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volume 21 number 2

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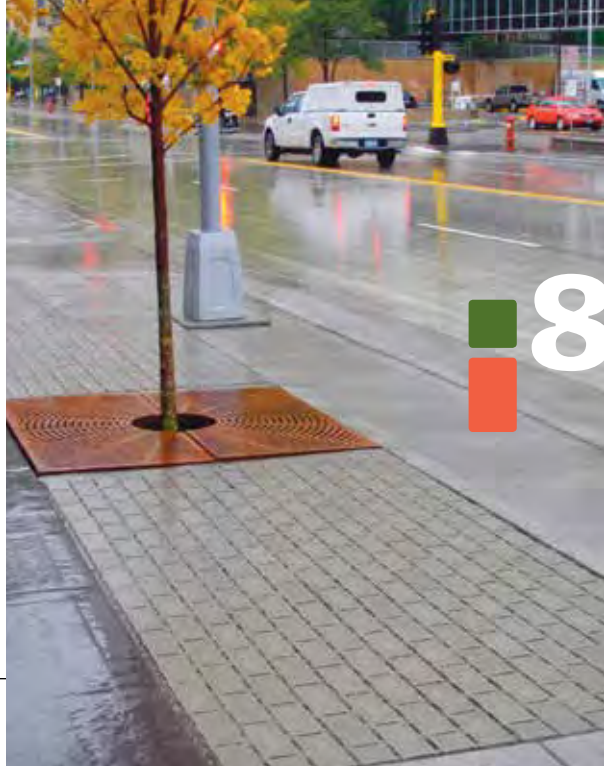

Photo Credit: Behringer Design

The Marq2 project in downtown Minneapolis spans 48 blocks of city sidewalks.

the contents

FEATURES

DEPARTMENTS

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EXECUTIVE DIRECTOR: Charles McGrath, CAE

PUBLISHING DIRECTOR: Jessica Chase, CAE

MANAGING EDITOR: David R. Smith

CONTRIBUTING EDITOR: Robert Bowers, P.Eng.

EDITOR: Brad Causey

ART DIRECTOR: Kathleen Wilson

icpi
Interlocking Concrete Pavement Institute

14801 Murdock Street, Suite 230
Chantilly, VA 20151
Tel **703.657.6900**
Fax **703.657.6901**
Email ***icpi@icpi.org***

ICPI Canada
P.O. Box 1150
Uxbridge, ON L9P 1N4 Canada

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For further information about this publication or about membership in ICPI, write to the appropriate address, call **703.657.6900** or fax **703.657.6901**.

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David R. Smith

MPCA PIONEERS WIKI FORMAT FOR GUIDANCE

How Much Is One Million?

Big numbers boggle the mind. Two people won $414 million from the Maryland lottery the other day. How much is that besides more money than you would ever need? Let's start simply on how much one million is. It's roughly all the rice grains in about 31 2-pound boxes. So experiencing one million could happen in the grocery store.

Most of our readers know that state stormwater agencies publish guidelines of best management practices for reducing runoff and pollution. Some state agencies are moving away from the term, "best management practices" or BMPs, to a more regulatory-flavored term, "stormwater control measures" or SCMs. In either case, all of the state manuals are available online, providing guidance to city and county governments charged with implementing reduction of runoff and pollution. Some of the manuals offer general guidance while others are quite prescriptive.

Many state stormwater manuals have been revised and updated. An increasing number emphasize runoff volume reduction as a means to reduce pollutant concentrations. This means greater reliance and detailed information on infiltration practices such as rain gardens, roof gardens, bioswales and permeable pavements.

Over the years, the Interlocking Concrete Pavement Institute took the opportunity to review several drafts of state stormwater manuals' guidance on permeable pavements. These include those from state stormwater agencies in Virginia, Washington D.C., Maryland, Pennsylvania, North Carolina, New Jersey, Massachusetts, Minnesota, Wisconsin, Washington state and California (issued by Caltrans). Virginia and Minnesota provide detailed information on permeable pavements.

In addition, Virginia and Minnesota offer Excel-based calculators to assist in determining how much water can be infiltrated in order to earn credits, i.e., a ticket to site development.

The Minnesota Pollution Control Agency (MPCA) organizes its SCMs into nine Minimal Impact Design Standards (MIDS). These are the core of revisions to their state stormwater manual. MIDS provide a toolbox for city and county agencies to implement via local ordinances to reach a performance goal of managing the first 1.1 inches of rainfall. One of the nine MIDS is called permeable pavements, posted on the MPCA website in July 2013.

MPCA took a different approach than most states by presenting its guidance in a wiki format that links and integrates MIDS practices to each other, to a calculator and to other guidance pages. It is a refreshing, non-linear approach to presenting the complexities of managing stormwater. We hope that other state agencies will move from static PDFs to a wiki format that requires a more integrated approach, and one that can be easily updated.

