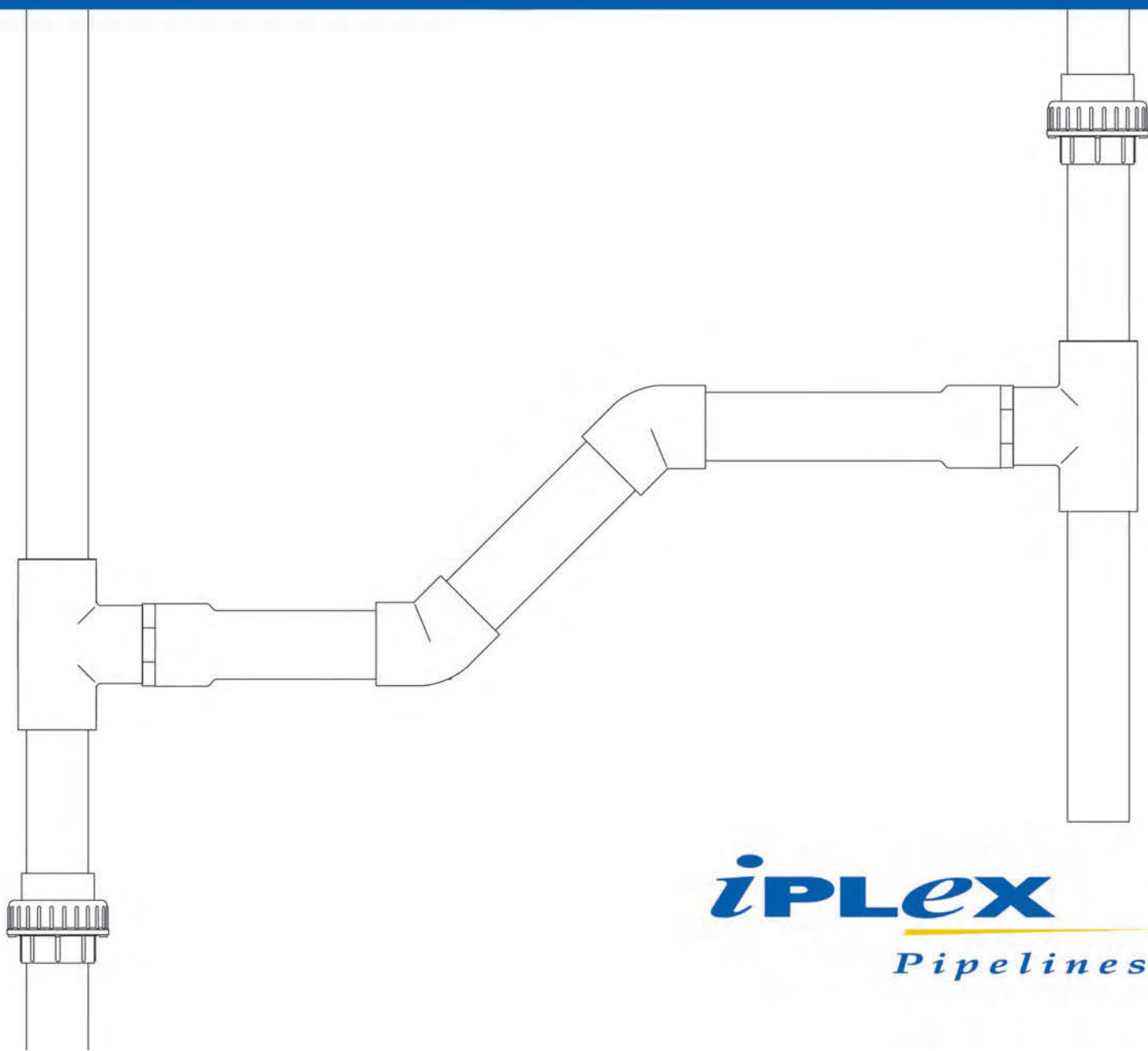


# ENGINEERING DESIGN AND INSTALLATION GUIDE

## PVC-U Pressure Pipes and Fittings



***iplex***  
*Pipelines*

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## 1.1 Introduction

PVC pressure pipes are manufactured from unplasticised polyvinyl chloride polymer (a thermoplastic material) using the extrusion process. PVC (also known as uPVC and PVC-U) pipes were introduced into Australia in the early 1960's and are now widely accepted for use in water supply, irrigation and sewerage rising mains.

Their high strength to weight ratio together with exceptional resistance to corrosion or chemical attack make these pipes ideal for major infrastructure applications.

A report has been published by PIPA (PVC Pipelines Industry Association of Australia) on an investigation of 600 km of PVC pipes laid in the early 1970s as part of the Millewa Waterworks District Scheme. It involved the exhumation and testing of numerous pipe specimens and confirmed the long-term durability and serviceability of PVC-U pressure pipes.

Iplex PVC-U pressure pipes meet the requirements of AS/NZS 1477 "PVC pipes and fittings for pressure applications" and the Water Services Association of Australia (WSAA) Reticulation Code WSA 03.



