

UNI-GROUP U.S.A.

Frequently Asked Questions - Interlocking Concrete Traditional and Permeable Pavers

General
Design & Installation
Structural & Engineering
Aesthetics & Appearance
Durability, Maintenance & Repair
Permeable Pavers

General

What are interlocking concrete paving stones (concrete pavers)?

Pavers are individual precast concrete units. They are produced on specially designed paving stone machines according to ASTM or CSA standards. This specialized manufacturing process ensures an exacting quality controlled environment that produces pavers of higher strength and durability than normal concrete. Pavers are a minimum of 8000 psi, compared to about 2500 psi for poured in place concrete.

How long have paving stones been in use?

The original paving stone was used by the Roman armies centuries ago. They built roads using an aggregate base with the placement of stones on top. These roads are still in place today and wind their way through the European countryside. Following World War II, there was a dire need for reconstruction. To facilitate the construction of roads, the Dutch recreated stone cobbles in concrete. In the 60's, Germany improved the rectangular "Holland Stone" by creating dentated shapes. In the early 70's the popularity of paving stones reached the shores of North America and have gained in popularity ever since.

How does the interlocking system work?

Pavers are placed on a one inch bed of sand over a compacted aggregate base. The thickness of the base will vary depending on its application. Paving stones are restrained using edge restraints. Commonly used edge restraints include concrete curbing, plastic edge restraints, and aluminum edge restraints. Once the pavers are placed and restrained, they are compacted into place. Fine masonry sand is swept into the joints, and the pavement compacted for 3 or 4 passes until full interlock is achieved. Upon completion of this compaction process, the area is ready for immediate use. Unlike asphalt and concrete, no curing or setting time is required for interlocking concrete paving stones.

What types of areas are appropriate for interlocking pavers?

Interlocking concrete paving stones are used at airport, container facilities, railway container facilities, municipality streets, plazas, parks, driveways, walkways and patios. Pavers are the perfect solution for almost any applications because of their high quality, aesthetic value, and lower life-cycle cost in comparison to asphalt or concrete.

Are UNI[®] pavers strong enough for frequent use under traffic?

Yes, our pavers exceed the industry standards for strength and low moisture absorption. The industry standard for concrete pavers is a minimum of 8,000 psi and typically the UNI[®] pavers test between 10,000 to 11,000 psi. That is approximately 3 times stronger than poured concrete. In addition, our absorption rate is in the 2% to 3% range and the industry requires 5% or less. Compared to regular poured concrete that has an absorption rate of about 17%, concrete pavers will not absorb much moisture or be damaged by freeze thaw cycles. However, an 8-12 inch foundation of road base is required in order to handle the weight of the load. Also, edge restraints must be used in all paver applications.

Are ICPs the same as bricks?

No bricks are made from clay and are fired in kilns to harden. Interlocking pavers are a concrete product, produced with specialized equipment and made to specific industry standards.

Design & Installation

Where can I find guide specifications and detail drawings in electronic format?

UNI-GROUP U.S.A. can supply CAD drawings and guide specifications. Call or visit our web site.

How important is good installation?

Proper installation is critical to good performance for all types of interlocking pavements. If you use a contractor, look for certification from the Interlocking Concrete Pavement Institute. If you plan to do a project yourself, consult your UNI[®] dealer for design and installation guidance.

Should concrete pavers be placed in mortar or mortar used for the joints?

No, it is not a recommended practice especially in areas subject to vehicles. Interlocking paving stone are a flexible system and should be placed on a sand bed. It is recommended that you use coarse granular sand, which will help bind the pavers together with a friction joint. This sand is swept into the joints and compacted to achieve the proper installation.

Can I use UNI pavers over my old concrete patio?

As long as your existing patio is in good condition. There can be cracks in the old patio as long as it is still level and has not "heaved" up in any areas. You will still need to retain the border of your project. Since you will not be able to stake in an edge restraint around it, a heavy-duty silicon based construction adhesive is recommended. Use this on the bottom of your border stones only to adhere it directly to the existing concrete. IMPORTANT NOTE: Any time you are overlaying an existing patio, it is important to recognize how much room you have between the existing patio and the threshold of your door. Our typical paver is 2 3/8 inches tall. There has to be enough room for you to overlay the patio without raising the new level above your door's threshold.

