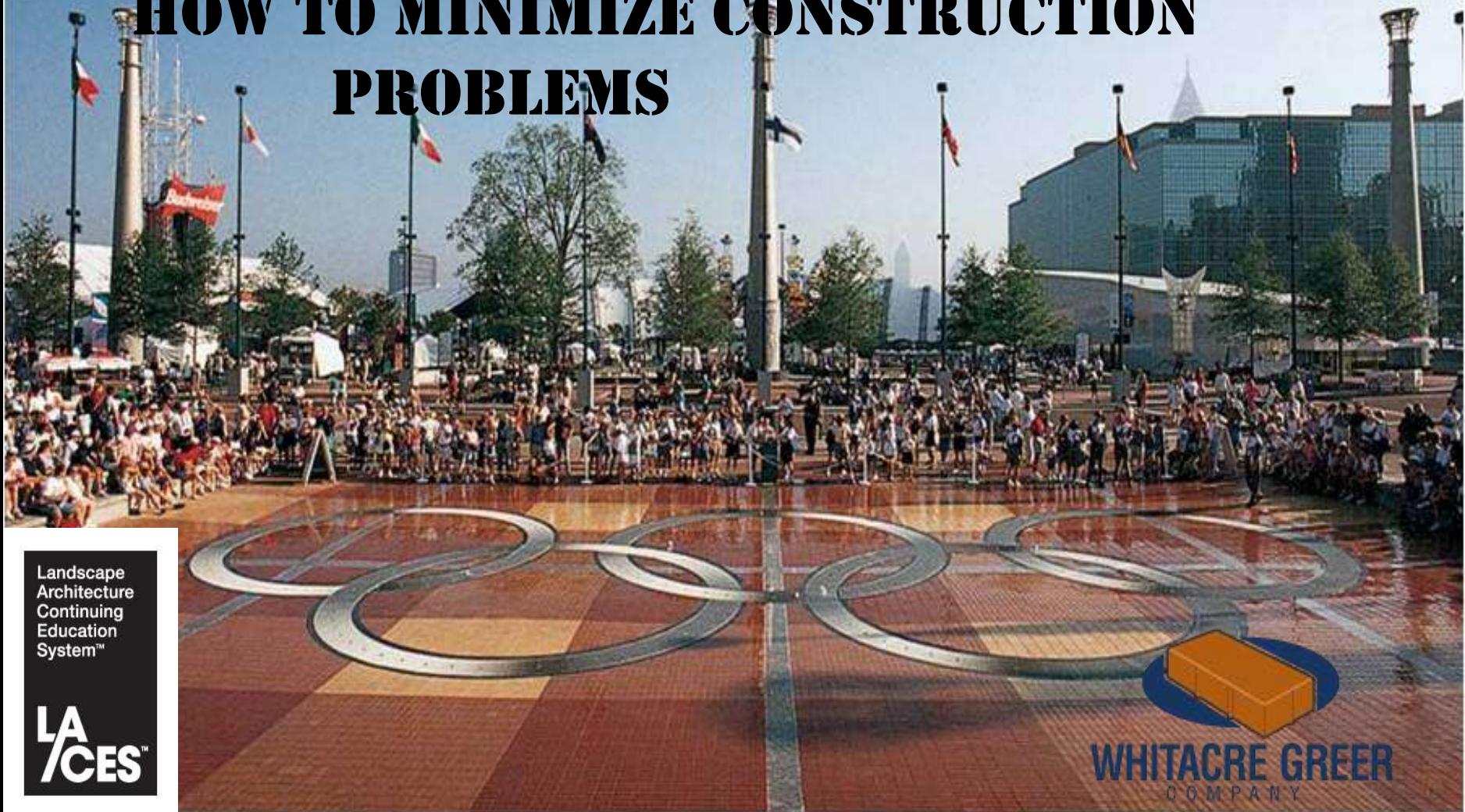


SUCCESSFUL BRICK PAVER PROJECTS.....

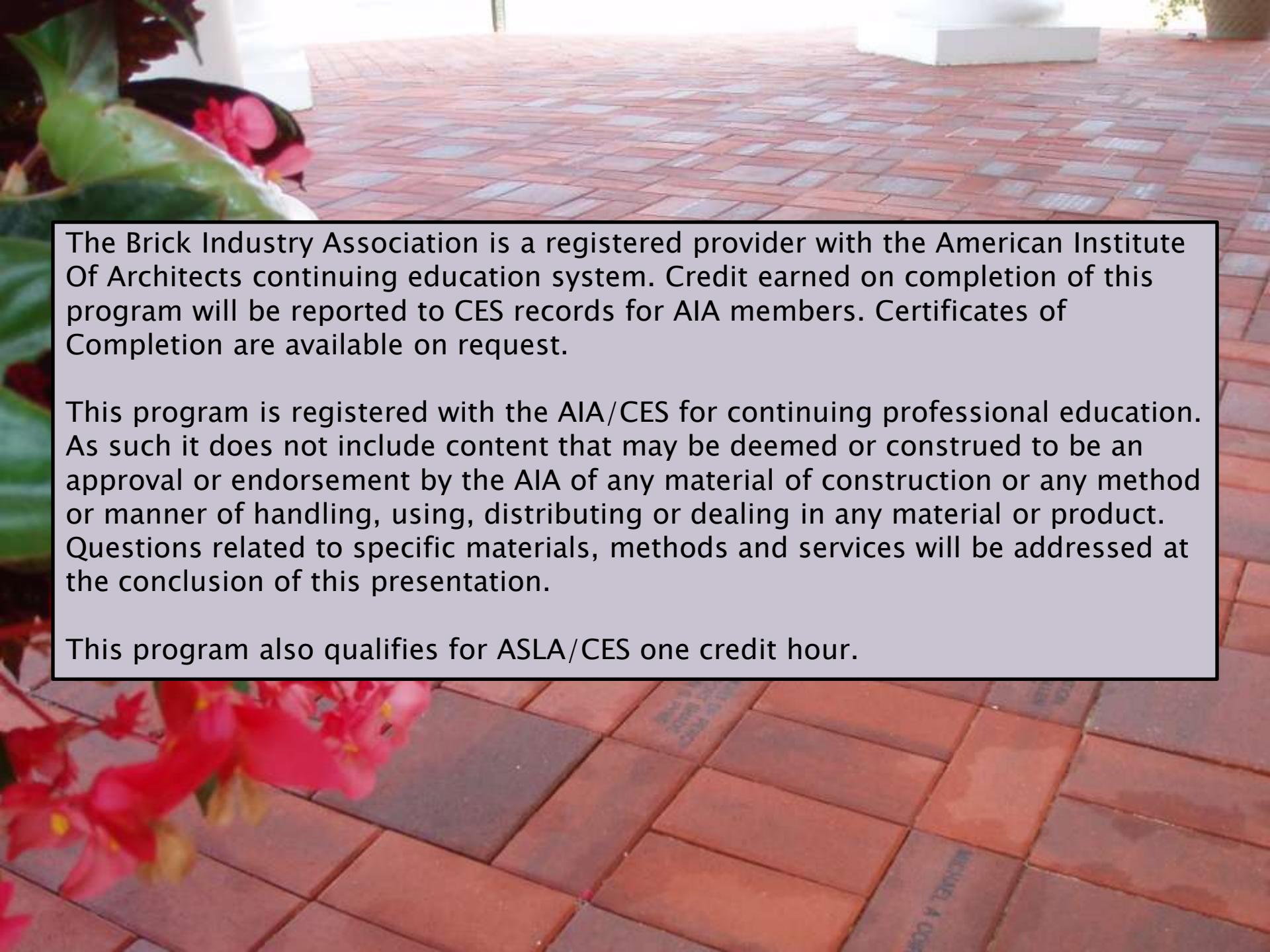
HOW TO MINIMIZE CONSTRUCTION PROBLEMS



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This program is registered with the 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. Questions related to specific materials, methods and services will be addressed at the conclusion of this presentation.

This program also qualifies for ASLA/CES one credit hour.



This program explores proper materials and techniques required for successful segmental brick paver projects. Common and reoccurring construction and design issues are discussed. Topics such as settlement, edge restraints, interlock, protection of completed work, efflorescence, color variation, contractor qualifications and attributes of brick pavers are included in the presentation

LEARNING OBJECTIVES

Success of pavement systems depend on proper drainage, a sound base and subbase, containment of the system, proper design and qualified installers.

- . Learn common areas where system failure occurs and why it occurs and how to minimize these problem areas
- . Become familiar with aggregates required for successful projects
- . Learn how to specify and identify qualified contractors
- . Learn the attributes of brick pavers

CONTENTS

- >PAVEMENT SETTLEMENT**
- >BASES....SUBBASES...COMPACTION**
- >EDGE RESTRAINTS**
- >PAVER JOINTS...INTERLOCK**
- >AGGREGATES**
- >PROTECTION OF WORK**
- >SAMPLE PANELS & MOCK-UPS**
- >EFFLORESCENCE**
- >COLOR VARIATION**
- >DESIGN CONCERNS**
- >CONTRACTOR QUALIFICATIONS**
- >ATTRIBUTES OF BRICK**
- >RESOURCES**

Program applies primarily to sand and bituminous set pavers. Permeable installations may have different techniques and materials.

PAVEMENT SETTLEMENT.....COMMON CAUSES

- >Aggregate base/subbase"the base/subbase is the backbone of this system. Any deficiency in the base and/or subbase will be reflected in the finished surface."
- >Improper Compaction and or materials
 - compact subgrade to 95% standard proctor density – soils with a CBR <3 will need to be replaced with additional subbase or have geotextiles installed
 - compact base/subbase to 98% density in lifts of 3–6", using a 10 ton roller for large areas and a 13,000 lbf compacter in smaller installations
- >Loss of bedding sand....improper edge restraints
 - ..loss through weep holes in concrete bases
 - ..loss through voids in curb joints



PAVEMENT SETTLEMENT





DENSITY TESTS NEED TO BE DONE ON ALL JOBS.

Pay special attention to areas where settlement usually occurs:

- corners of buildings and against curbs
- walls
- utility structures
- tree pits



Table 6. ASTM D 2940 Gradation for Unbound Aggregate Bases and Subbases

Sieve Size (square openings)	Design Range*		Job Mix Tolerances (Mass Percentages Passing)	
	Bases	Subbases	Bases	Subbases
2 in. (50 mm)	100	100	-2	-3
1½ in. (37.5 mm)	95 to 100	90 to 100	±5	+5
¾ in. (19 mm)	70 to 92		±8	
⅜ in. (9.5 mm)	50 to 70		±8	
No. 4 (4.75 mm)	35 to 55	30 to 60	±8	±10
No. 30 (0.600 mm)	12 to 25		±5	
No. 200 (0.075 mm)	0 to 8**	0 to 12**	±3	±5

*Select the Job Mix Formula with due regard to the availability of materials and service requirements of project. Test results outside the design range are not prohibited, provided they are within the job mix tolerances.

**Determine by wet sieving. Where local environmental conditions (temperature and availability of free moisture) indicate that in order to prevent damage by frost action it is necessary to have lower percentages passing the No. 200 (0.075 mm) sieve than permitted in Table 6, appropriate lower percentages shall be specified. When specified, the material having a diameter smaller than 0.020 mm shall not exceed 3% mass.

