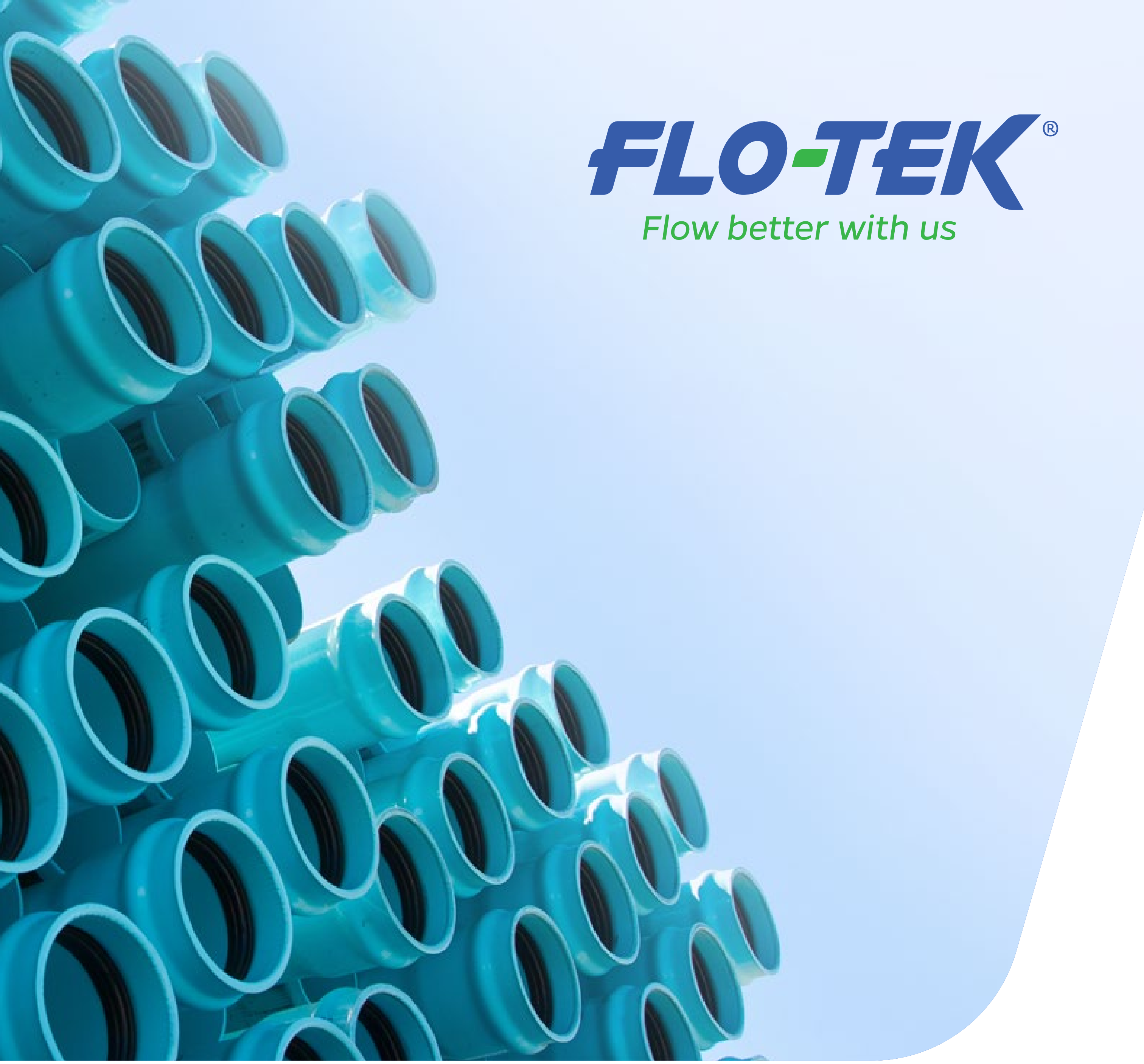


FLO-TEK®

Flow better with us

PVC *Pressure Pipes & Fittings*

UPVC | MPVC | High Impact |

Company Profile

Flo-Tek the leading manufacturer and supplier of plastic Pipes, Tanks, Fittings and Irrigation products, since 1998.

Radical Investments (Pty) Ltd, trading as Flo-Tek Pipes & Irrigation was established in Botswana in 1998 manufacturing PVC pipes. In July 2003 and June 2004 Flo-Tek commenced manufacturing rotational moulded products and HDPE pipes, respectively.

The company was established in South Africa in 2005 and an HDPE pipe factory was started in Clayville in August 2007. Flo-Tek South Africa has since opened subsidiary companies in Dundee, Port Elizabeth, Nelspruit and Klerksdorp. Flo-Tek also has an established operations in Angola and Namibia.

Within our South African and Botswana operations, we have trained staff who bring a wealth of knowledge and experience.

Flo-Tek ensures the best quality of products and the highest delivery standards.

www.flotekafrica.com

Flo-Tek's core business is the manufacturing and distribution of PVC-U and PVC-M Pressure Pipes & Fittings, HDPE Pipes & Fittings, Sewer Pipes & Fittings, Irrigation and Rotomoulded products. We also produce Borehole Casings, Screens and PVC Cable Ducts.

Our ISO 9001 certified factories in Botswana and South Africa enable us to manufacture our pipes and tanks as well as to distribute across the SADC region. Our factories have fully equipped laboratories which ensure Flo-Tek manufactures to SANS, BOBS ISO and SAPPMA specifications.

Broad-Based Black Economic Empowerment (BBBEE)

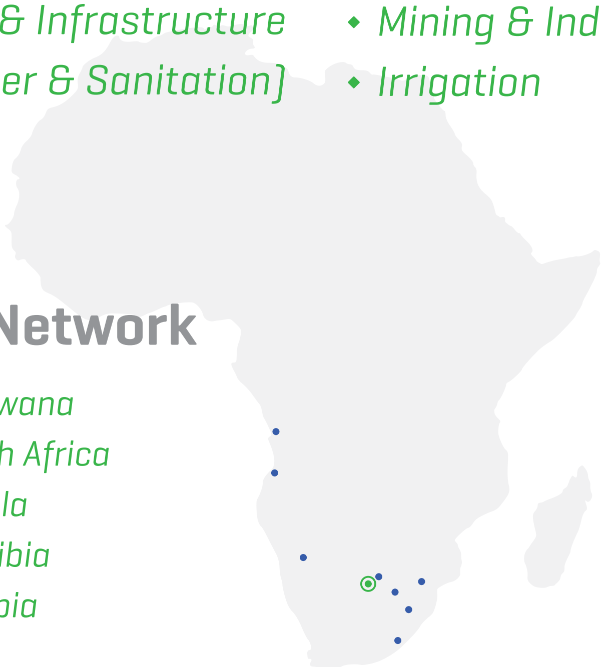
Flo-Tek South Africa is a BEE compliant company. The principles of broad-based BEE, through stakeholder empowerment, have also been integrated into how we do business, and how we can assist and support our clients in how they do their business. The empowerment of women and the development of skills at lower levels of the organization to facilitate career and personal growth opportunities are the particular areas that will continue to receive attention and focus within our business.

Sectors Serviced

- *Civil & Infrastructure (Water & Sanitation)*
- *Mining & Industrial*
- *Irrigation*

Our Network

- *Botswana*
- *South Africa*
- *Angola*
- *Namibia*
- *Zambia*



Contents

OVERVIEW

Composition of PVC Pipe Materials

Polyvinyl Chloride or PVC is one of the most versatile types of pipe materials. It is produced by the polymerisation of vinyl chloride which is made from coal (or oil) and common salt. In fact, salt makes up over 50% of the polymer, thus making PVC one of the most environmentally friendly plastic materials, being least dependent on increasingly scarce hydrocarbon resources.

The unique properties of PVC can be enhanced by the addition of special additives, for example, to create strong yet tough pipe materials such as modified PVC (PVC-M), foamed multilayer sewer and drainage pipes, and weather resistant, above ground drainage pipes. These additives, as well as heat stabilisers and lubricants, which are necessary to facilitate the extrusion of the pipes, are added to the PVC raw material in a special high speed mixer to produce a dry blend specially formulated for the pipe extrusion process.

During the manufacture of the pipe the dry blend is mixed in the extruder and through a combination of heat and shear, the material is 'gelled' into a homogeneous molten mass ready for passage through the die and calibrator to form a pipe which has tight tolerances in terms of the outside diameter, wall thickness and mechanical properties.

It should be noted that in recent years heat stabilisers and lubricants have been changed from lead based compounds to alternative, environmentally friendly materials such organic and calcium/zinc compounds.

Flo-Tek's PVC Pipe Systems

SANS 966 Part 1 UPVC

Below-ground pressure applications for the conveyance of potable water in reticulation systems and for other applications in which continuous temperatures in excess of 25 °C are not encountered.

SANS 966 Part 2 (MPVC)

Below-ground pressure applications for the conveyance of potable water in reticulation systems and for other applications in which continuous temperatures in excess of 25 °C are not encountered.

SANS 1283 High Impact

Suitable for the conveyance of non-potable water at temperatures between 5 °C and 50 °C for underground use in mines.

SANS 1452-2

For water supply and for buried and above ground drainage and sewerage under pressure.

Features and Benefits

- *Environment-friendly & Lead-free material.*
- *Excellent flow characteristics: reduces friction losses.*
- *Best long-term strength (serves in excess of 50 years).*
- *Long-term strength, toughness and stiffness.*
- *Large bore and high flow capacity.*
- *Durability and toughness.*
- *Resistant to acids and alkalis.*
- *Resistant to abrasion, scouring and modern cleaning methods.*
- *Light mass: for easy handling and installation.*
- *Elastomeric locked-in sealing ring system.*
- *Inflammable: Does not support combustion*

Physical Properties

Major properties of PVC pressure and sewer and drain pipes are given in Table 2. Please note that as with all thermoplastics, properties are dependent on the operating temperature and the duration of the stress application.

