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**SHED THE SHOVEL, HALT THE SALT**
An introduction to snowmelt heating systems.

**2016 HNA HARDSCAPE PROJECT AWARDS**
Recognizing excellence for hardscape projects from residential walkways, patios and driveways to commercial plazas, parking lots and streets.

Paver Designs, LLC won a 2016 HNA Hardscape Project Award for the Zeplin Residence in Omaha, NE.

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MODELING LIFE-CYCLE COSTS OF INTERLOCKING CONCRETE PAVEMENTS FOR MUNICIPAL STREET SYSTEMS

What if?

Many cities maintain a database describing the condition of their road pavements. The database includes the pavement structure, condition information listed as various 'distresses,' as well as their extent and severity. The database is used to calculate a pavement condition index (PCI) based on these combined factors. A PCI can rate a single pavement or a network from 1 to 100 with 100 being a brand new, perfect pavement while 1 suggests a surface like the Ho Chi Minh Trail after a B-52 bombing raid.

Two ASTM standards describe the index calculation process. For asphalt and concrete pavements, there is ASTM D6433 Standard Practice for Roads and Parking Lots Pavement Condition Index Surveys. For segmental concrete pavement, there is ASTM E2840 Standard Practice for Pavement Condition Index Surveys for Interlocking Concrete Roads and Parking Lots. (Both standards can be purchased at www.astm.org.)

Pavement condition surveys for asphalt and concrete streets have been in existence for decades. Municipal and state road agencies refine their models characterizing wear over time to accurately predict required maintenance, types, costs and budgets. For interlocking concrete pavements, such surveys exist in The Netherlands due to extensive segmental pavement use there. For the U.S. and Canada, there are millions of square feet of municipal interlocking concrete pavements. However, most are installed as specialty applications to highlight downtown or neighborhood business district improvements. There are only a handful covering an entire neighborhood, larger residential or commercial districts, or entire city centers.

Most municipalities struggle financially to maintain existing asphalt and concrete pavements. These pavements are institutionalized over the past 100 years through design, construction and maintenance requirements, plus equipment and crew investments. Considering wider use of interlocking concrete pavements by municipal road agencies is simply out of the question unless the industry presents compelling evidence for substantial reductions in material, equipment and personnel costs.

Such reductions from interlocking concrete pavement beg exploring in the context of a road network in a neighborhood or district. Experience has demonstrated that when properly designed and installed, interlocking concrete pavements last 30 to 40 years. The absence of damage and reduced pavement life from utility cuts, almost all-season repairs, no resurfacing, possible lane and parking space striping with colored pavers, lower capital expenses from using less and simpler maintenance equipment, and paver re-use all appear to present lower life-cycle costs for a municipal street system. ASTM E2840 provides tools to calculate PCIs from databases as a prerequisite to measuring costs and benefits.

ICPI would like to take this to the next level. Here’s the pitch: The industry seeks a willing municipal road agency (and possible supporting pavement consultant) with a pavement management system who would like to model the what-if life-cycle costs of interlocking concrete pavements to better understand and reduce agency costs, plus operational and institutional changes that would yield taxpayer benefits. Together, we might be surprised after examining the what-ifs that the next question turns out to be why not?

Moving municipalities toward using interlocking concrete pavements for entire street networks might start by asking them what if?
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OHIO TEAM WINS HARDSCAPE NORTH AMERICA INSTALLER CHAMPIONSHIP

Oak Leaf Landscaping of Danville, OH, won the 4th Annual HNA Installer Championship at the 2016 Hardscape North America trade show, an Interlocking Concrete Pavement Institute (ICPI) event.

Twenty-four segmental concrete pavement installation teams from throughout the United States and Canada competed in the two-day event. Each installation project was judged on safety, craftsmanship and compliance with industry best practices.

In the preliminary round, the teams were given 60 minutes to construct an 8 ft x 10 ft interlocking concrete patio with a seat wall as specified in drawings provided by the competition committee. Teams with the top four scores qualified for the championship round where they were given 90 minutes to construct their own creative design.

In the championship round, Oak Leaf Landscaping scored 402 out of a possible 450 points for its original design and construction of a square patio area with an ornate checker board table and two bench seats. The team consisted of Tobias Yoder, Daniel Nisley and Owen Nisley. They received the championship prize package that included a $1,000 award, an iQ Powertools 360 14” dustless masonry table saw with accessories, and a Weber MT CF3 Pro forward-plate compactor.

