PVC PIPE & FITTINGS

AS/NZS 4441
AS/NZS 4765
AS/NZS 1477
AS/NZS 1260
AS/NZS 1254

POLYVINYL CHLORIDE (PVC) PIPE SYSTEMS.

Version 1.0

clover

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For further information relating to PVC Pipe & Fittings or any other Clover product contact your local Clover sales office for assistance.

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WE ARE CLOVER, AN INTEGRATED PIPELINE INFRASTRUCTURE BUSINESS

Led by a passionate team of industry professionals, we combine strategic project consultation, product innovation and service excellence. We work with global partners to specify world-leading pipelines across Australia and the Asia Pacific region.

Future facing pipeline infrastructure

We believe in new ways of doing—at Clover, we do things differently. We don't rest on the past, or the present, we're committed to consistent innovation that supports existing communities and establishes new ones.

Australia's most complete pipeline infrastructure provider.

We partner with our clients to offer holistic design-led packages that go beyond supply and delivery—bridging the gap between planning, source and supply of pipeline infrastructure systems.

PLAN

Clover's inhouse engineering team combines specialist technical knowledge, creative thinking and on-the-job experience, to offer our clients a range of project planning and design consultation services.

SOURCE

Constantly pushing to challenge what's achievable, Clover harnesses an extensive global network of product partners to bring our clients the competitive advantage that comes with choice, availability and cutting edge innovation.

SUPPLY

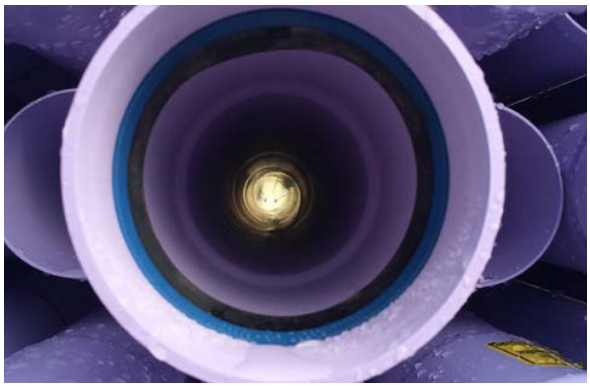
In a project based industry, timing is everything. At Clover, our approach to supply and distribution is based around a dedication to consistency, responsiveness and service excellence.

PVC Materials

PVC is a thermoplastic that contains mainly PVC resin with the addition of compounds such as stabilisers, lubricants, plasticisers, pigments and other products that aid in the manufacturing process.

PVC compound produced without plasticisers increases the strength attributes of the material. This type of unplasticised PVC (PVC-U) is hard, rigid, with a high strength to weight ratio and resistant to corrosion and most chemicals. PVC-U has been widely used in pipelines for many years because of these attributes, however given the random nature of the molecular structure, the pipes have low resistance to impact.

In recent years, other additives and manufacturing processes have been introduced that not only significantly enhance the ductility but the ultimate strength of the product.



PVC-M

The addition of Impact Modifiers to PVC produces a more predictable structure that enhances the material's toughness, ductility and resistance to cracking with little effect on the material strength.

PVC-O

TOM PVC-O pipes are the most advanced pipes for the conveyance of high-pressure water currently available on the market, with a number of exceptional features for this kind of application, thanks to the process of molecular orientation.

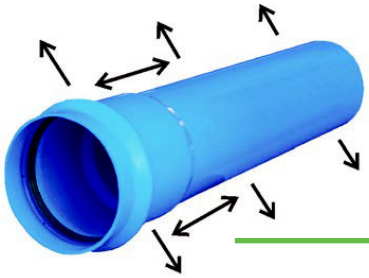
The stretching of PVC, under certain conditions of pressure, temperature and speed, orients and preferably aligns and lengthens the polymer molecules; which significantly increases the strength of the material.

TOM PVC-O are bi-axially oriented by stretching the initial extruded pipe along the axis (Axial orientation) and by expanding the diameter (Hoop orientation). The degree of Hoop orientation determines the resistance to internal pressure and impact. The Axial orientation provides resistance to internal stresses particularly in the socket.