**AGGREGATES ARE FREQUENTLY ADJUSTED SLIGHTLY TO CONFORM
TO STATE DOT STANDARD MIXES**

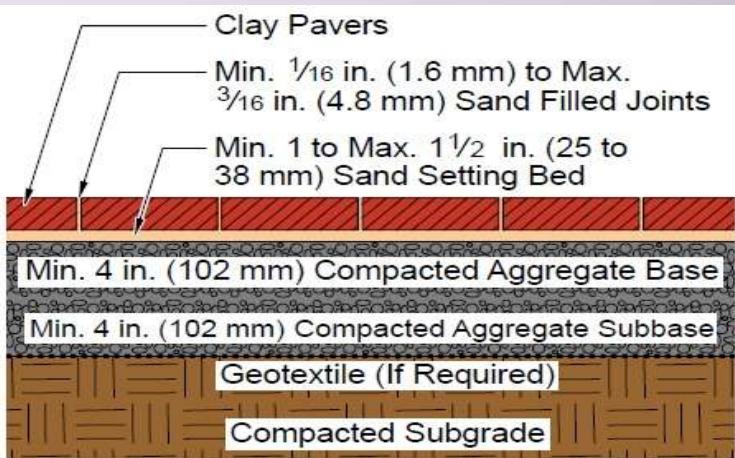


Figure 4
Typical Commercial/Pedestrian
Public Plaza/Sidewalk

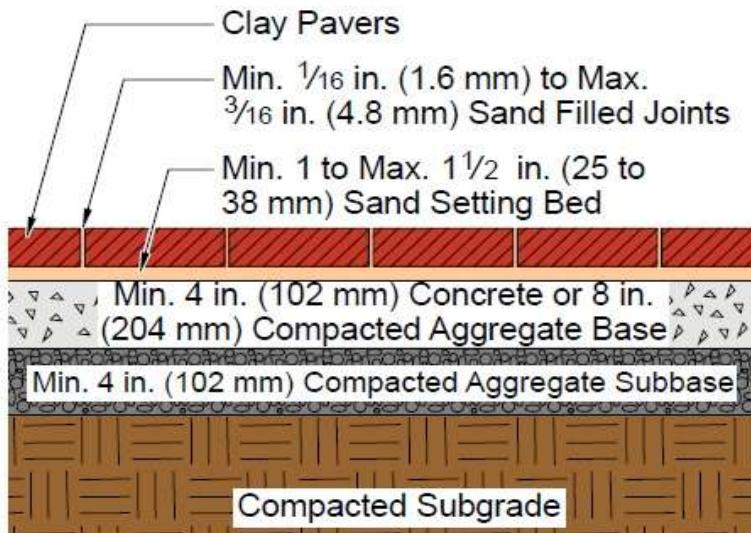


Figure 5
Typical Light Duty Vehicular

TYPICAL MINIMUM AGGREGATE BASE/SUBBASE THICKNESS

Residential sidewalks ... 4–6 inches

Residential driveways... 6–12 in.

Public walks/plazas....8–16 in.

Heavy vehicular ...Consult an
Engineer

****COLDER CLIMATES & WEAK SOILS
REQUIRE THICKER ASSEMBLIES**

CONCRETE BASES

Minimum 4 inches thick with weep holes at low points (1–2 inch diameter), filled with clean stone, covered with a geotextile square

WEEP HOLES IN CONCRETE BASE

>1-2" DIAMETER

>FILL WITH CLEAN STONE

**>COVER WITH GEOTEXTILE SQUARE- USE CONSTRUCTION
ADHESIVE**

**>FOR LARGE PLAZAS FLOOD/WET AREA - INSTALL
WEEP HOLES AT "BIRDBATH"/PONDING AREAS**



EDGE RESTRAINTS CONTAIN THE PAVERS AND BED MATERIAL. IMPROPER EDGE RESTRAINTS WILL ALLOW BED MATERIAL TO "MIGRATE" WHICH WILL RESULT IN HORIZONTAL PAVER MOVEMENT AND SETTLEMENT





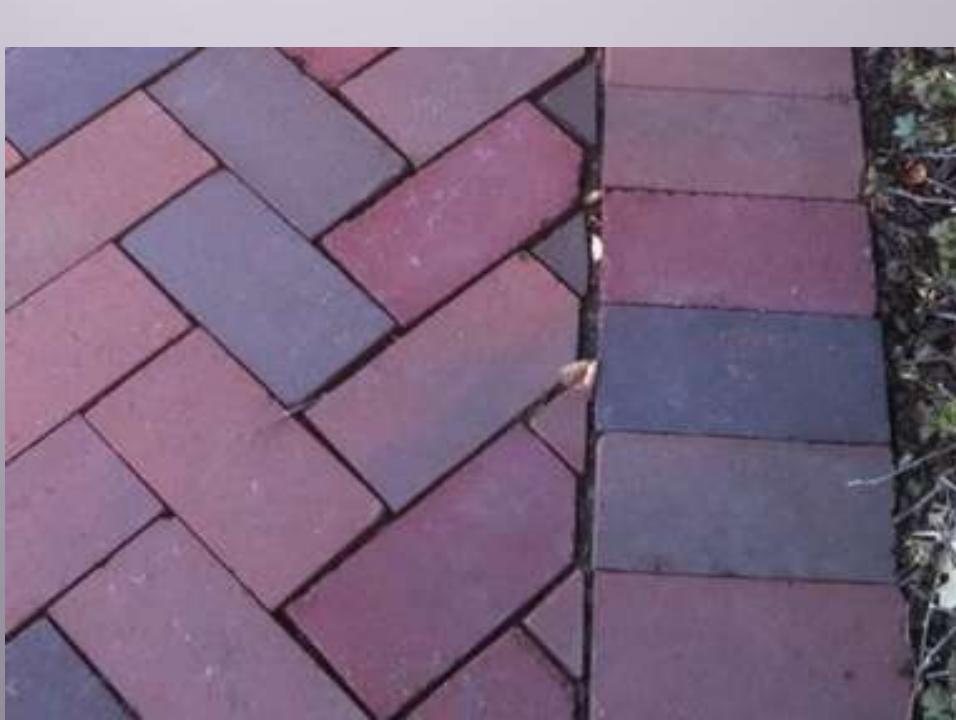
Photo by Pave Tech

EDGE SPIKED INTO BASE

**BASE EXTENDS BEYOND EDGING
8-12 INCHES**

**TOWELED MORTAR EDGE NOT
RECOMMENDED FOR COLD CLIMATES
ANGLE IRON WITH EXPANSION BOLT
INTO CONCRETE BASE IS TYPICAL**







Value engineering?



Permeable pavers can be very effective in reducing storm water run off and providing water to street trees in an urban environment.

PAVER JOINTS.....THERE MUST BE A 1/16 – 3/16 INCH SAND FILLED JOINT BETWEEN PAVER UNITS FOR SYSTEM INTERLOCK AND PREVENTION OF PAVER CHIPPING

The phrase “hand tight joints” should **NOT** be used and does **NOT** mean no joint



**NO SAND FILLED / TIGHT JOINTS CAN LEAD
TO CHIPPING. FOR VEHICULAR INSTALLATIONS
...NO CUT PIECE LESS THAN 1/3 FULL UNIT
...HERRING BONE PATTERN RECOMMENDED**

1/8" SPACER & BEVELED UNIT

NO SAND FILLED JOINT RESULT IS CHIPPED PAVERS

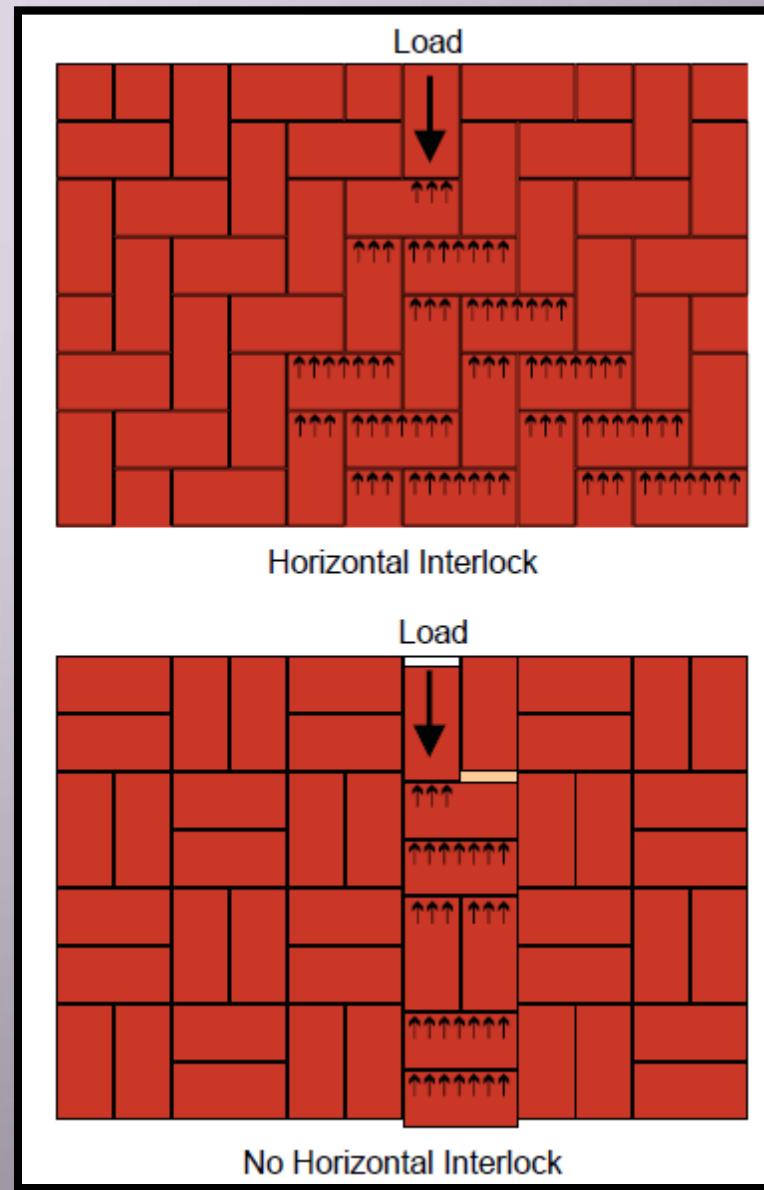


**LOSS OF JOINT SAND RESULTS IN
MOVEMENT AND CHIPPING
..TIRES CAN PULL JOINT SAND
OUT RESULTING IN MOVEMENT
AND CHIPPING. CONSIDER
POLYMERIC SAND FOR JOINTS.
EFFECTIVE IF DONE CORRECTLY.**



JOINT LOSS- MOVEMENT- GRANITE COBBLE

INTERLOCK IS THE INABILITY OF A PAVER TO MOVE INDEPENDENTLY



TYPES OF INTERLOCK...

