

Pipe Dreams

Selecting the Best Pipe for Your Application

Part Two of Two

Introduction

New pipe materials, changes in pipe classifications and labeling conventions can create confusion. In the first part of this two-part series we discussed pipe options for water mains, water services and sanitary force mains. This second part will discuss some of your options for sanitary and storm sewers. Specifically, we will offer our opinions about properties, advantages and disadvantages of the various types of pipes that are commonly used in northern Michigan. We will also provide some of the common names for these pipes that may not be technically current but may still be in general use.

Sanitary Sewers

The earliest sanitary sewers were made from brick or stone. Some large brick sanitary sewers are still in use. From more than a century, the predominant pipe material for sanitary sewers with a diameter of less than



Vitrified clay pipe

24 inches was vitrified clay. Because clay was widely available for manufacturing, the material was chemically resistant, and it has very good flow characteristics,

clay pipe was widely used. Most community sewer systems that were built before the mid-1960s used vitrified clay pipe.

In the past several decades, plastic pipes have replaced vitrified clay for sewers less than 18 to 24 inches in diameter. Plastic pipes are also chemically resistant and are not as prone to cracking or breaking as the comparatively brittle clay pipes. They are lighter and easier to handle than clay pipe.

In northern Michigan, the most common type of plastic pipe used for sanitary sewers is PVC. PVC pipe is typically used for sewers having a diameter of less than 12 to 15 inches. It is chemically resistant but can deflect under the weight of soil thereby requiring that it be carefully bedded and backfilled.

Some communities require the use of truss pipe for sanitary sewers. Truss pipe is a composite of concrete sandwiched between

two layers of PVC. The two layers of PVC are separated by a type of corrugation or "truss" and the void is filled with concrete. Truss pipe is heavier than single wall PVC pipes and the outer skin of plastic can be damaged if not handled properly. Truss pipe joints must be carefully sealed to meet leak testing specifications. Truss pipes' principal advantages include: it is less subject to deflection under soil loads, it is chemically resistant, and it has good flow characteristics.



Truss pipe

Reinforced concrete pipe can also be used for sanitary sewers. Concrete pipe is available in larger diameters than plastic or clay pipe and can resist higher backfill loads. Because concrete pipe is not as chemically resistant as PVC or vitrified clay it is not usually installed when the sewer diameters are less than 24 inches and sewer depths are less than 20 feet.

The table on the next page summarizes some of the characteristics, advantages and disadvantages of various sanitary sewer pipes.

Storm Sewers

Concrete, clay, plastic and metal pipes have been used for storm sewers. For decades however, reinforced concrete pipe has been predominately used to build storm sewers. It is available in larger diameters than clay pipe and most plastic pipes.



Reinforced concrete pipe

Concrete pipe is considerably less brittle than vitrified clay pipe and it is not subject to the corrosion problems that metal pipes can have. Its flow characteristic are

good and it can be reinforced to withstand traffic loads at shallow burial depths without crushing. Plastic pipes, including pipes typically used for sanitary sewers, can also be used for storm sewers.

Within the past 10 to 15 years, corrugated plastic pipe (CPP) has gained increased acceptance and utilization for storm sewers. Initially, CPP's resistance to crushing was low and its corrugations created poor flow properties. However, manufacturers have developed CPP with a double wall that provides a smooth interior surface and improved crush strength. It is available in longer laying lengths than concrete pipe and is lighter.



Double-walled corrugated plastic pipe



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Sanitary and Storm Sewer Material Comparison

Material	Available Sizes	Common Standards & Classifications	Deformation or Crush Resistance	Corrosion & Solvent Resistance	Flow Characteristics	Advantages	Disadvantages	Comments
PVC	4" to 15"	ASTM D-3034 SDR-35	Fair	Very Good	Excellent	Commonly used and is light and easier to handle than truss pipe or concrete pipe.	Can be crushed or deformed more easily than some other types of pipes.	Commonly used gravity sanitary sewer pipe in this area.
PVC	18" to 48"	ASTM F-679	Fair	Very Good	Excellent	Commonly used and is light and easier to handle than truss pipe or concrete pipe.	Can be crushed or deformed more easily than some other types of pipes.	
PVC Composite "Truss" Pipe	8" to 15"	ASTM D-2680	Very Good	Very Good	Excellent	Better deformation and crush resistance than PVC SDR-35. Has excellent flow characteristics.	Forming joints must be done carefully to obtain a leak-tight joint.	Sometimes used where depth of bury is considerable.
Vitrified Clay	3" to 48"	ASTM C-700	Fair	Excellent	Very Good	Very high corrosion and solvent resistance.	Brittle and heavy pipe.	Not commonly used in this area.
Corrugated Plastic	4" to 60"	AASHTO M-252 and M-294	Good	Very Good	Excellent	Relatively light weight compared to concrete pipe. Easy to install.	Pipe is semi-flexible and must be installed on a carefully prepared bed to avoid sags in the pipe grade.	
Corrugated Metal	12" to 120"	AASHTO M-36	Good	Fair	Fair	Pipe sections are longer than other materials facilitating culvert installation. Rigid pipe compared to CPP.	Joints are usually not water tight.	Usually used for culverts and some short runs of pipe.
Reinforced Concrete	6" to 144"	ASTM C-76	Excellent	Fair	Good	Durable and available in large diameters.	Heavy. Larger diameters may require a crane for pipe setting.	Also available in elliptical sizes.

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