

Plumbing Pipes

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ONCE AGAIN, THE WORD INVITES you to travel into the dark realm of subjects that are sometimes misunderstood by home inspectors. The Word hopes you will find this trip informative and maybe a little entertaining.

Our subject this month is **plumbing pipes**. The Word finds this topic interesting because the plumbing pipe family is like most families. Some members are well-adjusted, some are a little quirky, and some can get cranky and experience physical problems as they age. It's important that we know the personalities of plumbing pipes so we can alert our clients to pipes that may need an intervention.

ABS and PVC Pipe

ABS (acrylonitrile butadiene styrene) is a well-adjusted pipe that has been around since the late 1950s. Some ABS pipes manufactured between about 1985 and 1990 tend to misbehave and split along the seams, but other than that they perform well. Problem manufacturers were Apache, Centaur, Gable, Phoenix, Polaris, Spartan. You might want to snap a picture of the pipe label if you happen across ABS pipes in a house built during this period, then come back and see if it was made by one of these manufacturers. This misbehaving pipe is uncommon in most areas.

PVC (polyvinyl chloride) is a well-adjusted pipe. It has been around about as long as



Most solvent cement connections between ABS and PVC are wrong.

ABS. It has no significant disorders and performs well when installed properly.

ABS and PVC are used as interior DWV (drain, waste, and vent) pipe and as the building sewer pipe. PVC is used as the water service pipe but not as water distribution pipe (it's not listed for hot water). ABS may be used as water service pipe, but this is very uncommon.

ABS is almost always black, but gray is sometimes seen. PVC is usually white. PVC sewer pipe is sometimes green. Use seems to be regional with ABS more popular out west and PVC more popular back east. Either can be found anywhere, however. The service life of ABS and PVC is estimated to be over 50 years.

Proper support is important for all pipes. Lack of support places strain on the pipe and fittings. This strain can cause cracks and leaks. Support is especially important for DWV pipes so they will maintain fall toward the discharge point.

ABS and PVC pipe should be supported horizontally every 4 feet, and vertically every 10 feet. A mid-story guide should be installed for pipes 2 inches diameter and smaller. A mid-story guide is usually a strap or some other method to keep the pipe from moving laterally.

Connections between ABS pipes and between PVC pipes should be made using solvent cement and a fitting. Solvent

cement actually melts the pipe a little and chemically welds the pipe to the fitting. A primer is not required for ABS pipes. A primer (often purple) is required for PVC pipes; however, the 2015 IRC allows solvent cement without primer on 4 inch and smaller DWV pipes. Threaded connections using threaded fittings are fine too if the threads don't impede the flow.

A banded elastomeric coupling is often used to connect ABS to ABS and PVC to PVC when the pipe is repaired or when fittings are added. Banded couplings are not allowed when installed above ground, unless approved. The coupling could work loose, it could move, or it could degrade and leak. Besides, there's no good excuse for failing to make a proper connection between ABS pipes using an ABS fitting or between PVC pipes using a PVC fitting. That said, a banded coupling usually works fine, so it's a judgment call whether to report one as a defect.

Connection between ABS and PVC can get interesting. The approved method of connecting ABS to PVC is with a transition fitting. These fittings are half ABS and half PVC. The ABS pipe should be solvent cemented using ABS cement to the ABS half of the fitting, and the PVC pipe should be cemented using PVC primer and cement to the PVC half of the fitting; these fittings are very uncommon. Banded couplings are also not approved in this situation for the reasons stated above; however, as stated above, it's a judgment call whether to report one as a defect.

A product called transition cement is available to connect ABS to PVC using either fitting. The product seems to work, but it is not approved, so this is an incorrect connection as well.

Connection between ABS and PVC pipe and cast iron pipe is pretty easy. Either a caulked joint or an elastomeric compression gasket is good if the connection is to the hub (the enlarged part of the pipe or a fitting). We'll define a caulked joint in the cast iron pipe section. A banded coupling

is good for connecting ABS pipe, PVC pipe, or galvanized steel pipe to a cast iron pipe spigot (the straight end of the pipe). A banded coupling is also good for connecting ABS and PVC pipe to galvanized steel DWV pipe.

PVC electrical conduit is also available. Amateur plumbers see PVC and Schedule 40 and assume conduit is the same thing as plumbing pipe. It isn't. PVC conduit may not be used as plumbing pipe and PVC plumbing pipe may not be used as electrical conduit.