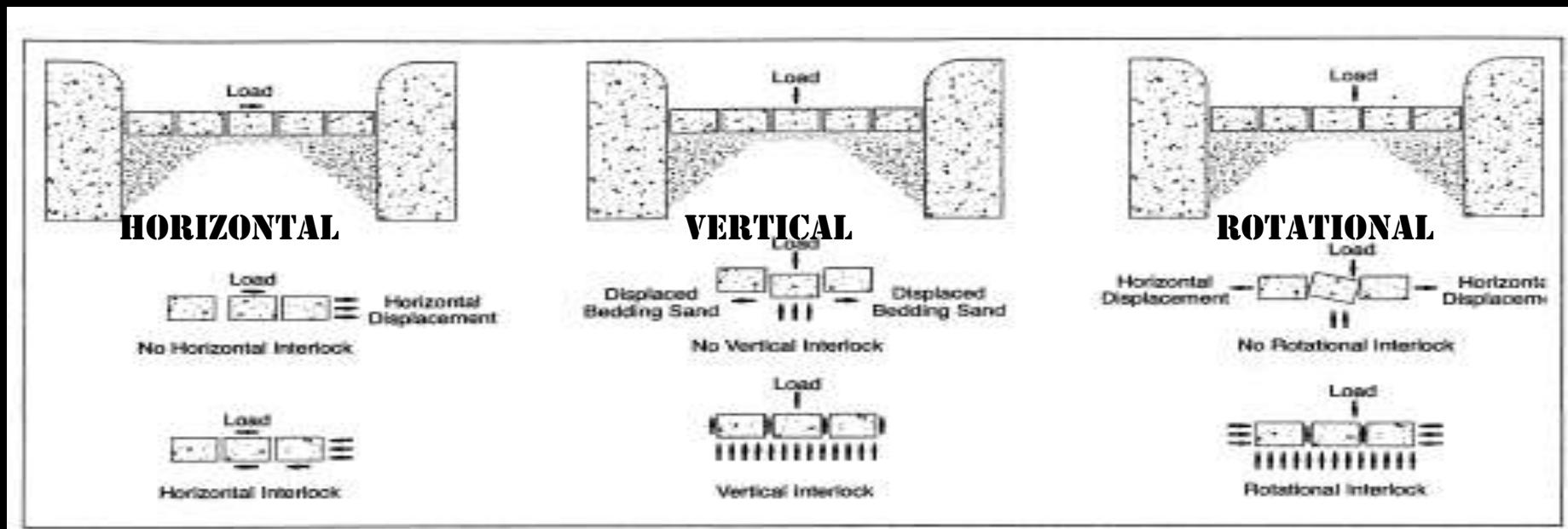
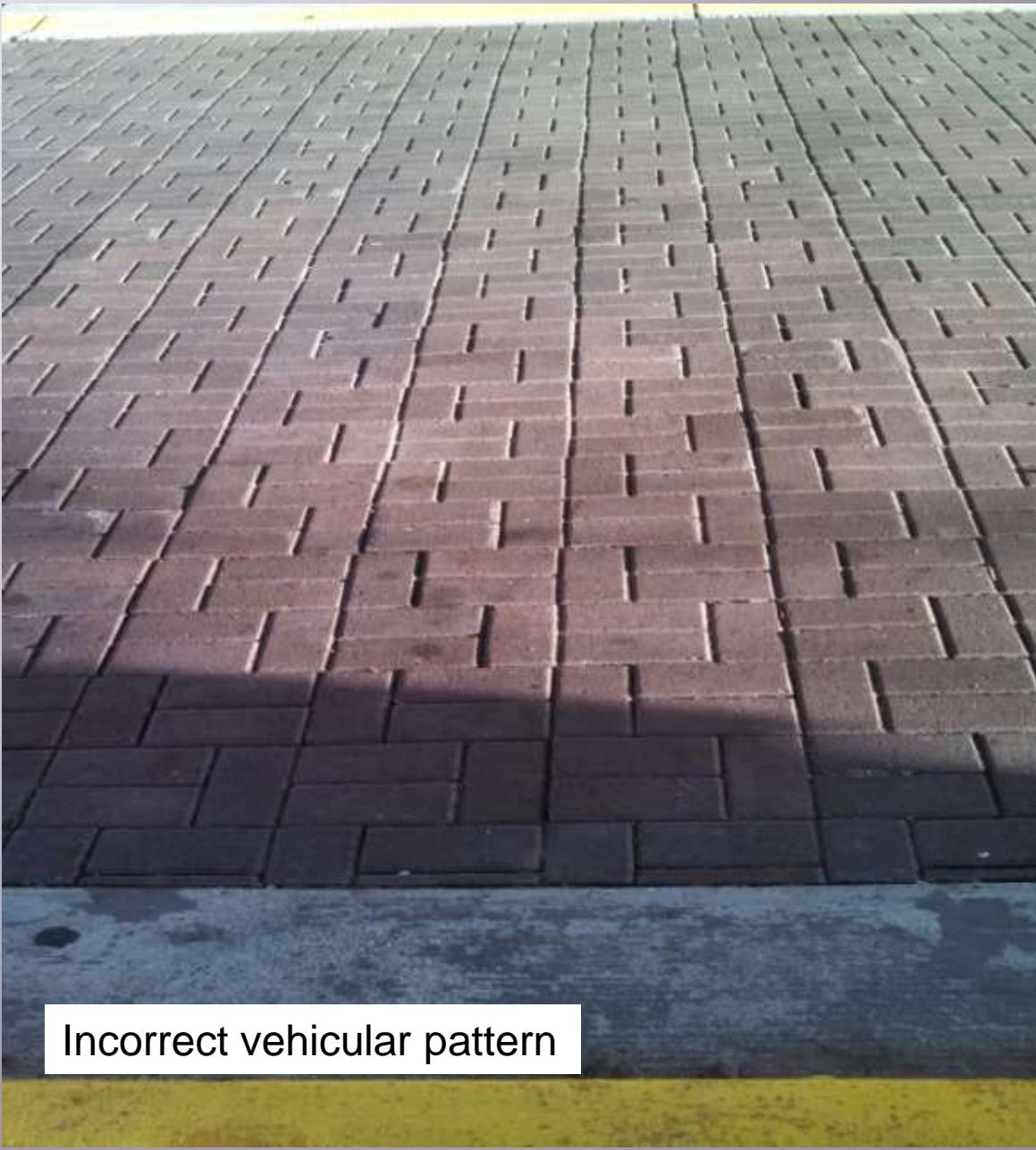


Figure 2. Types of interlock: horizontal, vertical, rotational

PRIMARY CAUSES OF PAVER MOVEMENT

- BASE/SUBBASE SETTLEMENT
- BEDDING SAND LOSS / MIGRATION
- JOINT SAND LOSS





INCORRECT PATTERN



CORRECT PATTERNS

PROTECTION OF COMPLETED WORK



VERY POOR EDGE..CONCRETE HEADER CURB



DAMAGE FROM MILLING MACHINE



**STEEL PLATES TO PROTECT
COMPLETED WORK**





Protection from construction traffic





Oil Stains



Always do small test areas when using any cleaning or sealing material.

BEDDING MATERIAL ASTM C 33 ..DO NOT USE STONE DUST!!!

NOR MASON'S SAND (ASTM C 144)

TABLE 13: Gradation for Bedding Sand (ASTM C 33)

Sieve Size	Percent Passing, by Weight
9.5 mm (3/8-in.)	100
4.75 mm (No. 4)	95 to 100
2.36 mm (No. 8)	80 to 100
1.18 mm (No. 16)	50 to 85
600 µm (No. 30)	25 to 60
300 µm (No. 50)	5 to 30
150 µm (No. 100)	0 to 10
75 µm (No. 200)	Less than 3

TABLE 14: Gradation for Bedding Sand in Channelized Traffic

Sieve Size	Percent Passing, by Weight
3/8 in. (9.5 mm)	100
No. 4 (4.75 mm)	95 to 100
No. 8 (2.36 mm)	75 to 100
No. 16 (1.18 mm)	55 to 90
No. 30 (600 µm)	35 to 70
No. 50 (300 µm)	0 to 35
No. 100 (150 µm)	0 to 5
No. 200 (75 µm)	0 to 0.3

TABLE 15: Gradation for Bituminous Setting Bed Aggregate

Sieve Size	Percent Passing, by Weight
No. 4 (4.5 mm)	100
No. 8 (2.36 mm)	75 to 100
No. 16 (1.18 mm)	50 to 74
No. 30 (600 µm)	28 to 52
No. 50 (300 µm)	8 to 30
No. 100 (150 µm)	0 to 12
No. 200 (75 µm)	0 to 5

**BITUMINOUS BEDDING MATERIAL
7% LIQUID ASPHALT
93% FINE AGGREGATE ALL PASSING
THE #4 SIEVE**

**MIXED AT ASPHALT “BATCH” PLANT
USUALLY 1-5 TONS DELIVERED TO
SITE AT > 300 DEGREES**

**SCREED BEDDING SAND
1 " THICK
PRE-COMPACTION OF ASSEMBLY

DO NOT COMPACT SAND BED**



**SCREED BITUMINOUS HOT MIXTURE
3/4 - 1" MAX. PRE-ROLLING
BED IS COMPACTED/ROLLED BEFORE
PAVERS SET

TACK COAT ON CONCRETE BASE
NEO-ASPHALT "ADHESIVE" APPLIED
TO BED BEFORE PAVERS SET**





PROTECT PAVER SURFACE

SMALLER COMPACTOR 4-5000 LBF

VS.



13,000 LBF FOR BASE



**NEOASPHALT “ADHESIVE” APPLIED
WITH SQUEEGEE OR TROWEL...
THINNER IS BETTER**





Figure 8. After the bitumen-sand mix cools, a 2% neoprene-asphalt adhesive is applied. The material can be trowel-applied as shown here. Some materials are more viscous and can be spread with a squeegee.



Figure 9. Perpendicular chalk lines are snapped and the pavers placed on the adhesive after the neoprene-asphalt adhesive dries (cloudy black surface).



Figure 10. Cut pavers are added along the edges.

Chalk lines on neo-asphalt adhesive after it dries
(cloudy black in color)

ICPI Tech Spec 20

BITUMINOUS SET PAVERS CAN AND SHOULD BE ROLLED OR COMPACTED TO ACHIEVE FULL BOND WITH THE SETTING BED, REDUCE LIPPAGE AND IMPROVE OVERALL FLATNESS OF THE SURFACE. (BIA TN14B PG.11, BIA HEAVY VEHICULAR GUIDE PG.36)

PROTECT PAVERS, USE RUBBER ROLLER, 4-500LBF PLATE TAMPER WITH PROTECTIVE MAT. PLYWOOD CAN ALSO BE USED AND IS PREFERRED TO SAND WHICH MAY DAMAGE PAVER SURFACE.



Photo by Pave Tech



Roller attachment for plate tamper. Protects pavers from metal to brick contact.

