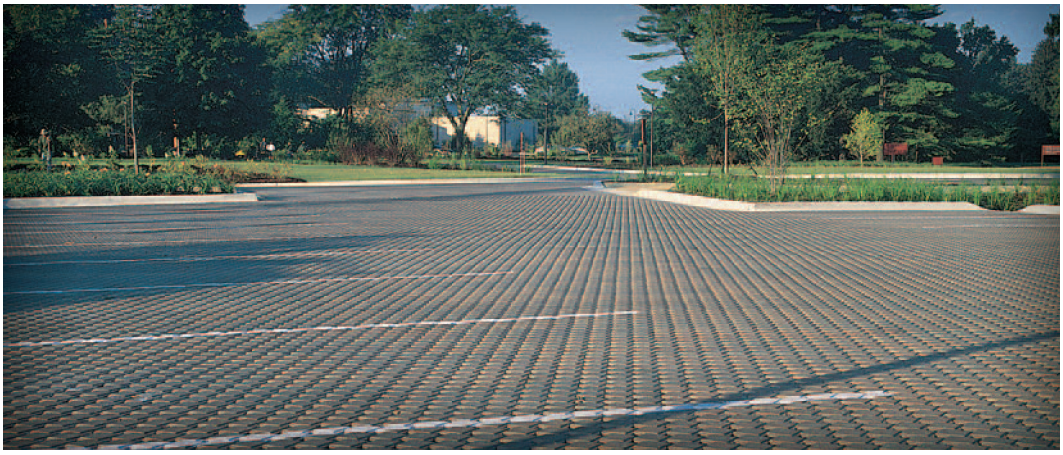
CASE STUDY

Morton Arboretum

Late in the 1990s Morton Arboretum, located in Lisle (DuPage County), IL, as part of a 20-year master plan decided to undertake a large-scale redevelopment. The redevelopment included a new visitor center and gardens, and a much larger parking area to accomodate more visitors. The designers for the project, Andrew J. Sikich, P.E. and Patrick D. Kelsey, CPSSc/SC of Christopher Burke Engineering West, Ltd., St. Charles, IL, decided to design the parking lot incorporating a number of best management practices (BMPs).



Morton Arboretum PICP Parking Lot Proves to be an Innovative Stormwater BMP

The parking lot project was adjacent to Meadow Lake, a retention area incorporated into a regional watershed. Morton Arboretum received a grant from the Illinois Environmental Protection Agency's (IEPA) Clean Lakes Program for a complete renovation of Meadow Lake. The lake was drained and dredged, re-benched for continued use as a retention pond as an aesthetic feature for the arboretum. An expanded impervious asphalt parking lot was considered inappropriate for the "low impact" design parameters of this project. An asphalt lot would produce significant stormwater runoff, increase thermal loads in the lake and degrade the water quality.

Project Size	173,000 sq ft
General Contractor	V3 Construction Corp Woodbridge, IL
Engineer	Christopher Burke Engineering St. Charles, IL
Landscape Architect	Conservation Design Forum Elmhurst, IL
Contractor/ Installer	LPS Pavement Company Oswego, IL
Paver Type:	Permeable Interlocking Concrete Pavement —3 1/8 in (80mm) thick

The Arboretum applied for and received an IEPA 319 Grant to construct BMPs within the parking area. The matching grant gave the Arboretum up to $1.2 million for the design and construction of the new visitor parking lot. Sikich and Kelsey had to consider the BMPs available to them and decide on those most suitable for the project. Project goals included a reduction in overall stormwater runoff and improvement in downstream water quality.

The first BMP selected was bioswales. Long linear medians and existing permeable soils made bioswales an obvious choice. The bioswale's function is to absorb stormwater and filter it, using plants and permeable soils to trap metals and other pollutants, keeping them from entering the groundwater.

The second and most significant BMP selected was the permeable interlocking concrete pavement (PICP) parking lot. The

The parking lot was adjacent to Meadow Lake, part of a regional watershed.

