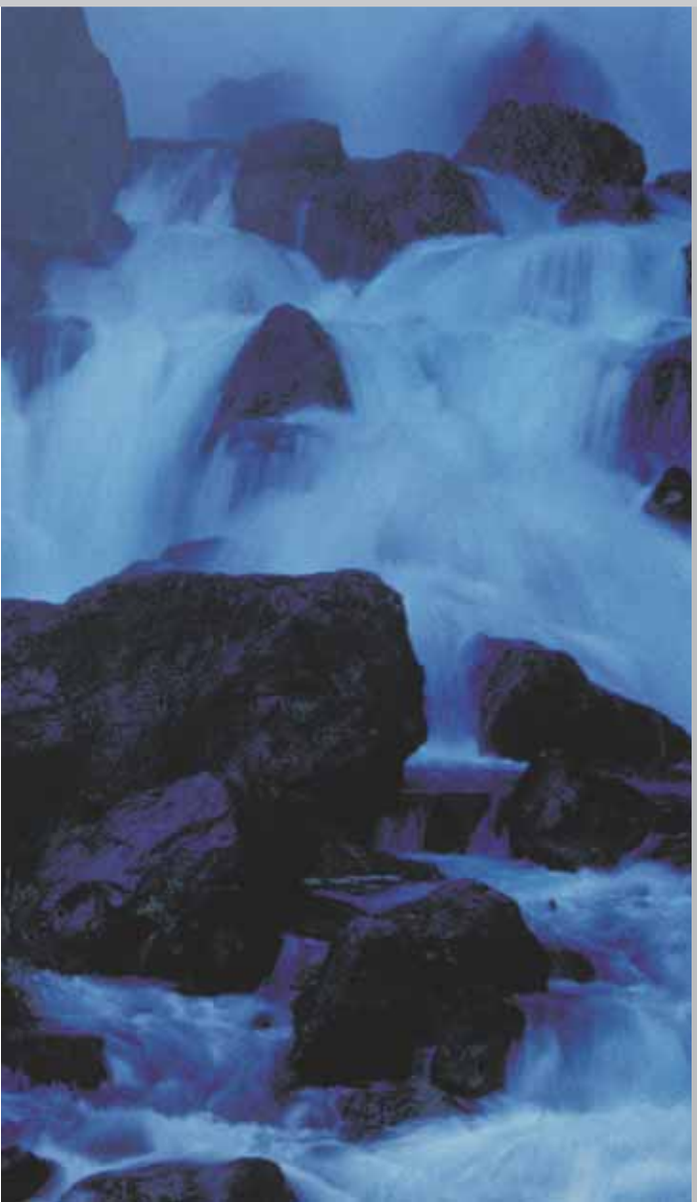
iPLEX Pipelines

Sustainable ... Enduring

The Principal Pipeline Asset

PVC-O PRESSURE PIPE

Apollo™



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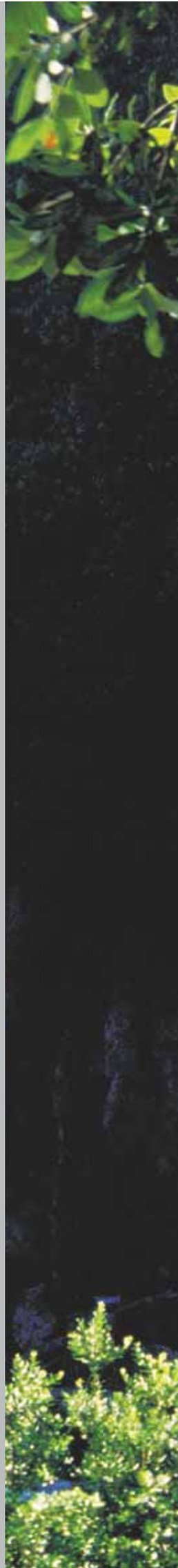


Apollo PVC-O Introduction and Origin

Iplex **Apollo™** PVC-O is a biaxially orientated PVC pressure pipe, for use in water and waste water infrastructure pipelines. Iplex manufactures Apollo using two new processes known as *biaxial extrusion* and *super socketing*, both of which are patented. This method of production results in an exceptionally tough, high performance thermoplastic pipe with greatly enhanced physical characteristics. Increased hydraulic capacity is possible with Apollo owing to its exceptionally smooth, enlarged bore. Apollo has greater impact resistance, higher ductility, improved fatigue resistance and reduced weight when compared with traditional Iplex PVC-U pipes.

Oriented PVC pipe manufacture was first developed by Yorkshire Imperial Plastics in the UK during the 1970s. It was found that by orienting the molecular structure of extruded PVC material in the circumferential direction, in a pipe wall at elevated temperatures, there was a marked improvement in its physical properties; especially hoop strength. Further development has been carried out by Wavin UK. Their latest process uses biaxial orientation, that is, a combination of radial and longitudinal expansion, to enhance the overall pipe performance. Arising from a technology sharing arrangement, Iplex is now in a position to introduce this more advanced technology to the New Zealand and Australian markets.

Iplex uses the latest equipment for the manufacture of Apollo™.

Applications for Apollo PVC-O Pressure Pipe

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

To readily distinguish between pipeline applications Apollo pipes may be colour coded.

Normally, Apollo Series 1 is coloured white, and ApolloBlue Series 2 is coloured blue. Other colours such as purple for recycled water and cream for pressure sewage must be specified at the time of ordering, and are subject to production availability.

White colour has been widely accepted and used for PVC sewer rising mains in New Zealand, when accompanied by appropriate identification tape marking above the pipe. Cream is another option for PVC-O pressure sewers to be included in AS/NZS4441.

Iplex ***do not recommend blue for sewer applications****, for obvious asset identification reasons.*

Apollo Manufacture and Biaxial Orientation

Processing for Molecular Orientation

PVC polymer molecules are extremely long, resembling long intertwined woollen threads with their shape comparable to balls of wool. They form the building blocks of the pipe.

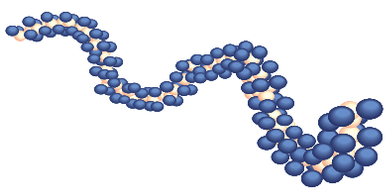


Figure 1: Short piece of a polymer molecule.

Figure 1 shows a model of a polymer molecule which on stretching would start to straighten but ultimately further stretching would result in rupture.

When a polymeric pipe is extruded in the traditional way a more or less spherical shaped molecular structure results. If the pressure capability is to be increased the pipe wall has to contain more building blocks (i.e. molecules) in the direction of the principle stress. Normally for higher design pressures, the wall of the pipe is made thicker to incorporate these additional building blocks.

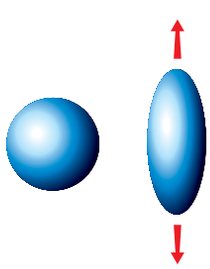


Figure 2: The diameter of the sphere decreases when stretched.

By stretching the pipe in the correct way the spherical polymer molecules are reshaped or oriented to the longitudinal direction. Because the cross section has become smaller, the oriented molecules now fit into a thinner wall section of pipe (Figure 3).

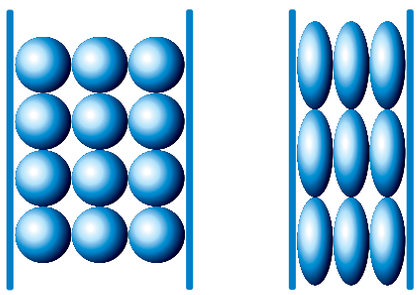


Figure 3: The oriented molecules now fit into a thinner wall section of pipe.

