PVC PIPE & FITTINGS: An Excellent Solution To Your Commercial Needs
For more than five decades, PVC pipe and fittings have been increasingly installed in applications that include water delivery, drain, waste and vent, building sewers, storm and rainwater disposal and industrial process piping. PVC is a hard-working alternative to metal piping systems -- affordable, versatile, easy to install, and durable. It also meets many of the requirements of today’s environmentally conscious public. If you are not installing PVC in your commercial jobs, you are missing the opportunity to add value to new and retrofit installations with Polyvinyl Chloride (PVC) pipe and fittings.

Why Install Anything Else?

History and use of PVC

Polyvinyl chloride was discovered in the mid-nineteenth century. Scientists observing the newly created chemical gas, vinyl chloride, discovered that when the gas was exposed to sunlight, it underwent a chemical reaction (now recognized as polymerization) resulting in an off-white solid material. But, the solid material was so difficult to work with that it was cast aside in favor of other materials. Years later in the 1920s, scientist Waldo Semon was hired by BFGoodrich to develop a synthetic rubber to replace increasingly costly natural rubber. His experiments eventually produced plasticized polyvinyl chloride. Initially, product developers used PVC in a variety of ways – in shoe heels, golf balls, and raincoats, to name just a few. Its application increased significantly during World War II as PVC turned out to be an excellent replacement for rubber insulation on electrical wiring and was used extensively on U.S. military ships. After 1945, its peace-time usage grew dramatically as scientists realized its versatility and cost effectiveness.

Today one of the largest uses of PVC is in pipe and fittings. In addition to residential and commercial drain, waste and vent, water service, and roof and floor drain installations, PVC is used in numerous other applications including transfer piping, food processing, chemical processing, and water treatment to name just a few. In short, PVC piping is as versatile as polyvinyl chloride itself.
Mechanical contractors who use PVC pipe and fittings report that low cost and ease of installation are among the top reasons for choosing it. PVC is lighter and easier to handle, requires less time to install, and provides years of dependable service. Many contractors have been installing PVC piping for 40 years or more, and they expect – as other piping costs increase – to install even more of it in the future. Those who install it say PVC has a great “track record.” It stands up to the rigors of daily use without repair or replacement.

PVC pipe and fittings are ideal not only for new construction, but also for retrofit installations and repairs. In fact in some cases, PVC’s affordability allows developers and contractors to retrofit buildings for modern use in installations where metal piping would be cost prohibitive.

According to the Vinyl Institute, today PVC piping surpasses all other piping materials in North America, accounting for 70-percent of the water distribution market and 75-percent of the sanitary sewer market.

**PVC Pipe and Fittings Manufacturing and Distribution**

PVC pipe and fittings are manufactured using standard extrusion and injection molding processes. There is very little waste in the manufacturing processes, and any product that does not meet dimensional specification is ground up and reused. Since PVC is a thermoplastic, PVC piping can be reformed and reworked into useful product. It can also be recycled after the end of its application life.

PVC pipe and fittings are sold in the U.S. and Canada by distributors and retailers. Pipe is available in 10- and 20-foot lengths in ½- to 48 to 60-inch diameters, in sizes conforming to IPS Schedules 40, 80 and 120 as well as several Standard Dimension Ratio (SDR) thicknesses. It conforms to ASTM and other standards for pressure and non-pressure applications. See the detailed specifications at the end of this brochure for more information.
Piping is an essential component in every building. Durable, dependable piping installations offer good service and save on costly repairs and replacements over the life of the system. PVC is the material of choice in drain, waste and vent installations as well as in cold water delivery because it offers a combination of characteristics unavailable with other materials, including easy installation and durability. PVC is also used extensively in industrial and process piping for many of the same reasons it’s used to deliver and dispose of water – it’s affordable, efficient, and durable.

- In DWV installations, PVC protects the environment from bacteria, waste and chemical contamination. Installed in roof and floor drains, PVC is an excellent choice for physically removing water and other liquids. This includes drains used to disperse rain water or melted snow. Because PVC is unaffected by most chemicals, it is also useful for installation in floor drains used to collect and disperse other chemicals. Specific chemical resistance depends on a given PVC product’s chemical composition. Always consult manufacturers for guidance regarding chemical resistance.

- In water service installations, PVC protects potable water from aggressive chemicals and/or bacteria outside the pipe and from chemical contamination within the pipe, making it the ideal choice for water service delivery systems in all construction. Because PVC does not corrode or accumulate mineral deposits, it offers a consistent flow rate over the life of the installation. Connections between PVC and other piping materials – as necessary for water delivery – are readily accomplished by transition fittings.

- Beyond traditional plumbing installations, PVC’s chemical resistance, light weight, easy installation and long service life have made it the backbone of a variety of water and chemical treatment systems. Unlike metal piping, PVC does not interact with chemicals or bacteria passing within or around it. Some water treatment systems operate with aerators, using PVC piping to carry oxygen to naturally remove harmful bacteria. In other process piping situations, PVC piping protects processing of food.

