Permeable Interlocking Concrete Pavement (PICP): Engineering Solution for Stormwater Management

LURVEY

AIA Continuing Education Provider

Landscape Architecture Continuing Education System™

LA CES

EDUCATION PROVIDER

This Learning Seminar is available courtesy of:

TECHO-BLOC

What type of projects do you specialize in or prefer to work on?

Are you seeing an increase in demand for permeable pavements?

What are some challenges you face with getting approval to specify permeable pavement?

American Society of Landscape Architects

The US Green Building Council SITES Certification program was originally launched in partnership with American Society of Landscape Architects (ASLA) and the Lady Bird Johnson Wildflower Center (LBJWC) in 2009.

American Society of Landscape Architects

Lady Bird Johnson Wildflowercenter
The University of Texas at Austin

THE Sustainable SITES Initiative®

Create sustainable and resilient land development projects using nature-based solutions.

In 2015, the ownership of SITES' rating system was handed over to Green Business Certification Inc, which oversees the certification of Leadership in Energy & Environmental Design or LEED.

American Society of Landscape Architects

- In 2016, LEED Certifications for Cities & Communities was launched.
- In August 2017, Washington DC became the first LEED Platinum city in the world.
- Today, there are more than 125 local governments in the US and over 300 across the world using LEED for Cities and Communities to communicate continuously improving performance of their sustainability and social responsibility efforts.

American Society of Landscape Architects

Who are the LEED Certified Communities in Your Area?

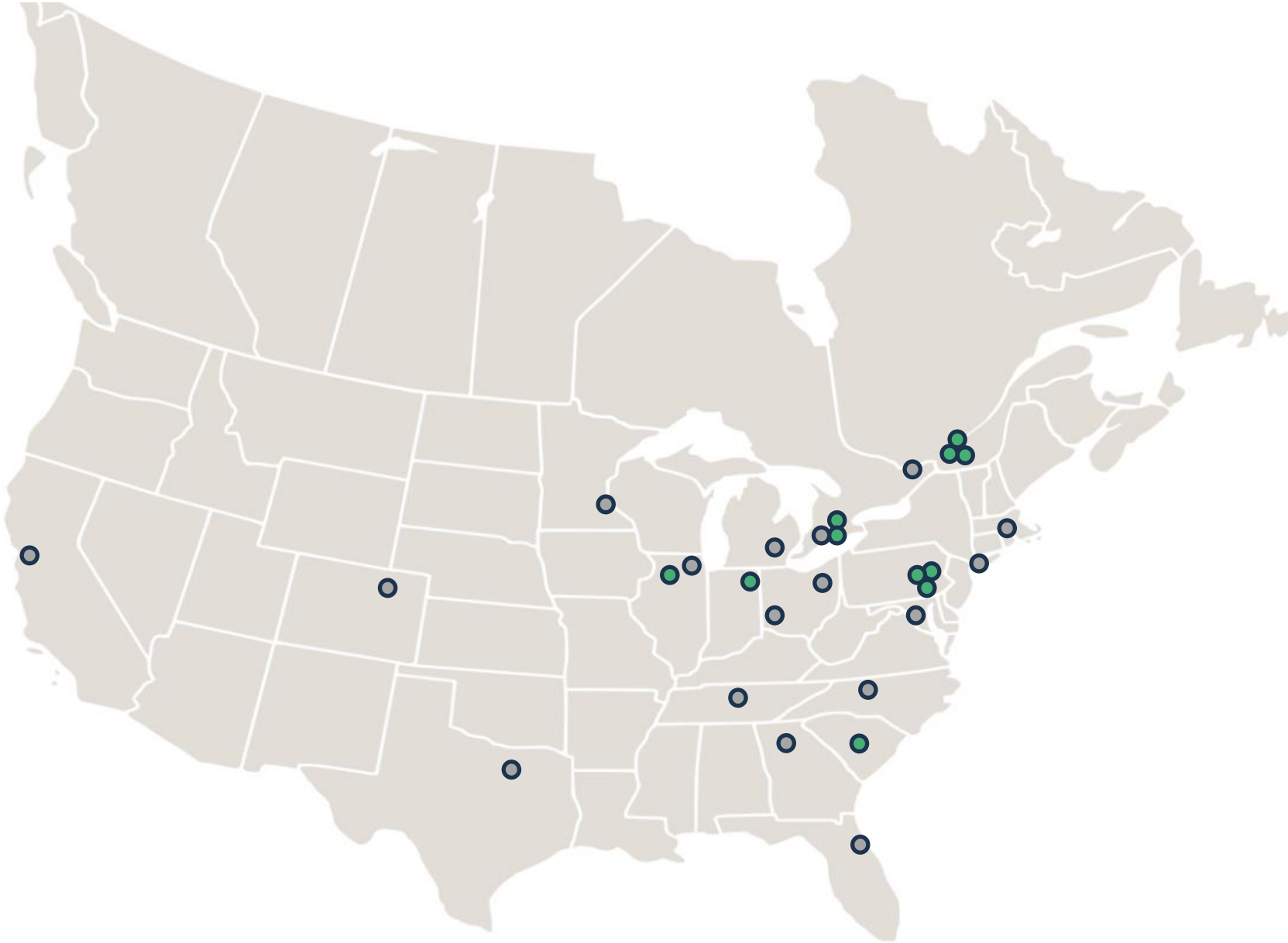
Which municipalities near you are in process of becoming LEED Certified?

- Abington Township, PA
- Albany, NY
- Albuquerque, NM
- Alexandria, VA
- Ann Arbor, MI
- Annapolis, MD
- Arlington County, VA
- Atlanta, GA
- Atlantic Beach, FL
- Austin, TX
- Balboa Park, San Diego, CA
- Baltimore, MD
- Beaverton, OR
- Bellevue, WA
- Billings, MT
- Birmingham, AL
- Bloomington, IN
- Blue Island, IL
- Boise, ID
- Broward County, FL
- Burlington, VT
- Cambridge, MA
- Evanston, IL
- Fayetteville, AR
- Fort Collins, CO
- Fort Lauderdale, FL
- Franklin, TN
- Frederick County, MD
- Frederick, MD
- Golden Triangle Business Improvement District, DC
- Goleta, CA
- Grand Junction, CO
- Greensboro, NC
- Henderson, NV
- Hillsborough County, FL
- Atlanta International Airport, GA
- Hoboken, NJ
- Houston, TX
- Howard County, MD
- Indianapolis, IN
- Iowa City, IA
- Issaquah, WA
- Johnson County, KS
- Palm Bay, FL
- Palm Beach County, FL
- Park Forest, IL
- Peoria, AZ
- Peter Cooper Village, NY
- Philadelphia, PA
- Phoenix, AZ
- Pinecrest, FL
- Pinellas County, FL
- Plano, TX
- Portland, OR
- Pueblo County, CO
- Raleigh, NC
- Rancho Cucamonga, CA
- Reading, PA
- Reno, NV
- Reston Town Center, Reston, VA
- Riverside, CA
- Rochester, MN
- Rosemount, MN
- Royal Oak, MI
- San Antonio, TX

https://www.usgbc.org/leed/rating-systems/leed-for-cities

TECHO

COMMERCIAL



PRODUCTION SITES: 11

DISTRIBUTION CENTERS: 17

BLOC

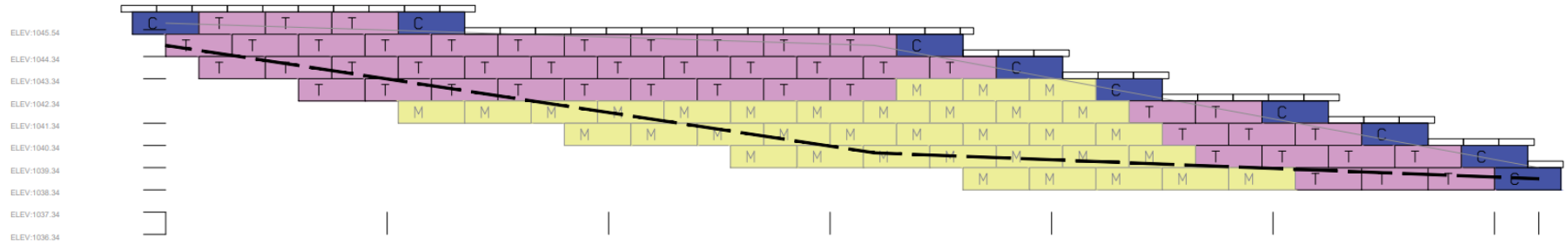
LEARN

SUPPORT AND SERVICES

EVERYTHING YOU
NEED TO BRING
YOUR VISION TO LIFE

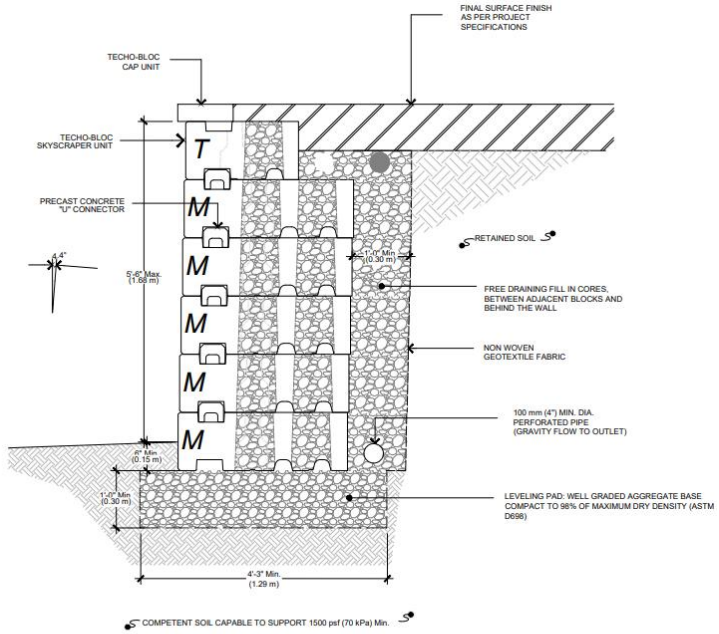
TECHO—BLOC
COMMERCIAL

Preliminary Wall Design Assistance + Takeoffs + Stamped Shop Drawings



Sta:0+0 Sta:0+10 Sta:0+20

ELEVATION VIEW WALL # 3



LEGEND :

SYMBOL	DESCRIPTION
C	SKYSCRAPER CORNER UNIT
T	SKYSCRAPER TOP UNIT
M	SKYSCRAPER MIDDLE UNIT
	GRADE IN FRONT OF THE WALL (SEE CIVIL DRAWINGS)

BLOCK DATA

TYPE OF BLOCK	LEGEND	DEPTH	QUANTITY (UNITS)	QUANTITY (ft²)	QUANTITY (m²)
CORNER UNIT	C	18" (457 mm)	9		
TOP UNIT	T	23 1/4" (590 mm)	47	141	13.1
MIDDLE UNIT	M	34 7/8" (886 mm)	35	105	9.8
BASE UNIT	B	48 1/16" (1220 mm)	-	-	-
EXTENDER UNIT *	E	+ 24 3/8" (+619 mm)	-		
CAP/WALL LENGTH		62 ft (18.9 m)			

TECHO—BLOC

COMMERCIAL

TECHO-BLOC TEXTURES AND COLORS SOLAR REFLECTANCE (SR) AND SOLAR REFLECTANCE INDEX (SRI)

FINISH	COLOR	SWATCH	SOLAR REFLECTANCE[1]	SOLAR REFLECTANCE INDEX[2]	COLOR	SWATCH	SOLAR REFLECTANCE[1]	SOLAR REFLECTANCE INDEX[2]
HD² Smooth	Beige Cream		0.38	42	Merlot		0.15	13
	Greyed Nickel		0.37	41	Chestnut Brown		0.21	20
	Shale Grey		0.21	19	Onyx Black		0.09	6
	Caffè Crema		0.36	38				
	Silver Granite		0.40	45				
Smooth	Beige Cream		0.33	36	Grey		0.25	25
	Greyed Nickel		0.34	37	Chestnut Brown		0.26	23
	Shale Grey		0.27	28	Onyx Black		0.09	6
HD² Polished	Beige Cream		0.38	42	Chestnut Brown		0.22	22
	Greyed Nickel		0.37	41	Onyx Black		0.13	10
	Shale Grey		0.17	15				
HD² Granitex	Beige Cream		0.33	36	Chestnut Brown		0.28	29
	Greyed Nickel		0.39	43	Onyx Black		0.16	14
	Shale Grey		0.29	31				
HD² Slate (drycast)	Greyed Nickel		0.34	38	Chestnut Brown		0.19	18
	Shale Grey		0.14	11				
HD² Slate (wetcast)	Victoria		0.31	33				
Slate	Shale Grey		0.24	26	Chestnut Brown		0.23	25
	Champlain Grey		0.23	25	Sandlewood		0.21	23
Klean-Bloc Slate (wetcast)	Ivory		0.40	45				
Klean-Bloc Brushed Travertine (wetcast)	Azzuro		0.15	12				

Slip Resistance of Techo-Bloc Paving products

According to the 2010 ADA Standards for Accessible Design, a slip-resistant surface is one that provides sufficient frictional counterforce to the forces exerted in walking to permit safe ambulation. The following addresses how Techo-Bloc paving products can be used to provide slip-resistant surfaces.

Slip resistant surfaces provide friction necessary to keep a shoe heel or crutch tip from slipping under a range of conditions. The measurement of wet Dynamic coefficient of friction (DCOF) represents a characterization of interaction between a wet surface and a passing shoe.

ANSI A326.3-2017 standard describes the test method for measuring DCOF of hard surface flooring materials using the BOT-3000E digital tribometer (see Figure 1). The device simulates and measures the resistance (or force) that must be overcome to keep one object, already in motion, moving over another object

According to ANSI A326.3, level surfaces expected to be walked upon when wet should have a wet DCOF of at least 0.42. Techo-Bloc paving products exceed this minimum DCOF value set by ANSI A326.3. However, it should be noted that for exterior applications, the suitability of the flooring material will significantly depend on the drainage of the assembly, expected footwear, intended use, maintenance, and contaminants among others. Therefore, products with a wet DCOF value of 0.42 or greater are not necessarily suitable for all applications. As a result, the Specifier or Owner can specify a higher DCOF value to reduce the risk of slips and falls.

The table below summarizes the wet DCOF results for the texture, production type and finish technologies of the Techo-Bloc paving units.

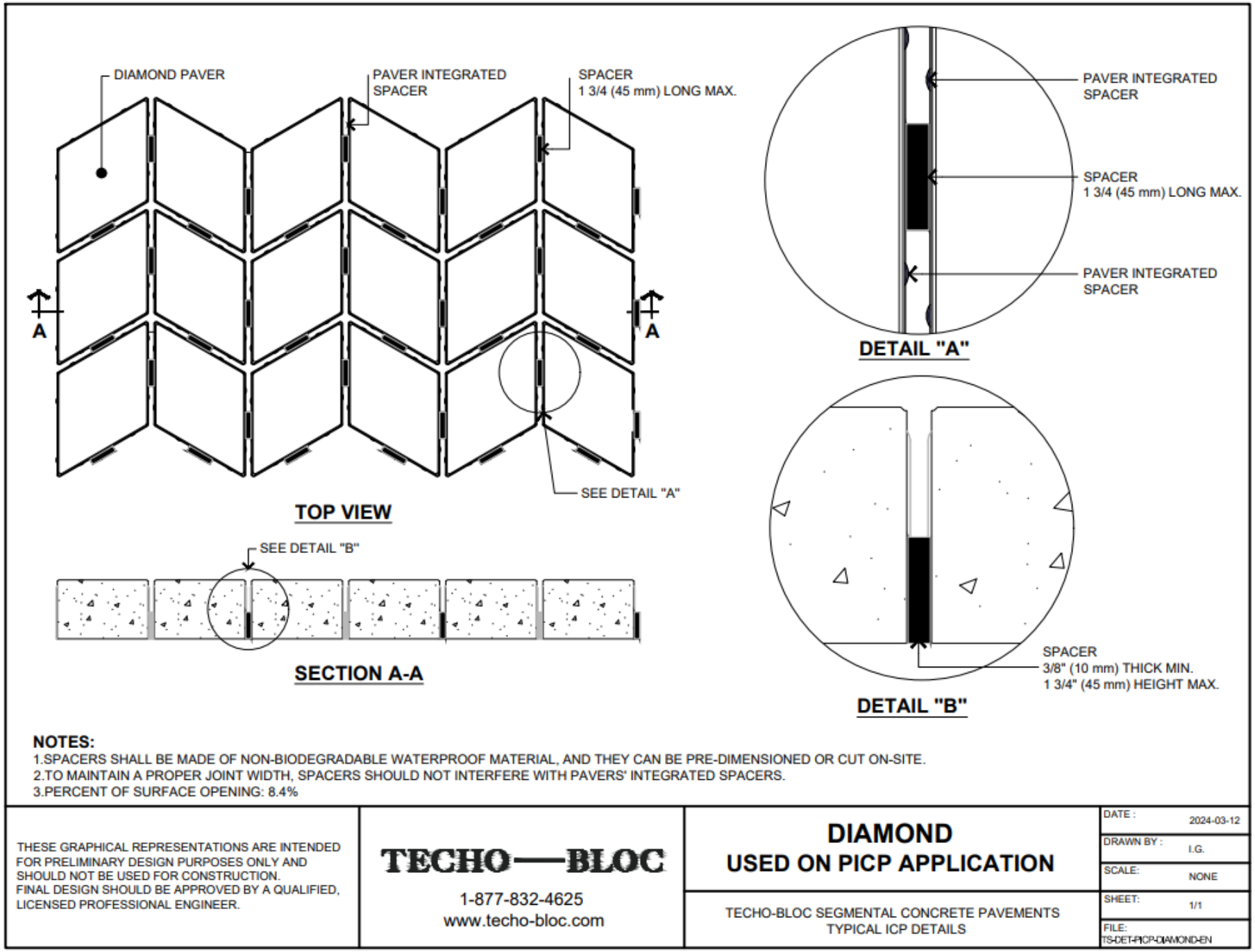
FIGURE 1: THE BOT 3000E DIGITAL TRIBOMETER MANUFACTURED BY REGAN SCIENTIFIC INSTRUMENTS, INC., IN SOUTHLAKE, TEXAS.

WET DYNAMIC COEFFICIENT OF FRICTION (DCOF) RESULTS AS PER ANSI A326.3				
	PRODUCTION / FINISH			
	TECHO-BLOC COLLECTION		STONEDGE COLLECTION	
TEXTURE	Single concrete throughout	HD² (face mix)	HD² (face mix)	Klean-Bloc (Face mix+Sealer)
SLATE	0.81	-	0.64	0.47
SMOOTH	0.83	0.77	-	-
POLISHED	0.81	0.67	-	-
GRANITEX	0.82	0.74	-	-
WOOD	-	-	0.62	0.49
BRUSHED TRAVERTINE	-	-	0.66	0.58
NATURAL STONE	-	-	-	-
SAND DUNES	-	-	0.57	-
OCEAN WAVES	-	0.79	-	-
BASALT	0.69	-	-	-

Techo-Bloc Permeable Product Infiltration Rates & Data

PERMEABLE PAVEMENT	% Void Space Installed	Rate of Infiltration	Joint Opening	Joint Fill	ASTM INTERNATIONAL Standards Worldwide	CSA	U.S. GREEN BUILDING COUNCIL LEED CERTIFIED USGBC	ADA AMERICANS WITH DISABILITIES ACT
ANTIKA	10+ (Variable)	993 in./hr	1 5/8"	#8, #89	✓	✓	✓	*
AQUASTORM	38.4	2,395 in./hr	9/32"	#8, #89	✓	✓	✓	*
BLU 60mm 6X13	6.2	570 in./hr	9/32"	#89, #9	✓	✓	✓	✓
BLU 60mm	4.8	570 in./hr	9/32"	#89, #9	✓	✓	✓	✓
BLU 80mm 6x13	6.2	570 in./hr	9/32"	#89, #9	✓	✓	✓	✓
BLU 80mm	4.8	570 in./hr	9/32"	#89, #9	✓	✓	✓	✓
HYDRA	8.3	605 in./hr	1/2"	#8, #89	✓	✓	✓	✓
MIKA	7.8	909 in./hr	5/8"	#8, #89, #9	✓	✓	✓	✓
MISTA random	6.3	610 in./hr	9/16"	#9	✓	✓	✓	✓
OXFORD *new*	7.3	TBA	3/8"	#8, #89, #9	✓	✓	✓	✓
PURE	6	726 in./hr	3/8"	#8, #89, #9	✓	✓	✓	✓
VALET	5.9	400 in./hr	9/32"	#89, #9	✓	✓	✓	✓
VILLAGIO	8	896 in./hr	3/8"	#8, #89, #9	✓	✓	✓	✓

Permeable Design & Void Space Ratio Calculations



Permeable Interlocking Concrete Pavement (PICP): Engineering Solution for Stormwater Management

LURVEY

AIA Continuing Education Provider

Landscape Architecture Continuing Education System™

LA CES

EDUCATION PROVIDER

This Learning Seminar is available courtesy of:

TECHO-BLOC

AIA & LA CES PROFESSIONAL DEVELOPMENT HOURS

AIA Continuing Education Provider

Landscape Architecture Continuing Education System™

LA CES

EDUCATION PROVIDER

https://forms.office.com/pages/responsepage.aspx?id=zox0xe1JVEO89IGmNKnPwnvD7AAahElIviDJ-mFqNrtUNFEzWlU5MzJDMlRHQ1cyM1BMUVpMNEkyUy4u&origin=QRCode&route=shorturl

This Learning Seminar is available courtesy of:

TECHO-BLOC

Permeable Interlocking Concrete Pavement (PICP): Engineering Solution for Stormwater Management

To ensure the current status of this course, including relevant association approvals, please view the course details here.

AIA Continuing Education Provider

The American Institute of Architects
Course No. TBCN-01A
This program qualifies for 1.0 LU/HSW Hour
Course Expiry Date: 3/14/2026

Techo-Bloc Corporation is a registered provider of AIA-approved continuing education under Provider Number 404109572. All registered AIA CES Providers must comply with the AIA Standards for Continuing Education Programs. Any questions or concerns about this provider or this learning program may be sent to AIA CES (cessupport@aia.org or (800) AIA 3837, Option 3).

This learning program is registered with AIA CES for continuing professional education. As such, it does not include content that may be deemed or construed to be an approval or endorsement by the AIA of any material of construction or any method or manner of handling, using, distributing, or dealing in any material or product.

AIA continuing education credit has been reviewed and approved by AIA CES. Learners must complete the entire learning program to receive continuing education credit. AIA continuing education Learning Units earned upon completion of this course will be reported to AIA CES for AIA members. Certificates of Completion for both AIA members and non-AIA members are available upon completion of the test.

PURPOSE

As populations in cities grow, natural ground cover is being replaced with impervious surface cover and this in turn is causing an increase in stormwater runoff.

The need to successfully manage and mitigate the harmful effects of stormwater runoff is becoming clear.