Biaxial Orientation

Biaxially oriented or “drawn” pipe is where both pipe circumference and length are extended after extrusion. Strength enhancement is achieved by drawing to elongate the PVC molecules, realigning them into the preferred directions.

If pipe stretching were done immediately behind the die-head where the temperature is approximately 190°C there would be no beneficial effect. The stretching process must take place at a temperature level where the PVC molecules can be distorted, but still low enough to freeze them immediately so as to keep their oriented shape. In other words drawing takes place at the lowest temperature possible, just above the molecular freezing point of about 85°C for PVC, to ensure the orientation remains permanent.

Figure 4: Wall cross-section of “pre-form” pipe with a small diameter and a large wall thickness being stretched circumferentially and axially into a pipe with larger diameter and a thinner wall.

An additional benefit of this process is the exceptionally smooth pipe bore which results from the “finishing” of the pipe bore as it is pulled over the polished steel expansion cone.

Apollo Standards Compliance / Design MRS

Pipe Standards

Apollo™ PVC-O pipe complies with Australia/New Zealand Standard AS/NZS 4441 "Oriented PVC (PVC-O) pipes for pressure applications".

Apollo PVC-O pipes are independently cerified in accordance with the test requirements of AS/NZS 4441 under Standards Mark License number SMKP20682.

Quality Endorsed Company

Australian Standard

Apollo pipe is also manufactured under third party accredited quality assurance programs complying with AS/NZS ISO 9001, License No. QEC 4169.

Design Material Class and Pressure Class (PN)

Iplex has chosen to manufacture **Apollo™** PVC-O using four *design material classes*. These are 315, 355, 400 and 450.

The Design material class is related to the *Design MRS* value and to the *maximum allowed working pressure (PN)*, as shown in the pipe specification chart below.

To simplify pipe selection, Apollo Series 1 and ApolloBlue Series 2 are each available in only two PN classes.

These are either PN 12.5 or PN 10 for Apollo Series 1, and either PN 16 or PN 12.5 for ApolloBlue Series 2.

The resulting actual pipe stiffnesses are ideal for urban reticulation purposes where pipes may be laid, either at minimum covers, or at depth, under road pavements.

Apollo PVC-O PRESSURE PIPE		DESIGN MRS (MPa)	Design Material Class	Maximum working pressure @ 20° C (m head)	Maximum working pressure @ 20°C (PN)
Apollo	Series 1 PN 12.5	40 MPa	400	125	12.5
	Series 1 PN 10	31.5 MPa	315	100	10
ApolloBlue	Series 2 PN 16	45 MPa	450	160	16
	Series 2 PN 12.5	35.5 MPa	355	125	12.5

AS/NZS 4441 allows manufacturers to choose from five material classifications with minimum required strengths (MRS) at 50 years ranging from 31.5 MPa (Material class 315) to 50 MPa (Material class 500).

Product Data and Range

Apollo Product Range - Dimensions / Design MRS

Nominal Size (DN) mm	Nominal Pressure Class (PN) Bar	Mean Outside Diameter (D_n) mm	Mean Inside Diameter mm	Mean Wall Thickness (e_n) mm	Design MRS (MPa)
Apollo Series 1 Metric Pipe					
DN100	10	114.25	108.2	3.0	31.5
DN150	10	160.25	151.6	4.3	31.5
DN200	10	225.35	213.5	5.9	31.5
DN300	10	315.50	299.1	8.2	31.5
DN100	12.5	114.25	108.2	3.0	40.0
DN150	12.5	160.25	151.6	4.3	40.0
DN200	12.5	225.35	213.5	5.9	40.0
DN300	12.5	315.50	299.1	8.2	40.0
ApolloBlue Series 2 Imperial Ductile Iron OD					
DN100	12.5	121.90	114.5	3.7	35.5
DN150	12.5	177.40	166.8	5.3	35.5
DN200	12.5	232.25	218.4	6.9	35.5
*DN225	12.5	259.30	244.1	7.6	35.5
DN250	12.5	286.25	269.4	8.4	35.5
*DN300	12.5	345.45	325.2	10.1	35.5
DN100	16	121.90	114.5	3.7	45.0
DN150	16	177.40	166.8	5.3	45.0
DN200	16	232.25	218.4	6.9	45.0
*DN225	16	259.30	244.1	7.6	45.0
DN250	16	286.25	269.4	8.4	45.0
*DN300	16	345.45	325.2	10.1	45.0

***Subject to minimum order quantity and availability.**

Note 1: Mean Internal diameter ID = $D_n - (2 \times e_n)$

Note 2: The effective length of all pipes is 6 m

Note 3: Design E modulus is 4000 MPa

Note 4: Design coefficient = 1.6

Pipe Colour Coding

To readily distinguish between pipeline applications, Apollo pipes may be colour coded. Normally, Apollo Series 1 is coloured white, and ApolloBlue Series 2 is coloured blue. Other colours such as purple for recycled water and cream for pressure sewage must be specified at the time of ordering, and are subject to production availability.

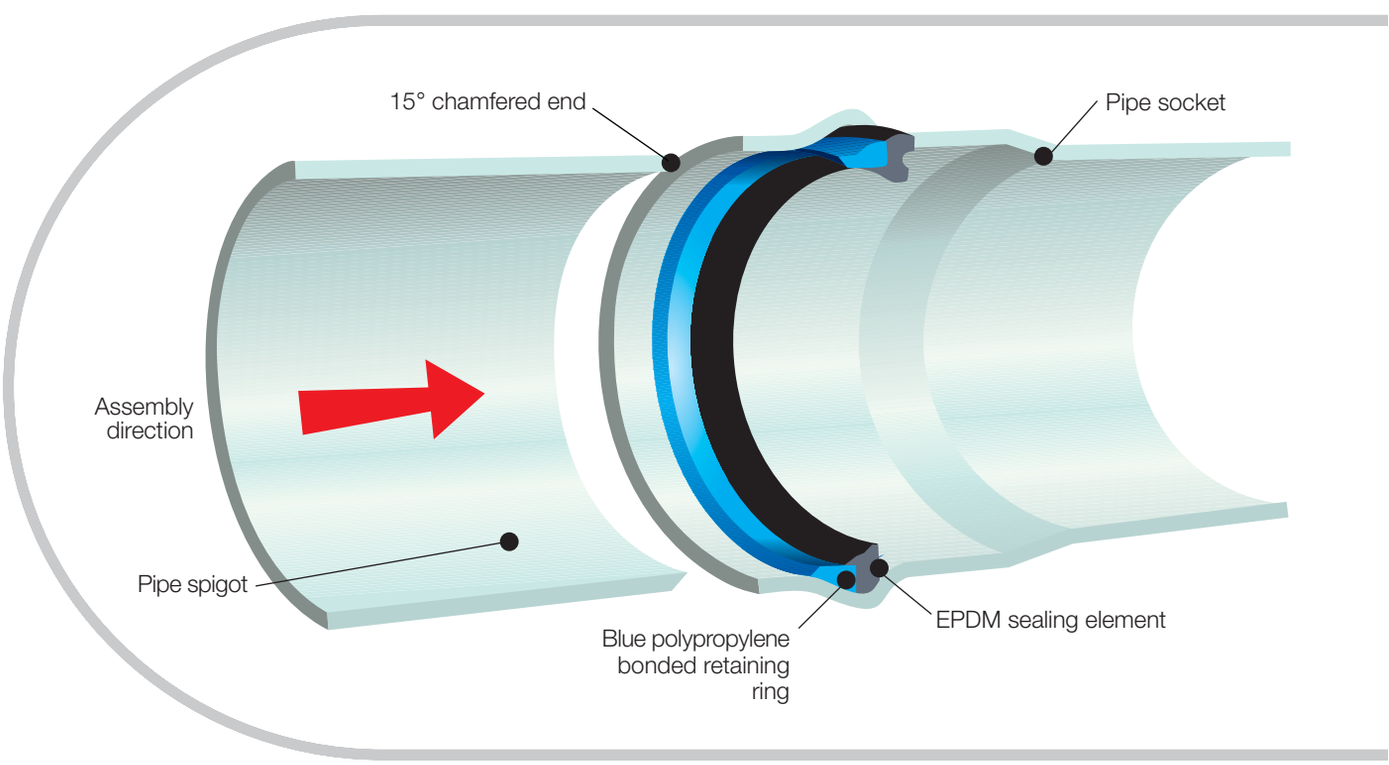
Refer also to page 3.

