Preventing Microbial Damage, Saving Money: Hammond IN Sanitary District Gets the Best for Less

by Angus W. Stocking, L.S.

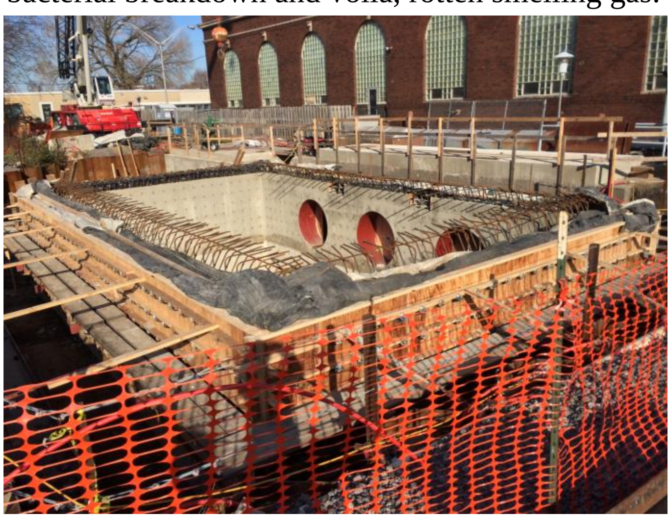
To prevent sewer overflows, the Sanitary District of Hammond, in Hammond, Indiana (population 80,000, part of the Chicago metro area) installed new detention ponds in one of its wastewater treatment plants, and also needed to build a new structure to serve those ponds. A large structure; "We're building 1,700 feet of 11'6" by 10'6" concrete box to bring combined storm and sanitary waste from existing culverts to the new ponds," says Marty Zurbriggen, general manager at Ellas Construction Company, Inc.

That's a big expense, of course, and the expense could have been dramatically increased by a factor well known to sewer network operators. MIC, or microbiologically induced corrosion, has been known to completely destroy concrete sewers in a matter of months, and it's not an easy challenge to surmount. MIC is caused by *Thiobacillus* bacteria, which consume hydrogen sulfide gas. You've probably encountered hydrogen sulfide; it's a colorless gas that commonly produces the 'rotten egg' odor associated with swamps and other places where organic matter is digested anaerobically. Sewers often present perfect conditions for hydrogen sulfide gas creation; the combination of warm turbulent water, low oxygen levels, and organic matter from sanitary and stormwater flows leads to bacterial breakdown and voilà, rotten smelling gas.

Hydrogen sulfide is bad in itself—it's poisonous, corrosive, flammable, and explosive—but from the standpoint of sewer network operators, its worst quality is that it feeds and fosters huge colonies of *Thiobacillus* that consume the gas and excrete sulfuric acid—some strains of *Thiobacillus* can thrive in acid concentrations as high as 7-percent. The acid attacks concrete and turns it into calcium sulfate, or gypsum; that is, literally more like drywall than concrete.

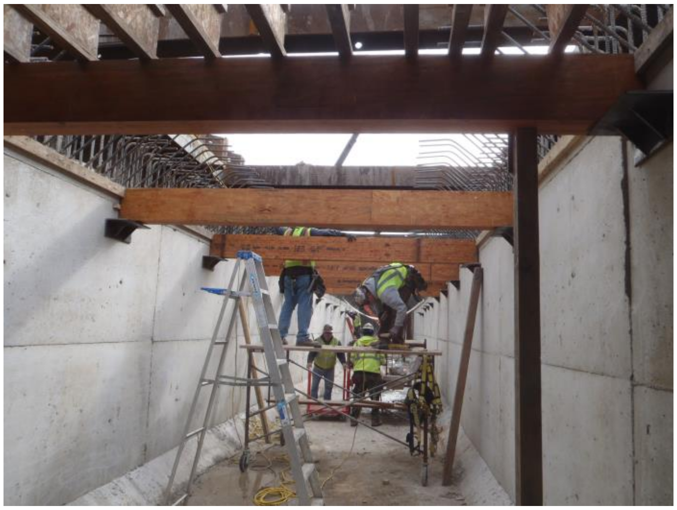
Preventing MIC is hard, and can rule out the use of concrete sewers in some applications. There are no good ways to prevent gas buildup in most sewers, so operators have tried various external coatings. But coatings often fail, as even small gaps and holes can provide a foothold for *Thiobacillus*… and if you give *Thiobacillus* an inch, it will take a sewer.

Since 1996, one solution has emerged that absolutely prevents microbiological corrosion of concrete; Con^{mic}Shield®, from ConShield Technologies, is a proven technology that makes concrete anti-microbial for as long as the concrete is in use. It's not a coating, it's a liquid concrete admixture that permeates the concrete and makes it intrinsically inhospitable to microorganisms. *Thiobacillus* can't find a foothold, so sulfuric acid is never formed.



Half a Solution Can Be Better Than One

"We knew this culvert would combine sewage and stormwater in an low oxygen environment," says Hubbell, Roth & Clark, Inc. (HRC) Senior Associate Dennis Benoit, P.E. "And we wanted to



do everything we could to reduce the potential for MIC damage. Con^{mic}Shield® is a great idea and there were reliable testimonials, so we specified it for this application."

But using Con^{mic}Shield® as an admixture for the entire concrete sewer structure—all 1,700 feet of it—could have been prohibitively expensive. So Benoit took advantage of the fact that the sewer would nearly always be about half full (or sure, half empty) with seasonal flows only occasionally raising the water level over six feet. Since hydrogen sulfide and *Thiobacillus* can't form underwater, this meant that about half of the sewer *didn't* need to be made with ConShield-treated concrete.

Zurbriggen took on the task of building a concrete sewer with two different kinds of concrete. "It's an ordinary job in most ways," he says. "The regular concrete and the ConShield-enhanced concrete are the same texture and there's no issue with bonding. So mainly it's a matter of ordering the correct mix at the right time, and making sure we're using the correct truck."

Ellas Construction is building the culvert in 120-foot sections. First the base and footing are poured, and then the wall is poured in strips that are three feet high. The elevation for the ConShield-enhanced concrete is marked on the plans, and Zurbriggen usually overlaps downward by a foot or so, to be sure all exposed concrete is protected against MIC. Making sure the right concrete is used isn't difficult but it is a little tedious; Zurbriggen has to monitor wall height, order concrete trucks with the right mix, and

double check the truck tickets prior to pour. He's backed up by subcontracted inspector Paul Knueppel, a senior project manager at Garcia Consulting Engineers. "On a typical day, we'll go through 21 cubic yards with Con^{mic}Shield®, and 32 cubic yards without," he says. "It's been relatively smooth—one of my main jobs is to check the ticket and be sure the right mix is being used."

The concrete is prepared at Smith Ready Mix, in nearby Valparaiso, Indiana. Sales Manager Scott Massom says mixing the Con^{mic}Shield® at short notice isn't a problem; "Our whole process is automated, so once the Con^{mic}Shield® is mixed and stored in an admixture tank, it's not a problem to make a batch at short notice. We just select the tank, and it's all standard procedure after that."

Using anti-microbial concrete in just a portion of the concrete box was a good idea, one that significantly reduced the cost of MIC-prevention in this structure. The Sanitary District of Hammond gets the best for less—that is, concrete sewer infrastructure that's fully protected by the best available anti-microbial technology, at a cost that's less than half of what it could have been.

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