The process of Molecular Orientation greatly enhances PVC's physical and mechanical properties and gives it a number of exceptional features, without altering the advantages and properties of the original polymer. Depending on the degree of orientation, the ultimate tensile strength of PVC-O can be up to double that of PVC. This makes for a plastic with unbeatable qualities in terms of resistance to traction and fatigue, flexibility and impact resistance.

Hoop Orientation

Attains excellent qualities for impact resistance or internal pressure.



Axial Orientation

Especially in the socket, reinforces the area where significant strains take place.

Mechanical Properties

Tensile Resistance

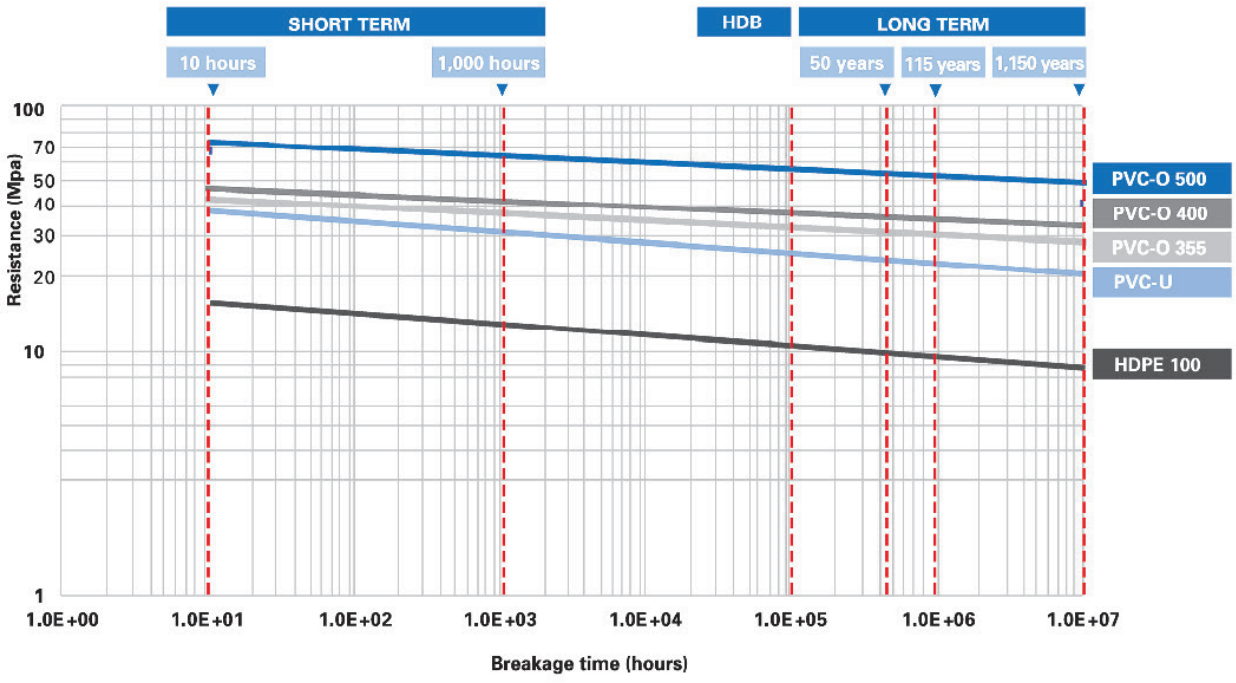
In terms of performance, PVC-O shows a very different stress-strain curve when compared to conventional plastics and comes very close to the curve of metals.

Mechanical properties complete transformation of PVC-O compared to conventional PVC can only be achieved in the higher class PVC-O class 500, such as TOM PVC-O pipes.

Long Term Hydrostatic Resistance

Materials lose their mechanical properties when they are subjected to strain over a long period of time. This characteristic, known as creep, appears to a far lesser extent in PVC-O Class 500 than in conventional plastics, which means better properties over the long term.

Bearing in mind that PVC-O, PVC-M and PVC-U are exceptionally resistant to fatigue and have a very good chemical resistance; it is no exaggeration to say that this kind of piping is capable of withstanding the pressures of work for over a hundred years.