BLUEseal Joint System

BLUEseal is a high performance, factory fitted EPDM rubber ring which provides security and ease of jointing (Super socketing patents apply, Australian patent situation A 01 286 329 and World: 0209926).

BLUEseal utilises the Forsheda Anger-lock™ EDPM rubber seal ring, a combined lip and compression seal that is positioned and locked inside the socket, at the time of manufacture. The seal design comprises an EPDM rubber sealing element, *bonded* to a distinctive blue coloured polypropylene retaining ring that holds the seal securely in position during transport and pipe joint assembly. Tool-assisted removal or installation in the field is possible in special circumstances.

The seals comply with BS EN 681 and have a UK Kitemark. Parts 1 and 3 of AS 1646 “Elastomeric seals for waterworks purposes” takes account of BS EN681. Test regimes used to certify the BLUEseal joint include those of ISO 13846 for pressure, ISO 13844 for vacuum performance and AS/NZS 4020 for drinking water applications.



Advantages of Apollo

Apollo pipe has increased strength, toughness and ductility which permits the use of a higher design stress, with improved overall performance, compared with traditional Iplex PVC-U or PVC-M pressure pipe, of equivalent/similar PN class. Apollo's larger bore can reduce pumping costs or, for the same head there will be greater flow carrying capacity than would be the case for the equivalent Iplex PVC-U or PVC-M pipe. These advantages can be summarised as follows:

Features	Benefits
PRESSURE CLASS Only two pressure classes per diameter Series	Simplifies pipe selection.
DIAMETERS Series 1 Diameters Series 2 Diameters	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
IMPACT STRENGTH Higher Impact strength, toughness and ductility compared with Iplex uPVC pressure pipe (higher impact mass, and test conducted at zero Deg C)	Improved resistance to accidental impact during handling and installation.
FLOW CAPACITY Increased internal diameter and flow capacity	Has a significantly larger bore and associated higher flow capacity compared with Iplex PVC-U and PVC-M of the same Series, and equivalent or similar PN class and diameter
SEAL RING LOCKED IN POSITION Factory fitted EPDM jointing seal ring "locked in the socket" with bonded blue coloured polypropylene retaining element	Eliminates potential seal ring displacement during joint assembly.
PIPE STIFFNESS	Pipe stiffness has been optimised to withstand both radial and axial loadings, together with internal vacuum in normal buried applications.
FATIGUE RESISTANCE	Provides extended fatigue resistance when designed according to PIPA Fatigue guidelines
DURABILITY Excellent internal/external corrosion resistance	Normal pipe asset design life of at least 100 years for Principal Watermains and Principal Pressure sewer pipelines, in accordance with relevant WSAA Codes. (WSA 02 and WSA 03)
LIGHT WEIGHT PIPE Apollo is lighter in weight than Iplex PVC-U or PVC-M of the same OD size and similar pressure class	Relative improvements in ease and cost of transportation, handling and installation

Sustainability

Iplex **Apollo™** PVC-O, is a sustainable infrastructure pressure pipeline asset.

It has **low Embodied Energy**, can utilise **re-processable PVC** from its manufacture, and **is fully recyclable** at the end of its service life.

Apollo's **light weight** requires relatively **less non-renewable energy** (eg ; diesel) during transportation. Light weight also means significantly **more length of pipes per tonne of raw material** can be produced, compared with almost any other pressure pipe of similar diameter and pressure class

Apollo has **no additives containing toxic heavy metal compounds**, such as lead based materials. This actively **prevents more of these compounds entering the environment**, and positively **reduces industry demand for these compounds**, upstream of the manufacturing process.

Apollo manufacture produces **less greenhouse gases**, than for traditional non-plastic pressure pipe manufacture. Recycled cooling water resources are used during production.

Apollo is **chemically inert.** There is **no corrosion or chemical or gas emissions** during its normal long service life as a public watermain or sewer.

Apollo is also **extremely durable**, meaning that the **one-off energy consumption** in manufacture to create the pipe asset, is only required to be used once, possibly up to every 100 years if installed and operated according to the relevant codes and standards.

Refer also to the PIPA website
www.pipa.com.au/environment

Embodied Energy

Embodied Energy

Construction industries are starting to embrace concepts of Life Cycle Analysis (LCA) and Whole of life Costing (WOLC). **Embodied Energy Analysis (EEA) is a method of comparison of the total energy used to manufacture and install different materials.**

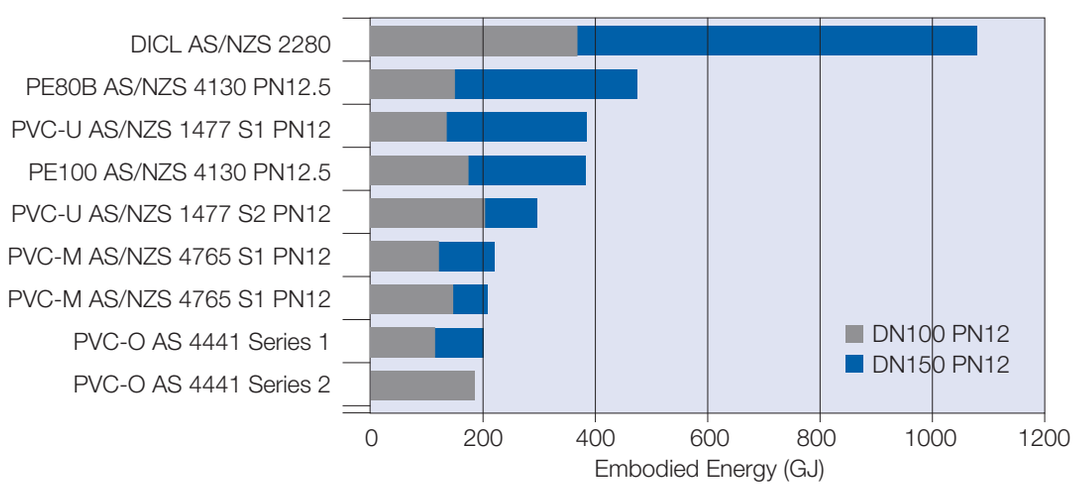
The manufacture of various pipes utilises different processes and materials, with differing energy requirements. Identifying how much total energy is needed, should account for the direct energy needs of the actual manufacturing process, as well as the indirect energy that comes from all the associated processes that contribute to creating a pipe.

This energy is called Embodied Energy, and can be used to determine the overall energy impact of a particular piping system.

