City of Marshfield, Wisconsin Storm Water Renovation Concrete Pipe Project



Reinforced Concrete Pipe: A Durable Choice for Long Term Value in Storm Sewer Applications

Why the City of Marshfield Chose to Replace Concrete with Concrete

In the spring of 2015, the City of Marshfield, WI began an extensive street reconstruction program in the heart of downtown. The \$2.9 million project, awarded to Earth, Inc. of Arpin, Wisconsin, includes pavement, streetscaping and utility improvements to six blocks of Maple Street and adjacent streets between 6th St. and Veteran's Parkway.

In preparation and design of the project, underground utilities were inspected to assess their condition and need for replacement. This effort included assessing 3,100 feet of precast concrete storm sewer. The 85-year-old concrete pipe bearing the manufacturer's stamp "WausaW29" was determined to have been manufactured by Wausau Concrete Co in 1929. That plant is now owned and operated by County Materials Corporation after acquisition in 1986. In spite of its structurally sound and functioning condition, it was decided to remove and replace the existing 1929 storm system with new reinforced concrete pipe (RCP) manufactured by County Materials.

Old pipe proves its mettle

"It was a tough call to replace the pipe," reports Tim Cassidy PE, Assistant City Engineer for the City of Marshfield. "The condition of the pipe itself was excellent. We ran our camera through it; looking at it internally there were no structural defects. In older pipe the joints are a bit different (than modern pipe) but they weren't cracked or falling apart. (The concrete) showed no sign of deterioration due to salts or deicing chemicals. (The pipe) definitely withstood the test of time."

In fact, the old concrete pipe sections were in such good shape that efforts have been made to request them in other projects. Some of

to re-use them in other projects. Some of the pieces have already been sold to local property owners for use as culverts. The City has also considered reusing some of the remaining pipe sections for other municipal projects as well.



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A decision based on sound design principles

Ultimately, the City of Marshfield's decision to replace the old pipe was based largely on the need to accommodate design changes to the new storm sewer system and other concerns not related to the condition of the concrete pipe. Some of these considerations include:

• Improvements in roadbed depth.

The design team was concerned that the original pipe had been installed at a shallower depth than is usual for modern construction. Marshfield's clay soils, especially, have the potential to cause heaving when pipe is not buried deeply enough. Even though this problem had not come up on Maple Street in the past, there was concern that the thickness of the new, crushed rock subgrade would be reduced where the old, shallow pipe passed under the roadway. Increasing the depth of cover over the storm sewer system assured the full thickness of subgrade under all areas of the new pavement.

• Reinforcement concerns. While the 1929 storm pipe did contain steel reinforcement, it was not as heavy as that used in today's concrete pipe. This, combined with the shallow depth of the old pipe and the reduced rock base cross-section, created concerns about it being damaged during construction if left in place.

• **Improved pipe size.** The original precast concrete storm sewer system ranged in size from 42-inch to 24-inch diameter. The City chose to redesign the system with larger, elliptical precast concrete pipe measuring 38"x60". This larger hydraulic capacity will provide more effective storm water drainage and help prevent flooding issues during heavy runoff events. Also, the reduced height of the elliptical pipe provides increased cover over the pipe.

• Planning for maximum longevity. The U.S. Army Corps of Engineers suggests a design life of 70-100 years for precast concrete pipe. At 85 years in service, the old storm sewer pipe was nearing this suggested limit. Many concrete pipes have been documented to remain sound for far longer than 100 years. While these 85 year old pipes would very likely have lasted for at least another 50 years, the City of Marshfield decided to err on the side of caution by replacing them.

Choosing Concrete

Despite the availability of other options, the City of Marshfield never considered anything other than precast concrete pipe for their replacement storm sewer system. Long-term value was a priority for them, and reinforced concrete's superior durability and structural integrity made it the ideal product for this project. The excellent condition of the existing pipe only

served to illustrate the economic advantage of this material when lifecycle performance is taken into account.

