PROTECTING PLASTIC PIPES

Best practices for shielding plastic piping from UV and chemicals

BY LANCE MACNEVIN

Whether new or old to the construction industry, most professionals likely have the impression that plastic materials make the perfect piping systems for plumbing, fire protection and hydronic applications. Inherent advantages of plastic materials include resistance to corrosion, ease of joining without flame, lightweight, better safety when handling and lower material cost, not to mention environmental advantages.

But did you know some types of plastic materials have sensitivities to certain exposures?

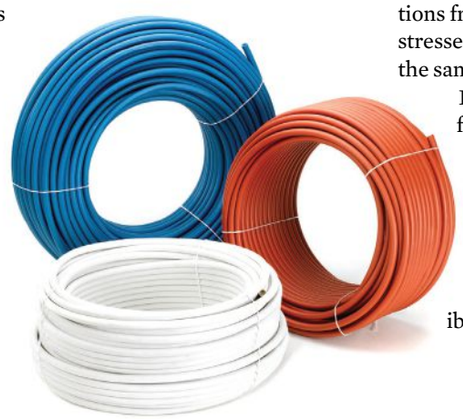
For example, I've often described the potential effect of sunlight on PEX tubing as the effect of kryptonite to Superman, if the PEX material is not protected against ultraviolet exposure from sunlight. This is because the materials known as polyolefins, of which PEX is one type, are sensitive to sunlight and can degrade unless protected.

To solve this problem, most HDPE water pipe contains carbon black, which provides decades of UV-blocking protection, and most PEX products contain UV inhibitors and/or UV-blocking colorants or coatings to protect them. In fact, PEX tubing is tested for UV resistance according to an official ASTM test method, which all manufacturers follow.

PEX manufacturers and industry groups such as the Plastic Pipe Institute endeavor to inform users of PEX systems about the need to be aware of UV resistance, which can be different for each product. Manufacturers do this through labeling and literature. PPI's Technical Note TN-32 *UV Labeling Guidelines for PEX Tubing and Pipe* provides guidance to manufacturers and users about how to list and interpret UV limits.

For chlorinated polyvinyl chloride piping materials, sunlight is not much of a concern. Instead, users of CPVC pressure pipes for applications like plumbing, fire protection and hydronics, need to be aware of the potential chemical effects that can occur when other construction materials come in contact with CPVC pipe or fittings. The effects of such contact can be slow and gradual, but can lead to eventual failure of the piping materials over time.

To a mechanical engineer like me, chemistry is a bit like black art. Fortunately, the piping world is staffed with chemical engineers with expertise in predicting, testing and analyzing the potential for compatibility issues. For example, there is a compatibility issue that can apply to CPVC pipe or fittings touching flexible plasticized insulation, such as on some electrical wire.



From top: Those using CPVC pipes need to be aware of the potential chemical effects that can occur when other construction materials come in contact with CPVC pipe or fittings. The effects of contact can be slow and gradual, but can lead to eventual failure of the piping materials over time. > Materials known as polyolefins, of which PEX is one type, are sensitive to sunlight and can degrade unless protected.

Lubrizol, a supplier of CPVC compounds to pipe and fitting producers in North America, states on its website, "CPVC is not compatible with some rubber and flexible plastic materials containing certain types of plasticizers ... Examples of materials which may contain incompatible plasticizers include, but are not limited to, caulks, rubbery hanger padding, vinyl dip coating on metal parts, rubber gaskets, electrical wire jacketing, electrical tape, flexible hoses or tubes, etc." If such contact occurs, CPVC pipes can soften or crack over time.

According to Michelle Knight, senior scientist at Lubrizol's headquarters, "The identification of a chemical as 'incompatible' with a plastic is often misunderstood as a guarantee of the eventual failure of the plastic if used in contact with the chemical. Actually," she continued, "chemicals range in effect from 'always causes failure in every circumstance' to 'zero effect in any circumstance.'"

Falling in between these two extremes are most chemicals that might contact the pipe in a typical building installation. In this range, chemicals are capable of having some weakening effect on the plastic, but often not enough to cause failure under most conditions. There must be additional contributions from high-mechanical stresses acting on the part at the same time.

Knight says there are two factors that need to be addressed to minimize the potential for chemically induced failure:

> First, contact with potentially incompatible products should be avoided. This can be done by selecting products known to be compatible with CPVC, or by isolating the pipe from questionable products.

> Second, minimize risk from unanticipated chemical contact by reducing mechanical stress.

"Seldom can one completely predict all the mechanical variables and all the different kinds of chemical substances that will end up inside or on the exterior of a piping system," explained Knight. "Therefore, it's prudent for the piping system designer and installer to do what they can to control the various factors that can contribute to environmental stress cracking."

Knight added it is crucial for the manufacturer's installation instructions to be consulted regarding the best way to design and install the piping system.

These guidelines, she continued, contain recommendations for proper connection and joining techniques, appropriate piping hangers, placement of supports, along with thermal expansion compensation, etc. Incorporating these recommendations into the design and construction of the piping system can help minimize extra mechanical stress.

Piping contractors need to be aware of these issues and take steps to protect CPVC pipes from contact with potentially incompatible products on the jobsite. To help installers understand potential compatibility issues and how to avoid them, visit lubrizol.com or plasticpipe.org.

Lance MacNevin, P.Eng., is director of engineering for Plastic Pipe Institute's Building & Construction Division. He also serves on committees within ASPE, ASTM, AWWA, CSA, IAPMO, IGSHPA, NSF, RPA and other industry organizations.