Richard Washington, ASLA

Cleveland Clinic Protects Wetlands With Permeable Pavers

Founded in 1921, Cleveland Clinic has grown to become one of the world's leading medical institutions, integrating clinical and hospital care with research and education. It offers a multisite healthcare delivery system with facilities throughout Ohio, as well as Florida, Nevada, Canada, and Abu Dhabi, with more than 5 million patient visits per year. Cleveland Clinic is ranked as one of the nation's five best hospitals and places in the top 10 nationally in 13 specialties. It has also been ranked number one in heart care for 21 consecutive years by *U.S. News & World Report*.

With more than 20 million square feet of built environment in its portfolio, Cleveland Clinic feels a responsibility to set an example for other hospitals and businesses and take the opportunity to minimize the health impacts of climate change. As a leader in the medical field, it has pledged to investigate creative solutions to environmental challenges that benefit the community and support economic health.

In 2008, Cleveland Clinic became the first healthcare provider in the nation to sign the United Nations Global Compact, and in 2014 it worked with the National Institutes of Health and the US Department of Health and Human Services to develop a Climate Resilience Toolkit for Healthcare. With sustainability a top priority for its new construction projects, Cleveland Clinic has built 11 LEED-certified buildings and has completed an additional four LEED-certified projects over the last eight years. Cleveland Clinic has established an Office for a Healthy Environment department and is working to enhance the resilience and sustainability of its facilities.

As a result of its commitment to the environment and community, Cleveland Clinic worked closely with environmental regulatory agencies on the development of the

Richard E. Jacobs Avon Health Campus in Ohio. "As part of our 'Healing in Nature' concept, we want all of our patient areas to be in natural settings as much as possible," says Brian Smith, director of strategic project development at Cleveland Clinic. To better serve the needs of the community, Cleveland Clinic decided to build a new, five-story, 221,500-square-foot "hospital of the future" on the north side of this existing family health center. The new Cleveland Clinic Avon Hospital will be the only Cleveland Clinic hospital connected directly to an established family center.

The design of the project began in 2013 with a large design and construction team. Architects Westlake Reed Leskosky, landscape architects Cawrse & Associates Inc., civil engineers CT Consultants Inc., and environmental consultants Davey Resource Group collaborated on the project design.

"With nearby EPA-protected wetlands and an already restricted site, it was a challenge to meet stormwater management requirements for the project," says Richard Washington, ASLA, of Cawrse & Associates. "We considered a number of design options, such as a parking garage to limit the footprint of the parking areas, bioswales, permeable pavement, and/or underground detention systems."

Washington notes that the site is very flat and surrounded by shallow streams with mapped floodplains that would require any stormwater management system to be built up above grade. The lowest point in a traditional retention basin would have been above the existing grade

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of the site, which would require importing a large amount of expensive fill to raise the grade by 5 to 6 feet and would also impact the wetlands. It was decided that a permeable interlocking concrete paver system would provide the most effective stormwater management for the site and come in at a lower initial cost than some of the other systems.

Both Washington and Craig Cawrse, FASLA, of Cawrse & Associates had prior experience with Eco-Optiloc permeable pavers produced by Uni-Group USA. manufacturer Unilock Ohio Inc. in Rittman, having installed them in their office parking lot seven years ago. As a result, they recommended them for the parking lots, drive lanes, and

Aerial Aspect Photography

The site of the new Cleveland Clinic Avon Hospital

Photos this page: Richard Washington, ASLA

connector roads for the project.

"The Eco-Optiloc pavers have proven to be durable and will stand up to a variety of traffic conditions," says Washington. "Initially, there was a learning curve for the client and the construction manager, Gilbane Building Corporation, to understand that the permeable paver system was very competitively priced compared to traditional asphalt paving and a traditional stormwater management system. However, we were able to demonstrate that with the Eco-Optiloc pavement, we could minimize the extent of the site's impact while accommodating their parking requirements."

