

DUROFLO PVC-U
ULTRAFLO PVC-M
Pressure Pipe
Systems



DPI Plastics (Pty) Ltd is a leading manufacturer of PVC and HDPE water reticulation and drainage pipe and fitting systems with two ISO 9001 certified South African factories based in Johannesburg and Cape Town. In addition, within the DPI Group are wholly owned subsidiary plants in Namibia and Botswana and joint venture (JV) manufacturing operations in Mauritius, Tanzania and Angola, producing plastic pipes to the relevant SABS or international specification.

DPI is wholly-owned by industry leader Dawn, which is listed in the construction, building materials and fixtures sector of the JSE. The group's strategy is centred on the manufacturing and wholesale distribution of local and international quality branded hardware, sanitaryware, plumbing, kitchen, engineering and civil products through a national, strategically-positioned branch network, as well as in selected African countries.

DPI Plastics' products and related components are sold to the rest of Africa via the Exports Department based in Johannesburg, as well as through relationships with AST International and Saffer International, each with offices of their own across the continent.



WHY PVC FOR PRESSURE APPLICATIONS?

PVC pressure pipe systems, including Duroflo and Ultraflo, offer many advantages when compared to traditional products, namely:

- Enhanced hydraulic performance.
- Durability and toughness – resistance to handling and installation damage.
- Corrosion resistance – greater service life.
- Lower mass – ease of handling and installation, particularly suited to labour intensive projects.
- Locked-in sealing ring system – no specialist installation skills required.
- Savings on installation time.
- Manufactured within internationally accepted standards.
- Highly recyclable - Waste generated during manufacturing is pulverized and reprocessed
- Savings on transport costs.
- Service performance in excess of 50 years.
- Unique combination of properties
 - Toughness
 - Stiffness
 - High tensile and hoop strength
 - Excellent resistance to creep
- Predictable long-term behaviour.
- Energy efficient - PVC pipe production consumes less energy during manufacturing than steel, clay or ductile iron

PVC PRESSURE PIPE SPECIFICATIONS

The SANS 966 is a two-part specification.

DUROFLO™	ULTRAFLO™
Part 1: Unplasticised Poly Vinyl Chloride (PVC-U) Pressure Pipe Systems SANS 966 Part 1 (PVC-U)	Part 2 : Modified Poly Vinyl Chloride (PVC-M) Pressure Pipe Systems SANS 966 Part 2 (PVC-M)

SABS
ISO 9001



	DUROFLO™ PVC-U	ULTRAFLO™ PVC-M
MATERIAL	Unplasticised Polyvinyl Chloride	Modified Polyvinyl Chloride
PIPE	SANS 966 Part 1	SANS 966 Part 2
SEAL RINGS	SANS 4633	SANS 4633
BENDS	SANS 966 Part 1	SANS 966 Part 2
FACTORIES	ISO 9001	ISO 9001

Diameter

PVC pressure pipes are specified by their nominal size (i.e. outside diameter) in millimetres. For design purposes, reference should be made to tables detailing the internal diameters as calculated from the average wall thicknesses of the particular pressure class of pipe.

Pressure Class

A range of pressure "classes" is available in each size. These classes are based on the pipe's recommended maximum working pressure in kPa.

For example, a class 16 pipe has a recommended maximum working pressure of 1 600kPa, or 160 metres head.

Duroflo™ unplasticised PVC (PVC-U) pressure pipe is a tried and tested system demonstrating a long track record in the water reticulation sector. Duroflo pressure pipes are manufactured to the SANS 966 Part 1 specification, incorporating the traditional design stresses of 10 and 12.5 MPa. The product is ideally suited to applications in both pumping and gravity designs.

Product Range

- Pressure Classes 4, 6, 9, 12, 16 and 20 Bar.
- Working Pressures 400, 600, 900, 1 200, 1 600 and 2 000 kPa.
- Length Supplied in standard 6m lengths.
- Outside Diameters Constant for all classes of a given size.
- Pipe Ends / Joints Spigot and socket pipe with integral socket and locked-in rubber ring seal.



966 - Part 1

Dimensions

Minimum wall thickness and mass per 6-metre length for each size and class.