MPCA's approach resulted in ***one million hits*** on the entire MIDS site in the first year of posting. A majority of those hits were on the permeable pavements pages. Not surprising because the MIDS wiki format brings information-rich web pages on permeable pavements. The pages include information on permeable interlocking concrete pavement systems that survive Minnesota's harsh winter climate. The million hits, led by those on permeable pavements, might be an unofficial record for a state stormwater agency. Among other things, the one million hits can be understood with a shopping cart full of rice boxes.

VISIT THE MPCA WEBSITE
***http://stormwater.pca.state.mn.us/index.php/Permeable_pavement*.**

PICP Structural Testing Begins at UC Davis

After eight days of construction during flawless weather in late January, load testing began in early February on 2,500 sf (230 m^2) of PICP at the Advanced Transportation Infrastructure Research Center at the University of California, Davis. Load testing will continue for three to four months and a report with recommended design charts is expected in the fall. The design charts will be based on mechanistic modeling developed by UC Davis for Caltrans.

The test site is a 96 x 25 ft (29 x 7.6 m) area over a compacted weak clay subgrade. The subbase consists of large, open-graded crushed stone between 2½ down to ¾ in. size (65 to 20 mm) (close to ASTM No. 2 gradation), a very hard material from the Sierra Nevada mountain foothills east of Sacramento. The depth of this subbase material is 18, 26 and 37 in. (450, 650 and 925 mm). There is non-woven Mirafi geotextile on the sides and bottom of the excavation. This was included to see how the fabric responds to the excessive loads. The jointing stone between the pavers is hard material, close to ASTM No. 9 size.

Installation was completed by an experienced PICP contractor and ICPI member, California Pavers, Inc., who used a roller compactor to compact the soil subgrade, subbase and base as well as mechanically install the rectangular pavers. The base, bedding and 3 ⅛ in. (80 mm) thick pavers are surrounded by a 6 x 9 in. (150 x 400 mm) steel-reinforced concrete curb. In addition the subgrade, subbases, 4-in. thick No. 57 stone base, bedding and pavers (donated by ICPI member Basalite) were compacted with a Weber CR7 (60 kN/13,500 lbf) place compactor.

The Heavy Vehicular Simulator load tests permeable interlocking concrete pavement at UC Davis.

HEAVY DUTY Watch a video of the HVS: *http://youtu.be/l0TOW2_LX-g*

Dual tire truck-type tire (~100 psi) wheel loads will be applied by the UC Davis HVS or heavy vehicle simulator. Wheel loading started at 6,500 lbs (25 kN) with a dry soil subgrade to settle the pavement then increased to 9,000 lbs (40 kN), half of an 18,000 lb (80 kN) equivalent single-axle load with a saturated soil subgrade to simulate worst-case structural conditions. Deflection testing is also being conducted at various loading intervals.

The $2 million HVS machine can apply up to 45,000 lbs (200 kN) if needed. The loaded dual wheels travel across the PICP at 7 mph (11 kph). The tests will take the pavement to failure defined as 1 in. (25 mm) rut depth. There are pressure sensors under the subbase (on top of the weak, clay subgrade, approximate R-value = 5) and under the paver bedding layer. The results will help define how applied loads and stresses are distributed by the paver surface and the open-graded crushed stone bases. This is the first full-scale testing in the western hemisphere of PICP structural behavior and load distribution.

The project is being funded by the Concrete Masonry Association of California and Nevada, the Cement Association of California and Nevada, the ICPI Foundation for Education and Research and the Interlocking Concrete Pavement Institute.

HARDSCAPE NORTH AMERICA 2014 DATES ANNOUNCED

Hardscape contractors, distributors and industry suppliers can mark their calendars for the eighth annual Hardscape North America (HNA), Oct. 22-24, 2014 at the Kentucky Exposition Center in Louisville, KY.

HNA brings top-notch education, certification courses, products and technology to hardscape contractors and distributors. HNA features indoor and outdoor exhibits displaying state-of-the-art tools and products, demonstrations, plus networking opportunities.

Back by popular demand, HNA will kick off with Dealer/Distributor Day on Wednesday, Oct. 22. This is a premier event for distributors and dealers to take advantage of—a full day of action-packed seminars followed by an exclusive opportunity to preview new products and meet one-on-one with HNA suppliers exhibiting in the co-located GIE+EXPO (the Green Industry & Equipment Expo).

On Thursday and Friday, Oct. 23 and 24, HNA, GIE+EXPO and the popular 19-acre Outdoor Demonstration Area will be open to all industry participants.

HNA OFFERS:

- **New Products** – More than 750 indoor and outdoor exhibits spotlighting new products and equipment.
- **Education** – Seminars and workshops for all segments of the industry. ICPI Certified Installers can earn up to eight continuing education credits. Candidates who complete an SRW course and pass the written exam offered during HNA earn the Certified SRW Installer (CSRWI) credential. Education program to be announced soon.
- **Networking** – Contractor roundtables, awards programs, free concerts and peer-to-peer interaction.
- **Demos** – The HNA Outdoor Arena offers an exclusive, up close and personal opportunity to learn the latest installation methods and techniques for paver and SRW installation, raised patios, outdoor kitchens and fire pits.
- **Informed Purchasing Experiences** – In the unique outdoor exhibit area—within steps of the indoor exhibits—distributors and contractors have the opportunity to gain hands-on knowledge of the newest tools, products and equipment.

