MUNA NOOR

uPVC PRESSURE PIPES

uPVC PRESSURE PIPES

uPVC pressure pipes and fittings are manufactured from unplasticised polyvinyl chloride polymer which is a thermoplastic material commonly used for potable water distribution, irrigation systems and sewer mains.

The high strength to weight ratio, together with exceptional resistance to corrosion makes these pipes ideal for buildings and infrastructure applications.

uPVC pipes and fittings are available in diameters from 20mm to 315mm and in pressure classes ranging from PN 6.0 to PN 16.

The uPVC pressure pipes are available in socketed and plain ended lengths and can be jointed in various ways, (see installation guide)

OMANPLAST™ uPVC pressure pipes are suitable for the following applications:

- Potable water distribution systems
- Industrial process pipelines
- Pressure sewer
- Effluent pipelines
- Slurry pipelines
- Irrigation and watering systems

Main Features:

- Reliability and proven service performance.
- Complete plastic system.
- Extensive range of pipes and fittings.
- Smooth bore preventing the build-up of deposits.
- Minimal maintenance.
- Corrosion resistant allowing high flow speeds of transported liquids.
- Lightweight which makes it easy to handle and install, resulting in reduced laying costs.
- Reliable and durable, whether using the easy rubber push-fit system or solvent cement, both ensure a tight and durable connection.
- Effective rubber ring seal joint.
- Reduced jointing effort and improved reliability.
- OMANPLAST™ uPVC pressure pipes and fittings are resistant to a great number of chemical agents.
- Manufactured according to Omani and international standards.

Easy Handling and Installation
uPVC Pressure pipes and fittings are lightweight (approximately one sixth the weight of steel) which results in reducing the transportation, handling and installation costs. The installation does not require the special tools other than normal pipe cutter.

Chemical Resistance
Muna Noor's range of uPVC Pressure Pipes and fittings are highly resistant to a wide range of strong acids, alkalis, salt solutions, alcohols and many other chemicals. This property makes uPVC pressure pipes and fittings preferred in corrosive applications and gives no tastes or odours to fluids carried in them. They do not react with fluids carried, nor act as a catalyst.

High Strength
Muna Noor uPVC pressure pipes and fittings are highly resilient, tough and durable products with high tensile and high impact strength.

Corrosion Resistance
Muna Noor high pressure uPVC system is a high corrosion resistant system, with the ability to stand low pH levels in water.

It also offers a major reduction in oxidation, which consequently guarantees durability of the system. uPVC pressure pipes and fittings are highly resistant to industrial fumes, humidity, salt water, weather and underground conditions. Scratches or surface abrasions do not provide points which corrosive elements can attack.

Resistance to Galvanic or Electrolytic Attack
uPVC pressure pipes and fittings are resistant to galvanic and electrolytic attack. They can be used underground, underwater and can be safely connected to metal parts.

Free from Toxicity, Odours, Tastes
uPVC pressure pipes and fittings are non-toxic, odourless and tasteless. Therefore they are ideal for use with drinking water.

Low Friction Loss
uPVC pressure pipes and fittings have low coefficient of friction due to its smooth internal surfaces which results in low friction loss and high flow rate.

Therefore they will not fail prematurely due to corrosion or scale build-up, especially in areas where water, soil and/or atmospheric conditions are aggressive in nature like the Gulf region.

Low Thermal Conductivity
uPVC pressure pipes and fittings have a lower thermal conductivity compared to metal pipes. This ensures that fluids maintain a more constant temperature and therefore, they require less insulation than metal pipes. In most cases, pipe insulation is not required.

Maintenance free system
uPVC pressure pipes and fittings do not rust, scale, corrode, or build-up on the system interior, which ensures years of trouble-free service.

Resistance to Ultraviolet Exposure
Certain onsite temperatures are higher in the Gulf region and Muna Noor high pressure uPVC system can easily withstand the ultraviolet exposure commonly experienced during the construction phase of the project, provided the onsite inventories are appropriately stored. Although uPVC pipes can be installed in direct sunlight, it will be affected by ultra-violet light which tends to discolour the pipes and can cause a loss of imapact strength. No other properties are impaired. If the pipe is to be installed in continuous direct sunlight, it is advisable to paint the exterior with a white or light colour PVC paint.

Low Thermal Expansion
Laboratory testing and installation experience have demonstrated that the potential expansion problems in uPVC are much smaller than those which the coefficient of thermal expansion might suggest. The stresses developed within uPVC pipes are generally much lower than those developed in equivalent metal pipe for equal temperature changes due to their elastic nature.

Low Condensation
Due to the uPVC's polymeric structure, costly condensation and damp concerns are eliminated, in addition to a considerable reduction in most of the long-term problems that would be experienced with metal installation.

Noise Reduction
Muna Noor high pressure uPVC system is a quiet system and therefore when used for water distribution in residential contexts, an additional advantage is derived. The low noise performance is due to the polymeric structure of the uPVC material, so the noise associated with water hammer is eliminated.

Cost Effectiveness
Muna Noor high pressure uPVC system is cost effective and easy to install, due to the simple jointing method by using solvent cement or rubber gaskets, in addition to the absence of costly metal cutting procedures.

No Fire Hazard
uPVC material is fire rated as Class 1 to BS476, part 7 and Class 0 to Part 6. Once manufactured, uPVC compositions have a higher ignition temperature than many other commonly used thermoplastics and other organic materials such as wood and paper.

uPVC pressure pipes and fittings are self-extinguishing and do not support combustion. They have an ATSM E84 flame-spread rate of 25 or less.