(Wall thickness = mm / Mass = kg)

Outside Dia.mm	Class 4		Class 6		Class 9		Class 12		Class 16		Class 20	
	mm	kg	mm	kg	mm	kg	mm	kg	mm	kg	mm	kg
16	-	-	-	-	-	-	-	-	1.5	0.62	-	-
20	-	-	-	-	-	-	-	-	1.5	0.79	-	-
25	-	-	-	-	-	-	1.5	1.01	1.9	1.25	-	-
32	-	-	-	-	1.5	1.31	1.8	1.55	2.4	2.03	-	-
40	-	-	1.5	1.65	1.8	1.96	2.3	2.47	3.0	3.16	-	-
50	1.5	2.08	1.8	2.48	2.2	3.00	2.8	3.77	3.7	4.88	-	-
63	1.5	2.63	1.9	3.31	2.7	4.64	3.6	6.09	4.7	7.80	-	-
75	1.5	3.15	2.2	4.57	3.2	6.56	4.3	8.67	5.6	11.07	-	-
90	1.8	4.53	2.7	6.73	3.9	9.58	5.1	12.34	6.7	15.89	-	-
110	2.2	6.77	2.6	8.14	3.9	12.11	5.1	15.67	6.7	20.29	8.2	24.48
125	2.5	8.91	3.0	10.66	4.4	15.53	5.8	20.25	7.6	26.15	9.3	31.55
140	2.8	11.19	3.3	13.19	4.9	19.37	6.5	25.41	8.5	32.75	10.4	39.51
160	3.2	14.64	3.8	17.36	5.6	25.32	7.4	33.10	9.7	42.76	11.9	51.73
200	3.9	22.40	4.7	26.92	7.0	39.68	9.2	51.62	12.1	66.92	14.9	81.24
250	4.9	35.33	5.9	42.46	8.7	62.68	11.5	81.12	15.1	105.03	18.6	127.58
315	6.2	56.44	7.4	67.28	11.0	99.04	14.5	129.29	19.0	167.12	-	-
355	7.0	72.19	8.4	86.55	12.4	126.57	16.3	164.83	21.4	213.49	-	-
400	7.9	90.90	9.4	109.40	14.0	161.41	18.4	210.21	-	-	-	-
450	-	-	10.6	139.39	15.7	204.60	-	-	-	-	-	-
500	-	-	11.8	172.59	17.4	252.34	-	-	-	-	-	-
560	11.0	182	13.2	217	19.5	318	-	-	-	-	-	-
630	12.5	232	14.8	274	21.9	401	-	-	-	-	-	-

Note:

1. The wall thicknesses for pipe diameters 90mm and below, including the entire class 4 pressure range, are based on a design stress, σ_s of 10MPa and an overall service (design) coefficient (or safety factor) of C = 2.5.
2. Wall thicknesses for pipe diameters from 110mm are based on a design stress, σ_s of 12.5MPa and an overall service (design) coefficient (or safety factor) of C=2.0.



ULTRAFLO PVC-M Pressure Pipe

Ultraflo™ PVC-M is a tough and resilient, modified PVC pressure pipe, developed to offer greater strength and toughness. Ultraflo pressure pipes are manufactured in accordance with the SANS 966 Part 2 specification, incorporating a design stress of 18MPa.

Product Range

- Pressure Classes 6, 9, 12, 16, 20 and 25 Bar.
- Working Pressures 600, 900, 1 200, 1 600, 2 000 and 2 500 kPa.
- Length Supplied in standard 6m lengths.
- Outside Diameter Constant for all classes.
- Pipe Ends / Joints Spigot and socket pipe with integral socket and locked-in rubber ring seal.



966 - Part 2

Dimensions

Minimum wall thickness and mass per 6-metre length of each size and class.