The recent published study by CSIRO in Australia "Piping Systems Embodied Energy Analysis" has demonstrated the significant reduction in embodied energy for PVC-O pipes compared to other pipe materials, based upon the same hydraulic performance conditions.

Example of Embodied Energy Comparison

Chart based on Scenario 1 Figure 1 for PVC-O pipe, refer www.pipa.com.au/environment (Embodied energy)



Note: This graph is sourced from the Plastics Pipeline Industry website shown above. It arises from a report carried out for a manufacturer of PVC-O pipe and is not a report of tests conducted on Iplex Apollo™. It is included to illustrate the possible capability of PVC-O product generically. As this test was not conducted by or for Iplex Pipelines, Iplex accepts no responsibility for its accuracy.

Renewable Energy and Recycling

Renewable Energy

The manufacturing process for **Apollo™** pipe in New Zealand, uses electrical energy, which includes that generated from sustainable or renewable resources including major wind farms located near Iplex's production site in Palmerston North, as well as geothermal and hydro-electric sources.

Recycling

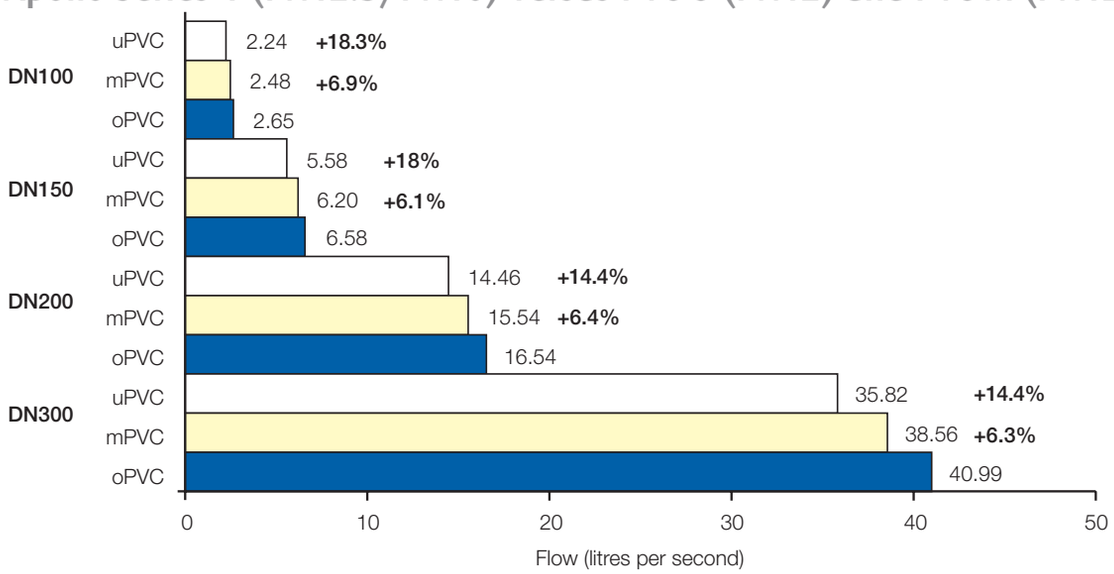
Iplex Apollo can utilise re-processable PVC material from the PVC-O process, as permitted by the manufacturing Standard.

Processes and methods exist in New Zealand for collection and recycling of PVC pipe offcuts from the market place. Iplex Apollo PVC-O material is 100% recycleable at the end of its long service life.

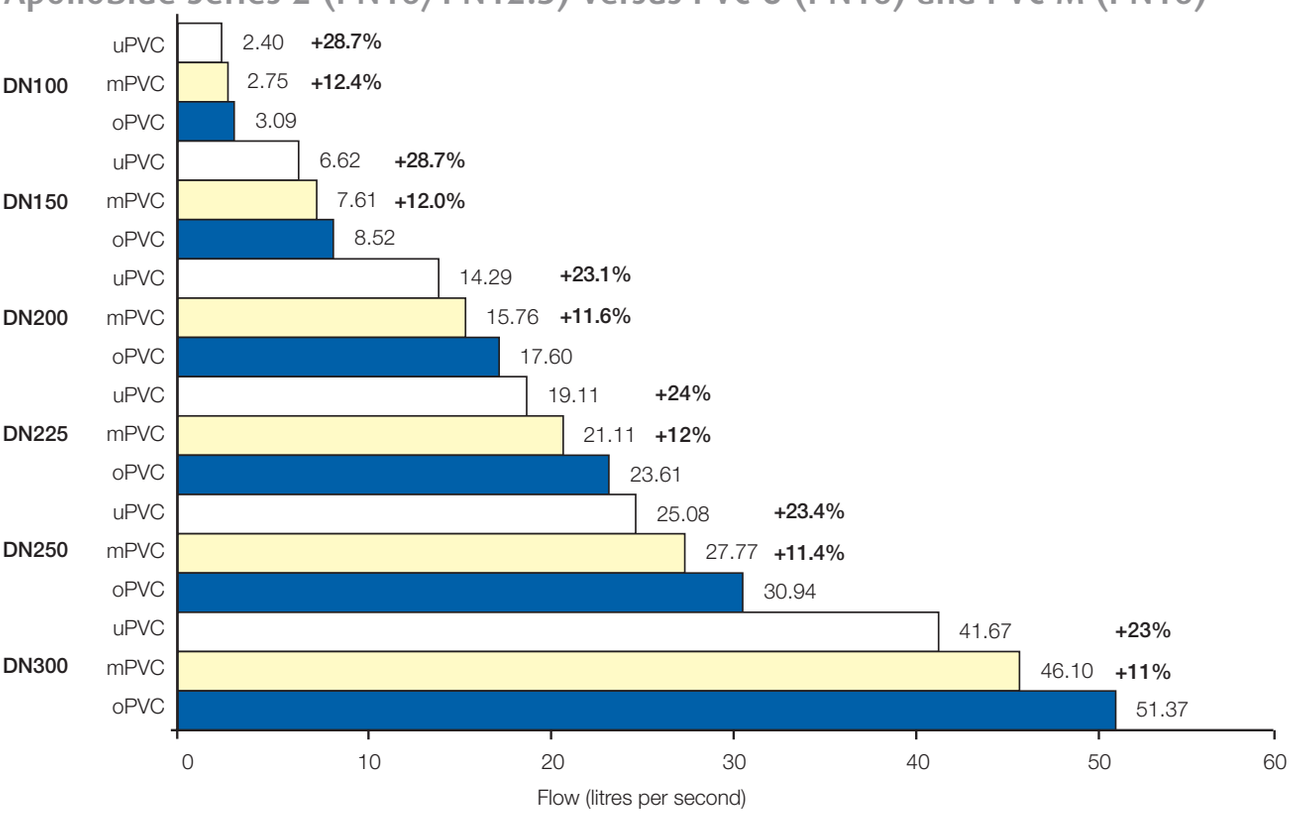
Performance – Flow Comparison

Iplex Apollo Flow Rate Comparison with Iplex PVC-U and PVC-M*

Apollo Series 1 (PN12.5/PN10) versus PVC-U (PN12) and PVC-M (PN12)



ApolloBlue Series 2 (PN16/PN12.5) versus PVC-U (PN16) and PVC-M (PN16)