Also, this year keep an eye out for the return and expansion of last year's inaugural HNA Installer Championship, a competition that tests the skill, dedication and passion of hardscape contractors in a race against the clock.

Kent Deeben of Sislers Stone said, "The experience and information you gain at HNA can be shared with your employees to improve your business. For years I had heard from other distributors and contractors, 'You've got to go to HNA.' It far exceeded my expectations."

TO LEARN MORE ABOUT HNA, visit *HardscapeNA.com* or call 888-580-9960. Online registration opens June 1.

ICPI Honors William (Bill) Schneider with First Lifetime Achievement Award

ICPI recognized William (Bill) Schneider for his significant contributions to the segmental concrete pavement industry at the ICPI 2014 Annual Meeting and 20th Anniversary in New Orleans.

Mr. Schneider is a charter member of ICPI and the first to Chair the ICPI Construction Committee. His noteworthy accomplishments include developing the content for the Concrete Paver Installer Course and the Commercial Paver Technician Course. Mr. Schneider was the first instructor of the Concrete Paver Installer Course that has seen over 15,000 participants since its inception. Additionally, he served on ICPI's Board of Directors, Executive Committee, and numerous standing and special committees. Mr. Schneider has always maintained that educating contractors on industry best practices is paramount to success. He demonstrated this by becoming a founding member and instructor of ICPI courses.

The ICPI Lifetime Achievement Award recognizes significant contributions to the industry through knowledge, technical innovation and advocacy. The award emphasizes dedication of the recipient to safety and well-being of employees, demonstrated leadership, and/or outstanding contribution to the industry from volunteer service to ICPI which promotes growth and advancement of the association and/or industry. The award recognizes noteworthy public service activities at the local, regional, state, national or international levels that bring honor to the industry or to ICPI.

"There is no one better fitting to be the first recipient of such a prestigious award," said Dave Carter, ICPI Immediate Past Board Chair. "Bill's professional accomplishments are numerous, and he is widely recognized as the pioneer of paving installations in the United States."

Mr. Schneider's pioneering efforts include the creation of a company specializing in permeable interlocking concrete pavement (PICP) installations that transformed the Chicagoland market. This effort resulted in several trademarks and patents he holds on permeable paver shapes. He also accelerated mechanical paver installation to lower project costs.

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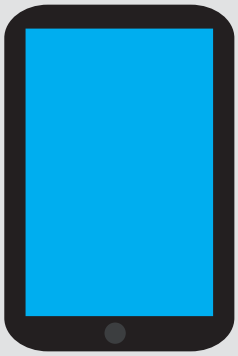
The survey link is:
https://www.surveymonkey.com/s/interlockdesign



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By Elizabeth Millard

long-term payoffs *with* permeables

PERMEABLE PAVERS HELP MINNEAPOLIS HANDLE STORMWATER AND EXTEND THE LIFE OF URBAN TREES

Numerous surveys rank Minneapolis as one of America's best places to live. *Forbes* magazine recently ranked the City of Lakes as the healthiest in the nation, in part because of its green spaces and walk-friendly downtown. So, when dealing with stormwater, it's no surprise the City chose permeable interlocking concrete pavement that boasts a major benefit: extending the longevity of urban street trees. "This project was unique because the City wanted to treat rainfall where it fell while capturing nearby runoff, and they realized that tree health could benefit from that process," says Bob Kost, Landscape Architect Director for Short Elliott Hendrickson (SEH), who worked on the project. "This was one of the first projects of its kind in the country, and I think other cities should consider this kind of system."

NEW VISION

Named Marq2, the project extends along Minneapolis' major downtown corridors of Marquette Avenue and Second Avenue South and covers about 15,000 sf (1,400 m^2) along 48 blocks of city sidewalks. Marq2 rebuilt streetscapes, from building front to building front, widening sidewalk space and incorporating 190 new trees, public art and new transit shelters. Permeable pavers enabled a substantial reduction in stormwater and pollutant runoff on a mile-long stretch of downtown.

The stormwater retention system consists of an underground grid of nearly 11,000 plastic-framed cells filled with about 580 cf (16 m^3) of a bioinfiltration soil mix. The cell groups, which resemble milk crates stacked on top of each other, provide pavement support while preventing soil compaction in order to maintain infiltration. Perforated pipes in the cells convey excess water out of the system. Based on research by Prince George's County, MD, the filtration by the soil inside the cells removes 80 percent of the phosphorous, 60 percent of the nitrogen, and over 90 percent of the lead, copper, zinc and iron from the stormwater.

A grated cap on top of the cells is covered with geotextile, granite infiltration stone, followed by a layer of smaller granite bedding aggregate. Permeable pavers were placed over that, allowing runoff to enter the soil-filled cells beneath. Tree grates and guards were designed by a local artist and fit well with the natural gray-colored pavers. The grates allow water to filter down to the tree roots. The combined use of the permeable pavers and the bioinfiltration system can receive some 21,600 cf (610 m^3) of stormwater from each rain event, keeping it from entering the Mississippi River.