PURPOSE

This course discusses how permeable interlocking concrete pavement (PICP) offers solutions for stormwater management including:

- **Mitigating runoff volumes**
- **Decreasing peak flow**
- **Reducing flooding potential**
- **Decreasing stream bank erosion**
- **We will also examine:**
  - **Pavement components**
  - **Design considerations**
  - **Maintenance**


PROVISIONS
ATLANTIC AVE
NORTH
90
South
93
B5A
B5B


HISTORIC RAINFALL IN CHICAGO
DAMAGES HOMES & BUSINESSES


BREAKING NEWS UPDATE
RECORD RAINFALL


NEW AT 5PM
SEARCHING FOR SOLUTIONS
TO URBAN FLOODING

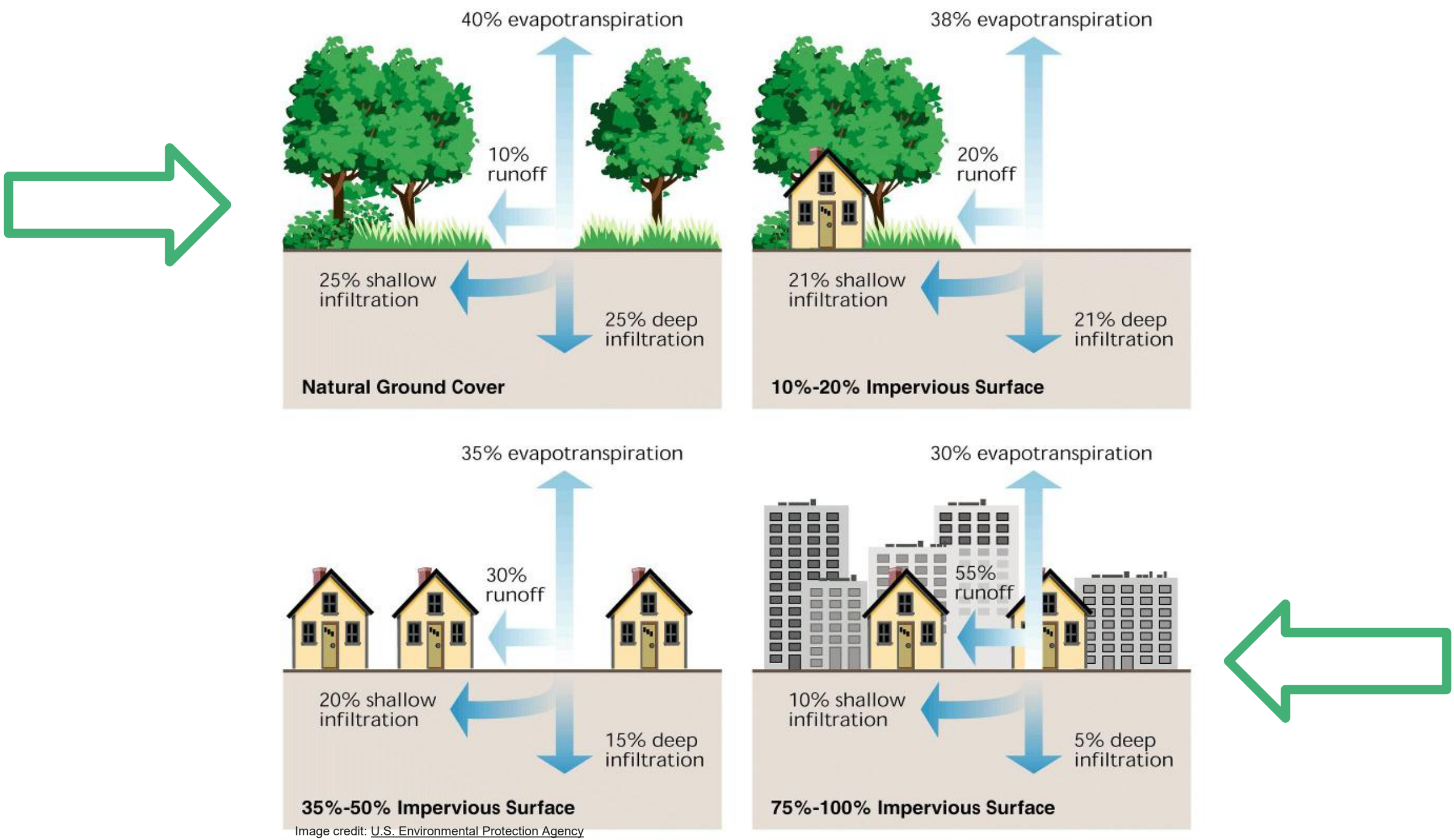


Image credit: U.S. Environmental Protection Agency

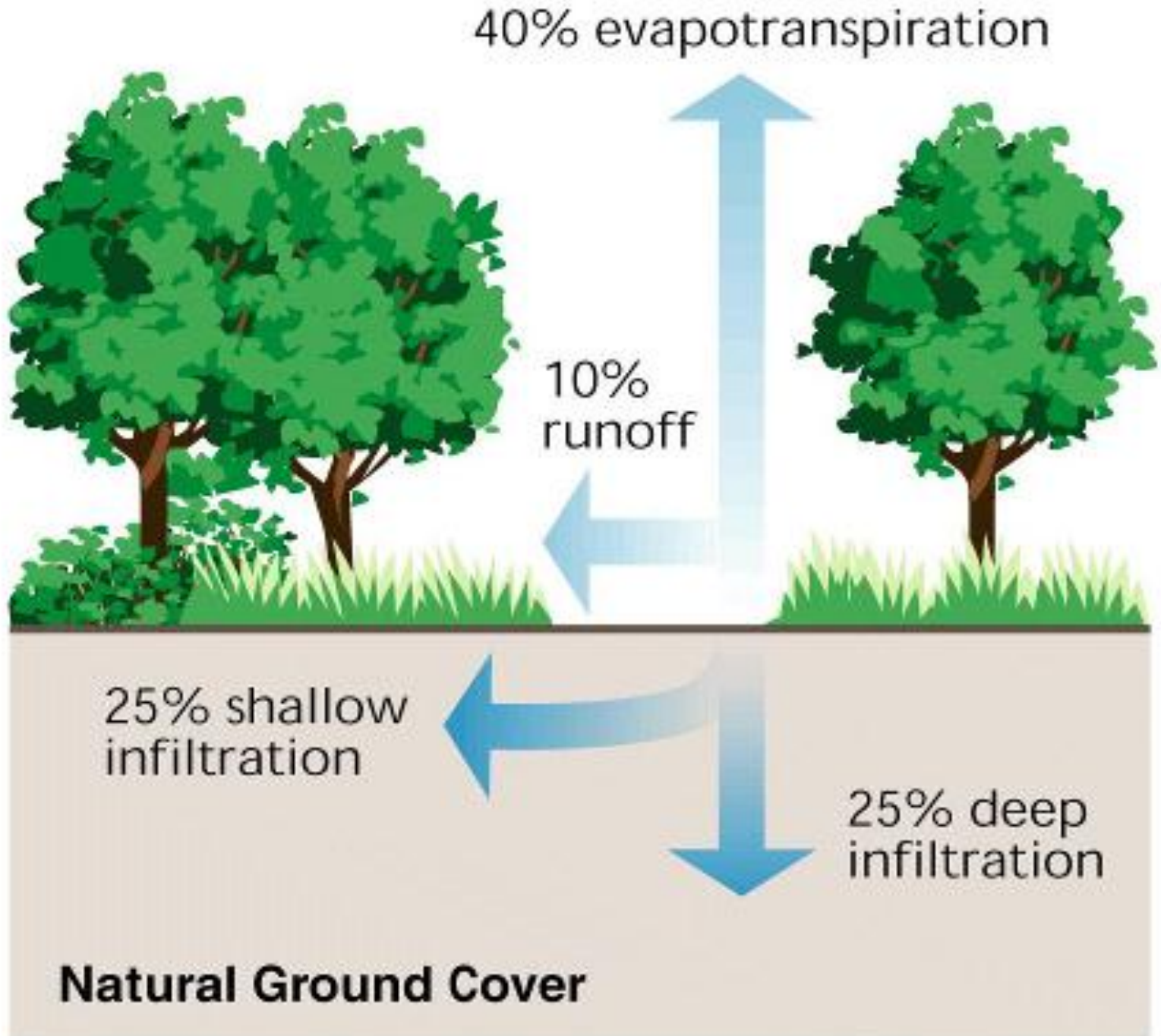


Image credit: U.S. Environmental Protection Agency

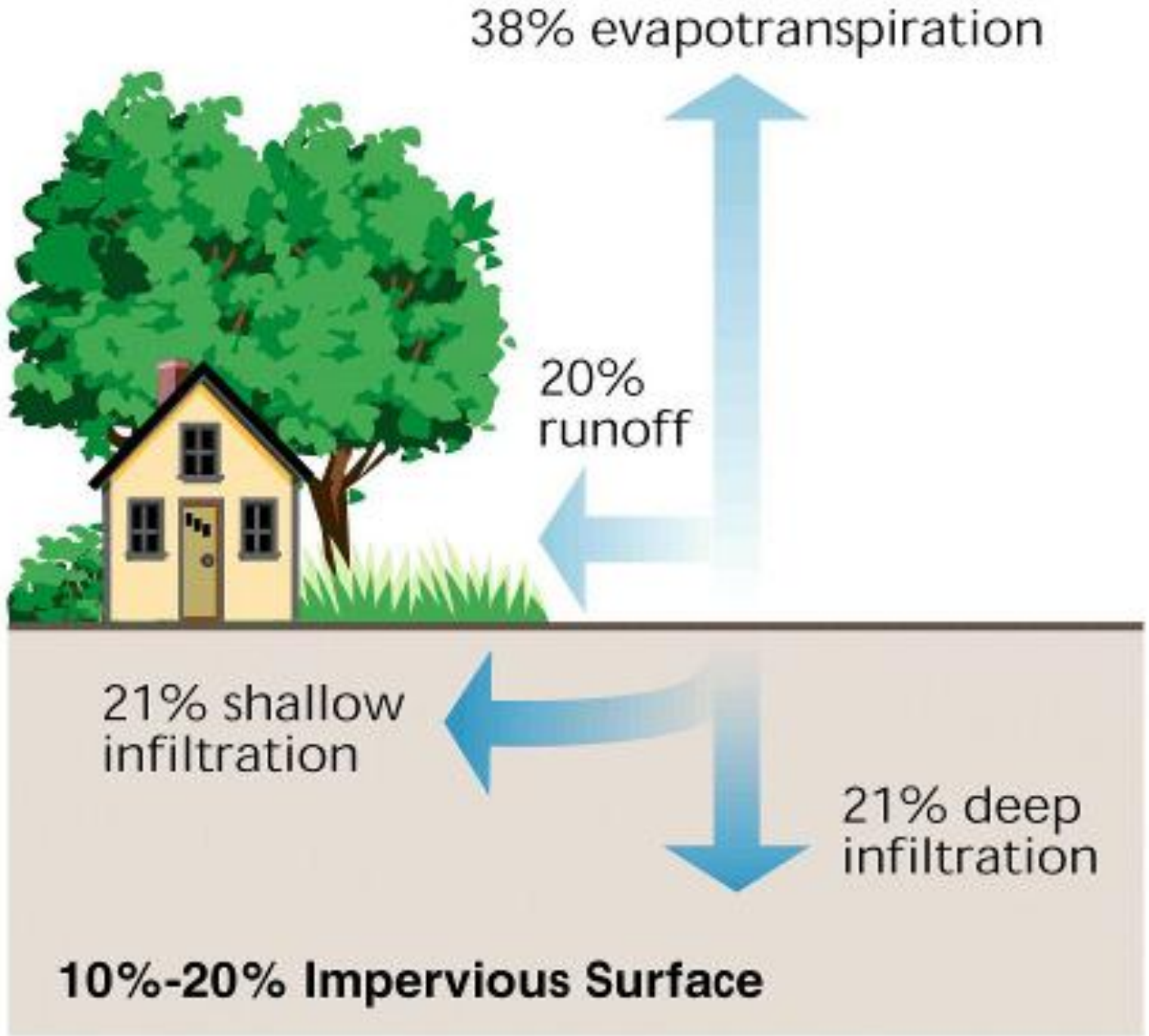


Image credit: U.S. Environmental Protection Agency

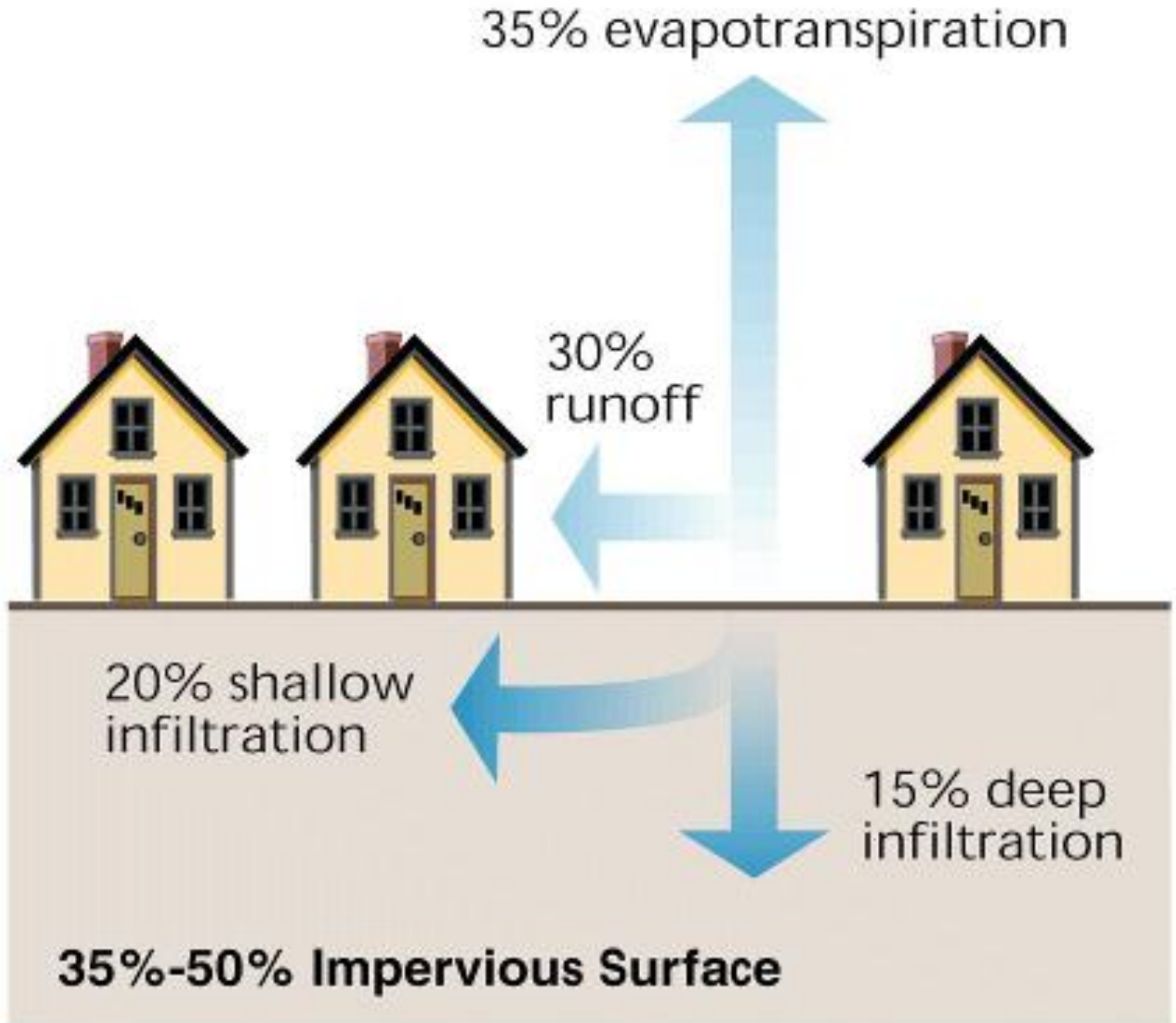


Image credit: U.S. Environmental Protection Agency

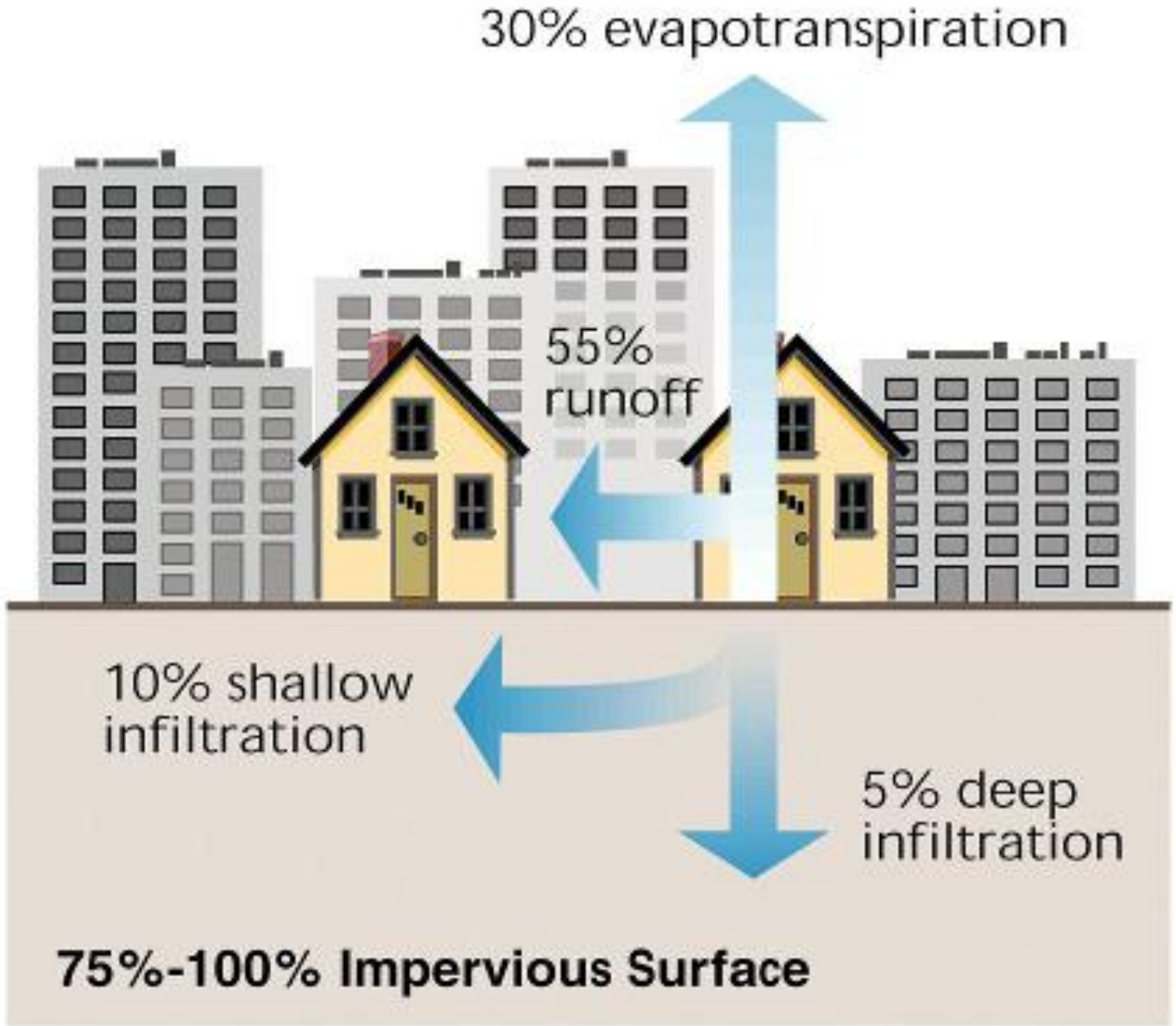


Image credit: U.S. Environmental Protection Agency

STORMWATER POLLUTION

Rainwater picks up pollutants including salt, oils, fertilizers, pesticides, litter and other debris.

STORMWATER SEDIMENT & EROSION

Sediment will settle on impervious surfaces until rainwater washes them into nearby storm drains and eventually discharges them to waterways through the storm sewer system.

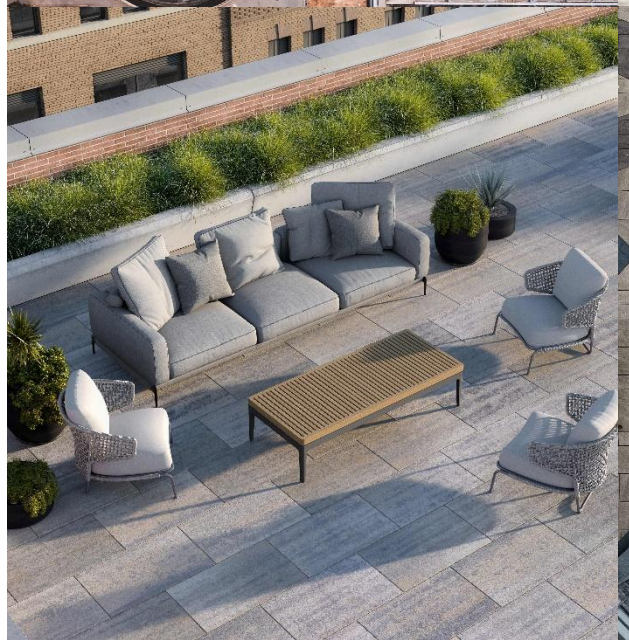
FISH & WILDLIFE HABITATS DESTROYED

This discharge can have a significant impact on water quality by affecting water supply, increased costs to treat the stormwater, fish and wildlife habitat, recreational waterways, and aesthetic value.

BEST MANAGEMENT PRACTICES

To protect waterways, stormwater control measures, also known as best management practices (BMPs), were introduced to manage stormwater at its source.

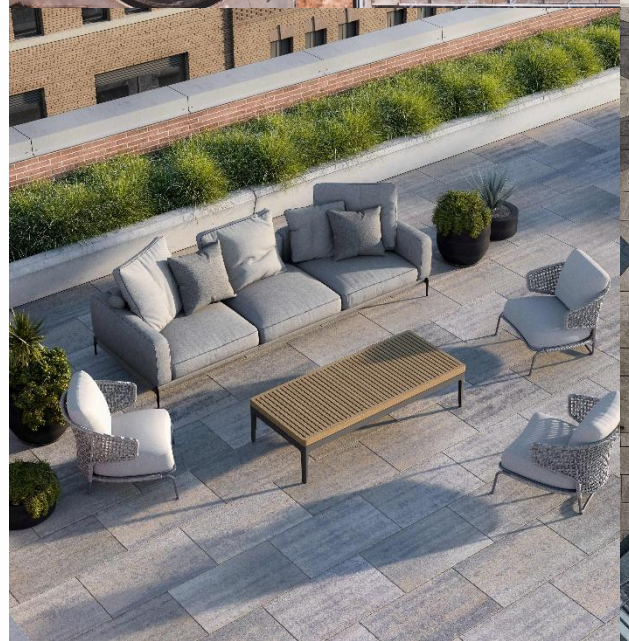
Some BMPs rely on gravitational settling and/or infiltration through a porous medium plus chemical and biological processes for pollutant reduction.



