

PIPE TYPES, PIPE SIZE & FRICTION LOSS

PIPE TYPES

Low Density (LDPE)

Common uses for LDPE are domestic irrigation and pipes are joined with barbed connectors and plastic clamps. The pressure rating on LDPE is lower than Rural and Metric Poly. It is generally rated at a maximum working pressure of 300kPa (43.5 PSI) at 35°C. At higher temperatures the working pressure reduces. Common sizes for Low Density pipe are 13, 19 and 25mm. Low density pipe does not normally have a stripe.

Rural Poly Pipe (Green Line PN8)

Rural Poly PN8 is an old standard which remains popular with farmers and irrigators for irrigation supply. It is often referred to as B Class poly and generally has a green stripe. The maximum Pressure Rating on Rural Poly PN8 is 800kPa (115psi). Rural pipe sizes are ¾", 1", 1 ¼", 1 ½" and 2". It is recognised by its green stripe.

Metric Poly Pipe Range (Blue Stripe PN8 – PN16)

There are several classes within the Metric pipe range each with a different pressure rating and wall thickness. It is often required for domestic plumbing with a mains supply. Metric pipe ranges from 16mm up to 110mm and beyond (16, 25, 32, 40, 50, 63, 75, 90 and 110mm) and have a blue stripe. They typically have pressure ratings of 800kPa up to 1600kPa (PN8, PN10, PN12.5, PN16).

PVC Pressure Pipe Range (PN4.5 – PN20)

There are several classes within the PVC Pressure pipe range each with a different pressure rating and wall thickness. It is often required for domestic plumbing with a mains supply. PVC Pressure Pipe ranges from 15mm up to 150mm. Pressure ratings of 450kPa up to 2000kPa (PN4.5, PN6, PN9, PN12, PN12.5, PN15, PN16, PN18, PN20) and are based on a temperature of 20°C. Most common pressure rating is PN12 for domestic applications. Higher ratings are used in commercial applications. PVC Pressure Pipe is White and Connections are made using PVC Primer & Solvent.

DWV Pipe (Drain Waste Vent)

DWV is similar to PVC Pressure pipe but is not designed for pressure. DWV pipe and fittings system is used for non-pressure drain, waste, and vent applications which use gravity to create the flow of water and waste through the pipe line in above ground and below ground applications. Sizes range from 40mm to 375mm. DWV is light grey and connections are made using PVC Primer & Solvent.

Copper & Stainless Steel Tube

Copper Pipe is used extensively in domestic plumbing applications. Stainless Steel is more expensive and is used in commercial applications. Copper is supplied in a range of types based on wall thickness – Types A,B,C & D. The most common type of Copper Tube is Type B Hard Drawn Copper Tube which is supplied in straight lengths or Annealed Copper which is in coils. The reason copper is used for plumbing is because it has a tensile strength of 2200kPa on annealed tube and up to 3800kPa on hard drawn tube, making it up to 10 times stronger than plastic piping materials. Also copper is not affected by hot water like PVC. In addition copper does not harden or soften with age and is UV resistant meaning it's also suitable for use in direct sunlight. Traditionally Copper Tube has to be soldered together but in recent years it is more commonly joined using special fittings and a press tool.

Other Pipe Types

There are many other pipe types including, Galvanised Pipe, Steel Pipe, Aluminium Pipe & Hoses in a wide range of materials including rubber and PVC and Layflat Hoses.

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PIPE SIZES

Pipe Sizes can be confusing. The nominal size has little resemblance to the actual measured size.

Low Density and Rural Poly Pipe

are measured by their inside diameter. These pipes have connectors which fit on the inside of the pipe. Which helps support it when it is joined. For example, 1" Rural poly pipe has an OD of 28.9mm and an ID of 25.3mm.

Metric Poly Pipe

is measured by the outside diameter. The external diameter remains the same and these pipes have connectors which fit on the outside of the pipe. For example 25mm PN12.5 Metric Poly Pipe has an OD of 25mm and an ID of 21mm and PN25 has an OD of 25mm and an ID of 18mm.

PVC Pressure Pipe

is measured based by the nominal bore or approximate internal diameter. The external diameter remains the same as the connections all fit over the outsides of the pipe. The internal diameter varies based on the pressure rating. Eg 50mm is always 60.4mm Outside Diameter. PN 12 has an internal diameter of 53.7mm and PN18 has an internal diameter of 50.5mm because the wall thickness is greater to take the higher pressure.

Copper and Stainless Steel Tube

is measured by the outside diameter. The external diameter remains the same and these pipes have connectors which fit on the outside of the pipe.

Hoses

are measured by their internal diameter.

FRICTION LOSS

Friction is the resistance that a pipe imparts on water as it moves through it.

It is a bit like putting your hand out the window of your car. When you are stopped there is no resistance, but the faster you go, the more resistance there is. It is also often compared to voltage drop in an electrical cable.

In essence the faster water moves through the pipe, the more resistance there is. The resistance is called pressure loss or pipe friction. For example, if we are moving 100L per minute through both a 2" pipe and a ¾" pipe, the water will be moving faster in the ¾" pipe – and hence there will be more pressure loss (friction) in the ¾" pipe.

Additionally, it makes sense that water flows quicker through a 1m long hose than a 100m long hose. Friction works on a per meter basis. So, the smaller the pipe and the longer the pipe, the more friction (and thus less flow) will result.

The following friction loss tables will give you the friction loss based on 100 metres.

Pipework Size is Critical

Pipework selection is critical to ensure good flow and to ensure that your pump is not restricted. Compare 60L/min through 20mm Poly Pipe (128.97m Head Loss per 100m) versus 32mm Poly Pipe (12.78m Head Loss per 100m). This is 10 x Less.

Velocity for Sewage and Wastewater

While size matters when pumping all liquids, when pumping raw sewage, special attention also needs to be given to the velocity. This is how fast the liquid is traveling in the pipe. The larger the pipe the less friction and hence the slower it is moving **in terms of metres per second**. The issue if sewage is pumped too slowly is that the solids will drop out of suspension and block the pipework over time. A rule of thumb is 1 metre/second. This value is shown on the friction loss table at any given flow rate.