Standards

Pressure Applications

AS/NZS 4441	PVC-O Oriented PVC pipes for pressure applications
AS/NZS 4765	PVC-M Modified PVC pipes for pressure applications
AS/NZS 1477	PVC-U Pipes and Fittings for pressure applications

Non-Pressure Applications

AS/NZS 1260	PVC-U pipes and fittings for drain, waste and vent applications
AS/NZS 1254	PVC-U pipes and fittings for stormwater applications

Design Considerations

Flow Capacity

Whether designing a pumping system or a gravity-enabled pipe system, deciding the dimensions of the pipes involves calculating losses in the terms of load. The flow capacity and head loss of a pipeline can vary depending on the following:

- Internal pipe surface resistance to roughness over time
- Potential settlement of sediment due to low velocities
- Type and number of fittings and other flow restrictors in the pipeline
- The effect on water viscosity as a result of temperature increases

Pipe Class and Pressure Considerations

The nominal pressure rating for a pipe must be re-rated when operating at temperatures greater than 20 deg C. (Refer table below).

Surge pressure associated with water hammer also has an impact on the pipe class and must be considered.

Operating Pressures (with Temperature Considerations)

OPERATING PRESSURES – PVC PRESSURE PIPE (PVC-U, PVC-M, PVC-O)

Pressure Class:		PN 6	PN 9	PN 12	PN 15	PN 16	PN 18	PN 20	PN 25
Working Pressure (kPa):		600	900	1200	1500	1600	1800	2000	2500
OPERATING TEMP (°C)	**RE-RATING FACTOR**	**MAXIMUM ALLOWABLE OPERATING PRESSURE (kPa)**							
20	1	600	900	1200	1500	1600	1800	2000	2500
25	0.94	564	846	1128	1410	1504	1692	1880	2350
30	0.87	522	783	1044	1305	1392	1566	1740	2175
35	0.78	468	702	936	1170	1248	1404	1560	1950
40	0.7	420	630	840	1050	1120	1260	1400	1750
45	0.64	384	576	768	960	1024	1152	1280	1600
50	0.58	348	522	696	870	928	1044	1160	1450

Source: International Standard ISO 4422.2 and PIPA Technical Document PV006/2

Environmental Sustainability

100% Recyclable

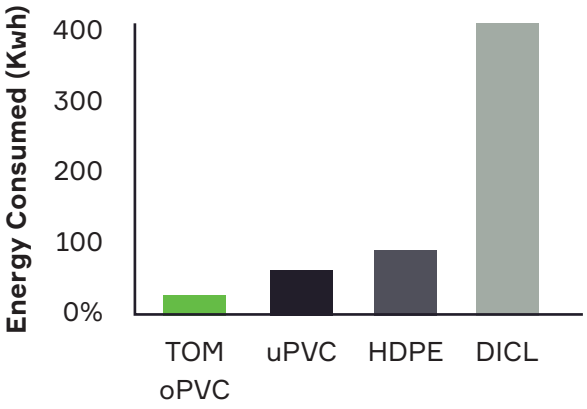
TOM PVC-O, PVC-M and PVC-U pipe products are 100% recyclable and can be ground and reprocessed for reuse in the manufacture of other pipes or plastic products.

Low Embodied Energy

Embodied energy is defined as the non-renewable energy consumed in all the activities associated to the pipes lifecycle, referring to direct energy during the raw material extraction, processing, and use, and other supporting functions, such as transportation.

PVC pipes have a considerably lower Embodied Energy compared to other products such as Polyethylene and Ductile Iron pipes. The TOM PVC-O manufacturing process currently makes the most ecofriendly pressure pipe product anywhere in the world.

A comparison of the estimated energy consumption by PVC-O, PVC-U, HDPE and Ductile Iron piping production and use is shown. Source: Polytechnic University of Catalonia, Spain, December 2005.

