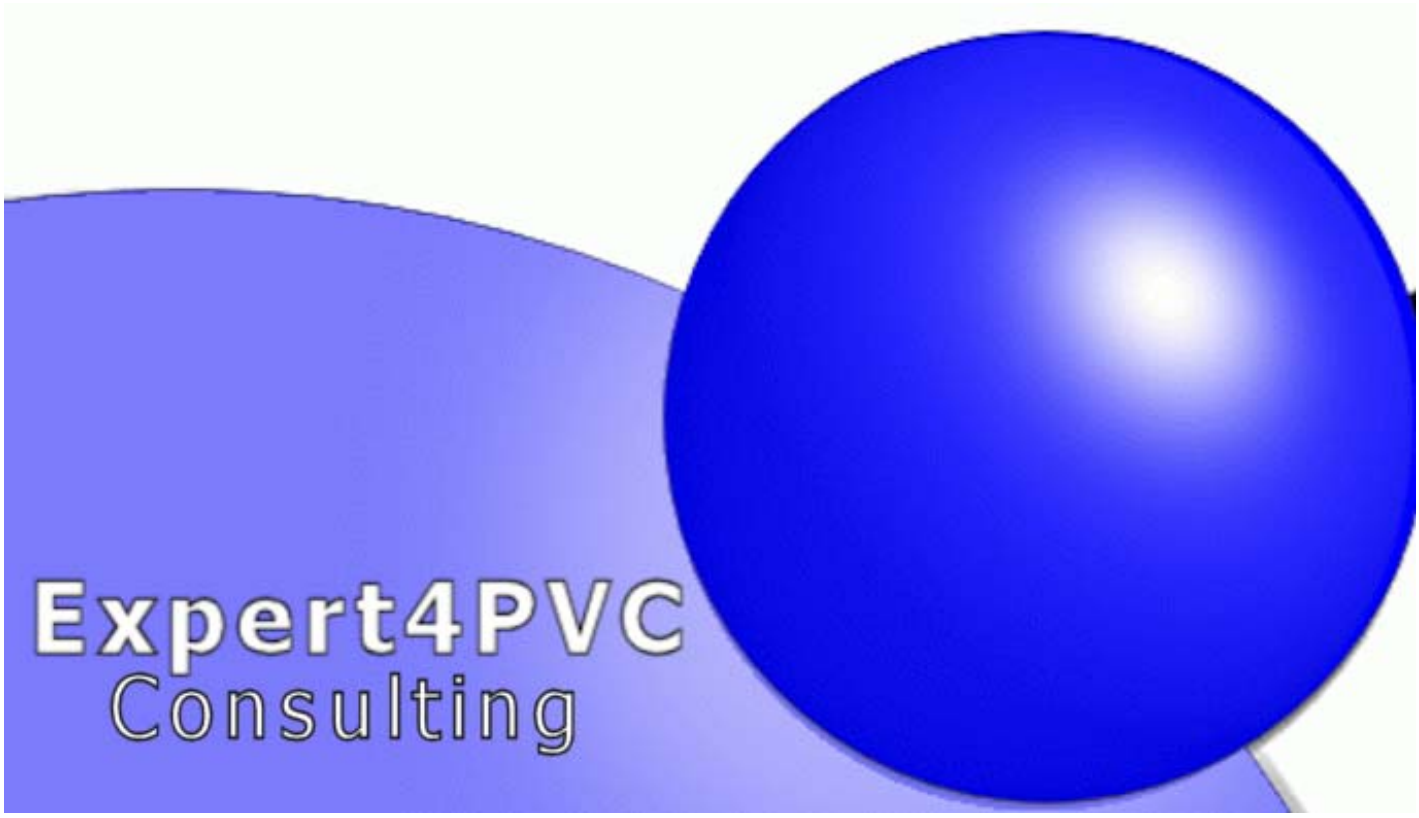
PVC & CPVC Pipe Properties



Plastic piping systems have been used in a multiplicity of applications the most common are irrigation and swimming pool, and to uses such as chemical transfer and industrial process systems. Although PVC pipe and fittings have been used in many of these systems for more than 50 years, there is still some confusion about them.