Second place was awarded to the Cheeseheads Team, Zillges Materials of Oshkosh, WI. Team members were Emmanuel Oesterreich and Jourdain Oesterreich. In the championship round, they scored 393 points and were awarded $400 and an iQ Powertools 360 dustless masonry table saw.

“IT’s an adrenaline rush,” said Emmanuel Oesterreich. “It not only tests someone’s skill level, but really tests their composure and how they react under pressure.”

Third place went to Epic Pavers of Evless, TX, with team members Luis Garcia, Jose Garcia and Samuel Guijaro. The team scored 388 points in the championship round. For their efforts, the team received a $100 award. Fourth place was awarded to LR Landscaping of Lincoln, CA, with team members Lee Reveles, Daniel Preciado and Elmer Casasola. In the championship round, they scored 378 points.

All four finalist teams also received a hand tool package provided by Ox Tools and a plaque.

The judges for the Championship were Fred Adams of Fred Adams Paving Co., Inc.; Frank Gandora of Creative Hardscape Company; Tim Huinker of Anchor Wall Systems; and Chuck Taylor of Belgard Hardscapes by Oldcastle.

The Championship was sponsored by Alliance Designer, Anchor Wall, Belgard, iQ Power Tools, Ox Tools, Pavestone and Weber MT.
Twenty-four teams competed in this year's competition. “It’s an adrenaline rush,” said Emmanuel Oesterreich of Zillges Materials, whose team finished in second place. “It not only tests someone’s skill level, but really tests their composure and how they react under pressure.”

QUALITY IS REMEMBERED LONG AFTER THE PRICE IS FORGOTTEN

Create beautiful pathways with Columbia/Technmatik molds.

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Five axis milling centers allow for complex paver shapes.

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PAVE // RETAIN // BUILD
New Product Spotlight

The 2016 Hardscape North America trade show featured many new products on display at exhibitor booths. These are just a few that caught attendees’ attention. ICPI does not endorse these products and welcomes member companies to submit information on new products to icpi@icpi.org.

**ADJUSTABLE HEIGHT PEDESTALS**

On display at the Techo-Bloc booth, Buzon BC Series pedestals for slab applications feature a screw-jack design for quick and easy installation. The pedestals can be extended to a height of 44 in. (1,100 mm) using couplers. Slope corrector components of the system allow for a 5% pitch adjustment or compensation for uneven subbases up to the same amount. Made from 78% recycled and 100% recyclable polypropylene, each pedestal can support loads of more than 1 ton (1,000 kg).

**PROVENCE SLABS**

Belgard’s new Provence Slabs are designed with Satura technology, emulating the look and feel of natural stone but with standard dimensions to lower labor costs and shorten project timelines compared to natural stone installations. Available in a three-piece modular set, large square and large rectangle options, Satura's surface coating also enhances color saturation and provides improved protection against stains and efflorescence. The availability of natural stone is often limited by region; Provence Slabs offer popular bluestone and ledgerock hues to a broader market and open new possibilities for project designs and color selection.

**SOLAR-POWERED LED STARLITES**

Kerr Lighting by SEK’s self-contained, solar-powered LED lights come in a range of sizes and shapes, including standard rectangular paver dimensions, and can be placed into an installation as easily as setting a paver. Unlike lithium ion batteries, the double-layer capacitor used in these lights will not need replacement. Under full sunlight, charging time is 3-5 hours to provide 12 hours of working time. The stainless steel light fixture with UV-resistant polycarbonate lens is engineered to withstand light vehicular traffic, is waterproof and has a slip-resistant surface. In addition to standard warm white, special order alternatives of red, green, blue, yellow and cool white colors are also available.
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20% MORE POLYMERS

Quality is our strength
inter’s snowfall brings inconvenience and injury risk for many across North America. Slipping on snow or icy surfaces can cause hip dislocations, wrist fractures or even head injuries. From private residences to commercial storefronts, snow and ice removal is a responsibility not to be taken lightly. A snowmelt heating system effectively tackles that responsibility with benefits beyond merely melting snow. By significantly reducing or potentially eliminating the need for deicers and shoveling, a pavement heating system can also help preserve the beauty and longevity of pavers while reducing liability.

While the cost to install a pavement heating system may qualify it as a luxury item, the return on investment comes from saving hours of shoveling and deicer costs. When considering the savings season after season, particularly in heavy snowfall regions, the investment yields valuable returns.