PVC-U PRESSURE PIPE
TO BRITISH STANDARDS SPECIFICATION BS: 3505 / 1986

Standard Length: 6 Metres
Colour: Dark Grey
Socket Type: Rubber Ring / Solvent Weld

Wall Thickness								
Nominal Size Inch	Outside Diameter		Class C 9.0 bar (90m head of water)		Class D 12.0 bar (120m head of water)		Class E 15.0 bar (150m head of water)	
	Min mm	Max mm	Min mm	Max mm	Min mm	Max mm	Min mm	Max mm
1/2	21.2	21.5	-	-	-	-	1.7	2.1
3/4	26.6	26.9	-	-	-	-	1.9	2.5
1	33.4	33.7	-	-	-	-	2.2	2.7
11/4	42.1	42.4	-	-	2.2	2.7	2.7	3.2
11/2	48.1	48.4	-	-	2.5	3.0	3.1	3.7
2	60.2	60.5	2.5	3.0	3.1	3.7	3.9	4.5
3	88.7	89.1	3.5	4.1	4.6	5.3	5.7	6.6
4	114.1	114.5	4.5	5.2	6.0	6.9	7.3	8.4
6	168.0	168.5	6.6	7.6	8.8	10.2	10.8	12.5
8	218.8	219.4	7.8	9.0	10.3	11.9	12.6	14.5
10*	272.6	273.4	9.7	11.2	12.8	14.8	15.7	18.1
12	323.4	324.3	11.5	13.3	15.2	17.5	18.7	21.6

*These are not regular sizes and not normally available in stock

PVC-U PRESSURE PIPES
BS EN ISO 1452-2: 2009 (METRIC SERIES)

Standard Length: 6 Metres
Colour: Dark Grey
Socket Type: Rubber Ring / Solvent Weld

Nominal outside Diameter	Outside Diameter		S - 20 (SDR 41) Wall Thickness		S - 16 (SDR 33) Wall Thickness		S - 12.5 (SDR 26) Wall Thickness	
	Min	Max	Min (mm)	Max (mm)	Min (mm)	Max (mm)	Min (mm)	Max (mm
mm	mm	mm	Nominal Pressure PN based on design coefficient C = 2.5					
					6 bar		* 8 bar	
12	12	12.2			-		-	
16	16	16.2			-		-	
20	20	20.2			-		-	
25	25	25.2			-		-	
32	32	32.2			-		1.5	1.9
40	40	40.2			1.5	1.9	1.6	2
50	50	50.2			1.6	2	2	2.4
63	63	63.3			2	2.4	2.5	3
75	75	75.3			2.3	2.8	2.9	3.4
90	90	90.3			2.8	3.3	3.5	4
			Nominal Pressure PN based on design coefficient C = 2.0					
			6 bar		* 8 bar		10 bar	
110	110	110.4	2.7	3.2	3.4	4	4.2	4.9
125	125	125.4	3.1	3.7	3.9	4.5	4.8	5.5
140*	140	140.5	3.5	4.1	4.3	5	5.4	6.2
160	160	160.5	4	4.6	4.9	5.6	6.2	7.1
180*	180	180.6	4.4	5.1	5.5	6.3	6.9	7.8
200	200	200.6	4.9	5.6	6.2	7.1	7.7	8.7
225	225	225.7	5.5	6.3	6.9	7.8	8.6	9.7
250	250	250.8	6.2	7.1	7.7	8.7	9.6	10.8
280	280	280.9	6.9	7.8	8.6	9.7	10.7	12
315	315	316	7.7	8.7	9.7	10.9	12.1	13.6
355*	355	356.1	8.7	9.8	10.9	12.2	13.6	15.2
400*	400	401.2	9.8	11	12.3	13.8	15.3	17.1

* On request

PVC-U PRESSURE PIPES
BS EN ISO 1452-2: 2009

Standard Length: 6 Metres
Colour: Dark Grey
Socket Type: Rubber Ring / Solvent Weld

Nominal Size	Individual Outside Diameter		Wall Thickness PN 9 bar (Class C)		Wall Thickness PN 12 bar (Class D)		Wall Thickness PN 15 bar (Class E)	
Inch	Min	Max	Min (mm)	Max	Min	Max	Min	Max
1/2	21.2	21.5	-	-	-	-	1.7	2.1
3/4	26.6	26.9	-	-	-	-	1.9	2.5
1	33.4	33.7	-	-	-	-	2.2	2.7
1 1/4	42.1	42.4	-	-	2.2	2.7	2.7	3.2
1 1/2	48.1	48.4	-	-	2.5	3.0	3.1	3.7
2	60.2	60.5	2.5	3.0	3.1	3.7	3.9	4.5
3	88.7	89.1	3.5	4.1	4.6	5.3	5.7	6.6
4	114.1	114.5	4.5	5.2	6.0	6.9	7.3	8.4
6	168.0	168.5	6.6	7.6	8.8	10.2	10.8	12.5
8	218.8	219.4	7.8	9.0	10.3	11.9	12.6	14.5
10*	272.6	273.4	9.7	11.2	12.8	14.8	15.7	18.1
12	323.4	324.3	11.5	13.3	15.2	17.5	18.7	21.6