Concrete is the most durable pipe material currently in use. In contrast, the U.S. Army Corps of Engineers suggests the designer should not expect a material service life greater then 50 years for any plastic pipe. They have also recommended a maximum 50 year service life for aluminum pipe as well as corrugated metal with the use of coatings. Thus one can expect concrete pipe to last 1 1/2 to 2 times longer than alternate materials such as HDPE, PVC, and polypropylene. Precast concrete pipe is also non-flammable, will not rust, tear, buckle, or deflect.

Shortly after the old storm drain was removed, County Materials delivered 3,070 linear feet of new

reinforced concrete pipe (RCP) to replace it. The delivery included 716' of 38"x60" horizontal elliptical pipe and 1290' of RCP ranging in size from 18" to 36" for the new storm sewer mainline under Maple Street, and 1,064' of 12" and 15" RCP for the inlet leads.

"We prefer precast," says Cassidy. "With other pipe options, we could not have put as much road base in. We know that the concrete will hold up and that's our preferred material for storm sewers."





Milwaukee, Wisconsin Zoo Interchange Concrete Pipe Project



Largest Transportation Project in Wisconsin History Goes with Concrete Pipe

The Zoo Interchange in Milwaukee is a freeway Interchange on the west side of the city, southeast of the 200 acre Milwaukee County Zoo. It was built in 1963, as one of the first Interstate Highway projects in Wisconsin. Forming the junction of I-94, I-894, and US 45, it is the busiest interchange in the state. Deteriorated structures of the interchange, obsolete design of the roadway and bridges, current and future capacity needs, and high crash rates, prompted the Wisconsin Department of Transportation (WisDOT) to redesign and reconstruct the interchange to increase efficiency, reduce accidents and add capacity. Reconstruction of the interchange required 57,000 feet (over 10 miles) of reinforced concrete pipe storm sewer.

The first three years of the project were focused on upgrading the arterial streets to handle additional traffic generated by closures on the interstate when work began on the Interchange itself in late 2014. In addition to the new storm sewers, the project included contracts for 21 bridges, 30 walls, 11 noise barriers, concrete pavement, 20 million lbs of structural steel, steel tub flyover bridges with stainless steel concrete deck reinforcement, pre-stressed concrete girder bridges, earthwork, structure and pavement demolition, intelligent transportation systems, large diameter drilled shafts, MSE walls with precast panels, utility relocations and pile supported foundations. The current project is valued at nearly \$200 million.

Completion Deadline of Tunneled Storm Sewer one of Many Challenges

The main challenge faced by contractors was the aggressive schedule, combined with the uncertainty of harsh weather conditions. WisDOT scheduled completion of the Interchange structures before December 2015. The Phase

1 core contract running through December, 2016 requires the Blue Mound Road Bridge over Highway 45 to be demolished and rebuilt before Memorial Day 2015. A massive new pumping station must be installed by



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Milwaukee, Wisconsin Zoo Interchange Concrete Pipe Project

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the end of May 2015, and a 60-inch storm sewer must be tunneled underneath the interchange.

County Materials Corporation supplied a wide range of reinforced concrete pipe ranging in size from 12-inch to 96-inch diameter in Classes III to V. In addition, there was nearly 600 feet of Class HE III 58-inch x 91-inch and 77-inch x 121-inch horizontal elliptical pipe along with nearly 1000 structures including inlets, catch basins and manholes ranging in diameter from 3-foot to 12-foot. County Materials shipped the concrete pipe and structures from the company's various locations throughout Wisconsin.

Concrete Pipe at the Core of this Major Transportation Link

The Zoo Interchange is a major transportation link in Wisconsin, and a significant component of America's Interstate Highway network. The core materials for the interchange are concrete and steel. It is designed to be a resilient asset for the city and state for generations. Large quantities of reinforced concrete storm sewer pipelines and culverts are critical infrastructure that will function as long as the design life of the intersection. The ability for designers to specify different classes of standard engineered pipe with varying strengths and shapes to save costs of installation, while accommodating earth and live loads of traffic, suggests that WisDOT has strong specification guidelines and rules that support good engineering practices.