HYDRONIC OR ELECTRIC?
There are two types of pavement heating systems: electric and hydronic. Electric systems conduct heat through wires or cables, whereas hydronic systems pump and recirculate a mix of glycol and water through a loop of flexible polymer or synthetic rubber tubing. Generally, an electric system is cheaper to install but costs more to operate over time because the current draws continuously while the system is on. A hydronic system is more expensive to install due to the additional components required such as a dedicated boiler, pumps and manifolds, often installed by a plumber. Hydronic systems have lower operating costs because they reheat and recirculate the fluid. With more parts, hydronic systems may require more maintenance over time than electric systems.

THE INSULATION FACTOR
Another key factor to determine at the outset is whether or not an insulation layer is required by local building codes. Places like Aspen, CO, or Sun Valley, ID, for example, require an
insulation layer for pavement heating systems to maximize energy efficiency. This adds costs and can cause the pavement to fail if not correctly installed.

“It’s a 70-foot driveway where the pavers slid six inches and left a gap at the top,” said Marc Larsen of Mountain West Paver Specialists. The insulation material often used is squishy, like bubble-wrap, explained Larsen, and installers mistakenly place it on top of the base. “You have to remove the flexibility of that insulation material by putting it under the rigid base of a concrete slab.”

If there is no building code requirement to use insulation, it can be presented to the customer as an efficiency option but it’s not necessary for the system to function optimally, according to Larsen. The ICPI construction guidelines in ICPI Tech Spec 12 – Snow Melting Systems for Interlocking Concrete Pavements do not recommend insulation below the bedding sand in residential driveways. However, insulation below the bedding sand is acceptable for pedestrian-only applications such as a patio or sidewalk. For roads or crosswalks, concrete or asphalt bases are recommended.

PERFORMANCE PLANNING
The design and performance of a snowmelt system depends on three environmental factors: the rate of snowfall, the temperature of the snow and wind conditions. Snowmelt rates will vary with the application. For example, melting 1 in. (25 mm) of snow per hour is usually acceptable for a residence but may be unacceptable for a sidewalk in front of a store. Most manufacturers of hydronic and electric snowmelt systems

*Continued on page 12*
provide design guidelines and/or software to calculate the BTUs per square foot (watts/m²) required to melt a range of snowfalls for a given region.

The design methods work through a series of calculations that consider the snow temperature (density), air temperature, exposure of the pavement to wind, and unusual site conditions. The calculations indicate the size and spacing of cables or tubing required, as well as the temperature of the fluid, its flow rate, or the electricity required. The Radiant Panel Association (radiantpanelassociation.org) provides design guidelines for liquid snow melt systems.

**LAYOUT AND CONSTRUCTION**

With electric and hydronic systems, the best performance comes from a heat source placed as close to the pavers as possible, nestled into the bedding sand. The recommended depth for bedding sand is normally 1 inch. However, the wires or tubing need a ½ inch of sand over them for protection from abrasion and possible rupture. Therefore, the diameter of the wires or tubing may increase the bedding sand thickness to a maximum of two inches before compaction.

Once the base is installed and compacted to the proper depth and density per ICPI Tech Spec 2 – Construction of Interlocking Concrete Pavements, a galvanized wire mesh is placed over the surface of the base and secured to the base with stakes. The wires or tubing for the heating system are then fastened to the wire mesh with plastic zip ties. Installation of

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**HEATED SIDEWALK/RESIDENTIAL DRIVEWAY ON ASPHALT OR CONCRETE BASE**

Concrete curb/edge restraint

Geotextile turn up at curb

Concrete paver 2 ¼ in. (60 mm) min. thickness

1 ½ in. (40 mm) bedding sand (2 in. max)

Wires or tubing secured to base (layout determined by manufacturer)

2 in. (50 mm) diameter drain hole at lowest elevation(s) filled with pea gravel

Concrete base 4 in. (100 mm) min. thickness

Asphalt base 2 in. (50 mm) min. thickness

Compacted soil subgrade

Aggregate subbase as required under concrete and asphalt

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Experienced electrical and plumbing contractors should install snowmelt systems.

Spreading and screeding bedding sand must be done without moving or damaging wires or tubing.
wires or tubing should be done by an electrician or plumbing contractor experienced with these systems. Before placing sand or pavers over the system, it should be tested for leaks.