For example, working pressures of pipes used at higher temperatures should be lowered (or a higher class to be used) in order to maintain the long—term design life of the pipe.

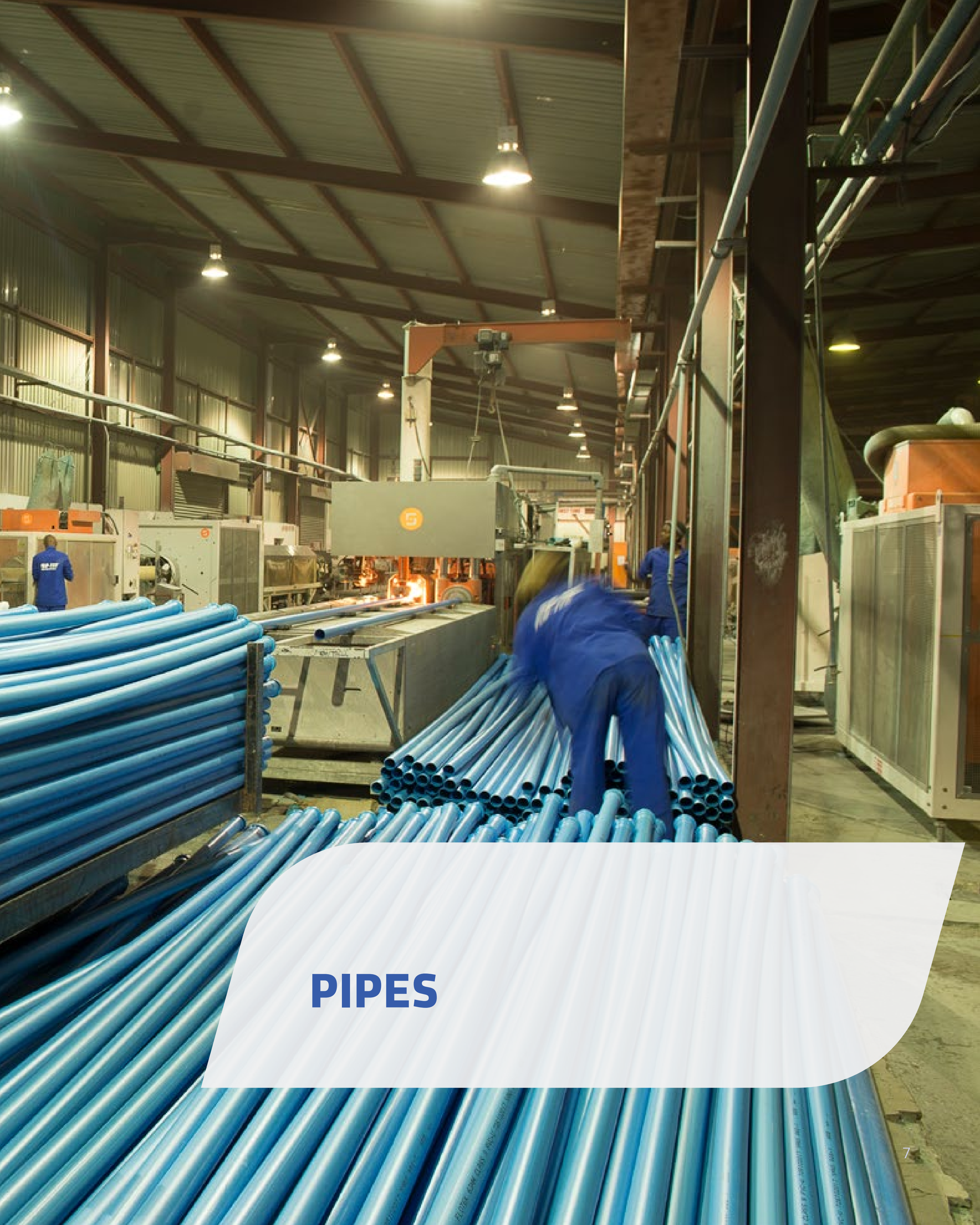
Product Range

PRODUCT	RANGE (ia)	SPECIFICATION
PVC-U Pressure Pipes	20 -500 mm	SANS 966-1
PVC-U Pressure Pipes	50 -500 mm	SANS 966-2
PVC-U Pressure and Pressure Sewer	20 - 500 mm	ISO 1452-2
PVC-M Mining Pressure Pipes High Impact	110 - 200 mm	SANS 1283
Borehole Casings and Screens	50 - 315 mm	DIN 4925 & ASTM F480-88

Product Properties

PHYSICAL	UNITS	PVC-U	PVC-M
Co-Efficient of Linear Expansion	k^{-1}	6×10^{-5}	6×10^{-5}
Density	Kg/m^3	1.4×10^3	1.4×10^3
Flammability (oxygen index)	%	45	45
Shore Hardness (D)		70—80	70—80
Softening Point (Vicat- minimum)	˚C	> 80	> 80
Specific Heat	J/Kg/K	1.0×10^3	1.0×10^3
Thermal Conductivity (0˚C—50˚C)	W/m/K	0.14	0.14
MECHANICAL			
Elastic Modulus (long term: 50 years)	MPa	1500	1400
Elastic Modulus (short term: 100 seconds)	MPa	3300	3000
Elongation at break (Minimum)	%	45	45
Poisons Ratio		0.4	0.4
Tensile Strength (50 year - extrapolated)	MPa	26	26
Tensile Strength (short-term / Minimum)	MPa	45	45
FRICTION FACTORS			
Manning		0.008—0.009	0.008—0.009
Hazen Williams		150	150
Nikuradse Roughness (k)	mm	0.03	0.03


FLOTEK 63MM CLASS 9 PVC-U



PIPES

PIPES

1. SANS 966 Part 1 PVC-U Pipes

From the stress-time line (also known as the creep rupture regression line) the minimum required strength (MRS) at 50 years is determined and the design stress (s) is then obtained by applying a safety factor (C). The safety factor (or overall service design coefficient) takes into account the properties of the material and the service conditions and any unknown loading or environmental conditions.

$$\sigma s = \frac{MRS}{C}$$

As can be determined from the stress line, the MRS for PVC-U and for modified, 'high impact' PVC-M mine pipes is 25 MPa. It is important to note that since the design stress is the constant stress that the pipe wall can resist for at least 50 years, the safety factor applies at 50 years.

The safety factors used in the design of PVC-U and PVC-M Pipes have been accepted by the water and mining industries after many years of excellent performance.

Pipe Standards

Designation	Standard	MRS (MPa)	Design Stress	Safety Factor
PVC-U (20mm-90mm)	SANS 966-1	25	10.0	2.5
PVC-U (100mm-90mm)	SANS 966-1	25	12.5	2.0

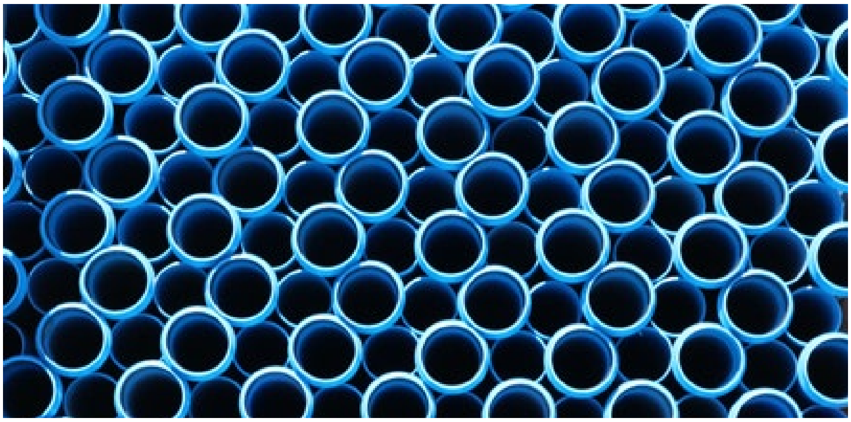
Features and Benefits

- *Manufactured from environment friendly virgin PVC & Lead free material does not affect water quality for human health.*
- *Excellent flow characteristics: reduces friction losses.*
- *Best long—term strength/cost ratio of all pipe materials, serves in excess of 50 years. So cost effective with very low lifetime ownership cost achieved.*
- *Unique combination of mechanical properties: long-term strength, toughness and stiffness, making it ideal for pressure, sewer and drainage pipes.*
- *Large bore and high flow capacity: lowers pumping costs and overall energy requirements.*
- *Durability and toughness: resistant to handling, transport and installation damage.*
- *Resistant to abrasion and scouring and modern cleaning methods.*
- *Light mass: lower transport costs and easy handling and installation, ideally suited for labour intensive projects.*
- *Elastomeric locked-in sealing ring system: resistant to most chemicals, long—term sealing performance and easy low cost installation with unskilled labour.*
- *Inflammable: Does not support combustion*

Pipe Dimensions

All pipes are made to provide an effective length of 6.0 meters from 20 mm — 250 mm and 5.8 meters from 315 mm — 500 mm after installation; the outside diameters are the same for all pressure classes of the same size and there are 6 classes of pipes. The minimum wall thickness and mass per meter are given in the table below.