Figure 1.1 - PVC irrigation pipe installation

## 1.2 Applications

Iplex PVC-U pipes are recognised for their advantages and have been used extensively since the 1970's in the following applications,

- Major potable water supply trunk and reticulation mains
- Irrigation and turf watering systems
- Industrial process pipelines
- Effluent pipelines for pumped sewage, industrial and rural wastes
- Slurry pipelines carrying abrasive and corrosive mine or quarry materials

## 1.3 Features and benefits

PVC plastic pipe systems offer major advantages over traditional materials including corrosion resistance, installation economics, operating efficiencies and significant reductions in maintenance costs. The following outlines some of the features and benefits of PVC pipes.

Table 1.1: Features and benefits

Features	Benefits
Excellent internal/external corrosion resistance	Long service life
Electrically non conductive	Do not suffer from electrolytic corrosion
Reiber rubber ring	Reduced jointing effort and improved reliability
Light weight	Ease of handling and reduced laying costs



Figure 1.2 - Potable water PVC-U pipeline installed in roadway.



Figure 1.3 - The light weight nature of PVC pipes allows ease of handling during installation.

## 2.1 Material properties

The general physical properties of PVC-M are provided in Table 2.1.

**Table 2.1 – Typical material properties**

Property	Value
<b>Physical and mechanical</b>	
Specific gravity	1.43 to 1.5
Effect on potable water - AS/NZS 4020	Complies
Hydrostatic design stress – AS/NZS 1477	≤DN150=11.0 MPa >DN150=12.3 MPa
Mean hoop stress at 20°C extrapolated to 50 years - AS/NZS 1462.6	≤DN150=23.6 MPa >DN150=26.0 MPa
Fracture toughness - AS/NZS 1462.19	4.14 MPa m <sup>0.5</sup>
Flexural modulus - ISO 9969	3200 MPa
Poisson's ratio	0.38 – 0.40
<b>Thermal</b>	
Coefficient of linear thermal expansion	70 x 10 <sup>-6</sup> /° C
Thermal conductivity	0.138 x 10 <sup>-3</sup> W/m.K
Specific heat	1045 J/kg.K
Maximum practicable working temperature	50°C
<b>Fire resistance</b>	
Flammability	Will not support combustion
Ignitability - AS 1530*	7
Smoke development - AS 1530*	9
Spread of flame - AS 1530*	0
Heat evolved - AS 1530*	2
* AWTA Product Testing, test report number 7-558788-CV	
<b>Electrical</b>	
Volume resistivity	10 <sup>16</sup> ohm.cm (60% RH)
Surface resistivity	10 <sup>13</sup> - 10 <sup>14</sup> ohm
Power factor	0.015 - 0.020 at 20°C
Dielectric constant	3.4 - 3.6 at 25°C (60 Hz)



## 2.2 Sustainability

Iplex PVC-U pressure pipe is a sustainable infrastructure pressure pipeline. It has low embodied energy, can utilise re-processible PVC from its manufacture and is fully recyclable at the end of its service life.

Iplex PVC-U pressure pipes are lightweight and as result require less non-renewable energy (e.g. diesel) during transportation. Lightweight PVC-U pressure pipe also allows the production of more lengths of pipe per tonne of raw material, compared with almost any other pressure pipe of similar diameter and pressure class.

Iplex PVC-U pressure pipes do not contain any compounds based on lead, cadmium or mercury. This actively prevents more of these compounds from entering the environment and positively reduces industry demand for these compounds upstream of the manufacturing process.

Iplex PVC-U pressure pipe is chemically inert. There is no corrosion or chemical or gas emissions during its normal service life as a public water main or sewer.

Iplex PVC-U pressure pipe does not require any further application of protective coatings or sealing compounds, which are known to liberate volatile organic compounds to atmosphere.

Iplex PVC-U pressure pipe is also very durable enabling a one off energy consumption in the manufacture of the pipe asset. This is only required once in its 100 year service life, if installed and operated to the relevant codes and standards.

For further information refer to the PIPA website, [www.pipa.com.au/environment](http://www.pipa.com.au/environment).

## 2.3 Temperature effect on pressure rating

PVC 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 Table 2.2.

**Table 2.2: 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

*\*Based on ISO 4422-2 Pipes and fittings made of un-plasticized polyvinyl chloride (PVC-U) for water supply Part 2: Pipes (with or without integral sockets)*

## 2.4 Chemical resistance

Resistance of PVC pipe and elastomeric seals to reaction with or attack by the chemical agents listed in the "Chemical Resistance Guide" has been determined by research, investigation and reference to data from international and local sources.

Information provided is intended as a guide only. Due to the complexity of some organochemical reactions, it is suggested that in critical applications, additional long-term testing be performed.

Data provided should not necessarily be regarded as applicable to all exposure durations, concentrations and working conditions likely to be encountered.

PVC has exceptional resistance to attack from high concentrations of alkalis and acids, except for strong oxidising agents at maximum or near maximum concentrations. The material is not recommended for use with aromatic and chlorinated hydrocarbons, ketenes, esters and ethers.

For further information please visit the Iplex Chemical Resistance Guide at [www.iplex.com.au](http://www.iplex.com.au) in design tools.

### 3.1 Standards and testing

Iplex PVC-U pipes and associated materials are manufactured to relevant Australian Standards under third party accredited quality assurance programs complying with AS/NZS ISO 9001

PVC-U pressure pipes and fittings are manufactured in accordance with Australia/New Zealand Standard AS/NZS 1477 "PVC pipes and fittings for pressure applications".