*These are not regular sizes and not normally available in stock

n)	S - 10 (SDR 21) Wall Thickness		S - 8 (SDR 17) Wall Thickness		S - 6.3 (SDR 13.6) Wall Thickness		S - 5 (SDR 11) Wall Thickness	
	Min (mm)	Max (mm)	Min (mm)	Max (mm)	Min (mm)	Max (mm)	Min (mm)	Max (mm)
	10 bar		* 12.5 bar		16 bar		* 20 bar	
	-		-		-		1.5	1.9
	-		-		-		1.5	1.9
	-		-		1.5	1.9	1.9	2.3
	-		1.5	1.9	1.9	2.3	2.3	2.8
	1.6	2	1.9	2.3	2.4	2.9	2.9	3.4
	1.9	2.3	2.4	2.9	3	3.5	3.7	4.3
	2.4	2.9	3	3.5	3.7	4.3	4.6	5.3
	3	3.5	3.8	4.4	4.7	5.4	5.8	6.6
	3.6	4.1	4.5	5.2	5.6	6.4	6.8	7.7
	4.3	5	5.4	6.2	6.7	7.6	8.2	9.3
	* 12.5 bar		16 bar		* 20 bar		* 25 bar	
	5.3	6.1	6.6	7.5	8.1	9.2	10	11.3
	6	6.8	7.4	8.4	9.2	10.4	11.4	12.8
	6.7	7.6	8.3	9.4	10.3	11.6	12.7	14.2
	7.7	8.7	9.5	10.7	11.8	13.2	14.6	16.3
	8.6	9.7	10.7	12	13.3	14.9	16.4	18.3
	9.6	10.8	11.9	13.3	14.7	16.4	18.2	20.3
	10.8	12.1	13.4	15	16.6	18.5	-	
	11.9	13.3	14.8	16.5	18.4	20.5	-	
	13.4	15	16.6	18.5	20.6	22.9	-	
	15	16.8	18.7	20.8	23.2	25.8	-	
	16.9	18.8	21.1	23.5	26.1	29	-	
	19.1	21.3	23.7	26.3	29.4	32.6	-	

Note: To apply a design coefficient of 2.5 (instead of 2.0) for pipes with nominal diameters above 90mm, the next higher pressure rating, PN, should be chosen

PVC-U PRESSURE PIPES
DIN 8061/8062 : 2007/2010

Standard Length: 6 Metres
Colour: Dark Grey
Socket Type: Rubber Ring / Solvent Weld

Nominal Size	Outside Diameter		S-6.3 (SDR 13.6) Wall Thickness		S- 10 (SDR 21) Wall Thickness		S-16.7 (SDR 34.4) Wall Thickness		S-25 (SDR 51) Wall Thickness	
mm	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Pressure rating bar			PN 16		PN 10		PN 6		PN 4*	
12*	12	12.2								
16*	16	16.2	1.2	1.6						
20	20	20.2	1.5	1.9						
25	25	25.2	1.9	2.3						
32	32	32.2	2.4	2.9	1.6	2				
40	40	40.2	3	3.5	1.9	2.3				
50	50	50.2	3.7	4.3	2.4	2.9	1.5	1.9		
63	63	63.3	4.7	5.4	3	3.5	1.9	2.3		
75*	75	75.3	5.6	6.4	3.6	4.2	2.2	2.7	1.5	1.9
90	90	90.3	6.7	7.6	4.3	5.0	2.7	3.2	1.8	2.2
110	110	110.4	8.1	9.2	5.3	6.1	3.2	3.8	2.2	2.7
125*	125	125.4	9.2	10.4	6.0	6.8	3.7	4.3	2.5	3.0
140*	140	140.5	10.3	11.6	6.7	7.6	4.1	4.8	2.8	3.3
160	160	160.5	11.8	13.2	7.7	8.7	4.7	5.4	3.2	3.8
180*	180	180.6	13.3	14.9	8.6	9.7	5.3	6.1	3.6	4.2
200	200	200.6	14.7	16.4	9.6	10.8	5.9	6.7	3.9	4.5
225*	225	225.7	16.6	18.5	10.8	12.1	6.6	7.5	4.4	5.1
250	250	250.8	18.4	20.5	11.9	13.3	7.3	8.3	4.9	5.6
280*	280	280.9	20.6	22.9	13.4	15.0	8.2	9.3	5.5	6.3
315	315	316.0	23.2	25.8	15.0	16.7	9.2	10.4	6.2	7.1
355*	355	356.1	26.1	29.0	16.9	18.8	10.4	11.7	7.0	7.9
400*	400	401.2	29.4	32.6	19.1	21.3	11.7	13.1	7.9	8.9

* These are not regular sizes and not normally available in stock

Note: In the table, the allowable working pressure/pressure rating (bar) have been mentioned for PVC-U pipes with a safety factor (SF) = 2.5

If safety factor 2 to be applied (for pipe sizes above 90mm) MNMT will provide the pressure rating of the pipe.

PVC-U PRESSURE PIPES
ATSM D 1785/2015 SCHEDULE 40 & 80

Standard Length: 6 Metres
Colour: Dark Grey
Socket Type: Rubber Ring / Solvent Weld

			ATSM 1785 Schedule 40		ATSM 1785 Schedule 80	
Nominal Size	**Outside Diameter**	**Tolerance**	**Min. Wall Thickness**	**Tolerance**	**Min. Wall Thickness**	**Tolerance**
Inch	**mm**	**mm**	**mm**	**mm**	**mm**	**mm**
1/8*	10.29	± 0.10	1.73	+ 0.51	2.41	+ 0.51
1/4	13.72	± 0.10	2.24	+ 0.51	3.02	+ 0.51
3/8*	17.14	± 0.10	2.31	+ 0.51	3.20	+ 0.51
1/2	21.34	± 0.10	2.77	+ 0.51	3.73	+ 0.51
3/4	26.67	± 0.10	2.87	+ 0.51	3.91	+ 0.51
1	33.40	± 0.13	3.38	+ 0.51	4.55	+ 0.53
1 1/4	42.16	± 0.13	3.56	+ 0.51	4.85	+ 0.58
1 1/2	48.26	± 0.15	3.68	+ 0.51	5.08	+ 0.61
2	60.32	± 0.15	3.91	+ 0.51	5.54	+ 0.66
2 1/2*	73.02	± 0.18	5.16	+ 0.61	7.01	+ 0.84
3*	88.90	± 0.20	5.49	+ 0.66	7.62	+ 0.91
3 1/2*	101.60	± 0.20	5.74	+ 0.68	8.08	+ 0.96
4	114.30	± 0.23	6.02	+ 0.71	8.56	+ 1.02
5*	141.30	± 0.25	6.55	+ 0.79	9.52	+ 1.14
6	168.28	± 0.28	7.11	+ 0.86	10.97	+ 1.32
8	219.08	± 0.38	8.18	+ 0.99	12.70	+ 1.52
10*	273.05	± 0.38	9.27	+ 1.12	15.06	+ 1.80
12	323.85	± 0.38	10.31	+ 1.24	17.45	+ 2.08