(Wall thickness = mm / Mass = kg)

Outside Dia.mm	Class 6		Class 9		Class 12		Class 16		Class 20		Class 25	
	mm	kg	mm	kg	mm	kg	mm	kg	mm	kg	mm	kg
50	1.5	2.1	1.5	2.1	1.7	2.4	2.2	3.0	2.7	3.7	3.3	4.4
63	1.5	2.7	1.6	2.8	2.1	3.7	2.7	4.7	3.4	6.0	4.1	7.0
75	1.5	3.2	1.9	4.0	2.5	5.3	3.2	6.8	4.0	8.2	4.9	10.0
90	1.8	4.6	2.2	5.6	3.0	7.6	3.9	9.7	4.8	11.9	5.9	14.4
110	2.2	6.9	2.7	8.4	3.6	11.1	4.7	14.4	5.8	17.6	7.2	21.5
122	-	-	-	-	4.0	13.3	5.2	17.2	-	-	-	-
125	2.5	8.9	3.1	11.0	4.1	14.4	5.4	19.1	6.6	22.7	8.2	27.9
140	2.8	11.2	3.5	14.2	4.6	18.1	6.0	24.1	7.4	28.6	9.1	35.8
160	3.2	14.6	4.0	18.2	5.2	23.5	6.9	30.8	8.5	37.6	10.4	45.5
177	-	-	-	-	5.8	28.1	7.7	36.8	-	-	-	-
200	3.9	22.3	4.9	27.9	6.5	36.8	8.6	48.2	10.6	60.3	13.0	71.3
250	4.9	35.1	6.1	44.9	8.1	57.6	10.7	75.4	13.2	94.6	16.3	112.5
315	6.2	56.3	7.7	69.7	10.2	91.7	13.5	120.3	16.6	146.7	-	-
355	7.0	72.0	8.7	89.2	11.5	117.3	15.2	153.6	-	-	-	-
400	7.8	90.3	9.8	113.5	13.0	149.8	17.1	195.4	-	-	-	-
450	8.9	116.7	11.0	144.0	14.6	190.1	-	-	-	-	-	-
500	9.8	144.4	12.2	177.7	16.2	234.8	-	-	-	-	-	-
560	11.0	182	13.5	222	17.1	280	-	-	-	-	-	-
630	12.5	232	15.4	285	20.4	375	-	-	-	-	-	-

Note:

1. Wall thicknesses for PVC-M pipes are based on a design stress, σ_d of 18MPa and an overall service (design) co-efficient (or safety factor) of $C = 1.4$.

DESIGN COEFFICIENT (SAFETY FACTOR)

Product	Design stress	Design coefficient	
		1 hour	50 years
Duroflo PVC-U (16-90mm) (110-630mm)	10 MPa	4.2	2.5
	12.5 MPa	3.4	2.0
Ultraflo PVC-M (50-630mm)	18.0 MPa	2.3	1.4

PVC pressure pipes are compatible with standard SG iron fittings and a range of PVC fittings.

SG Iron Valves and Fittings

A complementary range of valves and fittings is available.

The fittings are socketed and manufactured in SG iron grade 42 to suit PVC pipe in sizes up to 315mm. They are either bitumen dipped or fusion bonded epoxy powder coated to prevent corrosion.



Valves include: Resilient seated Gate valves – either Socketed or Flanged, for pressure rating of PN10/PN16 and in sizes up to DN300; Double Door Check Valves for PN16 pressure ratings in sizes up to DN200; Spring loaded Swing Check Valves for PN16 pressure ratings and in sizes up to DN200; Fire Hydrants with either London Round or Bayonet outlets; Wafer Pattern Rubber Lined Butterfly Valves for PN16 pressure ratings and in sizes up to DN300 and; Inline Strainers in sizes up to DN200. Valves are manufactured as standard in SG iron, fusion bonded epoxy powder coated with stainless steel trim.

PVC Pressure Bends

Both PVC-U and PVC-M pressure bends are manufactured to class 9 and class 16 working pressures. Bends to class 25 can be manufactured on request. The range of bends is available in 11.25°, 22.5°, 45° and 90°.

Steel Fabricated Fittings

For sizes 315, 355, 400, 450 and 500mm plain ended steel fabricated bends, equal tees, hydrant and scour tees, reducing tees, reducers, flanged adaptors, end caps and saddles are available. These fittings are suitably protected against corrosion.

