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CaseHistory

21st Century Material for Colonial City

Market Segments:	- Infrastructure - Sewer Rehabilitation
Composite Applications:	- Sewer interceptor structures - Vortex chambers with baffles
Resin:	Blend for proprietary polymer concrete
Manufacturing Process:	Casting
Diameter:	10 feet (3 meters)
Deepest Structure:	110 feet (33.5 meters)
Chemical Exposure:	Sewer gases
Installed:	2007
Location:	Charleston, South Carolina

Charleston, South Carolina, is a charming city immersed in more than three centuries of history going back to colonial America. Civil engineers serving the city help preserve the community's past by turning to solutions that are designed for long-term durability into future.

For an underground sewer system in need of repair, the forward-looking solution included unique cast polymer composite sewer interceptor structures manufactured by U.S. Composite Pipe.

A worker sets the formwork for casting the 12-foot high vortex section.

The structures combine the strength of steel reinforcing rod with a special polymer concrete formulated with Vipel® corrosion-resistant resin from AOC. These high strength characteristics became quite an asset considering Charleston is located in a seismic region.

21st Century Material for Colonial City, continued

Composite sections are ready to install upon arrival at the job site.

The composite structures are 10-foot (3-meter) diameter, vertical access shafts up to 110 feet (33.5 meters) deep. At the base of each shaft, U.S. Composite Pipe used the same Vipel resin-based composite to manufacture a foundation floor and as well as a vortex chamber with baffle wall to help control sewage flow.

The composite installation was part of a major sanitary sewer rehabilitation project design-engineered by the Charleston office of consulting engineers Black & Veatch. The interceptor structures were contracted to Affholder Inc., a subsidiary of Insituform Technologies®, Inc., Chesterfield, Missouri. Dan Swidrak, now with Independent Concrete Pipe, was the on-site Project Engineer for Affholder. He said the polymer concrete had several advantages over traditional concrete.

"Because the composite pipe was ready to install upon arrival, it took weeks off the time for installation," said Swidrak. "With conventional concrete, additional time would have been needed to pour the material in place, wait for it to cure, clean and prepare the surface, then apply a protective epoxy liner."

Swidrak also pointed out the durability and performance benefits of composite. "A protective liner requires regular inspection and maintenance," he said. "If the liner surface is abraded or nicked, the concrete is exposed to corrosive sewer gases. With composite, the protection against corrosion is inherent throughout the entire structure."

Each sewer interceptor shaft was installed by stacking cylindrical composite riser sections up from the composite floors. Joints between sections were accomplished using steel end ring joints that U.S. Composite Pipe integrally manufactured into the structure. These special joint rings adhere to American Water Works Association (AWWA) C-302 standards for air and water tightness and were tested to 50 psi (3.5 bar).

Casting procedures for both conventional and polymer concrete are similar. U.S. Composite Pipe components are manufactured by first placing a steel reinforcement cage into a formwork. Like conventional pipe, the steel reinforcing gives the finished product the ability to handle severe loading. The polymer concrete is then vertically cast into the formwork and vibrated for optimal compaction.

Instead of making its pipe with a traditional cementitous material, U.S. Composite Pipe uses a special resin, filler, aggregate and additive mixture licensed from PPT, LLC, Des Moines, Iowa.

The section is lowered into the shaft.

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The polymer formulation specifies a Vipel resin that, when compared to cementious binder, provides improved compressive, tensile, shear, bonding and flexural properties.

Another advantage to using high performance building materials is the ability to reduce the overall weight of the structure by using thinner wall sections. Since polymer concrete has nearly the same unit weight as Portland cement concrete, this reduction in wall thickness can significantly lower the total weight of the structure.
Lower weight can lower the overall cost of the finished product, the cost of shipping it to the job site, and the cost of a larger crane.

The average depth of a completed shaft was 80 vertical feet.

Eric H. Davidson, P.E., Vice President of U.S. Composite Pipe said, "We took the original design from B&V and were able to reduce the wall thickness by forty percent or more through our own U.S. Composite Pipe in house engineering".

According to Davidson, the Vipel resin technology comes with excellent technical support. "We are part of a company that has more than 20 years experience making pipe with conventional concrete," Davidson said. "When we started developing composite materials, AOC representatives were on hand to check our gel times and see how the resin was cooking off. Now we have a formulation that, with the help of AOC resin consistency, we just 'dial in' to make polymer concrete."

About U.S. Composite Pipe
Located south of Ft. Worth, Texas, U.S. Composite Pipe, Inc. is part of Thompson family-owned KTI, Inc., which has been providing quality products and service to the construction industry for more than 30 years. In addition to sewer interceptor structures, U.S. Composite Pipe products include pump stations, manholes, microtunnel and jacking pipe, tunnel segments, direct bury pipe and custom structures. For more information, contact Eric H. Davidson, P.E. by phoning (817) 783-3444, e-mailing edavidson@kticp.com or go to www.uscompositepipe.com.

About AOC
AOC is a leading global supplier of resins, gel coats, colorants, additives and synergistic systems for composites and cast polymers. AOC knows technology, lives quality and delivers service better than any other supplier. For more information, e-mail corrosionresins@aoc-resins.com, phone (901) 854-2800 or go to www.CorrosionResins.com or AOC-RESINS.com.

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AOC®
World Leader in Resin Technology
955 Highway 57 East
Collierville, TN 38017
Toll Free: (866) 319-8827
www.aoc-resins.com