

Selection of materials



PVC-C: Post-Chlorinated Polyvinyl Chloride

Post-chlorinated Polyvinylchloride (PVC-C) is a highly versatile material that has been used for both pressure and drainage piping systems for above and below ground applications for more than forty years. It is an amorphous thermoplastic material with good tensile, flexural and mechanical strength, low moisture absorption, good flammability characteristics, exceptional dimensional stability and good tenacity.

PVC-C also has excellent chemical resistance across its operating temperature range of 0°C to 90°C, with a broad band of operating pressures. In addition, because of its long-term strength characteristics, high stiffness and cost effectiveness, PVC-C systems are suitable for a wide diversity of thermoplastic piping installations.

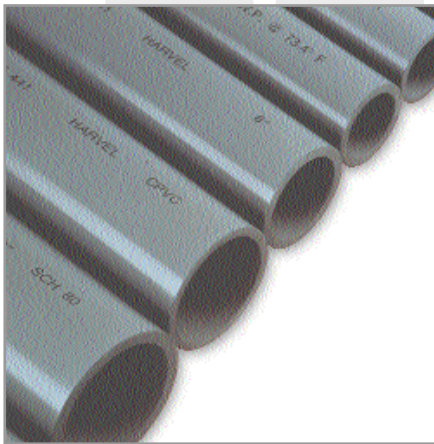
PVC-C systems feature a broad range of pipe sizes, fitting configurations, valve choices and ancillary items compared to other thermoplastic piping materials.

PVC-C piping systems are joined by solvent cement welding, whilst transition joints can be made using flanges, threaded connections, mechanical fittings, and compression fittings.

IPS supplies a comprehensive range of PVC-C piping systems in inch dimensions according to ASTM standards. Systems are available in inch sizes up to 24" for use as both pressure and ventilation piping systems.

General properties of PVC-C

PVC-C exhibits thermal stability in the temperature range 5°C to 100°C, however at low temperatures the impact strength of PVC-C decreases. It is therefore not recommended for use at very low temperatures unless there is no likelihood of the piping materials being disturbed or subjected to impact damage. PVC-C is free from toxic metals thus ensuring that it is physiologically harmless for drinking water and foodstuffs applications.



Some important advantages of PVC-C are:

- Low Specific weight 1.5 g/cm³
- Wide range of applications
- Good chemical and corrosion resistance
- Safe for potable water applications
- Low friction loss
- Self extinguishing
- High mechanical strength
- Low coefficient of thermal expansion
- Rigid and requires less support

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Materials

PVC-C piping systems are produced without plasticizers and fillers, however for injection moulding purposes lubricants are added to assist in the production of complex parts, and to combat the effects of UV light, stabilisers are added.

PVC-C is created when PVC homopolymer undergoes a chlorinating reaction resulting in additional chlorine atoms on the base atom. Owing to the high chlorine content of PVC-C, it does not support combustion after removal of a flame, and thus PVC-C falls into the class V-0 according to UL94. This material meets FMRC 4910 clean rooms materials flammability test protocol.

Properties of PVC-C (Average values)		
Property	Value	Unit
Density	1.55	g/cm ³
Tensile Strength	55	N/mm ²
Elongation at Break	3	%
Impact Strength	80	J/m (23°C)
Modulus of Elasticity (Young's Modulus)	2500	N/mm ²
Coefficient of Linear Expansion	0.07	mm/m °C
Maximum Operating Temperature	90	°C
Minimum Operating Temperature	0	°C
Vicat Softening Point	> 105	°C(VST/B 50)
Water Absorption	0.03	%
Surface Resistance	Approx. 10 ¹³	Ω
Thermal Conductivity	0.066	W/m · K
Flammability	V-0	UL94
Colour	Light Grey	

Chemical resistance

PVC-C displays excellent chemical resistance to a variety of commonly encountered industrial chemicals, such as acids, bases and salt solutions. Resistance to sodium hypochlorite solutions is also very good. PVC-C is not resistant to aromatic and chlorinated hydrocarbons, solvents, esters and ketones. The chemical resistance of PVC-C should be checked with our technical department for applications involving varnish, oils or fats, and PVC-C is not recommended for use with compressed air or gases. For information on the suitability of PVC-C for your application, consult the chemical resistance tables or our technical department.

Weathering resistance

With the use of additives such as ultraviolet absorbers, PVC-C systems display excellent weathering resistance to the long-term effects of sunlight, wind and rain. Over time, grey PVC-C will lose some of its colour because of exposure to UV light and it will have slightly reduced impact strength. In extreme cases, the use of insulation or an application of UV absorbent coating such as AGRU Coat or the use of a water based paint will help to minimise the effects of solar radiation.