### 3.2 Rubber ring seals

Iplex Rieber sealing rings comply with AS1646 'Elastomeric seals for waterworks purposes'. They are manufactured from SBR or EPDM polymer.

### 3.3 Certification

Iplex PVC-U pressure pipes are StandardsMark licensed to AS/NZS 1477.



SAI Global licence numbers,  
SMK1304  
SMK1058  
SMK1173  
SMK1531

### 3.4 Colour and Markings

Iplex PVC-U pipes are colour coded in accordance with AS/NZS 1477 and WSAA product specification WSA PS211, to readily distinguish between the different types of pipe applications. The following is a summary of the colours used for common applications.

- PVC-U (Series 1) pipes for drinking water applications are white in colour
- PVC-U (Series 1) pipes specified for recycled water applications are purple in colour
- PVC-U (Series 1) Pipes intended for pressure sewerage applications are cream in colour



Figure 3.1 - Iplex PVC-U Series 1 Pressure Pipe. PPSO1225, DN25 PN12 SWJ PVC-U pressure pipe x 6m

### 3.5 Product codes

The computer identification codes used by Iplex Pipelines are given in the Table 3.1 and are in the form,

'AAAA (A) BBCCC (D)' – the brackets indicate the symbol is used only where required.

Table 3.1 Pipe product codes

Product description	Product code AAAA (A)	Pressure class		Nominal diameter		Pipe effective length	
		PN	Code BB	DN	Code CCC	(m)	Code (D)
PVC-U Pressure Series 1 SWJ	PPSO	4.5	04	100	100	1	A
PVC-U Pressure Series 1 RRJ	PPHO	6	06	150	150	2	B
Purple PVC-U Series 1 RRJ	PPHL	9	09	200	200	3	C
Cream PVC-U Series 1 RRJ	PPHC	12	12	225	225	4	D
		15	15	300	300	5	E
		16	16	375	375	6	-
		18	18				



### Examples

The product code for RRJ DN200 PN16 (Series 1) PVC-U Pipe in 6m length is:

**"PPHO16200"**

The product code for SWJ DN100 PN9 (Series 1) PVC-U Pipe in 6m length is:

**"PPSO09100"**

**Table 3.2 - Product codes for lubricants**

Container size (grams)	Product code	
	Iplex standard lubricant	Iplex Plus* (Bactericidal)
500	JLO10500	JLB10500
1000	JLO11000	JLB11000
4000	JLO14000	JLB14000

\* This product is accredited under the WaterMark Scheme to technical specification ATS 5200.014, licence No: WMKA00103.

**Table 3.3 - Solvent cement - Type P**

Container size (grams)	Product code	Colour
125	JPG0125	Green
250	JPG0250	Green
500	JPG0500	Green
4000	JPG04000	Green
500	JPC0500	Clear

**Table 3.4 - Priming fluid**

Container size (ml)	Product code	Colour
250	JR0250	Red
500	JR0500	Red
1000	JR1000	Red
4000	JR4000	Red
250	JC0250	Clear
500	JC0500	Clear

#### 4.1 PVC-U pressure pipe dimensions

PVC-U pressure pipes are available in both solvent weld joint (SWJ) and rubber ring joint (RRJ). DN15 up to and including DN150 pipes are available in solvent weld joint and DN80 up to and including DN375 pipes are available in rubber ring joint. Typical pipe dimensions are shown in Table 4.1 and Table 4.2.

**Table 4.1 – Series 1 PVC-U (SWJ) pressure pipe dimensions**

Nominal diameter DN	Mean outside diameter	PN4.5		PN6		PN9		PN12(PN15*)		PN18	
		T	ID	T	ID	T	ID	T	ID	T	ID
15	21.4	-	-	-	-	-	-	1.5 *	18.3 *	1.8	17.8
20	26.8	-	-	-	-	-	-	1.5	23.7	2.2	22.4
25	33.6	-	-	-	-	1.5	30.5	1.9	29.8	2.7	28.1
32	42.3	-	-	-	-	1.9	38.5	2.4	37.5	3.4	35.4
40	48.3	-	-	1.5	45.2	2.1	44.1	2.7	42.8	3.9	40.5
50	60.4	-	-	1.8	56.8	2.6	55.2	3.3	53.7	4.9	50.5
65	75.4	1.7	72.0	2.2	71.0	3.2	68.9	4.2	67.0	6.1	63.2
80	88.9	2.0	84.9	2.6	83.7	3.8	81.3	4.9	79.0	7.1	74.6
100	114.3	2.5	109.3	3.2	107.8	4.8	104.6	6.3	101.7	9.1	96.0
125	140.2	3.0	134.1	4.0	132.2	5.9	128.4	7.6	124.9	-	-
150	160.3	3.4	153.4	4.5	151.3	6.7	146.9	8.8	142.7	12.8	134.7

**Table 4.2 – Series 1 PVC-U (RRJ) pressure pipe dimensions**

Nominal diameter DN	Mean outside diameter	PN4.5		PN6		PN9		PN12(PN15*)		PN18	
		T	ID	T	ID	T	ID	T	ID	T	ID
80	88.9	2.0	84.9	2.6	83.7	3.8	81.3	4.9	79.0	7.1	74.6
100	114.3	2.5	109.3	3.2	107.8	4.8	104.6	6.3	101.7	9.1	96.0
125	140.2	3.0	134.1	4.0	132.2	5.9	128.4	7.6	124.9	-	-
150	160.3	3.4	153.4	4.5	151.3	6.7	146.9	8.8	142.7	12.8	134.7
200	225.3	-	-	5.7	213.8	8.4	208.5	11.1	203.1	16.2	192.9
225	250.4	4.8	240.8	6.3	237.7	9.3	231.7	12.3	225.8	18.0	214.4
250	280.4	-	-	7.1	266.2	10.5	259.4	13.7	252.9	20.1	239.9
300	315.5	6.0	303.4	8.0	299.5	11.7	292.0	15.5	284.5	22.6	270.2
375	400.5	7.7	385.1	10.1	380.3	14.9	370.7	19.6	363.3	-	-

*Note:*

All dimensions are in millimetres.