SANS 966-1 PVC-U PRESSURE PIPE															
MINIMUM WALL THICKNESS AND MASS PER METER OF RUBBER RING SOCKET PIPE FOR EACH SIZE & CLASS															
NOMINAL SIZE	OUTSIDE DIAMETER		EFFECTIVE LENGTH	CLASS 4		CLASS 6		CLASS 9		CLASS 12		CLASS 16		CLASS 20	
mm	Min.	Max.	m	mm	Kg	mm	Kg	mm	Kg	mm	Kg	mm	Kg	mm	Kg
20	20	20.2	6.0	-		-		-		-		1.5	0.13	1.9	0.16
25	25	25.2	6.0	-		-		-		-		1.9	0.21	2.3	0.25
32	32	32.2	6.0	-		-		-		1.8	0.26	2.4	0.34	2.9	0.40
40	40	40.2	6.0	-		-		1.8	0.33	2.3	0.41	3.0	0.53	3.7	0.64
50	50	50.2	6.0	-		1.8	0.42	2.2	0.51	2.8	0.65	3.7	0.84	4.6	1.02
63	63	63.2	6.0	-		1.9	0.57	2.7	0.80	3.6	1.04	4.7	1.34	5.8	1.62
75	75	75.2	6.0	1.5	0.54	2.2	0.79	3.2	1.13	4.3	1.49	5.6	1.91	6.9	2.30
90	90	90.3	6.0	1.8	0.78	2.7	1.16	3.9	1.65	5.1	2.13	6.7	2.75	8.2	3.30
NOTE: *ABOVE WALL THICKNESS BASED ON σS OF 10 Mpa. [SAFETY FACTOR 2.5]*															
110	110	110.3	6.0	2.2	1.17	2.6	1.37	3.9	2.04	5.1	2.63	6.7	3.41	8.2	4.11
125	125	125.3	6.0	2.5	1.51	3.0	1.80	4.4	2.61	5.8	3.40	7.6	4.39	9.3	5.30
140	140	140.4	6.0	2.8	1.89	3.3	2.22	4.9	3.26	6.5	4.27	8.5	5.50	10.4	6.64
160	160	160.4	6.0	3.2	2.48	3.8	2.93	5.6	4.27	7.4	5.57	9.7	7.20	11.9	8.70
200	200	200.5	6.0	3.9	3.78	4.7	4.54	7.0	6.68	9.2	8.68	12.1	11.24	14.9	13.63
250	250	250.6	6.0	4.9	5.98	5.9	7.18	8.7	10.46	11.5	13.67	15.1	17.67	18.6	21.45
315	315	315.6	5.8	6.2	9.59	7.4	11.41	11.0	16.76	14.5	21.83	19.0	28.18	-	-
355	355	355.7	5.8	7.0	12.26	8.4	14.65	12.4	21.37	16.3	27.78	21.4	35.92	-	-
400	400	400.7	5.8	7.8	15.45	9.4	18.55	14.0	27.30	18.4	35.47	24.1	45.76	-	-
450	450	450.8	5.8	8.9	19.83	10.6	23.53	15.7	34.45	20.7	44.89	-	-	-	-
500	500	500.9	5.8	9.8	24.27	11.8	29.10	17.4	42.42	22.9	55.19	-	-	-	-
NOTE: *ABOVE WALL THICKNESS BASED ON σS OF 12.5 Mpa. [SAFETY FACTOR 2]*															



2. SANS 966 Part 2 PVC-M Pipes

PVC-M has been used successfully in Southern Africa, Australia and New Zealand for over 15 years and is proven as one of the most cost effective and energy efficient piping materials. The reason for this is the lower long-term safety factor which may be used with tough materials.

Toughness can be defined as resistance to impact and resistance to cracks, i.e. toughness prevents cracks from starting (initiation) and also prevents the propagation of cracks through the pipe wall. Cracks or notches may be initiated during handling or installation or during service due to bending stresses and point loads on the pipe. Brittle failure does not occur with tough materials having predictable failure properties; therefore the material's toughness bears a direct relationship with the long-term safety factor.

It is now accepted by pipe standards authorities and by the water industry that the 50 year safety factor depends as much on strength as it does on toughness. Tough materials fail by predictable ductile yielding and hence allow the use of lower safety factors. Thus the 50 year safety factor relates to the type of material and its properties; HDPE has much lower strength than PVC-U but has higher toughness, hence a safety factor of l.25.

The excellent long-term hydrostatic strength properties of PVC-U are maintained, as shown in the stress-time line figure , and toughness improved to the extent that ductile failure modes are achieved according to the most rigorous test procedures detailed in SANS 966 Part 2.

For PVC-M, a design stress of l8 MPa is used for the calculation of wall thickness and is derived from the MRS of 25 MPa and the application of a 50 year safety factor of 1.4.

Pipe Standards

Designation	Standard	MRS (Mpa)	Design Stress	Safety Factor
PVC-M (50mm-500mm)	SANS 966-2	25	18.0	1.4

Features and Benefits

- *Modified polymers achieve improvement in resistance to cracking.*
- *Minimization of the effect of stress concentrators such as scratches.*
- *Reduction in the factor of safety.*
- *Higher wall stresses are allowable, which lead to reduced wall thickness.*
- *The increased internal diameter for a given external diameter than PVC-U and ductile iron.*
- *Depending on size and class, weight savings in excess of 10% over PVC-U.*
- *PVC-M pipes will not affect the taste, smell, appearance or health aspects of drinking water.*

Pipe Dimensions

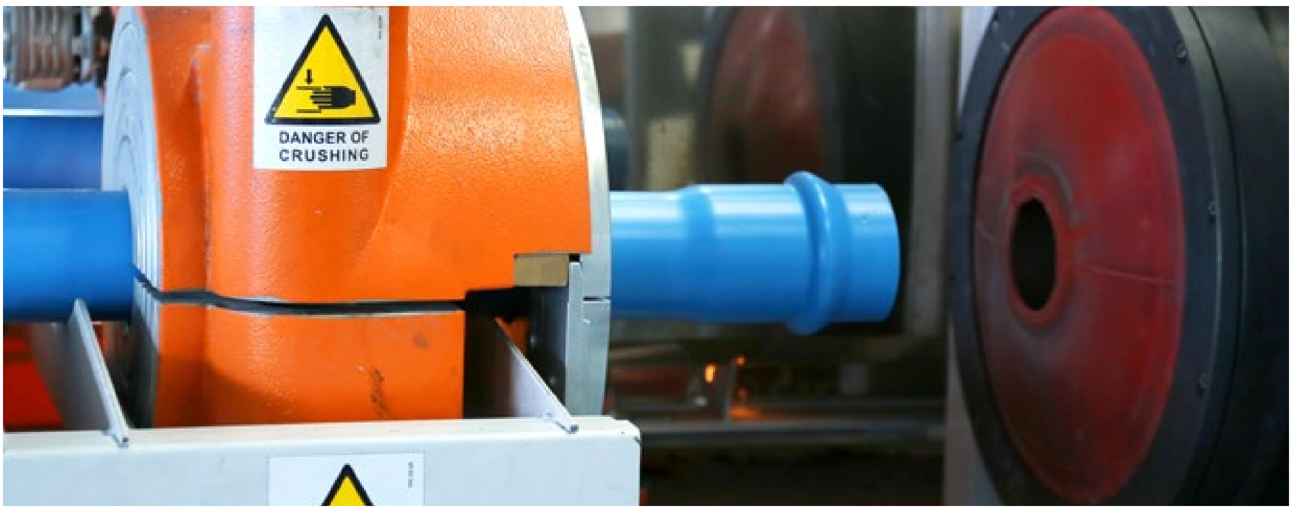
All pipes are made to provide an effective length of 6.0 meters from 50 mm — 250 mm and 5.8 meters from 315 mm — 500 mm after installation; the outside diameters are the same for all pressure classes of the same size and there are 6 classes of pipes. The minimum wall thickness and mass per meter are given in the table below.

SANS 966-2 PVC-M PRESSURE PIPE

MINIMUM WALL THICKNESS AND MASS PER METER OF RUBBER RING SOCKET PIPE FOR EACH SIZE & CLASS

NOMINAL SIZE	OUTSIDE DIAMETER		EFFECTIVE LENGTH	CLASS 6		CLASS 9		CLASS 12		CLASS 16		CLASS 20		CLASS 25	
mm	Min.	Max.	m	mm	Kg	mm	Kg	mm	Kg	mm	Kg	mm	Kg	mm	Kg
50	50.0	50.2	6	xx	xx	1.50	0.36	1.70	0.40	2.20	0.51	2.70	0.62	xx	xx
63	63.0	63.2	6	1.50	0.45	1.60	0.48	2.10	0.62	2.70	0.80	3.40	0.99	xx	xx
75	75.0	75.2	6	1.50	0.54	1.90	0.68	2.50	0.89	3.20	1.13	4.00	1.39	xx	xx
90	90.0	90.3	6	1.80	0.78	2.20	0.95	3.00	1.28	3.90	1.65	4.80	2.01	xx	xx
110	110.0	110.3	6	2.20	1.17	2.70	1.43	3.60	1.89	4.70	2.44	5.80	2.98	7.20	3.64
125	125.0	125.3	6	2.50	1.51	3.10	1.86	4.10	2.44	5.40	3.18	6.60	3.85	xx	xx
140	140.0	140.4	6	2.80	1.89	3.50	2.35	4.60	3.07	6.00	3.96	7.40	4.83	xx	xx
160	160.0	160.4	6	3.20	2.48	4.00	3.08	5.20	3.97	6.90	5.21	8.50	6.36	10.40	7.68
200	200.0	200.5	6	3.90	3.78	4.90	4.73	6.50	6.22	8.60	8.14	10.60	9.92	13.00	12.02
250	250.0	250.6	6	4.90	5.98	6.10	7.41	8.10	9.76	10.70	12.76	13.20	15.58	16.30	18.98
315	315.0	315.6	5.8	6.20	9.59	7.70	11.86	10.20	15.58	13.50	20.39	16.60	24.82	xx	xx
355	355.0	355.7	5.8	7.00	12.26	8.70	15.16	11.50	19.87	15.20	25.99	18.70	31.64	xx	xx
400	400.0	400.7	5.8	7.80	15.45	9.80	19.32	13.00	25.42	17.10	33.08	21.10	40.39	xx	xx
450	450.0	450.8	5.8	8.90	19.83	11.00	24.39	14.60	32.11	19.20	41.78	23.70	51.04	xx	xx
500	500.0	500.9	5.8	9.80	24.27	12.20	30.06	16.20	39.59	21.30	51.51	26.40	63.16	xx	xx

NOTE: *ABOVE WALL THICKNESS BASED ON σS OF 18 Mpa. (SAFETY FACTOR 1.4)*



3. SANS 1283 High Impact PVC Pipes

The Southern African mining industry presents one of the most demanding applications for PVC pressure pipes anywhere in the world. Plastic pipes are preferred over conventional steel pipes because of their light mass, quick and easy installation and most importantly, their resistance to the most corrosive of environments.

