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RECEIVED
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to: Pipe Resource Organization

from: Dan Stanowick DS

subject: Drinking Water Technical Paper

date: July 31, 1991

copies to: Roy Gottesman
Pat Benkner
Nora Jacobs
Dave Meeker

Enclosed for your files is a copy of our revised technical paper about PVC pipe and drinking water safety. We'll be promoting the availability of this via a news release to appropriate industry trade magazines. Please let Pat Benkner know directly if you or your customer contacts would like additional copies.

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The Vinyl Institute

TECHNICAL INFORMATION

(Revised July 1991)

PVC PIPE AND DRINKING WATER SAFETY

PVC (polyvinyl chloride, or vinyl) piping has been used for over 30 years in water distribution applications. First employed extensively in irrigation systems, today PVC pipe also is used for municipal and rural water transmission distribution mains and service connections, as well as cold water piping within buildings. A special form of PVC, chlorinated polyvinyl chloride (CPVC), has been developed for hot and cold water distribution piping. Other common applications for PVC include DWV (drain-waste-vent) systems and sewer connections and collection mains. Because of their excellent resistance to chemicals, fats and acids, PVC and CPVC piping systems also are used in food processing plants and numerous industrial applications.

While some piping materials have been "grandfathered" into the plumbing codes, PVC -- like all plastic pipe products -- must meet strict, more recently established requirements for safety and performance. All three major plumbing code groups, as well as nearly all state, regional and local plumbing codes, require that plastic pipe used to transport potable (drinkable) water be approved for this purpose by a laboratory recognized by the public health profession. Both PVC and CPVC are approved by the National Sanitation Foundation (NSF).

Vinyl's share of the pipe market has grown quickly because of an unmatched combination of properties. These include:

- **Durability** -- PVC will not rust or corrode, thereby eliminating encrustations on interior pipe walls and pinhole leaks. It is resistant to electrical, electrostatic and galvanic interaction, is not electrically conductive nor subject to corrosion. PVC also is unaffected by excessively "hard" or "soft" water and changes in pH. Buried PVC pipe resists aggressive soil conditions, while household piping resists attack by cleaners and other household chemicals. Because PVC withstands conditions that other pipe materials cannot, it frequently is selected in place of, or to replace, iron, copper, asbestos cement, concrete, clay and galvanized steel pipe.

- **Ease of Installation** -- Small diameter PVC pipe is easily and quickly assembled without the need for soldering, a complex process that must be performed by a skilled professional to ensure leak-free joints. Soldering also requires the use of a torch, a source of many fires and worker injuries.[1] Large diameter PVC pipe is easily joined with gasketed joints. It also is lightweight, thereby speeding installation and reducing the possibility of worker injury.

- **Economics** -- While many variables such as local labor rates and wholesale prices will determine the cost of a piping system, the **total installed cost** of a PVC system often is less than that of competitive materials. A recent study conducted on behalf of the Vinyl Institute by IFT Technical Services confirms this. That study found that installed costs for PVC drain-waste-vent pipe, and CPVC hot and cold water distribution systems were, respectively,

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up to 37 percent and 44 percent less than competitive systems in six representative cities located throughout the country.[2]

Savings like this are possible because, in general, a PVC piping system results in savings on both material and labor. Most important, however, is the fact that PVC pipe typically lasts longer and requires less maintenance than competitive materials, thus reducing repair and replacement costs.

SCIENTIFIC EVIDENCE CONFIRMS PVC'S SAFETY

Perhaps no other piping material has been as thoroughly tested for potential health and safety effects as has PVC. Two studies in particular confirm that PVC pipe can be safely used, without harming those who consume water transported by it. Those studies found:

Sound engineering practices are key to avoiding permeation contamination.

Battelle Memorial Institute undertook a series of tests in 1983 to determine whether various piping materials were susceptible to permeation -- the phenomenon by which potential water contaminants (such as soluble fertilizers or spilled gasoline) pass through the pipe wall to contaminate the water being carried within. Battelle conducted tests on ductile iron, PVC and asbestos cement piping systems. In the case of all three materials, permeation was found to occur at the pipe joint, not through the pipe wall, demonstrating that any gasketed pipe system is vulnerable to high concentrations of soil contaminates. Additional testing showed that ungasketed PVC pipe was highly resistant to permeation.[3] A separate study by Battelle concluded that the great majority of soil in the U.S. has either no contamination or extremely low levels of contamination.[4] It is the PVC industry's recommendation that no type of piping system be installed in an area known to have highly contaminated soil, or likely to be subject to soil contamination.

PVC withstands aggressive water; "leaching" is not a concern to water integrity.

In 1986, McKesson Environmental Services (now, Clayton Environmental Consultants of Pleasanton, California) conducted a series of tests to assess the potential leaching hazard of both CPVC and copper piping systems. (Leaching is the phenomenon whereby the alkalinity or acidity of the water being transported through a piping system causes chemicals or contaminating compounds to be extracted from the pipe wall itself.) The testing revealed that no carcinogens or highly toxic substances leached from the CPVC pipe after initial flushing took place. The copper system produced some elevated lead levels and, under some conditions, potentially harmful levels of copper.[5] A subsequent independent health risk assessment of the test data, conducted by CH2M Hill, concluded that PVC pipe poses no greater threat to health than copper pipe and, under some conditions, may be the preferred piping material.[6]

[1] National Fire Data Center, 1983.

[2] *PVC Drain, Waste and Vent Pipe vs. Cast Iron Soil Pipe: A Cost/Benefit Comparison, and PVC vs. Copper Domestic Hot and Cold Water Systems: A Cost/Benefit Comparison, conducted* by IFT Technical Services, Berkeley, California, for the Vinyl Institute, September 1989.

[3] *Evaluation of the Permeation of Organic Solvents Through Gasketed Jointed and Unjointed Poly (Vinyl Chloride), Asbestos Cement and Ductile Iron Water Pipes,* Battelle Columbus Laboratories, 1983.

[4] *Literature Study of Low Contaminant Levels of Organics In Soils and Their Potential for Permeation through Plastic Pipe,* Battelle Columbus Laboratories, 1985.

[5] *Effects on Water Quality By Leachable Substances From Copper Tubing, CPVC Piping and Galvanized Pipe Fittings,* McKesson Environmental Services, Inc., May 1986.

[6] *Metal vs. Plastic Pipe: A Comparative Health Risk Assessment on Drinking Waste Quality,* prepared by CH2M Hill, Inc., Emeryville, California, August 1987.