BEST MANAGEMENT PRACTICES

Examples of BMPS:

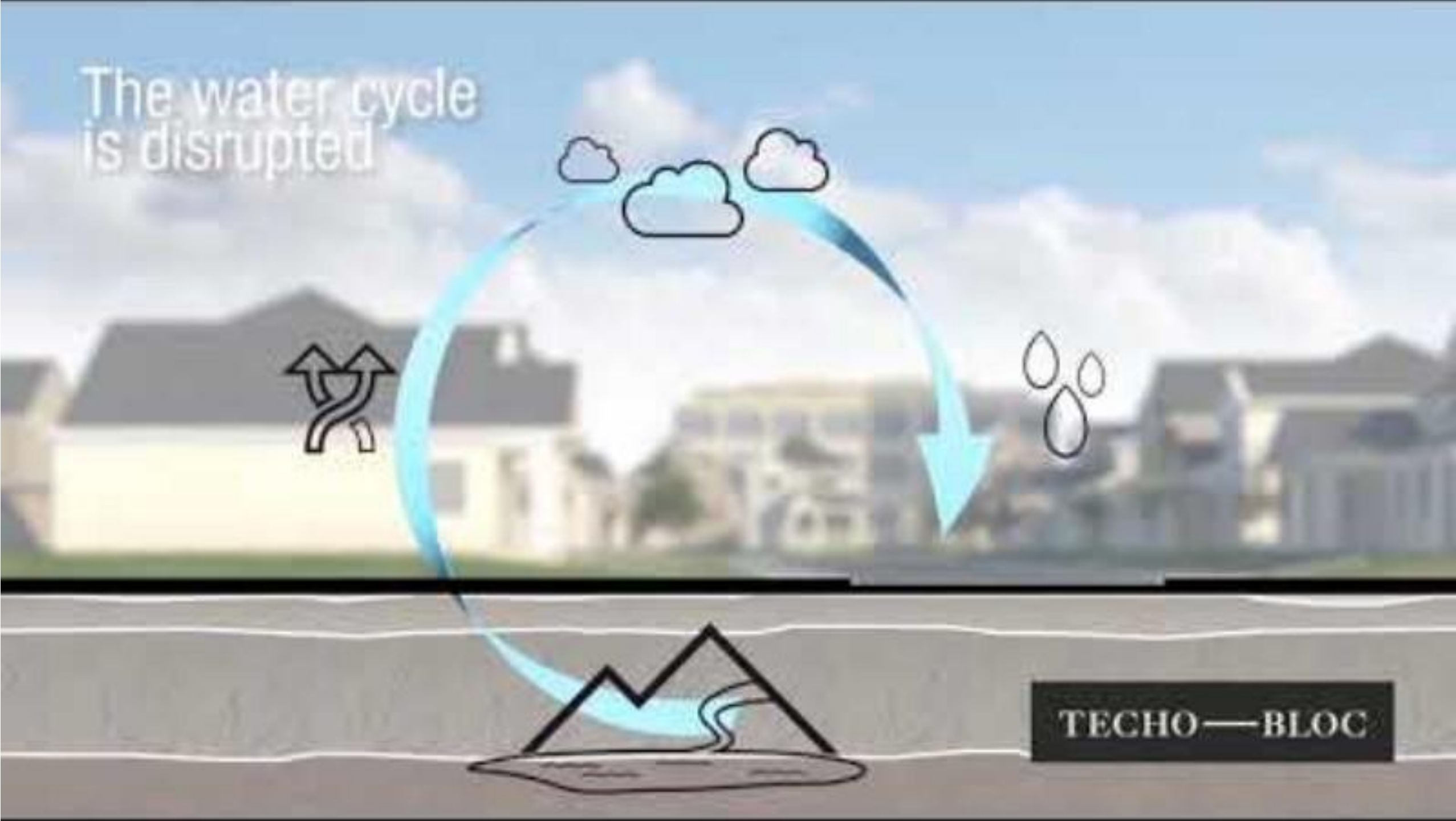
- Dry/wet ponds
- Sand filtering systems
- Bioretention systems
- Infiltration trenches
- Green roofs
- Rain gardens
- Bioswales
- Permeable pavements



PERMEABLE PAVEMENTS

Permeable pavements are typically divided into four major categories:

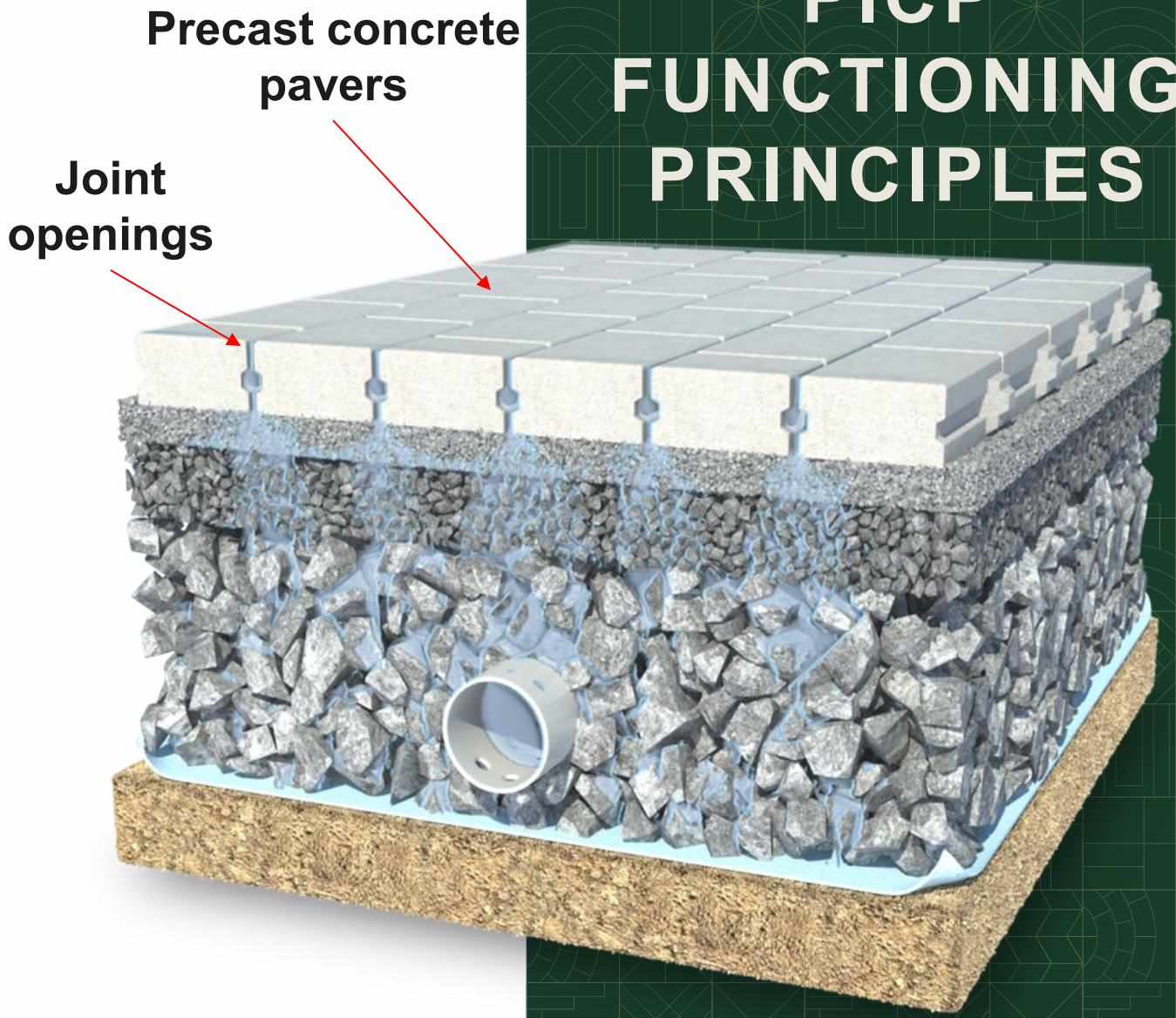
1. **Porous asphalt**
2. **Pervious concrete**
3. **Grid pavement (concrete or plastic)**
4. **Permeable interlocking concrete pavement (PICP)**


The water cycle
is disrupted
TECHO—BLOC

PICP FUNCTIONING PRINCIPLES

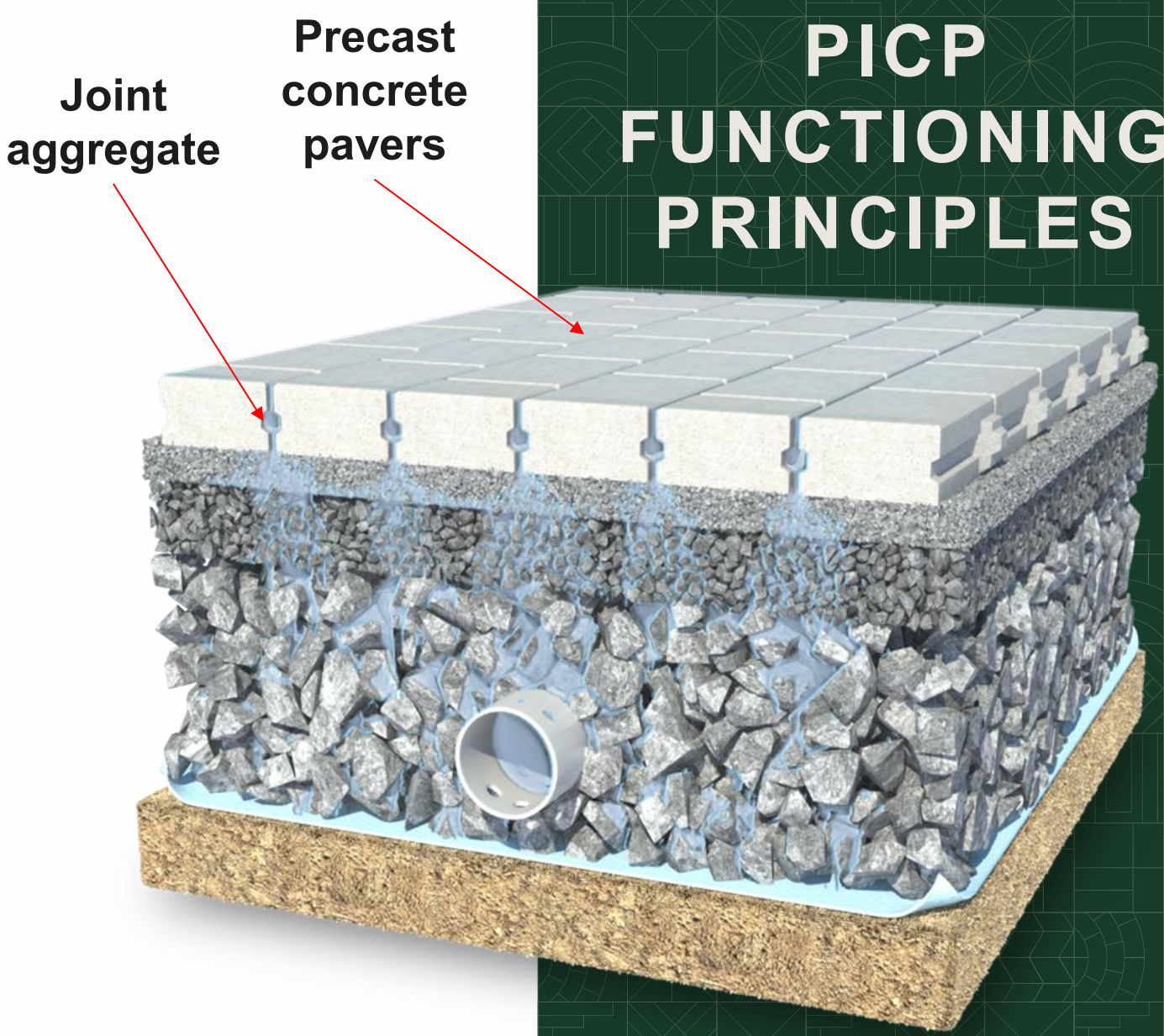
Permeable interlocking concrete pavement is surfaced with impervious concrete pavers with enlarged molded joints or openings between units.

The openings typically range from 5% to 15% of the total surface area and the joint widths usually range from ¼″ to ½″ (6 mm to 12.5 mm).



PICP FUNCTIONING PRINCIPLES

The openings are filled with permeable aggregate joint material to allow stormwater to freely enter the pavement surface.



JOINT FILL RECOMMENDATIONS

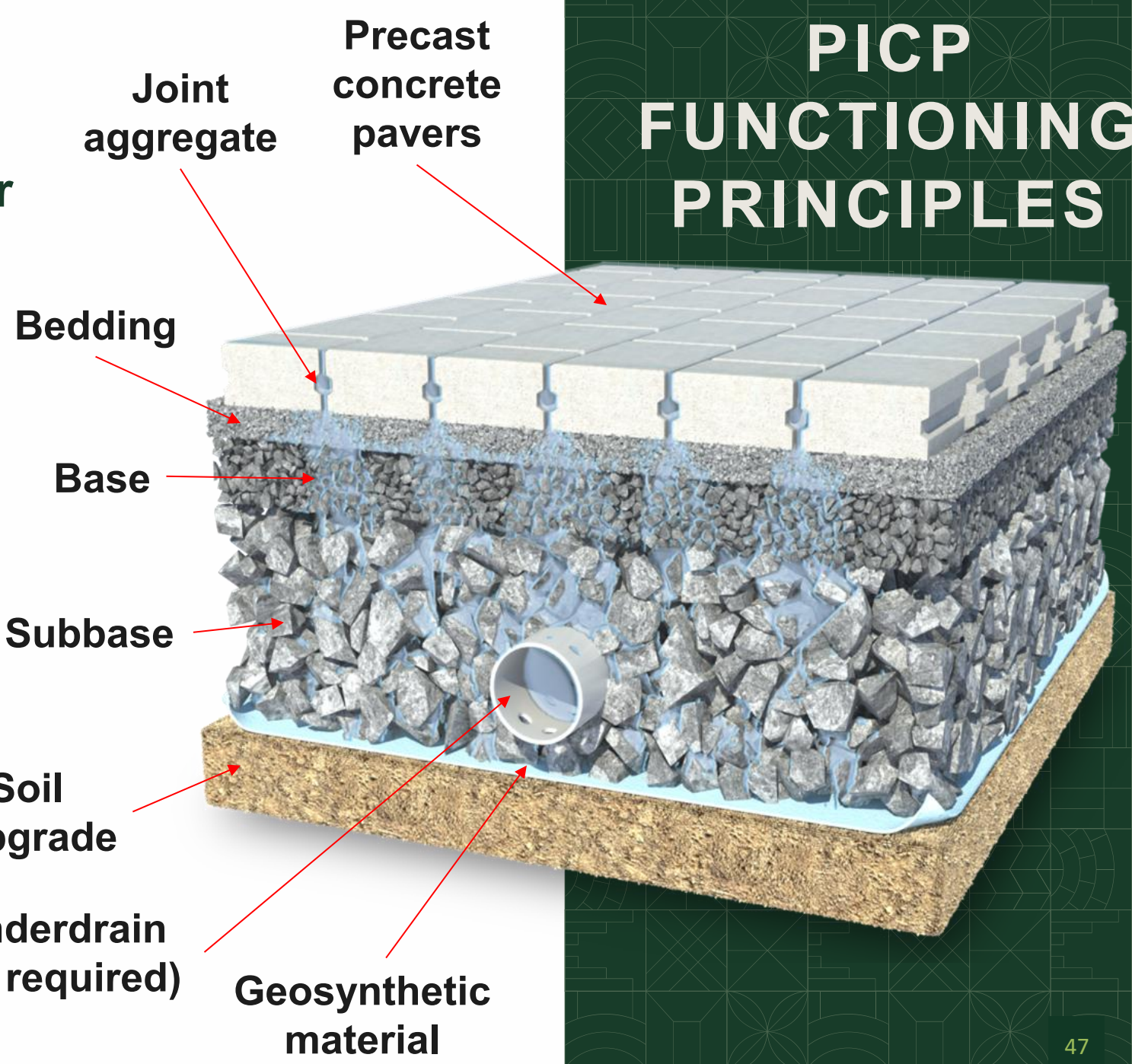
Proper joint fill installation is crucial for preventing premature clogging/failure and reducing maintenance costs:

- **Washed & Bagged ASTM #9 gravel**
- **Consolidated enough that you cannot pass a puddy knife past ½”**
- **Recessed below the chamfer**

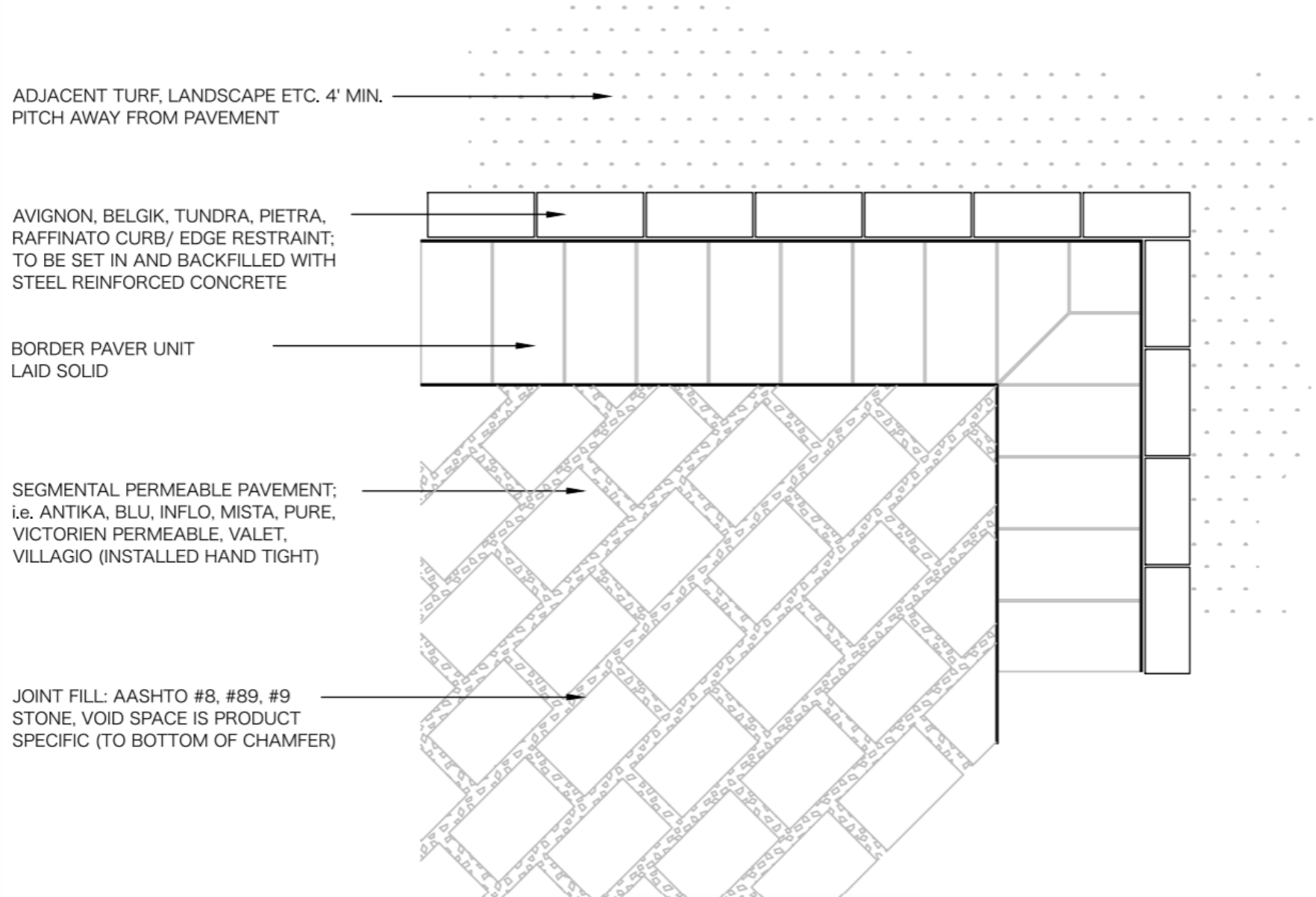
PICP FUNCTIONING PRINCIPLES

The stormwater is then directed to the bedding layer and base/subbase structure for temporary storage and treatment.

Ultimately, the stormwater gradually infiltrates into the soil or is first cleaned and slowed down before it enters the sewer system.