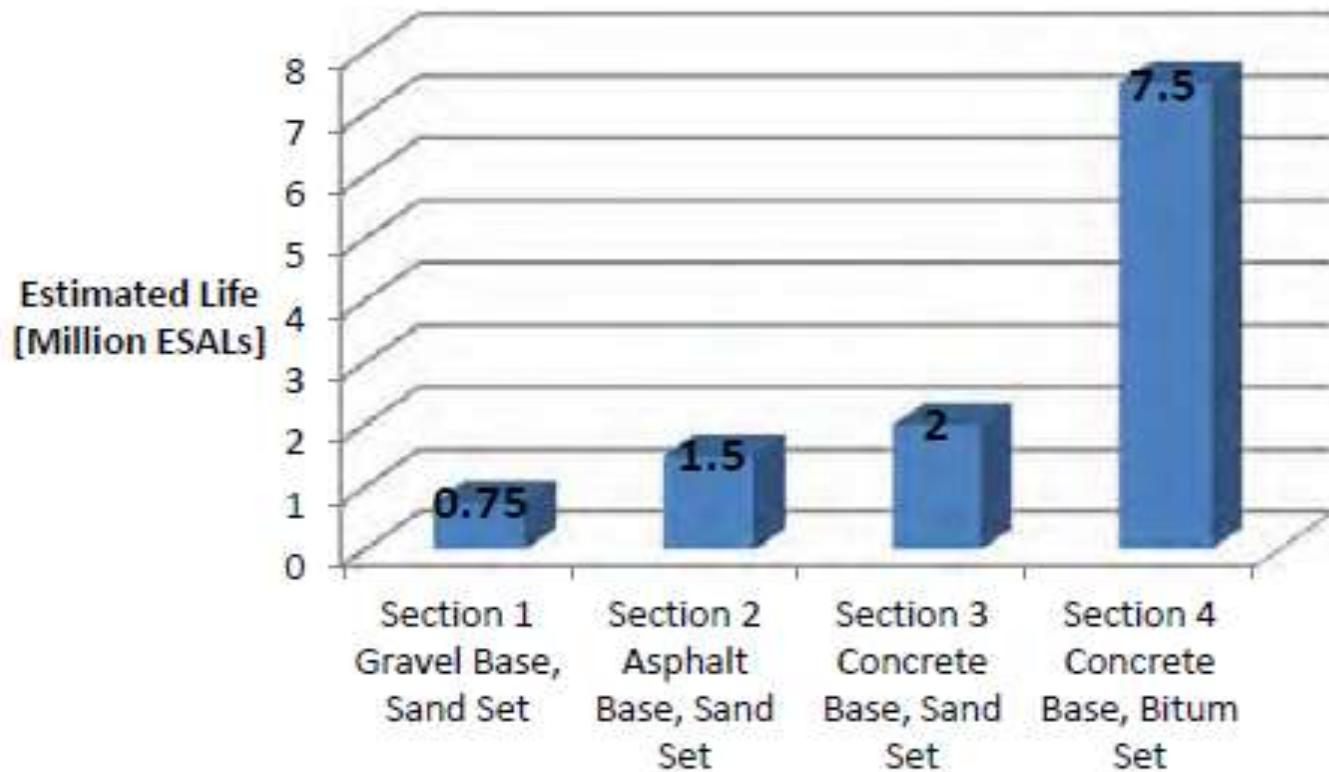


Figure 12. Once the pavers are in place, the joints are filled with dry joint sand and the surface is compacted.

Compaction of bituminous set concrete
Pavers ICPI TS 20

Expected life span for each section (include bar graph)

Design life is expressed as the total number of 18,000 lb (80 kN) equivalent single axle loads (ESALs) the pavement can withstand before major rehabilitation is required. ESALs standardize or equalize the spectrum of lighter axle loads from cars to that from heavier truck and bus loads into a composite single axle load. ESALs inflict damage to pavements typically measured as rutting in ICPs.



Trucks and buses damage pavement much more than cars. * one truck or bus applies the same load and damage as 15,000 cars*****

Loaded tractor trailer 3.35 ESALS.....a car .0002 ESALS (2 ten thousandths)

EFFLORESCENCE / “ROCK SALT STAIN”

BRICK PAVERS ARE NOT THE SOURCE OF EFFLORESCENCE

NBRC TESTS CONCLUDE CORRELATION BETWEEN SOLUBLE SALTS IN AGGREGATES AND EFFLORESCENCE DISPLAYED ON BRICK PAVERS

TYPICAL SOURCES ARE:

- >BASE AND BED MATERIAL**
 - >CONCRETE BASES, CURBS, CIP CONCRETE WALKS**
 - >MORTAR USED IN WALL CONSTRUCTION**
 - >BUILDING WALL CLEANING SOLUTIONS**
 - >FERTILIZERS**
 - >IRRIGATION WATER**
 - >DEICING MATERIAL ...ESPECIALLY ROCK SALT (CALCIUM CHLORIDE)**
- NOTE: MAGNESIUM CHLORIDE CAUSES LESS EFFLORESCENCE**

SOLUBLE SALTS + WATER (MOISTURE) = EFFLORESCENCE

USUALLY WILL DISAPPEAR OVER TIME WHEN SOURCE IS REMOVED

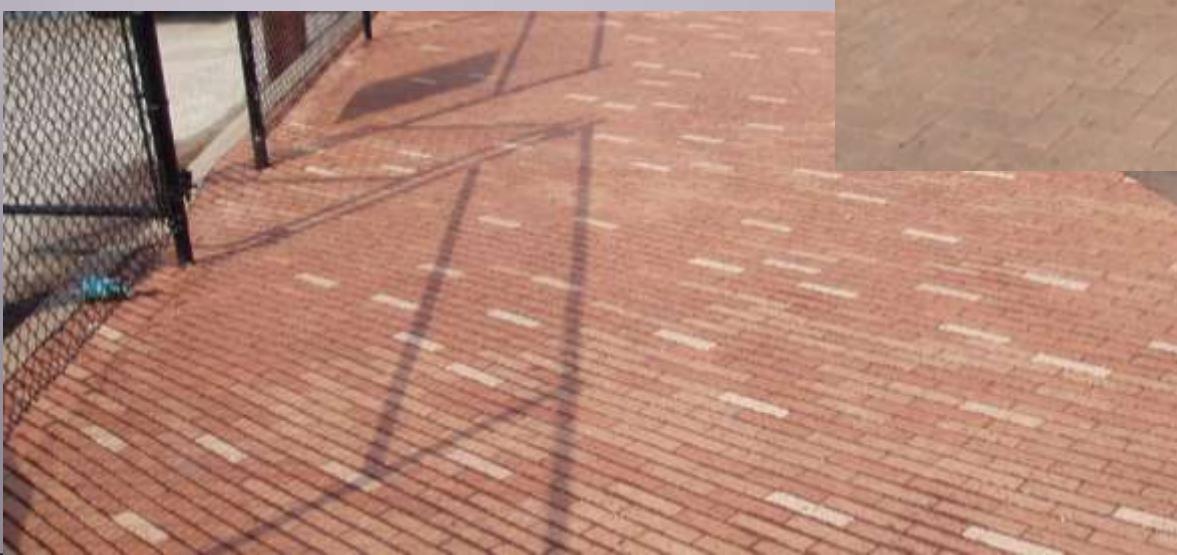


SALTS THAT CAUSE EFFLORESCENCE ARE NOT FOUND IN BRICK PAVERS IN HIGH ENOUGH CONCENTRATIONS TO CAUSE EFFLORESCENCE

THESE SALTS ARE FOUND IN CEMENT PRODUCTS



**COLOR VARIATION.... BLENDING OF PAVERS FROM AT LEAST 3 PALLETS IS RECOMMENDED
...COLOR WITHIN A GIVEN PRODUCTION RUN WILL VARY SLIGHTLY**



MOCK-UPS & SAMPLE PANELS ..

APPROVED MOCK-UPS WILL BE THE STANDARD BY WHICH APPEARANCE, WORKMANSHIP, SUBSTRATE AND MATERIAL APPLICATION WILL BE JUDGED.

SAMPLE PANELS WILL SHOW THE COLOR RANGE AND SIZE VARIATION OF THE PRODUCT



FIELD/SAMPLE PANEL



**APPROVED MOCK-UPS MAY BE PART OF COMPLETED WORK
THE STANDARD OF EXPECTED WORKMANSHIP**



LAYING PATTERN MODULES

**ADJUSTING FOR SIZE VARIATION
LAYING BASED ON LARGEST
SIZE PAVER...BRICK SPECIFICATIONS
INCLUDE PERMISSIBLE SIZE
VARIATION, DUE TO RAW MATERIALS
AND HEAT VARIATION IN KILN.
ADJUSTING FOR SIZE VARIATION IS
AN INSTALLATION ISSUE**



ALLOWABLE SIZE VARIATION..ASTM C902 & C1272

TABLE 4 Tolerances on Dimensions

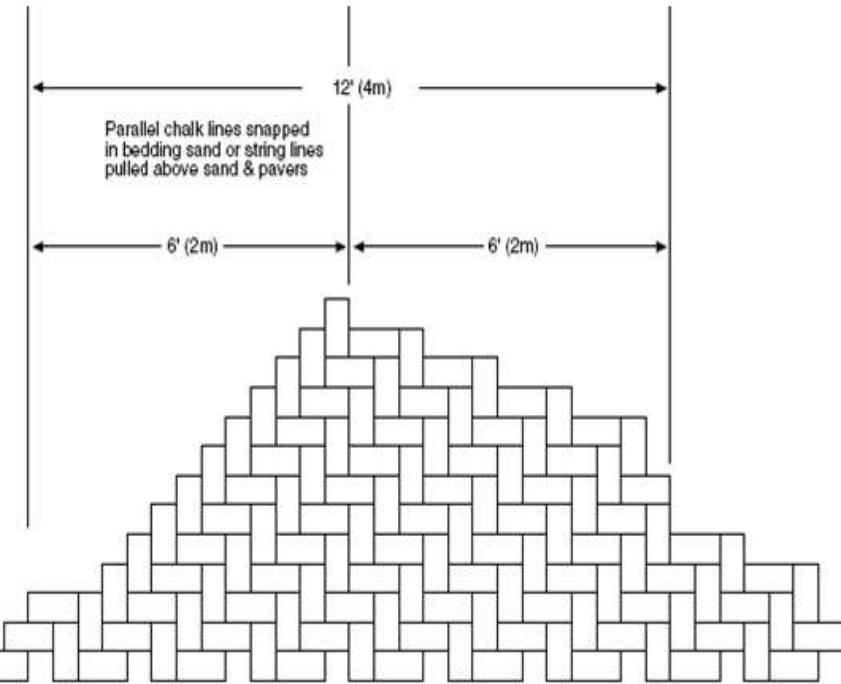
Dimension, in. (mm)	Maximum Permissible Variation from Specified Dimension, plus or minus in. (mm)		
	Application PS	Application PX	Application PA
3 (76) and under	1/16 (3.2)	1/16 (1.6)	no limit
Over 3 to 5 (76 to 127) incl	3/16 (4.7)	3/16 (2.4)	no limit
Over 5 to 8 (127 to 203) incl	1/4 (6.4)	1/8 (3.2)	no limit
Over 8 (203)	5/16 (7.9)	7/32 (5.6)	no limit

C902...MATERIAL SPECIFICATION FOR PEDESTRIAN AND LIGHT VEHICULAR

C1272. MATERIAL SPECIFICATION FOR HEAVY VEHICULAR PAVING BRICK



Figure 45:
Marking parallel
lines and creating
a pyramid-shaped
laying face.