In addition, because they are poor conductors of heat they offer an ideal pipe for the conveyance of chilled water in underground mines in order maintain a reasonable, safe working environment. Modified PVC pipes are also self extinguishing hence improving safety.

Given harsh mining environments, rough handling and installation, as well as strict safety considerations, it is necessary to produce a toughened, impact resistant PVC pipe by the incorporation of impact modifiers. In addition, as the pipes are suspended in the haulage ways and not buried; an end thrust resistant joint is required to prevent pipes from pulling apart under pressure.

A Victaulic shouldered end produced from cast and machined SG iron is fitted to the end of each pipe and joined by standard Victaulic clamps and rubber seals.

The steel Victaulic stub end is precision machined with gripping teeth on the inside to provide a mechanical interference fit with the pipe that is resistant to high pressures. The shouldered end is galvanised to provide protection against corrosion.

The toughened PVC-M pipe and Victaulic jointing system has been used in the mining industry since the late 1970's and proven itself over the past 30 years as a cost effective and lasting piping systems. The Victaulic stub allows for jointing to steel pipes as well as the use of standard corrosion protected mild steel fittings such as tees, bends and saddles, etc. Victaulic clamps and seals and fittings are generally standard stock items in mining stores.

A full range of fabricated fittings with Victaulic shouldered ends made from tough, modified PVC pipe is also available. The following photographs illustrate the pipe system.

The victualic jointing system (minus rubber seal).

High impact PVC-M pipes are made to the SANS 1283 specification which ensures consistent, high quality products. The result of the high speed impact test from a height of 20m (carried out according to the procedure detailed in SANS 966 Part 2 and SANS 1283) illustrates the toughness properties exhibited by PVC-M pipes. Note the ductile nature of the 'failure' where a hole is formed with stress whitening as opposed to brittle-type failure.

Note: Toughness of PVC-M pipes (20m High Impact test)

These tough pipes offer easy installation, long trouble free life and the end thrust resistant joints provide advantages in the way of minimising anchor thrust blocks. Johannesburg Water has used this pipe system since the early 1980's and today this pipe is being used to replace the very problematic asbestos pipes which are now failing in many cities and towns in Southern African countries. A typical installation is shown below.

Applications

- *Underground Mining Pipe Systems*

Pipe Standards

Designation	Standard	MRS (Mpa)	Design Stress	Safety Factor
PVC-M (110mm, 160mm & 200mm)	SANS 1283	25	12.5	2.0

Pipe Dimensions

All pipes are made to provide an effective length of 9.0 meters after installation; the outside diameters are the same for all pressure classes of the same size and there are 6 classes of pipe. The minimum wall thickness (as per the applicable SABS standard) and mass per meter are given in the tables below.

SANS 1283 PVC-M MINING AND HIGH IMPACT PRESSURE PIPE

MINIMUM WALL THICKNESS AND MASS PER METER FOR EACH SIZE AND PRESSURE CLASS

OUTSIDE DIAMETER		EFFECTIVE LENGTH	CLASS 6		CLASS 9		CLASS 12		CLASS 16		CLASS 20		CLASS 25	
Min.	Max.	m	mm	Kg	mm	Kg	mm	Kg	mm	Kg	mm	Kg	mm	Kg
105.0	105.3	9	2.50	1.226	3.70	1.793	4.80	2.301	6.40	3.019	7.80	3.627	9.50	4.340
110.0	110.3	9	2.60	1.336	3.90	1.979	5.10	2.559	6.70	3.311	8.20	3.993	10.00	4.784
155.0	155.4	9	3.60	2.607	5.40	3.864	7.10	5.023	9.40	6.547	11.50	7.894	14.10	9.504
160.0	160.4	9	3.80	2.839	5.60	4.136	7.40	5.402	9.70	6.974	11.90	8.431	14.60	10.155
200.0	200.5	9	4.70	4.391	7.00	6.463	9.20	8.397	12.10	10.876	14.90	13.193	18.20	15.828
210.0	210.5	9	5.00	4.903	7.30	7.078	9.70	9.294	12.70	11.987	15.60	14.507	19.10	17.442
250.0	250.6	9	5.90	6.889	8.70	10.042	11.50	13.120	15.10	16.968	18.60	20.589	22.80	24.780
315.0	315.6	9	7.40	10.889	11.00	15.997	14.50	20.844	15.10	21.100	XX	XX	XX	XX

NOTE: *NOTE: ABOVE WALL THICKNESS BASED ON σs of 12.5 MPa [SAFETY FACTOR 2]*

Features and Benefits

- *Modified polymers achieve improvement in resistance to cracking.*
- *Minimization of the effect of stress concentrators such as scratches.*
- *Higher wall stresses are allowable.*
- *PVC-M pipes will not affect the taste, smell, appearance or health aspects of drinking water.*
- *Environment-friendly & Lead-free material.*
- *Excellent flow characteristics: reduces friction losses.*
- *Best long-term strength (serves in excess of 50 years).*
- *Long-term strength, toughness and stiffness.*
- *Large bore and high flow capacity.*
- *Durability and toughness.*
- *Resistant to acids and alkalis.*
- *Resistant to abrasion, scouring and modern cleaning methods.*
- *Light mass: for easy handling and installation.*
- *Inflammable: Does not support combustion*

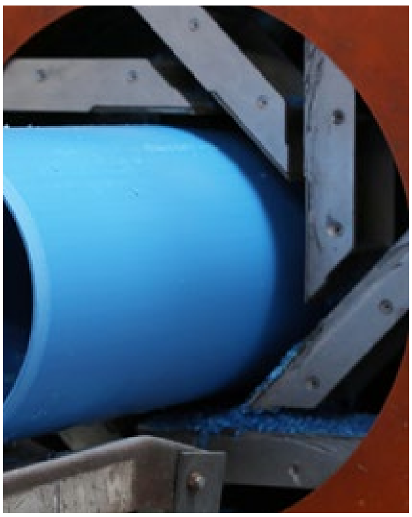
4. BOBS ISO 1452-2 PVC-U Pipes

Flo-Tek pipes and fabricated fittings are intended for below groundwater supply, drainage and sewerage under pressure applications in which continuous temperatures between 25°C and 45°C are encountered.

Pipe Standards

Flo-Tek's pressure pipe produced under this standard covers pressure sewer pipes, where as there is no standard in SABS to cover pressure sewer pipe.

Designation	Standard	MRS (Mpa)	Design Stress	Safety Factor
PVC-U (20mm-90mm)	ISO 1452-2	25	10.0	2.5
PVC-U (110mm-500mm)	ISO 1452-2	25	12.0	2.0



Features and Benefits

- *Buried and sewerage under pressure application.*
- *Environment-friendly & Lead-free material.*
- *Excellent flow characteristics: reduces friction losses.*
- *Best long-term strength (serves in excess of 50 years).*
- *Long-term strength, toughness and stiffness.*
- *Large bore and high flow capacity.*
- *Durability and toughness.*
- *Resistant to acids and alkalis.*
- *Resistant to abrasion, scouring and modern cleaning methods.*
- *Light mass: for easy handling and installation.*
- *Elastomeric locked-in sealing ring system.*
- *Inflammable: Does not support combustion*

Pipe Dimensions

All pipes are made to provide an effective length of 6.0 meters from 20 mm — 250 mm and 5.8 meters from 315 mm — 500 mm after installation; the outside diameters are the same for all pressure classes of the same size and there are 7 classes of pipe. The minimum wall thickness (as per the applicable BOBS ISO standard) and mass per meter are given in the tables below.

	DIMENSIONS & WEIGHT OF PVC-U PRESSURE PIPES AS PER ISO 1452-2														
	MINIMUM WALL THICKNESS AND MASS PER METER FOR EACH SIZE AND PRESSURE CLASS														
NOMINAL SIZE mm OUTSIDE DIAMETER	EFFECTIVE LENGTH (METERS)	NOMINAL (MINIMUM) WALL THICKNESS													
		S 20 (SDR 41) PN 6		S 16 (SDR 33) PN 8		S 12.5 (SDR26) PN 10		S 10 (SDR 21) PN 12.5		S 8 (SDR 17) PN 16		S 6.3 (SDR 13.6) PN 20		S 5(SDR 11) PN 25	
		mm	Kg	mm	Kg	mm	Kg	mm	Kg	mm	Kg	mm	Kg	mm	Kg
	NOMINAL PRESSURE PN BASED ON DESIGN COEFFICIENT C = 2.5														
20	6	-	-	-	-	-	-	-	-	-	-	1.5	0.133	1.90	0.166
25	6	-	-	-	-	-	-	-	-	1.50	0.169	1.9	0.210	2.30	0.252
32	6	-	-			1.50	0.219	1.60	0.233	1.90	0.274	2.4	0.340	2.90	0.406
40	6	-	-	1.50	0.276	1.60	0.294	1.90	0.346	2.40	0.432	3	0.531	3.70	0.646
50	6	-	-	1.60	0.378	2.00	0.469	2.40	0.558	3.00	0.689	3.7	0.837	4.60	1.024
63	6	-	-	2.00	0.596	2.50	0.739	3.00	0.879	3.80	1.099	4.7	1.338	5.80	1.629
75	6	-	-	2.30	0.820	2.90	1.025	3.60	1.260	4.50	1.556	5.6	1.906	6.80	2.284
90	6	-	-	2.80	1.202	3.50	1.491	4.30	1.814	5.40	2.249	6.7	2.748	8.20	3.314
		S 20 (SDR 41) PN 6		S 16 (SDR 33) PN 8		S 12.5 (SDR26) PN 10		S 10 (SDR 21) PN 12.5		S 8 (SDR 17) PN 16		S 6.3 (SDR 13.6) PN 20		S 5(SDR 11) PN 25	
NOMINAL PRESSURE PN BASED ON DESIGN COEFFICIENT C = 2															
		mm	Kg	mm	Kg	mm	Kg	mm	Kg	mm	Kg	mm	Kg	mm	Kg
110	6	2.70	1.426	3.40	1.784	4.20	2.188	5.30	2.732	6.60	3.360	8.1	4.064	10.00	4.943
125	6	3.10	1.860	3.90	2.325	4.80	2.841	6.00	3.515	7.40	4.284	9.2	5.245	11.40	6.398
140	6	3.50	2.352	4.30	2.873	5.40	3.578	6.70	4.397	8.30	5.382	10.3	6.577	12.70	7.991
160	6	4.00	3.080	4.90	3.751	6.20	4.706	7.70	5.788	9.50	7.056	11.8	8.630	14.60	10.513
200	6	4.90	4.726	6.20	5.939	7.70	7.319	9.60	9.035	11.90	11.065	14.7	13.465	18.20	16.41
250	6	6.20	7.532	7.70	9.297	9.60	11.500	11.90	14.119	14.80	17.346	18.4	21.235	-	-
315	5.8	7.70	11.856	9.70	14.838	12.10	18.364	15.00	22.547	18.70	27.762	23.2	33.920	-	-
355	5.8	8.70	15.158	10.90	18.870	13.60	23.360	16.90	28.747	21.10	35.446	26.1	43.189	-	-
400	5.8	9.80	19.318	12.30	24.090	15.30	29.734	19.10	36.752	23.70	45.053	29.4	55.042	-	-
450	5.8	11.00	24.395	13.80	30.409	17.20	37.606	21.50	46.540	26.70	57.095	33.1	69.711	-	-
500	5.8	12.30	30.304	15.30	37.463	19.10	46.401	23.90	57.483	29.70	70.562	36.8	86.111	-	-

