

LINED REINFORCED CONCRETE PIPE

There are various methods of protecting concrete pipe from acid attack, whether it be Hydrogen Sulfide gases that may attack concrete in the airway portion of a sanitary sewer pipe, or from acids flowing in the influent.

The many methods of protecting concrete pipe against acid attack would first include good design principles, such as utilizing proper gradients and slope/flow relationships in the initial design of the pipeline; additional concrete coverage over the reinforcement; injection of chemicals or air into the flow; ventilation; increasing the alkalinity content of the unlined concrete pipe; etc. If the acid potential is severe, to the extent that these methods may not provide the desired design life, then plastic liners should be considered.

In the case of severe potential acid generation, one method of protection is to mechanically lock a plastic liner into the concrete pipe at the time of manufacturing. This method has been in use since 1947 and has proven to be an excellent means of protection.



When protection is needed from hydrogen sulfide gases, which may be converted to sulfuric acid by moisture and bacteria on the pipe wall, a liner is selected that protects only the airway portion of the pipe and not the waterway portion. Generally, a 270 degree coverage is ample protection. If the depth of flow varies considerably, then a 360 degree liner can be used providing protection to the entire pipe. For pipe that will be jacked, a 360 degree liner is recommended to compensate for possible rotation that might occur in the jacking operation.

The surface to be protected is not limited to 270 degrees or 360 degrees, but can be any angle as required for the project. The concrete pipe manufacturer may elect to use a specially prepared liner that initially is in a tube shape, but allows for an unribbed portion of the liner to be cut away and discarded after the concrete pipe is cured, thus leaving the desired degree of liner needed.

The plastic sheets have a projecting ribbed configuration, spaced about 2-1/2" apart, extending from top to bottom of the plastic liner. The ribs, usually about 3/8" high with a 1/4" wide top section, a "T" shaped configuration, are embedded in the concrete at the time of pipe manufacturing.

During installation, a smooth strip of plastic is heat bonded, or welded, across the adjacent pipe sections at the joints of the installed concrete pipe, making a continuously protected pipeline. In cases where the pipe may be below ground water elevation, a 10 inch \pm weld strip is omitted at the invert.

Two different types of joint weldings are used: one is a narrow strip of liner material that is heat welded on both sides of the joint, and the other is where additional liner material is provided with each section of pipe and extends across the joint and welded to the mechanically locked liner of the next section of pipe. The joints are welded at 500 to 600 degrees F.

Plastic liners are made of high molecular weight poly vinyl chloride resins (PVC) or polyethylene (PE) and are 65 mils or greater in thickness. For PVC liners, a special blend of resins is required such that approximately 99% of the resin material will be high molecular poly vinyl chloride (PVC) and the remainder is pigments, plasticizers, and stabilizers. Copolymer resins are not allowed. The liner material can be supplied in either white or black colors.

Such liners are resistant to acid solutions, diluted solvents, petroleum products, exposure to vegetable and animal oils, alkali chemicals, and are bacteria resistant.

Liners have been tested to withstand 40 psi (92 foot head) water pressure applied on the back side of the liner material without disbonding of the mechanical interlocking of the material to the concrete. Also, a spark test is performed at the manufacturing plant to determine any possible pin holes in the liner that may have developed, and repair is done immediately.

Polyethylene liners, which became commercially available in the United States in the mid-1980's, have similar manufacturing, testing and welding qualities as do PVC liners.