* These are not regular sizes and not normally available in stock

PVC-U PRESSURE PIPE SYSTEMS
FOR DRINKING WATER - OMANI STANDARD OS 85/1985

Standard Length: 6 Metres
Colour: Dark Grey
Socket Type: Rubber Ring / Solvent Weld

Wall thickness													
		Class 1			Class 2			Class 3			Class 4		
		6.12 kgf/cm²			9.19 kgf/cm²			12.25 kgf/cm²			15.30 kgf/cm²		
Nominal outside diameter	Tolerance	Averaged Value	Individual Value		Averaged Value	Individual Value		Averaged Value	Individual Value		Averaged Value	Individual Value	
mm	mm	Max mm	Min mm	Max mm	Max mm	Min mm	Max mm	Max mm	Min mm	Max mm	Max mm	Min mm	Max mm
17.0	+ 0.3	-	-	-	-	-	-	-	-	-	1.9	1.5	1.9
21.2	+ 0.3	-	-	-	-	-	-	-	-	-	2.1	1.7	2.1
26.6	+ 0.3	-	-	-	-	-	-	-	-	-	2.5	1.9	2.5
33.4	+ 0.3	-	-	-	-	-	-	-	-	-	2.7	2.2	2.7
42.1	+ 0.3	-	-	-	-	-	-	2.7	2.2	3.2	3.2	2.7	3.2
48.1	+ 0.3	-	-	-	-	-	-	3.0	2.5	3.0	3.7	3.1	3.7
60.2	+ 0.3	-	-	-	3.0	2.5	3.0	3.7	3.1	3.7	4.5	3.9	4.5
75.0*	+ 0.3	-	-	-	3.5	3.0	3.5	4.5	3.9	4.5	5.5	4.8	5.5
88.7	+ 0.4	3.4	2.9	3.4	4.1	3.5	4.1	5.3	4.6	5.3	6.5	5.7	6.6
114.1	+ 0.4	4.0	3.4	4.0	5.2	4.5	5.2	6.8	6.0	6.9	8.3	7.3	8.4
140.0*	+ 0.4	4.4	3.8	4.4	6.3	5.5	6.4	8.3	7.3	8.4	10.1	9.0	10.4
168.0	+ 0.5	5.2	4.5	5.2	7.5	6.6	7.6	9.9	8.8	10.2	12.1	10.8	12.5
193.5*	+ 0.5	6.0	5.2	6.0	8.7	7.7	8.9	11.4	10.1	11.7	13.9	12.4	14.3
218.8	+ 0.6	6.1	5.3	6.1	8.8	7.8	9.0	11.6	10.3	11.9	14.1	12.6	14.5

* These are not regular sizes and not normally available in stock

OMANPLAST™ PVC-U PIPE SYSTEMS MATERIAL
PROPERTIES

Material Properties	
Material	Unplasticised Polyvinyl Chloride
General Properties	
Specific Gravity	1.42
Water Absorption	Less than 4 mg/cm²
Flammability	Will not support combustion
Mechanical Properties	
Tensile Strength	450-525 kgf/cm²
Elongation at Break	Above 80%
Compressive Strength	620 kgf/cm²
Impact Strength	Complies with relevant BS, ISO, DIN & OS standards
Modulus of elasticity	3.2 x 10^4 kgf/cm²
Thermal Properties	
Vicat Softening Point	80°C
Co-efficient of linear expansion	0.08mm/m/°C
Co-efficient of thermal conductivity	0.16 W/(m.K)
Specific heat	1000 J/kg/°C
Electrical Properties	
Volume resistivity	10^{14} ohm/cm
PVC is a non-conductor of electricity and is not subject to galvanic or electrolytic attack	

Note: Values given in the above table are approximate

LONG RADIUS BENDS AND FABRICATED STANDARD FITTINGS

Omanplast™ manufactures a comprehensive range of Long Radius Bends formed from PVC-U pipe conforming to BS 3505 : 1986. Bends are supplied as standard to Class D (12 bar) pressure rating with 'ANGER' joint socket at one end. Bends in other classes or with pipe preparation other than 'ANGER' are available to special order – as are bends formed to intermediate angles.

Code LR900	Size	L	R
90° Long Radius Bend	2	432	229
	3	610	356
	4	762	457
	6	1016	610
	8	1194	762

Code LR220	Size	L	R
22 1/2° Long Radius Bend	2	254	229
	3	330	356
	4	406	457
	6	533	610
	8	584	762

Code LR450	Size	L	R
45° Long Radius Bend	2	305	229
	3	406	356
	4	508	457
	6	660	610
	8	762	762

Code LR110	Size	L	R
11 1/4° Long Radius Bend	2	229	229
	3	305	356
	4	356	457
	6	457	610
	8	508	762

Code A44	Size	L
Double Coupler	4	356
	6	457
	8	533

uPVC PIPE SYSTEM INSTALLATION

Working Temperature

Muna Noor uPVC pipes and fittings are recommended for applications where the operating temperature does not exceed 60°C.