DESIGN CONSIDERATIONS

Durability and the Long-Term Safety Factor

It should be noted that the stress — time line does not indicate a loss of strength with time rather that the material can support lower stresses for longer times. With each new loading, for example, water hammer or pressure surges, the material acts according to the short-term strength properties. Short-term strength is independent of how much time has passed since the first loading - the pipe acts as a new pipe.

Numerous studies conducted on PVC-U pipes excavated at various times up to 60 years service, have shown the exceptional durability of these 'old' pipes, with little or no difference in mechanical properties to recently manufactured pipes. Tensile strength, impact strength, burst pressure and elastic modulus show virtually no change with time in service . A study conducted on 60 year old PVC-U pipes states: 'although the plastics industry is a relatively young materials segment PVC-U pipe is now about 70 years old, which is more than the predicted service lifetime of 50 years for PVC pipe applications.

Short -Term Safety Factor

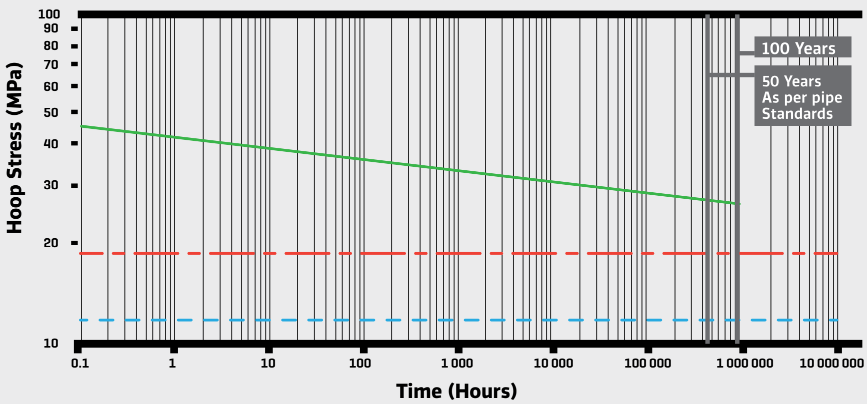
The question is often asked, "how do PVC-U and PVC-M pressure pipes withstand sudden surges in pressure caused, for example, by water hammer"? The short answer is, "extremely well"! The question usually results from a consideration of the safety factors of 2.0 and 1.4 applied in the design of the two materials, PVC-U and PVC-M, respectively. However, it should be noted that these are long-term, i.e. 50 year safety factors, while their short-term safety factors are much greater.

The polymer molecular structure ensures that the more rapid the pressure increase the greater the strength exhibited by these materials; the molecular structure reacts so as to resist the stress.

The short-term safety factors of PVC-U and PVC-M are over 3 times the design operating pressure and can be as high as 4 or 5 times depending on the rate of the pressure surge.

Long -Term Hydrostatic Strength Properties and The Long-Term Safety Factor

The strength of plastics pipes can be defined in terms of the maximum stress to cause failure in a given time, usually 50 years, and is determined at various extended times according to the procedure described in ISO 9080. The results are graphically illustrated by plotting the hoop stress against the time to fail on a log scale, as shown below.



Stress-Time line for PVC-U and PVC-M at 20˚C. [1]

PVC-U and PVC-M regression line as per SANS 966 Parts 1 and 2

PVC-M design stress, SANS 966-2 (18 MPa)

PVC-U design stress, SANS 966-1 (12.5 MPa)

Pressure Variation and Surge Pressures

The stress-time lines are derived using constant stresses; in pipelines the stress on the material is rarely constant, varying as the pressure varies and as superimposed loads vary. The latter stabilise fairly quickly, usually within the first year or two of the network life, but pressure variations are there forever. As with any other pipe material, due allowance for this must be made in designing a water reticulation network with PVC pipes.

Anti-surge devices such as air vessels, non-return valves, programmed use of pumps etc, should be incorporated where necessary. Lower surge pressures develop in PVC pipes as a result of lower surge wave velocities and this has enabled PVC pipes to be used in areas where water hammer has caused pipes manufactured from other materials to fracture. Above all, it enables one to operate with lower pressure classes for PVC.

Considerable research has been done on the fatigue properties of plastic pipelines. Recently work has been published on fatigue properties of PVC-M related to actual site conditions in water distribution systems. It concludes that PVC-M pipes will not fail under conditions of dynamic and static stress within 50 years provided the total stress does not exceed 18 MPa and the stress amplitude over one million pressure cycles (equal to 55 cycles per day for 50 years) is below 3,0MPa.

The Effect of Temperature Changes on Working Pressure

The pressure classes of PVC pipes carrying the SABS mark have been allocated on the basis of design at 20'C. PVC pressure pipes perform well at temperatures below 20'C and can withstand higher pressures at lower temperatures. Pipes used in applications where operating temperatures exceed 25'C should be de-rated to ensure that the 50 year design life is not adversely affected. The following pressure reduction factors should be applied.

WORKING TEMPERATURE (˚C)	MULTIPLICATION FACTORS
25	1.0
30	0.9
35	0.8
40	0.7
45	0.6
50	0.5
55	0.4
60	0.3

Expansion and Contraction

All plastics have high co-efficients of expansion and contraction, several times those of metals. This must be allowed for in any installation by the use of expansion joints, expansion loops etc.

MATERIAL	CO-EFFICIENT OF EXPANSION (K^{-1})
PVC	8×10^{-5}
HDPE	20×10^{-5}
LDPE	20×10^{-5}
Steel	1.2×10^{-5}
Copper	2.0×10^{-5}

Examples based on the above are as follows:

- A PVC pipe will expand or contract by 0.06mm per metre per ˚C change in temperature.
- A HDPE pipe will expand or contract by 0.2mm per metre per ˚C change in temperature.
- A 30˚ rise in temperature will cause an increase in length of 10.8mm (0.06 x 30 x 6) on a 6m length of PVC pipe and an increase of 36mm (0.2 x 30 x 6)on a 6m length of HDPE pipe.

Calculating Water Hammer

The Wave Celerity for PVC-U and PVC-M which is used in the calculation of water hammer in pipelines is given in the table below.

Higher wave celerity values result in higher levels of water hammer. Each class of pipe has a constant value of wave celerity. By comparison the wave celerities for materials such as steel and fibre cement are much higher - by multiples of 3 or more.

CLASS	PVC-U	PVC-M
6	263	249
9	325	270
12	378	312
16	439	363
20	495	407
25	559	458

DESIGN CONSIDERATIONS ...

Resistance to Weathering (Ultraviolet Light)

Most plastics are affected by UV light. PVC pressure pipes have pigments and light stabilisers incorporated in their formulation and if pressure pipes have to be exposed for an indefinite period, they should be painted, preferably with one coat of white alkyd enamel or PVA, or suitable covering should be provided. Paint containing solvent thinners should be avoided.

Long-term exposure (more than 4 - 6 months, but dependent on climatic conditions) to UV light can cause discolouration of the pigments in the pipe and, in severe cases, lead to some embrittlement. Such embrittlement affects the ability to withstand impacts but does not reduce pressure handling capabilities.

It is recommended that pipes should be buried wherever possible.

Compressed Air

Normal forms of PVC pipes should NOT be used for the reticulation of compressed air.

Bending

An important feature of PVC pipes is that they may be deliberately bent, within limits, thus eliminating the need, in some cases, for separate bend fittings. As a rule of thumb the radius of such a bend must not be less than 300 times the pipe diameter.

In addition each rubber ring joint can accommodate a further 2° of bend. This feature significantly reduces costs and speeds up installation times when compared to some traditional pipe materials.

Flow Rates, Velocities and Friction Losses

The flow velocities in pressure pipelines should fall in the range 0.8 to 2.5 m/s, the lower rate to maintain self-cleansing flow and assist in the removal of air and the upper limit to maximise air release at high points. Approximate flow rates, flow velocities and friction losses in straight PVC pressure pipelines without fittings can be read off the following Nomogram.

How to use a Nomogram:

1. You need a straight edge and at least two of the four values.
2. Place the straight edge across all four columns so that it intersects the two known values.
3. Read off the other two values.