Some contractors install the wires or tubing into the top inch of the base to forego the wire mesh and facilitate easier sand screeding. In this case, base material is added around the wires or tubing and then compacted to bring the level of the base to its final grade. The wires or tubing are exposed flush with the compacted surface of the base.

While the above guidance is suitable for pedestrian and residential driveway applications, areas subject to constant vehicular traffic such as crosswalks or roads require wires or tubing placed within a concrete slab or asphalt, rather than on top of the base. This protects the heating system from tire damage. Check with the wire or tubing manufacturer to be sure materials can withstand hot asphalt and its compaction. When an asphalt or concrete base is used, 2-inch diameter weep holes should be added at the lowest elevations for drainage, filled with washed pea gravel, and covered with geotextile to prevent bedding sand loss.

For permeable interlocking concrete pavements, wire or tube spacing will most likely be reduced to account for heat loss to the air voids within the permeable aggregate bedding layer. The manufacturer of the heating system should be consulted on durability of the wires or tubing when placed against bedding aggregate and then subjected to vehicular tire loads.

**INSTRUCTION AND GUIDANCE**

ICPI Tech Spec 12 – Snow Melting Systems for Interlocking Concrete Pavements provides detailed installation guidance and is available for download from the resource library page of ICPI’s website: icpi.org/resource-library. ICPI also offers courses that provide instruction and certification. See page 23 for a calendar of upcoming courses and locations. Visit icpi.org/education-certification to learn more and to register.
The HNA Hardscape Project Awards recognize outstanding hardscape projects by contractors building residential walkways, patios, driveways, commercial plazas, parking lots and streets. In its ninth year, the awards program received 114 entries. Projects were judged on intent, design, quality of construction and craftsmanship, compatibility with related construction materials and systems, construction innovation, detailing and overall design excellence.

**Award Winners**

1 Combination of Hardscape Products – Commercial – More than 20,000 SF

**UNIVERSITY OF SAN FRANCISCO**

**Location:** San Francisco, CA  
**Contractor:** The Legacy Paver Group  
**Manufacturers:** Pavestone Company & Natural Granite Pavers  
**Designer:** Interstice Architects

**Description:**  
The University of San Francisco campus has undergone major redevelopment over the last eight years, removing asphalt driveways and paths and replacing them with over 50,000 sf of interlocking concrete pavers. The new science building included over 30,000 sf of granite pavers. The campus walk consists of Pavestone Villa pavers, and the science building pavers are custom-cut granite slabs in various sizes and shades of gray. The most challenging aspect of the installation was working with tight deadlines over the summer to get everything in place before students returned for the fall semester.
**NURSING HOME COURTYARD**  
**Location:** Wilmington, MA  
**Contractor:** Monello Landscape Industries  
**Manufacturer:** Techo-Bloc  
**Designer:** Joe Monello

**Description:**  
The contractor provided the client with a showcase for the ages utilizing outdoor kitchens, pergolas, water fountains, audio, lighting, seat walls, custom pavers, a sensory garden and a variety of beautiful plantings. The outdoor kitchens feature a steel superstructure and have an exterior veneer. A leathered granite was installed for the countertops and was also used for the many bistro tables throughout the courtyard. Half of the tables were lowered to ADA height compliance so wheelchair users can sit and enjoy the space. The main patio uses Techo-Bloc Blu 60 aged pavers while the inner walkways contain Techo-Bloc Blu 60 smooth pavers. Using two different pavers creates a unique identity while instilling a sense of movement throughout the space.

**BALTAZAR RESIDENCE**  
**Location:** Wilbraham, MA  
**Contractor:** Bahler Brothers  
**Manufacturer:** Techo-Bloc  
**Designer:** Jen Kloter, Bahler Brothers

**Description:**  
The owners of Baltazar Residence have large families and frequently entertain, so they needed a large space for activities supporting both. A series of retaining walls and patio levels create several outdoor rooms. To preserve the panoramic view from the back of the house, the design kept a low profile. An infinity-edge pool was a crucial focal point of the design. The overall design and curves of each of the 10 walls created niches for intimate spaces as well as more expansive areas. The interaction between landscape bed lines, patio edges and walls flows across the different levels, working together as a whole. The entire area becomes a resort-like oasis for entertaining 100 people, yet has intimate enough spaces to be comfortable for this family of four.
**Butler Rear Yard Makeover**