T = average mean wall thickness

ID = average mean inside diameter

The standard effective length for all pipes is 6m + 50mm, -0mm

Some sizes and classes are subject to minimum order quantities and availability at time of order



## 4.2 Fittings

A full range of bends, tees, reducers, and valve connectors are available for Iplex PVC-U Series 1 pressure pipes with appropriate socketed joints.

## 4.3 PVC-U fittings

The Iplex solvent weld joint (SWJ) PVC pressure fitting range is compatible with Series 1 pipes and is available for pipe sizes DN15 to DN150.

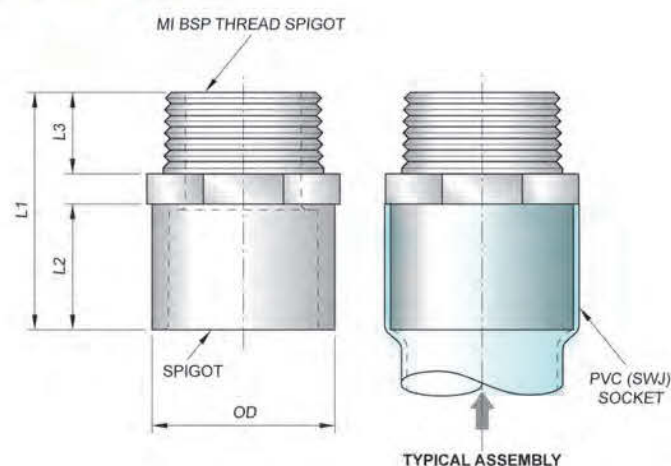
*Note: The use of imported solvent welded PVC-U fittings with parallel sockets will require gap filling solvent complying with ASTM D-2564. Failure to use the appropriate solvent and cleaner will result in joint failure.*

All PVC fittings are electrically non conductive and do not require corrosion protection in aggressive environments.

### 4.3.1 PVC solvent weld joint pressure fittings

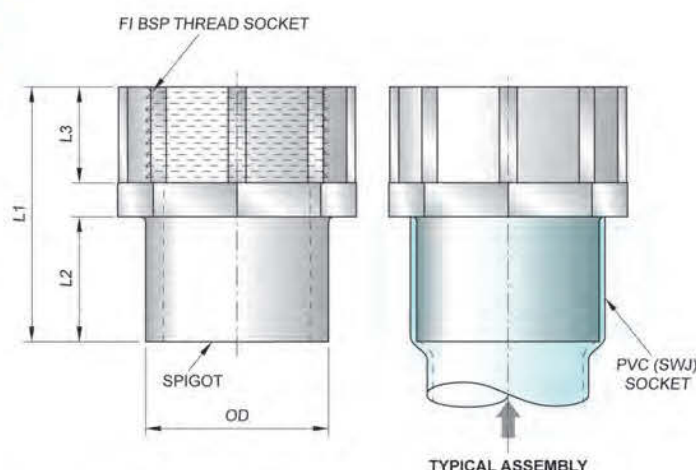
#### P002 (CAT 2) PVC pressure (Valve) adaptor - Spigot (SWJ) x MI BSP thread.

Product code	DN x BSP	PN (bar)	OD	L1	L2	L3
P0021515	15 x 1/2"	18	21	48	25	17
P0022015	20 x 1/2"	18	27	49	22	20
P0022020	20 x 3/4"	18	27	46	21	16
P0022515	25 x 1/2"	18	33	52	25	20
P0022525	25 x 1"	18	33	54	24	23
P0023232	32 x 1 1/4"	18	42	63	30	23
P0024020	40 x 3/4"	18	48	56	33	16
P0024025	40 x 1"	18	48	59	33	19
P0024032	40 x 1 1/4"	18	48	63	33	22
P0024040	40 x 1 1/2"	18	48	67	33	23
P0025025	50 x 1"	18	60	63	37	19
P0025040	50 x 1 1/2"	18	60	67	37	21
P0025050	50 x 2"	18	60	79	38	27
P0028075	80 x 3"	18	89	106	51	35
P002100100	100 x 4"	18	114	180	69	40



#### P003 (CAT 3) PVC pressure (Faucet) adaptor - Spigot (SWJ) x FI BSP thread.

Product code	DN x BSP	PN (bar)	OD	L1	L2	L3
P0031515	15 x 1/2"	18	21	44	19	18
P0032020	20 x 3/4"	18	27	47	21	18
P0032515	25 x 1/2"	18	33	50	25	17
P0032525	25 x 1"	18	33	55	24	22
P0033232	32 x 1 1/4"	18	42	62	29	24
P0034025	40 x 1"	18	48	62	33	23
P0034040	40 x 1 1/2"	18	48	67	33	25
P0035025	50 x 1"	18	60	66	37	23
P0035040	50 x 1 1/2"	18	60	71	37	25
P0035050	50 x 2"	18	60	75	37	29



