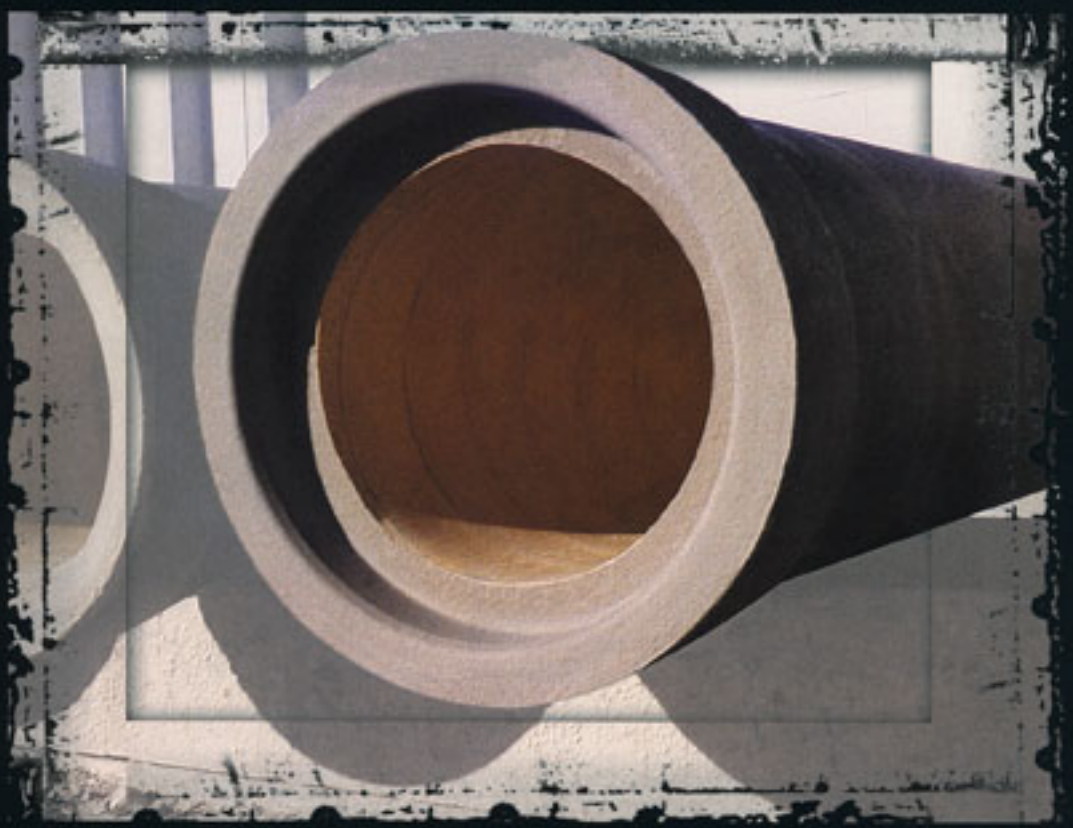
AMER-I-LINE

An innovative concrete pipe solution designed for corrosive environments.



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History of Hydrogen Sulfide Research

Hydrogen sulfide generation and concrete corrosion have been researched since the early 1900's, but it was not until 1946 that the first predictive equation for sulfide buildup was developed. In 1950, a more complete empirical formula was proposed and later modified by Dr. R. D. Pomeroy into what is known as the Z formula. In the early 1970's, the U.S. Environmental Protection Agency commissioned the development of a process design manual for sulfide control in sanitary sewer systems. The *EPA Manual* was the first comprehensive guide to predictive and control methods for sulfide generation and corrosion of concrete. The EPA Manual was widely distributed and provided the impetus, which rapidly resulted in several important developments.