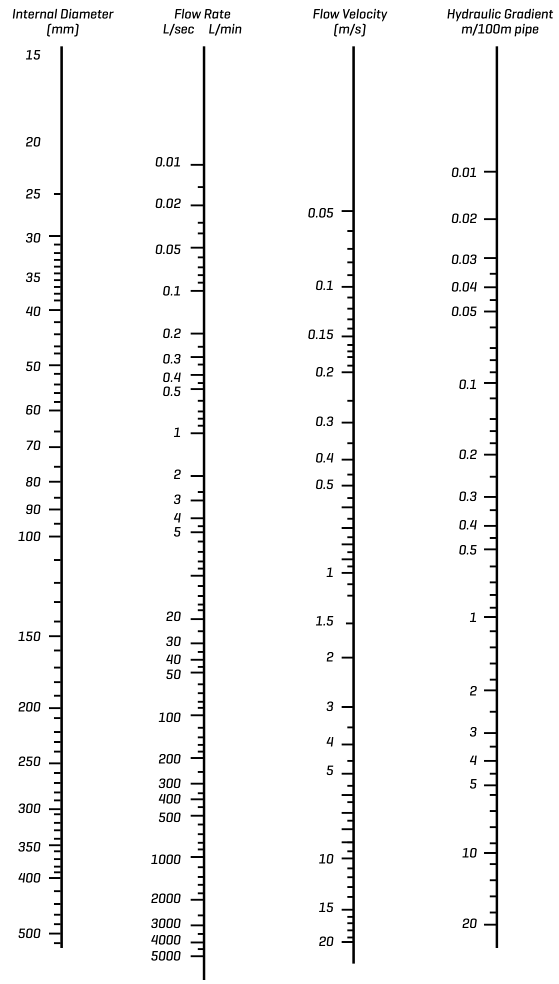
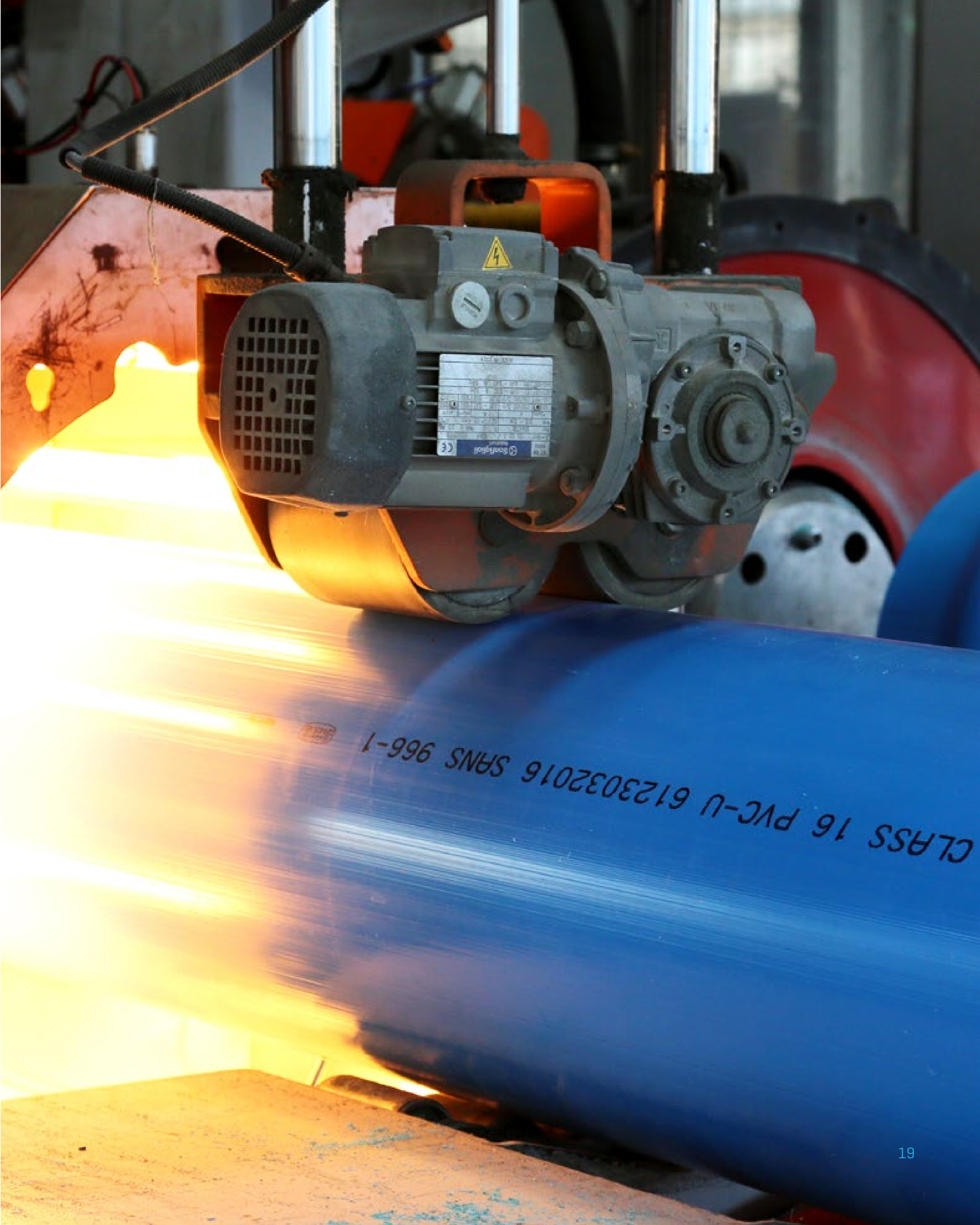


Diagram for water at 10°C

Approximate values only


CLASS 16 PVC-U 6123032016 SANS 966-1

FITTINGS

FITTINGS & VALVES

Flo-Tek supplies a range of Cast Iron Valves and Fittings. They have corrosion protective coatings and are also used extensively by the water industry. These are usually of the socket ribber ring type as used on PVC or HDPE and flanged fittings. Viking Johnson fittings are also used for joining plain ended PVC pipes.

Valves Product Range

- Flanged Resilient Seated Gate Valve – SABS 664
- Socketed Resilient Seated Gate Valve – SABS 664
- Plain End Resilient Seated Gate Valve
- Manufactured Flanged Resilient Seated Gate Valve – PN16
- Flanged Wedge Gate Valve – PN16 – SABS 664
- Resilient Seated Gate Valve – Rising Spindle – SABS 665
- Wedge Gate Valve Industrial Pattern -Non Rising Spindle – PN 10
- Wedge Gate Valve Industrial Pattern – Rising Spindle – PN 10
- Shouldered Butterfly Valve – Rubber Lined Disc
- Shouldered Non Return Valve
- Shouldered Coupling
- Diaphragm Valve
- Butterfly Valve Wafer Nickel Plated Disc - PN16 Pinned
- Butterfly Valves Wafer Type 316SS Disc -PN16 Pinned
- Gearbox for Butterfly Valve Wafer type
- Butterfly Valve Wafer Type, 304 Stainless Steel Disc Pinned
- Butterfly Valve Wafer Type, 316SS disc, Pinless – PN25
- EPNS Butterfly Valves Wafer 316 Stainless Steel Body & Disc (Spline Shaft) PTFE Liner - PN16
- Double Eccentric Flanged Butterfly Valves
- Slurry Wafer Butterfly Valves
- Fire Hydrant Valves

Product Range

- Fittings Product Range
- Unequal Tee
- Scour Tee
- Equal Tee
- Flange Adaptor
- Reducing Socket
- Reducing Bush
- End Cap
- Repair Coupling
- Hydrant Tee
- Scour Tee

CAST IRON FITTINGS

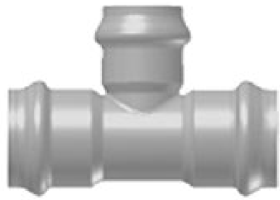
Reducing Bush

Socketed Reducer

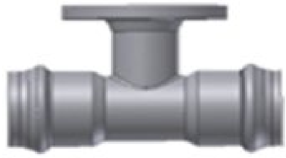
End Cap

Flange Adaptor

Straight Connector (Repair Coupling)



Unequal Tee



Scour Tee

PVC FITTINGS

Flo-Tek supplies fabricated fittings suitable for irrigation, civil and agricultural industries. These fittings are fabricated from SABS approved 966-1 UPVC and 996-2 MPVC pipes.

A full range of fabricated UPVC and MPVC fittings is available in most sizes up to 315mm; these include tees, bends, hydrants, reducers, adaptors for joining to repaired AC pipes, etc. These fittings are made in two pressure classes, 9 and 16. We also have a range of Cast Iron fittings and Valves available.

PIPE JOINTING

JOINTING METHODS

1. Cutting

PVC pipes can be easily cut using a number of different cutting tools, such as proprietary cutting tools which cut, deburr and chamfer in one operation. Circular saws or hand saws may be used. It is important to ensure that, after cutting, the pipe end is thoroughly deburred.

2. Rubber Ring Joints

A rubber ring socket is integrally moulded on one end of the pipe and incorporates a factory fitted rubber sealing ring which is retained in position. The opposite end of the pipe (spigot end) is suitably chamfered and has a depth of entry mark near its end. Each joint is capable of handling expansion and contraction as well as angular deflection of up to 2°C and a pressure of up to 75 kPa below the ambient atmospheric pressure. The seal ring is designed to provide a watertight joint at high and low pressures.

3. Depth of Entry

The depth of entry mark is a guide to ensure correct depth of insertion of the spigot into the socket of the next pipe. If pipes are cut to measure on site it is necessary to remark the depth of entry according to the dimensions given in the following table or as per the pipe being installed at the same time.

Re-marking can be done with a permanent felt tipped marker pen. The correct depth of entry allows for expansion and contraction of the pipes in the pipeline.