How Durable is PVC?

PVC resists corrosion, scale buildup and pitting. It is unaffected by hard or soft water or aggressive ground water. It does not react with the chemical makeup of domestic and industrial waste. However, PVC piping used to transport specific chemicals or chemical waste should be tested for those installations.

This durability eliminates the cost of repair, replacement and cleanup from leakage. In addition, PVC is often the material of choice for replacing less durable piping.

Because PVC maintains its smooth interior surface over the life of the piping, it maintains efficient flow in pumping situations and does not require cleaning.
The Benefits of PVC

What About Water Quality?

For potable water applications, PVC pipe has been successfully tested against the NSF/ANSI 61 standard and other health effects standards for more than 40 years. While the safety qualifications of its metal counterparts have been consistently challenged, PVC has continued to deliver water as pure at the end of the pipe as when it enters the system. PVC is a thermoplastic material made from compounds that commonly meet Class 12454 per ASTM D 1784 or Class 11432 per ASTM D 4396 (for cellular core pipe).

Code Acceptance

PVC pipe is permitted to be used in any water service system, DWV, or sewer, without limitation, in the following:

• International Plumbing Code (International Code Council),
• Uniform Plumbing Code (International Association of Plumbing and Mechanical Officials),
• National Standard Plumbing Code (Plumbing-Heating-Cooling Contractors Association) and
• PVC is also accepted in most local building and plumbing codes as well as specifications in most municipalities.

Installation Of PVC Saves Time, Money, Labor

• Installing PVC pipe and fittings requires solvent cements developed specifically for this purpose. These cements must conform to ASTM D 2564. When primer is also required, it must conform to ASTM F 656. PVC piping eliminates the time-consuming welding or soldering processes required for metal pipe and fittings and their related safety concerns.
• PVC pipe is easily cut with a wheeled cutter, miter saw or power saw designed to make square cuts. Cut pipe ends should be deburred, chamfered and wiped clean before dry fitting. When joining with solvent cement, always follow manufacturer’s instructions; including using primer as required.
• PVC pipe can also be joined using mechanical fittings where permitted.
• Horizontal/Vertical above ground installations are easily installed: Follow manufacturers installation recommendations and local codes for proper support spacing at various temperatures.
Meeting The Greenbuilding Challenge

PVC meets the challenges of today’s greenbuilding specifications. Greenbuilding refers to the techniques and systems for construction materials and practices which limit the impact on natural resources in the manufacturing of raw materials, the construction and the long-term maintenance and life cycle of a commercial or residential building.

PVC pipe and fittings offer a number of sustainable qualities. These include:

- Properly installed PVC pipe and fittings offer an especially long service life. Many systems installed fifty or more years ago continue to provide dependable, maintenance-free service. Long after copper and steel pipe have suffered irreparable damage due to corrosive water and other fluids passing through them or from the aggressive soil conditions in which they have been installed, PVC systems continue to function without maintenance.
- PVC protects potable water and does not allow outside contaminants to leach into the pipes. Because PVC is an inert substance, it does not react with chemicals around it. In fact, it’s often the material of choice for chemical processing. Since PVC is so dependable, it protects the surrounding environment – soil, sand, etc., -- from sewage and other undesirable materials.
- Solvent cements and their use have been carefully studied. As a result, guidance for their use is documented in ASTM D 2564 and ASTM F 656, D 2855 and F 402. Concerns regarding the use of solvent cement are easily addressed by using appropriate ventilation and protection against skin and eye contact. In addition, low VOC cements meeting SCAQMD Rule 1168 are available.
- PVC’s long life cycle means that most installed PVC remains in service, delivering water and discarding waste, so the issue of handling discarded PVC materials is somewhat minimized. However, even discarded PVC can be recycled. According to the Vinyl Institute, vinyl may be automatically sorted from other recyclables. The industry has also developed a specific standard which incorporates recycled content. ASTM F1760 includes a middle layer of post consumer or internally recycled PVC.
- No waste in the manufacturing process. Leftover materials are simply reground and reused in pipe and fitting production.

PVC Pipe is an Easy to Recycle Thermoplastic Material

Resin and Pulverized Pipes are Blended to Extrude New PVC Pipes

Pipes In Use 20-100+ years

Collect, Regrind and Pulverize PVC Pipe
PVC pipe, fittings, cements, and primers for the following applications are contained in the applicable Plumbing Code and/or Municipal Specifications.

- Drain, Waste and Vent Piping (DWV)
- Water Service
- Water Distribution
- Sewer
- Industrial

PVC related products should conform to one or more of the standards listed below.

**PVC Product Standards**

Product standards set out the minimum requirements and/or criteria products must meet for specific uses or applications. Product standards, as used in the plumbing industry, are usually voluntary, national-consensus standards. The following table lists the ASTM Standards for PVC piping systems, the appropriate applications, sizes, design pressure and dimensioning systems.

