

# Sewer Corrosion Caused by Bacteria-by Ed Pennypacker

Concrete sewer structures, both pipe and manholes can be destroyed quickly if nothing is done to prevent the damage. Hydrogen sulfide gas (sewer gas) is natural to sewage. Most of the time it is dissolved in the liquid and is simply carried along to the final treatment at a disposal plant. But bring turbulence into the equation and things change rapidly. Turbulence caused by pumping, as in force mains, or gravity as in steep drainage can stir up the liquid and release hydrogen sulfide into the air above the liquid. Then under the right conditions, a family of bacteria feeds on that gas and thrives on the surface. Their waste is sulfuric acid, which corrodes the concrete.



In 2016 the city of Blacksburg, Virginia decided to replace damaged manholes. As shown on the left, the concrete has been attacked to the extent that the structure is physically compromised. These bacteria (*Thiobacillus*) need certain conditions to thrive. When concrete is new, the surface pH is around 13. As time passes that drops to about 9. At that level of alkalinity, the bacteria cannot establish a colony. But add moisture and sewer gas and the surface pH can drop to where the bacteria can live. The first of them arrive at pH 8 and they remain until the surface becomes more acid reducing the surface to pH4. As they live their waste,

which is acidic, reduces the pH. When the acidity becomes too severe for the first colonies a different strain moves in, as they further increase the acidity they set up conditions for the worst case. A strain that lives at pH 2 that produces a waste product of over 40% pure sulfuric acid.

The waste reacts with the concrete, particularly attacking the weak spot, Calcium Hydroxide, which is converted to mushy gypsum. The picture above is typical of a manhole in its last stages.

What can be done? One solution is to protect the concrete surface from acids. Epoxy coatings have been used, but the results have been spotty. Miss one small spot and it is like a submarine with an open window. The acid gets under the coating and it peels off. Another solution is to completely line the structure with plastic. Done correctly, it works, but the cost runs around \$30.00 dollars a square foot.

Another solution is to prevent the bacteria from establishing colonies. This is done by either surface treatment or adding a treatment to the mix when the concrete is made. ConSeal makes ConBlock MIC for this purpose. It makes the surface uninhabitable for the bacteria. At its tiniest view, it looks like a bed of nails on the surface. Any bacteria are speared and die. The same chemical is put into paint for hospital rooms, cutting boards, and you can buy a shirt that won't stink when you sweat because it is in the cloth.

Blacksburg bought new manholes in 2016, made with ConBlock MIC as an additive. If it works the manholes will not be corroded by thiobacillus bacteria like the old ones.



The same manhole as seen in 2022. No visible damage. The ConBlock MIC works.



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