PIPE SIZE (mm)	DEPTH OF ENTRY (mm)
50	110
63	120
75	130
90	135
110	150
125	160
140	165
160	175
200	200
250	225
315	230
355	240
400	250
450	265
500	275

4. Chamfering

The spigot end of all rubber ring jointed pipes is chamfered at the time of manufacture. Chamfering facilitates the insertion of the spigot end into the socket of the next pipe without damaging or dislodging the rubber ring. If however, the chamfering has been cut off it is important to re-chamfer the end correctly. Re-chamfering can easily be done using a file that leaves no sharp edges which may cut the rubber ring.

It should be at an angle of about 12° - 15° and the length of the chamfer should be such that at least half the wall of the thickness is removed. The chamfering should not be done to such an extent that a sharp edge is made at rim of the bore.

5. Lubricant

It is the most important to use correct lubricant when making a joint. The lubricant considerably reduces the effort required to insert the spigot into the socket and at the same time minimizes the possibility of dislodging the rubber ring. The lubricant should be water soluble, non-toxic and of a gel consistency. Alternative lubricants such as oil, grease, diesel, dish-washing liquid, etc. must under no circumstances be used.

Joints Per Lubricant

PIPE SIZE (mm)	JOINTS / 2kg	JOINTS/ 5kg
50	290	725
63	250	625
75	220	550
90	180	450
110	140	350
125	130	325
140	120	300
160	110	275
200	75	188
250	60	150
315	50	125
355	35	88
400	30	75
150	25	70
500	25	60

JOINTING PROCEDURE

Rubber Ring Joints of Pipes

1. Check the spigot end of the pipe for correct chamfering (at an angle of approx. 15° and a half of the thickness). Ensure that the "depth of entry" mark is visible and that there are no burrs and damage present.
2. Wipe the spigot end clean.
3. Check the socket end of the pipe to ensure that the rubber ring is present and correctly fitted. Make sure that no dirt or mud is present.
4. Apply the thin film of lubricant evenly around the circumference of the spigot up to about half the distance to the "depth of entry" mark.
5. Lubricate the rubber ring sparingly.
6. Place the spigot end of the pipe into the socket so that it rests against the rubber ring.
7. Ensure the two pipes are correctly aligned both horizontally and vertically. Failure to do this could lead to the rubber ring being dislodged when the next step is carried out.
8. Push the spigot into the socket until the "depth of entry" mark is just visible at the end of the socket. It should not be necessary to use undue force — if this becomes necessary it is normally an indication that something is amiss and the joint making process should be started again.

Solvent Weld Joints of Pipes

It must be stressed that solvent cement jointing is a welding and not gluing process. It is important therefore that there is an interference-fit between the spigot and socket to be joined. Do not attempt to make a joint when an interference-fit between a dry spigot and socket is not achieved (ie. a rattle fit).

There are different types of solvent cement available for pressure pipes and for non-pressure applications. Make sure that the appropriate cement is being used. Do not dilute or add anything to the solvent cement.

Excellent solvent weld joints can be made to withstand high pressures, provided the correct welding procedure is followed.

Solvent Cement Joints of Pipes & Fittings

Assemble all the required fittings, pipes and equipment. For the best results, follow the jointing procedure below.

a. Make sure that the spigot has been cut square and that all burrs have been removed.

b. Mark the spigot with a pencil line (or similar) at a distance equal to the internal depth of the socket.

c. Check that, while dry, there is an interference fit between the spigot and the socket before the spigot reaches the full depth indicated by the pencil line.

d. Ensure that both the spigot and the socket are properly dry (not illustrated).

e. Degrease and clean both with an appropriate etch cleaner (not illustrated). This also acts as a primer first.

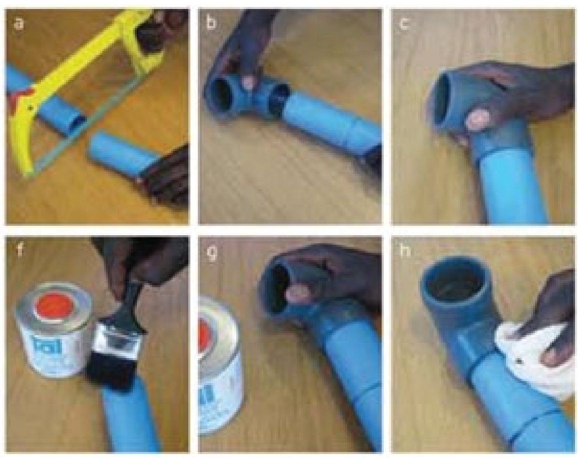
f. With a suitable brush apply a thin film of solvent cement to the internal surface of the socket. Then apply the solvent cement in a similar manner up to the mark on the spigot. Do not use excess solvent cement. The brush width should be such that the solvent cement can be applied to both surfaces within about 30 seconds.

g. Make the joint immediately. While inserting the spigot rotate it by about 90° and ensure that it is fully inserted up to the pencil mark, as there is a bead of excess solvent cement indicating the correct amount has been applied. Hold steady for at least 30 seconds. Mechanical assistance may be necessary for large pipes.

h. Wipe off any excess solvent cement with a clean rag.

i. Do not disturb for at least 5 minutes.

j. Do not apply pressure for at least 24 hours.



RUBBER RING TYPE INTEGRAL PIPE END SOCKETS

Laying, backfilling and Hydrostatic test pressure Requirements

1. At the level of the top of the pipes, the trench should be not less than the external diameter of the pipe plus 300 mm.
2. The bottom of the trench should be carefully leveled and cleared of any sharp edge sand stones. If this is not possible, apply suitable bedding material to a thickness of at least 100 mm over the bottom of the trench.
3. Only stable backfill materials should be used. In general, sands and fine gravels are the best materials.
4. If materials have been extracted from the trench which can be compacted sufficiently to fix the pipes properly in place, these may be used. This applies to sand, gravel, top soil and light soils.
5. Pipes should not be encased in concrete.
6. Correct assembly of the joint requires that the spigot end be chamfered and correctly lubricated prior to insertion into the socket
7. The spigot shall be inserted into the socket up to the reference (depth-of-entry) mark made by the manufacturer.
8. A confirmatory visual check of joints can be made on the bore of the pipe by using a lamp.
9. If the elastomeric sealing ring is not in place at the time of delivery, clean the groove, remove any foreign bodies and then locate the ring correctly in the groove.
10. After the pipe has been firmly and uniformly bedded, start backfilling the trench, up to the top level of the pipe, in layers of thickness not exceeding 100 mm. The same material should then be compacted in successive layers over the pipe until a thoroughly compacted layer of 300 mm above the pipe is achieved. Do not roll or use heavy mechanical compaction until at least 600 mm of material has been placed over the pipe.
11. Pressure test requirements stipulate that pressure testing should take place with the pipes only partially backfilled, leaving the joints open for inspection during the pressure testing procedures.
12. For large scale networks, the tests are done on sections of maximum length 500m.
13. Air vents at high points should be open during the filling of the network.
14. Pipes should be slowly filled with water starting from the lowest point to avoid any pressure surges (and water hammer).
15. The air in the system should be allowed to escape during the filling with water.
16. It should be ensured that no air is trapped in any part of the system.
17. The test pressure should normally be not more than 1½ times the maximum working pressure of the system.

Note: These are just guide lines. For detailed procedure please refer SANS 10112 (The installation of polyethylene and poly (vinyl chloride) (PVC-U and PVC-M) pipes). ***Please follow above points to achieve best result.***

STORAGE AND TRANSPORTATION

Storage

Pipes should be stored on level, flat ground, free of stones. They may be stored on timber supports of at least 75 mm width placed 1.5 metres apart with side supports. The height of pipe stacks should not exceed 1.5 metres.

All pipe stacks and stored fittings should be covered to avoid prolonged exposure to direct sunlight

PIPE SELECTION CRITERIA

PRESSURE & NON-PRESSURE PIPES

A very good description of the criteria which may be used for the selection of the various plastics pipes available for each application is given in the SAPPMA Technical Manual (Second Edition, March 2009) (1).

The section in the Technical Manual covers the following:

HYDRAULIC REQUIREMENTS

- Basic Principles
- Operating Pressure, Hoop Stress and Wall Thickness
- Surge and Fatique
- Factory Tests

EXTERNAL LOADS

- Design Basis
- Load Classification
- Pipe Stiffness
- Determining Required Pipe Stiffness
- Vertical Deflection

DURABILITY REQUIREMENTS SYSTEM COMPONENTS

- Secondary Loads
- Manholes
- Joints and Fittings
- Valves

PIPE INSTALLATION

An excellent section in the SAPPMA Manual covers the following on pipe installation procedures:

- Pre-construction Activities
- Excavation
- Embedment
- Pipe Laying and Jointing
- Backfilling
- Anchoring
- Support Spacing for Mine Pipes
- Support Spacing for Soil, Waste and Vent Pipes
- Site Tests

A COPY OF THE SAPPMA TECHNICAL MANUAL IS FREELY AVAILABLE FROM FLO-TEK PIPES AND IRRIGATION, EITHER IN HARD COPY OR ON CD. Please contact any of our Sales Offices or our Export Department.


FLOTEK 315MM CLASS 4 PVC-U

GLOSSARY

Circumferential Hoop Stress
The stress induced around the wall of a pipe as a result of pressure within the pipe.

Design Stress
The stress induced into the wall of the pipe when operated at it's rated pressure.

Factors of Safety
MRS divided by the Design Stress.

Field Test Pressure
The pressure applied to an installed pipeline in order to establish the quality of workmanship of the contractor. This is usually stipulated by the consulting engineer in charge.

Flow Rate
This is the volume of water (or other fluid) that is flowing through a pipeline. It is often measured in "Litres per Second" (l/s) or "Litres per Minute" (11m).

Flow Velocity
The speed at which water is travelling along a pipeline. A particular volume of water will have a higher flow velocity in a small diameter pipe than in a large diameter pipe. It is measure in metres per second (m/s).