Working Pressure

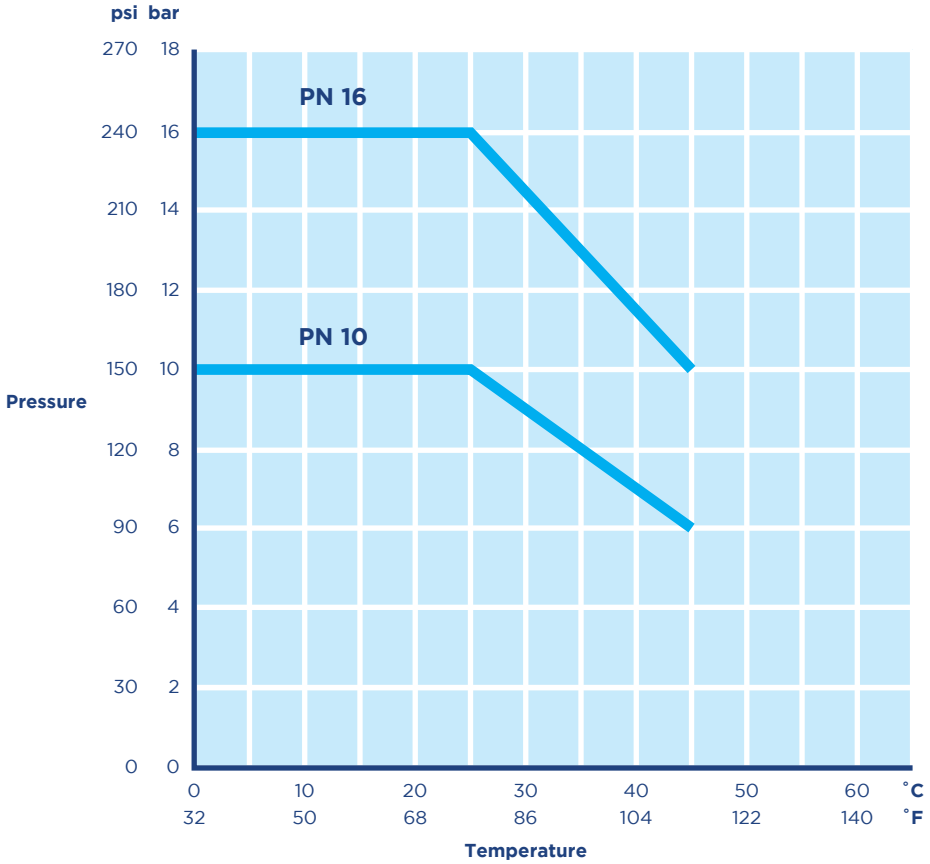
Muna Noor uPVC pipes and fittings are able to withstand working pressure of 16 Bar which is based on the water pressure at 20°C.
At temperatures above 20°C the maximum allowable operating pressure is reduced and is defined by the Pressure / Temperature diagram.

At temperatures below 20°C, the resistance to internal pressure increases. However, the nominal pressure rating at 20°C, or PN, will still be the maximum allowable operating pressure at low temperatures.

Relationship between recommended sustained working pressure and temperature

As temperatures increase above 20°C the burst strength of PVC-U pressure pipe decreases. The recommended maximum sustained operating pressure must therefore be reduced for operating temperatures greater than 20°C. A reduction in pressure rating of 2% per °C above 20°C is recommended. The chart below is based on this reduction. PVC-U pressure pipe is not recommended for use where temperatures are in excess of 60°C.

Pressure/Temperature Diagram

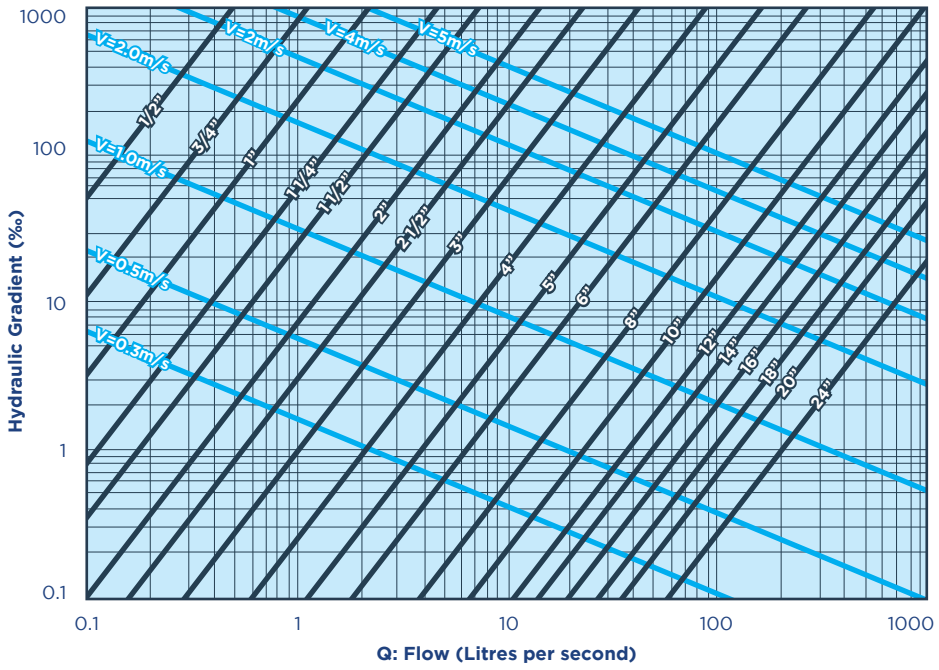


The above diagram should be used as general recommendation only and not as a guarantee on performance

The de-rating required for different temperatures for service life

Temperature °C	Service Life Years	De-rating Factor	Pressure Class						
			16	15	12.5	12	10	9	6
20	50	1	16	15	12.5	12	10	9	6
30	50	0.8	12.8	12	10	9.6	8	7.2	4.8
40	50	0.6	9.6	9	7.5	7.2	6	5.4	3.6
50	25	0.43	6.88	6.45	5.375	5.16	4.3	3.87	2.58
60	25	0.26	4.16	3.9	3.25	3.12	2.6	2.34	1.56

Flow Diagram



INSTALLATION BELOW GROUND

Cover depth

The diversity of soil types and local conditions make recommendations difficult for maximum and minimum depths of cover. Good quality backfilling material and workmanship are the important factors in protecting pipes from excessive deformation.