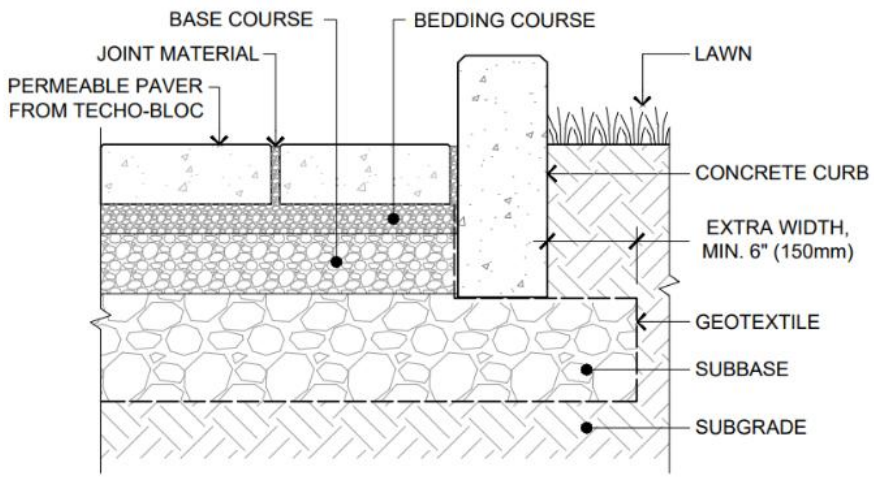


SOLID HEADER COURSE

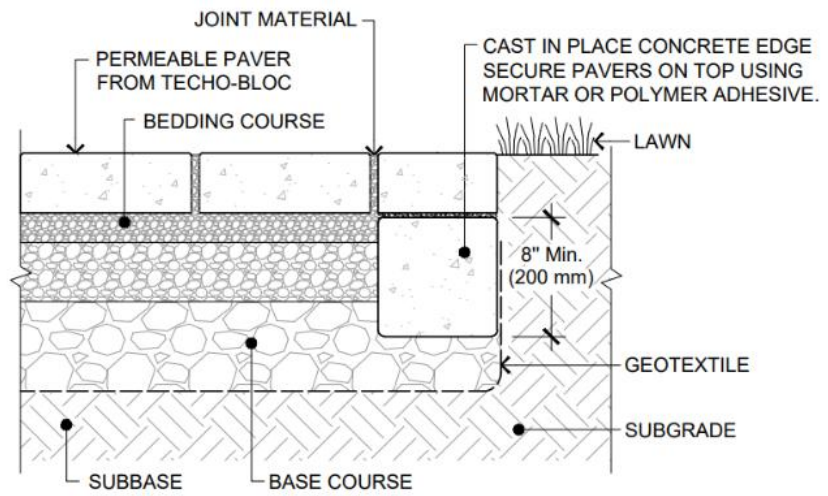


CURBING OPTIONS

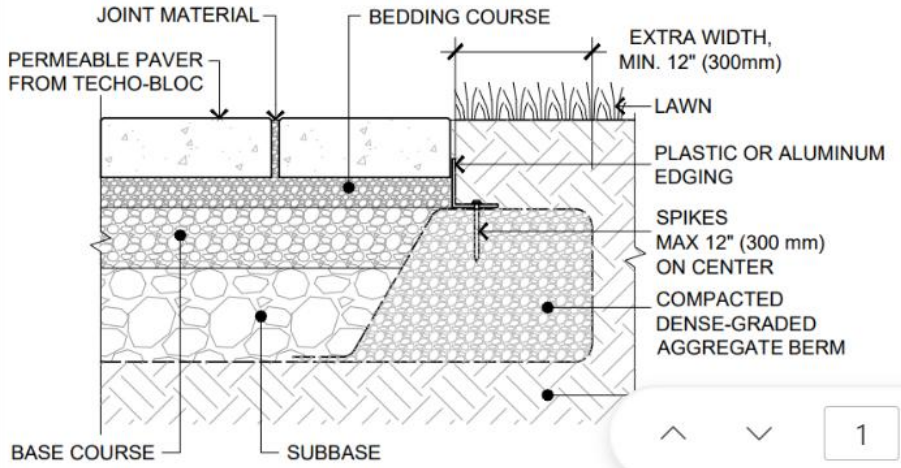
CONCRETE CURB



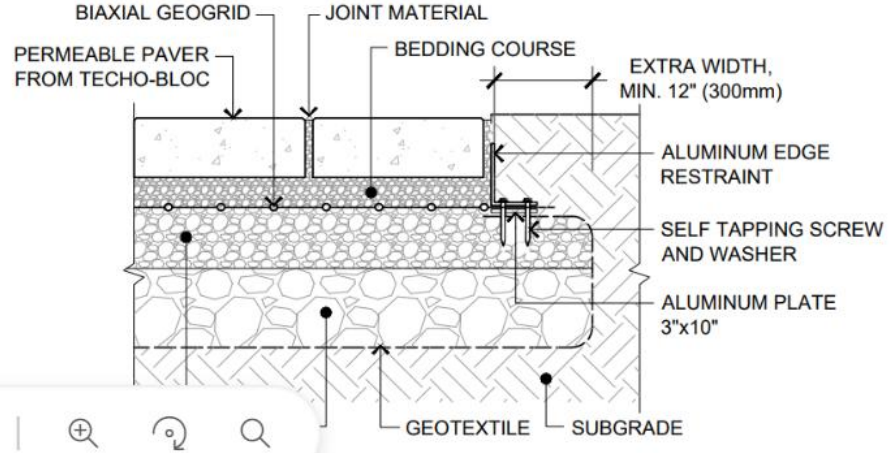
PAVER ON TOP OF CONCRETE CURB



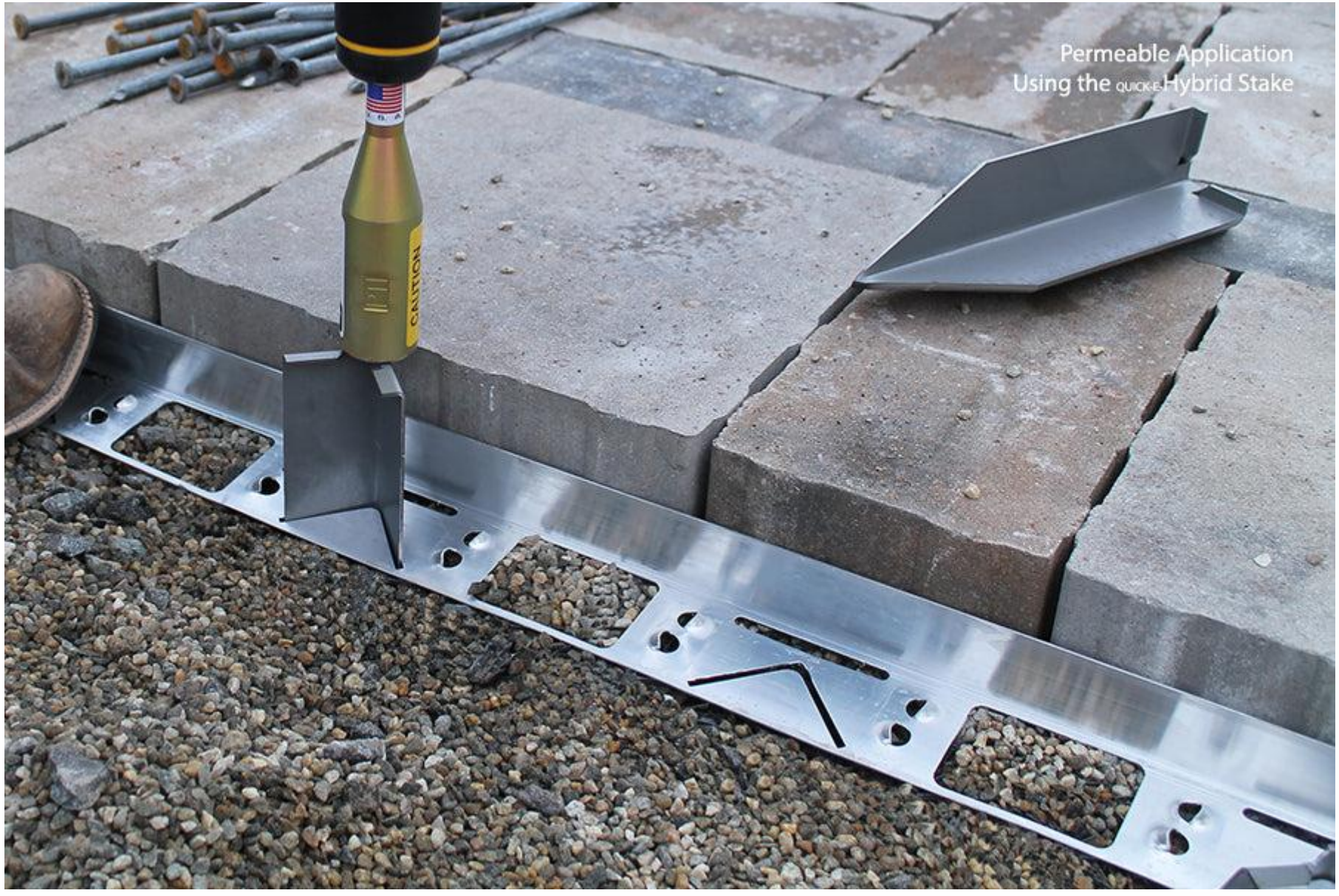
EDGE RESTRAINT ON AGGREGATE BERM



EDGE RESTRAINT WITH GEOGRID



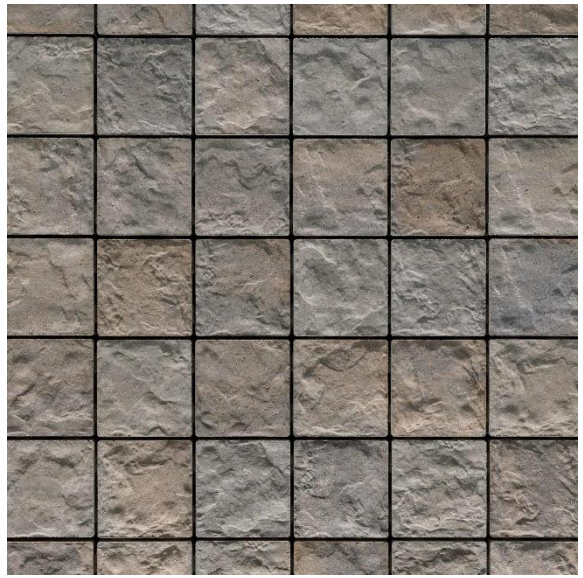
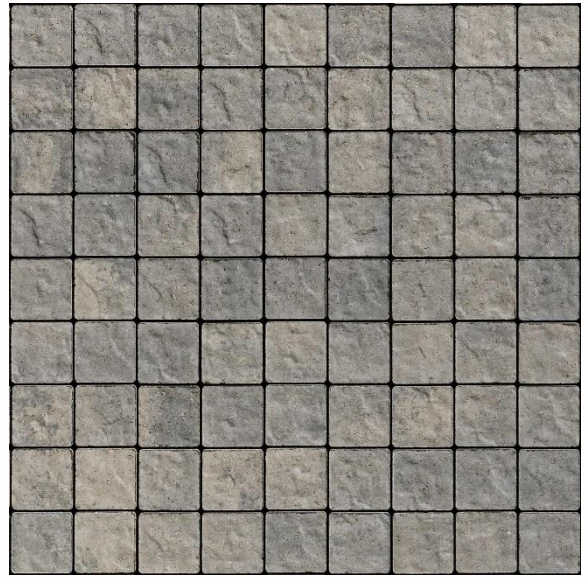
CURBING OPTIONS

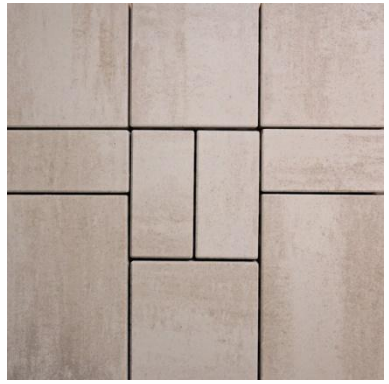
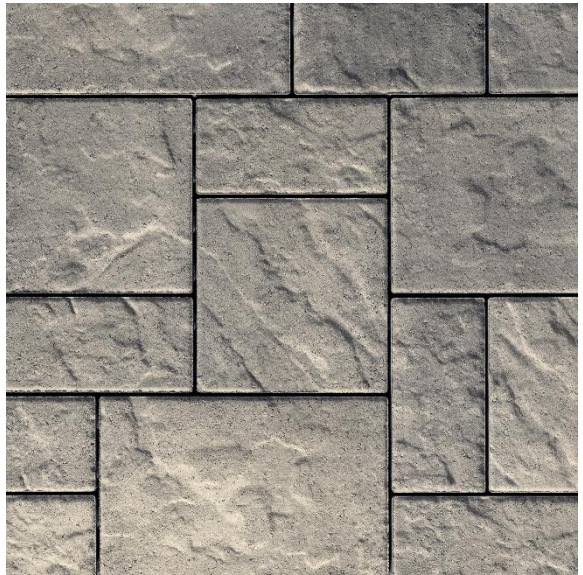



Pave Tool
INNOVATORS

SHAPES, COLORS, SIZES, & TEXTURES



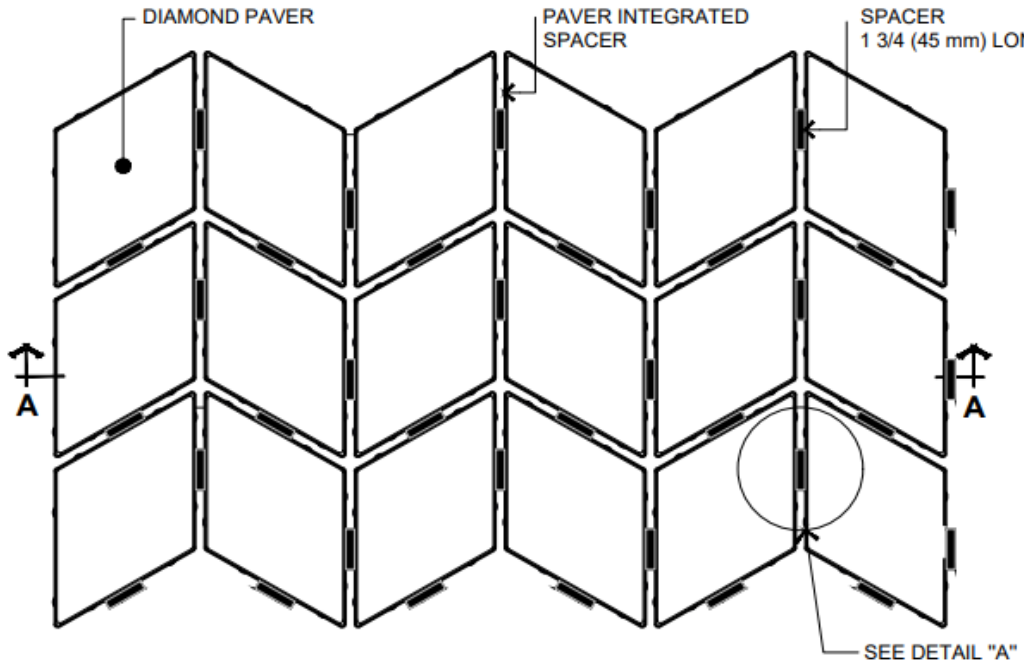



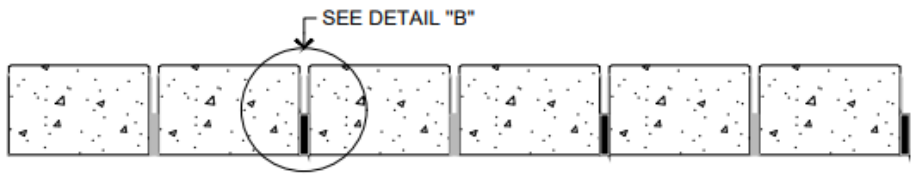



SPACERS

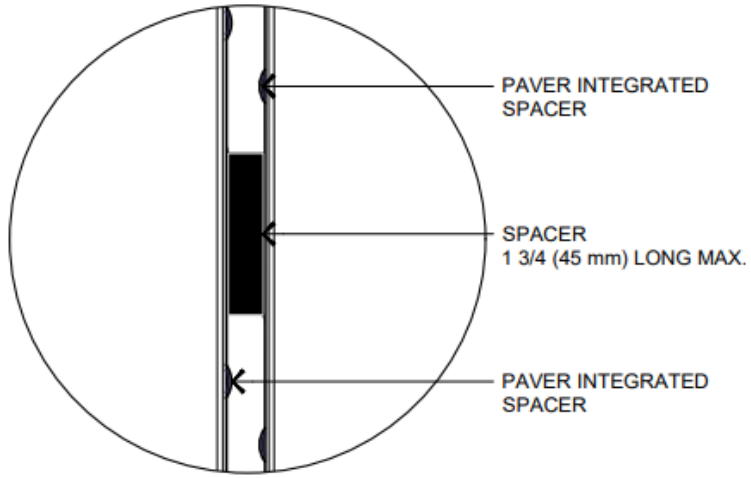
Joint spacers can be installed between the units designed with narrow joints.



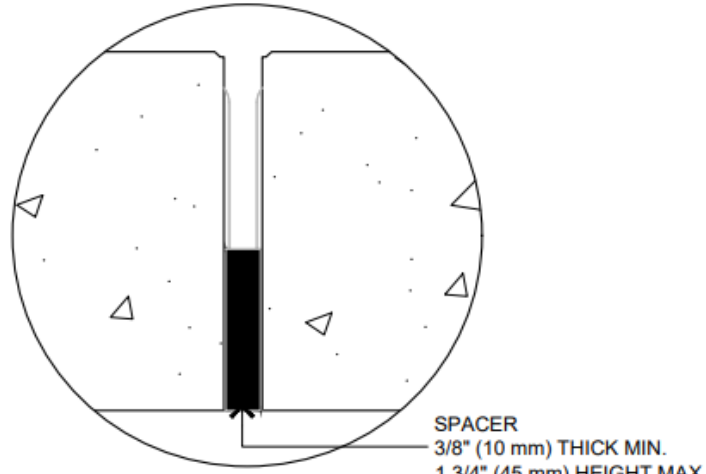
TOP VIEW



SECTION A-A



DETAIL "A"



DETAIL "B"

NOTES:

1. SPACERS SHALL BE MADE OF NON-BIODEGRADABLE WATERPROOF MATERIAL, AND THEY CAN BE PRE-DIMENSIONED OR CUT ON-SITE.
2. TO MAINTAIN A PROPER JOINT WIDTH, SPACERS SHOULD NOT INTERFERE WITH PAVERS' INTEGRATED SPACERS.
3. PERCENT OF SURFACE OPENING: 8.4%

TECHO—BLOC
1-877-832-4625
www.techo-bloc.com

DIAMOND
USED ON PICP APPLICATION

TECHO-BLOC SEGMENTAL CONCRETE PAVEMENTS
TYPICAL ICP DETAILS

DATE :	2024-03-12
DRAWN BY :	I.G.
SCALE:	NONE
SHEET:	1/1
FILE:	TS-DET-PICP-DIAMOND-EN

TECHO-QUIZ

Stormwater runoff can negatively affect which of the following?

A. Water supply

B. Fish and wildlife habitat

C. Recreational waterways

D. Water quality

TECHO-QUIZ

For urban areas with impervious surface covering 75% to 100%, what is the approximate percentage of surface runoff?

A. 35%

B. 55%

C. 42%

D. 15%

TECHO-QUIZ

PICP joint openings to surface ratio typically range from _____.

A. 10% to 20%

B. 15% to 20%

C. 5% to 15%

D. 2% to 5%

TECHO-QUIZ

What two variables have a significant impact on the surface infiltration rate:

A. Subbase and base materials
B. Paver and geomembrane materials
C. Joint aggregate and subbase material
D. Joint aggregate size and joint width

PICP BENEFIT: Reduction of Runoff Volumes

PICP mitigates the runoff headed directly to the sewer, spreading the discharge to the sewer network over a longer period.

Reducing the runoff volume and peak flows has the following advantages:

- **reduced burden on the sewer network including sewer overflows and flooding**
- **reduced sewer and treatment costs**
- **reduced downstream flows and stream bank erosion**

PICP BENEFIT: Water Quality Improvement

PICP improves the quality of stormwater runoff by trapping or breaking down pollutants through processes such as:

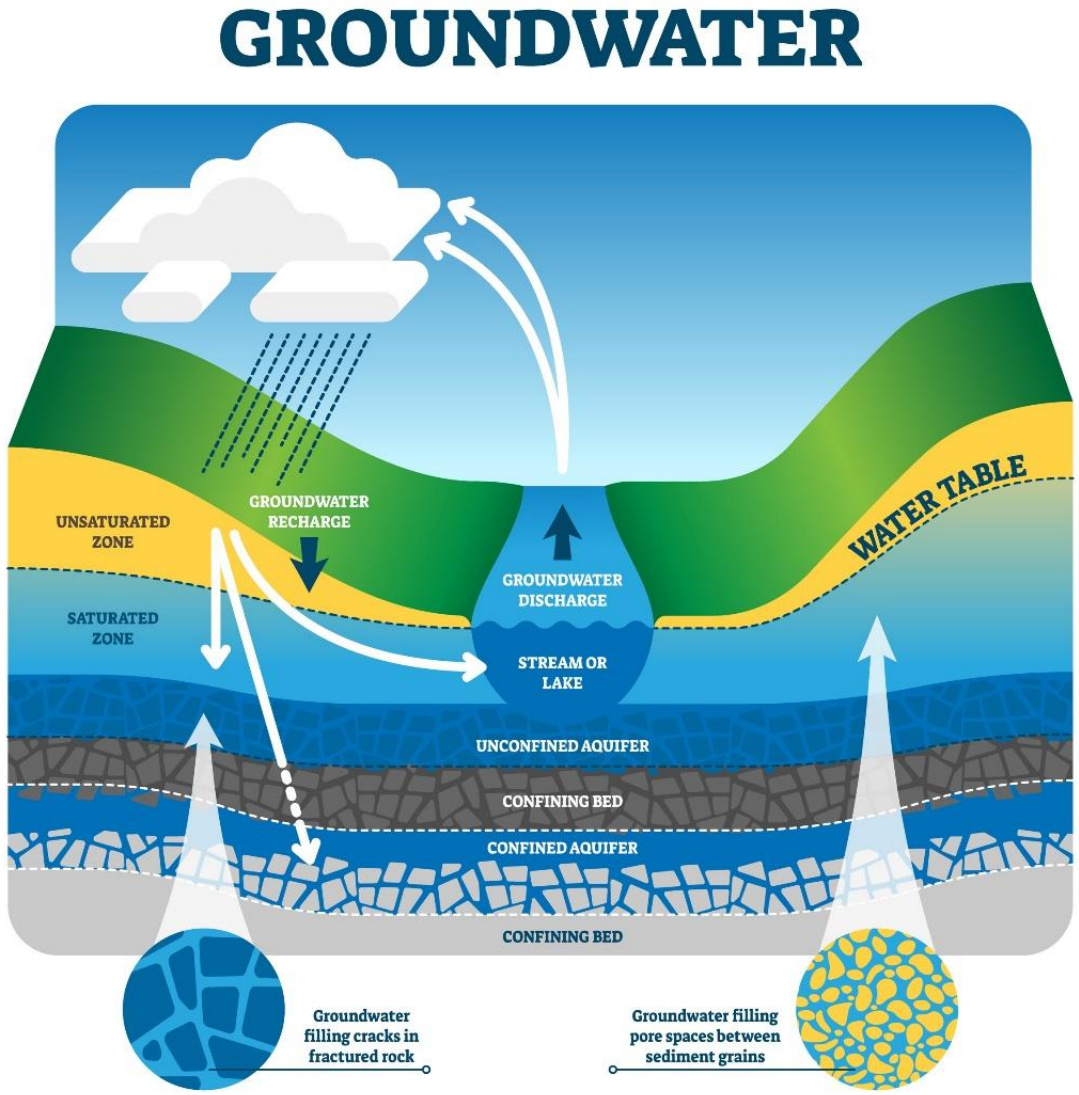
- **Filtration**
- **Sedimentation**
- **Adsorption**
- **Volatilization**
- **Biological Degradation**

PICP systems have shown to process oil drippings from vehicles.

PICP BENEFIT: Groundwater Recharge & Infiltration

PICP contributes to the recharge of groundwater which supplies water to wells and provide a base flow to streams.

Infiltration also results in more available water for nearby vegetation.

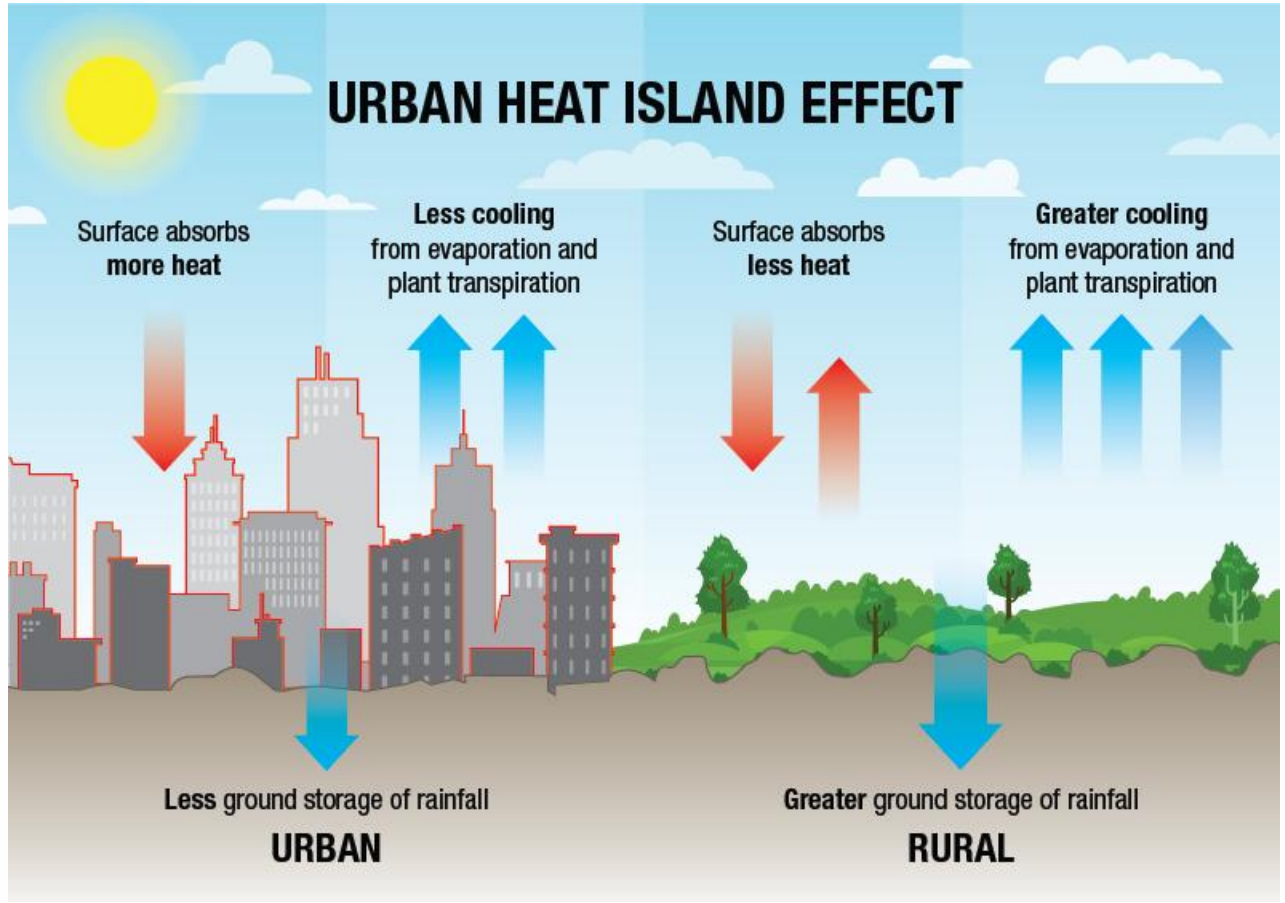


PICP BENEFIT: Reducing Heat Island Effect

PICP contributes to the reduction of heat island effects due to light-colored pavers absorbing less heat and the evaporation of infiltrated rainwater cooling the ambient air.

Urban areas, where natural ground cover is replaced by dark pavements and dark rooftops, experience elevated air temperatures compared to their rural surroundings.

The air temperature in a large city has proven to be on average 1.8°F to 5.4°F warmer than its rural surroundings and on a clear, calm night can be as much as 22°F warmer.



PICP BENEFIT: Solar Reflectance

PICPs can be manufactured in light colored materials, unlike asphalt.

When wet, PICPs can lower temperatures through evaporative cooling. Moisture within the pavement structure evaporates as the surface heats, thus drawing heat out of the pavement, like vegetated land cover.

Generally, for pavement applications on the ground and the requirements of the project or if this a LEED project, the typical values that will be targeted are a SRI of at least 29.

FINISH	COLOR	SWATCH	SOLAR REFLECTANCE[1]	SOLAR REFLECTANCE INDEX[2]
HD² Smooth	Beige Cream		0.38	42
	Greyed Nickel		0.37	41
	Shale Grey		0.21	19
Smooth	Beige Cream		0.33	36
	Greyed Nickel		0.34	37
	Shale Grey		0.27	28
HD² Polished	Beige Cream		0.38	42
	Greyed Nickel		0.37	41
	Shale Grey		0.17	15
HD² Granitex	Beige Cream		0.33	36
	Greyed Nickel		0.39	43
	Shale Grey		0.29	31

We now have 14 colors & textures with an SRI over 29 & 7 over 40.

Caffe Crema brings high SRI values to the brown tone family of colors. Silver Granite is amongst the highest of SRIs with a value of 45.

Our engineers are available to calculate SRI values for a mixed product/color design for LEED Credits.

PICP BENEFIT: LEED Credits

LEED v4 and v4.1 Credits

PICP contributes to get LEED points among different credit categories. Specific BD+C credit categories that can be supported with PICP are:

- **Integrative Process (IP)**
- **Sustainable Sites (SS)**
- **Water Efficiency (WE)**
- **Materials and Resources (MR)**
- **Innovation (IN)**
- **Regional Priority (RP)**

LEED BD+C Credit Category v4 and v4.1	Potential Points Using PICP
Integrative Process (v4 and v4.1)	1
Sustainable Sites	
Open Space (v4 and v4.1)	1
Rainwater Management (v4 and v4.1)	3
Heat Island Reduction (v4 and v4.1)	2
Water Efficiency	
Outdoor Water Use Reduction (v4 and v4.1)	1
Materials and Resources	
Building Product Disclosure and Optimization-Environmental Product Declarations (v4)	1–2
Environmental Product Declarations (v4.1)	1–2
Building Product Disclosure and Optimization-Sourcing of Raw Materials (v4)	1–2
Sourcing of Raw Materials (v4.1)	1–2
Building Product Disclosure and Optimization-Material Ingredients (v4)	1–2
Materials Ingredients (v4.1)	1–2
Construction and Demolition Waste Management (v4 and v4.1)	1–2
Innovation (v4 and v4.1)	1–5
Regional Priority (v4 and v4.1)	1–4
Range of potential points	14–26

Source: ICPI Tech Spec 16 - Achieving LEED Credits with Segmental Concrete Pavement

PICP BENEFIT: Reduced Ice Accumulation

Studies show that PICPs provide equivalent or better levels of safety (surface friction) compared to asphalt when treated with up to 50% less deicers.

Therefore, PICPs can have a lower risk of slips and falls for pedestrians and lower risk of skidding for vehicles, while still meeting ADA compliance of joints less than ½“ or 12mm.

COLD CLIMATE CONSIDERATIONS

PICPS do not heave when frozen:

- **Base/subbase and saturated soil subgrade drains prior to freezing.**
- **Air in the aggregate voids provides some insulating effect, coupled with the heat from the ground (due to higher soil moisture content) slows the movement of freezing temperatures toward the soil subgrade.**
- **Should water freeze in the base/subbase, the space in the aggregate voids provide sufficient space for the frozen water to expand as it freezes.**

Once snow is plowed, remaining snow can melt and infiltrate into the surface when the temperature rise, thereby reducing or eliminating refreezing and ice hazards.