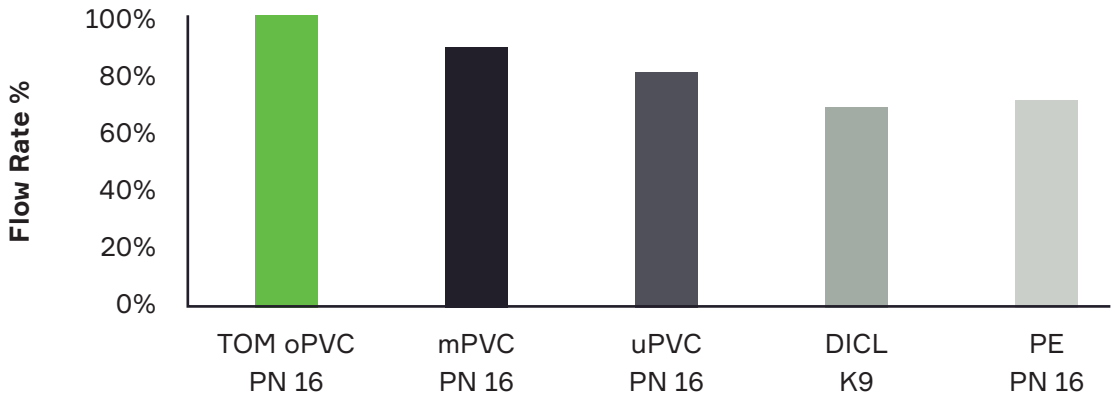


Energy Consumed by Pipes

(Raw Materials and Manufacture)

Flow Capacity - Pressure Pipes

Due to the enhanced toughness and strength of PVC-O and PVC-M, both of these products can be manufactured with a thinner wall than that of traditional PVC-U which provides a larger internal bore with improved flow characteristics.



Comparison of Hydraulic Capacity

(150NB Pipe at Constant Head Loss)

PVC PRESSURE PIPE

Tom PVC-O Pipe – Series 2

Pressure Pipe to AS/NZS 4441

Applications

- Water supply reticulation and trunk mains
- Irrigation systems
- Recycled water systems
- Pumped Effluent – Sewage, Industrial & waste water
- Slurry pipelines – mining waste
- Potable water applications (Blue pipe)
- Recycled Water applications (Purple pipe)
- Pressure Sewer applications (Cream pipe)

Features

- Exceptional Strength and Ductility
- High Impact Resistance
- Larger Bore – Better flow characteristics
- Smooth Bore – Low flow resistance
- Corrosion Resistant
- Guaranteed Stiffness > SN10,000
- Light Weight – Installation savings
- Material & Energy efficient – 100% Recyclable (Low Embodied Energy)

TOM PVC-O PIPE – SERIES 2 (RRJ)

NB	OD (mm)	LENGTH	MEAN ID (mm)			PACK QTY
			PN16 QTY Class 450	PN16 Class 500	PN25 Class 500	
100	122	6m	114.9	-	112.3	36
150	177	6m	167.3	-	163.5	18
200	232	6m	219.1	-	214.1	10
225	259	6m	244.7	-	239.1	8
250	286	6m	270	-	263.8	6
300	345	6m	325.9	-	318.5	6
375	426	6m	-	404.7	393.1	
450	507	6m	-	481.7	467.7	
600	667	6m	-	633.9	615.5	

PVC PRESSURE PIPE

Tom PVC-O Pipe – Series 2

Pressure Pipe to AS/NZS 4441

Technical Data

Standard (Approval):	AS/NZS 4441:2008
Material:	PVC-O – Class 450 (MRS 45MPa) and Class 500 (MRS 50MPa)
Size Range:	DN 100 - 600
Pressure Range:	PN16 & PN25 (at 20deg C)
Temperature Range:	0 to 50 deg C (Refer Design Data for Temperature Derating)
Lengths:	6m Spigot-Socket Rubber Ring Joint
Colour:	Blue, Lilac & Cream

PVC PRESSURE PIPE

PVC-M Pipe – Series 2

Pressure Pipe to AS/NZS 4765

Applications

- Water supply reticulation and trunk mains
- Irrigation systems
- Recycled water systems
- Pumped Effluent – Sewage, Industrial & waste water
- Slurry pipelines – mining waste
- Potable water applications (Blue pipe)
- Recycled Water applications (Purple pipe)
- Pressure Sewer applications (Cream pipe)