**REQUIRE STRING
AND CHALK LINES
TO KEEP BOND
LINES STRAIGHT**
>WORK FROM CENTER OUT
>LINES EVERY 2 TO 6 FEET
>GRID LINES BEST



CONSTRUCTION TOLERANCES.....hold the installer to high standards but there are acceptable/normal construction tolerances AND IF YOU HAVE A VERY GOOD, QUALITY INSTALLER LISTEN TO THEIR SUGGESTIONS BUT GET DOCUMENTATION

Paver and bedding layer

Attribute

Paver joint width

Paver surface flatness

Lippage at catch basins/drains

Lippage between individual pavers maximum $\frac{3}{16}$ in. (5 mm) for pedestrian access routes

Attribute

Paver aspect ratio (l:t)

(length divided by thickness)

Joint fill depth

Bond lines¹

Slope for drainage

Cut pavers²

Paver laying pattern³

Minimum paver thickness

Bedding layer thickness

Joint sand gradation

Bedding sand gradation

Tolerance*

$\frac{1}{16}$ in. (2 mm) to max. $\frac{3}{16}$ in. (5 mm)

$\pm \frac{3}{8}$ in. (10 mm) in 10 ft. (3 m) (non cum.)

$\frac{1}{8}$ in. to $\frac{3}{8}$ in. (3 to 10 mm) (non ADA)

ICPI recommendation

max. 4:1 for pedestrian & driveways

max. 3:1 for street/parking

max. $\frac{1}{2}$ in. (13 mm) measured from top of pavement

$\pm \frac{1}{2}$ in. (13 mm) max. over 50 ft. (16 m)

min. 2%

No less than $\frac{1}{3}$ for vehicular application

No less than $\frac{3}{8}$ in. (10 mm) for all other applications

Acceptable for application

$\frac{3}{8}$ in. (8 cm) for street/parking

$\frac{2}{3}$ in. (6 cm) for pedestrian & driveways

1 in. (25 mm) nominal

ASTM C144 or C33

CSA A23.1 FA1 or CSA A179

ASTM C33 or CSA A23.1 FA1

Base and subbase layer

Attribute

Top of base surface variation

Attribute

Base thickness variation⁴

Compaction

Over-excavation

(dense graded bases)

Geotextile

Minimum base thickness⁵

Sidewalks, patios, pedestrian

4 in. (100 mm)

Residential driveways

6 in. (150 mm)

Parking lot/residential street

8 in. (200 mm)

Edge restraint/curb edge

Attribute

No movement

Proper restraint

ICPI recommendation

firmly in place

acceptable for application

(see "Guide References" on reverse)

Notes:

¹Bond lines: Unless it is deemed that the pavement is not adequately restrained at the edges the bond line tolerance is considered cosmetic.

²Paving layer pattern: ICPI recommends herringbone laying pattern for all vehicular applications.

³Base thickness variation: An example of an acceptable variation is $7\frac{1}{2}$ in. to $8\frac{3}{4}$ in. (190 to 220 mm) for an 8 in. (200 mm) required total base thickness.

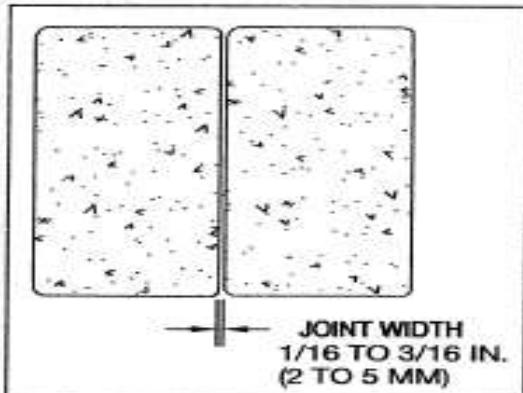
The excavated cut should have the same slope and contouring as the final surface profile.

⁴Minimum base thickness: These are for well drained soils. Increase thickness in colder climates or weak soils.

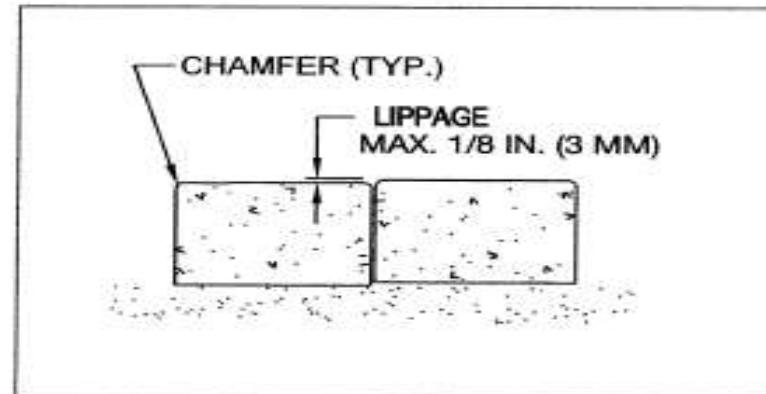
⁵The contractor should have the discretion on cuts no less than $\frac{1}{3}$ paver size. Sometimes it is not possible to adjust the cuts to less than $\frac{1}{3}$ paver size without adjusting laying pattern, and sometimes it is not possible to adjust laying pattern with certain shapes.

Tolerance Measurement Guidance

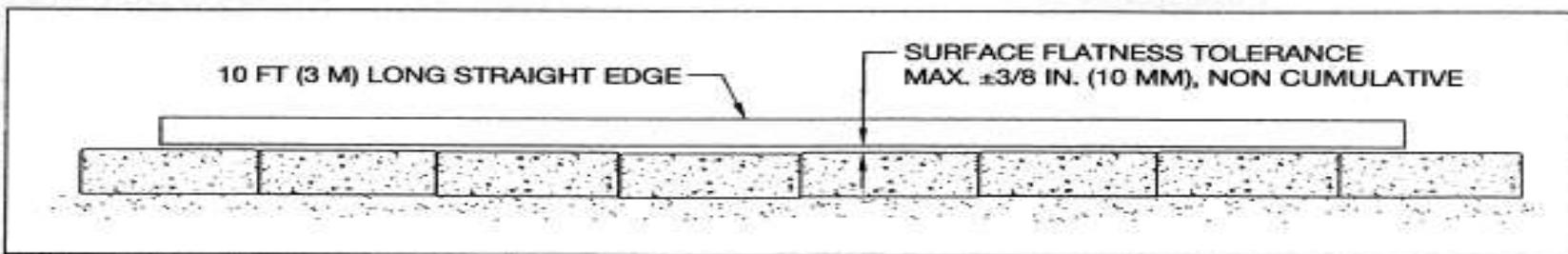
ICPI details



Joint widths are measured with a ruler from inside edge of paver to inside edge paver between adjacent pavers



Lippage is measured from the top of a paver to the top of the adjacent paver.



Paver surface flatness and top of base surface variation are measured with a straight edge for simple slopes and with a transit for complex contours

- >JOINTS 1/16 – 3/16" SAND FILLED
- >FLATNESS + - 3/8" PER 10 FEET
- >BLEND FROM AT LEAST 3 PALLETS UNLESS FACTORY BLENDED
- >STRAIGHT AND TRUE PAVER BOND LINES SHALL NOT DEVIATE MORE THAN + - 1/2" AT THE END OF 50 FEET
- >VEHICULAR ASPECT RATIO L DIVIDED BY THICKNESS 3:1 MAX. SAND/BITUM SET 8 DIVIDED BY 2.75 = 2.91 (ROTATIONAL STABILITY)

- >LIPPAGE 1/8"
- >DO NOT USE WET OR FROZEN MATERIALS

DESIGN CONCERNS

- VEHICULAR .. HERRINGBONE PATTERN IS RECOMMENDED
RUNNING BOND MAY BE USED FOR LIGHT
VEHICULAR APPLICATIONS (PERPENDICULAR TO
THE CURB) .. 4X8 X 2 3/4" FORCE OF STOPPING AND
TURNING**
- POOR DRAINAGE ..**
- PROPER EDGE RESTRAINTS**
- EXAMINE YOUR DOCUMENTS .. FREQUENTLY THE
DETAILS AND SPECIFICATIONS DO NOT AGREE AS TO PRODUCT SIZE
AND PRODUCT REQUIREMENTS**



POOR DRAINAGE MAY RESULT IN EFFLORESCENCE , SYSTEM FAILURE DUE TO SATURATION AND ICY PAVEMENT LIABILITY

RETAINING WALL NEEDED TO KEEP SOIL AND MULCH OFF PERMEABLE PAVEMENT



ENVIRONMENTAL...DO NOT ALLOW INSTALLATION:

- > DURING RAIN OR SNOWFALL**
- > OVER FROZEN BASE**
- > USING FROZEN MATERIALS**
- > ON FROZEN OR SATURATED SAND**
- >>DO NOT ALLOW THE USE OF STONE DUST/ SCREENINGS UNLESS IT IS GRANITE MEETING ASTM C33**
- >COMPLY WITH OSHA CUTTING REGULATIONS**





Dry-cutting
incorrect

Correct cutting of brick and concrete



Saw with vacuum
correct

Dry cutting is against OSHA regulations and a health hazard.

CONTRACTOR QUALIFICATIONS...