Trench Preparation

The width of the trench at the crown of the pipe should be as narrow as is practicable but should not be less than the outside diameter of the pipe plus 300mm (12 in) to allow proper compaction of the side fill material.

The trench bottom should be carefully examined for the presence of hard objects such as flints, rocky projections or large tree roots. In uniform, fine-grained soils found to be free of such objects and where the trench bottom can readily be brought to an even finish to provide a uniform support for the pipes over their length, the pipes may be laid directly on the trench bottom. In other cases the trench should be cut correspondingly deeper and the pipes laid on a prepared under bedding, which may be drawn from selected excavated material if suitable. The suitability of proposed backfill material should be checked, as described in Appendix “A” of the British Standard Code of Practice 312 Part 1:1973.

Ideally the prepared underbed should consist of a free-running granular material passing a 19mm (3/4 in) sieve.

The thickness of the prepared under bed should be at least 100mm (4 in). It should be raked to a level surface so as to provide uniform support for the pipe.

Pipes must not be allowed to ‘bake’ in the trench prior to back-filling. Exposed pipes in open trenched can easily be exposed to temperatures beyond their maximum allowable limit. Similarly pipes waiting for laying must not be covered with dark sheeting thus allowing heat to build up between the sheet and the pipes beyond allowable limits.

Side-filling and back-filling

Before commencing to place any side-fill or back-fill material, all trench sheeting should be partially withdrawn and the pipe bed checked for stones or other hard objects which may have fallen into the trench after the pipe was laid.

In order to develop reaction from the side-fill, necessary for a flexible pipe to sustain top load, some deformation of the pipe’s cross section must occur. It is generally considered that the maximum acceptable decrease in vertical diameter expressed as a percentage of the pipe’s outside diameter is 5%.

To ensure the 5% maximum pipe deformation is not exceeded, the selection, placing and compaction factor of side-fill material is of supreme importance. Granular material as described in “Trench Preparation” and having a fraction of 0.1 or less should be placed carefully between the pipe and trench walls and thoroughly compacted by hand in layers not exceeding 75mm (3in). This should continue up to a level of at least 100mm (4in) above the crown of the pipe.

Selected excavated material may be used for the remainder of the back-filling, except that special consideration of its suitability may be necessary where the risk of surface subsidence is a consideration e.g. under roads. The back-fill material should be compacted in 300mm (12in) layers or with any special requirements. Stones or any other hard objects larger than 150mm (6in) should be rejected.

Mechanical compactors should not be used until the fill has reached a depth of at least 300mm (12in) above the crown of the pipe.

Pipes above natural ground level which are subsequently to be covered with fill should not be laid until the deposition and compaction of the fill has been completed up to a height of approximately one metre above the proposed level of the crown of the pipe. A trench should then be cut in the fill and the pipe laid in the manner previously described.

Buried pipes with Anger-Seal Mechanical Joints

OMANPLAST™ PVC-U pipes complete with integral mechanical joints should preferably be installed and jointed in the trench. Pipes up to and including 6 in. diameter may, if necessary, be joined at the trench side and thereafter snaked into the trench. In such cases extreme care should be taken to ensure no separation of the joints occurs during this operation and the joints should be checked to ensure that they are still fully engaged.

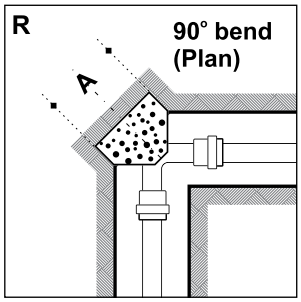
Rubber ring, push-fit mechanical joints generally do not resist end thrust. Pipes should therefore be laid on a prepared bed as previously described and anchored at all changes of direction, valves, reducers and blank ends. For typical anchor details see “pipe anchors and thrust blocks”.

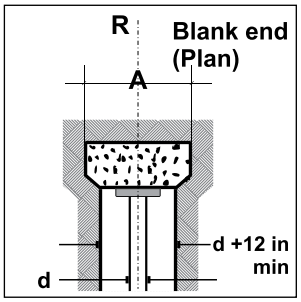
All temporary pipe supports, levelling pegs etc. MUST be removed from beneath the pipe prior to laying.

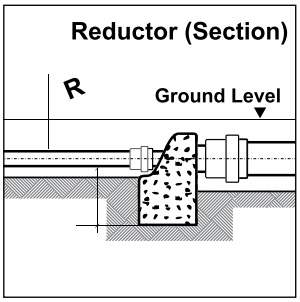
The amount of expansion and contraction of buried pipes carrying cold water will normally be small and easily accommodated by the mechanical joint. Initially contraction will occur when the pipes are filled with cold water, particularly if laying is carried out in hot sunny conditions. It is preferable therefore for pipelines to be back-filled as soon as possible after laying and allowed to cool before filling.

Instructions for Anger Seal Jointing

1. Check that the rubber sealing ring is correctly positioned and fully depressed in place.
2. Check spigot pipe end for damage or inadequate chamfer.
3. Check inside the socket for any foreign matter particularly behind the rubber ring.
4. Thoroughly wipe clean both the inside of the socket and the outside surface of the spigot.
5. Apply an approved lubricant evenly to both rubber ring and spigot chamfer (ref. table for lubricant requirements).
6. Engage the spigot pipe into the socket mouth up to the point where the resistance of the rubber ring is met.
7. Carefully align the pipes in both vertical and horizontal planes.
8. Complete insertion beyond the rubber ring using a block of wood and lever (crow bar, shovel etc.) up to the entry depth mark on the spigot pipe.







