



## City of Bend Sewer Structure Improvement

*Bend, Oregon, USA*



Precast Supplier  
**JOE FLOYD & SONS**

Products  
**ADMIX C-500,  
PATCH'N PLUG**

Project Type  
**WASTEWATER COLLECTION  
& TREATMENT**



### City of Bend Re-Evaluates Conventional Practices in Sewer Structures

On paper, Bend, Oregon's \$3.8M North Area Sewer Improvements project seems like a routine, albeit very large effort, to update aging sewer infrastructure. However, a closer look shows the rebuild and rehabilitation efforts are driving change to some conventional practices.

The North Area Sewer Improvements project includes the culmination of a five-year effort to resolve a microbial-induced corrosion (MIC) problem caused by hydrogen sulfide gas in the sewer system and especially at the manholes.

Throughout the project, Joe Floyd, owner of Joe Floyd & Sons, a leading precast concrete manufacturer in the Northwest, took on a principal role in finding a practical and high performing answer to the problem.

He explains, "We were looking for alternatives to new city and county specifications for the manufacture and installation of sewer manholes. The challenge has been to find an effective solution that's affordable, easily installed and locally accessible. That's where crystalline waterproofing entered the picture."

### Beyond Conventional Practices

The conventional approach to protecting concrete sanitary sewer structures against deterioration caused by MIC is to use protective systems, such as liners and coatings.

The City of Bend and Deschutes County has been using polymer coated manholes for a number of years. Unfortunately, the manhole manufacturer selected was located several hundred miles away and the products were very expensive. Purchase, delivery and installation were logistically and economically prohibitive.

Additionally, the engineers had concerns about repair and replacement. For example, what would happen if the takeoff was wrong and the manholes were produced incorrectly? What if the manholes needed repair? Would the city have the flexibility to wait for a solution?

Like any liner or coating, polymer coated manholes require a specialty crew to weld the joints, therefore the civil contractors can't own a job from beginning to end and don't have control of the schedule.

"The polymer coated manholes are a wonderful manhole except for the challenges associated with schedule, installation, the potential for infiltration from the outside to inside, and that it's 6x as expensive as a regular concrete manhole," says Floyd. "We knew that the city was concerned with hydrogen sulfide corrosion and had settled on a solution that, while effective, was very expensive. It was in that search to find a solution that I came across Xypex."

About five years ago, Floyd called on fellow member of the National Precast Concrete Association, Gainey's Concrete Products, a producer in Louisiana. He adds, "Their high

groundwater would likely create challenges related to hydrogen sulfide corrosion, so I called the company representative and he recommended Xypex.”

A high-water table (groundwater) would be a problem for ‘infiltration’ which can cause liners and coating to lose their adhesion to the surface. While this is a problem in Louisiana, a bigger issue would be the slow flow of sewage resulting in high hydrogen sulfide gas concentrations in the pipe and at locations of higher turbulence resulting in more microbial induced corrosion.

For the past 5+ years, Joe Floyd & Sons has been investigating, learning and testing concrete products with Xypex crystalline waterproofing solutions and helping educate city and county leaders, engineers, specifiers and inspectors.

### The Crystalline Edge

Crystalline waterproofing technology, used at the time of batching becomes an integral, permanent part of the concrete structure. The crystalline chemicals react with the byproducts of cement hydration to make the concrete waterproof and more resistant to deterioration.

When moisture is present, the crystalline structure will form in the pores, capillary tracts and shrinkage cracks in concrete. Wherever water can penetrate the concrete, the crystalline formation will follow. The crystalline formation engages the material filling and plugs the voids in concrete to become an integral and permanent part of the structure.

Crystalline waterproofing has all the advantages of liners and coatings along with considerable lifecycle benefit. The technology works within the concrete to make it waterproof and improve durability by filling and plugging pores, capillaries and micro-cracks of the mix with a non-soluble, highly resistant crystalline formation.

Floyd adds, “I specifically researched Xypex products as a potential solution to the hydrogen sulfide corrosion problem. From what I’ve seen, nobody understands the science of crystalline waterproofing and no other manufacturer has the extensive history and testing of Xypex. They have tested and evaluated concrete structures for 50 years in every conceivable harsh environment—I don’t know anyone who does that.”

Once he’d done his own research on Xypex products and capabilities, Floyd contacted Steve Keyser, Xypex’s Oregon representative to learn more.

“He did a presentation for me and then for the local engineers, architects and contractors,” recalls Floyd. “I also shared the lifecycle benefits of Xypex with my customers and most of them were all in. They want the best quality and longevity.”

However, the presentation had limited value to engineers and architects, who are often restricted by owner requirements. Floyd continued to advocate for the benefits.

Two years later, Keyser and Floyd made a follow-up presentation on the effectiveness of crystalline technology for protection against microbial induced corrosion caused by acid and sulfate attack focusing on the lifecycle benefits at the City of Bend engineering offices. This time, twice as many professionals attended and interest was much greater. Keyser even helped by writing a specification for Xypex that architects/engineers could simply cut and paste into their documents.

Currently, Floyd offers Xypex as an upgrade on many of his products including septic tanks, cisterns and water troughs. All his experiences and lessons learned about crystalline waterproofing came together when the city began the North Area Sewer Improvements project.

Floyd adds, “The City of Bend was waiting for a good test project to use crystalline waterproofing and evaluate its cost effectiveness. The North Area Sewer Improvements project, which included the replacement of a number of manholes, proved the ideal project.”

### The Test Bed

The North Area Sewer Improvements project will upgrade the city’s sewer pipe and conveyance system, which is near capacity. City of Bend consultant, Niall Boggs from Parametrix wrote the test project specifications for Xypex in the manholes.

Floyd explains, “The project went pretty smoothly. We had to do a little education with contractors about the best mix procedure and dosage rates for Xypex [Admix C-500](#), and joint grouting with Xypex [Patch’n Plug](#), but we worked through those details with help from Steve. This was a great project for me as a distributor to see what hurdles we need to overcome and how best to help contractors.”

To help inspectors, Floyd’s company colors and stencils manholes to help inspectors identify Xypex-incorporated systems.

“The best part is that the City of Bend has saved thousands of dollars on every manhole by using crystalline waterproofing instead of the polymer coated systems. We’re hoping that in the future any lift station or any concrete structure to be installed in an area with a potential MIC issues will incorporate Xypex.”