The Eco-Optiloc permeable pavement project was presented to the US Army Corps of Engineers as a stormwater management system located adjacent to the wetlands that would provide effective water-quantity and -quality mitigation. The Corps supported the use of the permeable pavers over a traditional stormwater management system.

Davey Resource Group, the environmental consultant for the project, was instrumental in securing wetland permits and reducing the wetland impacts for the project. Civil engineers CT Consultants worked with Drew Snoply, commercial sales manager at Unilock Ohio, on the design of the permeable pavement cross-section, which is based on the Ohio Department of Natural Resources design guidelines and Unilock's recommended standard section. They also developed all stormwater calculations for the site per regulatory requirements.

The design features a 12-inch subbase of ASTM No. 1 and 2, a 6-inch base of ASTM No. 57, and 1.5-inch setting bed of ASTM No. 8. The joint fill is an ASTM No. 9 stone. The depth of the subgrade preparation varied based on existing soil conditions, which were poor and required the use of soil cement for stabilization. Geotextile fabric was placed at the vertical walls at the limits of the aggregate base. The base section was designed to store stormwater in the voids of the stone, with 6-inch perforated pipe and multiple outlet control structures designed to release stormwater to meet typical discharge rate limits. The stone volume and control structures provide water-quality treatment and flood control for the 10-year critical design storm through the 100-year storm event and match predevelopment discharge levels for less frequent storms. The existing parking lots for the original building feature bioswales, and a drainage channel passing through the site was realigned and restored to provide additional stormwater capacity for the area. Unilock also provided technical guidance recommendations on deicing and vacuum sweeping maintenance to help ensure the pavement continues to function as designed.

Construction of the new hospital began in the fall of 2014, and the Eco-Optiloc permeable paver parking

Top: Placing the Eco-Optiloc pavers; *Bottom:* Aggregate base and perforated pipe

lot was started in the spring of 2015. Paver installer Gator Construction Inc. worked with Unilock and general site contractor Precision Engineering and Contracting Inc. on the installation, which was done mechanically, providing significant cost savings over manual installation.

The Eco-Optiloc paver features an L-shape configuration, which is ideally suited to mechanical installation. The project was a challenge for the design team and site contractor because it took place around a functioning family health center. The new hospital footprint removed the emergency department drop off, the helipad, and an existing parking lot with 400 spaces. A new relocated emergency department entrance and helipad were the first phase of construction, and a temporary onsite parking lot had to be constructed to replace the lost parking spaces.

The Eco-Optiloc permeable paver parking lot is being constructed in five phases around the temporary lot, which will eventually become permanent. This process maintains approximately 900 useable parking spaces at all times. Once the project is completed, there will be a total of 1,516 parking spaces, of which 850 will be paved with permeable pavers. Approximately 345,000 square feet of Eco-Optiloc in a charcoal color will be in place upon completion, which is scheduled for the end of this year. The Cleveland Clinic Avon Hospital plans to accept its first patient in the fall of 2016.

"Throughout this process Cleveland Clinic was very supportive of the permeable pavement system," says Washington.

Smith from the Cleveland Clinic notes, "The Avon site was a real opportunity to provide minimal impacts to the nearby wetlands. Our permeable paver installation was exactly the right solution at the right time. Although the realities of vehicular parking can sometimes dominate design, the permeable paver solution allowed us to construct parking lots that blend in with the site and do not present themselves as a 'sea of asphalt.'"

Unilock is proud to have provided the Eco-Optiloc pavers for this important project. "It has been a pleasure working with the design team and Cleveland Clinic on their newest health center and helping them meet their goals of sustainability and environmental protection," says Snoply.

"From both the environmental viewpoint, as well as aesthetics, we are very pleased with our investment in what has turned out to be a very large permeable paver parking lot," says Smith. "We look forward to the financial returns as well, as we anticipate our lifecycle maintenance costs to be well below those associated with an asphalt lot."

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