Electrical characteristics

PVC-C is non-conductive, therefore systems will remain free from electrolytic corrosion. Precautions should be taken to avoid static discharge should any part of a PVC-C piping system pass through an area where explosive gases may be present.

Physiological characteristics

PVC-C piping systems from IPS are free from lead, cadmium or other poisonous heavy metals. They are suitable for use in contact with cold potable water, and are WRAS listed for this application.

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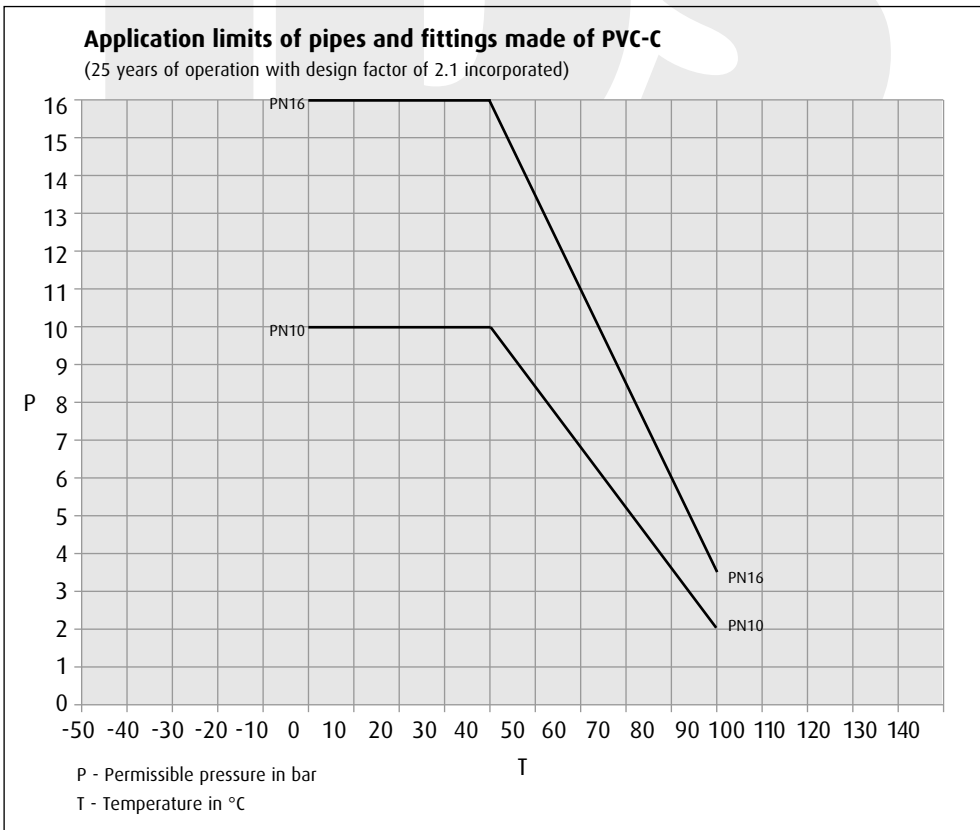
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Pressure ratings for PVC-C pipe, fittings and valves

For guidance, the following table gives an indication of the pressure ratings for PVC-C pipes, fittings and valves. The pressure rating of individual items should always be verified with our technical department before installation. The test requirements of ASTM standards for PVC-C pipes and fittings require minimum burst pressure ratings to be achieved. Consequently, in comparison to other materials, the pressure rating of PVC-C pipes and fittings can appear to be unusually high. Care should be taken to ensure that PVC-C systems are engineered in such a way that the pressure rating of the lowest rated component in the system is not exceeded.

Product	Size	Pressure Rating
PVC-C Sch 40 pipe	1/4" - 12"	53 bar - 9 bar
PVC-C Sch 80 pipe	1/4" - 16"	78 bar - 15 bar
PVC-C Fabricated Fittings	4" - 16"	10 bar
PVC-C Moulded Fittings	1/4" - 8"	16 bar
PVC-C Moulded Fittings	10" - 12"	10 bar
PVC-C Ball Valves	1/2" - 2"	16 bar
PVC-C Ball Valves	2 1/2" - 6"	10 bar
PVC-C Butterfly Valves	1 1/2" - 12"	10 bar
PVC-C Diaphragm Valves	1/2" - 8"	16 bar - 5 bar