*Location:* Oceanside, CA  
*Contractor:* Landmark Pavers  
*Manufacturer:* Belgard  
*Designer:* Isaiah Ruczewski

**Description:**
This project’s initial challenge was taking full advantage of the expansive view of a ridgeline and canyon location while maximizing the shallow depth of the backyard space. A family-friendly, conversational fire pit surrounded by freestanding seating walls creates a focal point for the hardscape setting. A Belgard Cambridge Cobble patio accented by raised planter bed walls with soft-curved lines was installed next to an artificial turf yard to complete this outdoor entertaining space. The one unforeseen challenge during construction was the elevation that required drainage well beneath the standard depth while providing adequate fall to the street. Having solved this, the homeowners now enjoy their westward sunset view, surrounded by a colorful softscape of organics that complement this stunning hardscape installation.

**Centennial Mall**

*Location:* Lincoln, NE  
*Contractor:* Dreamscapes, Inc.  
*Manufacturers:* Pavestone Company  
*Designer:* Clark Enerson

**Description:**
Built in 1967 to commemorate Nebraska’s 100th anniversary, Centennial Mall recently underwent a complete makeover to serve as a community gathering place. The recent renovation effectively connects the state capitol to the University of Nebraska via a pedestrian-friendly environment. Stretching from K Street to R Street, visitors encounter information about Native American tribes, Nebraska’s diverse eco-regions, transportation history, state leaders and community supporters. Pavestone supplied 30,000 sf of pavers instrumental to telling the Nebraska story. Various paver colors depict the different eco-regions of Nebraska. Using special tools and creative talents, the contractor engraved and inlaid pavers to depict Nebraska’s rivers and railroad lines. The design also included a dark, monolithic, square-edged paver to highlight the importance of the state capitol building. Fountains along the way celebrate education, imagination and creativity—supporting Nebraska’s motto, “The Good Life.”
Concrete Paver – Commercial – Less than 15,000 SF

TERRITORY SQUARE LIBRARY
Location: Florence, AZ
Contractor: Re-Create Companies, LLC
Manufacturer: Belgard
Designer: Hidell Associates Architects

Description:
This project supports a multi-faceted, multi-owner project in development along the Gila River dedicated to the future of the entire community. The town worked closely with a legendary architect and planner to develop a bold vision linking this historic town with the growing suburbs. Pavers create a warm, beautiful and inviting environment for senior citizens, adults, teenagers and children to join together for the use of the surrounding amenities. Square units dominate the installation, starting with the overall layout, the 12 x 12 in. paver stack bond walkways, and finishing with a field of ashlar pattern pavers. A ground-face soldier course frames each paver area elegantly. Additionally, the differing paver colors helped maintain consistency with the overall design of the building.

Concrete Paver – Residential – More than 3,000 SF

NEVADA WOLFPACK BASKETBALL COURT
Location: Reno, NV
Contractor: Hain Enterprises
Manufacturer: Basalite Concrete Products
Designer: Mark Hain

Description:
Always up for a creative challenge, Mark Hain of Hain Enterprises was asked to create a basketball court for a customer that replicated the one at Lawlor Events Center on the University of Nevada, Reno, campus. Mark accepted the challenge, obtaining access to the actual court at the Lawlor Events Center, creating a template over the center court logo and then creating an intricate concrete paver design. Through painstaking scribing and an insistence on precision handmade cuts, Mark's crews crafted a court that's now the envy of all Nevada Wolfpack fans and one that will last a lifetime. His use of several different paver colors and shapes to enhance the periphery of the logo completes the artistic canvas, in addition to the logo itself that can be seen and enjoyed by airplane passengers flying south of Reno.
FEATURE STORY

8 Concrete Paver – Residential – Less than 3,000 SF

ZEPLIN RESIDENCE
Location: Omaha, NE
Contractor: Paver Designs, LLC
Manufacturer: Belgard/Techniseal
Designers: Jim and Justin Hampton

Description:
This project design features a paver patio with inlay, seat wall, fire pit and water feature to deliver some height and character to the large flat backyard. The homeowner wanted to make the patio a destination spot that would draw guests and visitors. To access the patio, one first crosses over a stream via a stone bridge. Paver Designs hand-carved two stone pillars and inset stained glass backlit with LED lighting to lead the way. After laying the pavers, Paver Designs hand-drew the inlays for cutting. A band of natural stone included in the wall columns matches those on the house. Forty tons of granite boulders create a waterfall feature, which includes a shallow wading area for the homeowner’s grandchildren. LED lighting throughout the project creates a warm and welcoming effect at night.