Can I put concrete pavers over a driveway that is cracked in several places?

If the cracks in your driveway have started to drop or heave too much, it is recommended that you remove the old driveway before you lay your pavers. If your cracked driveway is still basically flat then you can use it for a base for your pavers. Any minor dips can be filled with concrete mix before screeding your sand. You should mortar set the Holland Stone paver in a soldier course (placing the Holland Stone side-by-side in the mortar) all around your perimeter border. Then screed your 1" of sand bed for your field pavers. After your sand bed is screeded, you can lay your pavers and compact them into the sand bed. Next, spread a light layer of sand on the pavers and compact it one more time to complete the lockup. Once that is complete, you should sweep sand into the joints, sweep off the excess and your job should be complete.

Which types of edge restraint do you recommend I use around a patio – plastic, aluminum or concrete?

We recommend edge restraints for all types of concrete paver projects, including light duty residential applications such as walkways or patios. Edge restraints help keep pavers from spreading apart or tipping, thereby maintaining consistent interlock of the units throughout the pavement. Many types of edge restraints are available including precast concrete or cut stone, steel, aluminum, plastic, timber, and troweled concrete toes. Existing curbs, stairs, and walls are also suitable as edging for pavers. Consult your local UNI[®] manufacturer licensee for recommended edge restraints for your type of project.

What type of sand do I need to use between my pavers?

Use a sharp coarse river washed sand or sharp sand with multi-sized grains. The coarse sand will bind together when you go over the pavers with the compactor. This will make the joints between the paver solid and prevent moisture from getting under the pavers. Fine sand will wash out easily and not create a locking friction joint between the pavers.

Can I till in dry Portland cement into the soil before putting my 1 inch bed of sand down on a residential paver project?

By tilling dry Portland cement into the ground 4 to 5 inches, compacting and moistening it, you are creating a strong sub-base that will resist ground movement and keep your project looking great for years to come. This process is only recommended if you have sandy type soils. If you have the clay type of soils it is recommended that you excavate enough material out to put down 4 to 6 inches of crushed limestone or road base material and compact it before you screed your 1 inch of bedding sand. On paver projects, the base preparation is the most important part, so take a little extra time and effort on your base to make your project look great.

What type of aggregate is used for the base?

Typically a coarse graded aggregate ranging in size from approximately 3/4" to sand size particles is used for base construction. This is usually material that is suitable for a road base. This material facilitates compaction to a required density to support vehicular loading.

How will the aggregate base be compacted?

Layers are typically compacted in 4 to 6" (100-150mm) layers to achieve the maximum density and load bearing capacity. Each layer will require several passes of a compactor to achieve this.

How is the bedding sand installed?

The bedding layer is comprised of clean, coarse sand that is screeded to a depth of 1- 1/2 ". This provides a setting bed for the pavers. When the pavers are placed on the sand and compacted, the sand moves up into the joints. This causes the pavers to interlock and become level after compaction. *NOTE: Limestone screenings and stone dust should not be used for the bedding sand.*

How will the contractor assure an even color mix of the pavers?

To ensure proper distribution of colors, pavers are installed section by section, top to bottom from several bundles or cubes of pavers simultaneously.

Will an edge restraint be installed?

Yes, an edge restraint around the perimeter of the pavers is essential for eliminating horizontal creeping of the pavers and loss of bedding sand. Commonly used edge restraints include concrete curbing, plastic edge restraints, and aluminum edge restraints. Contact your dealer for more information.

Are the joints filled between the pavers?

Yes, with clean, fine sand. The sand should be dry, so it will flow freely into the joints.

Where can I get a plate compactor and what do I need it for?