ADD CONTRACTOR QUALIFICATIONS TO SPECIFICATIONS

- > 5 YEARS EXPERIENCE WITH AT LEAST 75-100,000 SF INSTALLED**
- > 5-10 SIMILAR PROJECTS DOCUMENTED**
- > EXPERIENCE INSTALLING CLAY/BRICK PAVERS MINIMUM 50,000 SF, SUCCESSFUL & DOCUMENTED**
- > COMPLETED INSTALLER CERTIFICATE COURSES**
- > HAS INCLUDED ALL THE SPECIFIED MATERIAL IN THEIR BID**
- > HAS READ AND UNDERSTANDS ASTM C-902 AND C-1272 MATERIAL SPECIFICATIONS & STANDARDS FOR BRICK PAVERS**

**REQUIRE PRECONSTRUCTION MEETINGS COVERING SCOPE,
AGGREGATES, EDGE RESTRAINTS, COMPACTION, ENVIRONMENTAL
RESTRICTIONS, SPECIFIED PRODUCTS AND TIMELY ORDERING
OF MATERIAL,* ORDERING MATERIAL FOR ENTIRE JOB*,
MOCK UPS, EXPECTED WORKMANSHIP**

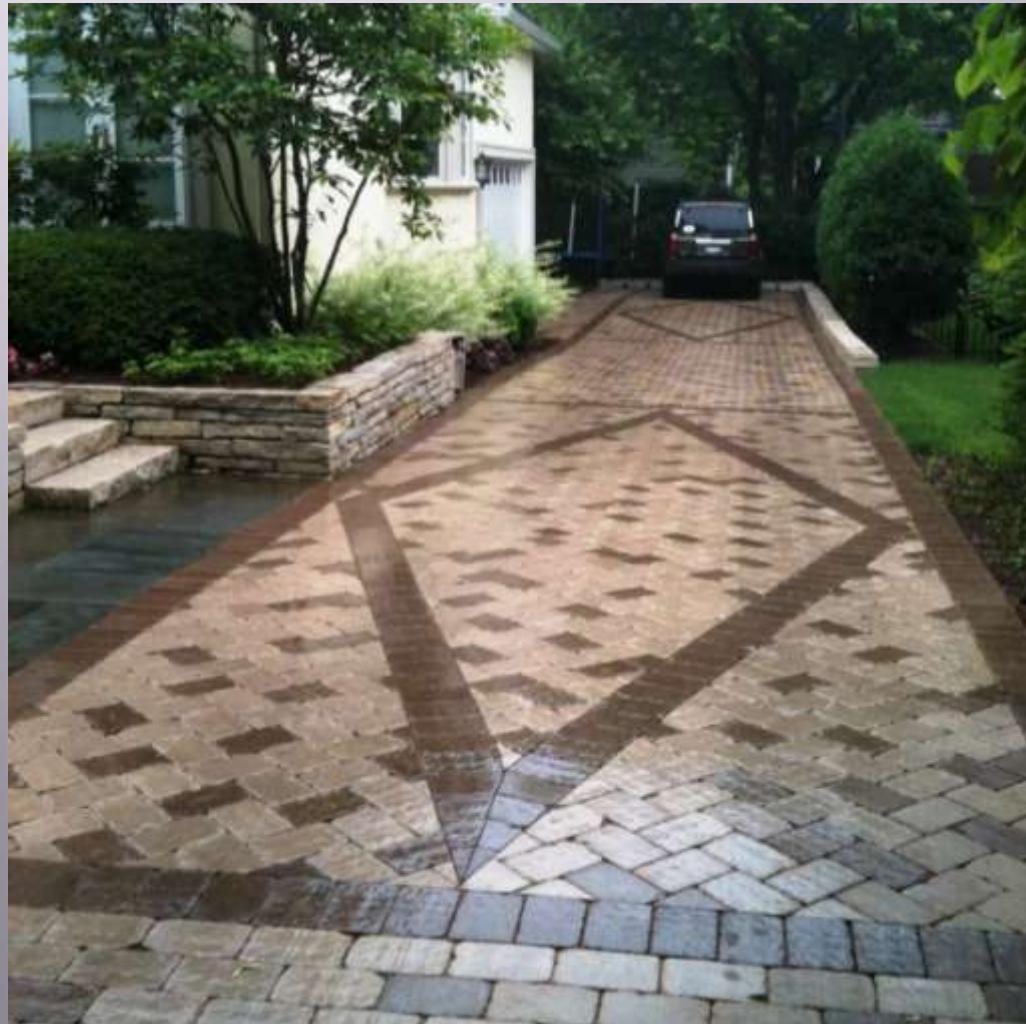
**INCLUDE A KNOWLEDGEABLE DISTRIBUTOR OR A MANUFACTURER'S
REPRESENTATIVE**

**CONTRACTORS SEE CHANGE ORDERS AS AN OPPORTUNITY TO INCREASE
PROFITS.....**

MAKE SURE EVERY ONE IS CLEAR ON WHAT IS EXPECTED

YOU WANT

THIS



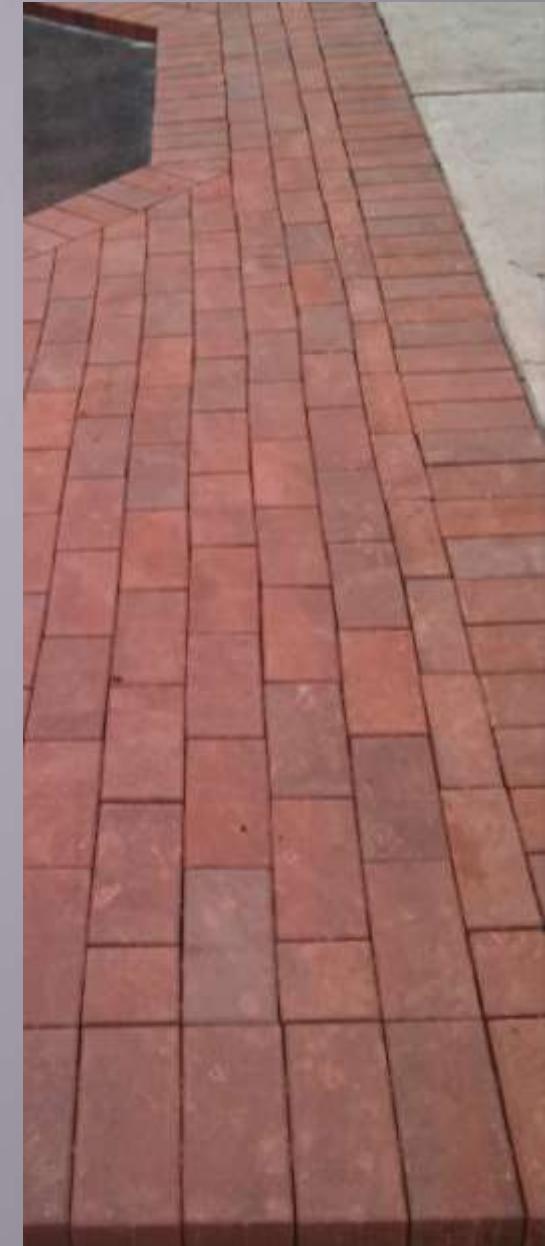
NOT THIS



THIS



NOT THIS



Winter Maintenance

- . Remove snow with rotary brooms when possible.
 - . Plows should have rubber edges and rollers to be elevated above the pavement.
 - . Snow blowers should have roller skids and rubber paddles and elevated above the pavement.
- ..Metal contact with pavers will cause chips and scratches.
- .Deicing salts will not harm the paver structurally but may contribute to efflorescence.



ATTRIBUTES OF BRICK/CLAY PAVERS

- >COLORFAST**
- >SUPERIOR FREEZE/THAW RESISTANCE**
- >IMMUNE TO STRUCTURAL DAMAGE BY DEICING PRODUCTS....SALTS
MAY CONTRIBUTE TO EFFLORESCENCE**
- >TYPICALLY HAVE A HIGHER COMPRESSIVE STRENGTH THAN
OTHER TRADITIONAL PAVING PRODUCTS**
- >>ADA COMPLIANT....JOINT WIDTH AND COEFFICIENT OF FRICTION**
- >100% PRE-CONSUMER RECYCLED PRODUCT AVAILABLE**
- >MANY SHADES QUALIFY FOR HEAT ISLAND EFFECT CREDIT FOR HIGH
SRI VALUES**

- >**QUALIFY FOR MANY LEED AND ASLA SUSTAINABLE SITE CREDITS**
- >**BRICK IS “GREEN”.. PRODUCED FROM SHALE AND CLAY, FIRED TO +-2000 DEGREES**
- >**BRICK HAS A LONG USEFUL LIFE**
THERE ARE MANY PROJECTS IN WASHINGTON, DC, BALTIMORE, PHILADELPHIA, BOSTON AND OTHER CITIES WITH BRICK PAVERS IN PLACE FOR OVER 80 – 100+ YEARS.

**WHEELCHAIR VIBRATION
TESTS..BRICK PAVERS
PERFORMED AS WELL OR
BETTER THAN CAST-IN-
PLACE CONCRETE**



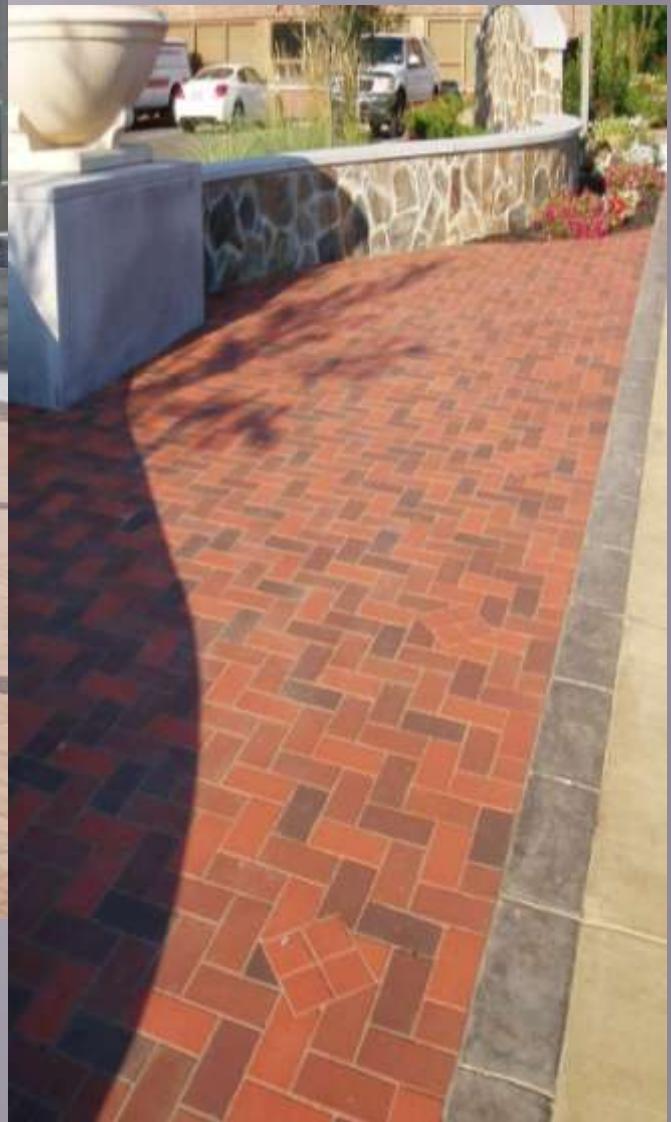
**PATHMET
PATHWAY MEASUREMENT TOOL
TESTING PAVEMENTS FOR
SMOOTHNESS/ROUGHNESS
ESTABLISH ASTM STANDARD**



