NATIONAL CLAY PIPE INSTITUTE

WESTERN REGION

Vitrified Clay Pipe VS Polyvinyl Chloride Pipe

"Clay takes the load off contractors concerned about the risks they take when installing Structured Wall Plastics."

Source: Clay Pipe Development Association (CPDA). Clay Today for Sustainability Tomorrow. Issue 1.

A COMPARISON OF TWO SANITARY SEWER PIPE MATERIALS

Structural Characteristics

VCP

Rigid Conduits

Because of its significant strength, clay pipe is part of the trench structure. For a CLASS D bedding with a safety factor of 1.1, approximately 90% of the support strength required is built into the pipe, reducing bedding, labor and inspection costs.

VCP looses 0% of its tensile strength and 0% of its modules of elasticity for life of the pipe.

The characteristics of Clay Pipe remain constant due to its inherent physical characteristics.
Source: National Clay Pipe Institute. (2006). *Clay Pipe Engineering Manual.* U.S.A.

PVC

Flexible Conduits

Significantly less Load Support is built into PVC pipe requiring contractors to build appropriate support around the pipe. The engineer must use flexible design parameters for installation. The result is increased potential for failure, construction costs and inspection costs.

"PVC pipe loses ½ of its strength in 11.5 years."
Source: Johns-Manville Pipe Division. (1987). PVC *Pipe Seminar Synopsis.*

PVC becomes more brittle with age, reducing its life span.

PVC pipe exposed to higher temperature becomes weaker.

"The main feature of plastics and polymer composites is that their physical, mechanical, thermal, and chemical properties are strongly time and temperature dependent."

Source: Mehdi Farshad. Plastic Pipe Systems: Failure Investigations and Diagnosis. Elsevier Science: 2006.

VCP

Rigid Conduits

As a rigid material and the introduction of factory applied joints, VCP has demonstrated dependable service with a minimum of maintenance.

Vitrified Clay Pipe is a rigid material and is not subject to the problems of deflecting or flattening under load.

As a ceramic, Vitrified Clay Pipe has superior wear characteristics.

PVC

Flexible Conduits

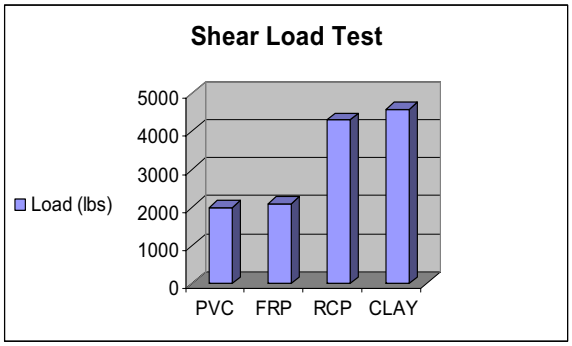
Extensive support from compacted bedding is required around the PVC pipe in order to limit deflection. The cost of achieving this necessary support for flexible pipe can be substantial and **MUST** be considered in any evaluation.

Severely deflected plastic pipe must be replaced at excessive, unplanned expenses.

The deflection or distortion of PVC pipe can cause an increased turbulence in the flow which not only reduces the lines capacity, but the resulting turbulence promotes the release of entrapped sewer gases.

Joints

Leaky joints are a story of the past. Prior to 1950 it was not considered particularly important to have leak free sewer lines. A certain amount of infiltration was thought to be desirable in order to maintain flow velocity as well as carry away storm and ground water. Today's VCP joints are engineer designed to meet today's rigid standard (50 gallons/capita/day). All clay pipe jointing systems in use today, whether on bell-and-spigot pipe or plain end pipe, are designed to provide resilience and flexibility to accommodate pipe movement which might occur. **All compression type jointing methods meet the requirements of ASTM C425.** With proper installation, a VCP sewer system will meet all ASTM infiltration or exfiltration requirements. An independent study performed by the University of Houston demonstrated the capability of clay's compression jointing system. **Only VCP exceeded the test protocol of 4500 lbs without leakage.**



Source: University of Houston. Department of Civil and Environmental Engineering. (April 2003). *Sewer Main Collection System. Pipe Joint Infiltration Testing Program.* UH Report No. 2002-1.

Abrasion

VCP

Vitrified Clay Pipe demonstrates superior abrasion resistant qualities and has a bearing strength ***after*** abrasion which greatly exceeds the ASTM minimum requirement.

Rigid Vitrified Clay Pipe, with its thick, dense pipe wall, is seldom affected by abrasion.

PVC

The most abrasion resistant plastic pipe abraded at a rate which was nine times greater than clay pipe

All tested plastic pipe demonstrated a substantial decrease in pipe stiffness following abrasion.

ABRASION RATING OF SELECTED SEWER PIPE MATERIALS

Pipe (All 8" Diameter)	Wall Thickness Abraded	
	Inches	Percent
1. Vitrified Clay	.003	0.3
2. Solid Wall PVC	.027	10.5
3. Solid Wall PVC with filler	.043	19.4
4. Profile Wall PVC	.048[a]	100.0[a]
5. PVC Truss	.059[a]	100.0[a]
6. ABS Truss	.067[a]	100.0[a]

a – Complete abrasion through the interior lining.

PIPE STIFFNESS TEST (ASTM D2412 – 8" Diameter)

Pipe (All 8" Diameter)	MINIMUM REQUIREMENT	AFTER ABRASION	% UNDER MINIMUM
1. Solid Wall PVC (ASTM D3034)	46 psi	32.1 psi	30.2%
2. Solid Wall PVC (ASTM 789)	46 psi	19.2 psi	58.3%
3. Profiled Wall PVC	46 psi	28.6 psi	37.8%
4. PVC Truss (ASTM D2680)	200 psi	152.6 psi	23.7%
5. ABS Truss (ASTM D2680)	200 psi	143.5 psi	28.3%

BEARING STRENGTH TEST (ASTM C301 – 8" Diameter)

PIPE	MINIMUM REQUIREMENT	AFTER ABRASION	%OVER MINIMUM
1. Vitrified Clay (ASTM C700)	2200 lbs/Linear ft.	4067 lbs/Linear ft.	84.9%

Source: National Clay Pipe Institute. *The Abrasion Resistance of Plastic Sewer Pipe Compared to Vitrified Clay Pipe.* Report No. 141.

"Clay pipe is perhaps the most inert of the common pipe materials in terms of corrosion, and it's resistance to abrasion. A 100 year service life may be assumed for most clay pipe installation."

Source: John C. Potter. Department of the Army, Geotechnical Laboratory, Waterways Experiment Station, Corps of Engineers. Life Cycle Cost for Drainage Structures.