CASE STUDY

Children's Hospital of Philadelphia (CHOP) Buerger Center for Advanced Pediatric Care

STORMWATER PIONEERS
PHILADELPHIA WATER DEPARTMENT
2017

Stormwater Pioneers

Beginning in 2014, the Philadelphia Water Department introduced the Stormwater Pioneers program to recognize outstanding stormwater management projects implemented by private property owners. The program showcases innovation, excellence, the ability to overcome technical challenges and a true dedication by the property owners, developers, engineers and designers to reduce runoff.

About the Project

The Children's Hospital of Philadelphia's Buerger Center for Advanced Pediatric Care provides out-patient services to children with some of the most acute medical needs. Completed in 2015, the 12-story, $475 million project which is expected to receive LEED® Silver certification from the U.S. Green Building Council, was developed with a singular focus on improving the hospital experience for patients and their families. Many features work together to accomplish this goal – including the stormwater management solutions. Although required to capture stormwater to meet Water Department regulations, CHOP's unique approach successfully integrated these requirements into beautifully landscaped outdoor areas for recreation, relaxation and rehabilitation that benefit patients, families and staff.

PHILADELPHIA WATER DEPARTMENT

Children's Hospital of Philadelphia®

Stormwater Management

The CHOP Buerger Center includes two green roofs and two storage tank systems that together filter stormwater and slowly release it back to the City's combined sewer system. While other designs could have met the Water Department regulations, CHOP intentionally integrated the stormwater management features into natural spaces that can soothe sick children and their caretakers.

Public Plaza ▲

Many of the children visiting the Buerger Center come from around the region and travel many miles to get to Philadelphia – so providing ample parking for patient families was a key consideration. Unfortunately, the site, once home to the Philadelphia Civic Center, was solid rock. CHOP ultimately built a 1,500-car underground garage that required 70-foot excavation into solid bedrock – one of the deepest excavation projects in the city. A publicly accessible plaza graces the top of the parking garage. The 2.3 acre plaza includes more than 35,000 square feet of vegetation that filters rain water during storms and provides a variety of experiences from quiet outdoor benches to playful fountains.

Rooftop Plaza▲

In addition to the ground-level plaza, CHOP also included a 14,000 square foot roof garden and plaza on the 6th floor accessible to patients, families and staff. Here, children can play in a water fountain inspired by the Schuylkill River and improve their mobility by learning to use a wheel chair or walking and running on pathways built with unique materials that each provide a different feel.

Not only do these features provide patients with direct access to outdoor space, but the building is designed to offer views of the green spaces below. CHOP intentionally developed these views knowing that data show patients experience reduced stress and a faster healing process with views of green space. From the rooftop plaza, patients can also look out over the Schuylkill River which the stormwater management tools help to protect each time it rains.

Stormwater Storage Tanks ▲

Although the green roof areas reduce the number of impervious surfaces draining to the sewer system, there was still a significant amount of stormwater runoff that needed to be managed. As a result, CHOP constructed two different rooms for stormwater storage tanks in the upper levels of the parking garage. These strong and lightweight fiberglass tanks can hold approximately 70,000 gallons of water.

Although not a regulatory requirement, CHOP also uses some of the stored rainwater to irrigate the plaza and green roof. This reduces water consumption and saves money on irrigation costs.

Award Winning

In October 2016, The Buerger Center for Advanced Pediatric Care was named "Health Care Best Project" for the MidAtlantic region by Engineering News-Record. In April, 2017, the project was again recognized by Engineering News-Record at its "Best of the Best" black-tie gala as the best healthcare project in the United States for 2016.

Project Team

Architects
FKP Architects and
Pelli Clarke Pelli Architects

Landscape Architect
Nelson Byrd Woltz,
Landscape Architects

Civil Engineering
Pennoni Associates, Inc.

Construction Manager
Turner Construction
Company

Technical Summary

Stormwater Requirements

The project was applicable to the Water Quality and Flood Control requirements of the Water Department regulations. The Flood Control requirement was met by reducing the impervious cover on site by at least twenty percent (20%). The Water Quality requirement was met through a series of stormwater tools including the green roof areas and storage tanks, and the incorporation of new trees and pavement disconnection.

Overcoming Technical Challenges

Water Department stormwater regulations require infiltration where feasible. The geotechnical investigation revealed a significant amount of rock under the site, precluding infiltration into the soil. Constrained development sites are not unique in Philadelphia and technical teams often work closely with their clients and the Water Department to meet stormwater requirements without sacrificing overall project goals. CHOP overcame these technical challenges by creatively integrating the stormwater features into the use of the site through a mix of green and gray solutions.

Watershed	*Schuylkill River Watershed*
Sewer Type	*Combined*
Applicable Requirements	*Water Quality, Flood Control*
Limit of Disturbance	*203,014 sf*
Proposed Impervious	*150,323 sf*
Green Roof Area	*41,897 sf*
Volume of Water Managed in Storage Tanks	*Over 70,000 Gallons*
Compliance Approach	*Green Roofs, Slow Release Storage Tanks, Pavement Disconnection, Tree Credits*

Stormwater Solutions

Since infiltration was not feasible, detention systems were used to store stormwater and slowly release it back into the sewer. These tank systems are located in two areas on the upper levels of the Buerger Center parking garage. One storage system consists of several independent tanks set in series with a combined storage volume of approximately 4,600 cubic feet, managing more than 77,000 square feet of imperious area. The second storage system consists of a single tank with a storage volume of approximately 5,000 cubic feet managing more than 38,000 square feet of imperious area. Both tank systems include a slow release design that minimizes the stormwater entering the sewer system during a rain storm so the water can later be treated before flowing to the river. CHOP also planned for a future expansion of the parcel by oversizing the tank systems to account for an additional impervious drainage area.

While the stormwater storage tanks manage most of the site's runoff, a series of green features effectively reduce the amount of impervious cover on the site. CHOP incorporated two green roof areas into the site, including throughout the plaza above the parking garage and on the 6th floor of the Buerger Center building. These green roofs, totaling nearly an acre in size, absorb and filter the stormwater and promote evapotranspiration of the runoff. Stormwater runoff from the impervious roof areas is conveyed through the building and garage drainage systems to the stormwater tanks.

Stormwater Review Timeline

August 12, 2010	October 29, 2010	April 3, 2012	June 26, 2012	March 24, 2013	Summer 2015
Conceptual design submitted	*Conceptual design approved*	*Technical design submitted*	*Technical design approved*	*Maintenance Agreement Recorded*	*Construction Completed*