COLD CLIMATE CONSIDERATIONS

Pavers should meet the freeze-thaw durability test as per ASTM C936 (immersed in 3% saline solution if units will be exposed to deicing materials).

Rock salt (sodium chloride or NaCl) is the least damaging to concrete. If a quicker acting deicer is necessary, consider judicial use of calcium chloride ($CaCl_2$).

The use of magnesium chloride ($MgCl_2$) and calcium magnesium acetate (CMA) can degrade concrete and are not recommended.

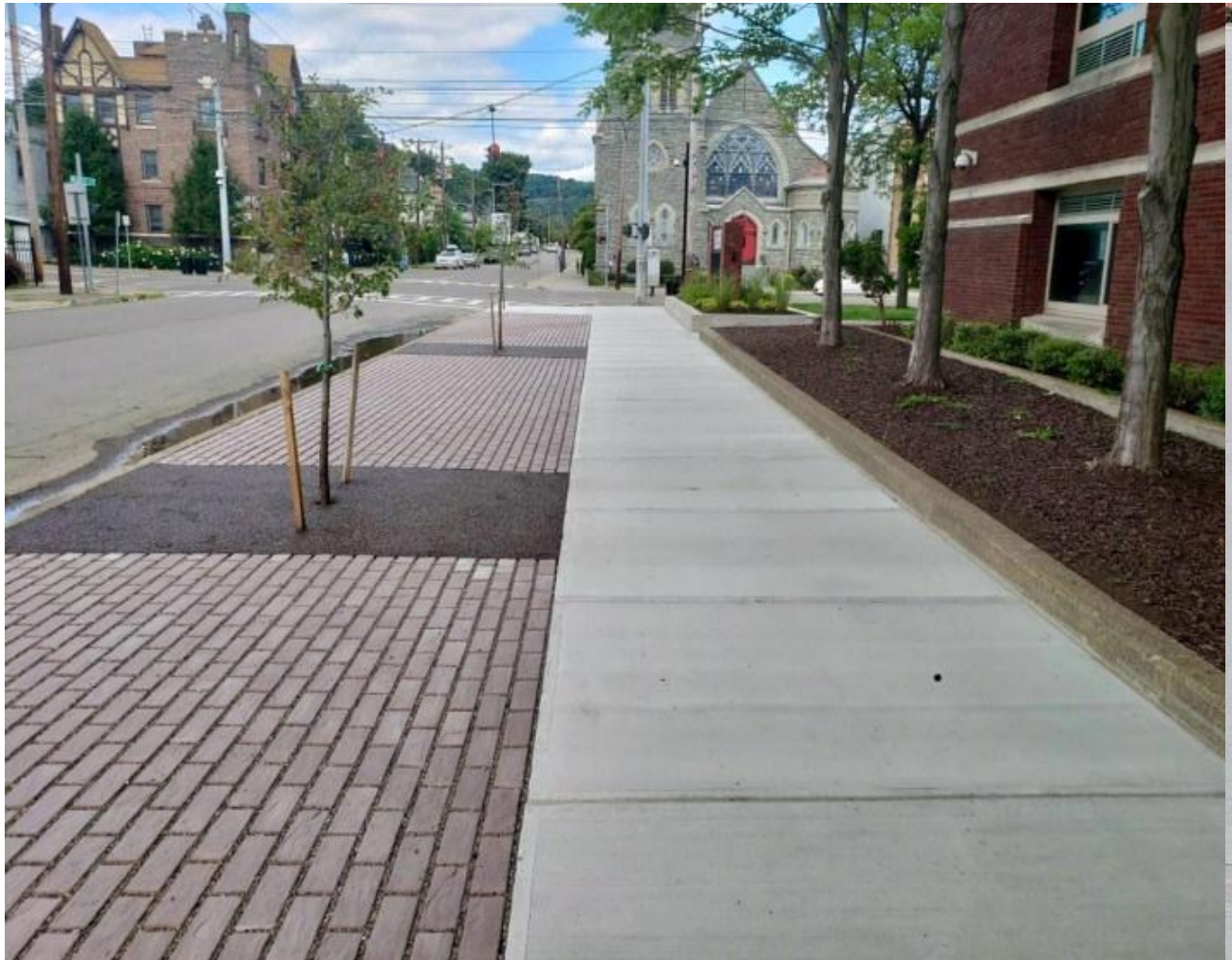
PICP can retain its infiltration capacity throughout the winter.

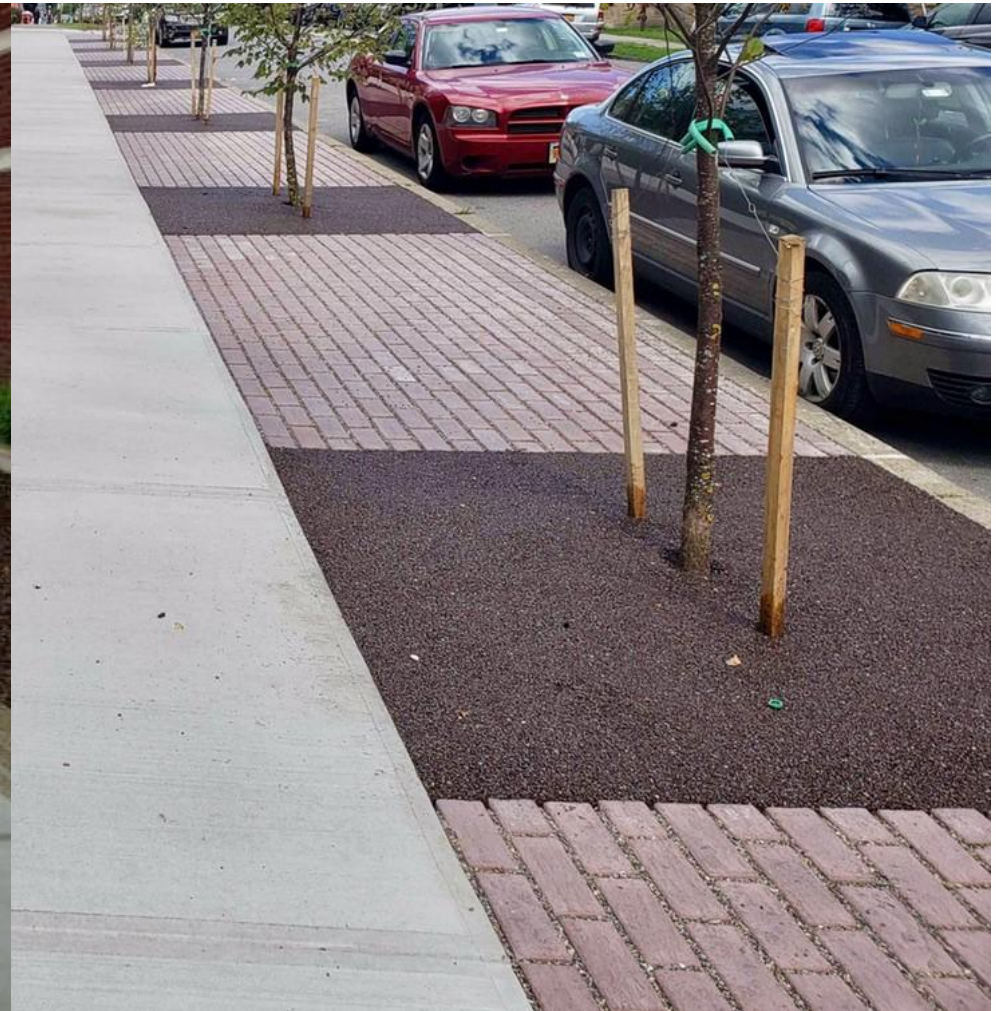
APPLICATIONS & CONSTRAINTS

Walkways, Sidewalks, Patios & Pedestrian Plazas

APPLICATIONS & CONSTRAINTS

Recreational and park-related applications: areas around water fountains, permeable buffers around tree beds and planters



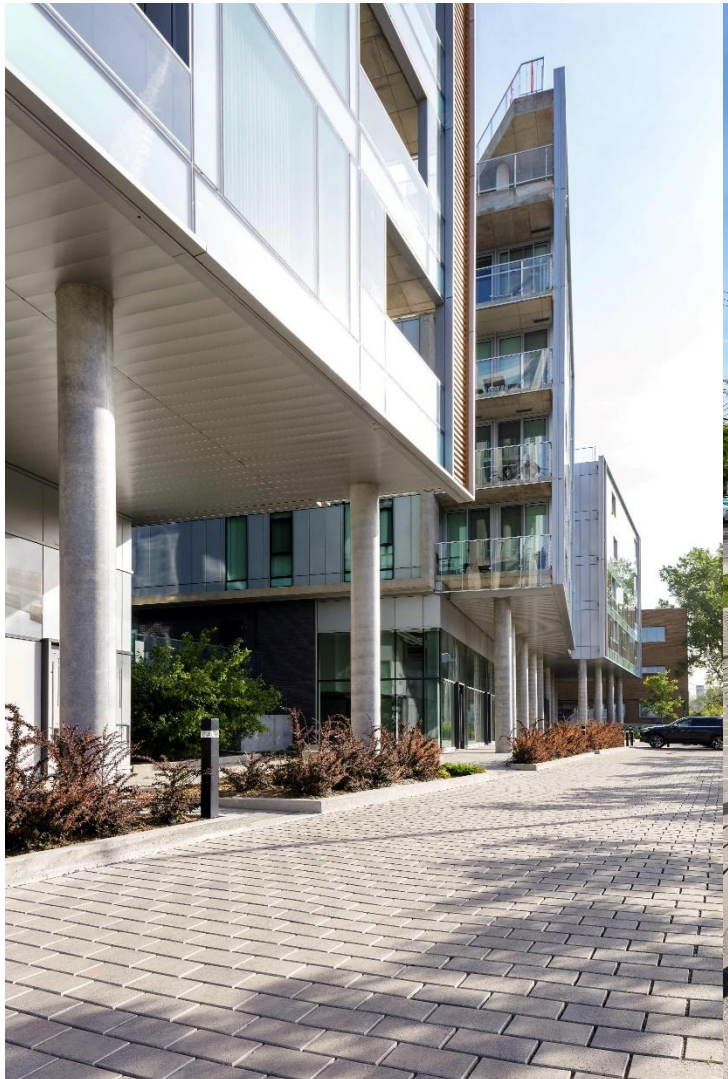


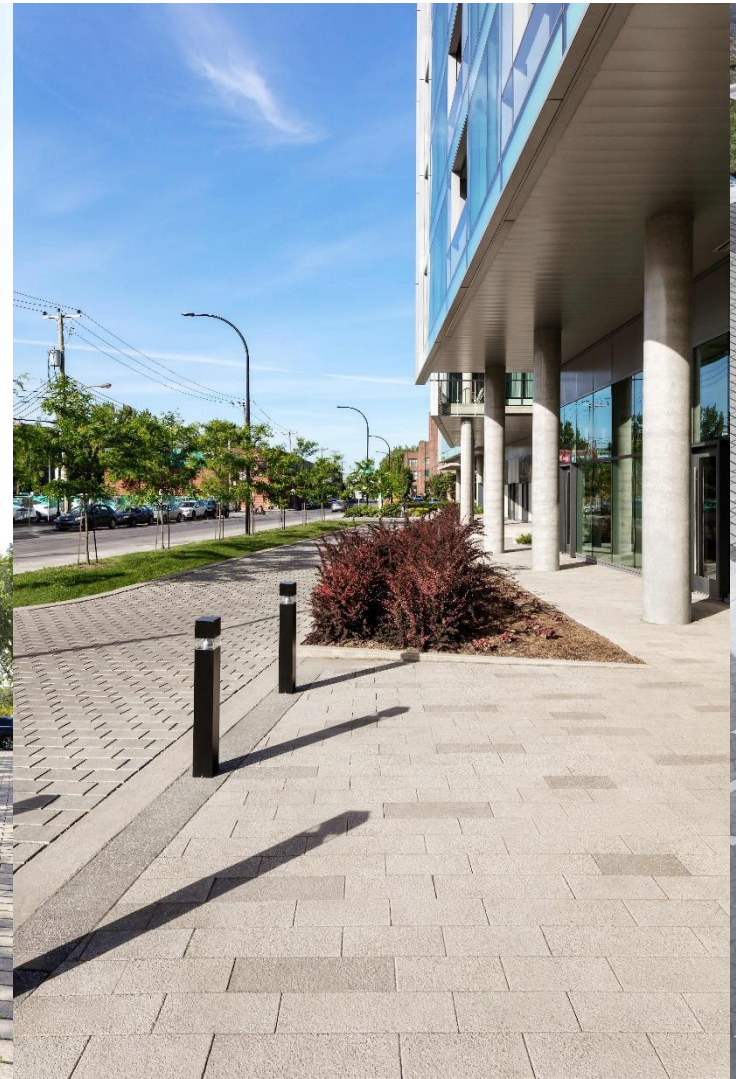
APPLICATIONS & CONSTRAINTS

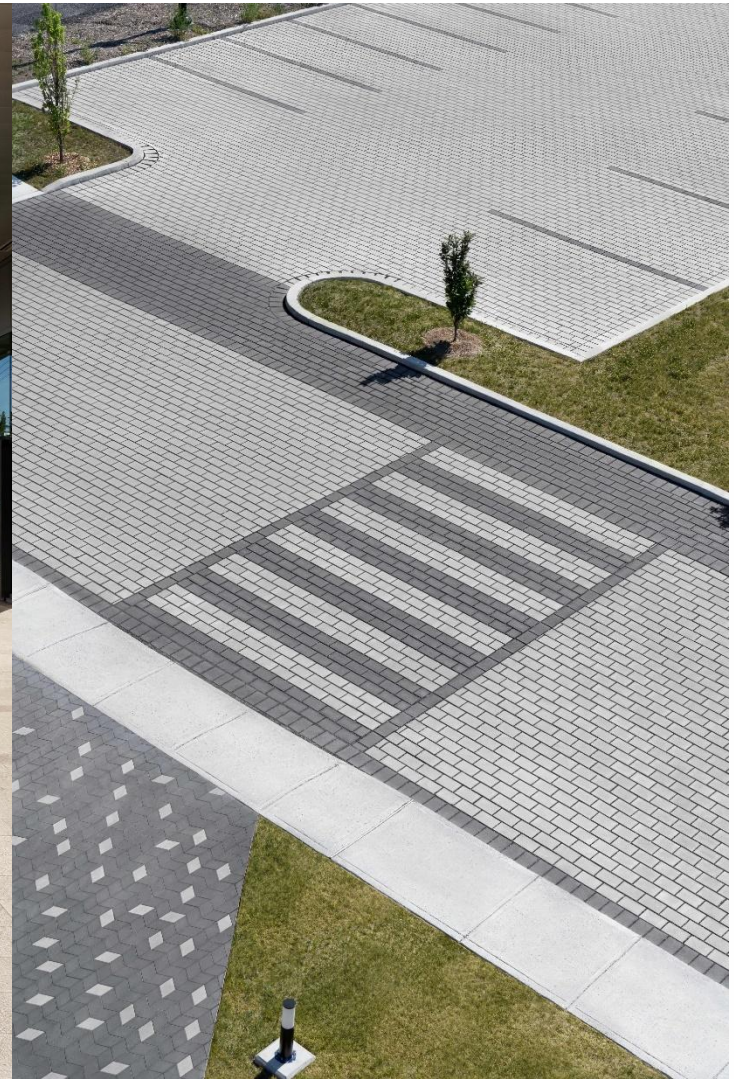
Main & Service Drive Lanes

APPLICATIONS & CONSTRAINTS

Commercial Alleys & Parking Lots

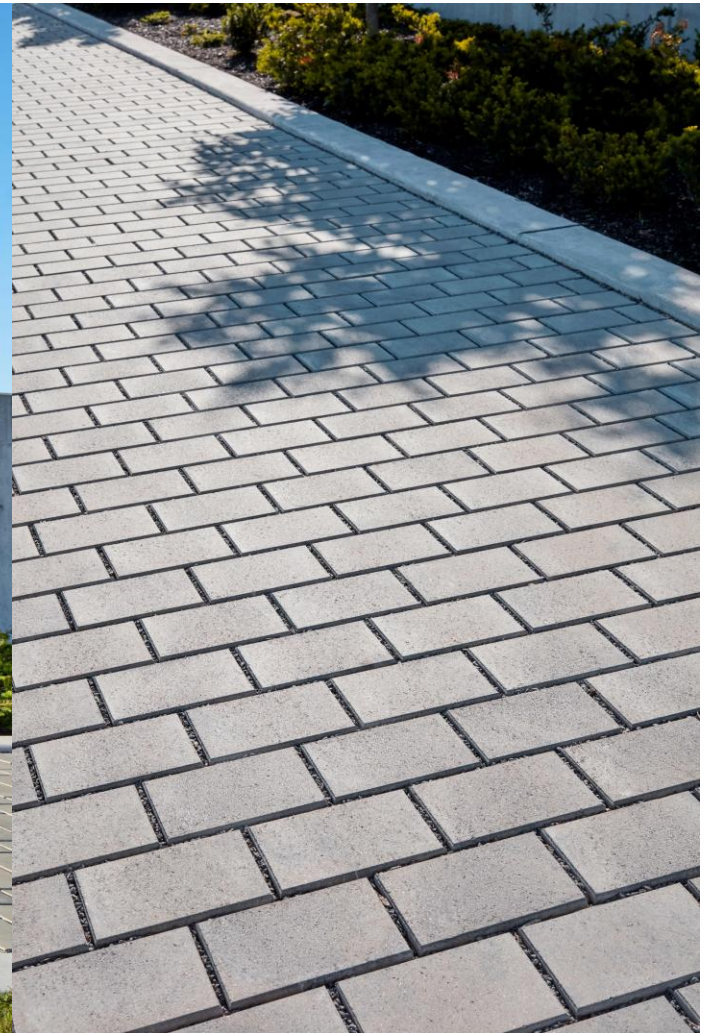






APPLICATIONS & CONSTRAINTS

Low-Volume Roadways (speed limits of 35 mph or less)



APPLICATIONS & CONSTRAINTS

Heavy-duty loading or industrial sites with no hazardous materials (no risk to groundwater or soils from spills)

1,000,000 ft^2+ of Permeable Pavements now installed at our own facilities.

Most recently, 140,000 SF at our new Design & Distribution Center in Minooka, IL

APPLICATIONS & CONSTRAINTS

Where PICP may NOT be appropriate:

- PICP is not recommended in areas where the exposure of stormwater to hazardous materials or pollutants is significantly higher than normal (i.e., stormwater hotspots).

- Examples of stormwater hotspots include, but are not limited to, fueling facilities, vehicle maintenance areas, scrap yards, wastewater treatment plants, landfills, or industrial facilities that store hazardous materials. Designers should verify compliance with local jurisdictional authorities.

- PICP is not recommended for use with consistent, high speed/high volume roadways.

DESIGN CONSIDERATIONS

The design of a permeable paving system is based on site conditions, including, without limitation, rainfall data, topography, soil characteristics, height of water table and bedrock surface, tributary runoff surface, and proximity to water supply wells. Additionally, the following should be considered when designing with PICP:

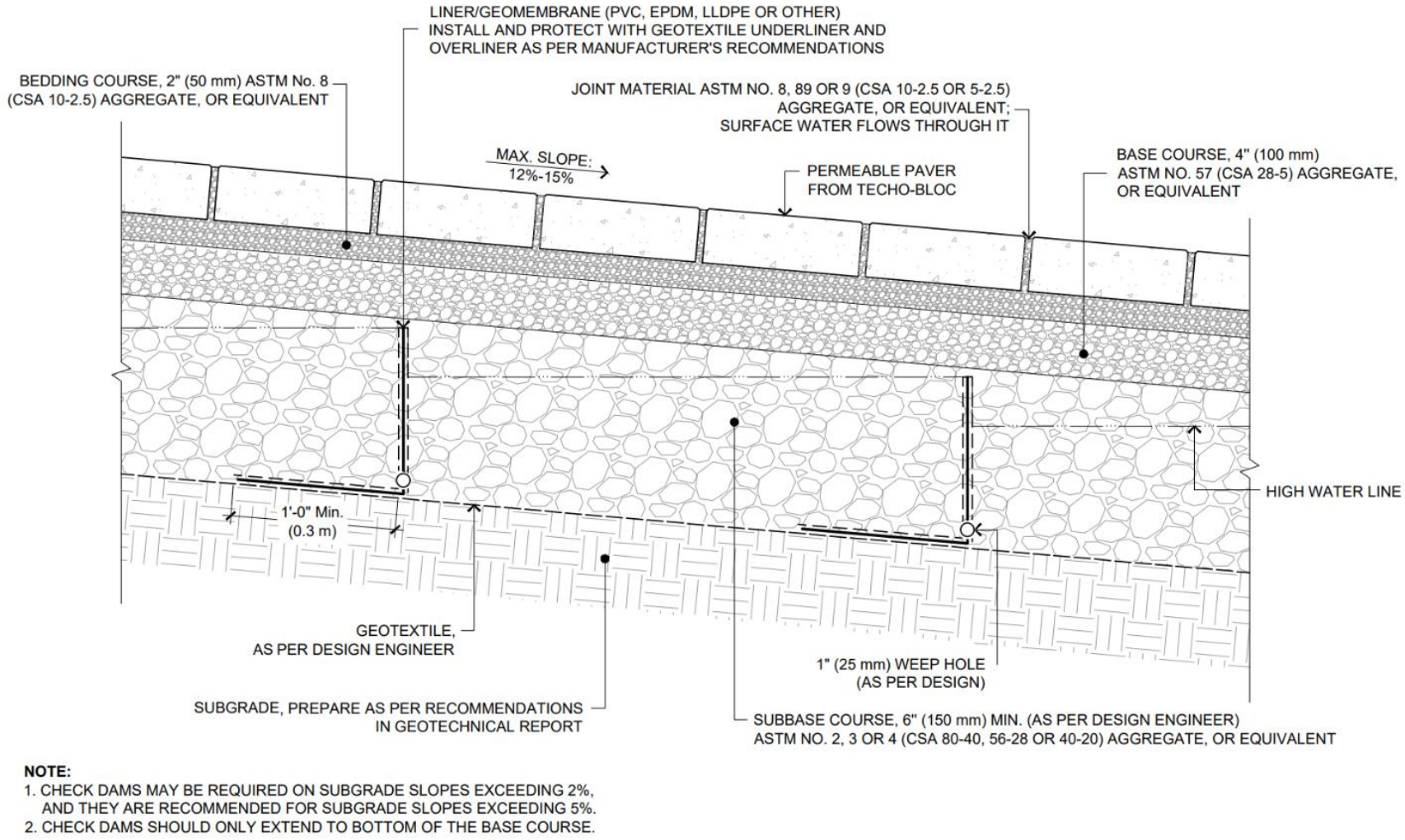
- **The impervious area contributing to runoff should not exceed five times the area of the PICP receiving the runoff**
- **The slope of the land surrounding and draining into the PICP should not exceed 20%**
- **Runoff draining onto PICP should not be from soil erosion, exposed topsoil, or mulch**
- **A distance of at least 100 ft (30 m) should be maintained between PICP and water supply wells (check with local regulations)**
- **Low speed residential roads: 35 mph (55 kph) max.**
- **Adjacent buildings within 10 ft of PICP must be waterproof protected and pavement sloped away from building**

DESIGN CONSIDERATIONS

Pavement Surface Slope:
While the slope of most PICP surfaces is 2% or less, there should be a minimum 1% surface slope to enable removal of water in the extreme case of the entire system is filled with water. Slopes should not be greater than 12%.

DESIGN CONSIDERATIONS

Subgrade Slopes: Subgrade slopes of 3% or more will typically require spaced berms in subbase to create a stepped system with level sections to slow downslope flows and increase infiltration.



NOTE:
1. CHECK DAMS MAY BE REQUIRED ON SUBGRADE SLOPES EXCEEDING 2%, AND THEY ARE RECOMMENDED FOR SUBGRADE SLOPES EXCEEDING 5%.
2. CHECK DAMS SHOULD ONLY EXTEND TO BOTTOM OF THE BASE COURSE.