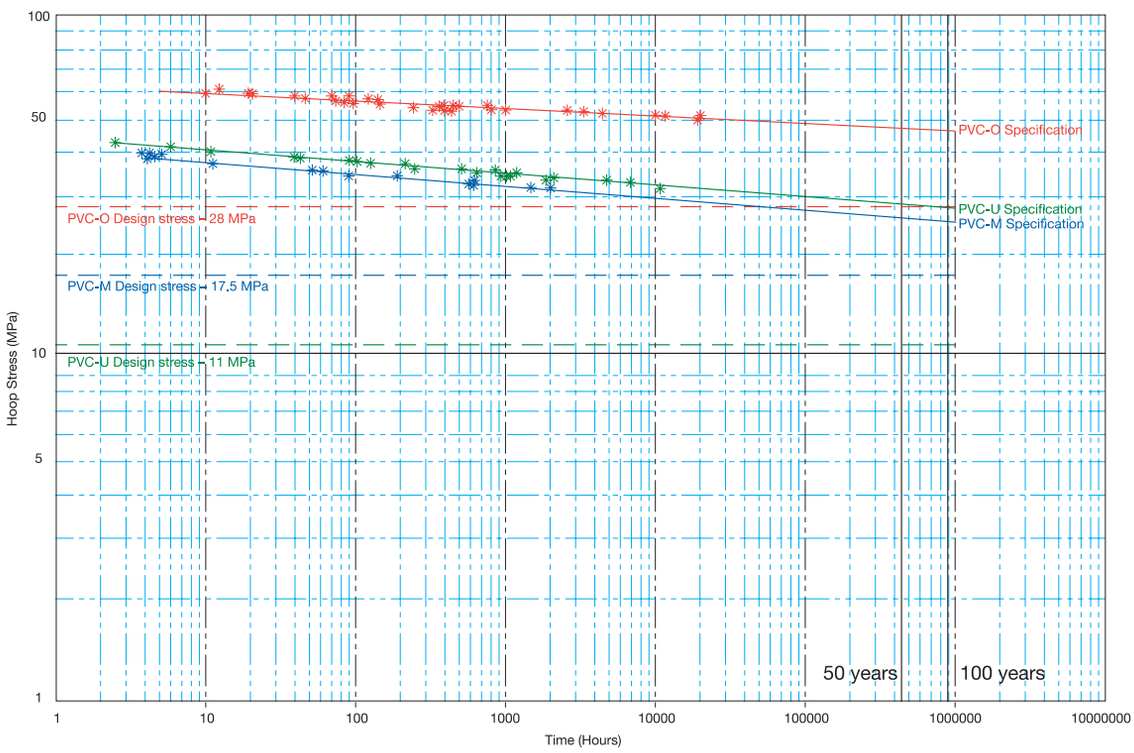


*Based on mean pipe internal diameters and hydraulic gradient (i) - 0.001
Flow rate percentages compare Iplex PVC-U or PVC-M against Apollo PVC-O.

Performance - Tensile Strength

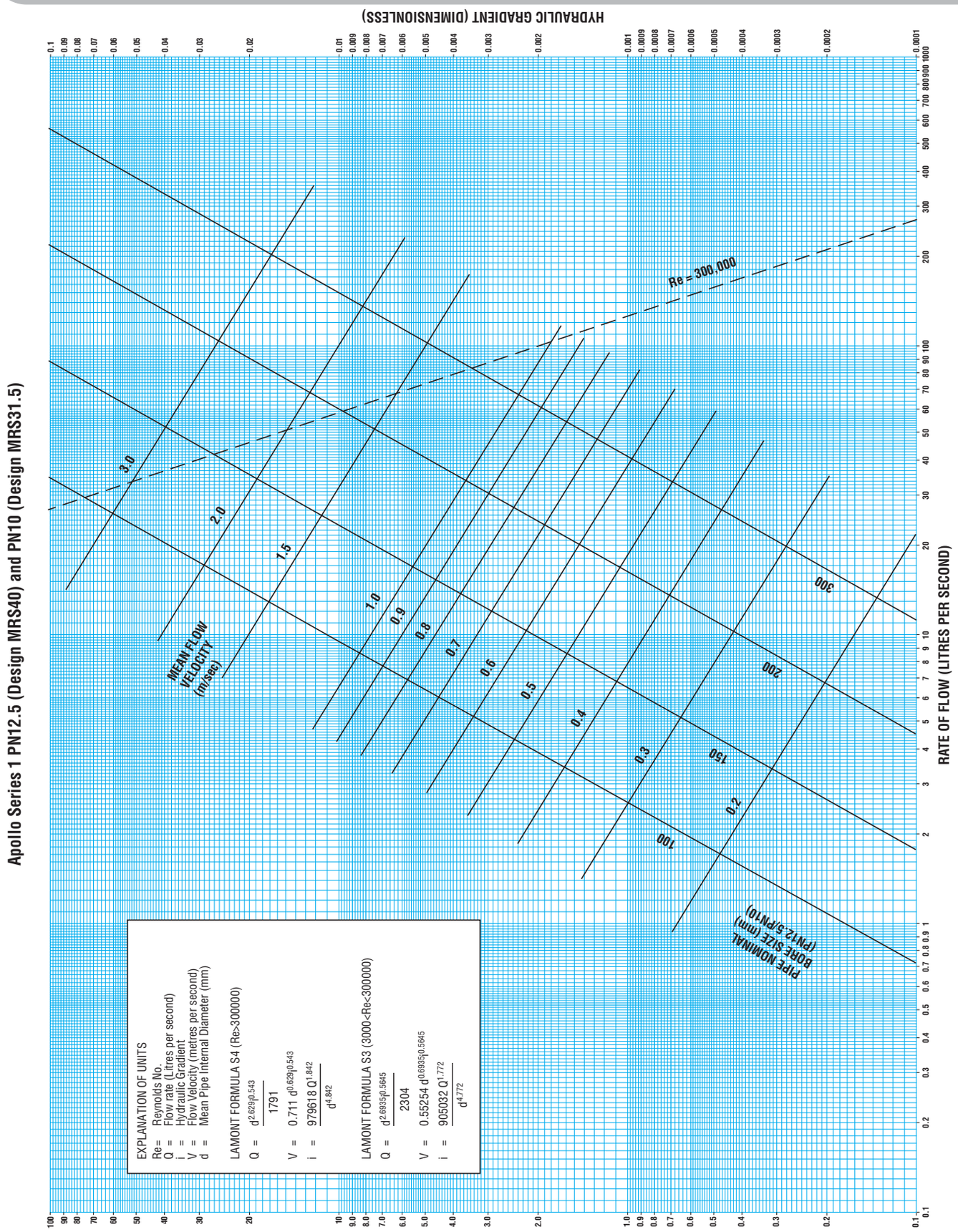
The long-term hydrostatic design stress of Apollo PVC-O is significantly greater than either Iplex PVC-M or Iplex PVC-U. This superior strength allows Apollo to be manufactured with a larger bore for a similar pressure class.