"This system protects the waterway," says Kost. "Many cities face this exact issue because plenty of them have old stormwater systems connected to sewer systems. Managing each of these is important if you want to protect your water resources."

ROLE OF PAVERS

Utilizing the permeable interlocking concrete pavers led to greater sustainability, believes Chris Behringer, principal at Behringer Design, who worked as

Permeable pavers provide enhanced irrigation for tree longevity and prevent unnecessary runoff from reaching the Mississippi River, which runs along the north side of downtown.

Continued on page 10

CROSS SECTION:

— 15,000 sf (1,400 m²)
— 4 in. x 8 in. x 8 cm permeable pavers
— natural gray color
— running bond pattern

Photo Credit: Behringer Design

senior urban designer on the Marq2 project. She notes that the permeable pavers are becoming a regular part of planning for landscape architects because they allow for better storm-water management. "There's a higher comfort level with pavers than with other permeable surfaces like porous concrete or asphalt," she says. "The pavers help alleviate stress on the whole system because they disperse water in a larger capacity [than other options]."

That's important not just for summer and fall rainstorms but also for spring thaws. Minneapolis receives an average of 45 in. (114 cm) of snowfall annually and as the huge mounds of plowed snow melt, the permeable pavers make runoff management more effective.

Like any well-traveled surface, the pavers require maintenance, she adds, but even then, they seemed a much stronger choice than other options. Unlike asphalt, which would have to be cut out in a chunk, for example, the pavers can be replaced on a smaller scale, limiting disruption and saving on maintenance costs. "You mainly have to replace some of the infill as well as vacuum out some of the substrate to prevent clogging," she says. "These are very affordable, minimal maintenance tasks, though."

LEAFY RETURN ON INVESTMENT

Another key factor for improved ROI for the City of Minneapolis is just above pedestrians' heads. Typically, urban trees need to be replaced about every five to seven years, Kost notes. Trees begin to decline in health due to soil compaction and/or limited availability of suitable soil, or a city might replace them to control irrigation costs. Because of Marq2's innovative system, the mix of hardwoods and ornamentals planted in 2009 are still growing strong and aren't up for replacement in the near future. The permeable interlocking concrete pavers and the system beneath prevent soil from compaction while stormwater draining through the permeable pavers significantly reduces the need for additional irrigation. That means the City saves money that would have been spent for watering. Also, each tree costs

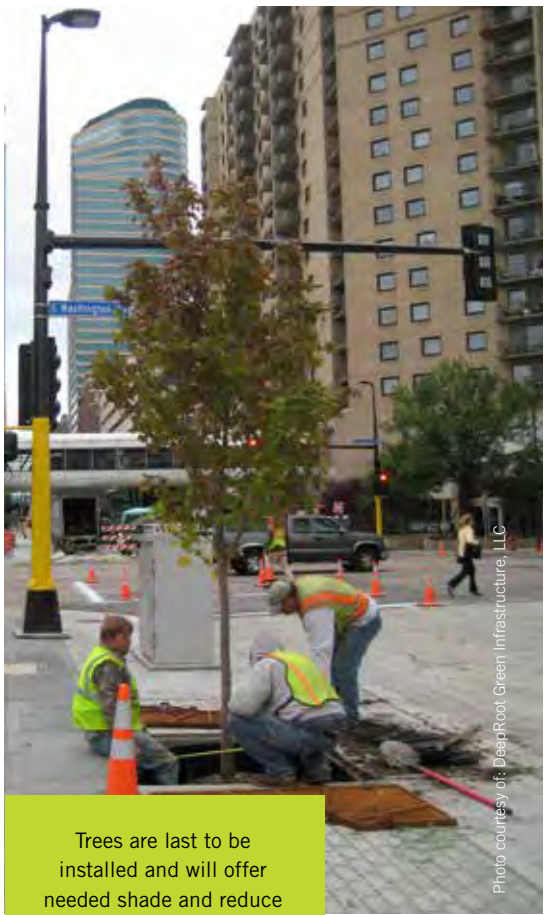

Photo courtesy of: DeepRoot Green Infrastructure, LLC

Trees are last to be installed and will offer needed shade and reduce the urban heat island in the busy downtown district.

This close-up photo shows the DeepRoot plastic grid structure that holds the bioinfiltration materials.

Photo courtesy of: Willow Creek Paving Stones

Walkways along Marquette Avenue are prepared for the installation of Silva Cells, a structured soil system that will be filled with a bioinfiltration soil mix. The soil mix removes much of the phosphorus, nitrogen and metals from the stormwater that permeates through the paver joints.

Photo courtesy of: DeepRoot Green Infrastructure, LLC

> There's a higher comfort level with pavers than with other permeable surfaces like porous concrete or asphalt. The pavers help alleviate stress on the whole system because they disperse water in a larger capacity [than other options]."
>
> —Chris Behringer, principal at Behringer Design

about $450, so extending the lives of all 190 trees means major savings.