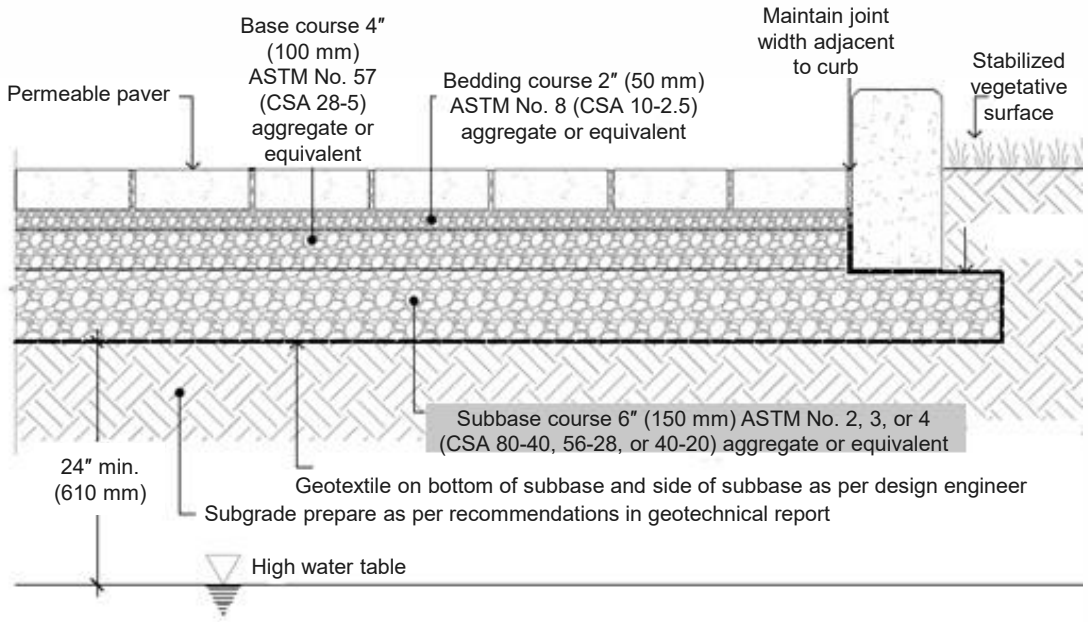
DESIGN CONSIDERATIONS

Adjacent conventional pavements & structures: Conventional pavement bases/subbases/subgrades and structures require protection from water infiltration. A geomembrane can be used to separate PICP and conventional pavement.

DESIGN CONSIDERATIONS

Water table and bedrock depth: The underside of the PICP system (bottom of subbase) should be at least 2 ft (0.6 m) above the high-water table and bedrock. Local government agencies may require greater separation.

Expansive soils: Use of a geomembrane under the subbase to protect subgrade from expansion. Other options are subgrade stabilization with additives (e.g., lime, cement) or replacement of subgrade soil; both should be addressed by the engineer.



DESIGN CONSIDERATIONS

Base/subbase thickness:

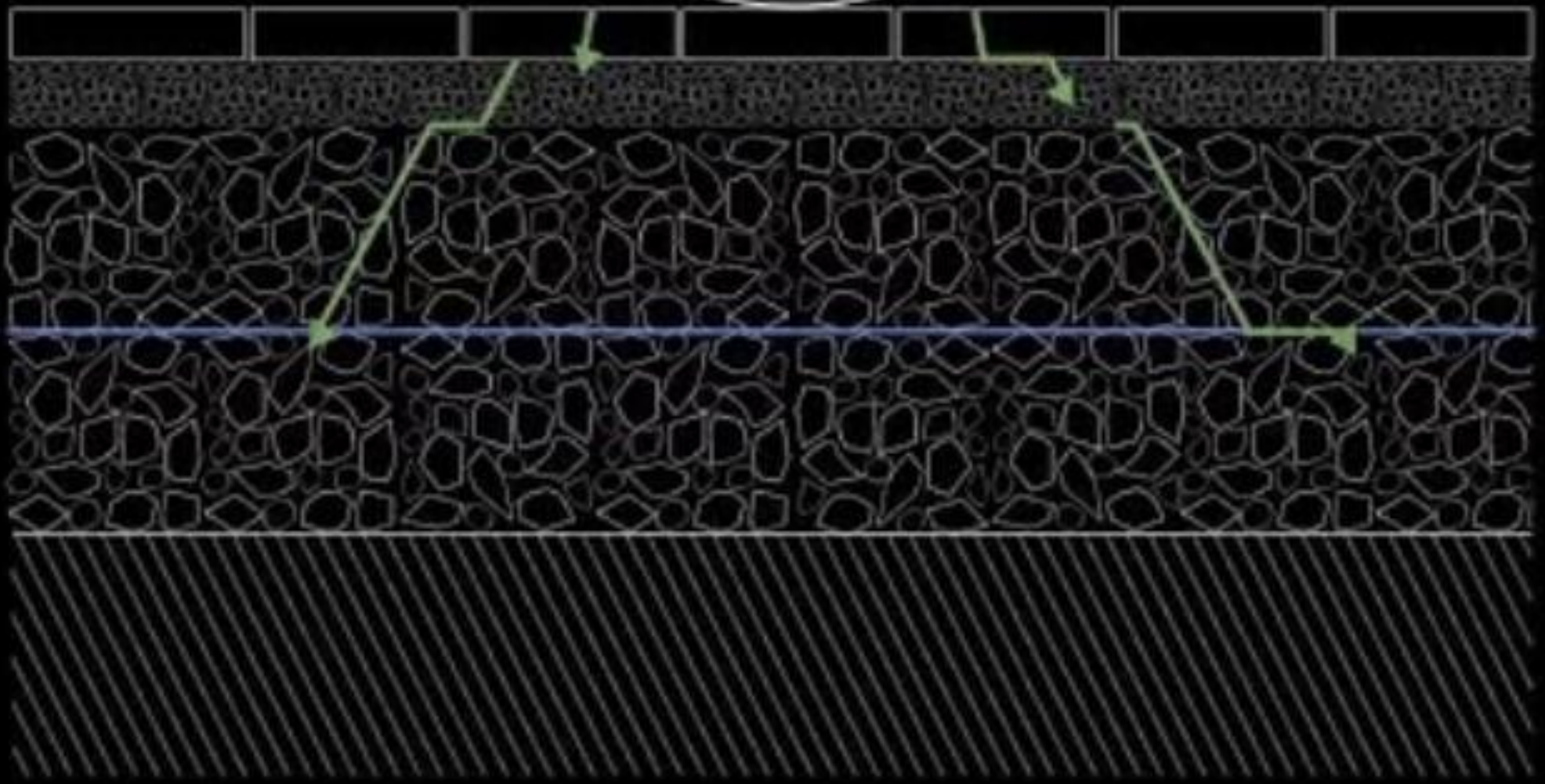
PICP design calls for expertise from two civil engineering disciplines: structural and hydrological analysis.

The base/subbase thickness is determined for structural and hydrological needs and the thicker section is selected.

Base/Subbase Thickness for Preliminary Assessment Only (thicker subbase can be used for water storage)

	Subgrade strength: Low (CBR: 3)			Subgrade strength: Medium (CBR: 7)			Subgrade strength: High (CBR: 10)		
Pavement use	Base	Subbase	Total (Min.)	Base	Subbase	Total (Min.)	Base	Subbase	Total (Min.)
Sidewalk (nonvehicular)	4″	6″	10″	4″	6″	10″	4″	6″	10″
Residential driveway	4″	7″	11″	4″	6″	10″	4″	6″	10″
Parking and alleys for multifamily residential properties	4″	11″	15″	4″	6″	10″	4″	6″	10″
Commercial retail parking lots	4″	21″	25″	4″	11″	15″	4″	8″	12″
Bus parking or drop-off areas	4″	24″	28″	4″	14″	18″	4″	10″	14″
Local residential street	4″	31″	35″	4″	19″	23″	4″	15″	19″

Techo-Bloc



TECHO-QUIZ

All the following are possible applications for PICP EXCEPT:

A. Commercial alleys & parking areas
B. Recreational & park-related applications
C. Main & service drives around commercial & institutional buildings
D. High-volume roadways w/ speed limits over 35 mph

TECHO-QUIZ

The slope of the land surrounding and draining into the PICP should not exceed _____ .

A. 20%

B. 12%

C. 5%

D. 2%

TECHO-QUIZ

When designing with PICP, the impervious area contributing to runoff should not exceed _____ times the area of the PICP receiving the runoff.

A. Two

B. Five

C. Six

D. Eight

SURFACE INFILTRATION TESTING

Surface infiltration rates can be tested using the following method:

- **ASTM C1781, “Standard Test Method for Surface Infiltration Rate of Permeable Unit Pavement Systems.”**
- **12″ (300 mm) diameter ring set on plumber’s putty.**
- **Water is poured in the diameter ring while being timed with a stopwatch.**
- **Infiltration rate is calculated using formulas in the test method.**

PICP MAINTENANCE

There are two types of maintenance to ensure PICP surface infiltration:

1. **Routine (preventive)**
2. **Restorative.**

Several factors will affect each project's short-term and long-term maintenance schedule.

Tech Spec 23

icpi
Interlocking Concrete Pavement Institute®

Maintenance Guide for Permeable Interlocking Concrete Pavements

Introduction

Permeable interlocking concrete pavements (PICP) are a proven method for reducing stormwater runoff and pollutants while supporting pedestrian and vehicular traffic. Many laboratory and in-situ research projects over the past two decades by universities, government stormwater agencies, and industry have demonstrated significant runoff and pollutant reductions with cost-saving benefits. The U.S. Federal Highway Administration **www.fhwa.dot.gov/pavement/concrete/pubs/hif19021.pdf** has published information supporting PICP use in walkways, plazas, driveways, parking lots, alleys and streets.

Like all stormwater control measures, PICP requires maintenance as it traps sediment on its surface not unlike an air conditioning filter. Larger particles are initially trapped while allowing water to pass. Some enter the jointing stone and are trapped there. The jointing stone with larger particles eventually captures smaller particles and this decreases the infiltration rate over time. While still infiltrating water, many smaller particles are trapped within the surface and interior joints. Smaller particles are trapped and eventually decrease infiltration which results in surface ponding.

Figure 1. PICP is seeing increased use in municipal streets to reduce stormwater runoff, local flooding, storm pipe upsizing, and combined sewer overflows. These streets are in Atlanta, GA.

PICP MAINTENANCE

Initial postconstruction

- Surface Infiltration Rate (SIR) >400 inches/hour

Preventative Maintenance

- SIR <20 inches/hour
- SIR <40 in/h, if PICP surface sloped over 2%
- Ponding areas representing more than 20% of total PICP area

JOINT FILL RECOMMENDATIONS

Proper joint fill installation is crucial for preventing premature clogging/failure and reducing maintenance costs:

- **Washed & Bagged ASTM #9 gravel**
- **Consolidated enough that you cannot pass a puddy knife past ½”**
- **Recessed below the chamfer**

PICP MAINTENANCE

Restorative Maintenance

- Could lose up to 90% surface infiltration in first 10 years if unmaintained
- Surface Infiltration Rate (SIR) <10 in/h
- Near clogging: standing water for more than 15 minutes (during or after a rain event)

TECHO-QUIZ

Which standard test method can be used to measure the surface infiltration rate of PICP?

A. ASTM C936
B. CSA A231.2
C. ASTM C1781
D. None of the Above

TECHO-QUIZ

What minimal initial postconstruction surface infiltration rate can be expected for PICP?

A. 400 inches/hour

B. 200 inches/hour

C. 40 inches/hour

D. 20 inches/hour

TECHO-QUIZ

Studies have shown that unmaintained PICP can lose its surface infiltration rate by as much as ___ % in the first 10 years.

A. 86

B. 65

C. 90

D. 57

SUMMARY

- PICP plays an important role in stormwater management as it allows the reduction of runoff volumes and peak flows, improves the quality of stormwater runoff, promotes groundwater recharge, and contributes to the reduction of heat island effects.
- PICP may contribute to a project obtaining LEED points among different credit categories.
- PICP has performed successfully in walkways, driveways, parking lots, low-volume roadways, industrial sites with heavy-duty loading as well as in cold climate conditions.

SUMMARY

- PICP may not be appropriate in areas with high risk of groundwater contamination or high speed/high volume roadways.
- As with any stormwater management practice, PICP requires maintenance to preserve its surface infiltration capacity. Specialized equipment can restore PICP's surface infiltration in case of neglected maintenance.

RESOURCES

"2010 ADA Standards for Accessible Design." US Dept. of Justice, 15 September 2010, https://www.ada.gov/regs2010/2010ADAStandards/2010ADAStandards_prt.pdf. Accessed Mar. 2021.

Borgwardt, Soenke. "Long-Term In-Situ Infiltration Performance of Permeable Concrete Block Pavement." 8th International Conference on Concrete Block Paving, November 6–8, 2006, San Francisco, California. https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.365.9174&rep=rep1&type=pdf. Accessed Mar. 2021.

"Calculating Credits for Permeable Pavement." *Minnesota Stormwater Manual*. Minnesota Pollution Control Agency, August 2019, https://stormwater.pca.state.mn.us/index.php/Calculating_credits_for_permeable_pavement Accessed Mar. 2021.

Comprehensive Environmental Inc. & New Hampshire Department of Environmental Services. "New Hampshire Stormwater Manual vol 2, Postconstruction Best Management Practices: Selection and Design. n.p. December 2008, https://www.des.nh.gov/sites/g/files/ehbemt341/files/documents/2020-01/wd-08-20b.pdf. Accessed Mar. 2021.

Drake, Jennifer, et al. "De-icing Operations for Permeable Interlocking Concrete Pavements." University of Toronto, April 2020, https://www.researchgate.net/publication/340950433_De-icing_Operations_for_Permeable_Interlocking_Concrete_Pavements. Accessed Mar. 2021.

RESOURCES

Drake, Jennifer, et al. “Maintenance Equipment Testing on Accelerated Clogged Permeable Interlocking Concrete Pavements.” University of Toronto, April 2020, https://www.researchgate.net/publication/340950434_Maintenance_Equipment_Testing_on_Accelerated_Clogged_Permeable_Interlocking_Concrete_Pavements. Accessed Mar. 2021.

Leipard, A., et al. “Hydraulic Characterization and Design of Permeable Interlocking Concrete Pavement.” Conference: World Environmental and Water Resources Congress, May 2015, pp. 292–301. https://www.researchgate.net/publication/300487921_Hydraulic_Characterization_and_Design_of_Permeable_Interlocking_Concrete_Pavement. Accessed Mar. 2021.

“New Jersey Stormwater Best Management Practices Manual, April 2004 (section 9.7 Pervious Paving Systems, updated November 2016).” *nj.gov.* n.p., November 2016, https://www.nj.gov/dep/stormwater/pdf/2016-11-07-pervious-paving-final.pdf. Accessed Mar. 2021.

Newman, Alan, et al. “Oil Bio-Degradation in Permeable Pavements by Microbial Communities.” Water Science and Technology: A Journal of the International Association on Water Pollution Research, vol. 45, pp. 51–56. IWA Publishing, February 2002, https://www.researchgate.net/publication/11380201_Oil_Bio-Degradation_in_Permeable_Pavements_by_Microbial_Communities. Accessed Mar. 2021.

RESOURCES

Drake, Jennifer, et al. “Maintenance Equipment Testing on Accelerated Clogged Permeable Interlocking Concrete Pavements.” University of Toronto, April 2020, https://www.researchgate.net/publication/340950434_Maintenance_Equipment_Testing_on_Accelerated_Clogged_Permeable_Interlocking_Concrete_Pavements. Accessed Mar. 2021.

Leipard, A., et al. “Hydraulic Characterization and Design of Permeable Interlocking Concrete Pavement.” Conference: World Environmental and Water Resources Congress, May 2015, pp. 292–301. https://www.researchgate.net/publication/300487921_Hydraulic_Characterization_and_Design_of_Permeable_Interlocking_Concrete_Pavement. Accessed Mar. 2021.

“New Jersey Stormwater Best Management Practices Manual, April 2004 (section 9.7 Pervious Paving Systems, updated November 2016).” *nj.gov.* n.p., November 2016, https://www.nj.gov/dep/stormwater/pdf/2016-11-07-pervious-paving-final.pdf. Accessed Mar. 2021.

Newman, Alan, et al. “Oil Bio-Degradation in Permeable Pavements by Microbial Communities.” Water Science and Technology: A Journal of the International Association on Water Pollution Research, vol. 45, pp. 51–56. IWA Publishing, February 2002, https://www.researchgate.net/publication/11380201_Oil_Bio-Degradation_in_Permeable_Pavements_by_Microbial_Communities. Accessed Mar. 2021.

RESOURCES

"North Carolina Stormwater Control Measure Credit Document, revised November 7, 2018." n.p., November 2018, https://files.nc.gov/ncdeq/Energy%20Mineral%20and%20Land%20Resources/Stormwater/BMP%20Manual/SCM-Credit-Doc-2018-11-7.pdf.
Accessed Mar. 2021.

"Pennsylvania Stormwater Best Management Practices Manual, Appendix A – Water Quality." Department of Environmental Protection, Bureau of Watershed Management, December 30, 2006, https://pecpa.org/wp-content/uploads/Stormwater-BMP-Manual.pdf.
Accessed Mar. 2021.

Pomerantz, M., et.al. "The Effect of Pavements' Temperatures on Air Temperature in Large Cities." *heatisland.lbl.gov.* Berkeley Lab, April 2000, https://eta-publications.lbl.gov/sites/default/files/2000_pomerantz_et_al_effect_of_pavement_temp_on_air_temp_in_large_cities.pdf.
Accessed Mar. 2021.

Pratt, CJ, et al. "Mineral Oil Bio-Degradation within a Permeable Pavement: Long Term Observations." Water Science and Technology, vol. 39. no. 2, pp. 103–109. Elsevier Science Ltd, December 1999, https://www.researchgate.net/publication/240792474_Mineral_Oil_Bio-Degradation_within_a_Permeable_Pavement_Long_Term_Observations. Accessed Mar. 2021.

RESOURCES

Smith, David R. “Permeable Interlocking Concrete Pavement.” ICPI, January 2017.

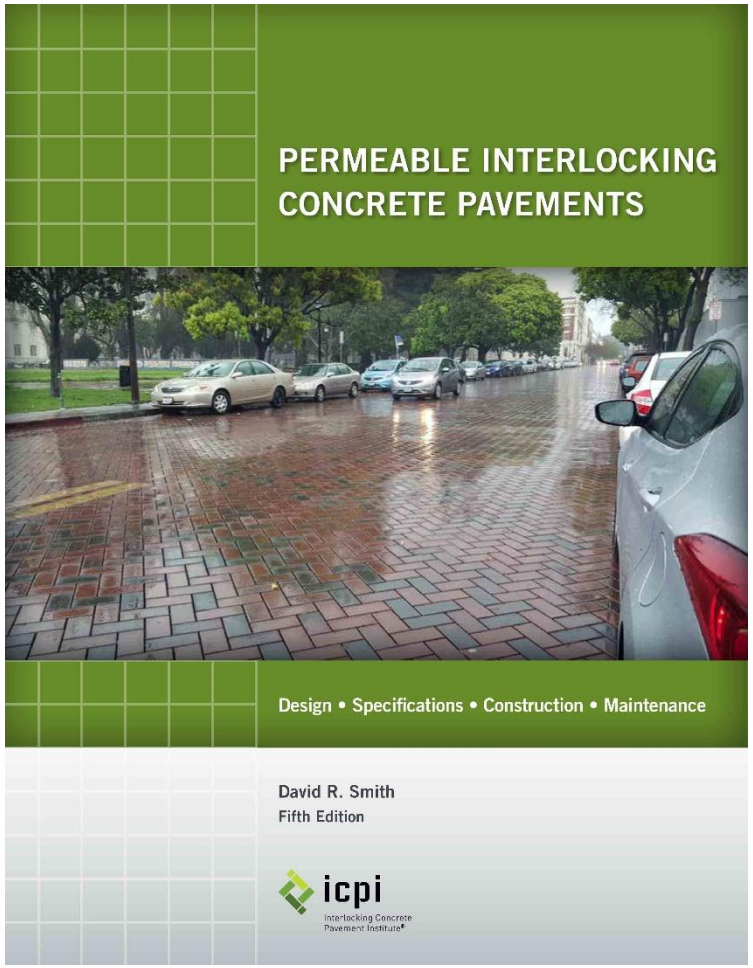
“Summary of the Clean Water Act.” *Epa.gov*, September 9, 2020, https://www.epa.gov/laws-regulations/summary-clean-water-act. Accessed Mar. 2021.

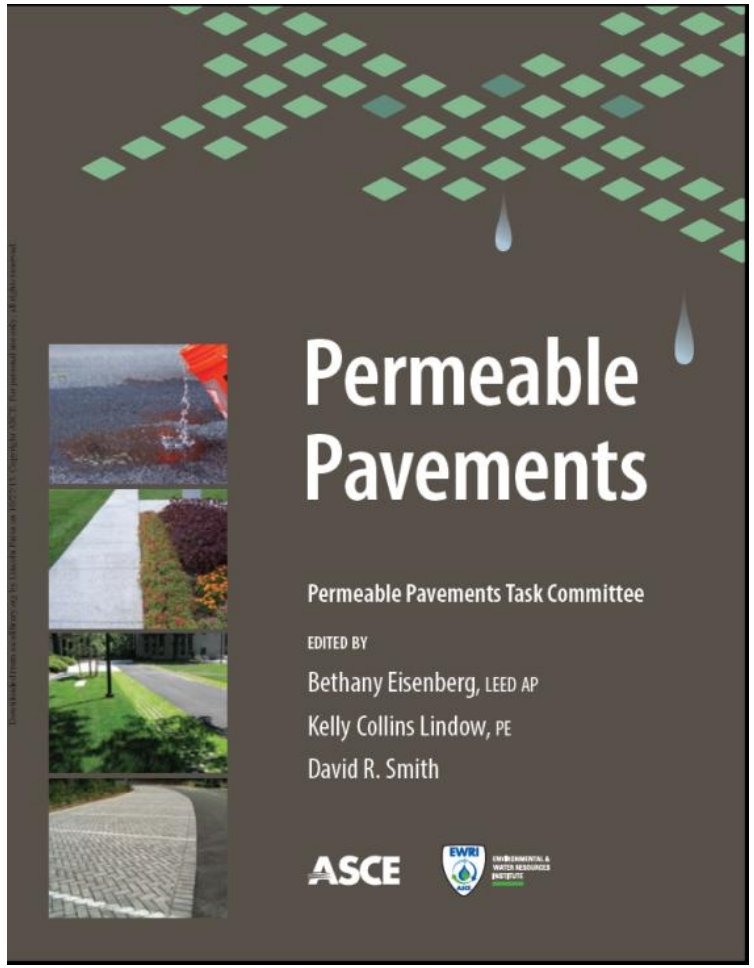
U.S. Environmental Protection Agency. “Reducing Urban Heat Islands: Compendium of Strategies. Draft.” *Epa.gov*, 2008, https://www.epa.gov/heat-islands/heat-island-compendium. Accessed Mar. 2021.

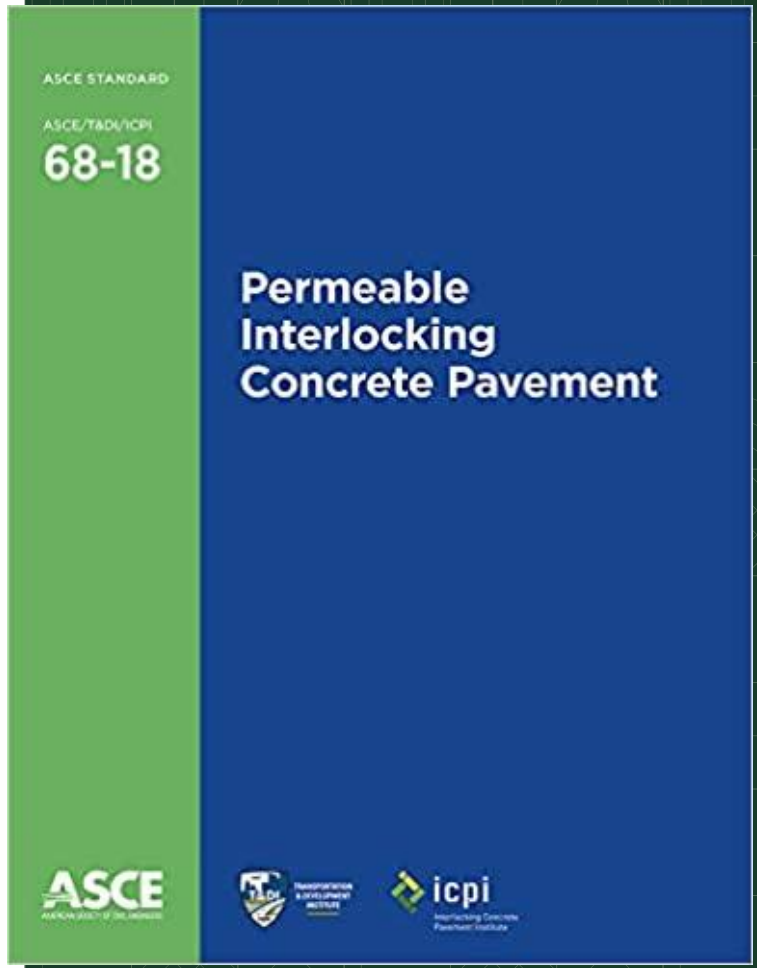
“VA DEQ Stormwater Design Specification No. 7, Permeable Pavement version 1.8.” n.p., Mar. 2011.