9 Concrete Paver – Permeable – Commercial

SEA SCOUT BASE GALVESTON
Location: Galveston, TX
Contractor: Gulf Coast Pavers
Manufacturer: Pavestone Company
Designer: Studio Outside

Description:
The Sea Scout Base Galveston is a destination and educational experience for Boy Scouts and Sea Scouts from all over the country. Concrete pavers were used throughout the site to connect multiple outdoor spaces and provide a functional yet beautiful underlying floor with high-end finishes and textures. With a focus on environmental stewardship, the site landscape captures and reuses rainwater. Parking for 50 cars and associated driveways are executed with permeable pavers, allowing rainwater to be collected via below-grade storage. By using locally-manufactured permeable pavers in colors with high solar reflectivity, the project earned sustainable sites and resource conservation credits toward LEED Platinum Certification. The pavers used for this job were 6 x 12 City Stone I and Eco-Priora permeable pavers in charcoal, shot-blast pewter and marble Quartex finishes.
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– Matthew Bragg
Liberator Restoration, Brookhaven, NY

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– Matt Griffin
Prime Lawn. Kingwood, TX

This is clearly a game changer in the segmental paving industry!

– Andrew Vear
PaverCrafters West Reno, NV

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JOINTING MATERIAL • PAVER TREATMENT PRODUCTS
Post Oak Community is a private subdivision in an upscale Atlanta suburb. The permeable paver design met the impervious cover limitations and water quality requirements. Pavestone’s Eco-Venetian four-piece combo created a striking visual interest to the pavement. The designer managed storm drainage and provided stormwater detention with an aesthetic that matches the design of the new homes while complementing the surrounding existing homes. The warmth of the Chattanooga Sandstone color includes earth tones of buff and charcoal for a subtle blend of natural stone. By using a permeable paver system, all stormwater is out of sight and mind. The result: an inviting neighborhood that draws one in like a Norman Rockwell painting.

Honorable Mentions

1. Combination of Hardscape Products – Commercial – More than 20,000 SF
   Tivoli Auraria Campus
   Location: Denver, CO
   Contractor: Continental Hardscape Systems
   Manufacturer: Pavestone Company
   Designer: Wenk Landscape Architecture and Planning

2. Combination of Hardscape Products – Commercial – Less than 20,000 SF
   Oak Ridge Country Club
   Location: Oak Ridge, TN
   Contractor: Ladd-Sapes, Inc.
   Manufacturer: Belgard

3. Combination of Hardscape Products – Residential – More than 4,000 SF
   Collo Backyard Retreat
   Location: Ashburn, VA
   Contractor: Holloway Company
   Manufacturer: Travertine
   Designer: Ted Tidmore
   Hot Tub Movie Theater
   Location: Wayne, NJ
   Contractor: Monello Landscape Industries
   Manufacturer: Techo-Bloc
   Designer: Joe Monello

4. Combination of Hardscape Products – Residential – Less than 4,000 SF
   Beausir Residence
   Location: Overland Park, KS
   Contractor: MW Lawn and Landscape
   Manufacturer: Pavestone Company
   Designer: Aaron Albertson

5. Concrete Paver – Commercial – More than 15,000 SF
   State Farm Regional Office at Cityline
   Location: Richardson, TX
   Contractor: Builders Services Company
   Manufacturer: Pavestone Company
   Designer: The Office of James Burnett

6. Concrete Paver – Commercial – Less than 15,000 SF
   Look Cinemas Prestonwood
   Location: Dallas, TX
   Contractor: Arlington Pavers
   Manufacturer: Pavestone Company
   Designer: StudioOutside

7. Concrete Paver – Residential – More than 3,000 SF
   Honesuckle Lane Residence
   Location: Appleton, WI
   Contractor: CLA Landscaping
   Manufacturer: County Materials Corporation

8. Concrete Paver – Residential – Less than 3,000 SF
   Old Town Oasis
   Location: Fort Collins, CO
   Contractor: Lindgren Landscape
   Manufacturer: Belgard
   Designer: Tim Lindgren

Hardscape Art
Location: Kingsport, TN
Contractor: Jackson Jones Construction
Manufacturer: Techo-Bloc
Designer: Jackson Jones Construction