CORPORATION

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Milwaukee, Wisconsin Sanitary Sewer Interceptor Concrete Pipe Project



Photo: Courtesy of Ruekert & Mielke – civil engineering

Concrete Pipe Resiliency Acknowledged for Vital Sanitary Sewer Interceptor

Concrete pipe has long been acknowledged as the premier product of choice for countless sanitary sewer projects, providing resilient infrastructure through engineered strength and durability. County Materials Corporation is supplying over 29,000 feet of 24 to 48-inch diam-



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eter precast concrete sanitary sewer and jacking pipe for a major interceptor in the Milwaukee Metropolitan Sewerage District.

Sewage was projected to be present in the interceptor for long transient times. To keep the interceptor in service for 75 to 100 years, the designation of interceptor materials was very important to eliminate corrosion as much as possible. It was decided that the interceptor pipe materials be limited to those that would resist corrosion by sulfuric acid formed by hydrogen sulfide buildup, while providing a sewer system capable of maintaining structural integrity at the required depths of 30-45 feet. For these reasons, PVC-lined reinforced concrete pipe and fiberglass reinforced polymer mortar pipe were selected. In addition, precast concrete manholes with field applied epoxy-coated interiors were specified.

Strength, service life, corrosion resistance and joint performance were the major considerations in the design of the interceptor. With depths reaching up to 45 feet, and portions of the project requiring tunneling under wetlands, Ruekert & Mielke, civil engineers for the project, selected precast concrete pipe as the clear material of choice. From the vertical overburden depth to the axial load of jacked-pipe tunneling, concrete pipe provides the flexibility of design to meet specific load requirements.

The interceptor project runs approximately 6 miles from Muskego to the Milwaukee Metropolitan Sewerage District (MMSD) interceptor at 60th street in Milwaukee. **For more information call (800) 289-2569**

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Milwaukee, Wisconsin Sanitary Sewer Interceptor Concrete Pipe Project

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Ruekert & Mielke awarded contracts to three local contractors who chose County Materials Corporation to supply T-Lock lined concrete pipe. The T-Lock lined concrete pipe incorporates a PVC inner liner during the manufacturing process. Fully anchored into the concrete prior to curing, the liner and pipe perform as a single product to resist both load and corrosion. Project-specific strength designs were individually engineered to support the variety of loads on the various sections of the sewer. To assure that the interceptor would be able to serve the entire service area by gravity, it was necessary to complete the preliminary design of more than 81,000 feet of local sewers (12 inch and greater in diameter) to determine the required invert elevations of the interceptor sewer.

Crews utilized open cut, jacking with tunnel boring machine, jacking with hand mining, hand mining with timber sets, auger boring and microtunneling to install the sewer system. These different methods were necessary given the varying conditions and topography found in the project corridor. In addition to the placement of 29,000 feet of gravity sewer, the project included 2,000 feet of microtunneling, four stream crossings, numerous wetland crossings, wetland mitigation, acquisition of forty-five easements, public participation with multiple communities, local, state, county and federal permitting, four extensive intermunicipal agreements and a Clean Water Fund financing plan.



Photo: Courtesy of Ruekert & Mielke - civil engineering





Wazee Pipe Project, Black River Falls, Wisconsin Concrete Pipe Project



County Materials Manufactures Storm Drain Pipe for New Ho-Chunk Nation Subdivision

County Materials Corporation was the supplier of concrete storm drain pipe installed on the Ho-Chunk Nation reservation in the Wazee area near Black River Falls, WI. The site is the future home of a new subdivision the tribe plans to build in the area. Round reinforced concrete pipe was selected as the most economical and reliable choice for the drainage project because it boasts an impressive record of long service life and minimal maintenance.





NCRETE

The contractor, A-1 Excavating of Bloomer, WI, installed 14,640 lineal feet of Class III round reinforced concrete pipe with a 6-man crew. Pipe sizes ranged from 18" to

54" in diameter. Storm lateral leads were included in the installation.