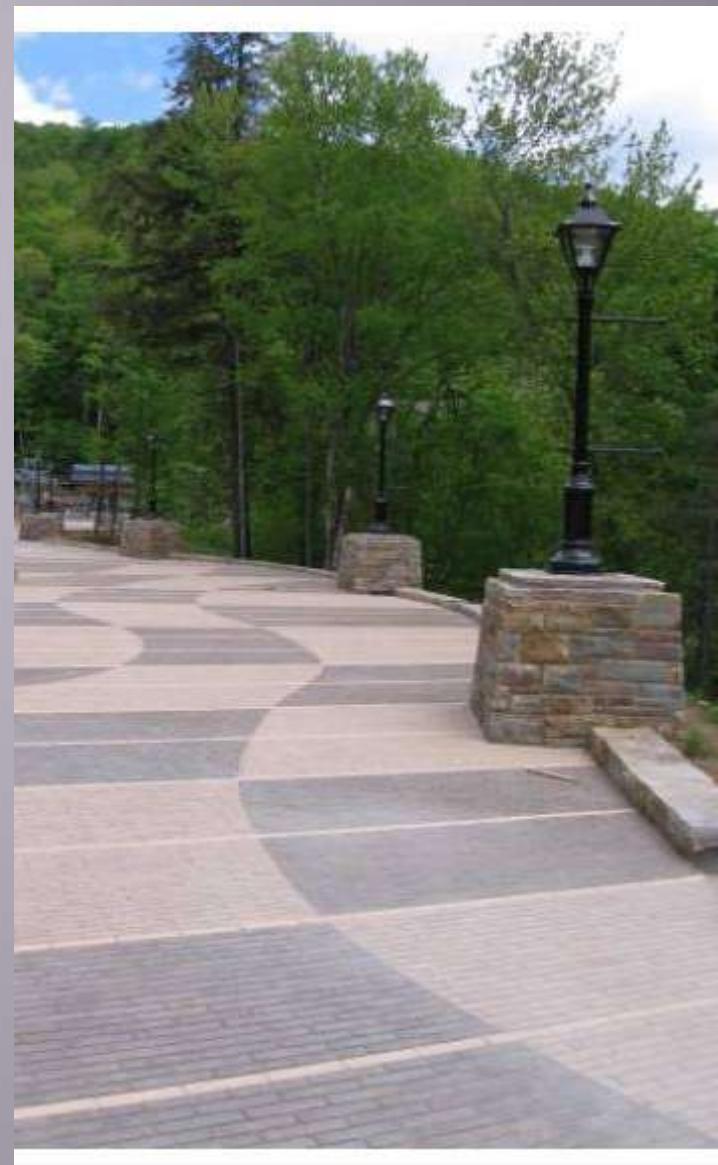


Port Imperial, NJ

4x8" pavers



New City, NY



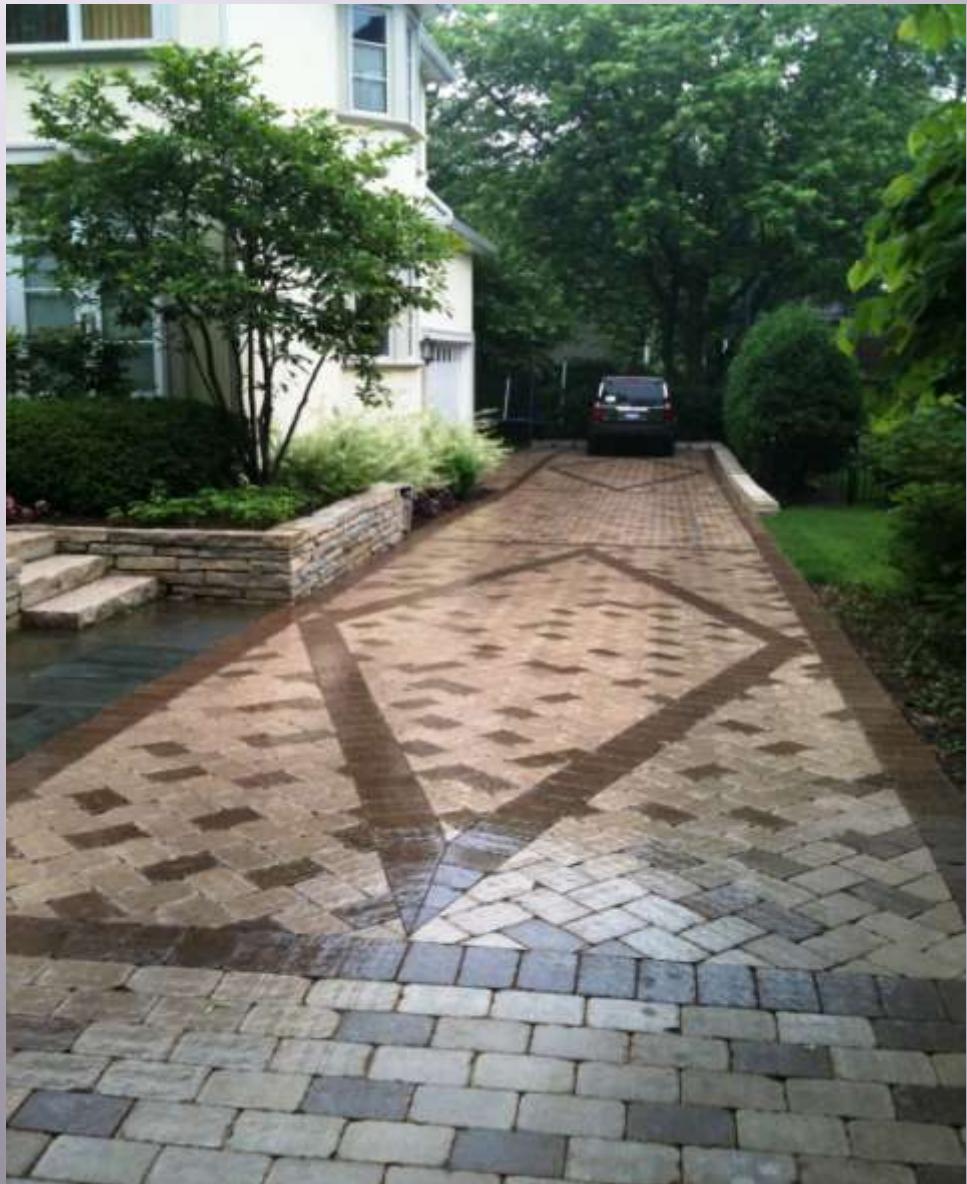


Univ. Tenn



Visiting Nurses Assoc., NJ

4x8 & 8x8



Cobbled 6x9

Midwest Residence



Cobbled 4x8

PA Residence



Maryland Project



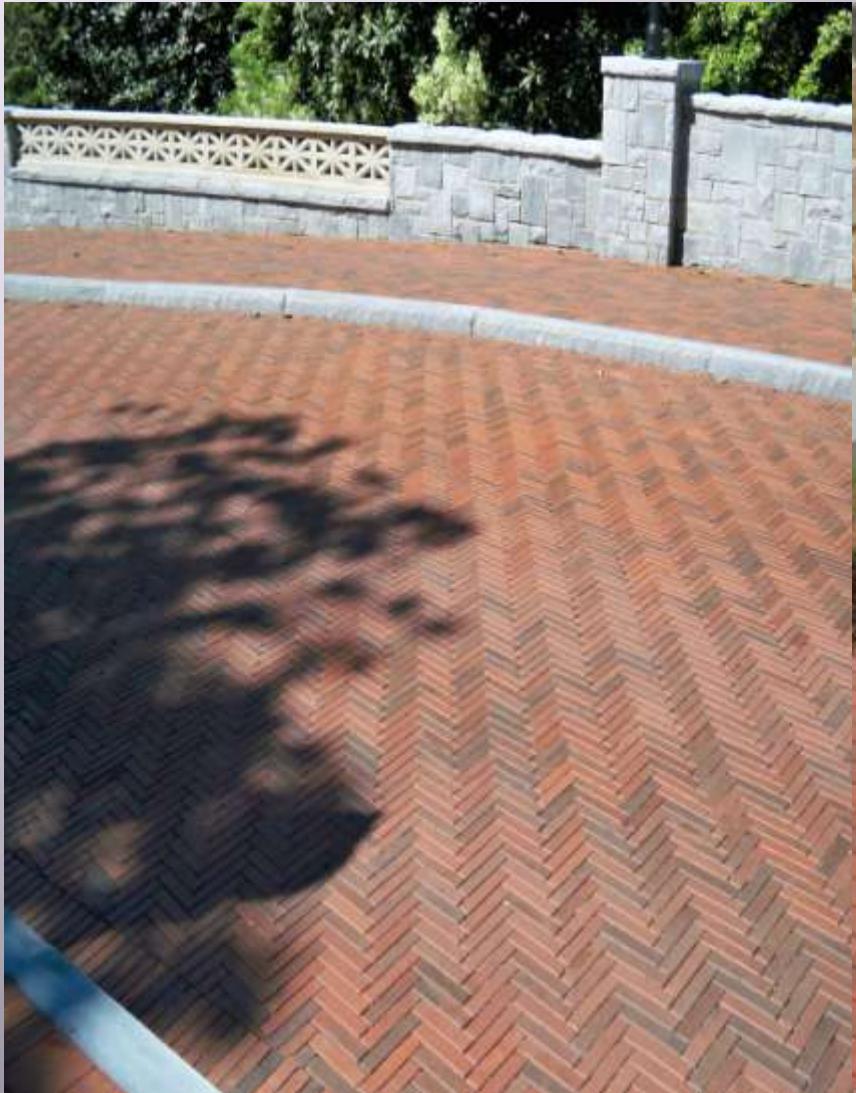
Water Jet Cut Design



Boardwalk 3x9x3 Essex County Courthouse, Newark, NJ



Boardwalk 3x9x3 Cherokee, NC



Emory Univ.
Boardwalk



The Barns..Gladstone, NJ

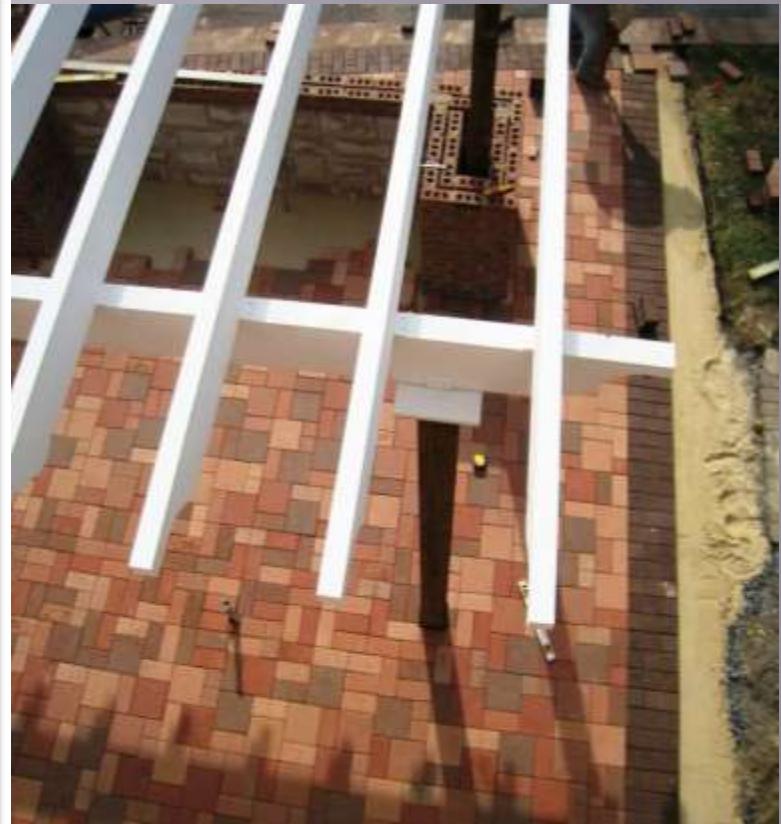


Germanna College, VA

Boardwalk Pavers



Mont Tremblant



Patio..NJ

Bethesda Terrace...Central Park, NYC



Oak Park, ILL Cobbled Boardwalk



Indiana Univ. Stadium



Georgia Tech Univ.