Cast Iron Pipe

Cast iron pipe is the grandfather of pipes. Its first recorded use was centuries ago and it was the go-to DWV pipe from the 1850s to the 1950s. It is a well-adjusted pipe during its service life, but like some seniors, it can get a little cranky in its later years and can experience physical problems.

Cast iron pipe's expected service life is around 50 years, although much older pipes are still functioning well. Cast iron pipe's weakness is rust. It rusts from the inside, so evidence of impending breakage is usually not visible. The rust also makes the pipe's interior surface rough so it is more prone to blockage as it ages. An end of life comment may be prudent when inspecting cast iron pipe. A recommendation to run a camera through a cast iron sewer pipe may also be prudent.

Cast iron pipe is used as interior DWV pipe and as building sewer pipe. It is almost always black. Cast iron pipe should be supported horizontally every 10 feet when 10 foot sections are used, every 5 feet when a fitting is used, and vertically every 15 feet. A mid-story guide is not necessary nor is protection against puncture when the pipe is installed in concealed space.

Connecting cast iron pipes to cast iron pipes is by a caulked joint or by a compression gasket when a hub and spigot are available. A caulked joint is very old school and involves stuffing oakum (tar-

soaked hemp) in the joint then pouring molten lead in the remainder of the joint. The Word wonders how many plumbers can still make this joint. The new joint is an elastomeric compression gasket. The connection between cast iron pipe and galvanized steel pipe may use a threaded joint in addition to the caulked joint and the compression gasket joint.

Copper Tubing

Copper tubing is a well-adjusted middle-aged member of the pipe family. It has been around since the 1930s and was the go-to material for water distribution from the 1960s through the end of the last century.

Copper tubing is available in two types, which are really just different versions of the same material. Rigid (hard-drawn) tubing is most commonly seen as water distribution tubing. Flexible annealed tubing is most commonly seen as gas distribution tubing and as water distribution tubing for low volume applications such as dishwasher and ice maker supply tubes. Copper pipe, by the way, is a different and thicker material used for DWV.

Copper tubing is available in three wall thicknesses (as commonly used in houses). Type K is the thickest and is marked with green. Type L is in the middle and is marked with blue. Type M is the thinnest and is marked with red. Types K and L may be installed anywhere in or under the house. Type M may not be embedded in or installed below concrete.

Copper tubing should be supported horizontally every 6 feet and every 10 feet vertically. A mid-story guide is not required.



Fitting copper to PVC sharkbite: Push connect Fitting.

There are many ways to connect copper tubing. Soldered connections are one of the most common as are threaded connections. Flared connections are common, almost always using annealed copper. Compression connections are also common, usually using annealed copper. Push connect fittings may also be used. Press connect connections are less common and are suitable only for hard drawn copper. These connections use proprietary fittings and a proprietary crimping tool.

Copper tubing may be connected to CPVC and PEX using an adapter fitting or a push connect fitting. Copper tubing is sometimes seen connected to polybutylene tubing using a push connect fitting. This use may not conform to the fitting manufacturer's instructions. Copper tubing should be connected to galvanized steel pipe using a dielectric fitting.

Copper tubing is usually well-adjusted with an expected service life of 50+ years if installed and treated well. It is known to act out when mistreated. Aggressive water (high or low PH) in places like Florida and from some wells can degrade copper tubing causing pinhole leaks.

CPVC

CPVC (chlorinated polyvinyl chloride) is well-adjusted pipe that has been around since the 1960s. It performs well unless you abuse it, like subjecting it to freezing or using too much solvent cement on the fittings.

CPVC is used mostly as interior water distribution pipe and rarely as water service pipe. It is usually a cream color and sometimes has a yellow stripe. CPVC's service life is estimated to be over 50 years.

CPVC should be supported horizontally every 3 feet and vertically every 10 feet. A mid-story guide should be installed for pipes 2 inches diameter and smaller.

Connecting CPVC pipes to CPVC pipes should be made using solvent cement and

a fitting. A primer is usually not required. A threaded fitting is fine too. Connection to other water supply pipes such as copper tubing and PEX (cross-linked polyethylene) can use a push connect fitting such as Sharkbite® or an adapter fitting.