Just about any equipment rental yard will have a plate compactor that usually rents for about \$45-60. One of the final steps in completing your UNI[®] paver project is running a plate compactor over the top of your paving stones. Simply put, this helps lock your pavers into place. The compactor helps seat your pavers down into your base sand evenly (they will drop approximately 1/4") and also helps to vibrate your joint sand down to entirely the joints and securely lock the pavers into place.

Can you make curves with pavers for round designs?

This is possible with UNI[®] products. The best way to handle curves is to outline your curve with a border stone like Holland. Then place as many whole pavers as needed up to the border stone. Next, cut the pavers to fill in the leftover gaps, using a guillotine splitter or diamond blade wet saw, which can be rented. For precision cuts, the diamond blade wet saw is preferred.

Structural & Engineering

Is there a structural difference between various paver shapes?

Yes. UNI[®] pavers feature interlocking designs that offer superior structural performance, especially under traffic loads.

Do interlocking pavers contribute to the pavement structure?

Yes, there have been many studies that have shown that interlocking pavements have the same or better load-spreading capability than an equivalent thickness of asphalt.

Should concrete slabs be used in vehicular areas?

Paving slabs are units that are generally 10" x 10" or larger. With the exception of residential driveways and special shapes, they are not recommended in areas subject to constant vehicular traffic. The slabs are designed for pedestrian areas such as plazas, patios, and walkways. This restriction is based on the aspect ratio - typically pavers larger than 10" x 10" x 2 3/8" thick are deemed unsuitable for vehicular traffic due to flexural issues. However specially shaped, thicker slabs can provide enough interlock for traffic. Contact your UNI[®] Manufacturer for more details.

Would the pavement be stronger if I added cement into the joints/cracks?

Actually, one of the benefits of using sand is that it allows the pavement to flex with ground movement. When you place cement between the cracks of anything, it will become a single ridge slab that will crack due to ground movement.

Will freezing and thawing damage pavers?

No, damage from ice is virtually non-existent. UNI[®] Interlocking Concrete Pavers are ideal for cold northern climates and are unaffected by extremes of heat and frost. Because the pavers are installed on a sand bed without mortar, they can expand and contract with the freeze-thaw cycles without cracking, chipping or spalling. Once properly installed and compacted, a UNI[®] street or driveway pavement can be snow-plowed.

Does water infiltrate through the sand around standard pavers?

No, the water does not drain through the sand around the pavers. If they are installed properly, you will only get a minimal amount of infiltration for the first few weeks, but silt and dust in the air will seal the joint entirely in time. Therefore, you need to slope your paver project for water run off. Typically, it is recommended that you allow for a slope of 1" for every 8 to 12" of pavement. UNI[®] does feature permeable interlocking concrete pavers (PICP) for infiltrating stormwater runoff. These are constructed differently from traditional paver installation to accommodate infiltration of water into the reservoir base. Please see the section on PICP at the end of this document or visit our web site for additional information on the Eco-Stone[®] family of permeable interlocking concrete pavements.

What are the specification performance requirements for concrete paving stones?

For the U.S., as required by ASTM C 936, the paving stone average compressive strength must be 8000 psi (55 Mpa) at the time of delivery with no individual unit less than 7200 psi (50 Mpa). The average absorption value must be no more than 5%, with no individual unit greater than 7%. For freeze-thaw durability, pavers must have no more than 1% weight loss of any individual UNIT after 50 cycles of freezing and thawing as described in ASTM C 67. Abrasion loss, as measured using ASTM C 418, must be no more than 15 cm³/50 cm² of paving stone surface, with no more than 3 mm of average thickness loss once testing is completed.

In Canada, paving stones are governed by CSA-A231.2, which requires paver average compressive strength to be at least 50 Mpa (7250 psi) after 28 days of moist curing as described in the specification. Compressive strength specimens are either cores or cubes cut with an aspect ratio of 1:1. Freeze-thaw durability is evaluated using deicing salt, whereby the average weight (mass) loss after 25 cycles of freezing and thawing is no more than 200 g/m² of paving stone surface, or no more than 500 g/m² after 50 cycles of freezing and thawing. For further details of these test methods, please see CSA-A231.2.

