

## Pipe materials

Pipes are selected primarily for channeling storm water, conveying sanitary sewage, or distributing water. While in the past water systems commonly required ductile iron or steel pipe, today there are many choices of material for storm water and sewage collection. Selecting pipe materials might be a matter of complying with local ordinance or preference, but selecting materials should also involve a consideration of the costs and benefits of the possible choices.

**Acrylonitrile butadiene styrene (ABS).** ABS is used primarily for waste and storm water pipe. ABS is lighter than PVC, but it is more than twice as expensive. There have been reports of instances of off-quality material making it to the marketplace, resulting in failures in the field. ABS has almost twice the thermal expansion capacity of PVC. The resin material from which it is made is expensive to manufacture. ABS manufacturing involves a number of toxic materials, which have environmental impacts.

**Cast iron.** Many building codes still require cast iron pipe, but these codes tend to be related to political and economic pressures rather than to the value of the material itself. Cast iron is durable, and it has a low thermal expansion coefficient, but its great weight and associated labor costs would seem to offset those values. Cast iron is no more durable than PVC, for example. The energy and environmental impacts of cast iron pipe manufacture are quite high.

**Concrete.** Although very durable and resistant to wear, concrete pipe is heavy and expensive to install. It is still required in some local and state codes because of its durability. The strength of concrete makes it useful in applications where there is minimal cover or where significant loads are expected.

**High-density polyethylene (HDPE).** HDPE is the least expensive, lightest, and most flexible of the pipe materials. HDPE is relatively simple to manufacture, and it is the most easily recycled pipe material. It is manufactured in long sections, and it is familiar as the coils of pipe material used often to reline old pipelines and sewers. For all of its positive characteristics, HDPE unfortunately has the greatest expansion coefficient of any of the popular pipe materials; its capacity is more than twice the thermal expansion capacity of PVC, which limits the usefulness of HDPE for many applications.

**Polyvinyl Chloride (PVC).** PVC has become widely used because it is very strong, durable, lightweight, inexpensive, and easy to work with. It is used in a wide array of products, but in site design, it is used primarily as pipe or site furniture. About 60 percent of the PVC used in the United States is used in the construction industry. Available pipe diameters in PVC range from  $\frac{1}{8}$  to 36 in. Nearly all wastewater sewers constructed in the United States today are built of PVC pipe.