Features

- High Toughness and Ductility
- High Impact Resistance
- Larger Bore – Better flow characteristics
- Smooth Bore – Low flow resistance
- Corrosion Resistant
- Light Weight – Installation savings
- Available in Rubber Ring Joint (RRJ)

PVC-M PIPE - SERIES 2 (RRJ)

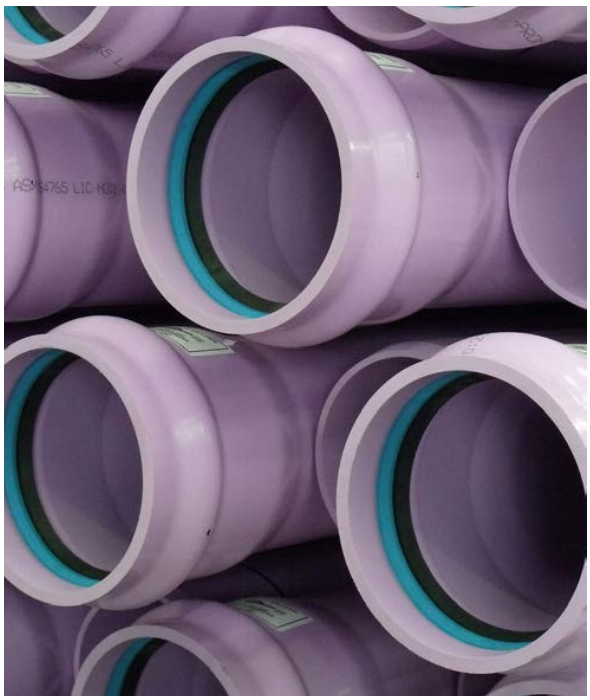
NB	OD (mm)	LENGTH	MEAN ID (mm)				PACK QTY
			PN12	PN16	PN18	PN20	
100	122	6m	113.1	110.3	109.1	107.8	36
150	177	6m	164.8	160.8	159	157	18
200	232	6m	215.9	210.7	208.3	205.8	10
225	259	6m	241	235.1	232.5	229.7	8
250	286	6m	266	259.7	256.6	253.4	8
300	345	6m	321	313.5	309.8	306.1	6
375	426.2	6m	396.4	386.9	382.2	377.7	6
450	507	6m	471.5	460.2			2
500	560.3	6m	519.8				2

PVC-M Pipe – Series 2

Pressure Pipe to AS/NZS 4765

Technical Data

Standard (Approval):	AS/NZS 4765:2007 (Standardsmark Licence SMKP21476)
Material:	PVC-M (MRS 24.5MPa)
Size Range:	DN 100 - 450
Pressure Range:	PN12, PN16, PN18 & PN20 (at 20deg C)
Temperature Range:	0 to 50 deg C (Refer Design Data for Temperature Derating)
Lengths:	6m Spigot-Socket Rubber Ring Joint (Other lengths available and made to order)
Colour:	Blue, Lilac & Cream



PVC-M Pipe – Series 1

Pressure Pipe to AS/NZS 4765

Applications

- Water supply reticulation
- Irrigation systems
- Recycled water systems
- Pumped Effluent – Sewage, Industrial & waste water
- Slurry pipelines – mining waste
- Potable water applications (White pipe)
- Recycled Water applications (Purple pipe)
- Pressure Sewer applications (Cream pipe)

Features

- High Toughness and Ductility
- High Impact Resistance
- Larger Bore – Better flow characteristics
- Smooth Bore – Low flow resistance
- Corrosion Resistant
- Light Weight – Installation savings
- Available in Rubber Ring Joint (RRJ) or Solvent Cement Joint (SCJ)

PVC-M PIPE - SERIES 1 (RRJ)

NB	OD (mm)	LENGTH	MEAN ID (mm)			PACK QTY
			PN6	PN9	PN12	
100	114.1	6m	108.7	108	106.1	63
150	140	6m	152.4	151.7	148.9	45
200	225.3	6m	215	213.1	209.3	12
225	250.4	6m	238.8	237	232.8	12
250	280.4	6m	267.6	265.5	260.6	8
300	315.5	6m	301.1	298.7	293.2	6
375	400.5	6m	382.1	379.3	372.3	6
450	500.5	6m	476.9	472.9	464.3	2
500	560.5	6m	534.1	529.6	520	2
575	630.5	6m	601.1	596	585	2