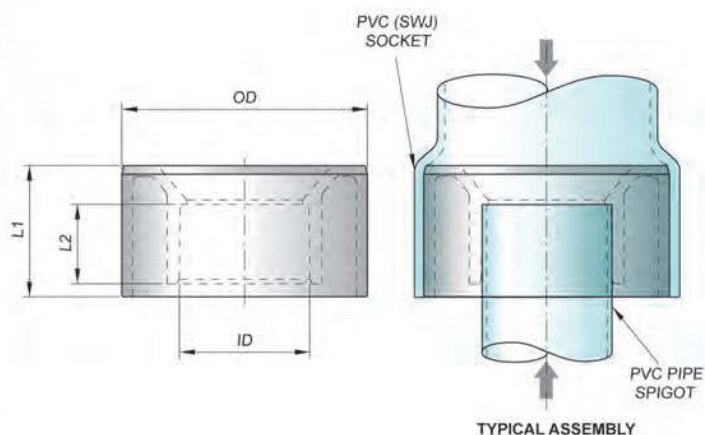
**Note:** All Illustrations are not to scale.

All dimensions are approximate only. If critical please contact Iplex Pipelines for confirmation.

### 4.3.1 PVC solvent weld joint pressure fittings

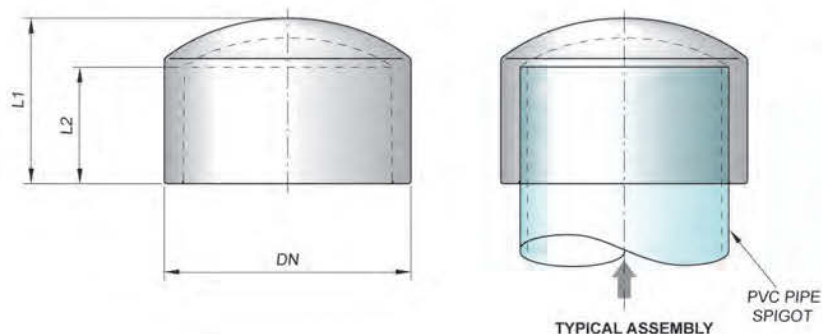
#### P005 (CAT 5) PVC pressure reducing bush - SWJ

Product code	DN x dn	PN (bar)	OD	ID	L1	L2
P0052015	20 x 15	18	27	21	20	18
P0052515	25 x 15	18	33	21	23	20
P0052520	25 x 20	18	33	27	23	20
P0053225	32 x 25	18	42	33	28	23
P0054025	40 x 25	18	48	33	30	27
P0054032	40 x 32	18	48	42	30	27
P0055025	50 x 25	18	60	33	37	28
P0055040	50 x 40	18	60	48	37	34
P0056550	65 x 50	18	75	60	44	37
P0058050	80 x 50	18	89	60	52	37
P00510050	100 x 50	18	114	60	61	37
P00510080	100 x 80	18	114	89	63	50
P005150100	150 x 100	18	160	114	88	61



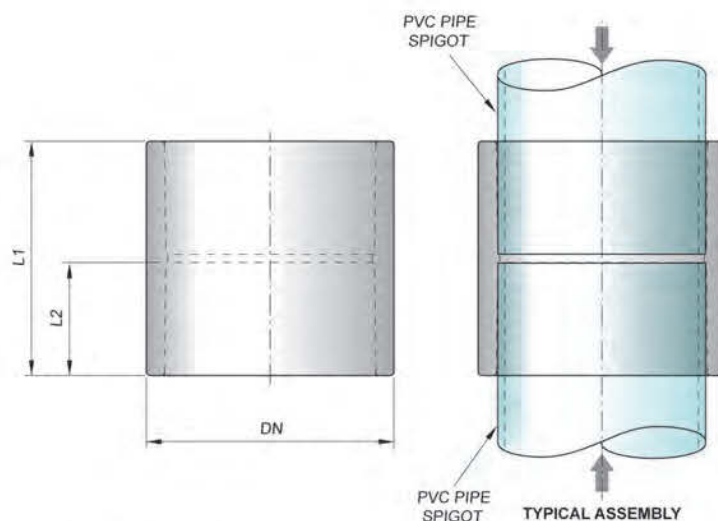
#### P006 (CAT 6) PVC pressure end cap - SWJ

Product code	DN	PN (bar)	L1	L2
P00615	15	18	38	25
P00620	20	18	32	20
P00625	25	18	25	23
P00632	32	18	35	28
P00640	40	18	38	31
P00650	50	18	52	37
P00665	65	18	75	48
P00680	80	18	73	54
P006100	100	18	91	64
P006150	150	18	126	88



#### P007 (CAT 7) PVC pressure coupling - SWJ

Product code	DN	PN (bar)	L1	L2
P00715	15	18	56	26
P00720	20	18	43	20
P00725	25	18	49	23
P00732	32	18	58	28
P00740	40	18	66	31
P00750	50	18	76	36
P00765	65	18	103	48
P00780	80	18	108	51
P007100	100	18	128	62
P007150	150	18	184	88