Sewer and water infrastructure already existed on the site, having been installed earlier by another contractor. A-1's crew ran into a minor challenge when it came to integrating the storm drain system. The existing water main had to be lowered in two spots to make room for the storm drain. In one location, it was dropped 24" and in the other, 18".

Another change of plan involved a manhole changeover. The original bid called for three 10' manholes. However, in order to accommodate the angles and sizes of pipe used, one

of the manholes was changed out for a 12' diameter unit. Larger equipment was subsequently needed in order to install the larger manhole.

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Wazee Pipe Project, Black River Falls, Wisconsin Concrete Pipe Project

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Project manager Charlie Storing expressed satisfaction with County Materials' product and service. "The material, shipment and delivery went smoothly. They kept ahead of us," he reported.

The storm drain portion of the project commenced in mid-October of 2015. All pipe was in the ground by December 1, 2015. Road construction is scheduled to begin in the spring of 2016.













S. Jackson Rd., Sarasota County, Florida Concrete Pipe Project



Reinforced Concrete Pipe Material of Choice for Tough Florida Soil Conditions

A rainy spell in July, 2015 proved too much for a 40+ year old corrugated metal pipe culvert located on S. Jackson Rd in Sarasota County, FL. The pipe's connection to an adjacent concrete headwall decayed, causing the pipe to pull away from the headwall. The gap allowed sediment to enter the interior of the pipe and resulted in flooding sufficient to wash away part of the road, requiring road closure and emergency repair.





Jackson Road connects two major arterial roadways, Venice Avenue and Center Road. It provides direct access to the Venetian Falls community as well as

Sarasota County's Solid Waste Facility and a major employer in the area. It also serves as an alternative to two major thoroughfares for residents of local communities.

The \$240,000 repair project on Jackson Road included replacing both concrete headwalls, replacing the pipe system, and elongating the pipe to allow for a wider roadway section. County Materials' plant in Astatula, FL, supplied 58"x91" elliptical reinforced concrete pipe (RCP) to replace the original 54"x60" metal pipe. Three sections of 48" RCP were also supplied to connect the pipe to the existing structure. The increase in capacity, along with the superior durability of RCP, are expected to prevent future flooding issues in the area.

The U.S. Army Corps of Engineers lists the life expectancy of concrete pipe at

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S. Jackson Rd., Sarasota County , Florida Concrete Pipe Project

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75 to 100 years. It is not uncommon for RCP to continue providing safe and satisfactory service well past the 100 year mark. By choosing RCP to replace the failed metal drainage pipe on this project, Sarasota County is hoping to avoid having to take reactive emergency action in the future. "Reinforced concrete pipe was chosen based on its projected lifespan in the acidic, saline soil conditions that exist in the area; corrugated metal pipe was not considered an option," commented Sarasota County Storm Water Engineering & Operations Manager Ben Quartermaine, P.E., adding that they are now aggressively monitoring and rehabilitating corrugated metal pipe all over the County to avert this same type of failure.

Traffic was immediately re-routed after the Jackson Road failure the last week in July 2015. County officials determined that any traffic on the busy county road caused an unsafe environment both for residents and the contractor. The roadway was kept closed for the remainder of the construction project, primarily as a safety precaution. Jackson Rd. was reopened to traffic during the last week in September following the successful RCP installation.











City of Greenacres, Florida Storm Drain Project Concrete Pipe Project



County Materials Delivers Value for Raulerson Drive Storm Drain Project

The heat and water conditions in south Florida are tough on metal pipe. As a result, many Florida communities are phasing out metal storm drains. Despite its lower upfront cost, metal pipe typically only lasts 20-25 years, one quarter the life span of reinforced concrete pipe.

A Palm Beach County Road and Bridge Division project in the City of Greenacres, FL, is a case in point. The metal storm drain pipe which channeled canal water from one side of Raulerson Drive to the other was showing signs of corrosion. It was replaced with 60" Class 3 reinforced concrete pipe (RCP) supplied by County Materials in Astatula, Fla.

