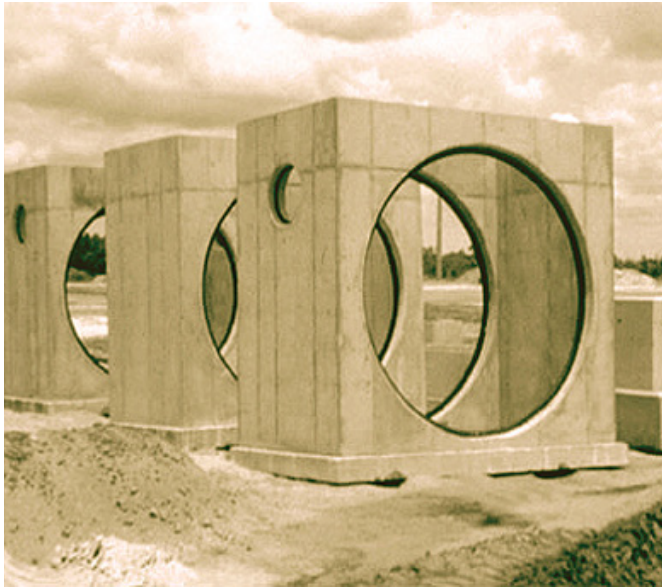


PRECAST CONCRETE MANHOLE STORMWATER GASKETS



Watertight pipe and structures have historically been considered critical elements with sanitary systems. However, issues of construction, maintenance, roadway safety and stream and groundwater contamination have raised awareness of the need for similar watertight connections for stormwater systems.

Federal, state and municipal agencies, contractors, pipe and precast concrete producers, and design engineers all want watertight storm drainage systems. The reasons may vary, but their overall goal is the same. That's why stormwater gaskets are considered a critical component of any system that deploys precast concrete manholes.

What are Exfiltration and Infiltration?

Exfiltration occurs when leaking joints allow water flowing from the pipe into the structure to leak into the supporting material. Minor leakage may not be a significant problem unless soils are quite erosive.

Infiltration is the opposite of exfiltration. When the water

table is higher than the pipe invert, water may seep into the structure between storms. Infiltration can also occur during flood events by suction from pressure differentials between the soil and the pipe.

What are the Consequences of Excessive Exfiltration and Infiltration?

When a joint permits the infiltration of water into the structure or pipeline, it carries soil particles with it. The loss of the soil fines around a structure undermines its integrity and will eventually result in a pavement settlement or pipeline collapse.

Another result of infiltration is the drainage of the groundwater or surrounding surface water. When located near or through a wetland, they will, over time, drain the entire wetland and destroy the sensitive ecology of the area.



Excessive leaking can lead to pavement collapse when the integrity of the soil is compromised.



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Infiltration and Exfiltration Can Cause Contamination

When stormwater conveyance systems are in an area with contaminated soils, industrial complexes or farms, pollution-laden waters can infiltrate into a system that is not watertight. Once in the system, these contaminants blend with pollutants from other parts of the storm system. When a storm event occurs, these contaminants can have significant impacts to the receiving body of water.

When exfiltration occurs, the stormwater conveyance system contributes to the contamination of the groundwater. Pollutants can leach out of the stormwater conveyance system and contaminate the groundwater that is below the pipe invert.

Surface drainage pollutants entering the system from

catch basins far upstream may also contaminate an area's groundwater in this same manner.

ASTM C 969, "Standard Practice for Infiltration and Exfiltration Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines," currently allows an infiltration or exfiltration leakage rate of 200 gallons per inch of internal diameter per mile (18.5 liters per millimeter of internal diameter per kilometer) of sewer over 24 hours.

If we apply this rate to a 3,000 foot run of 60-inch diameter concrete storm sewer pipe, the rate of contamination would be 6,750 gallons per day. In three days, this would be enough to fill an average swimming pool.



Brick and mortar connections are labor-intensive, dependent on the weather and can't be backfilled until the mortar cures.



Flexible rubber gaskets quickly conform to the shape of the opening, creating a watertight seal. They are not dependent on weather and the site can be backfilled immediately.