Beyond those short-term savings lie longer-term benefits. As trees mature and expand their canopies, they provide more oxygen, urban island heat reduction and sidewalk shade. "You don't get these benefits from younger trees; it's only when trees reach a certain size," Kost says. "Many cities are forced to replace trees just before they mature so they don't reap these huge advantages." By extending tree longevity and controlling stormwater management — with the help of permeable pavers — Minneapolis isn't likely to lose its healthiest city title anytime soon. "This whole system is part of creating a healthier environment," says Behringer. "It creates benefits for everyone."


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By Elizabeth Ecker

restoring glory

A lucrative business is emerging in aftermarket paver restoration, repair and maintenance

> "The investment comes back quickly to make you more efficient and effective. It's a very natural progression to get involved with maintenance, particularly in markets with older paver projects."
>
> —Pat McCrindle, east coast regional sales manager and technical sales rep for Global Sealer Technologies (GST) International

Concrete pavers are long-lasting. No one disputes their decades-long staying power. But as with all investments, a little maintenance can go a long way. All pavements get dirty, and interlocking concrete pavement owners want to keep great pavement looking great. From discolored pool decks to driveways marred by oil leaks and tire marks, contractors are rising to the demand for sprucing up pavers, especially high-visibility residential applications.

Photo Credit: Pat McCrindle

When sealing older pavers like those in this 18-year-old installation, it is important to consider the change in absorption rate from when the pavers were originally manufactured.

Contractors today are landing residential and commercial paver restoration projects installed 10, 15 and 20 years ago. "When they first came out, concrete pavers were being sold as [practically] maintenance-free," says Rich Colletti, founder of Seal n' Lock, a Florida manufacturer of concrete paver sealing products. "That's what people believed at the time." But as they aged, the UV light, environment and surface wear made them not look as good as when they were new.

All pavements are at the mercy of nature and use. However, it's how they age and what can be done about it that's important. Older paver projects can be restored economically and quickly. Today, there are a host of solutions that contractors can use to develop revenue opportunities from existing and new clients.

Additionally, the capital investment isn't as high as that required to equip a paver installation company. The biggest upfront expense is equipment used for power washing and cleaning to remove efflorescence and stains, and for applying sealers. This investment is augmented by the redeployment of existing equipment to repair pavers, including pullers, pry bars, mallets, screens and the like.

Contractors say it's a good supplemental or standalone business, and it's growing.

"You do a paver installation, with everything according to

CASE 3
Location: Southern California
Age of installation: 5 years
Restoration process: 1. Stain removal; 2. Surface cleaning and preparation to remove ground-in dirt and efflorescence; 3. Application of water-based protector to enhance paver colors with a gloss finish.
Equipment: Airless sprayer and slit foam roller
Timeframe: Day 1: Stain removal and surface cleaning; Day 2: Protector application.

Editor's note: *The photos for this story were selected from the best available before-and-after examples to illustrate paver restoration. They do not correspond to the case studies in the story; they are separate examples as noted in the captions.*

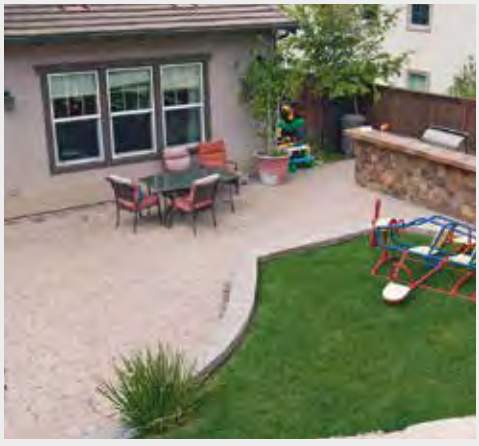


Photo Credit: Al Dorais, Techniseal

ICPI guidelines, but they still need to be maintained," says Pat McCrindle, east coast regional sales manager and technical sales rep for Global Sealer Technologies (GST) International, who started a maintenance and repair company after several years of installing pavers. "The investment comes back quickly to make you more efficient and effective. It's a very natural progression to get involved with maintenance, particularly in markets with older paver projects."

A PRODUCT EVOLUTION

In just a few decades, a host of products and methods rose to meet the demand for paver maintenance, cleaning and restoration. Treatment of pavers might include applying a colored seal—yellow, red, green—allowing owners to redesign their installations, or a specific product to protect against mold, moisture or chemical stains.

From water- and solvent-based sealers to penetrating and surface sealers, polyurethane and acrylics, there is a sealer solution for every climate and installation. Many are compatible with polymeric sand. "If you look at 15- to 20-year-old pavers, they're structurally sound, and they will last another 20 years," says Al Dorais, president of Techniseal, a maker of sealing products based in Candiac, Quebec, Canada. "We can take old pavers and bring them back to life."

Contractors report that while interest is increasing among newer clients who are opting for cleaning and maintenance plans that begin shortly after installation, there's a substantial market for clients with older installations looking for the "wow factor" of restoration.