Wikipedia contributors, "Cation-exchange capacity," *Wikipedia, The Free Encyclopedia,* https://en.wikipedia.org/w/index.php?title=Cation-exchange_capacity&oldid=975618821. Accessed Mar. 2021.

REFERENCES


PERMEABLE INTERLOCKING
CONCRETE PAVEMENTS
Design • Specifications • Construction • Maintenance
David R. Smith
Fifth Edition
icpi
Interlocking Concrete
Pavement Institute


Permeable
Pavements
Permeable Pavements Task Committee
EDITED BY
Bethany Eisenberg, LEED AP
Kelly Collins Lindow, PE
David R. Smith
ASCE
EWRI


ASCE STANDARD
ASCE/T&DI/ICPI
68-18
Permeable
Interlocking
Concrete Pavement
ASCE
icpi

AIA & LA CES PROFESSIONAL DEVELOPMENT HOURS

AIA Continuing Education Provider

Landscape Architecture Continuing Education System™

LA CES

EDUCATION PROVIDER

https://forms.office.com/pages/responsepage.aspx?id=zox0xe1JVEO89IGmNKnPwnvD7AAahElIviDJ-mFqNrtUNFEzWlU5MzJDMlRHQ1cyM1BMUVpMNEkyUy4u&origin=QRCode&route=shorturl

This Learning Seminar is available courtesy of:

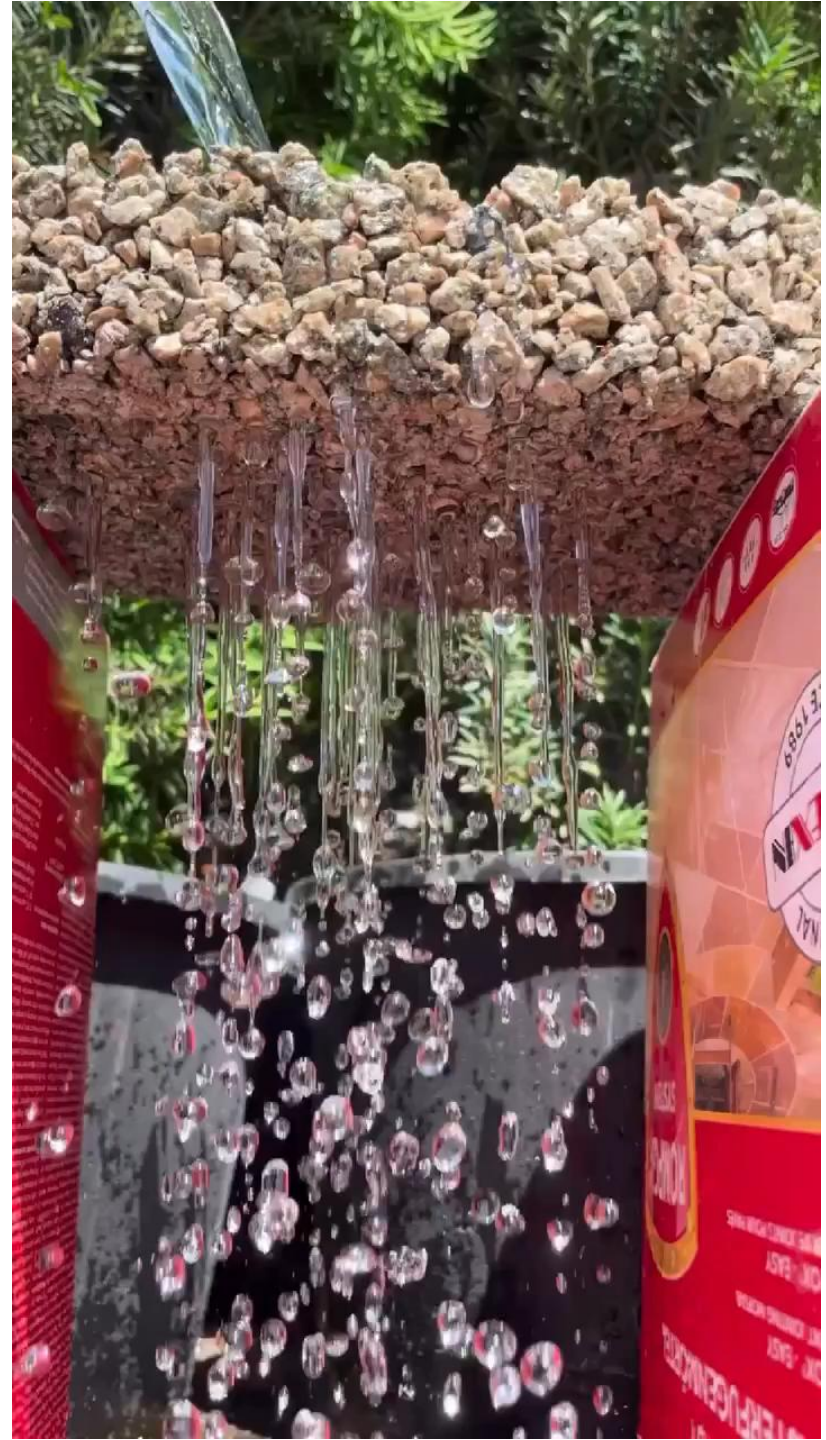
TECHO-BLOC

QUESTIONS?

ROMEX® HARDSCAPES

New Hardscape Installation Technology

- Trass Bedding System
  - Permeable
  - Increases Load Bearing Ability
    - Natural Stone
    - Slabs in Driveways
- Jointing Compounds (Resin Sand)



SUSTAINABILITY STARTS FROM THE GROUND UP

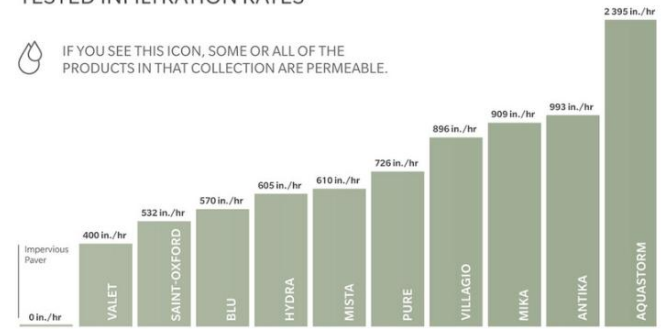
Rainwater filters through, keeping runoff and pollutants away

RECONNECT WITH YOUR OUTDOOR SPACES WHILE CARING FOR THE ENVIRONMENT.

- **Save money** by implementing a rainwater management system and you could get tax credits or subsidies.
- **Make every square foot count.** Permeable pavers boost your paved space and meet municipal green requirements.
- **Personalize your outdoor design** to match the aesthetic of your home
- **Natural water drainage** that can help you get the most out of rainwater like irrigation systems and preventing accumulated water.
- **Better water quality** by filtering out contaminants such as harmful polluants and heavy metals.
- **Temperature control** by absorbing the sun's re-emissions and reduce the overall temperature.

THE PERMEABLE COLLECTION: TESTED INFILTRATION RATES

IF YOU SEE THIS ICON, SOME OR ALL OF THE PRODUCTS IN THAT COLLECTION ARE PERMEABLE.



EXPLORE PERMEABLE PRODUCTS

HARDSCAPER SEMINAR 2026

REGISTRATION NOW OPEN

OPPORTUNITIES ARE EVERYWHERE

See Them. Seize Them.

Register for an Event

NEW! Now available in Spanish:

How to install Interlocking Concrete Pavement & How to build Segmental Retaining Walls

NUEVO! Ahora disponible en español:

Cómo instalar el Pavimento con Adoquines de Concreto & Cómo construir y Muros de Retención Segmentados

Click here - acceder aquí

Alphabetical | All Categories

3 Lessons

Budgeting, Estimating, and Job Costing

This course is comprised of 3 lessons containing 13 different topics- each topic contains a video...

14 Lessons

Interlocking Concrete Pavement (ICP)

This course is comprised of 14 lessons – each lesson containing a video presentation and a...

4 Lessons

Landscape Lighting

This course is comprised of 4 lessons – each lesson containing a video presentation and a lesson qui...

8 Lessons

Segmental Permeable Pavement (SPP)

This 8-module training course provides a complete, field-ready guide to designing, building,...

14 Lessons

Segmental Retaining Walls

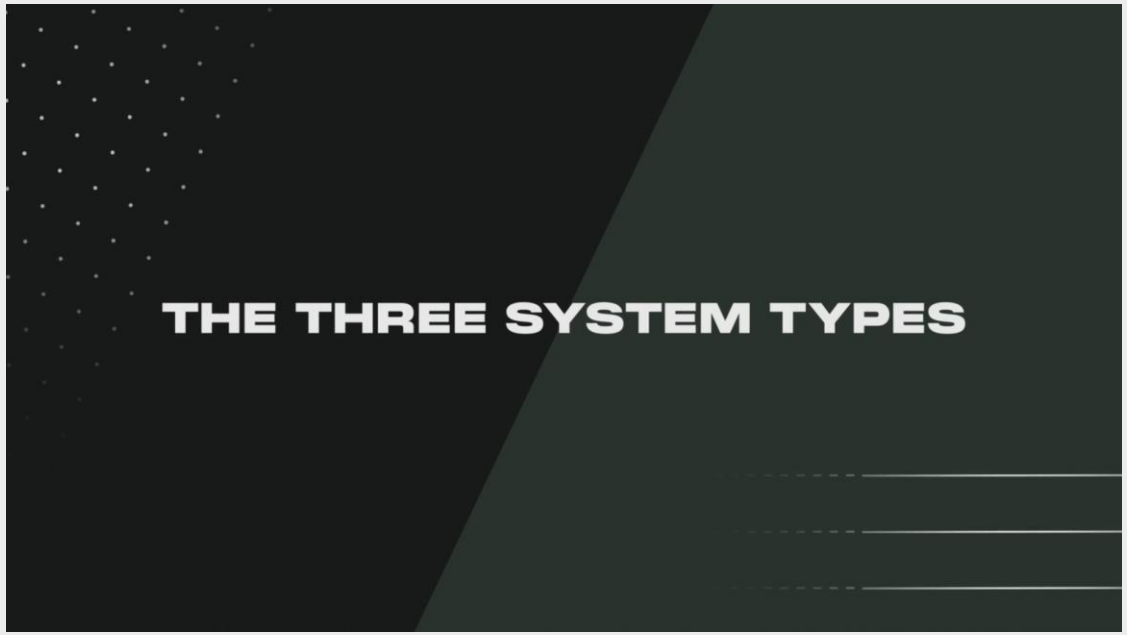
12 Lessons

The Hardscaper's Blueprint to Scaling With Online...

This course is comprised of 12 lessons – each lesson containing a video presentation. The...

NEW

SEGMENTAL PERMEABLE PAVEMENT COURSE



You're not looking
to blend in,
but rather stand out
from the crowd.

We take that philosophy
to the outdoors,
reshaping the idea
of what landscapes
can look like.

We live to create.

THANK YOU!

TECHO—BLOC

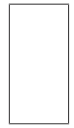
2025 NEW PRODUCTS

TERRAZZO COLLECTION

Slab - 600 × 150

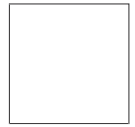
23 5/8 × 5 7/8 × 2 3/8 in
600 × 150 × 60 mm

Slab - 600 × 300



23 5/8 × 11 13/16 × 2 3/8 in
600 × 300 × 60 mm

Slab - 600 × 600



23 5/8 × 23 5/8 × 2 3/8 in
600 × 600 × 60 mm

Cap - Regular

Depth: 14 in
2 3/8 × 32 in
60 × 813 mm

Cap - Bullnose

Depth: 14 in
2 3/8 × 32 in
60 × 813 mm

Step

Height: 6 in 152 mm
15 × 48
381 × 1 219

Meteor Black

Opal Grey

Mineral White

Terrazzo

COLLECTION

AVAILABLE SPRING 2025

Slip-resistant

Made from recycled marble and granite.

Factory-applied protectant makes it de-icing salt & stain resistant.

Limited commercial warranty 1-year

For residential standard warranty applies.

Slabs can be installed as a traditional ground cover on granular base or as a concrete overlay.

LEED Compliant for groundcovers (white & grey)**.** Mineral white has the highest recorded SRI index (SRI of 70)

TERRAZZO COLLECTION

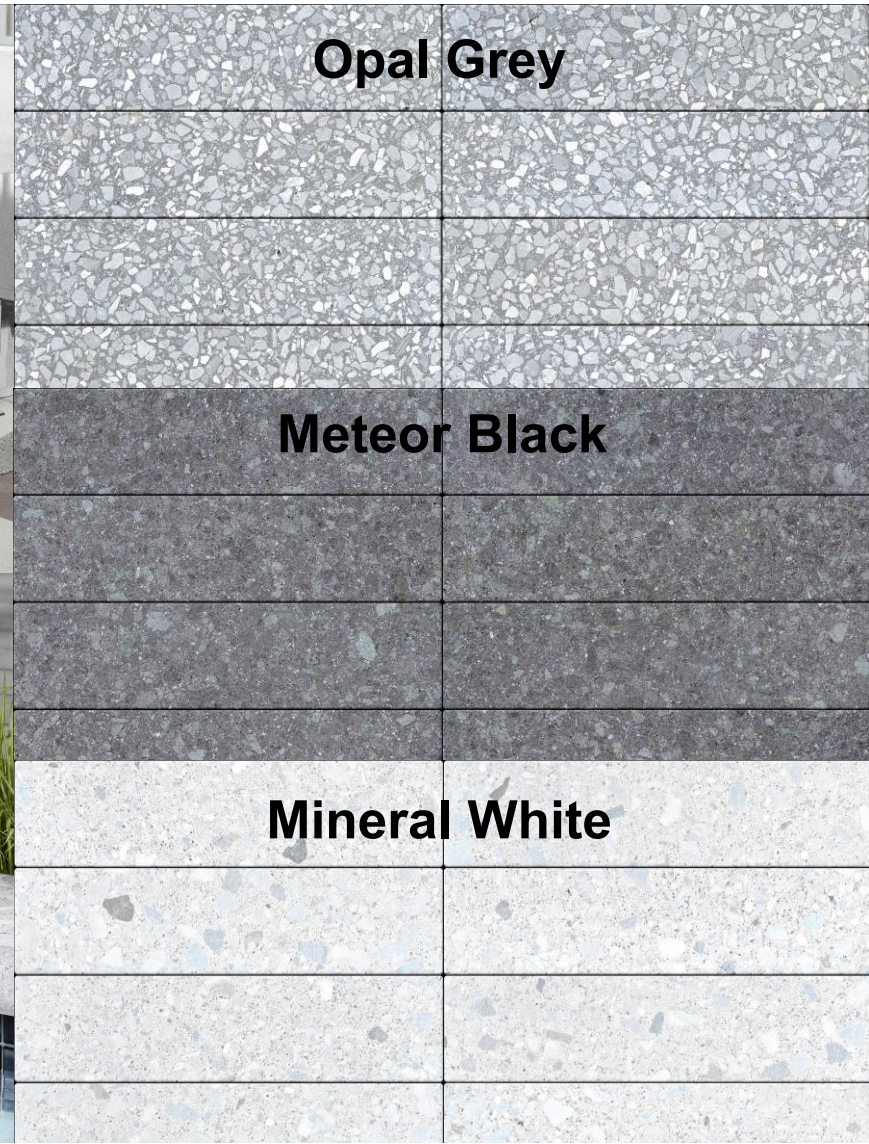
STEP INTO STYLE

Various Sizes

600x600x60 mm

600x300x60 mm

600x150x60 mm




Industria 600x900
SLAB

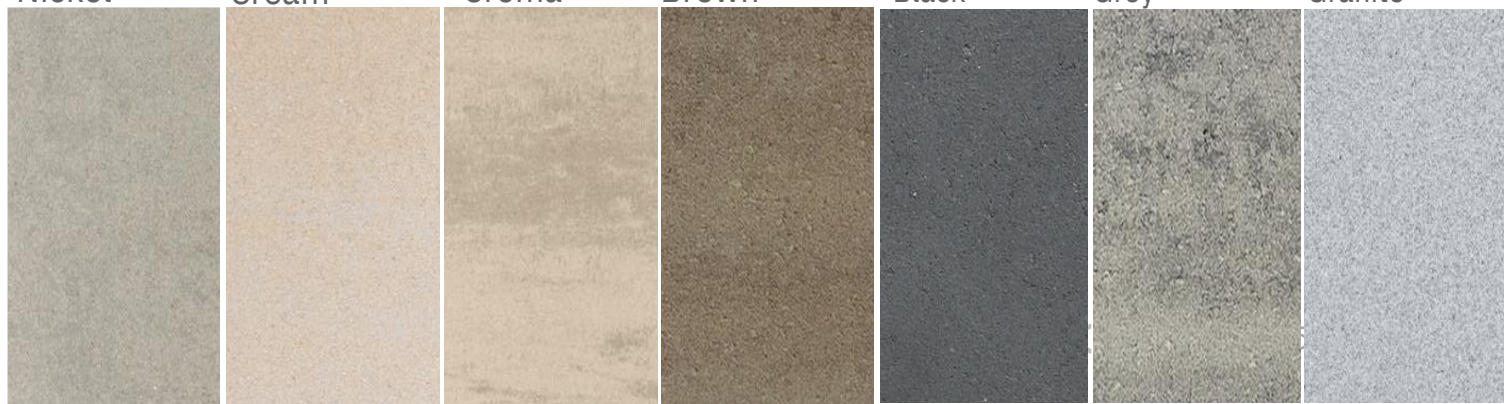
Industria

SLAB

AVAILABLE SUMMER 2025

600 Series

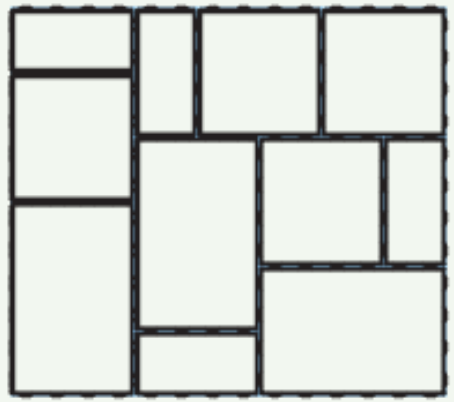
23 5/8 × 35 7/16 × 2 3/8 in
600 × 900 × 60 mm



MORE SQ FT PER PALLET ON BLU 60 HD² SMOOTH!

NEW PALLET OVERVIEW

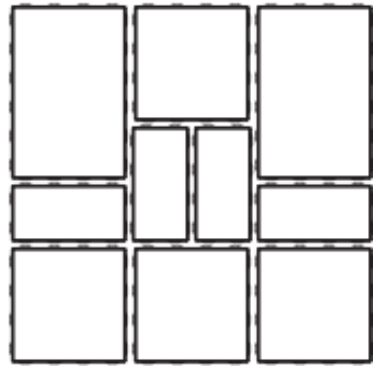
135.39 sq ft per pallet



INC = Available Now
COR = ETA May 2025
MID = TBD

OLD PALLET OVERVIEW

116.82 sq ft per pallet



BLU 60 HD² Smooth
SLAB

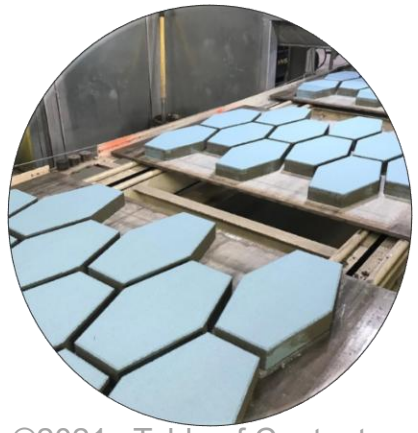
BLU 80 6X13 PERMEABLE

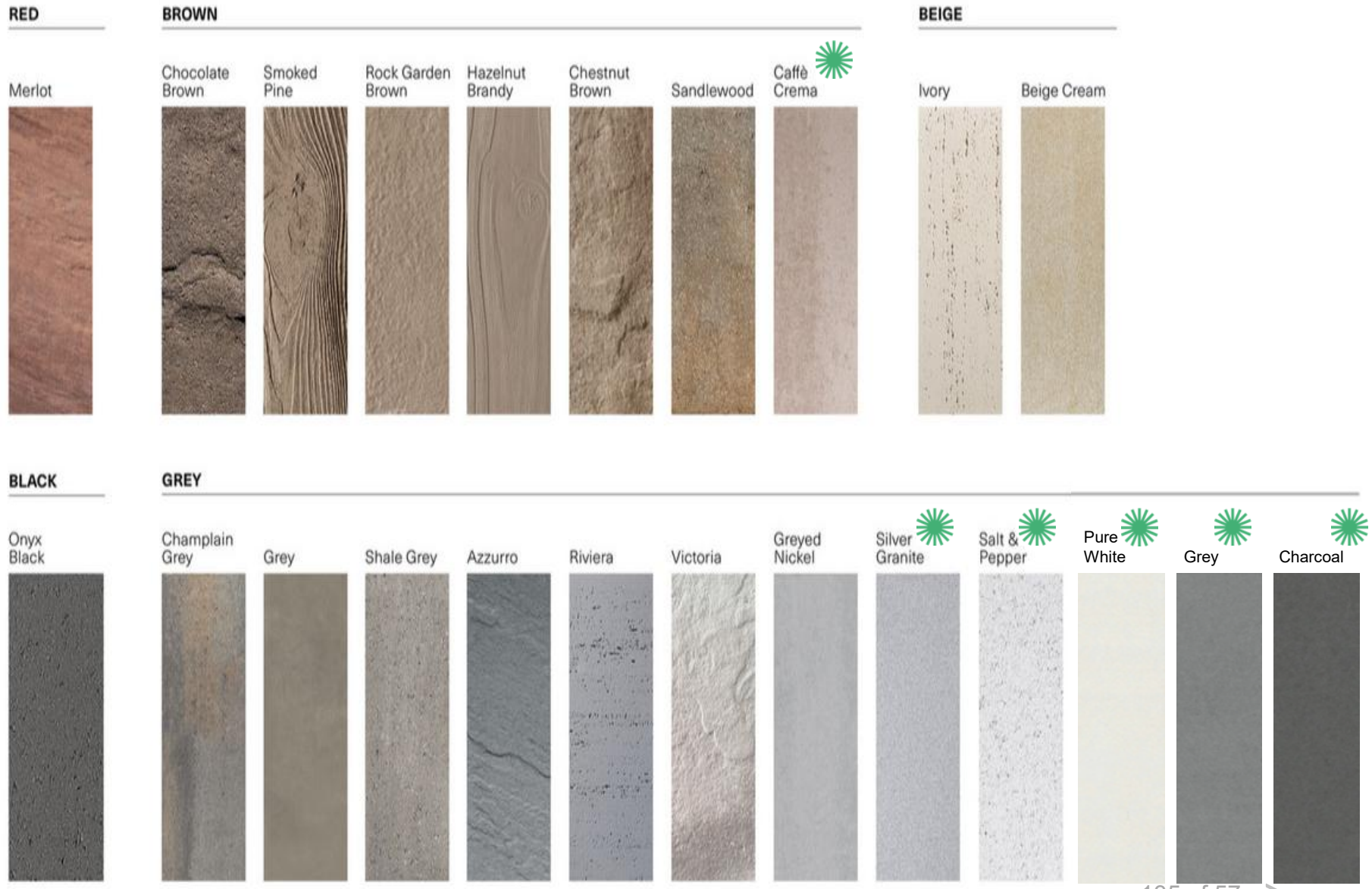
- Competitive pricing
- Machine install
- Variety of colors & textures
- In Stock
- 7mm joints
- ADA compliant
- Slip-resistant
- Rock salt resistant

NEW Colors for 2024!