Are continuing education credits for training on the design and specification of concrete pavers available?

Yes, UNI GROUP U.S.A. manufacturers offer presentations that qualify for continuing education credits or professional development hours for registered architects or engineers. Visit our web site for more information or contact your local UNI[®] manufacturer.

Aesthetics, Durability and Maintenance

What is the white residue on the pavers?

The white hazy residue that sometimes appears on the surface of the pavers is a condition called efflorescence. Efflorescence is a natural by-product that can appear on the surface of all types of masonry units. UNI® manufacturers typically use additives to minimize this condition. Efflorescence will wear off naturally over time, but it can be removed with specially formulated cleaners. Most cleaners contain acid and detergents, so be sure to follow all label directions and environmental regulations when using these cleaners. Ask your UNI dealer for more information.

If pavers need to be removed for below grade repairs, can they be replaced afterwards?

Yes, unlike other pavements, concrete pavers can easily be removed and reinstated without any visual or functional changes.

How do you prevent weeds and grass from coming up in paver installations?

For the most part, if the pavers were installed and properly compacted, this will minimize weed growth. There will still be times when weeds may start growing in the sand between the cracks. When this happens you can usually pull them out very easily or spray them with a weed killer. This problem can also occur in cracks in any concrete or asphalt pavements where sand and dust accumulates.

Can dirty or broken pavers be replaced?

Yes, you can be assured of replacement pavers by keeping extras from the job. When replacing a paver, scrape out the sand in the joints from those surrounding the paver to be removed. Use two screwdrivers to wiggle it out. Others can be removed by hand. Insert the new paver, replace the joint sand, and compact the paver into place with a rubber mallet.

Are pavers slippery when wet?

No, their surface texture is ideal for safe traction in pedestrian, vehicular, and pool applications, even when wet. They offer excellent slip and skid resistance. Interlocking concrete paving stones actually surpass the standards for slip resistance established by the American with Disabilities Act.

Do concrete pavers stain?

There is no way to completely prevent certain stains such as oil or grease from getting on any pavement surface. However, if your pavement is stained, there are a number of specialty cleaners that are available to remove stains such as dirt, oil and grease. Consult your UNI® dealer for more information.

How are damaged pavers replaced?

One of the benefits of a project built with UNI® pavers is the ability to replace a paver should it become permanently stained or damaged. Simply take a flat head screwdriver and insert it between stones and pry the stone out. If the installation is mature, it may be necessary to break the stone and then pry it out.

Do pavers have to be sealed?

The main reason for using a sealer on pavers is to deepen the color, add sheen and minimize staining, though it is not necessary to seal them. If you choose to use a sealer, remember that the pavement will need to be resealed at intervals depending on the traffic levels. If you choose to seal, allow a minimum of 60 to 90 days after installation before application. Consult your dealer for complete sealing instructions.

How long do UNI® products last?

Individual pavers have a virtually unlimited lifespan – some installations in Europe have been in place for over 50 years and almost 40 years in North America.

How soon after installation, can an interlocking concrete pavement be used?

Immediately. There is no curing or wait time to use the pavement.

How do paving stones compare with other paving or decking materials?

Over the lifetime of your installation, paving stones are more aesthetically pleasing, durable, and cost-effective than other types of paving or decking.

Can paving stones be used around a swimming pool?

Absolutely! UNI® pavers not only enhance the area around a pool, they also provide a slip-resistant surface to walk on. And if you ever have to service the area below the pavers, you can easily lift and re-lay the pavers.

Can concrete pavers be used near trees?

On an established tree, if you are not raising the soils around the tree by any more than a couple of inches, it shouldn't present a problem. Well-established trees normally get their water from underground sources. Young trees grow best with an open space around the trunk of at least a 1' radius. Consideration should also be given to the growth rates of trees and the pavement designed accordingly.

Why are interlocking concrete paving stones so strong and durable?

Paving stones are made up of a high-strength, dense concrete formulation that produces a strength in excess of two times that of normal poured concrete. Paving stones are not subject to damage from de-icing salts or snow plowing. Installed properly, paving stones will provide an interlocking, flexible engineered paving system that will provide years of service.

