field of DRAINS

By Steve Cooper

The new CitiField built for the New York Mets has a state-of-the-art playing field that actually floats. An integral part of the field is the new water drainage system that can help nurture the grass for better root growth, even early in the playing season. Because of the flexibility of the field, the drainage system needed to be designed so that it would move with the field. For this reason, high-density polyethylene (HDPE) pipe was selected due to its ability to flex and maintain joints. Sections of the pipe are perforated to allow water from the field to enter and to be drained.

HDPE pipe system protects stadium's grass, provides needed flex

CitiField, the new home of the New York Mets, has an underground network of corrugated HDPE pipe that allows the groundskeeper to remove standing water or force air into the root system of the natural grass field.

Built on reclaimed marshland at Willets Point just south of LaGuardia Airport, the stadium is on piles embedded into the bedrock. The field, however, was designed to be independent of the stadium to accommodate future, if any, settling.

The open-air stadium features natural grass and has a design that is reminiscent of legacy ballparks such as New York's famed Ebbets Field. Underneath the field is a network of HDPE pipe that enables the groundskeeper to create a vacuum to remove standing water or force cool or warm air into the root system of the natural grass. To ensure literally greener pastures, the field counts on corrugated HDPE pipe from Advanced Drainage Systems, Inc. (ADS).

The Installation

The pipe pattern is set up like an underground tree. A 30-in.-diameter pipe runs under the field from behind home plate to the warning track. This 430-ft run of ADS N-12 WT pipe has watertight bell and spigot connections between sections. Connected to this trunk line are 6-in.-diameter lateral branches—42 lines on each side, 10 ft apart. The HDPE pipe is perforated on the top to allow water to infiltrate and also will provide a means for air exchange in the turf. The project used 560 ft of 30-in.-diameter perforated pipe, 11,600 ft of 6-in.-diameter perforated pipe and 240 ft of 6-in. solid wall HDPE pipe from ADS.

Installation of the field, drainage system and turf was done by the LandTek Group, Amityville, N.Y. John Sulinski headed up the project. LandTek was responsible for all of the field construction, including the drainage system, the subgrade for the field, laser grading clay, sod and the warning track.

"The goal was twofold," Sulinski said. "First was to effectively drain the field, and the second was to aid in the growth and integrity of the natural grass turf. The system can blow warm air up through the root system of the grass. This three- to four-degree boost actually can help green the turf and is a key part of starting the grass to grow in the early spring in the northeast."

Sulinski and his 15-man crew started as soon as the foundation for the field was ready. Installing the 30-in.-diameter trunk line first, a trench was dug 5 ft deep and 22 sections of the ADS corrugated pipe were put together.

"For our crew, there is nothing better than the ADS pipe," he said. "It is rugged and can be easily handled because it is made from HDPE. Connection of the 42 lateral lines was very unique because the custom-made saddle tees had to set into each of the 30-in.-diameter pipe sections. It took about 20 days to do the installation."

Pipe Details

The ADS N-12 pipe has a smooth inner wall to provide optimum hydraulic flow. Its structural strength from a corrugated outside will support H-25 live loads with 12 in. of minimum cover for these pipe diameters. Sections are joined together using the pipe's watertight integral bell and spigot with a factory-installed gasket; the pipe requires no extra couplers to install. The joint meets or exceeds the ASTM 3212 lab test and ASTM F2487 infiltration/exfiltration field test.

The N-12 pipe was designed for culverts, storm sewers, highways, airports and other civil design construction. ADS pipe is available in diameters from 3 in. to 60 in. The product used for this project, ADS N-12 WT IB, includes a pressure-tested coupler that provides a watertight connection, meeting a full 10.8 psi in accordance with ASTM D3212.

Trench Lining

An ADS 4-oz woven geotextile fabric lines the trench. This fabric lays on the subgrade, drops down to the bottom of the trench, comes back up the wall and lays on the subgrade on the other side of the trench. Consistent throughout the field, the trenches are on 10-ft centers.

"We don't believe in wrapping the fabric around the pipe itself," Sulinski said. "The fines on the stone would clog the geotextile on top in no time, especially with the water movement that you have through the profile."