Stress Regression Lines PVC–O, PVC-U, PVC–M



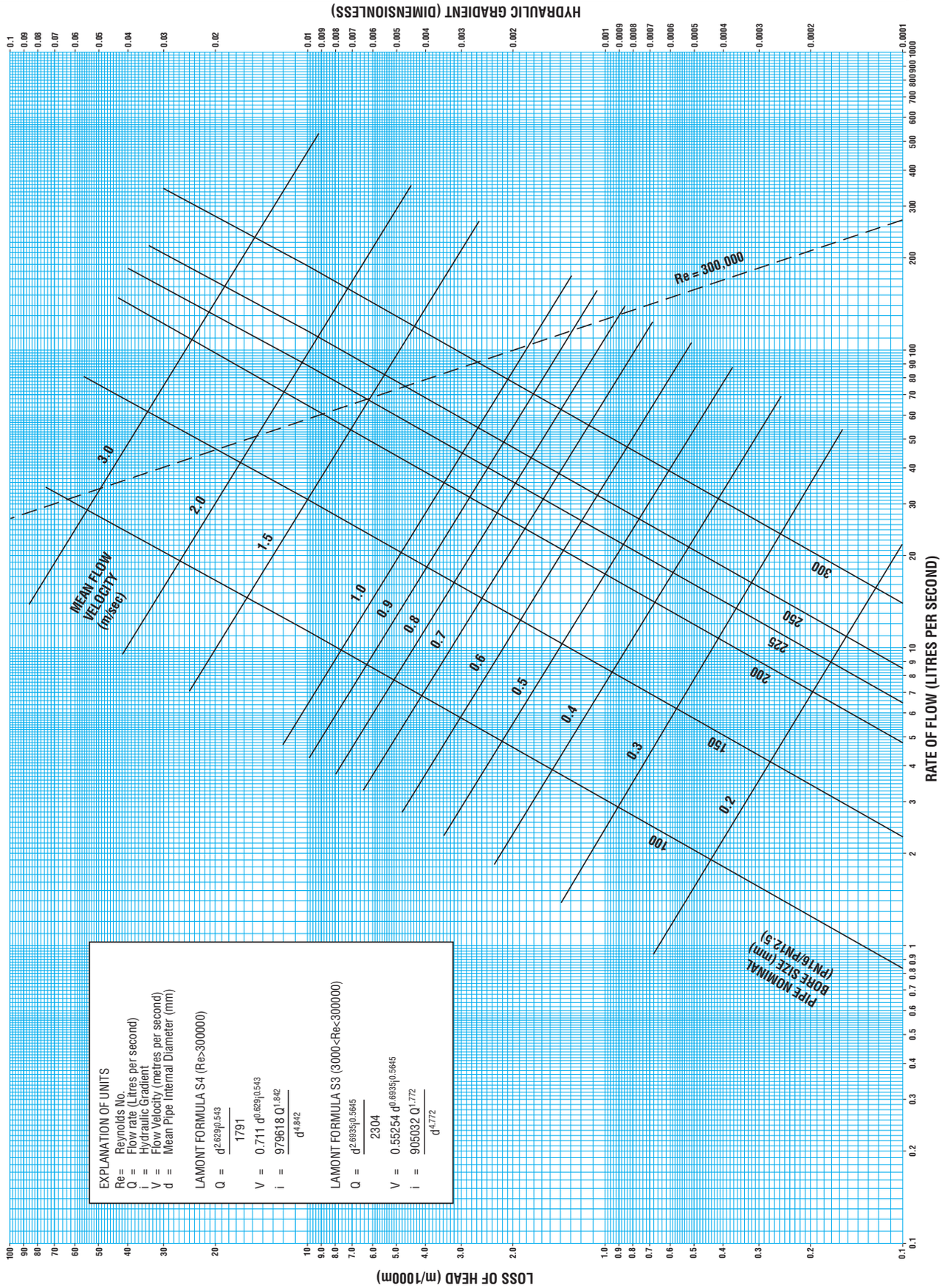
The long-term hydrostatic design stress of Apollo is derived from long-term stress regression analysis and using the design coefficient (1.6) nominated in AS/NZS 4441. The stress regression lines for Apollo PVC-O compared with Iplex PVC-U and Iplex PVC-M are shown in the graph above.

Headloss Chart – Apollo Series 1



Headloss Chart – ApolloBlue Series 2

ApolloBlue CIOD/DI equivalent diameters (Series 2) PN16 (Design MRS45) and PN12.5 (Design MRS35.5)



Fatigue Performance

Fatigue design

Apollo™ pipelines can be designed to provide long-term fatigue performance under cyclical pressures. The designer should take account of the frequency of pressure fluctuations during the life of the pipeline, (ie number of pressure cycles and the size of each pressure variation). The amplitude of the pressure change between the maximum and minimum steady state operating pressures plus water hammer effects, when divided by the load factor given in the table below should not exceed the nominal class (PN) pressure rating of the pipeline.

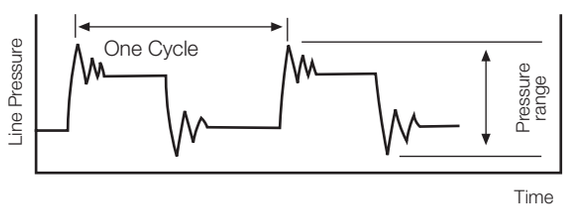
Designers are strongly recommended to refer to PIPA Industry Guideline POP101 for more complete information. www.pipa.com.au

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	82	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

In practice the pressure changes in water reticulation systems are seldom of sufficient amplitude and frequency for fatigue to affect pipe class selection, but they can be an important consideration for sewer rising mains. For practical purposes the pressure range will be the difference in the hydraulic gradients for when the pump is running and when stopped.

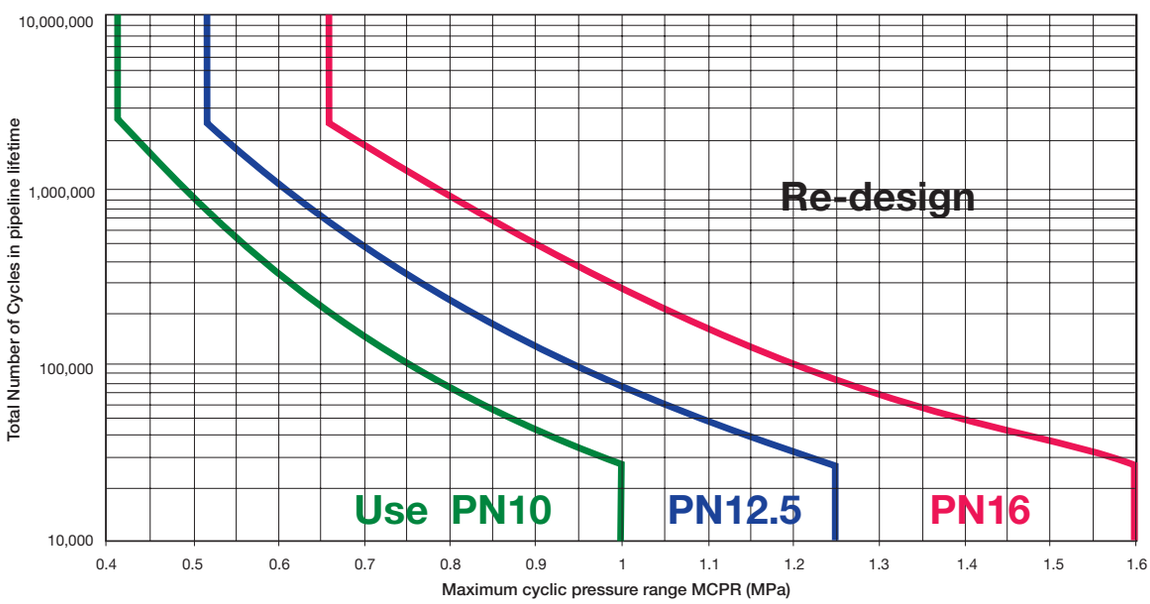
The frequency is defined as the number of combined pump start and stop cycles. If an allowance is considered necessary to allow for attenuation of water hammer oscillations, the frequency can then be taken as twice the number of start/stop cycles. (It can be shown mathematically that this is appropriate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



Procedure

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

1. Estimate the likely pressure range, ΔP, 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 page 16 or the chart below, find the fatigue cycle factor, *f*, for PVC 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.