Here are some case studies.

CASE 1: THE FACELIFT

When Omaha, NE, homeowner Reid Kenedy contracted the installation of a concrete paver patio over 10 years ago, he couldn't have imagined how it might respond to the harsh climate. Fortunately, a local contractor was able to offer restoration services. "Normally we do our sealing right as we finish the job," says Justin Hampton of Paver Designs LLC in Omaha. "But we installed a patio more than 10 years ago, and the pavers had lost their original color. We were trying to come up with a way to restore it." The 400 sf (37 m^2) red and black patio provided a home for outdoor enjoyment and activity while enduring hot, humid Midwestern summers and cold winters.

Hampton recommended a colored sealing product. Kenedy had several extra pavers remaining from the original installation, which they used as a test for the new treatment. They waited 10 days after the test application and decided to move forward with the entire patio. "It made all the difference in the world," Kenedy says. "They look better today than they did when they were first installed."

The concrete pavers' color was restored and the patio has not required additional maintenance since the sealer was applied.

CASE 2: BODY AND FENDER WORK

Name it, and this 10-year-old Howell, NJ, patio endured it: snow, rain, heat, moss, fading and settlement. Owner Greg Varner initially imagined surface restoration was in order, but the patio required some repairs, too. "The repairs covered every aspect of pavers without replacing them," Varner says of his repair and restoration, completed by Rob Densieski of Paver Restoration Inc, in Freehold, NJ. The patio had also become a safety hazard. "It's a high traffic area," Varner says. "People tripped constantly."

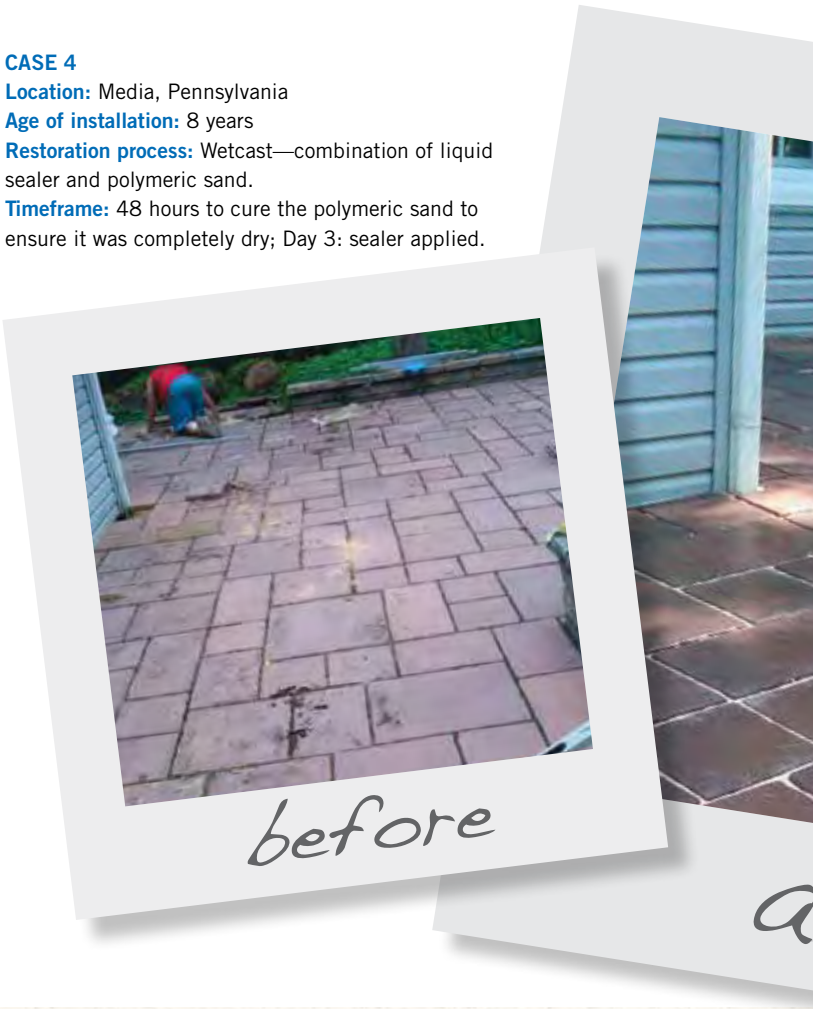
The 920 sf (85 m^2) patio received more than just restoration and spanned services Varner didn't know were available. "It was a total restoration including cleaning, polymer sand placement and sealing of steps, patio and walkway," says Densieski, who completed the work in fall 2013. In addition to cleaning and restoring the existing pavers, some were pulled up and moved to relay the shape that had been desired initially—but never fully realized—for the multi-color, multi-shaped patio. This was inexpensive compared to repairs on cast-in-place concrete surfaces that require cutting and replacing with a patchy result.