Pipe anchors and thrust blocks

The function of a thrust block is to prevent deflection or extension of the pipeline under the action of internal fluid pressure and to transfer resultant forces to surrounding ground of load bearing quality. The sketches are intended as a guide to the design and position of the pipe anchors. The magnitude of the resultant force R can be calculated from:

R = A x P x Z sin (ø/2) where:

A = Cross section of external pipe diameter

P = Maximum Proof hydraulic test pressure

ø = Angle of deviation of bend

In all cases the required area of the thrust block at position A is obtained by dividing the resultant force R by the safe bearing capacity of the soil.

Instructions for solvent cement jointing

1. Carefully read all instructions printed on the solvent cement and cleaning fluid containers, paying particular attention to storage directions and hazard warning. Do not use in an enclosed space.
2. Do not stir solvent cement.
3. Check that the spigot pipe end is cut square and free from burrs.
4. Measure depth of socket and mark on spigot pipe.
5. Clean spigot and socket bonding surfaces with cleaning fluid.
6. Thoroughly abrade spigot and socket bonding surfaces using a glass paper or emery cloth.
7. Re-clean bonding surface as in point 5 and before proceeding check that both are perfectly dry.
8. Using a clean brush apply cement evenly and in one coat to spigot and socket bonding surfaces stroking in a longitudinal direction. (For pipes above 3 in. the cement should be applied to spigot and socket simultaneously).
9. Immediately and without twisting push spigot into socket until mark on spigot pipe reaches socket mouth.
10. Remove surplus cement from around socket mouth.
11. The drying time of solvent cement joints depends on variables such as temperature, humidity and cement integrity. For more information, including hazard warning you may contact the solvent cement manufacturer.
12. Each joint must remain undisturbed for at least 30 minutes, although jointing may proceed as a continuous operation.

Solvent cement and lubrication requirements

	Solvent Cement	Lubricant
Nominal pipe size	Approximate joints per 1/2 liter	Approximate joints per 1/2 kg
1/2	80	-
3/4	70	-
11/4	60	-
11/2	60	-
2	30	98
3	25	59
4	20	45
5	18	37
6	12	28
8	6	21
12	4	18

INSTALLATION ABOVE GROUND

OMANPLAST™ PVC-U pipes installed above ground must be solvent cement jointed. Solvent cement joints will support end loads at changes of direction, blank ends etc. caused by the action of internal pressure. Pipelines jointed by solvent welding techniques do not therefore require external mechanical restraint against thrust forces.

Pipelines designed for above ground applications should be installed in such a way as to minimize stress in the pipe material, e.g. movement due to expansion and contraction. As a general rule Omanplast™ PVC-U pressure pipe should never be restrained in the hoop direction by U-straps, clamps etc., manufactured from totally unyielding material. Such restraints should always be lined with a compressible material, e.g. rubber.

Omanplast™ PVC-U pipe may be supported along walls and in pipe racks by spring hangers, U-straps, clamps etc. Freestanding supports constructed in steel or concrete are also acceptable. In all cases spacing of supports is important. Preferably supports to flexible pipelines installed above ground should provide support in the lateral and vertical planes but allow for longitudinal movement if necessary.

PVC-U pipelines should be located far enough away from hot objects or pipes to prevent the material being affected by radiated heat. See above (trenching guide) for guidance on heat build-up during pipe laying and storage.

All manually operated controls incorporated in the pipeline e.g. valves, should be adequately supported to avoid stressing the pipeline during operation (e.g. torque from operation of old gate valves).

Further information may be obtained from the British Standard Code of Practice 312, Parts 1 and 2.

HANDLING, STORAGE AND TRANSPORTATION

Handling and Storage

OMANPLAST™ PVC-U pipe is a strong though lightweight material, being about one-fifth the weight of steel or cast iron. As a result pipes are very easily handled and there is a tendency for them to be mishandled much more than their metal counterparts. This should be discouraged and reasonable care should be taken in handling and storage to prevent damage.

Pipes should be given adequate support at all times. They should not be stacked in large random piles, especially in warm temperatures, as the bottom pipes may distort resulting in increased difficulty with pipe alignment and jointing. Socketed pipes and those with Anger–Seal joints should be stacked in layers with sockets placed at alternate ends of the stack and with the sockets protruding, so as to avoid lopsided stacks and the imparting of a permanent set to the pipes.

For ideal storage, pipes should be uniformly supported throughout the length. If this is not possible then timber supports of at least 75mm (3 in) bearing width should be placed below the bottom layer and between each subsequent layers of pipes. Pipe stacks should not exceed 2 meters (6ft 6in) in height. The stack should be provided with side supports at spacing not greater than 1.5 meters (4ft 6in). Pipes of different sizes and wall thickness should be stacked separately. Where this is not possible, those with larger diameters and/or thicker walls should be at the bottom of the stack.

Pipe stacks should not be erected directly on ground with sharp projections, stones or other protuberances likely to deform them or create high point loads.

In tropical conditions stack heights should be reduced and pipes stored in the shade (see notes in Trenching section). Stack heights should also be reduced if pipes are nested (i.e. pipes stored inside those of larger diameter). Reduction in height should be proportional to the total weight of the nested pipes compared with the weight of pipes normally contained in such stowage.

Since the integrity of any joint depends on the condition of the spigot and the socket, special care should be taken in transit, handling and storage, to avoid damage to these ends. Pipes should not be dragged along rough ground.

