



Grand Slam for the Environment at a Major League Baseball Field

At 265,000 sf (24,620 m²), U.S. Cellular Field boasts the largest permeable interlocking concrete pavement in the United States.

With bases loaded, a home run hit at Chicago's U.S. Cellular Field baseball park landed outside the fence and in the parking lot. As one of the first of its kind in the U.S., the permeable interlocking concrete pavement (PICP) parking lot landing there is caught by thousands of fans at every game. Unlike a group of desperate fans in the nosebleed section scrambling for the baseball rolling under bleachers, everyone can enjoy and learn from the 265,000 sf (24,620 m²) of PICP parking Lot L, now the largest PICP installation in the U.S. and the first to be used in a major league sports facility.

The sustainable urban drainage project was managed by the Illinois Sports Facilities Authority (ISFA) and construction funded by the 2005 World Series champion Chicago White Sox baseball team. The ISFA (www.isfauthority.com) annually donates U.S. Cellular Field facilities and surrounding property to a wide variety of organizations and charitable entities that expand educational opportunities and athletic programming for thousands of Illinois youth.

The PICP structure includes mechanically installed 3¹/₈ in. (80 mm) thick concrete pavers bedded into 2 in. (50 mm) of CA-16. CA stands

for course aggregate meaning material with no fines and capable of storing water in its voids. The bedding layer lies over 6 in. (150 mm) of CA-7 base (see Figure 1) and 8 in. (200 mm) of recycled crushed concrete subbase generated from a foundation formerly on the site. The recycled material is the size of CA-1. The silty-sand soil near Lake Michigan provided sufficient infiltration rate to infiltrate most storms. CA-16 bedding stone, larger sized stone in the CA-7 base and even larger CA-1 subbase are similar in gradation to ASTM No. 8, 57 and 2 crushed stone, respectively. The CA designations are Illinois Department of Transportation standard gradations.

The PICP hydrological design strived to attain the 2008 City of Chicago Stormwater Management Ordinance designed to minimize stormwater runoff and erosion from new development and redevelopment. Specifically, the design incorporates runoff peak flow control using storage in the PICP base and infiltration. The City of Chicago Department of Water Management prescribed a maximum 100-year return period for the design rain storm. They required a release flow rate from the PICP parking lot of 0.2 cfs/acre (2.3 l/s/ha) or 1.275 cfs (36 l/s) for the entire 6.37 acre (2.8 ha) PICP site. This flow rate



Figure 1. The permeable pavers, bedding and base are shown here. Not shown is the subbase or the permeable stone material that fills the joints.

was accomplished by storing about 73,100 cf (2,070 m³) of water from the design storm, which is just over a half a million gallons (2 million l).

The available void space in the base and subbase volume represents a water storage capacity of 24%. This is a conservative assumption as most open-graded base/subbase materials can hold over 30% of their total volume in water. All three IDOT CA materials have tested

out 39 to 41%. Some of the water in the base and subbase will infiltrate back into the soil thereby recharging groundwater. The PICP handles rainfall directly on it and doesn't store and infiltrate runoff from contributing impervious parking surfaces.

PICP Cost Savings

The overall project design was by Ernest Wong, Principal with Site Design Group, Ltd. and engineering provided by Robert Giurato, P.E. with Environmental Design International, a full-service national engineering firm committed to green initiatives. Both firms are located in Chicago. According to Mr. Wong, the PICP "Saved the owner 15% over a traditional bituminous asphalt parking lot due to the elimination of underground stormwater storage and drainage systems." The overflow from extreme rainstorms is handled by a combination of vegetated areas and adjacent catch basins. PICP construction was by Midwest Brick Paving, Woodstock, Illinois.

Like many PICP projects, base design is a balance of structural (to hold up traffic) and hydrological requirements. An innovative aspect of this project is the use of recycled crushed concrete subbase. Crushing the foundation and using it for the subbase saved time, fuel and expense, indeed a sustainable solution for this site. Moreover, some recycled concrete materials can stiffen a bit over

time (due to small amounts of hydrating cement), thereby offering modest long-term structural support. The downside to using recycled subbase materials is that they can shed excess fines that can slow infiltration. The designers recognized this cost-saving trade-off in the design.

The concrete pavers will easily endure the harsh Chicago winters. No heaving is expected as the base should not reach saturation when ice forms. Earlier PICP projects in the Chicago area such as Morton Arboretum in Lisle, Illinois have demonstrated surface and subsurface stability through several winters. Parking Lot L is not used in the winter, so deicing salts use is not expected. The project complements the success of many public and private PICP projects such as the City of Chicago's award-winning Green Alleys program (see February 2008 issue) which utilized PICP, and the overall efforts by the City to adopt green and sustainable approaches to urban design and infrastructure.

Baseball fans walking over the PICP will probably notice lower temperatures on hot summer days compared to walking across adjacent asphalt lots. The combination of the light paver colors, the cooler earth venting to the surface and water evaporating in the base will all contribute to a cooler microclimate and help reduce the heat island normally present with impervious urban surfaces. The exposure to PICP by thousands of baseball fans is a first step toward transforming the public's mind toward making PICP a normal pavement. With its expanding use across North America, we anticipate increasing public PICP use as a means towards establishing it as a symbol of sustainable urban drainage, and hopefully making it as recognizable as major league baseball, a symbol of summer fun. ❖



The Chicago Fire Department demonstrates the high surface infiltration rate of permeable interlocking concrete pavement at the U.S. Cellular Field.