"We didn't know this was available," Varner says. "I called around to landscape and hardscape companies. No one wanted to touch it. They only wanted to rip it out and redo it. I wanted it cleaned, but also wanted it to be fixed." The project was completed over a week and a half including cleaning and sealing plus the patio expansion with new pavers. "It looks brand new," Varner says.

BUILDING A BUSINESS ON RESTORATION

The concrete paver industry is quickly realizing the potential business from after-market products and services. McCrindle began his maintenance business with an initial investment of $4,000. Today, he has a $30,000 trailer with top-of-the-line equipment, including diesel-heated power washers and electric reels. Service contracts are offered to new customers as well as to those with older paver projects. A maintenance schedule is developed for new customers depending on environmental factors and intensity of use. "Patios need some maintenance," McCrindle says. "Any real estate investment has

CASE 4
Location: Media, Pennsylvania
Age of installation: 8 years
Restoration process: Wetcast—combination of liquid sealer and polymeric sand.
Timeframe: 48 hours to cure the polymeric sand to ensure it was completely dry; Day 3: sealer applied.



CLIMATE CONSIDERATIONS

Give it some time. The elements are a big consideration for paver maintenance. Most sealers require at least 30, 60 or 90 days after pavers are installed before applying the sealer. Check with the sealer manufacturer.

Heed the manufacturer's warranty. Each product is different, says Rich Colletti, founder of Seal n'Lock, and product specifications and warranty period should be considered in the purchase.

Pay attention to hydration. There are same-day maintenance products available, while others require pavers to be 100 percent dry before applying jointing sand or a sealer and that might require a few days. Additional guidelines apply if polymeric sand is used at the end of installation.

Photo Credit: Pat McCrindle

Photo Credit: Pat McCrindle

Bristles on the bottom of this 19-in. Whisper Wash remove old joint material and sand.

> If you look at 15- to 20-year-old pavers, they're structurally sound, and they will last another 20 years. We can take old pavers and bring them back to life."
>
> —Al Dorais, president of Techniseal

a maintenance schedule. You paint and repair your house. For pavers, we offer a two-year service contract with a renewal." The result is a patio that looks perpetually new.

Of the 10 billion sf (930 million m^2) of pavers in the U.S., less than 2 percent are sealed. While most don't need sealing, there is still a significant market. "The growth potential for the market is huge," McCrindle says. But education is a hurdle, especially when it comes to sealing pavers right after they have been installed as a means to prevent problems, repairs and restoration down the road. Dorias of Techniseal agrees. "It's about raising awareness."

Contractors are doing their part to spread the word. For Densieski, the launch of his business came after talking with a paver distributor nine years ago who told him that everyone is installing pavers, but no one is taking care of them. "For the first two years, it was an add-on to my full-time employment," Densieski says. Now, restoration is 95 percent of his business. "We'll install new projects, but we don't go out looking for them anymore," he says.

Others have been slower to expand into restoration, but they know it's becoming a lucrative and essential business line. "Historically, we did not push a lot of cleaning and sealing, but we are now looking at it as a mandatory part of the business," says Charissa Farley of Farley Interlocking Paving in Palm Desert, CA, now in the process of adding a maintenance unit to the business. "We are learning and growing and investigating what's appropriate and when; not just for residential maintenance but also for maintaining streets. This includes vacuum cleaning permeable surfaces and selecting different types of products for removing stains on municipal paver projects."

In the same way that waxing and washing a car keeps it looking new, or replacing mulch will keep landscaping appearing fresh, by explaining the benefits upfront, contractors are finding that customers are open to maintenance to keep pavement looking brand new.

"People are spending thousands of dollars on hardscaping," Densieski says. "You spent all that money, you want to maintain it to keep your investment looking beautiful."

before

Photo Credit: Al Dorais, Techniseal

after

CASE 5
Location: Montreal, Canada
Age of installation: 8 years
Restoration process: 1. Stain removal; 2. Surface cleaning and preparation to remove ground-in dirt and efflorescence; 3. Application of water-based protector to enhance paver colors with a gloss finish.
Equipment: Airless sprayer and slit foam roller
Timeframe: Day 1: Stain removal and surface cleaning; Day 2: Protector application.

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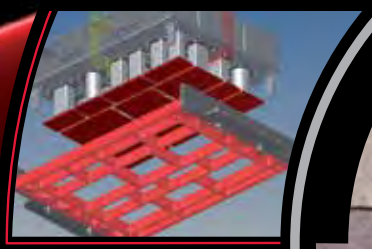

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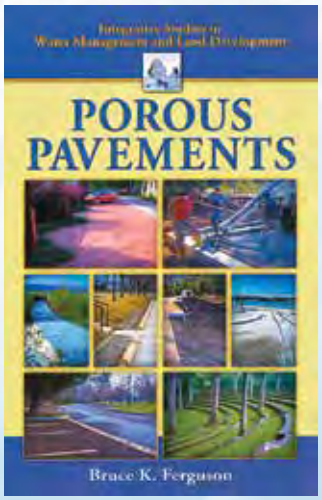
ENGINEER'S view

By David R. Smith

ASCE Ready to Release a Committee Report on Permeable Pavements

FOUR YEARS OF WORK BRINGS SIGNIFICANT SEQUEL

The ASCE report expands on Bruce Ferguson's 2005 book.