Handling Surprises Without Delay

It started off as a straightforward project. County Materials coordinated with the contractor, DS Eakens, to deliver 80 linear feet of 60 inch RCP to the jobsite in mid June. However, it soon became apparent that this would not be enough pipe.

"The county didn't know that there was another line tied into the old line," reports project manager Ron Rossi. "There was no record of it. We now had to put in a box intersection and needed three pieces of 42 inch pipe to tie into the crossing."

The next day, DS Eakens added an additional 40 linear ft of 42 inch pipe to the order. County Materials' team kept delays to a minimum by delivering the additional material to the job site only two days later.

County Materials' in-house dispatch team is credited for the speedy response, verses competitors who outsource their dispatch. "We have a vested interest in providing great service," explains County Materials' sales rep Rick Bolinger. "Our team follows up, calls the customer, gives good info on lead time, and does what we say we're going to do."

Delivering Lasting Value

Along with a smooth delivery experience, customers also appreciate overall value.

Referring to County Materials' pipe, Rossi says, "It's the best we've seen. Our people like the

self-lubing gasket. (County Materials') quality sets the standard that we've seen so far. We're more than 100 miles away and for them to quote a competitive price and deliver such a good product is pretty amazing."



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Hernando County, FL Highway Improvement Project Concrete Pipe Project



County Materials Delivers Through the Night for Hernando County, FL Project

In spring of 2015, the Florida Department of Transportation began the SR93 highway improvement project located on I-75 in Hernando County, FL. The project involved milling and resurfacing of the highway along with infrastructure improvements, including installing 2,208 lineal feet of 8"-48" round reinforced concrete pipe (RCP) manufactured by County Materials in Astatula, Fla.

The project's contractor was Middlesex Corporation. Delivery and unloading of the pipe presented them with a specific challenge for this project. Near Brooksville, the highway runs very close to a large body of water. It was necessary to install most of the RCP in that section. But with no room on the shoulder to unload the pipe, a lane closure was necessary in order to allow County Materials' trucks to park and be unloaded.

Because this section of highway services heavy commuter traffic, the DOT required it to remain open during daytime hours. As a result, the RCP deliveries were scheduled to take place overnight. An additional complication arose because the contractor's lane closure crew was only available on this project for five nights. It required a collaborative effort to coordinate the pipe deliveries and unloading in the time allotted.

In all, County Materials delivered 31 truckloads of RCP over the course of five nights. Six to eight truckloads arrived each night. The first trucks began unloading at 9:30 P.M. sharp,

shortly after the crew closed the lane for the night. Deliveries continued like clockwork until 4:00 A.M. Each day, the last pipe was unloaded in time for the truck to be off the road by 5 A.M., so that the lane could open again at 6:00 for early morning rush hour.



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ONE DAYTONA Development , Daytona Beach, Florida Box Culvert Project

ONE DAYTONA turns to County Materials Corporation for storm water management solution

When you think Daytona Beach, you think speed. So when the International Speedway Corporation (NASDAQ Global Select Market: ISCA; OTC Bulletin Board: ISCB) ("ISC") moved forward with a plan to build a premier mixed-use entertainment destination across from its Daytona International Speedway, engineers needed a state-of-the-art storm water management plan to carry out its design in the most efficient way possible. ISC's leading national developer Legacy Development turned to County Materials Corporation to supply its newly designed box culverts to get the conveyance job done fast and done right.

With over 300,000 square feet and a projected investment of approximately \$120 - \$150 million, the ISC's high profile ONE DAYTONA development required a leading-edge concrete drainage solution for its storm water conveyance from one overflow control pond to another. The central engineering issue involved hydraulic design and material selection due to the



terrain's natural elevations. The available hydraulic grade forced the engineering team to look for pipe geometries that could fit this terrain.