Patec Stadium Rochester, NY

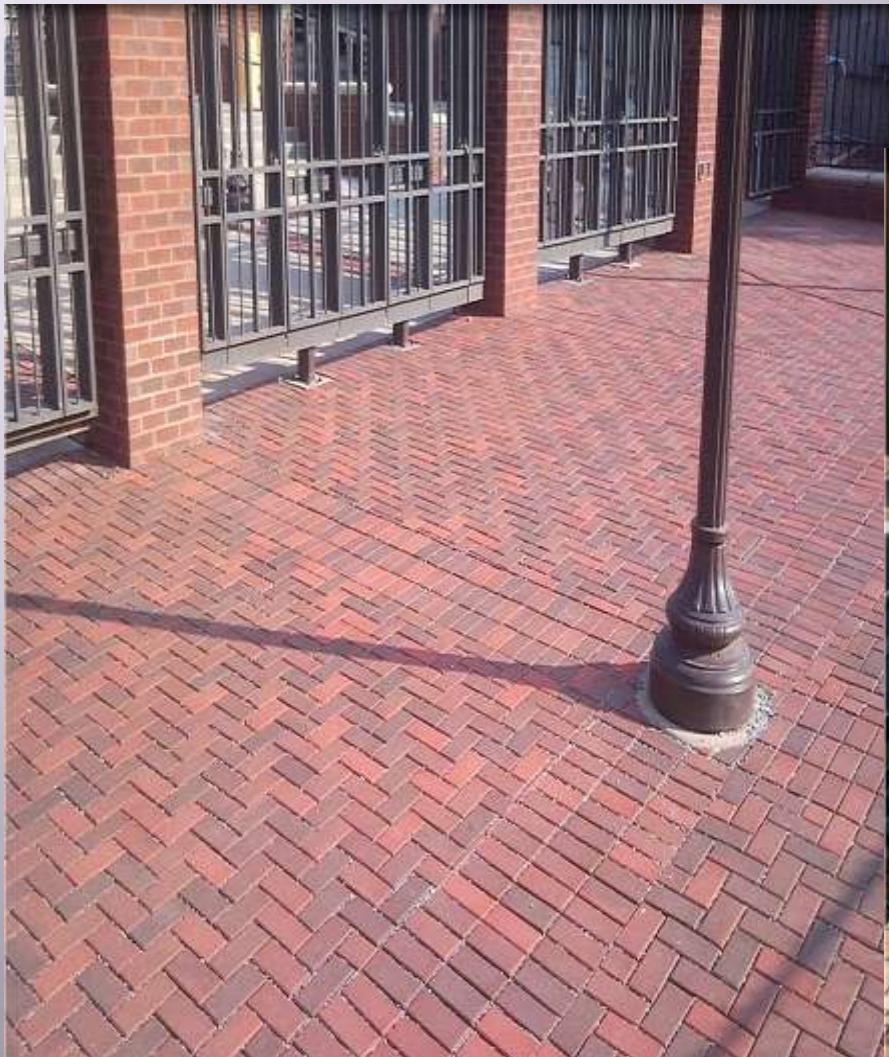


Youngstown State Univ.

Permeable 4x8

Wright State Univ.





Georgia Tech

4x8 permeable



Univ. Dayton



4x8 permeable

Maryland Residence

Miami Conservancy District





Hawthorne Park

Permeable Boardwalk

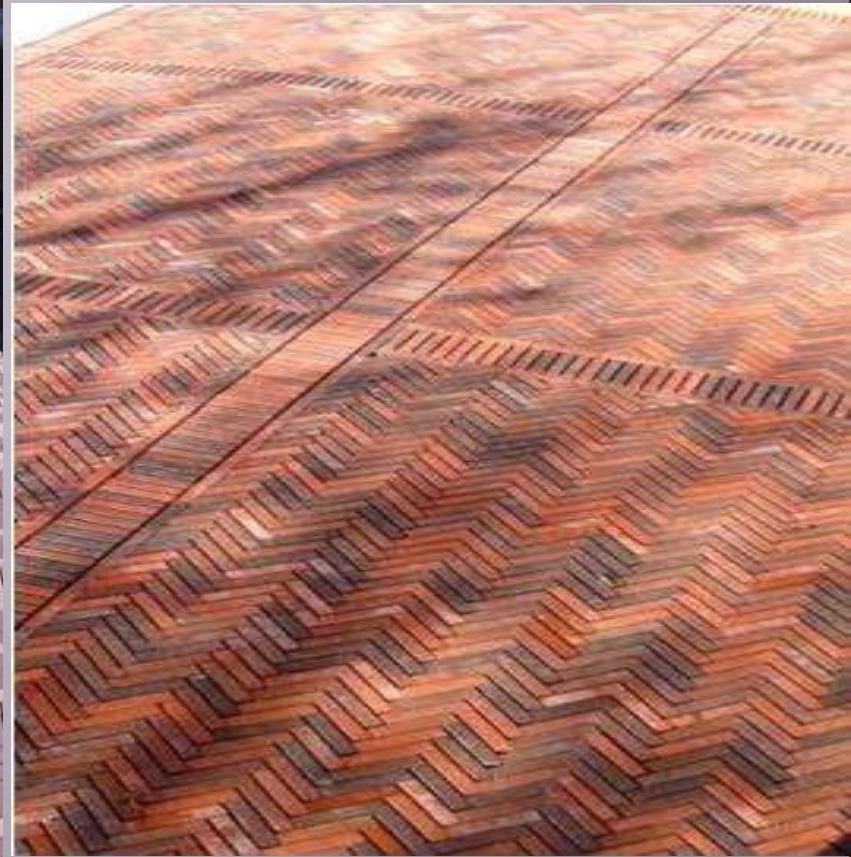
$2 \frac{1}{4} \times 9 \times 3"$







Sidwell Friendship School



Texas Installation



YouTube Videos Provide Proper Instruction on Clay Paver Installation

Two new videos detail the proper installation of clay pavers and the various steps to take to ensure your next paver project will provide the look and durability you desire.

[www.youtube.com/
BrickIndustry](http://www.youtube.com/BrickIndustry)

Proper Installation of Clay Pavers
Compaction of Clay Pavers

One viewer commented:
"Finally, a proper presentation about clay brick installation. You saved me a lot of trouble. Having watched dozens' of other brick paver installation videos, I would have done it wrong had I not seen this one and the companion video about sanding."

These videos covers the installation methods for clay pavers and the various steps to take to ensure your next paver project will provide the look and durability you desire.

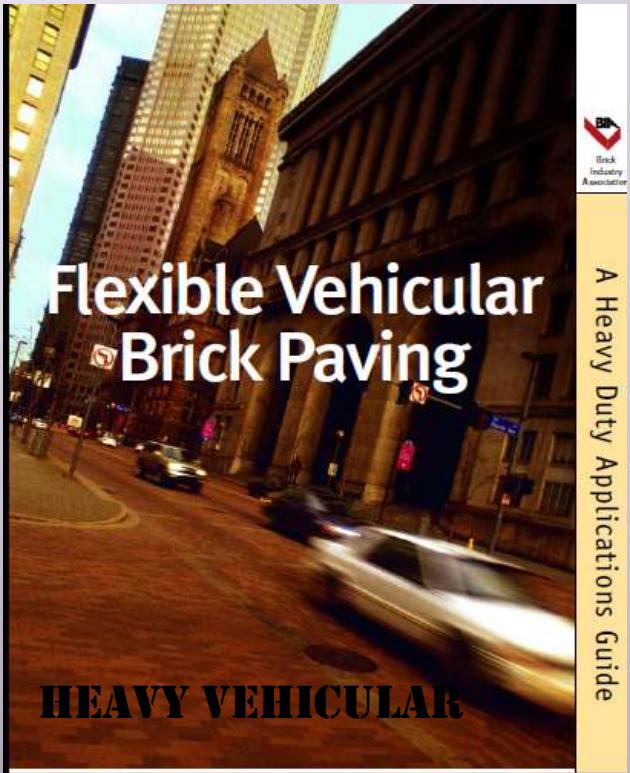
For more information, visit
www.gobrick.com/pavers



Videos also posted on the WG website

www.wgpaver.com

RESOURCES...BIA TECH NOTES AND GUIDES



TECHNICAL NOTES on Brick Construction | 14A
1850 Centennial Park Drive, Reston, Virginia 20191 | www.gobrick.com | 703-620-0010
October 2007

Paving Systems Using Clay Pavers on a Sand Setting Bed

Abstract: This Technical Note describes the proper design and construction of pavements made with clay pavers on a sand setting bed in pedestrian and vehicular, residential and nonresidential projects.

Key Words: flexible, mortarsless paving, paving, rigid, sand setting bed

SUMMARY OF RECOMMENDATIONS:

General

- Determine if application is pedestrian, light duty vehicular or heavy duty vehicular.
- Implement regular maintenance program to maintain pavements in a safe and serviceable condition.

Pedestrian

- Use herringbone pattern for pavements subject to vehicular traffic.
- Design flexibility into layout to accommodate field conditions.

Drainage

- Provide a minimum slope of 1/4 in. per foot (2 percent grade).
- For concrete and impermeable bases, provide weeps through base.

Edge Restraints

- If a curb or edge is subject to vehicular traffic, use concrete or stone curbs or steel angles anchored to a concrete base or foundation or a proprietary system rated for traffic.
- For all other pavements, use any of the above or clay pavers in a concrete foundation, proprietary paver or metal edge restraint systems applied to aggregate.
- Use edge restraint with vertical face at paver interface.

Clay Pavers

- For most residential, pedestrian and light duty vehicular applications, such as driveways, entrancesways and passenger drop-offs, use clay pavers complying with ASTM C 122.
- For heavy duty vehicular applications, such as streets, commercial driveways and industrial applications, use clay pavers complying with ASTM C 122.
- Refer to Technical Note 14 for additional recommendations.

Joint and Setting Bed Sand

- Use sand meeting requirements with ASTM C 33.
- Like where potential sand loss or high water permeability is anticipated and not desired.

Stabilized Joint Sand

- Follow the manufacturer's recommendation regarding the use of stabilized joint sand or joint sand stabilizer.
- Use performance history as a basis for selection.

Concrete Bases

- For concrete base on ground, provide control joints spaced a maximum of 12 ft (3.66 m) o.c.
- For concrete base, provide control joints through concrete wicks and expand joints through powdered above aligned with control joints.
- Provide drainage slopes for drainage.

Base, Subbase and Subgrade

- Refer to Technical Note 14.

Figure 1
Typical Brick Pavement

TECH NOTE

- 14A SAND SET**
- 14B BITUMINOUS**
- 14C MORTAR SET**
- 14D PERMEABLE**
- 14E ACCESSIBILITY/ADA**

UNIV. PITTSBURGH....EVALUATION OF SIDEWALK SURFACES WHEELCHAIR VIBRATION STUDIES

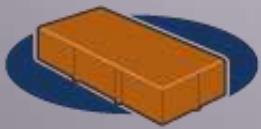
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QUESTIONS?



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