<table>
<thead>
<tr>
<th>STANDARD NAME</th>
<th>Standard Name</th>
<th>Application</th>
<th>Size</th>
<th>Design Pressure (1) Rating at 73°F, PSI</th>
<th>Basis for Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>PVC DWV Pipe &amp; Fittings</td>
<td>D2665 CSA B181.2</td>
<td>DWV</td>
<td>1 1/4 - 12</td>
<td>Not rated</td>
<td>IPS Sch 40</td>
</tr>
<tr>
<td>PVC Pipe with Foam Core</td>
<td>F891</td>
<td>DWV</td>
<td>1 1/4 - 12</td>
<td>Not rated</td>
<td>IPS Sch 40</td>
</tr>
<tr>
<td>Coextruded PVC Non-Pressure Pipe having Reprocessed Recycled Content</td>
<td>F1760</td>
<td>Sewer</td>
<td>1/2 - 12</td>
<td>Not rated</td>
<td>Sewer Drain IPS Sch 40</td>
</tr>
<tr>
<td>OD PVC DWV Pipe &amp; Fittings 3.25</td>
<td>D2949</td>
<td>DWV</td>
<td>3.25 OD</td>
<td>Not rated</td>
<td>In the standard</td>
</tr>
<tr>
<td>PVC Pipe Sch 40, 80, 120</td>
<td>D1785 CSA B137.3</td>
<td>Pressure</td>
<td>1/8 - 24</td>
<td>120 - 810</td>
<td>IPS Sch 40</td>
</tr>
<tr>
<td>PVC Pipe Pressure Rated (SDR)</td>
<td>D2241</td>
<td>Pressure</td>
<td>1/8 - 36</td>
<td>50 - 400</td>
<td>IPS SDR 13.5, 17, 21, 26, 32.5, 41, 64</td>
</tr>
<tr>
<td>Type PSM PVC Sewer Pipe &amp; Fittings</td>
<td>D3034</td>
<td>Sewer</td>
<td>3 - 15</td>
<td>SDR 23.5, 26, 35, 41</td>
<td></td>
</tr>
<tr>
<td>PVC Sewer Pipe &amp; Fittings</td>
<td>D2720</td>
<td>Sewer</td>
<td>2 - 6</td>
<td>In the standard</td>
<td></td>
</tr>
<tr>
<td>Threaded PVC Fittings, Sch 80</td>
<td>D2464</td>
<td>Pressure</td>
<td>1/8 - 6</td>
<td>50% of pipe</td>
<td>Sch 80</td>
</tr>
<tr>
<td>PVC Fittings Sch 40 (Socket &amp; Threaded)</td>
<td>D2466</td>
<td>Pressure</td>
<td>1/8 - 12</td>
<td></td>
<td>Sch 40</td>
</tr>
<tr>
<td>PVC Sch 80 Socket Fittings</td>
<td>D2467</td>
<td>Pressure</td>
<td>1/8 - 16</td>
<td></td>
<td>Sch 80</td>
</tr>
<tr>
<td>PVC Large Diameter Ribbed Sewer Pipe &amp; Fittings</td>
<td>F794</td>
<td>Sewer</td>
<td>4 - 48</td>
<td></td>
<td>Pipe Stiffness</td>
</tr>
<tr>
<td>PVC Plastic Schedule 40 Drainage and DWV Fabricated Fittings</td>
<td>F1886</td>
<td></td>
<td>4-24</td>
<td></td>
<td>IPS</td>
</tr>
<tr>
<td>Making Solvent Cement Joints, PVC</td>
<td>D2855</td>
<td>All</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Solvent Cement PVC</td>
<td>D2564</td>
<td>All</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Joints for IPS PVC w/Solvent Cement</td>
<td>D2672</td>
<td>All</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PVC Primers</td>
<td>F666</td>
<td>All</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pressure Joints using Flexible Elastomeric Seals</td>
<td>D3139</td>
<td>Supply and distribution lines for water</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Joints for Drain and Sewer Using Elastomeric Seals</td>
<td>D3212</td>
<td>Drain and gravity sewage</td>
<td></td>
<td>25-FT Head</td>
<td></td>
</tr>
<tr>
<td>Elastomeric Seals (Gaskets) for Joining Plastic Pipe</td>
<td>F477</td>
<td>Gravity, low pressure &amp; high pressure piping</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTES:**
Pressure ratings for Sch pipe vary for each pipe size. They also vary by Schedule. Pressure ratings for SDR pipe are constant for all sizes in a single SDR (e.g. SDR 21 pipe is rated 200 psi). Schedule 40 & 80 references apply only to IPS OD pipe. SDR references can apply to all OD systems (e.g. IPS, CTS, Sewer & AWWA Cast Iron).
For more information on PVC Pipe & Fittings contact THE PLASTIC PIPE & FITTINGS ASSOCIATION
800 Roosevelt Road, Suite 312
Glen Ellyn, IL 60137

www.ppfahome.org