The most common materials used in the manufacturer of plastic pipe and fittings are PVC and CPVC. The key difference between them is that CPVC is more capable of transporting liquids up to 212°F. However, PVC is limited to convey a liquid at, or near 73°F. In both cases, the safe working pressure for them decreases with elevated temperatures. It should also be mentioned that the ambient or environmental temperatures would affect the pressure rating, as does the internal liquid. Because PVC pipe and fittings are designed for cold-water use, many will have a marking 73°F on them.

There are two different sizing systems for PVC and CPVC pipes used for the transmission of fluids. The Copper Pipe Size (CTS) pipe and fittings of CPVC are commonly made in sizes from ½-inch to 2-inch. These “cream” to “tan” colored items are capable of being used for hot water distribution within a building. The other is Iron Pipe Size (IPS) pipes. These are generally rigid and available is straight lengths with sizes from ½-inch and up, made of PVC or CPVC.

Piping made to the IPS diameters is available in an assortment of pressure ratings. Although the external diameter of Schedule 40, Schedule 80 and Class/PR pipe is identical, the wall thickness varies.

Class or Pressure rated pipe is generally available in five common variations. The table shows the ratio of the Outside Diameter to wall thickness, or Standard Dimension Ratio, of the common variants and the pressure rating.

Working Pressure	125-psi	160-psi	200-psi	250-psi	315-psi
Class	125	160	200	250	315
SDR	32.5	26	21	17	13.5

The important difference between Schedule 40 and Schedule 80 pipe is that all diameters of a Class, or SDR, have the same pressure rating.

In Schedule 40 and Schedule 80 pipe, each size has a unique pressure rating. Some of the most common sizes and corresponding pressure ratings are shown. Observe that the larger size pipes have a lower pressure rating than the smaller. To sum up, the pressure of a piping system will be limited by the larger pipe size.

Size	½	¾	1	1¼	1½	2	2½	4	6
Schedule 40	600-psi	480-psi	450-psi	370-psi	330-psi	280-psi	300-psi	220-psi	180-psi
Schedule 80	850-psi	690-psi	630-psi	520-psi	470-psi	400-psi	420-psi	320-psi	280-psi

If the pipe has a thread connection, or is a nipple, the pressure rating of that item is cut by 50%, because the threads cut into, or reduce its wall thickness. This leads to a Schedule 80 pipe or nipple, having a pressure rating lower than an equal size Schedule 40 pipe.

The external diameter is the same as the corresponding SDR/Class pipes. This allows either Schedule 40 or Schedule 80 fittings to be utilized for the corresponding size of pipes, no matter the Schedule, Class or SDR.

The material used in the two schedule fittings is the same except for color, and wall thickness. The Schedule 80 fittings have thicker walls and are usually Gray.

It is important to note that Schedule 40 and Schedule 80 fittings DO NOT have a pressure rating. Yet, it is mostly satisfactory to apply the pressure rating related to the same size pipe, in systems without significant pressure fluctuations, surges or water hammer. The service life of fittings is drastically shortened if the peak pressure, surge or water hammer exceeds the pressure rating of the equivalent pipe. In systems with multiple valves and fluctuations, such as irrigation, it is recommended that the fittings will reduce the system pressure by 50 percent. This is because their physical bodies, such as elbows, tees and so forth, are not a pure cylinder shape as is pipe.

Some categories of plastic fittings do have pressure ratings! Flanges, unions, valves and swing joints are not considered as Schedule 40 nor Schedule 80, and have a pressure rating. It must be noted the pressure rating criteria for this group of fittings is completely different from what is used for the Schedule 40 and Schedule 80 fittings. Each is specified by their manufacturer with a pressure rating, generally

150-psi. Incorporating any of these items must affect the pressure rating of the entire piping system.

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