Water hammer surges and cyclical effects

Water hammer effects are considerably reduced in thermoplastic materials including Apollo™ when compared with ductile iron and steel due to the much lower modulus of elasticity. Typical values for celerities for Apollo™ and DI are shown in the table opposite

For more information please contact the Apollo 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

Temperature Conditions and Thermal Re-rating

Apollo™ pipes are suitable for service temperatures between 0°C and 50°C. For temperatures above 20°C, provision must be made for pressure re-rating in accordance with the table opposite. These re-rating factors are the same as for PVC-M or PVC-U.

Chemical Resistance

Apollo PVC-O pipe has excellent resistance to a wide range of chemical reagents. Please contact the Technical Services Team on freephone: 0800 800 262 for specific information on chemical resistance performance.

Negative Pressure Effects

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

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

Where

P_{CR} = critical buckling pressure (MPa)

E = short term Flexural Ring Modulus = 4000 MPa

υ = Poissons Ratio = 0.38

D = Outside Diameter (mm)

t = Pipe wall section (mm)

Critial buckling Pressure, P_{CR}, (MPa), for Short term loading at 20°C				
APOLLO PVC-O DESIGN CLASS				
Design Class	315	355	400	450
P_{CR}	**0.14**	**0.20**	**0.14**	**0.20**

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

Service Connections

Iplex recommends the use of PVC compatible, full circle supported tapping bands with Apollo pipe. These include Milnes 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 Apollo.

“Universal” tapping bands that use U-bolt support straps have been found to be inadequate and are not recommended.

Tapping bands must be installed centrally positioned over the drilled service hole. **This hole should be drilled using a fine-tooth hole saw.**

Fittings

Iplex recommends the use of deep socket ductile iron fittings manufactured to AS/NZS2280 – “Ductile Iron Pipes & Fittings”, for use with Apollo™ pressure pipe.

Appropriate Series 1 “metric” OD transition rubber rings may be used in conjunction with deep socket Series 2 ductile iron fittings. Socket spacers must be used with Series 1 160mm OD pipe to centrally locate and support the pipe.

Ductile iron fittings require suitable corrosion protection. Iplex recommends all 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.

Iplex recommends the use of unrestrained mechanical couplings manufactured to AS/NZS 4998 Unrestrained Mechanical Couplings for Water Works Purposes.

Solvent Cement Joints

Solvent Cement Joints have been used successfully between Apollo PVC-O Series 1 pipe and conventional PVC-U Series 1 solvent weld joint fittings, utilising the Iplex Novakey Brand pressure solvent cement and cleaner primer system.

However, as long term research testing by Iplex Pipelines, with solvent weld joints on Apollo PVC-O, currently in progress, had not been completed at the date of publication of this manual, please contact the technical Sales Team of Iplex Pipelines NZ Ltd for specific advice on any need to solvent Weld joint Apollo PVC-O.

Installation and Pressure Testing

Installation methods for Apollo pipes are the same as those used for Iplex PVC-U and PVC-M pipes.

Buried pipe installation should generally 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"

Site Pressure Testing

For more detailed information, please refer also to the Apollo Technical Manual, available from Iplex Pipelines.

Back fill particle size

Backfill material in direct contact with the pipe, including directly under, alongside and directly above the pipe must be only compactible, non-cohesive material, not exceeding 20mm maximum particle size.

Back fill compaction

As with any buried flexible pipe, including any type of PVC or PE pipe, compaction of the backfill under and alongside the pipe barrel is important to ensure good structural performance of the backfill and also of the completed pipeline.

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

(Refer picture below for the correct installation sequence with PVC pipe).

Placement and compaction ABOVE the pipe

Placement and compaction BESIDE the pipe

Placement and compaction UNDER the pipe

How to specify Apollo PVC-O Pipe and Installation

Iplex Apollo and ApolloBlue pressure pipe should be specified as follows, for inclusion in project Tender Documents and Local Authority engineering specifications.

PIPE IDENTIFICATION - Series 1 PN 12.5

Iplex Apollo Bi-axially-orientated PVC (PVC-O) pressure pipe, DN…(100 / 150 / 200 / 300), Pressure class PN 12.5, Design Material Class 400, Design Coefficient 1.6, conforming to AS / NZS 4441, coloured… (white = potable water / raw water / industrial/ pressure sewer*, purple = recycled water, cream = pressure sewer).

PIPE IDENTIFICATION - Series 1 PN 10

Iplex Apollo Bi-axially-orientated PVC (PVC-O) pressure pipe, DN…(100 / 150 / 200 / 300), Pressure class PN 10, Design Material Class 315, Design Coefficient 1.6, conforming to AS / NZS 4441 2003, coloured…(white = potable water / raw water / industrial / pressure sewer*, purple = recycled water, cream = pressure sewer).

PIPE IDENTIFICATION - Series 2 PN 16 DI OD compatible

Iplex ApolloBLUE Bi-axially-orientated PVC (PVC-O) pressure pipe, DN…(100 /150 / 200 / 225 / 250 / 300), Pressure class PN 16, Design Material Class 450, Design Coefficient 1.6, conforming to AS / NZS 4441, coloured…(blue = potable water / raw water / industrial, purple = recycled water, cream = pressure sewer).

PIPE IDENTIFICATION - Series 2 PN 12.5 DI OD compatible

Iplex ApolloBLUE Bi-axially-orientated PVC (PVC-O) pressure pipe, DN…(100 /150 / 200 / 225 / 250 / 300), Pressure class PN 12.5, Design Material Class 355, Design Coefficient 1.6, conforming to AS / NZS 4441, coloured…(blue = potable water / raw water / industrial, purple = recycled water, cream = pressure sewer).

*White colour has been widely accepted and used for PVC sewer rising mains in New Zealand, when accompanied by appropriate identification tape marking above the pipe. Cream is another option for PVC-O pressure sewers, in the Standard. Iplex do not recommend blue for sewer applications, for obvious asset identification reasons.

PIPE INSTALLATION

- 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 on-siteTesting
  AS / NZS 2566 Part 2 “Installation”

SITE PRESSURE TESTING

On site pressure testing of pressure pipes to be in accordance with AS / NZS 2566 Part 2, Appendix M, including sections M1, M2, M3 and M4. The recommended test pressure should not be less than the maximum design operating pressure, and at the same time not exceed 1.25 times the pipe pressure rating (PN) at any point along the line.

You can order Apollo PVC-O pipe products using the Iplex Apollo product codes below.