To solve this problem, LandTek used a natural soil-bridging criteria for the fabric that allows for rapid water filtration.

"We use this method all the time in natural grass construction," Sulinski said. "We measure the size of the particles and their cohesive properties. So, for example, the sand we put on top had to have a bridging criteria greater than the stone on the bottom. This means the sand mix would stay fully suspended on top of the stone, which would not allow the fines to migrate through the stone and into the pipe—a very critical aspect of the job. If the components of the bridging criteria weren't formulated in the proper ratio or particle size, what you'd have, obviously, is settlement over time. You'd wash the

fines though the stone product into the perforations on the ADS pipe and out, exiting the stadium."

Finding Fittings

It is not only the composition of the field and drainage system that makes CitiField rank at the top of the new stadium category. The stadium is built on piles, and the field is designed to "float" within the stadium. The area was a swamp called the Meadows and filled in with ash. It still has a very high water table.

"When they built CitiField, they had to come up with a design that would enable the field to float independently of the structure," Sulinski said. "Naturally, the design for any drainage system is at a predetermined elevation with a percentage of slope. But here, the field is designed to move. Therefore, the drainage system underneath also has be able to move in order to maintain that gradient for the water to travel."

"We had to come up with some very key fittings that were designed and custom made from corrugated HDPE pipe to a cast iron fitting that would be strong enough to hold the cast iron double-ball joint. There was a lot of engineering work to come up with a fitting that would actually work."

To hook up the pipe sections and enable the entire 2.5-acre system to move, LandTek used 24- and 30-in.-diameter FLEX-TEND flexible expansion joints fitting. These have double-ball joints and are connected at key locations to cast iron pipe to protect the pipeline from stress produced by ground motion (e.g., the stadium settling over time).

"That pipe was hung from the structure itself, so it is supported by the structure on piles," Sulinski said. "We connected to the ADS HDPE pipe with the ductile iron FLEX-TEND joint. This allowed us to pull the double joints to the highest position. So if the field settled, in theory, it will settle uniformly and still provide positive drainage because the fitting was set at its highest point. If the fitting dropped there would still be positive drainage. It's a very unique system."

The hypothetical rate of drop predicted is 6 in. to 7 in. in 10 years.

Air-Dry Abilities

Before the LandTek crew could get to work, there was a tremendous amount of field preparation, including stabilizing the subgrade. A foundation of 3 ft of lightweight concrete fill is inside the stadium 'bowl.' The concrete was installed prior to LandTek's work.

"When we put the pipe in, we used a laser-guided trenching machine to trench through this lightweight concrete fill," Sulinski said.

"It's automated with a computer on board that we could dial in percentages, so it automatically pitched the trench from the warning track to our 30-in. collector pipe. Everything was pitched toward the collector pipe, which runs into a large manhole. And that manhole has another 30-in. pipe coming off it which is called an "air line" for a sub-air system inside the stadium. Not only can they pull a vacuum to draw the water through the root zone and the stone and into the pipe, they can actually introduce cool air as well as heated air through the pipe network that comes out through the perforations on the 6-in.-diameter lines. This will uniformly warm the gravel layer, acting as radiant heat to warm the root zone so that you can warm the grass plant itself and start to mature the grass plant in February. It's amazing."

The groundskeeper at CitiField will be able to turn the heat on and off to raise the turf temperature three or four degrees, enough to green the turf, according to Sulinski.

"People forget that when you build these fields, they are 90% sand," Sulinski said. "So it does drain, but with that added vacuum mode, if there is 2 ro 3 in. of rain and you have a game that night, the system can actually help pre-dry the field. And when you play on a dry field, the chances of disturbing the turf and destroying the root system are reduced." WWD

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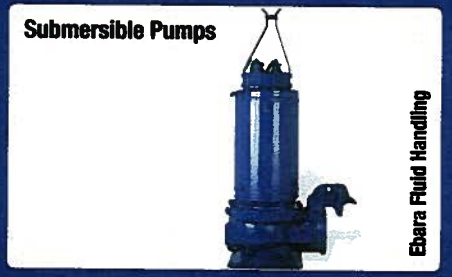

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