PVC-M Pipe – Series 1

Pressure Pipe to AS/NZS 4765

Technical Data

Standard (Approval):	AS/NZS 4765:2007
Material:	PVC-M (MRS 24.5MPa)
Size Range:	DN 100 - 375
Pressure Range:	PN6, PN9, PN12, PN15 & PN18 (at 20deg C)
Temperature Range:	0 to 50 deg C (Refer Design Data for Temperature Derating)
Lengths:	6m Spigot-Socket Rubber Ring Joint or Solvent Cement Joint (Other lengths available and made to order)
Colour:	White

PVC PRESSURE PIPE

PVC-U Pipe and Fittings – Series 1

Pressure Pipe & Fittings to AS/NZS 1477
For use in general water industry pipelines

PVC-U Pressure Pipe

Standard (Approval):	AS/NZS 1477
Size Range:	DN 15 - 375
Pressure Range:	PN6, PN9, PN12, PN15 & PN18 (at 20deg C)
Temperature Range:	0 to 50 deg C (Refer Design Data for Temperature Derating)
Lengths:	6m Spigot-Socket, Rubber Ring Joint or Solvent Cement Joint (Other lengths available and made to order)

PVC-U Pressure Fittings

Standard:	AS/NZS 1477	
Size Range:	DN 15 - 375	
Pressure Range:	PN18 (Fittings <= DN150), PN10 (Fittings > DN150)	
Temperature Range:	0 to 50 deg C (Refer Design Data for Temperature Derating)	
Joint Types:	Solvent Cement Joint (SCJ), Threaded (BSP) or Flanged	
Product Range:	Elbows:	45 or 90deg - SCJ, SCJ x BSP
	Tees:	SCJ, SCJ x BSP
	Couplings:	SCJ
	Adaptors:	SCJ x BSP
	Sockets:	SCJ x BSP
	Bushes:	SCJ
	Caps:	SCJ
	Barrel Unions:	SCJ
	Vanstone Flanges:	Table D, E and ANSI
	Stub Flanges:	SCJ c/w Backing Ring

DWV Pipe and Fittings

Non-Pressure Pipe & Fittings to AS/NZS 1260
For use in gravity sewer and waste water applications

DWV Pipe

Standard (Approval): AS/NZS 1260:2002

Size Range: DN 100 - 375

Stiffness Range: SN4, SN6, SN8 & SN10

Lengths: 3m, 6m Spigot-Socket, Rubber Ring Joint or Solvent Cement Joint
(Other lengths available and made to order)

DWV PIPE - (RRJ)

NB	OD (mm)	LENGTH	STIFFNESS OPTIONS		PACK QTY
150	160	3m	SN4	SN8	28
225	250	3m	SN4	SN8	12
300	315	3m	SN4	SN8	6
375	400	3m	SN4	SN8	4

DWV PIPE - (SCJ)

NB	OD (mm)	LENGTH	STIFFNESS OPTIONS		PACK QTY
100	110	3m or 6m	SN6	SN10	67
150	160	3m or 6m	SN4	SN8	28
225	250	3m or 6m	SN4	SN8	12
300	315	3m or 6m	SN4	SN8	6
375	400	3m or 6m	SN4	SN8	4

DWV Fittings

Standard: AS/NZS 1260

Joint Types: Solvent Cement Joint (SCJ), Rubber Ring Joint (RRJ)

Product Range:

Bends:	5 - 90deg F/F, M/F (RRJ/SCJ)	Couplings:	Plain, Slip, Access (RRJ/SCJ)
Tees:	F/F, M/F (RRJ/SCJ)	Tapers:	Socket, Level Invert (RRJ/SCJ)
Junctions:	F/F, M/F (RRJ/SCJ)		
MH Shorts:	M/F, M/M Sanded Unsanded (RRJ)	Caps:	Threaded BSP, Push on