Why have my pavers shifted or sunk?

This can be caused by a variety of factors, or a combination of factors. The main reasons bricks or pavers sink are:

1. They were installed at a time of year when there was a lot of moisture (early spring or late autumn) and there was shifting as a result of moisture in the ground.
2. Over a long period of time, constant pressure and traffic on any given area can cause some shifting or sinking.
3. Improper installation, such as a weak base of granular stone which was not properly compacted is often the cause.

How does the weather affect interlocking concrete pavements?

Pavers are your all-weather solution. In intense heat, they will not soften as asphalt does. They will not crack under repeated freeze/thaw cycles as the joints between the pavers allows for flexibility. During periods of rain, the joints will help slow the run off of water, thereby easing erosion.

Permeable Pavements

What types of applications are suitable for ECO-STONE® permeable interlocking concrete pavement (PICP)?

Eco-Stone® permeable interlocking concrete pavers can be used for a wide variety of residential, commercial, municipal and industrial (Ecoloc® and Eco-Optiloc®) applications. They can be used for parking lots, driveways, overflow parking, emergency lanes, boat ramps, walk-ways, low-speed roadways, and storage facilities. Permeable or porous pavements should not exceed 5% slope for maximum infiltration. In addition to some of the guidelines previously described, permeable pavements should typically be sited at least 100 ft (30m) from water supply wells, streams, and wetlands, though local jurisdictional regulations may supercede these guidelines. The minimum estimated depth from the bottom of the pavement base to the high level of the water table should be greater than 2 ft (0.6m) to allow for filtration of pollutants through the soils.

Are there any applications where permeable pavements should not be used?

Yes. There are certain circumstances when permeable pavements should not be used. Any site classified as a stormwater hotspot (anywhere there is risk that stormwater could infiltrate and contaminate groundwater) is not a candidate for permeable pavements. This might include salvage and recycling yards; fueling, maintenance, and cleaning stations; industrial facilities that store or generate hazardous materials; storage areas with contents that could damage groundwater and soil; and land uses that drain pesticides and/or fertilizers into permeable pavements. In addition, permeable pavements may not be feasible when the land surrounding and draining into the pavement exceeds a 20% slope, or the pavement is downslope from buildings where the foundations have piped drainage at the footers.

Can ECO-STONE® be installed mechanically?

Eco-Stone® and the other styles of UNI® permeable pavers can all be installed mechanically, saving time and money, especially on large-scale projects.

Can ECO-STONE® be used in freeze-thaw areas?

Yes. Because permeable interlocking concrete pavements are typically constructed with open-graded bases and the pavement is still a flexible pavement like our traditional interlocking pavements, freeze-thaw does not present a problem. The void space in the aggregate base and subbase materials allow for expansion, minimizing heaving.

Can ECO-STONE® be snow plowed?

Yes. If properly installed, it can be snow plowed, just as with our traditional interlocking pavers. In fact, studies have shown that snow and ice melt quickly on PICP and drain through the surface, thereby minimizing icing hazards. The studies have also shown that less deicing salts are necessary on this type of pavement, reducing the impact on the environment

What is the rate at which water will flow through ECO-STONE®?

In 1992, Professor Thomas Phalen, Jr. tested the flow-through rate of the drainage openings in Eco-Stone® pavements at 1872 in./hr. While this is very high, the permeability and amount of infiltration are also dependent on the infiltration rates of the aggregates used for the joint and drainage openings, the bedding, base, and subbase, and ultimately, the subgrade. Compared to soils, the materials used in Eco-Stone® permeable pavement systems have very high infiltration rates – from 500 in./hr (1270 cm/hr) to over 2000 in./hr (5080 cm/hr). This is far more pervious than any existing site soils. Though initial infiltration rates are very high, it is important to consider lifetime design infiltration of the entire pavement cross-section, including the soil subgrade when designing PICPs. Based on research to date, a conservative design rate of 10 in./hr (25 cm/hr) can be used as the basis for the design surface infiltration rate over a 20-year+ pavement life. As lifetime design infiltration rates may be difficult to predict, designers may want to use a conservative approach when –calculating the design infiltration rate.