Pressure ratings for thermoplastic pipes are determined in a water environment at a temperature of 20°C. As the temperature of the media (and/or the piping environment) increases, the thermoplastic material becomes more ductile, causing a decrease in the tensile strength. Because of this, the pressure rating of the system must be reduced as the temperature rises to allow for safe operation. The application limits for PVC-C piping materials are shown in the following diagram:



PVC-C pipe availability: inch sizes



		ASTM F441	
Class	Vent Pipe *	Sch 40	Sch 80
Colour	Grey	Grey	Grey
1/4" O.D. (mm)		13.7	13.7
Wall (mm)		2.2	3.0
Max WP (bar)		53.8	77.9
Weight/m (kg)		0.1	0.2
3/8" O.D. (mm)		17.1	17.1
Wall (mm)		2.3	3.2
Max WP (bar)		42.8	63.5
Weight/m (kg)		0.2	0.2
1/2" O.D. (mm)		21.3	21.3
Wall (mm)		2.8	3.7
Max WP (bar)		41.4	58.6
Weight/m (kg)		0.3	0.3
3/4" O.D. (mm)		26.7	26.7
Wall (mm)		2.9	3.9
Max WP (bar)		33.1	47.6
Weight/m (kg)		0.4	0.5
1" O.D. (mm)		33.4	33.4
Wall (mm)		3.4	4.5
Max WP (bar)		31.0	43.5
Weight/m (kg)		0.5	0.7
1 1/4" O.D. (mm)		42.2	42.2
Wall (mm)		3.6	4.9
Max WP (bar)		25.5	35.9
Weight/m (kg)		0.7	0.9
1 1/2" O.D. (mm)		48.3	48.3
Wall (mm)		3.7	5.1
Max WP (bar)		22.8	32.4
Weight/m (kg)		0.9	1.1
2" O.D. (mm)		60.3	60.3
Wall (mm)		3.9	5.5
Max WP (bar)		19.3	27.6
Weight/m (kg)		1.1	1.6
2 1/2" O.D. (mm)		73.0	73.0
Wall (mm)		5.2	7.0
Max WP (bar)		20.7	29.0
Weight/m (kg)		1.8	2.4
3" O.D. (mm)		88.9	88.9
Wall (mm)		5.5	7.6
Max WP (bar)		17.9	25.5
Weight/m (kg)		2.3	3.2
3 1/2" O.D. (mm)		101.6	101.6
Wall (mm)		5.7	8.1
Max WP (bar)		16.6	24.1
Weight/m (kg)		2.8	4.1
4" O.D. (mm)		114.3	114.3
Wall (mm)		6.0	8.6
Max WP (bar)		15.2	22.1
Weight/m (kg)		3.3	4.6
6" O.D. (mm)	168.3	168.3	168.3
Wall (mm)	4.7	7.1	11.0
Max WP (bar)	-	12.4	19.3
Weight/m (kg)	3.8	5.9	8.8
8" O.D. (mm)	219.1	219.1	219.1
Wall (mm)	4.7	8.2	12.7
Max WP (bar)	-	11.0	16.6
Weight/m (kg)	5.0	8.9	13.5
10" O.D. (mm)	273.0	273.0	273.0
Wall (mm)	4.7	9.3	15.1
Max WP (bar)	-	9.7	15.9
Weight/m (kg)	6.2	12.6	20.0
12" O.D. (mm)	323.9	323.9	323.9
Wall (mm)	4.7	10.3	17.5
Max WP (bar)	-	9.0	15.9
Weight/m (kg)	7.4	14.8	27.5
14" O.D. (mm)	355.6	355.6	355.6
Wall (mm)	4.7	11.1	19.1
Max WP (bar)	-	9.0	15.2
Weight/m (kg)	8.2	16.7	33.1
16" O.D. (mm)	406.4	406.4	406.4
Wall (mm)	4.7	12.7	21.4
Max WP (bar)	-	9.0	15.2
Weight/m (kg)	9.4	27.1	42.6
18" O.D. (mm)	457.2	457.2	457.2
Wall (mm)	4.7	14.3	23.8
Max WP (bar)	-	9.0	15.2
Weight/m (kg)	11.3	34.2	55.8
20" O.D. (mm)	508.0		
Wall (mm)	5.6		
Max WP (bar)	-		
Weight/m (kg)	13.6		
24" O.D. (mm)	609.6		
Wall (mm)	6.4		
Max WP (bar)	-		
Weight/m (kg)	18.7		

* Harvel Plastics PVC-C vent pipe is manufactured from raw material with a cell classification of 23437 as defined in ASTM D1784. This material meets the FMRC 4910 Clean Room Materials Flammability Test protocol.