“Viking Johnson” or similar couplings are used to connect these fittings to plain ended pipe. The “Viking Johnson” joint is a mechanical joint in which a rubber seal is compressed against the pipe spigots by tightening the bolts on the joint. The correct “barrel” length of the “Viking Johnson” joint must be used to allow for expansion and contraction of the PVC pipe or any possible movement after installation of the pipeline. The PVC pipe spigots must also be cut square to the axis of the pipe before making the joint. It must be noted that these joints offer little resistance to end thrust which occurs at bends, flanges, valves, etc.; consequently the pipe should be adequately anchored.



Steel Fabricated Fittings



PVC Pressure Bends and fabricated fittings

PIPE MARKING

The following information appears on all PVC pressure pipe, manufactured in accordance with the SABS specifications:

- SABS Mark.
- SABS Specification number.
- Nominal pipe size.
- Pressure class.
- The designation “PVC-U” or “PVC-M”.
- Manufacturer’s trade name or trade mark.
- Batch identification number that provides traceability of the product, with the date and time of manufacture.
- SAPPMA logo: a quality mark from the Southern African Plastic Pipe Manufacturers Association over and above the relevant SABS or international mark, indicating a responsible manufacturer of integrity and a quality product backed by a technical information service. SAPPMA is an affiliated member of the Plastics Federation of South Africa.



EXCAVATION

The width of the trench excavation should be kept to a minimum, allowing just sufficient working area for jointing and initial compaction around the pipe. For most purposes, a trench 300mm wider than the diameter of the pipe allows enough room for jointing. It is important that the trench is not excavated too far in advance of the pipe laying operation, especially in situations where the trench walls are unstable.

BEDDING

The quality of the bedding material and its compaction, together with the nature of the undisturbed material of the trench walls are all relevant to the ultimate performance of Duroflo and Ultraflo pressure pipes once installed. The trench bed must be free from all stones or sharp projections which are likely to cause damage to the pipe. The bottom of the trench should be backfilled to a depth of 100mm, with selected bedding material such as free draining coarse sand, gravel or soil of a friable nature. The size of soil particles in the bedding material should not exceed 20mm. The bedding onto which the pipe is laid, should be thoroughly compacted to the specified density. Reference should be made to SANS 2001 for bedding specifications.

BACKFILLING

It is essential that each length of PVC pressure pipe is backfilled immediately after installation in order to contain expansion and contraction that may occur in an open trench. All joints must be left exposed at this stage. Selected backfill material should be placed in consecutive even layers of 150mm in depth over the entire width of the trench to a height of 300mm above the crown of the pipe. All layers must be firmly tamped by hand. The remainder of the trench should be filled in layers of 300mm in depth. Excavated trench material may be used. Each layer must be firmly compacted, the first layer by hand and subsequent layers by mechanical means if needed.

ANCHORING

When an internal hydrostatic pressure is applied to the pipe, unbalanced forces develop at all changes of size and direction in a pipeline. Thrust blocks prevent the movement of fittings and must be placed at all changes of direction, valves, stop ends and reducers. Concrete thrust blocks are most commonly used at all anchor points. The dimensions of the thrust blocks must be calculated to suit the pipe diameter, pressure and the load bearing capacity of the soil.