Base and Subbase construction for parking lot

Maintenance workshop at Morton Arboretum demonstrates equipment that effectively cleans PICP openings

pavement surface needed to be durable and plowable. In addition, the location of the bus parking area and visitor center truck dock required that a significant portion of the parking lot be designed structurally to withstand heavy truck and bus loads. PICP is extremely durable and very high strength. The interlocking nature gives PICP the ability to withstand heavy traffic, and the high-strength concrete (over 8,000 psi) gives it durability and the ability to withstand heavy loads. The pavers were designed over a permeable base to capture and treat stormwater runoff, then transfer water to the bio-retention swales that would then be conveyed to a level spreader at the shore line edge of Meadow Lake where a wetland was established to apply final treatment prior to release to Meadow Lake.

Project Issues

Dupage County officials would not accept storage in the voids of the aggregate sub-base of the PICP system because they could not inspect these areas nor could they clean these areas should they get clogged. In addition, they would not give a National Pollutant Discharge Elimination System (NPDES) Phase II permit for the parking lot as a pervious surface and would only allow this to be built and designated as an asphalt parking lot. If it failed, the surface could be paved over and the lot could continue to be used. Despite such doubts, the PICP parking lot is still in place over eight years later, performing as designed. In 2010, North Carolina State University conducted a maintenance workshop that provided forensic proof that the sediment does not travel into the subbase and any sediment causing clogged voids at the surface can be removed and replaced with new chips that will reinstate infiltration rates.

Other information

An analysis comparing PICP with heavy duty standard asphalt performed by Hanscomb, Faithful & Gould, the project construction manager, provided key information about life-cycle cost. While PICP costs more to initially install, in the 23rd year costs for maintaining an asphalt parking lot would surpass maintenance costs for the permeable parking lot installed. This analysis helped convince the Arboretum to use PICP.

The Morton Arboretum

	Permeable Interlocking Concrete Pavement			Heavy Duty / Standard Asphalt Pavement		
Year	Maintenance Item	Per Year Expenditure	Accumulated Expenditure	Maintenance Item	Per Year Expenditure	Accumulated Expenditure
1	Initial Install	**$980,000**			**$650,000**	
3	Striping	$2,625	$982,625	Crack Filler, Seal Coating and Striping	$24,375	$674,375
5	Striping & Cleaning	$6,625	$989,250	Minor Patch, Crack Filler & Seal Coating	$30,500	$704,875
7	Striping	$2,625	$991,875	Crack Filler, Seal Coating and Striping	$24,375	$729,250
9	Striping & Cleaning	$6,625	$998,500	Minor Patch, Crack Filler & Seal Coating	$36,625	$765,875
19	Striping	$2,625	$1,019,625	Minor Patch, Crack Filler & Seal Coating	$30,500	$997,250
21	Striping & Cleaning	$6,625	$1,026,250	Crack Filler, Seal Coating and Striping	$24,375	$1,021,625
23	Striping	$2,625	**$1,028,875**	Minor Patch, Crack Filler & Seal Coating	$36,625	**$1,058,250**
25	Striping & Cleaning	$6,625	$1,035,500	Crack Filler, Seal Coating and Striping	$24,375	$1,082,625
27	Striping	$2,625	$1,038,125	Minor Patch, Crack Filler & Seal Coating	$42,750	$1,125,375
29	Striping & Cleaning	$6,625	$1,044,750	Mill & Overlay, Patching and Striping	$109,375	$1,234,750
45	Striping & Cleaning	$6,625	$1,081,750	Crack Filler, Seal Coating and Striping	$24,375	$1,551,500
47	Striping	$2,625	$1,084,375	Minor Patch, Crack Filler & Seal Coating	$30,500	$1,582,000
49	Striping & Cleaning	$6,625	$1,091,000	Crack Filler, Seal Coating and Striping	$24,375	$1,606,375
51	Striping	$2,625	$1,093,625	Minor Patch, Crack Filler & Seal Coating	$36,625	$1,643,000

Life-cycle cost comparison

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