9. Concrete Paver – Permeable Commercial
   Riviera Beach Marina
   Location: Riviera Beach, FL
   Contractor: Precise Paving
   Manufacturer: Belgard
   Designer: Calvin, Giordano & Associates Engineers, EDSA Landscape Architects

PROJECT GALLERY Visit interlockdesign.org to view additional images of these award-winning projects.
ENGINEER’S view
By David R. Smith

Updates on Paving Product Standards

NEW ASTM STANDARD SUPPORTS THE GROWING USE OF CONCRETE PAVING SLABS FOR COMMERCIAL AND RESIDENTIAL PROJECTS

ASTM’s C1782 Specification for Utility Segmental Concrete Paving Slabs provides a baseline acceptance standard for slab products manufactured with dry-cast, wet-cast and hydraulically pressed processes. Available for purchase on www.astm.org, C1782 determines the minimum average flexural strength (725 psi), dimensional and warpage tolerances, and freeze-thaw durability requirements for paving slabs with dimensions ranging from 12 x 12 to 48 x 48 inches.

Due to their larger size, segmental concrete paving slabs do not conform to ASTM C936 Standard Specification for Solid Concrete Interlocking Paving Units. The only available product standard for slabs prior to C1782 was a CSA (Canadian) paving slab standard in existence since 1972. C1782 now provides requirements with familiar ASTM terms and references that producers can meet. The standard was developed by paving slab manufacturers, testing labs and other experts within the ASTM Subcommittee on Manufactured Masonry Units and Related Units (also known as C15.03).

Architects, civil engineers and landscape architects will benefit most from C1782 by using it in construction specifications. Paving slab manufacturers will use the standard to promote products that meet or exceed its requirements. The standard will also give concrete testing labs the opportunity to provide an additional service in testing paving slabs. Most importantly, C1782 clearly differentiates slabs from the pavers in C936.

ICPI indicated that another segmental concrete paving slab standard will be submitted for balloting by ASTM in the coming months. This one will likely be named Specification for Architectural Segmental Concrete Paving Slabs. The architectural designation means it will cover units with textured architectural finishes such as hammered, polished or molded surfaces. Additionally, the specification will include closer tolerances than C1782 to better accommodate precision installations that use pedestals for roof decks, bitumen-set (sand-asphalt bedding) and some sand-set bedding applications. Such units may require grinding (also known as gauging) to conform to tighter dimensional tolerances.

UPDATES TO THE CONCRETE PAVER STANDARD

ASTM C936 Standard Specification for Solid Concrete Interlocking Paving Units received an appendix with a zone map that points to optional use of -15° C (5° F) as the lowest temperature using ASTM C1645 Standard Test Method for Freeze-thaw and De-icing Salt Durability of Solid Concrete Interlocking Paving Units. This test method calls for immersing pavers or coupons cut from paving slabs into a 3%...
The workhorse concrete paver gets an optional upgrade for freeze-thaw durability testing.

saline solution and then exposing them to a maximum of 49 freeze-thaw cycles (each 24 hours) while inside an automated freezer. The material loss from the paver is weighed and must not exceed 500 grams per square meter of surface area to meet C936. This optional ASTM test method is very similar to that in CSA A231.2 Precast Concrete Pavers. The new optional lower temperature in C936 should increase assurance of winter durability to the purchaser as well as to the manufacturer.

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EDUCATIONAL OPPORTUNITIES

**PICP Specialist Course**
- Jan. 12: Atlanta, GA
- Jan. 20: Woodbury, MN
- Jan. 25: Pewaukee, WI

**Certified Concrete Paver Installer Course**
- Jan. 12–13: Cypress, TX
- Jan. 16–17: Greensboro, NC
- Jan. 18–19: Frederick, MD
- Jan. 17–18: Las Vegas, NV
- Jan. 18–19: Woodbury, MN
- Jan. 19–20: Blacksburg, VA*
- Jan. 23–24: Pewaukee, WI
- Jan. 25–26: Hershey, PA
- Jan. 30–31: Waupaca, WI
- Feb. 1–2: Harpers Ferry, WV
- Feb. 8–9: Fairfield, NJ
- Feb. 14–15: Charlotte, NC*
- Feb. 22–23: Lindenhurst, NY
- Mar. 7–8: East Syracuse, NY
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