- Caffe Crema
- Silver Granite
- Grey
- Charcoal
- Pure White
- Salt & Pepper

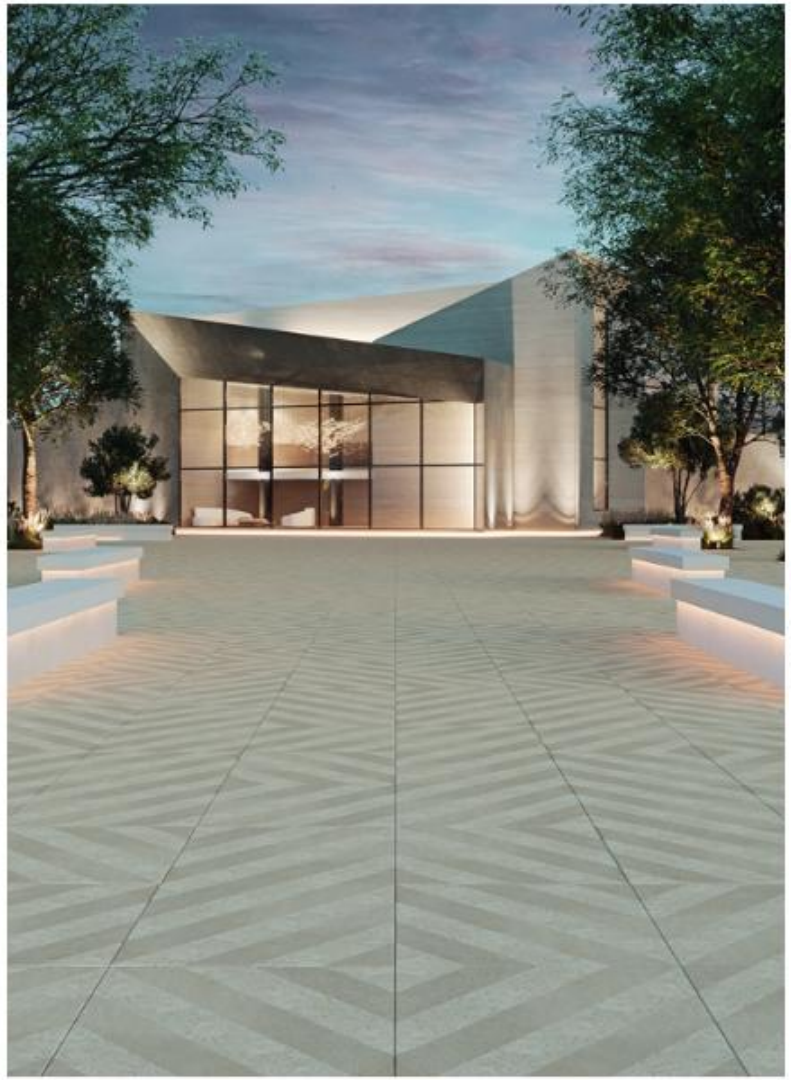
Custom Color Support Available!





Expansion of the warmer neutrals with Mika Paver in Ivory!

STUDI
SERVICE



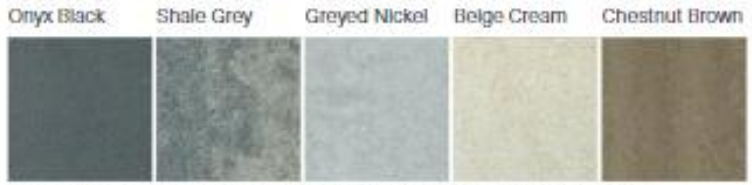
01.

Choose your size

- Paver: 600mm L × 600mm W × 100mm H
- Slab : 600mm L × 600mm W × 60mm H

02.

Choose your color

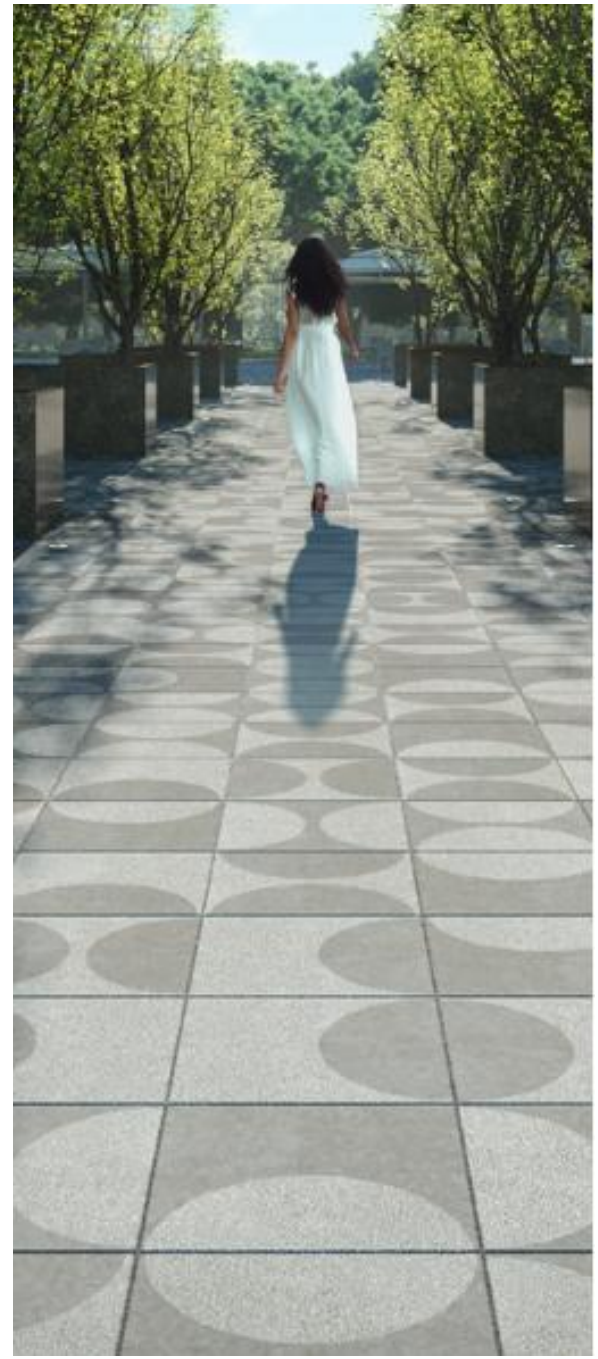


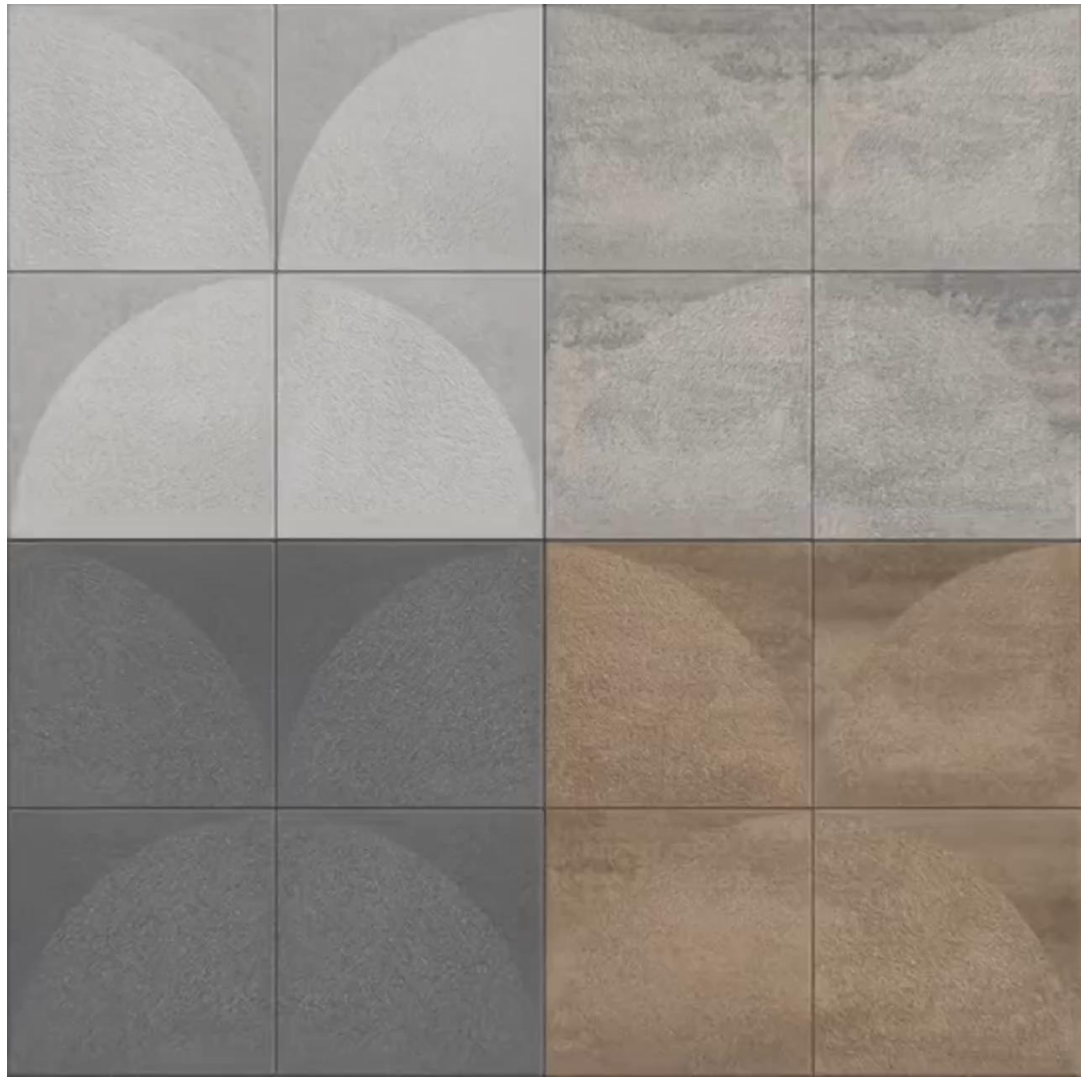
* Also available in Chocolate Brown, Champlain Grey, Sandlewood and Merlot

03.

Choose your pattern

TECHO—BLOC
COMMERCIAL





PERMEABLE PAVERS

PERMEABLE BY DESIGN
Aquastorm
Hydra
Pure

EXCELLENT PERMEABLE CAPABILITIES
Antika
Blu 80 mm
Mika
Mista Random
Travertina Raw
Valet
Villagio

1. PERMEABLE PAVER
Designed with larger joint space to allow storm water to percolate through.

2. SMALL AGGREGATE (2.5-10mm)
Filters out contaminants and debris from the rainwater.

3. MEDIUM AGGREGATE (5-28mm)
Transition layer that further filters out pollutants.

4. LARGE AGGREGATE (40-80mm)
Reservoir layer for rainwater harvesting and the evacuation of excess water through a drain pipe.

5. GEOTEXTILE
Filter fabric that separates large aggregate from the soil underneath.

- Industry leading infiltration rates

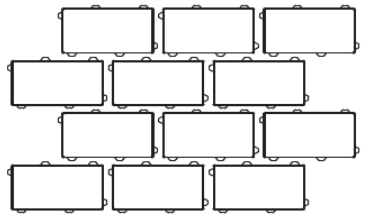
Hydra

Permeable

Height: 3 15/16 in 100 mm

7 7/8 x 11 13/16
200 × 300

PALLET OVERVIEW



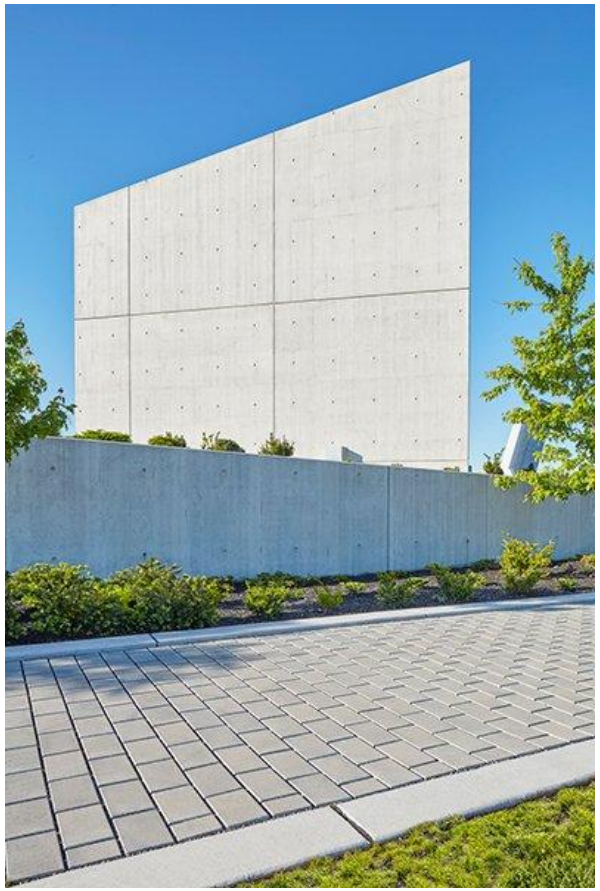
CHARACTERISTICS

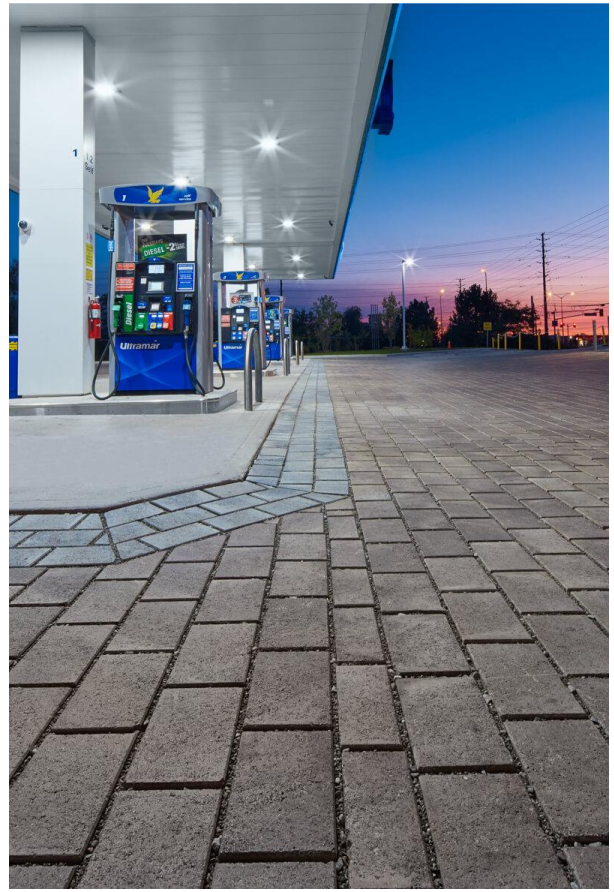
- Clamp or Mechanical tool available for machine installation. Check with your local Techo-Bloc representative for more information.
- 6000 to 8000 sq. ft can be installed per day with mechanical installation and a team of 5 persons
- LEED® Projects.
- Reduces stormwater runoff to municipal sewers.
- Eliminates the need for retention basins and optimizes the use of land.

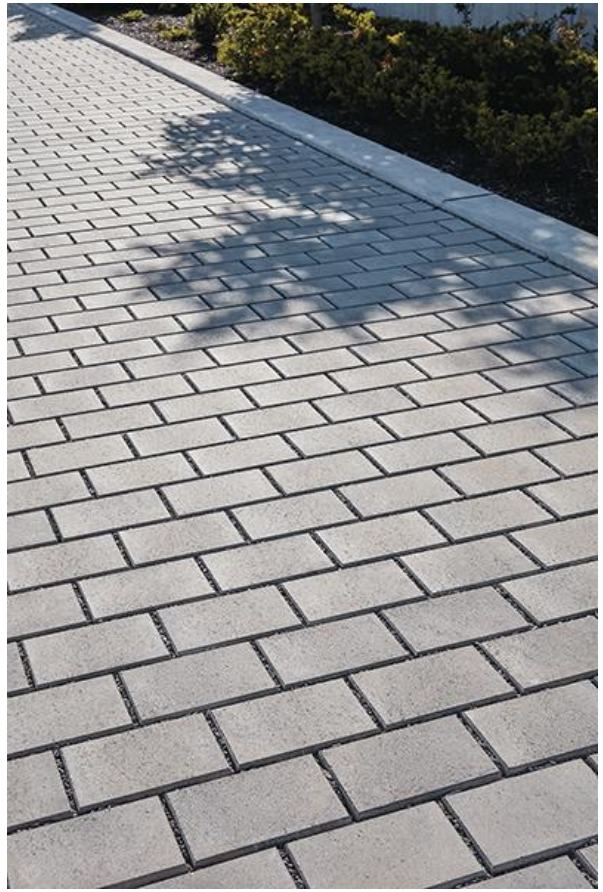
Chestnut Brown

Grey

Shale Grey







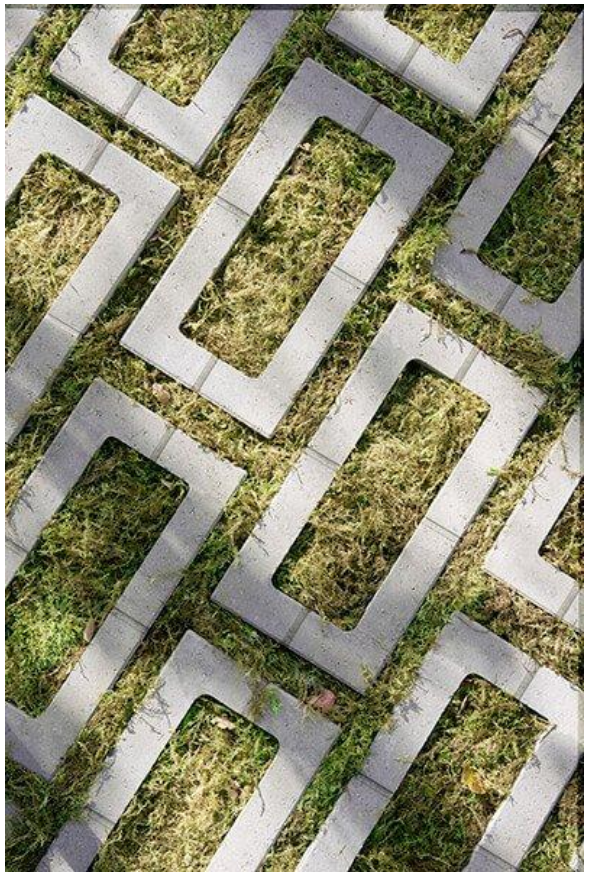
Aquastorm

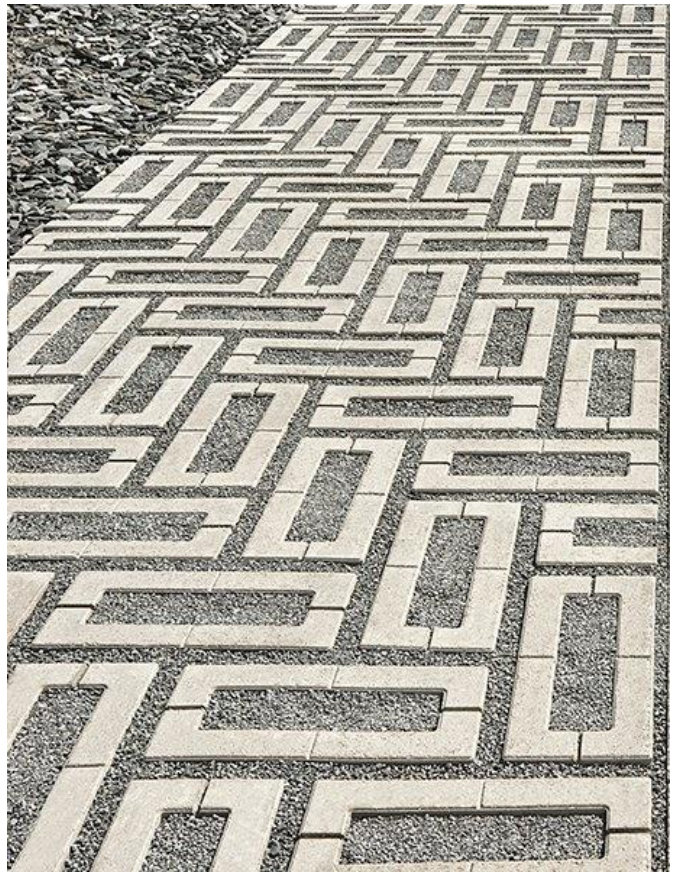
Height: 3 15/16 in 100 mm

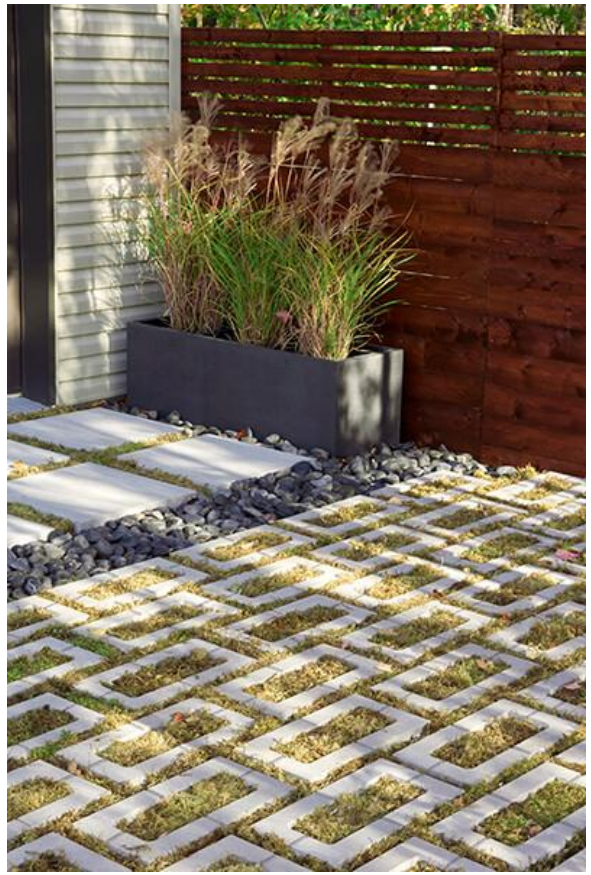
10 1/16 × 20 1/16
255 × 510

Grey
with stone

Grey
with grass



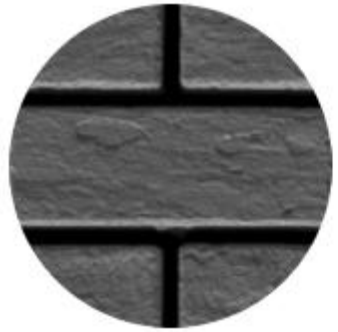




Mika

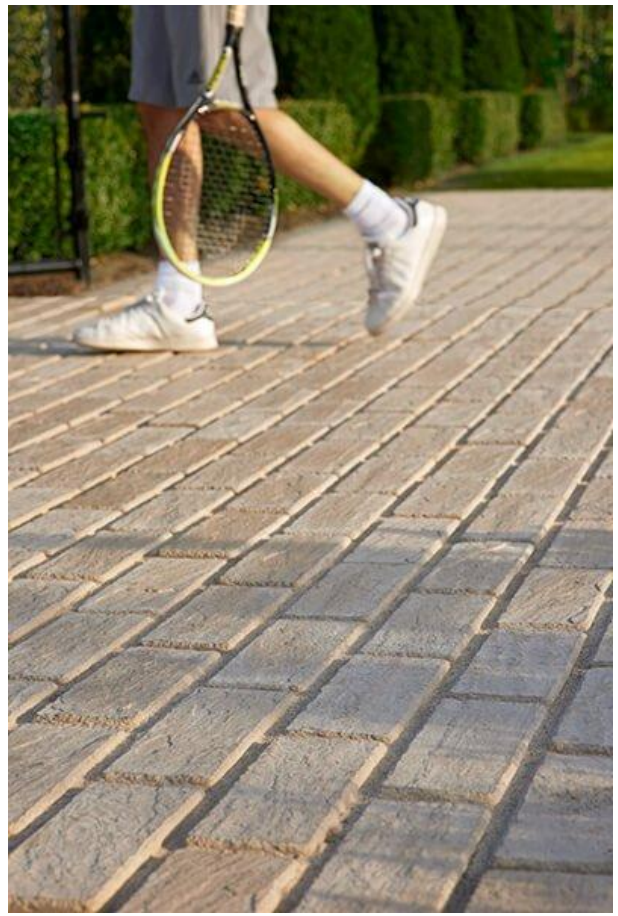
Height: 2 ¾ in 70 mm

4 7/16 × 11
112 × 279



ONYX BLACK

ROCK GARDEN BROWN



Antika

Height: 2 ⅜ in 60 mm

CHESTNUT BROWN

CHOCOLATE BROWN

ONYX BLACK

SANDLEWOOD

SHALE GREY

Villagio

Height: 2 3/8 in 60 mm

5 1/8 × 5 1/8	5 1/8 × 6 5/16	5 1/8 × 7 5/16	5 1/8 × 8 7/16
130 x 130	130 x 160	130 x 185	130 x 215


CHAMPLAIN GREY


CHESTNUT BROWN


CHOCOLATE BROWN


MERLOT


ONYX BLACK


SANDLEWOOD


SHALE GREY

You're not looking
to blend in,
but rather stand out
from the crowd.

We take that philosophy
to the outdoors,
reshaping the idea
of what landscapes
can look like.

We live to create.

THANK YOU!