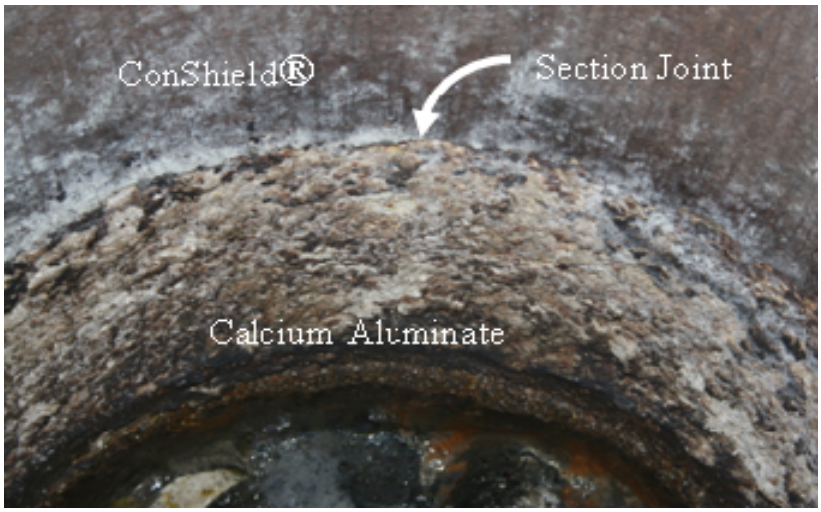
ConMIC Shield® Technologies, Inc.
biotech armor for concrete

Grand Rapids Eight-Year Test Demonstrates Benefits of Con[mic]Shield® Additive for Corrosion Protection of Concrete in Manholes

Eight-year test concludes Con[mic]Shield® treated concrete is superior to Calcium Aluminate cement in severe sulfide conditions.



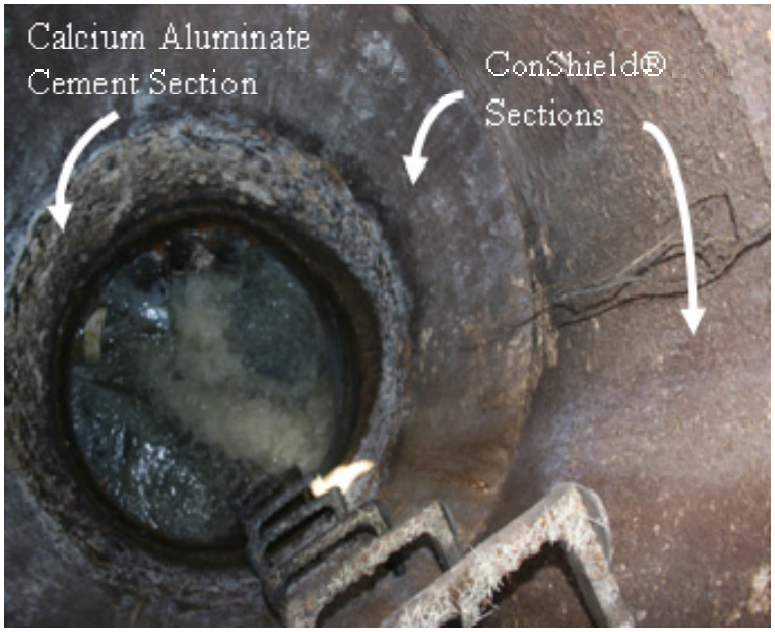
In 1999 the city of Grand Rapids, Michigan, under the direction of Chuck Schroeder, city engineer, embarked on a study to determine the optimal method for preventing concrete corrosion in sanitary manholes due to hydrogen sulfide gas. Turbulence, moderately-high temperatures, and septic sewage create conditions that are ideal for sulfuric acid (H_2SO_4) production. Sulfuric acid is formed when aerobic (air-breathing) bacteria on the walls of the manholes metabolize hydrogen sulfide gas and oxygen. Their waste by-product is sulfuric acid, which results in the rapid decay of concrete. The technical name of this process is *microbiologically induced corrosion* (MIC).

Mr. Schroeder summed up the city's problems: "Our sewer corrosion occurs mainly at the end of the force mains where the turbulence is the greatest. As the city continually works to reduce inflow and infiltration, we know that our undiluted sewers will make microbiologically induced corrosion (MIC) much more common."

With the cooperation of Premarc Industries, a local precaster, the city created a scenario where it could test the alternative methods of corrosion mitigation all within the same newly installed manhole. A manhole consisting of four sections was specially built. The bottom section of the manhole, which was subject to frequent scouring and inundation from force mains, was treated with a densifying-recrystallization additive. The mid section was cast with a calcium-aluminate cement mix. The top two sections were cast using an additive supplied by CONSHIELD Technologies Inc. of Atlanta, Georgia.

The test manhole was installed in an area where corrosion due to hydrogen sulfide (H_2S) gas bubbling out of solution was a known problem. Two sanitary sewer force mains discharged into the test manhole every 15 minutes. This created significant turbulence and an abundant release of hydrogen sulfide (H_2S) gas contacting the upper three sections of the manhole.

When the city inspected the manhole eight years later in August of 2007, the barrel sections with the Con[mic]Shield® additive showed no signs of corrosion and, in fact,



looked as good as the day they were installed. In contrast, the barrel section cast with calcium aluminate cement was clearly corroded. Since water drowns the bacteria, the bottom section was not expected to grow bacteria or corrode. Upon close inspection, there was no significant degradation from MIC corrosion of this bottom section except for portions above the water line.

Calcium aluminate cement is known to slow bacterial growth. It only diminishes production of the acid; it does not eliminate it. The Con^{mic}Shield® additive is unique, however, in that it *kills* the acid-producing bacteria when contact is made with the treated concrete. It does not just slow the growth of the harmful bacteria, it destroys it. Without the bacteria, there is no bacterial metabolism of the hydrogen sulfide gas, and therefore no sulfuric acid can be produced.

Since the Con^{mic}Shield® additive does not lose its potency over time, it never needs replenishment or maintenance. It is not a chemical kill of the bacteria, so the bacteria cannot develop immunity with repeated contact. Rather, the Con^{mic}Shield® additive *physically* kills bacteria by rupturing its cell wall when the bacteria come in contact with any treated portion of the concrete surface. The Con^{mic}Shield® additive is present throughout the entire thickness of the concrete, so the entire structure is protected. If abrasion occurs or the surface is otherwise damaged, protection is not diminished or comprised.

Con^{mic}Shield® does not change the physical properties of concrete, and it can be added to any mix without special equipment. It has applications in manholes, sewer pipe, or any poured-in-place structure such as a lift station or clarifier.