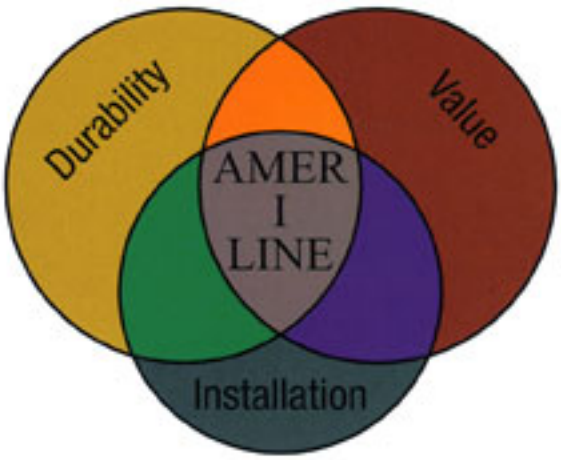
Pomeroy reported that the concrete corrosion rate was related to the concrete alkalinity and this relationship was used as a design parameter for a number of years. In the mid 1970's, K. K. Kienow modified the concrete corrosion formula in the *EPA Manual* and developed a life factor equation which ties concrete alkalinity, concrete cover over the reinforcement and required service life to the corrosion rate, thereby providing maximum flexibility in design and production of concrete pipe. In 1977, Pomeroy and J. D. Parkhurst published the first quantitative method for prediction of sulfide generation. These developments were the basis for several extensive and significant studies of sanitary sewer systems in California, Louisiana and Texas. These studies verified the Pomeroy/Parkhurst method and led to the specification of concrete pipe by the life factor method on sanitary sewer projects where concrete pipe was not previously permitted.

An Innovative Concrete Pipe Solution

Entering the year 2000, American Concrete Pipe has developed Amer-I-Line. Amer-I-Line consists of a PVC plastic inner liner which is cast into the wall of a concrete pipe. The inner liner prevents corrosion, chemical attack, permeation, biological attack and abrasion. Amer-I-Line is the superior pipe that provides resistance from corrosive environments.

Economic Consideration

It often is thought that hydrogen sulfide problems occur only in warm regions. While temperature is important, other factors such as low velocities, long detention times or solids buildup must also be considered to determine if a hydrogen sulfide problem exists. For example, force mains, industrial contributors, or a main, which is designed with a low velocity can cause hydrogen sulfide in a system regardless of the geographic location.



The system must be designed for durability, installation and value.

Corrosion must be considered when selecting the products. Corrosion attack can be anticipated in most underground systems; the PVC liner's corrosion immunity provides considerable savings in the form of reduced operating costs and increased system life.

Unplasticized polyvinyl chloride, the material used in the PVC liner, has proven itself to be immune to biological attack. Once the PVC lined pipe has been installed underground in normal water and sewer systems, it is not susceptible to the normal processes of deterioration found in nature.

Most piping system contracts are awarded to the lowest bidder. Contractors will usually bid materials and construction methods which allow for the lower initial cost with little thought to future maintenance or life of the system. Even for the owner, the lowest initial cost is often the overriding factor. However, the owner and the engineer should insist on a design based on value. For engineers, economics is always an important consideration; and any economic evaluation must include more than just initial cost. Annual maintenance and life of the system should also be considered. Initial cost may include such items as piping materials, trenching, select backfill, compaction, site improvements and restoration, and engineering and inspection. Pipe cost is related to pipe material and diameter. Diameter is controlled by the design flow rate and pipe roughness. Annual maintenance cost includes cleaning, repair and replacement due to corrosion, erosion, or related items. The life of the system is directly related to durability and is also affected by items such as erosion, corrosion and other types of environmental degradation. Care should be taken when selecting a pipe product for any service application to ensure that environmental effects upon the life of the system have been taken into consideration.

Amer-I-Line Pipe Standards

Scope:

This specification covers concrete pipe with an interior PVC liner intended for use as conveyance systems of sewage, industrial wastes, and storm water. A variety of joints are available that will satisfy the applicable design requirements.

Reference Documents:

The reference documents for this specification are ASTM C14, C985, C76, C655, C361, C443, and D1784 latest edition.

Terminology:

Definition of terms related to this specification are found in ASTM C822 and F412.

Pipe Characteristics

Materials:

The PVC plastic inner liner is cast and fully anchored into concrete prior to curing allowing the two materials to act together. Steel reinforcement may be added based on the indirect design procedure in accordance with the Concrete Pipe Design Manual. Special coatings may be applied to the bell and spigot.

Concrete:

Concrete is a minimum compressive strength of 5000 PSI.

Steel Reinforcement:

Any required steel reinforcement should be in conformance with ASTM C76 or C655.

Non-reinforced concrete pipe should be in conformance with ASTM C14 or C985.

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