**Note:** All Illustrations are not to scale.

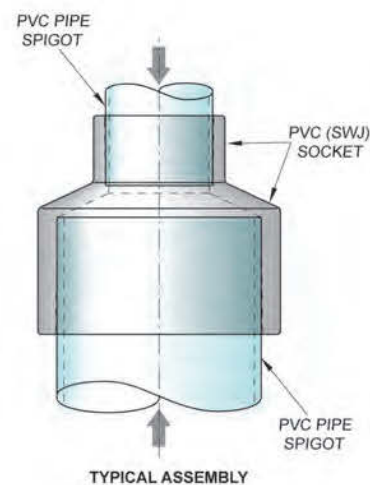
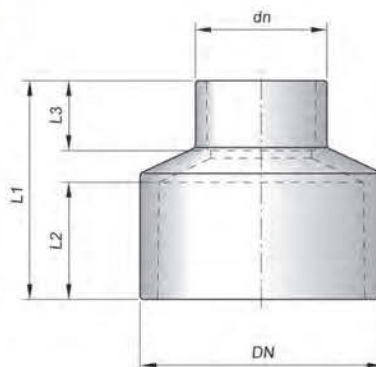
All dimensions are approximate only. If critical please contact Iplex Pipelines for confirmation.



### 4.3.1 PVC solvent weld joint pressure fittings

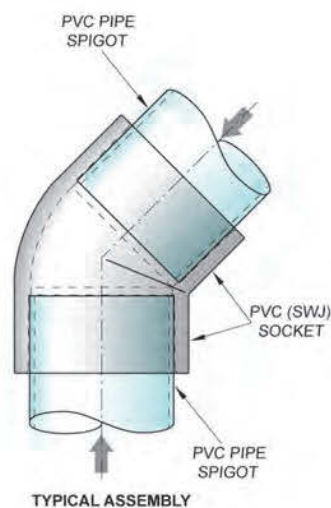
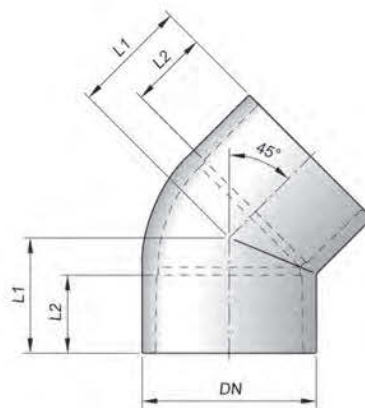
#### P008 (CAT 8) PVC pressure reducing coupling - SWJ

Product code	DN x dn	PN (bar)	L1	L2	L3
P0082015	20 x 15	18	46	22	20
P0082515	25 x 15	18	48	23	20
P0082520	25 x 20	18	51	24	21
P0083225	32 x 25	18	70	33	30
P0084020	40 x 20	18	64	33	26
P0084025	40 x 25	18	65	32	24
P0084032	40 x 32	18	74	36	33
P0085025	50 x 25	18	71	37	28
P0085040	50 x 40	18	78	38	32
P0086550	65 x 50	18	94	48	40
P0088050	80 x 50	18	107	54	38
P0088065	80 x 65	18	115	54	46
P00810050	100 x 50	18	122	65	39
P00810080	100 x 80	18	117	64	52
P008125100	125 x 100	15	165	92	63
P008150100	150 x 100	12	175	103	61



#### P010 (CAT 10) PVC pressure elbow x 45° - SWJ

Product code	DN	PN (bar)	L1	L2
P01015	15	18	28	20
P01020	20	18	30	23
P01025	25	18	35	24
P01032	32	18	45	35
P01040	40	18	52	40
P01050	50	18	60	45
P01080	80	18	80	53
P010100	100	15	90	61
P010150	150	15	126	88



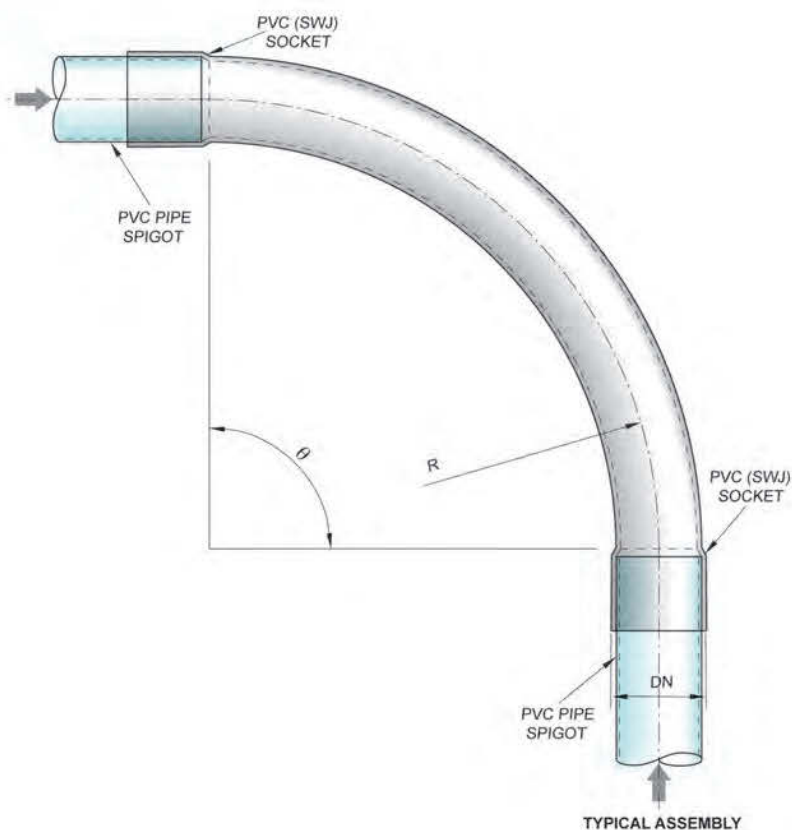
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### 4.3.1 PVC solvent weld joint pressure fittings