With over 100,000 members, the American Society of Civil Engineers (ASCE) not surprisingly spends a significant amount of time developing publications to advance their profession. Many publications emerge from ASCE committees as reports, manuals of practice or national standards. After four years of work, a committee report called *Permeable Pavements* will be released soon by ASCE's Environment and Water Resources Institute. It is a thorough 200-page sequel to a 2005 landmark book by landscape architect Bruce Ferguson, FASLA, called *Porous Pavements*.

The ASCE report will be in digital format only, available for purchase and download in its entirety, or by chapter. The report defines and standardizes terms used in permeable pavements. This should help reduce confusion among such words as subbase and subgrade, runoff and run-on, infiltration and exfiltration, underdrains and drain tiles, etc. Besides defining terms throughout the text, an appendix includes a glossary.

The chapter structure of the report is straightforward. The first chapter covers requirements common to all permeable pavements. This includes structural and hydrologic design considerations. A special feature is thorough design and construction checklists. Chapters two through six cover porous asphalt, pervious concrete, permeable interlocking concrete pavements, grid pavements and some new technologies. Chapters two through five are prefaced with fact-sheets consisting of a few pages providing an instant overview of each. The chapter after each then fills in the details.

Based on experiences of the committee and the immense amount of referenced research literature throughout the entire report, chapter seven reflects on actions required for successful projects. These include clarifying owner expectations on maintenance early in the process and holding a pre-construction meeting with the owner's representative/engineer, contractor, material suppliers and the material testing laboratory. A key objective for this meeting is sediment control through careful construction sequencing and equipment use.

Chapter eight is on maintenance and this one required the most committee discussion. The chapter sets forth surface infiltration test methods to determine when vacuuming maintenance might be required. This includes the recently approved test method for permeable interlocking concrete pavements, ASTM C1781 *Standard Test Method for Surface Infiltration Rate of Permeable Unit Pavement Systems*.

Chapter nine serves as an introduction to current modeling practice, as the subject could be its own book. This chapter touches on commonly used sizing models and mentions more complicated time-based simulation models used to design permeable pavements. A key consideration in selecting models is whether site outflows only are needed or if the analysis requires modeling permeable pavement within

flows through a larger drainage catchment.

Chapter ten sets forth research needs to make permeable pavements easier to design, build and maintain. This includes full-scale load testing that informs design chart/methods for more reliable structural designs. In addition, better models on pollutant reduction are needed that process inputs on pollutants, sediment loads, and base thicknesses and subgrade soil characteristics. While there have been a few dozen full-scale runoff and pollutant monitoring projects, additional research is needed to tell designers what types of pavement systems are most effective in targeting reduction of site-specific pollutants, such as nutrients, metals or oils.

The ASCE report was spearheaded by a stakeholder committee consisting of civil engineers and regulators from cities, states, the U.S. EPA and industry. The effort represents hours of discussion, debate and in-depth review of research papers on permeable pavements as well as report drafts. The effort also led to creating a comprehensive library of technical papers on the subject.

The motivation behind this effort has been direct; ask the customer what's needed to design, build and maintain permeable pavements. Obviously, the ultimate customer is the project owner asking about requirements for a durable and low-maintenance pavement. The civil engineer is also a customer who addresses design methods, hydrologic and water pollution models, design details and specifications. The report helps answer those questions from the engineer to better service their clients. As a bonus, the report includes guide construction specifications in chapters two through five that can be modified to project conditions by design professionals.

As a customer, regulators ask how permeable pavement performance can satisfy local or state pollution reduction goals; the ASCE report provides unvarnished information. Among other places, this information is found in the appendices, which include data on volume and pollutant reductions. Regulators also want checklists for plan review and sometimes for site inspections. The checklists in this report help address that need. The intent of the report is that state and local stormwater agencies will reference it as definitive guidance in their manuals.

While the report's chapters and pictures come from several authors, the editing and layout were orchestrated by Bethany Eisenberg with VHB Consultants and Kelly Lindow, P.E., an independent stormwater consultant. As co-chairs and seasoned stormwater professionals, both began the journey with this committee with questions asked about permeable pavements by their clients and regulators. Having provided answers, the committee delivers a landmark report.

the MAIN events

2014

Aug. 3-7	**Portland, OR**	*Stormcon*
Aug. 17	**Toronto, ON**	*APWA Congress*
Sept. 10-13	**Dallas, TX**	*ICPI 2014 Summer Meeting*
Oct. 22-24	**Louisville, KY**	*Hardscape North America*
Nov. 21–24	**Denver, CO**	*ASLA Annual Conference & Expo*

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CORRECTION

In the Interlockutor article from Fall 2013, the following statement was misprinted: "Unlike regular interlocking concrete pavers, permeable pavers can be reinstated after utility repairs." This statement should have been: "Like regular interlocking concrete pavers, permeable pavers can be reinstated after utility repairs."

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