Typical Thrust Block Sizes

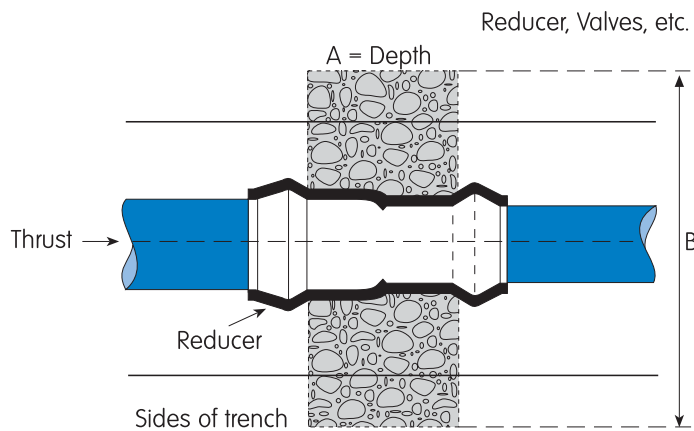
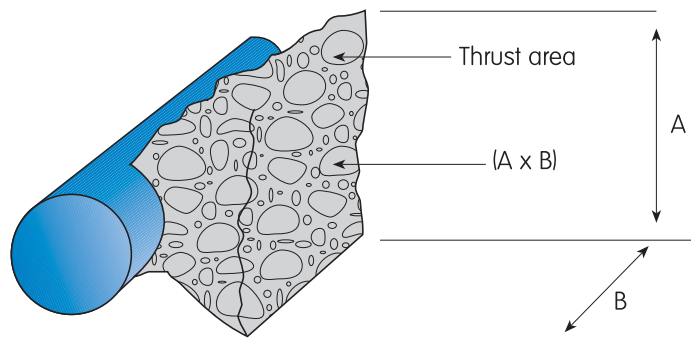
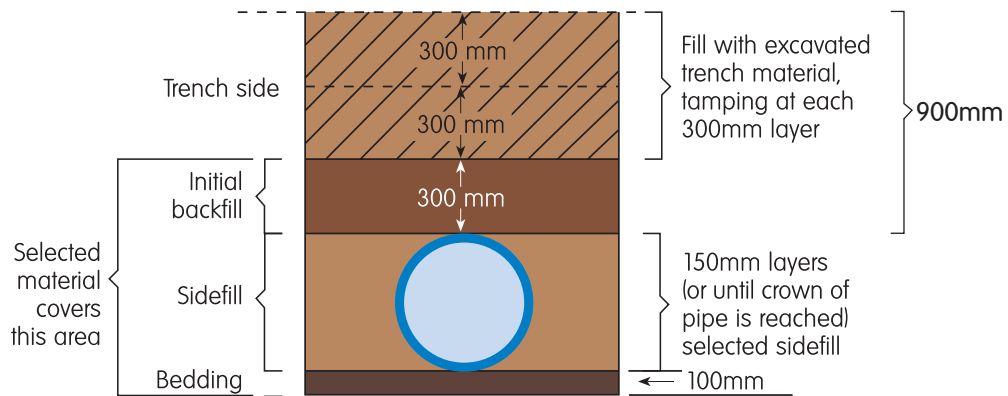
(Final dimensions must be specified by the consulting engineer)

Pipe Size (mm)	90° Bends A x B (m)	45° Bends A x B (m)	Tees A x B (m)	End Caps, Valves, Reducers A x B (m)
110	0.30 x 0.30	0.30 x 0.25	0.30 x 0.30	0.30 x 0.60
200	0.45 x 0.70	0.30 x 0.70	0.45 x 0.60	0.45 x 0.80
315	0.60 x 1.30	0.60 x 0.90	0.60 x 0.90	0.60 x 1.00
400	1.00 x 1.60	1.00 x 1.20	0.80 x 1.50	0.80 x 1.50

CUTTING TO LENGTH

When cutting PVC pressure pipe, clearly mark the cutting position on the pipe, ensuring that the cut is square to the axis of the pipe. Use a fine-toothed wood saw or power saw to cut the pipe. Remove all swarf and burrs from the cut end and chamfer the pipe with a fine to medium file, at 15° to half of the pipe wall thickness. Redraw the depth of entry mark.





DETAILED PIPELINE DESIGN TECHNICAL INFORMATION CONTAINED IN CD OR PDF FORMAT

Available on request from DPI Plastics and containing, inter alia:

- Design criteria and specific considerations
- Water hammer and surge
- Temperature effects
- Effect of entrapped air
- Longitudinal bending
- Friction and velocity calculation tables



DPI Plastics Reticulation and Drainage Pipe Systems include:

- Duroflo PVC-U Pressure Pipe
- Ultraflo PVC-M Pressure Pipe
- Mineflo PVC-M Pressure Pipe
- Duroflex Flexible PVC Hose
- Durodrain PVC-U Sewer and Drain Pipe
- Freeflo PVC-U Soil, Vent and Waste Pipe
- Ultracor PVC-U Structured wall Sewer and Drain Pipe
- Rainflo PVC D-shape Gutter System
- Duroduct HDPE Structured wall Cable Ducting
- Durocor HDPE Structured wall Drainage Pipe
- Polydrain HDPE Double Wall Drainage Pipe



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