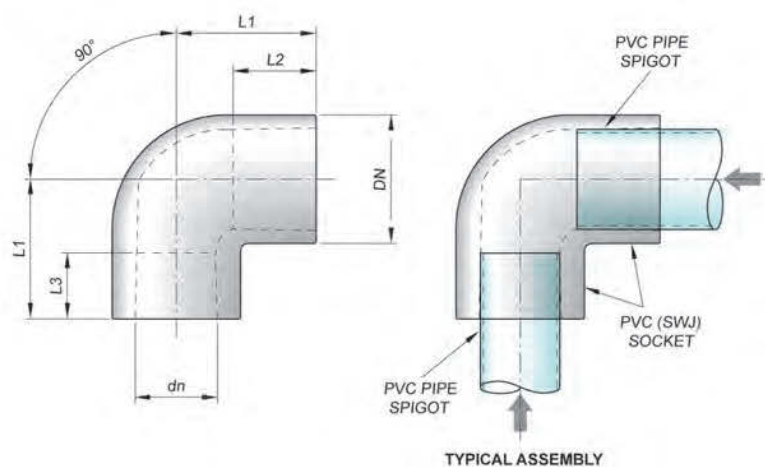
#### P012 (CAT 12) PVC pressure long radius bend - SWJ

Product code	DN	$\theta$	PN (bar)	R
P0122090	20	90°	18	245
P0122590	25	90°	18	245
P0123290	32	90°	18	245
P0124045	40	45°	18	245
P0124090	40	90°	18	245
P0125022	50	22½°	12	245
P0125045	50	45°	12	245
P0125090	50	90°	12	300
P0126545	65	45°	12	300
P0126590	65	90°	12	300
P0128011	80	11¼°	12	600
P0128022	80	22½°	12	600
P0128045	80	45°	12	600
P0128090	80	90°	12	600
P01210011	100	11¼°	12	600
P01210022	100	22½°	12	600
P01210045	100	45°	12	600
P01210090	100	90°	12	600
P01215022	150	22½°	12	800
P01215045	150	45°	12	800
P01215090	150	90°	12	800
P01220090	200	90°	9	900



#### P013 (CAT 13) PVC pressure elbow x 90° - SWJ

Product code	DN x dn	PN (bar)	L1	L2	L3
P0131515	15	18	28	17	-
P0132015	20 x 15	18	37	22	18
P0132020	20	18	36	20	-
P0132520	25 x 20	18	44	25	25
P0132525	25	18	42	23	-
P0133232	32	18	48	27	-
P0134040	40	18	54	30	-
P0135050	50	18	70	37	-
P0136565	65	15	87	48	-
P0138080	80	15	110	63	-
P013100100	100	15	124	64	-
P013150150	150	15	175	88	-



**Note:** All Illustrations are not to scale.

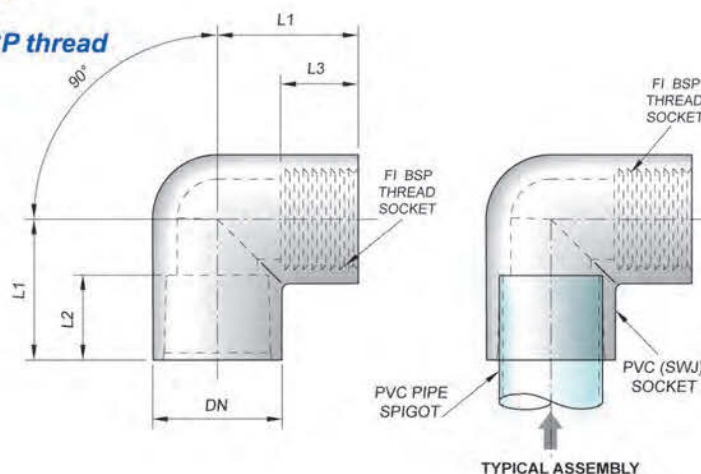
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### 4.3.1 PVC solvent weld joint pressure fittings

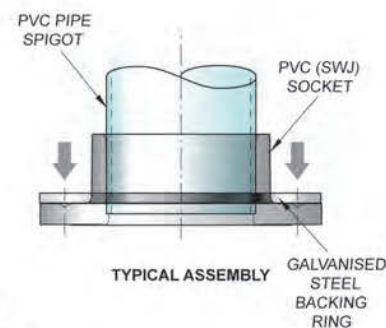
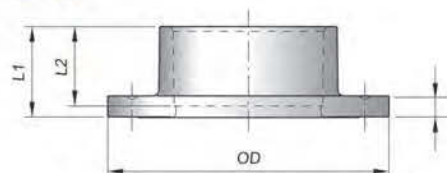
#### P015 (CAT 15) PVC pressure elbow - SWJ x FI BSP thread