Transportation

When loading pipes on to vehicles, care should be taken not to allow them to come into contact with any sharp corners such as cope irons, loose nail heads or the like, as pipes may be damaged by being rubbed against these during transit. Where mechanical handling is employed metal slings, hooks and chains must not come into direct contact with the pipe.

While in transit, pipes should be well secured and supported over their entire length. Pipes should not be left projecting unsecured over the tailboard of a lorry. Pipes may be off-loaded from vehicles by rolling them gently down on timbers, care being taken to ensure that pipes do not fall one upon another or onto any hard or uneven surface. Pipes must not be thrown from transport vehicles.

Hydrostatic Testing

When the pipeline system has been fully installed all pipework and fittings should be visually inspected and hydraulically tested. All joints should be left exposed until hydraulic testing has been fully completed. The testing procedure used for most pressure pipeline materials throughout the water industry is included in C.P. 312 Part 2: 1973. When applying this procedure to uPVC pipeline, variable results are occasionally obtained due to a number of factors such as length of testing section, diameter of the pipe, temperature changes, range of test pressure imposed, rate of pressure loading, the effect of creep, gradients of the pipe, presence of air in the pipeline, degree any of leakage present, relative movement of mechanical fittings etc. The testing procedure of uPVC pipeline therefore, needs careful attention and the interpretation of the testing results requires a balanced and experienced judgment.

Testing of the pipelines can be carried out in sections. The section under test is usually blanked off using blank steel flange, which is drilled and tapped for connecting the appropriate test equipment. It should also be strutted for protection against end-thrust. All the test equipment should be located at the lowest point of the pipeline section under testing. The pressure gauge should also be located at the lowest end of the pipeline and its calibration should be adjusted according to the pipe's position. Anchor blocks and solvent welded joints should be allowed sufficient time to build full strength before testing is carried out. Above ground supports and anchors should also be properly installed before testing. Underground installations particularly those being deflected should be properly back-filled, except for joints that should be left exposed until the testing is complete. Once the pipe, valves and pressure gauges are assembled filling of the pipeline can commence.

The pipeline section should be filled with water from its lowest point with all the air valves and control valves in the open position. Care should be taken to avoid pressure surges and to ensure that all air is expelled from the pipeline. Air valves should be closed as filling proceeds when the air valves are seen to be discharging water free from aeration. After the testing section is fully charged, it should be allowed to stand overnight and any seepage should be made good before the pressure test begins. A hand pump should be used to attain the required test pressure. Although a testing engineer will determine the exact specification of the test, a general rule of thumb is not to exceed 1.5 times the working pressure of the lowest rated component of the pipeline system and a time limit of 24 hours is usually ideal to test a pipeline.

The test is assessed on the basis of the amount of water required to maintain the test pressure during the prescribed period. The "make-up" water quantity Q should not exceed the amount calculated by the formula:

Q = 2 (litres) x diameter (metre) x length (Km) x head (metre) per day

For example, the permissible water loss for 1km of 6" dia 12 bar pipe when tested at 18 bar is calculated as under:

Q = 2 x 0.160 x 1 x 180 per day = 57.6 litres per day or 2.4 litres per hour

Any defects revealed during testing and any cause of failure to meet the prescribed requirements should be rectified and the system re-tested until a satisfactory result is obtained.

It may be helpful to retest the mains in sections to locate the exact fault locations.

In the case of gravity drains the pipeline should be tested to an internal pressure of 1.5 meters head of water above the invert of the pipe at the high end of the line and not more than 4 meters head of water above the invert of the pipe at the lower end of the line.

Fill the pipe with water and allow 2 hours for settlement, topping up as necessary. Then add water for 30 minutes to maintain the test head noting the quantity of water needed. Water loss may be due to trapped air or leakage. The rate of water loss should not exceed 1 litre per hour per metre diameter per linear metre run of pipe.

It may be quicker and more convenient to carry-out an air test, especially for large pipes or when water is not available. However, because this test is more sensitive than a water test and is affected by any changes in temperature, failure is not conclusive. Since it is difficult to detect the point of failure with an air test a water test should be carried out if failure does occur.

Pump air into the system until a pressure of 100mm head of water is shown on a connected U-tube for standard pipelines, or 50mm head of water is shown on a connected U-tube where gullied and / or ground floor appliances are connected.

The 100mm head of water pressure should not fall by more than 25mm over a period of 5 minutes. The 50mm head of water pressure should not fall more than 12.5mm over a period of 5 minutes.

Although smoke tests are not an officially accepted test, they are sometimes used to detect leakage points after other tests have failed. Certain smoke canisters are not suitable for use with uPVC drainage systems. Hence, obtain the advice of canister manufacturers before carrying out a smoke test.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ABOUT MUNA NOOR

Muna Noor is one of Oman's leading manufacturers and suppliers of plastic pipe systems, meeting the needs of the construction, civil, agricultural, industrial and petrochemical industries, primarily in the Middle East, but also supplying Asia and North Africa.

To date Muna Noor's divisions deliver large-scale and bespoke uPVC, HDPE, DWC and Multi-layer HDPE pipes, fittings, plastic fabrication, lining for steel pipe, traditional and electro fusion welding solutions, complete irrigation systems, SCADA control systems and a multiplicity of valves and controls for water.

The company continues to develop product state-of-the-art solutions with the aim to exceed client expectations and collaborate on new and exciting projects.

As an ISO 9001:2008 certified company, our primary commitment is to deliver quality products and services to clients. Muna Noor's quality and success has also been recognised by financial industry leaders in the region and has been made a subsidiary by the Boubyan Petrochemical Company (K.S.C), which is a blue chip company of the Kuwait Stock Exchange and premium institution in Kuwait for investment in the field of petrochemicals by the private sector.

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