PVC NON-PRESSURE PIPE

Stormwater Pipe and Fittings

Non-Pressure Pipe & Fittings to AS/NZS 1254

Size Range: DN 90 - 375

Lengths: 6m Solvent Cement Joint
Other lengths available and made to order
Slotted Pipe made to order

Fitting Range: Bends, Tees, Junctions, Couplings, Bushes, Adaptors, Reducers & Caps

STORMWATER PIPE - SCJ				
NB	OD (mm)	LENGTH	STIFFNESS	PACK QTY
90	90	6m	SN2	81
150	160	6m	SN2	33
225	250	6m	SN2	12
300	315	6m	SN2	6
375	400	6m	SN1.5	4

Lubricant And Solvent Cements

PVC PIPE LUBRICANT:	Bactericidal	250mL to 4L
PVC PIPE PRIMER:	Red or Clear	250mL to 4L
PVC SOLVENT CEMENT:		
Type N (Non Pressure)	Blue	250mL to 4L
TYPE P (Pressure)	Green or Clear	250mL to 4L

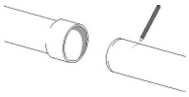
Jointing Procedures

SOLVENT CEMENT JOINTS

1. PREPARE THE PIPE

Ensure Pipe is cut square and remove burrs and sharps edges from inside and outside edges using deburring tool.

2. WITNESS MARK THE PIPE

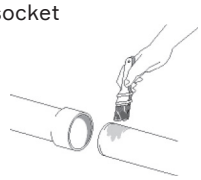


Mark the spigot with a pencil line ('witness mark') at a distance equal to the internal depth of the socket.

3. APPLY PRIMING FLUID

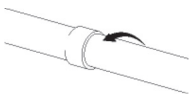
Priming is crucial as it cleans and softens the PVC surface for effective bonding. Using a lint free cloth dampened with priming fluid; rub the spigot and socket surfaces that are to be bonded.

4. APPLY SOLVENT CEMENT



Use a suitable size brush that can effectively coat the surfaces in 30 seconds. Apply a thin even coat of solvent cement to the internal surface of the socket, then to the spigot up to the witness mark. Take care to avoid excess pools of solvent that will weaken the pipe.

5. INSERTING THE SPIGOT



Make the joint immediately as solvent cement will dry quickly. Insert the spigot in a single movement for the full depth of the joint and twist the spigot so that it rotates about a 1/4 turn whilst inserting.

6. SECURE THE JOINT

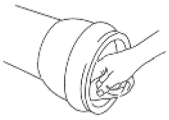
Hold the joint securely for 30 seconds then wipe off excess solvent cement. Do not disturb joint for a further 5 minutes to secure the bond.

7. CURE THE JOINT

Allow 24 hours before pressure testing

RUBBER RING JOINTS

1. CUTTING THE PIPE



PVC Pipe can be cut to length if required. Reproduce the chamfer and witness mark to match the manufactured dimensions.

2. PREPARE THE PIPE

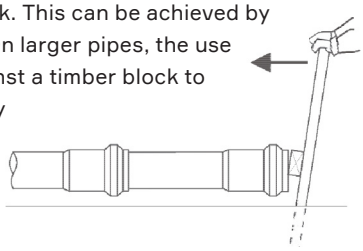
Inspect and clean socket, ring groove and spigot to witness mark. Ensure seal is securely in place. Do not use lubrication while cleaning.

3. APPLY LUBRICATION

Lubricate the pipe spigot to the witness mark including the chamfered edge.

4. ASSEMBLY

Pipes must be aligned during assembly to ensure an effective joint. Insert the chamfered edge of the spigot into the socket and apply a firm even thrust to push home to the witness mark. This can be achieved by hand on smaller pipes. On larger pipes, the use of a crowbar thrust against a timber block to protect the pipe end may be required.



SPECIAL NOTE – WITNESS MARKS:

Ductile Iron Fittings

Check the socket depth of the ductile iron fitting and mark a new witness line on the PVC spigot to match.

Couplings

Allowance should be made for a gap between pipe ends for couplings. Refer to the coupling manufacturer's instructions to determine the depth of insertion and mark a new witness line on the PVC spigot to match.

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