Friction Factor
Every type of pipe offers different amounts of 'resistance to flow' (or friction) to the flow of water. Extensive research has established friction factors for each type of pipe. Pipes with 'low' friction factors will typically be more energy efficient to operate.

Friction Losses
The friction factor for the pipe being used, the volume of water flowing through the pipeline and the length of the pipeline, will result in a specific amount of friction loss. The friction loss is measured in a number of ways, for example kPa/ 100 metres or metres per 100 metres.

MRS (Minimum Required Strength)
All plastic materials used for the manufacture of pipes have been extensively tested and can be shown to have a certain minimum failure stress after 50 years at 23°C. This is known as the MRS.

Multi-Layer (Foamed Core)
These are pipes which have a pipe-wall Consisting of several layers. Typically this is two solid sections of PVC wall, separated by a section which is foamed WC (similar to the center part of an AERO chocolate).

PN
This is the abbreviation for 'Pressure Nominal' and is commonly used as a Pressure Classification number for a particular pressure class of pipe. For example a PN 12' pipe is designed to operate at 12 bar.

Solid wall
The pipe-wall of these pipes consists of a single layer of solid PVC.

Standard Dimension Ratio (SDR)
Outside Diameter (OD) / Wall Thickness. For example a pipe with a wall thickness of has a SDR of 17. All sizes of pipe in a particular pressure class will have the same SDR.

Water Hammer
When the flow of water in a pipeline is suddenly stopped, it is possible under specific circumstances that a shock wave of very high pressure can be caused to travel rapidly up and down the pipeline. This shock wave is known as Water Hammer. Severe cases of Water Hammer can be heard as very rapid banging in the pipeline and can cause serious damage. Proper design of the pipeline can eliminate Water Hammer.

Wave Celerity
The physical properties of every type of pipe material and the dimensions of the pipe itself have an influence on the speed at which the shock wave of water hammer travels in the pipeline. This speed is known as the Wave Celerity and is measured in meters per second, higher values of wave celerity result in higher peaks of Water hammer pressure.

Working pressure
This is the maximum pressure at which the pipe is designed to operate, It is measured in a number of different ways, e.g. Metres of water, kPa or Bar.

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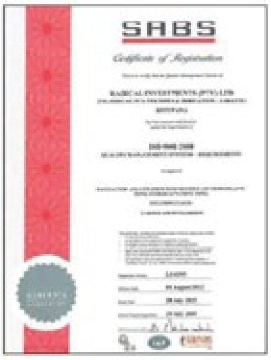
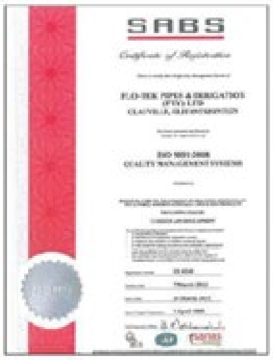
ACCREDITATIONS



ISO 9001- FLO-TEK Botswana



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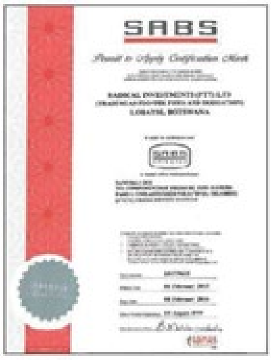
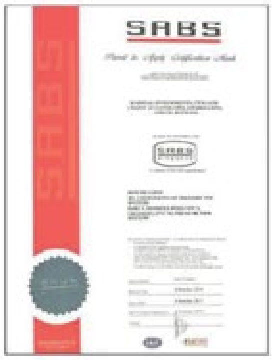
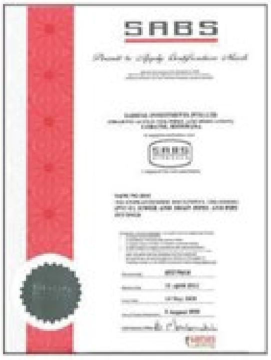


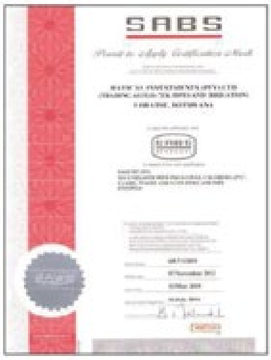
SANS 966-1 - PVC-U Pressure Pipe System



SANS 966-2 - PVC-M Pressure Pipe System

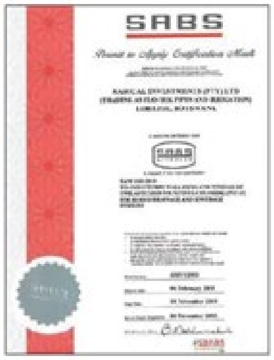


SANS 791 - PVC-U Sewer & Drain Pipes and Fittings

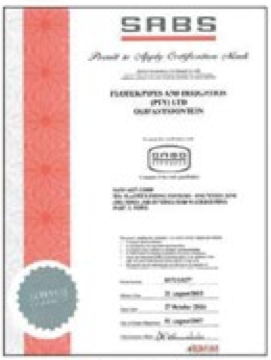


SANS 967 - PVC-U Soil, Waste and Vent Pipes and Fittings

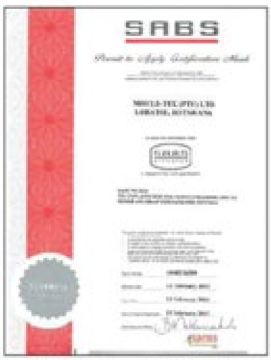
SANS 1283 - PVC-M Pressure Pipe in Underground Mining



SANS 1601 - PVC-U Pipes for Buried Drainange & Sewerage Systems



SANS 4427 - HDPE Pipes and Fittings



SANS 791 - PVC-U Sewer & Drain Pipes and Fittings

ISO 1452-2 Pipes, Drainange & Sewerage under pressure

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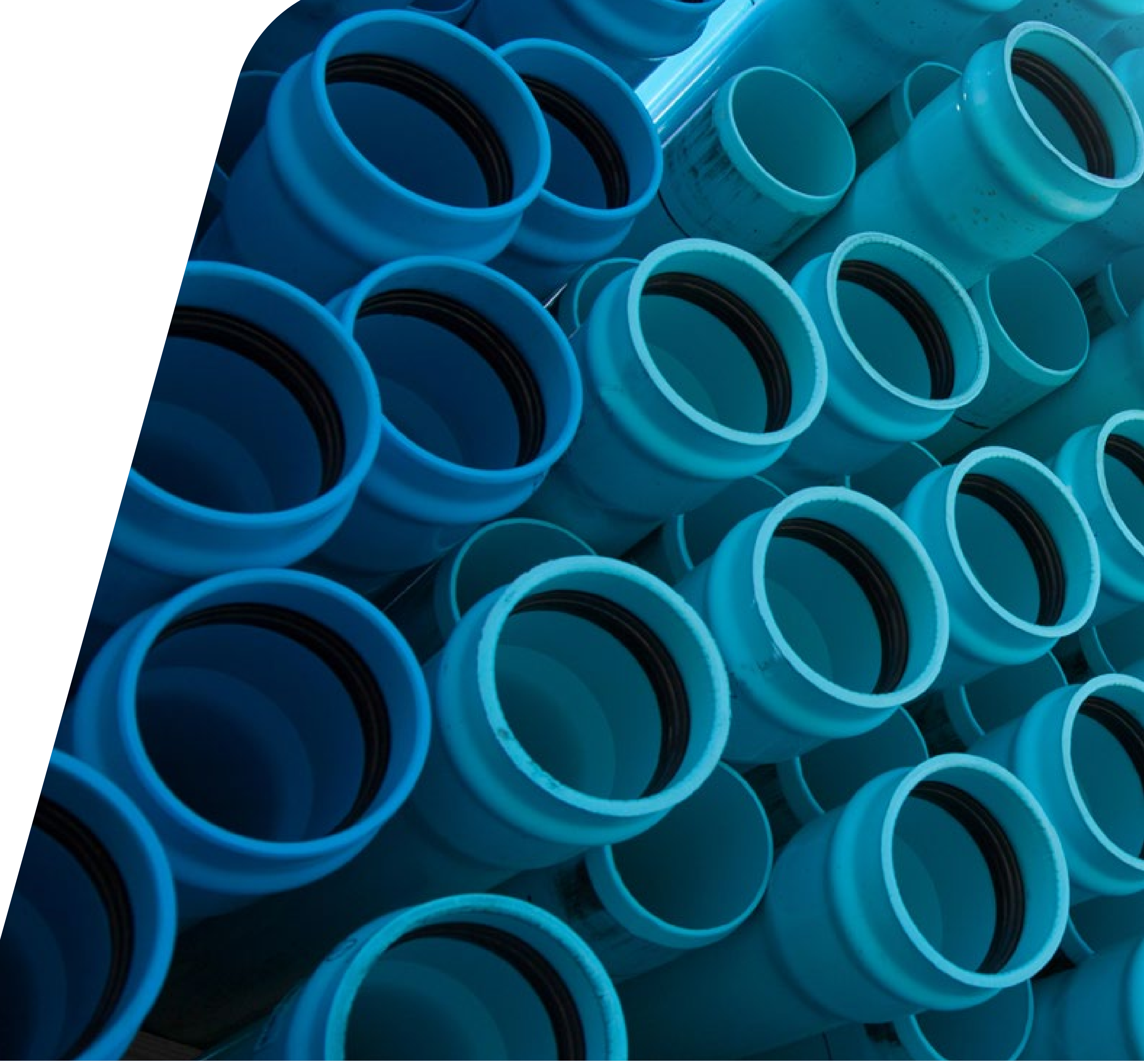

OUR NETWORK

Botswana | South Africa | Angola | Namibia | Zambia

Botswana
Tel: +267 533 2180 | **Fax:** +267 533 3146

South Africa
Tel: +27 11 316 6891 | **Fax:** +27 11 316 6896

Angola
Tel: +244 2222 90662 | **Fax:** +244 2222 90880

Namibia
Tel: +264 61 244239 | **Fax:** +264 61 232339

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