Does it qualify as a best management practice (BMP)?

Yes. As a permeable pavement, Eco-Stone® is considered a BMP under the Environmental Protection Agency's guidelines. Permeable pavement is an important part of Low Impact Development and Smart Growth initiatives by the EPA.

What happens when pollutants enter into the pavement instead of running off?

Permeable pavement systems are capable of filtering pollutants and they can be broken down by bioremediation in the soils. This is preferable to direct runoff into bodies of water, where pollutants will impact the aquatic environment.

How are the infiltration rates for permeable pavements maintained?

All permeable pavements, including porous asphalt and pervious concrete, require periodic cleaning to maintain infiltration, and care must be taken to keep sediment off the pavement during and after construction. Research has shown that sediments tend to be trapped in the top 1 inch (25mm) or so of the joint and opening aggregate and it does not migrate down into the base and subgrade. This trapping of the sediment in the joints and openings allows for easy removal by street sweeping/vacuuming equipment. Street sweeping can provide preventative and restorative maintenance depending on the equipment used. Conventional broom sweepers can be used to remove the sediment crust in the openings and joints. However, regenerative air vacuum sweepers are more effective for maintenance of permeable pavements. The vacuum settings on sweeping equipment may require adjustment to prevent the uptake of aggregate in the pavement openings and joints during routine cleaning of fine sediments. For more severely clogged pavements, vacuum sweepers have demonstrated the ability to remove up to 3 inches or more of aggregate from the openings and restore the PICP to its original infiltration rates. It is recommended that pavements be cleaned once or twice per year, though low usage pavements may not require cleaning as often.

What is the percentage of open area for UNI Permeable Pavers and does this correspond to the infiltration capability?

One of the most common misconceptions when designing or approving permeable interlocking concrete pavement is the assumption that the amount or percentage of open surface area of the pavement is equal to the percentage of perviousness. For example, a designer or municipal agency might incorrectly assume that a 15% open area is only 15% pervious. While the percentage of open area for UNI[®] Permeable Pavers range from 8 to a little over 12%, this does not mean that only 8-12% of the rainfall infiltrates. Up to 100% infiltration rates are possible depending on design parameters and typically, PICP is designed to infiltrate the amounts generated by design storms that comprise 75-85% of the design storms in the U.S.

Does the construction of PICP differ from that of traditional interlocking pavers?

Though the basics of flexible pavement construction are similar, different materials are typically used in construction of PICP. Generally coarser, open-graded base and subbase materials are used, as well as coarser bedding and joint fill materials. The volume and thickness of bases is determined by both traffic loading and amount of water coming into the system. For guidance on material specification and construction, please visit our web site and request our Eco-Stone[®] Design Guide and Research Summary.

What about handicap accessibility?

Permeable interlocking concrete pavement conforms to current ADA requirements that surfaces be firm, stable, and slip resistant. If the openings in the surface are not desirable, solid pavers can be installed in areas used by disabled persons. Potential changes to ADA design requirements are under considerations, and should they change in the future, UNI[®] permeable interlocking paver designs can be adapted to meet new guidelines. Eco-Priora[®] is a new UNI permeable paver that is designed for pedestrian areas and handicap-accessible pavements.

How do permeable interlocking concrete pavements compare in cost to asphalt or concrete pavements?

PICP should not be compared to traditional asphalt or concrete pavements alone. They should be compared to these pavements, plus the cost for drainage improvements and possibly land area if required for retention or detention ponds. PICP allows for better use of available land, combining parking with detention, especially in urban areas. In addition, they are a better environmental choice and help meet stormwater runoff regulations and requirements.

UNI-GROUP U.S.A

Manufacturers of UNI Paving Stones
Headquarters Office
4362 Northlake Blvd. Suite 204
Palm Beach Gardens, FL 33410

561-626-4666 • Fax 561-627-6403
www.uni-groupusa.org