Advantages of Watertight Connections

Gasketed connections have grown in popularity, because they are relatively easy to install, create a watertight seal and last for a long time. Here are some other advantages over the brick-and-mortar connections:

- **Reduced cost/Fixed cost:** Costs of precast concrete structures are simple to estimate. It is difficult to estimate how much brick or mortar will be needed, and how much labor will be involved.
- **No Repair Costs:** Some brick and mortar connections can fail within a few years. Stopping a leak can be expensive, but repairing a sheared pipe or fixing a pavement cave-in can be very expensive. A typical pavement failure due to subsidence can cost several thousand dollars to repair, plus there's an added factor of danger and traffic disruption. Larger failures can be substantially more expensive.
- **Quicker Installation:** With flexible connectors,

installation becomes easier and faster. Plus, you don't have to wait for mortar to dry before backfilling.

- **Less dependency on field conditions:** When using flexible connectors, there is less dependency on field conditions and construction methods. Sometimes the soil material around the structure will shift or settle. With a tightly grouted connection, there is additional risk of cracking the structure or the pipe. Shifting or settling could cause the mortar to crack and would compromise the watertight seal.

APPLICABLE SPECIFICATIONS

- C 923, "Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals"
- C 1478, "Standard Specification for Storm Drain Resilient Connectors Between Reinforced Concrete Storm Sewer Structures, Pipes and Laterals"

CASE STUDY



Watertight Connectors Keep the Contaminants Out

New Jersey stormwater project proves how “flexible” watertight connectors can be.

Installing new storm sewers in an industrial area where ground contaminants are rampant is major undertaking. Not only do you have to worry about creating watertight seals to keep the water in the pipes, but you also have to focus on keeping those outside contaminants away from the stormwater traveling through the pipes. Facing that challenge recently, the New Jersey Department of Transportation (NJDOT) turned to flexible, watertight connectors as a viable solution. Located on Doremus Avenue in Newark, the road-widening project required new trunk lines, new water lines, and the replacement of about 1,800 feet of deteriorated storm sewer lines. The main trunk line comprised 15-inch through 60-inch pipe with smooth adapters that fit into the flexible connectors. Specified by NJDOT, 450 connectors were used on 90 percent of the joints.

Making the project particularly challenging, says Hong Sun, highway design manager for global engineering firm The Louis Berger Group in East Orange, N.J., was a high groundwater level and surrounding soil, much of which was contaminated with petroleum and lead deposits.

“The majority of drainage was below ground level, and surrounded by contaminated soil,” said Sun, whose company designed and engineered the project. “Making it even trickier is the fact that the system discharges into the Passaic River, so we had to make sure that no contaminate whatsoever found its way into the drain.” Sun, who has used flexible connectors on previous projects, says the DOT was particularly concerned about getting the pipe joints and connections “as tight as possible,” a requirement that the watertight connectors were able to fulfill with ease.

Carbro Construction of Hillsborough, N.J., installed the pipe and manholes. Tom Tamashullo, supervisor for the construction firm, said the connectors solved the predicament of keeping

water from infiltrating the storm sewer system. Pino Carlomagno, vice president of Carbro Constructors, added that the fact that lead was found in the surrounding soil made the watertight connections that much more critical. “NJDOT was more worried about those contaminants getting into the pipe and eventually into the river, than it was about keeping the system itself watertight,” Carlomagno said. “It was a highly industrial area with a high level of ground contaminants to worry about.”

For Jerry Donahue of Atlantic Concrete Products, Tullytown, Pa., a watertight connection was vital because stormwater ends up in drinking water and inevitably back in the nation’s rivers, lakes, and streams. The aquifer can be highly affected by any contaminants that make their way into a system like NJDOT’s Doremus Ave. project, he said. “They don’t want any of that getting into the storm drain systems for obvious reasons,” Donahue said. So far, he added, the connectors have performed as expected, with all connections serving their purpose by staying secure and watertight. “If the connections weren’t watertight, the pollutants would find their way into the system when it rained,” he said. “There’s also no danger of mortar grout cracking from vibrations or human error during installation.”

Tamashullo added that the flexible rubber connectors also helped the contractor save on labor costs, which would have been required to brick up and mortar joints in the field. Though some unexpected alterations had to be made while working on the project (due to existing utility lines and other unforeseen challenges), Tamashullo said his crew simply repositioned the pipe, aligned it, backfilled it and moved on. “Bricking and cementing-up a connection is time consuming and labor-intensive,” he said. “Once you put the pipe into the flexible connector, it’s done – you don’t have to touch it.”