Galvanized Steel

Galvanized steel pipe shares grandfather status with cast iron pipe. It was the go-to water distribution pipe from the 1850s to the 1950s and was often used as interior DWV pipe during that era. It is a well-adjusted pipe during its service life, but like some seniors it can get a little cranky in its later years, and can experience physical problems similar to those suffered by cast iron pipe.

Galvanized steel pipe's expected service life is around 50 years. Its weakness is rust. It rusts from the inside, so evidence of impending breakage is usually not visible. The rust and debris from the water tend to block the pipe as it ages so reduced functional flow is common for this water distribution pipe. The rusted interior is rough and blockage of this drainage pipes is also common. An end of life comment may be prudent when inspecting galvanized steel pipe.

Galvanized steel pipe is usually a dull gray. It should be supported horizontally every 10 feet and vertically every 15 feet. A mid-story guide is not necessary nor is protection against puncture when the pipe is installed in concealed space.

Connection between galvanized steel pipes is made using threaded fittings. Connection to other water supply pipes such as CPVC and PEX can use an adapter fitting. Connection to copper tubing requires a dielectric or brass fitting to avoid electrolysis and the resulting corrosion. Connection to other DWV pipes is described in those pipe sections.

PEX Tubing

PEX (cross-linked polyethylene) tubing is the quirky teenager of pipes. It has been around in North America since the 1980s

and its use has expanded rapidly in new construction since the 2000s. It's very common in many markets and uncommon in others.

PEX is used as interior water distribution pipe and sometimes as water service pipe. Older versions are milky white and newer versions are color coded, red for hot and blue for cold. Milky white is still used. Any color can carry hot or cold water. PEX's service life is estimated to be over 50 years.

PEX should be supported horizontally every 32 inches and vertically every 10 feet. A mid-story guide should be installed for pipes 2 inches diameter and smaller. Support near manifolds and fittings is especially important because this is where PEX is most likely to leak if the connections are subject to stress.

Connecting PEX tubing to PEX tubing should be made using fittings supplied by the PEX manufacturer and that are sealed using compression or crimp rings. Fittings are usually plastic, brass, or copper. The rings are usually plastic, brass, bronze, or stainless steel. Connection to other water supply pipes such as copper tubing and CPVC can use a push connect fitting such as Sharkbite® or an adapter fitting may be used.

Some PEX is starting to act out. The most common problem is dezincification of yellow brass fittings produced from about 1996 to about 2010. Zinc is leached from the fitting producing a white powder at the fittings and sometimes blocking the fittings reducing functional flow. Lawsuits have been filed and some have been settled. The most famous of these lawsuits is the Zurn QestPEX suit. Look for yellow brass fittings stamped with Q or QPEX.

Other defects have been alleged, but these defects have yet to be well substantiated. The PEX drama looks as though it has a way to go before it plays out.

Polybutylene (PB) Tubing

PB (polybutylene) tubing has a well-known

history of bad behavior. It was installed in North America from the late 1970s to the mid-1990s. It is common in some markets like the South, Southeast, and Pacific Northwest and is uncommon in other markets. It was, however, used in other countries too.

PB was used as interior water distribution pipe and as water service pipe. It is usually gray/blue color and it was also produced in blue and black. PB's service life is uncertain.

PB should be supported horizontally every 32 inches and vertically every 4 feet. Support near fittings is especially important because this is where PB is most likely to leak if the connections are subject to stress.

Connecting PB tubing to PB tubing should be made using fittings that are sealed using crimp rings. Fittings from the 1980s were often plastic with aluminum rings. Fittings from the 1990s were often brass with copper rings. Connection to other water supply pipes such as copper tubing and CPVC an adapter fitting. Connection of PB using a push connect fitting may not conform to the fitting manufacturer's instructions.

PB failures are more common with the plastic/aluminum installations of the 1980s and are less common with the brass/copper installations of the 1990s. Failure indications include corrosion, mineral deposits, and active leaks at the fittings.

The Bottom Line

Like most families, the plumbing pipe family has some well-adjusted members and some black sheep. The Word hopes that you now have a better feel for how to identify which is which.

Memo to Neptune: The Word does not reside on Mt. Olympus (just at its base) and welcomes other viewpoints. Send your lightning bolts or emails to Bruce@DreamHomeConsultants.com. The thoughts contained herein are those of The Word; they are not ASHI standards or policies. ■