Nominal Size	Product Code	Description	Pressure PN Bar	Effective Pipe Length (m)
APOLLO				
Series 1 Pipe				
DN100	Z880.100PN10.6	Apollo™ PVC-O Pressure Pipe	10	6.0
DN150	Z880.150PN10.6	Apollo™ PVC-O Pressure Pipe	10	6.0
DN200	Z880.200PN10.6	Apollo™ PVC-O Pressure Pipe	10	6.0
DN300	Z880.300PN10.6	Apollo™ PVC-O Pressure Pipe	10	6.0
DN100	Z880.100PN12.5.6	Apollo™ PVC-O Pressure Pipe	12.5	6.0
DN150	Z880.150PN12.5.6	Apollo™ PVC-O Pressure Pipe	12.5	6.0
DN200	Z880.200PN12.5.6	Apollo™ PVC-O Pressure Pipe	12.5	6.0
DN300	Z880.300PN12.5.6	Apollo™ PVC-O Pressure Pipe	12.5	6.0
APOLLOBLUE				
Series 2 Ductile Iron Compatible				
DN100	1880.100PN12.5.6	ApolloBlue™ PVC-O Pressure Pipe	12.5	6.0
DN150	1880.150PN12.5.6	ApolloBlue™ PVC-O Pressure Pipe	12.5	6.0
DN200	1880.200PN12.5.6	ApolloBlue™ PVC-O Pressure Pipe	12.5	6.0
*DN225	1880.225PN12.5.6	ApolloBlue™ PVC-O Pressure Pipe	12.5	6.0
DN250	1880.250PN12.5.6	ApolloBlue™ PVC-O Pressure Pipe	12.5	6.0
*DN300	1880.300PN12.5.6	ApolloBlue™ PVC-O Pressure Pipe	12.5	6.0
DN100	1880.100PN16.6	ApolloBlue™ PVC-O Pressure Pipe	16	6.0
DN150	1880.150PN16.6	ApolloBlue™ PVC-O Pressure Pipe	16	6.0
DN200	1880.200PN16.6	ApolloBlue™ PVC-O Pressure Pipe	16	6.0
*DN225	1880.225PN16.6	ApolloBlue™ PVC-O Pressure Pipe	16	6.0
DN250	1880.250PN16.6	ApolloBlue™ PVC-O Pressure Pipe	16	6.0
*DN300	1880.300PN16.6	ApolloBlue™ PVC-O Pressure Pipe	16	6.0

***** Subject to minimum order quantity and availability.

Explanation of Product Code

e.g. Z880.150 PN12.5.6

Z880 = Series 1 PVC-O with BlueSeal Ring Joint

150 = Nominal bore size

PN12.5 = Pressure class in Bar

6 = 6 metre effective pipe length

e.g. 1880.150 PN12.5.6

1880 = Series 2 PVC-O with BlueSeal Ring Joint

150 = Nominal bore size

PN12.5 = Pressure class in Bar

6 = 6 metre effective pipe length

Iplex – The Company

Iplex Pipelines is a major Australasian manufacturer and distributor of a wide range of plastics-based pipeline systems for the plumbing, infrastructure, mining, irrigation and cable conduit markets.

Iplex Pipelines is wholly owned by Crane Group Ltd, the leading Australian manufacturer of non-ferrous metal products and a major supplier to the New Zealand plumbing industry.

Iplex Pipelines is well placed for accessing the latest overseas products, technologies and service initiatives and has become a recognised leader in plastics pipes and associated fittings together with related water engineering expertise.

Manufacturing and Standards

Iplex Pipelines operates modern manufacturing facilities in New Zealand and every mainland Australian state.

All factories operate under stringent requirements of local equivalents to International Standard ISO 9001. Where applicable Iplex products also have StandardsMark third party quality assurance accreditation.

Sales and marketing teams are backed by advanced technical, communication and distribution systems to ensure prompt and effective service.

Products and Brands

Iplex products and brand names in New Zealand include APOLLO PVC-O pressure pipes, RHINO PVC-M pressure pipes, NOVAKEY PVC-U pressure pipes and fittings, BLUE BRUTE PVC-U pressure pipes, NOVADRAIN DWV pipes and fittings, POLIplex polyethylene pressure pipes, RESTRAIN drillable PVC-U gravity sewer pipe, NEXUS subsoil drainage pipe and fittings and FARMTUFF culvert pipe.

Markets and applications for the Iplex product range in New Zealand include water reticulation and transmission mains, sewerage reticulation and carrier mains, stormwater drainage, trenchless pipe systems, chemical and process water circuits, slurry and tailings pipe systems, drain, waste and vent plumbing, domestic hot and cold water plumbing, Subsoil drainage systems, turf watering, stock watering, horticultural irrigation systems and broad acre irrigation systems.

Apollo PVC-O

Apollo PVC-O pipes represent the latest in PVC manufacturing and technology. Apollo is the result of sharing technology developed by Wavin UK. The strength, ductility and overall performance of Apollo pipes represent significant advances compared with older watermain pipes.

Product Limitations

Limitations

Apollo and ApolloBlue PVC-O pressure pipes should not be used:

- With aromatic and chlorinated hydrocarbons, ketones, esters and ethers
- At continuous service temperature above 50°C
- Where provision for temperature derating has not been made above 20°C
- With compressed air
- Without adequate support to the pipe both in above ground and below ground applications
- Without adequate thrust support
- Where depth of cover is less than:
  - 300mm where pipeline is not subject to vehicular loadings
  - 450mm where pipeline is subject to vehicular loadings not in roadways
  - 600mm where pipeline is subject to vehicular loading in sealed roadways
  - 750mm where pipeline is subject to vehicular loading in unsealed roadways
  - 750mm where pipeline is subject to construction equipment loadings
- Without provision for fatigue design where appropriate
- Where working pressure plus surge/cyclic pressure exceeds the nominated pressure performance rating of the pipe
- When exposed to direct sunlight above ground for long-term applications without protection. This protection may include pale coloured UV resistant paint systems or physical shading.

Important Disclaimer

The information, opinions, advice and recommendations contained in this publication are put forward with the main object of providing a better understanding of technical matters associated with pipeline design using Iplex Pipelines. Whilst all reasonable care has been made in ensuring that the information contained in this publication is accurate, this publication should not be used as the only source of information by the reader. Reference should also be made to established textbooks and other published material, and readers should not rely on the information contained in this publication without taking appropriate professional advice for their particular circumstances. Pipes and fittings have been shown as typical configurations, however, in some cases product dimensions may vary or be changed without notice. In all instances, the reader should contact Iplex Pipelines for clarification that the specific product is appropriate for their circumstances. Some photos are illustrative only and may not include Apollo Product.

Iplex Pipelines NZ Limited.

More Products from Iplex Pipelines

NOVADRAIN, NOVACOR & SUPERTUFF
PVC DRAIN WASTE & VENT SYSTEMS

POLIDRAIN™
POLYETHYLENE DRAINAGE SYSTEM

SUPERSTORM™ & STORMFIT
PVC STORMWATER DUCT SYSTEM

NEXUS™ HI-WAY
ROAD DRAINAGE SYSTEM

TEGRA™
CHAMBER SYSTEMS

NOVAKEY™ & BLUE BRUTE
uPVC PRESSURE SYSTEMS

WHITE & BLUE RHINO™
HIGH IMPACT mPVC PRESSURE PIPE

BLUELINE
MEDIUM DENSITY POLYETHYLENE PIPE

POLIPLEX
POLYETHYLENE PRESSURE PIPE

ALKATHENE™
LOW DENSITY POLYETHYLENE PIPE

NOVATUBE
HORTICULTURAL LATERAL TUBE

GREENLINE, REDLINE™, RURAL BLACK & BLACKLINE
MEDIUM DENSITY POLYETHYLENE PIPE

PLASSON
METRIC COMPRESSION FITTINGS

NEXUS™FLO, NEXUS™COIL, NOVAFLO™ & NOVACOIL
LAND DRAINGE SYSTEMS

IPLEX EFFLUENT PIPE
MEDIUM DENSITY POLYETHYLENE PIPE

FARMTUFF™ & NEXUS™ CULVERT
CULVERT PIPE

RAINWATER SYSTEMS
SPOUTING & DOWNPIPE

POLIGAS™
POLYETHYLENE GAS SYSTEMS

PVC-O PRESSURE PIPE Apollo™

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