To address these specifications, County Materials supplied a new type of box culvert to meet the hydraulic design demand. The performance of these single-pipe box culverts was a natural fit for ONE DAYTONA. Project engineers were drawn to using County Materials' design since it no longer required the use of double 54-inch pipes, as would be the case with a standard culvert. The intuitive model allowed workers to overcome this engineering issue and provided a much cleaner installation. Planners commented County Materials' box culverts streamlined the large-scale project. According to the lead project engineer, this conveyance project presented "[an] engineering issue we could overcome using County Materials' box culverts. [It was] much easier and cleaner to install one pipe as opposed to two. [It] made the project more efficient."

County Materials' Astatula, Florida location began manufacturing these box culverts this year to expand their product line for storm water management. The four-sided culverts were designed to provide an alternative to installations where circular or elliptical concrete pipes cannot provide adequate flow capacity. For the ONE DAYTONA development, the company manufactured 153 sections of 6 ft. by 5 ft. precast concrete boxes. Round pipes could not have been installed with the aforementioned limitations and still meet the required hydraulic conductivity therefore County Materials' culverts provided the perfect solution. While the ONE DAYTONA project utilized the box culverts for storm water conveyance, additional application options include highway and railroad culverts, short span highway bridges, livestock, pedestrian or golf cart under crossings, utility tunnels, groundwater recharge systems, and jacked or tunneled installations.

In the case of the large scale ONE DAYTONA project, the practical application of single-pipe box

culverts led engineers to County Materials' solution. Always at the forefront of concrete product technology, County Materials Corporation's design met the needs of an advanced hydraulic design challenge to keep the ISC's development right on track.



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County Materials Radius Pipe Offers Quality, Convenience, and Value to St. Louis, MO Metropolitan Sewer District Project

The St. Louis, MO Metropolitan Sewer District (MSD) is the 4th largest sewer district in the U.S. They have embarked on a long term, \$4.5 billion, 20-year sanitary sewer infrastructure improvement plan in the St. Louis community, entitled Project Clear. One phase of the project is to replace a sanitary sewer line in the Maryland Heights area of St. Louis County. County Materials Corporation was able to meet the rigorous MSD specifications for one aspect of this project with a cost-competitive product that also greatly reduced installation time.

This area of Maryland Heights, MO is heavily industrialized, with heavy traffic and multiple railway spurs. The project called for 4400 lineal feet of new pipe varying in sizes from 8 - 42", and rehabilitation of 240 lineal ft of existing sewer pipe in the area. Some of the pipe had to be laid under railroad tracks, requiring an installation depth of up to 17 feet. In addition, a portion of the pipe was required to be radius (curved) pipe, in order to meet a MSD requirement that the sewer line stay within road easements. County Materials supplied a total of 712 ft. of 42" class 4 reinforced concrete pipe (RCP), including 504 ft. of straight pipe and 208 ft. (26 pieces) of specially manufactured radius RCP for the open cut portion of the job.

Most radius RCP is manufactured to have an angle in the body of each piece. For this project's radius pipe, County Materials offered an alternative solution. Rather than bending the pipe itself, the desired angle was achieved by cocking the spigot (male end) of the pipe, in this case to 3.5 degrees. It also allows the pipe to remain intact, offering greater durability, as well as peace of mind when used in a sanitary project where leakage is especially undesirable. Finally, it installed quickly and easily.

The radius RCP was manufactured at County Materials' Springfield, IL plant using a modified header. This header can be shifted up to 7 degrees to allow manufacture of various angles of pipe. County Materials' Springfield drafting department calculated the correct angle through a combination of field measurements and CAD layouts, and by working closely with MSD and Fred M. Luth & Sons, the contractor for this project.

Delivery and installation of the radius pipe went smoothly. Even a last minute call at 6:30 on a Monday morning requesting same-day delivery on a load that had been scheduled for the next

day was handled efficiently by the County Materials team. MSD is notoriously stringent about job quality. Each pipe joint was air tested as it was laid. The requirement was to hold air at 5 psi for a 10 second test. Testing revealed that all the pipe and angled spigot joints sealed perfectly. The pipe installer stated that it was the easiest-installing radius pipe they had yet experienced.



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