Product code	DN x BSP	PN (bar)	L1	L2	L3
P0151515	15 x 1/2"	18	29	18	16
P0152015	20 x 1/2"	18	36	20	18
P0152020	20 x 3/4"	18	36	20	19
P0152515	25 x 1/2"	18	36	22	18
P0152520	25 x 3/4"	18	41	24	24
P0152525	25 x 1"	18	44	24	24
P0153232	32 x 1 1/4"	18	54	32	31
P0154040	40 x 1 1/2"	18	58	33	33



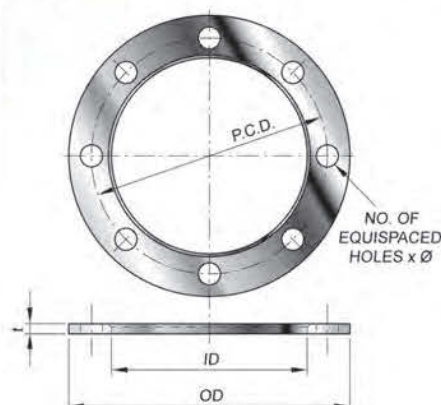
#### P016 (CAT 16) PVC pressure full face flange - SWJ x Flange

Product code	DN	PN (bar)	OD	L1	L2	t
P01650	50	18	150	43	37	12
P01665	65	15	165	54	48	12
P01680	80	15	185	68	60	13
P016100	100	18	215	69	61	14
P016150	150	18	280	98	88	20



#### P016 (CAT 16R) Galvanised steel backing ring - Drilled table E

Product code	DN	OD	ID	PCD	t	No. of holes x dia
P01650R	50	150	75	114	6	4 x 18
P01665R	65	165	93	127	6	4 x 18
P01680R	80	185	110	146	8	4 x 18
P016100R	100	215	138	178	10	8 x 18
P016150R	150	280	195	235	10	8 x 22



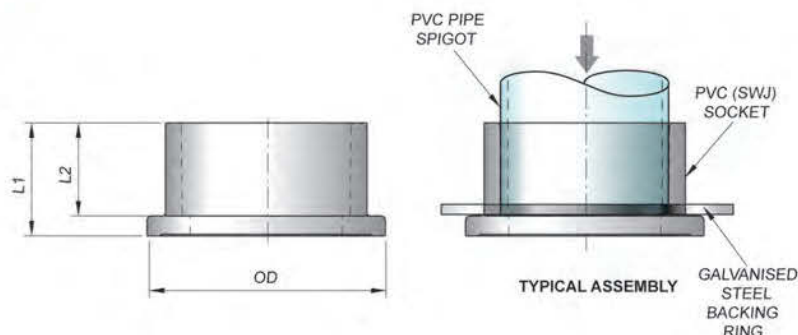
**Note:** All Illustrations are not to scale.

All dimensions are approximate only. If critical please contact Iplex Pipelines for confirmation.

### 4.3.1 PVC solvent weld joint pressure fittings

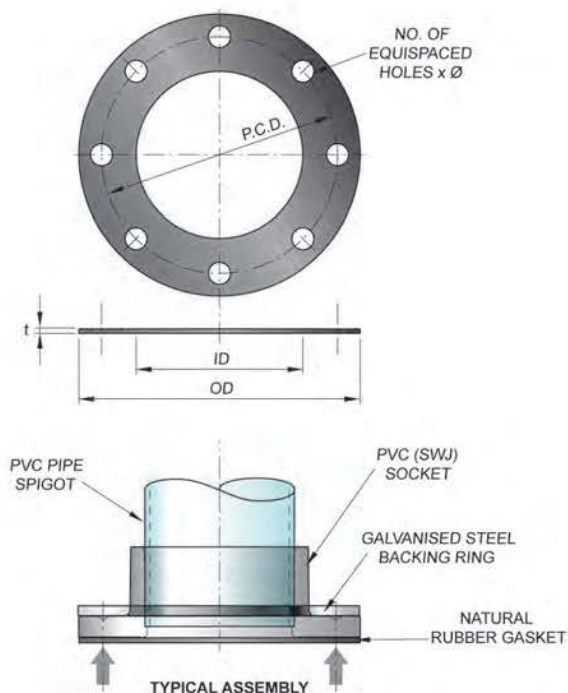
#### P016 (CAT 16S) PVC pressure stub flange - SWJ x Flange

Product code	DN	PN (bar)	OD	L1	L2
P01650S	50	15	97	43	31
P01665S	65	15	106	55	48
P01680S	80	15	129	69	60
P016100S	100	15	160	77	63
P016150S	150	15	215	98	88



#### P016 (CAT 16G) Full face natural rubber gasket. Table E

Product code	DN	OD	ID	PCD	t	No. of holes x dia
P01650G	50	150	60	114	3	4 x 18
P01665G	65	165	70	127	3	4 x 18
P01680G	80	185	88	146	3	4 x 18
P016100G	100	215	114	178	3	8 x 18
P016150G	150	280	168	235	3	8 x 22



**Note:** All Illustrations are not to scale.

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