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Construction Tolerances for PICP

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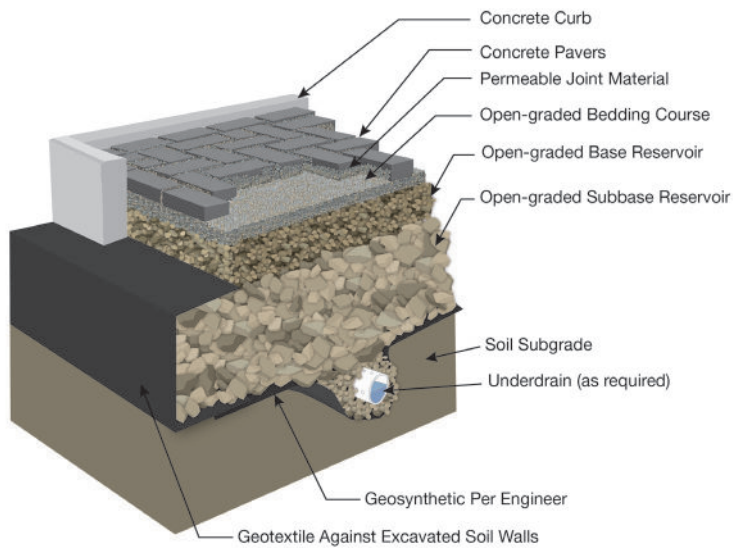


Recommended Construction Tolerances for Permeable Interlocking Concrete Pavements

Permeable interlocking concrete pavements comprise a system of unique components providing durable pedestrian and vehicular surfaces in all climates. This document provides achievable construction tolerances that contribute to structural and hydrologic performance that support stormwater management objectives.

Note: This guide does not apply to standard interlocking concrete pavements





The following are basic guidelines for permeable interlocking concrete pavement (PICP) installations. Review related ICPI Tech Specs for specific details. These tolerances and recommendations are applicable to most PICP products, but allowances may be required for tumbled, embossed or other unique products. Consult manufacturer's recommendations.

Minimum offsets

Attribute

Wells and surface water
Foundations
Water table and bedrock

ICPI recommendation

100 ft. (30 m)
10 ft. (3 m) unless protected by waterproofing and underdrains
24 in. (600 mm)

Paver and bedding layer

Attribute

Paver joint width
Paver surface flatness
Lippage at catch basins/drains
Lippage between individual pavers
Top of bedding surface variation

Tolerance (see page 4 detail)

Min. $\frac{3}{16}$ in. (4.5 mm) to max. $\frac{1}{2}$ in. (13 mm)
 $\pm \frac{3}{8}$ in. (10 mm) over a 10 ft. (3 m) straight edge (non cumulative)
Min. $\frac{1}{8}$ in. (3 mm) to max. $\frac{1}{4}$ in. (6 mm) for ADA compliance or max. $\frac{3}{8}$ in. (10 mm) for non-ADA
Max. $\frac{1}{8}$ in. (3 mm)
 $\pm \frac{3}{8}$ in. (10 mm) over 10 ft. (3 m)

Attribute

Paver aspect ratio (length : thickness)

ICPI recommendation

Max. 3:1 for streets, parking and driveways

Paver thickness

Max. 4:1 for pedestrian

Min. 3 $\frac{1}{8}$ in. (80 mm) for streets, parking & driveways

Min. 2 $\frac{3}{8}$ in. (60 mm) for pedestrian

Bond lines

Max. $\pm \frac{1}{2}$ in. (13 mm) over a 50 ft. (16 m) taut stringline

Surface Slope

Typically 0% to 5%

Cut pavers¹

Min. $\frac{1}{3}$ of full-size unit for vehicular application

Min. 2 in. (50 mm) long for all other applications

Paver laying pattern²

Acceptable for application

Joint fill depth

Max. depth of $\frac{1}{4}$ in. (6 mm) measured from the bottom of the chamfer, or the top surface of the paver if no chamfer, at the time of final inspection

Joint aggregate gradation

Washed ASTM No. 8, 89 or 9 stone or CSA Group II 10-5 or 5-2.5 Coarse Aggregate

Bedding layer thickness

2 in. (50 mm) nominal

Bedding aggregate gradation

Washed ASTM No. 8 stone or CSA Group II 10-5 Coarse Aggregate

Infiltration rate

Minimum 100 in./hr (2,540 mm/hr) at the time of final inspection per ASTM C1781

¹ The contractor should have the discretion on making cuts 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.

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

Base and subbase layer

Attribute

Top of base surface variation
Top of subbase surface variation

Tolerance (see page 4 detail)

± 1/2 in. (13 mm) over 10 ft. (3 m)
± 2 in. (50 mm) over 10 ft. (3 m)

Attribute

Base layer thickness
Base aggregate gradation
Base thickness variation³
Compaction
Base Extensions

ICPI recommendation

4 in. (100 mm) used in vehicular applications except residential drives
Washed ASTM No. 57 stone or CSA Group II 28-14 Coarse Aggregate
+ 3/4 in. to -1/2 in. (+20 mm to -13 mm)
Max. 0.5 mm deflection measured with LWD per ASTM E2835

Base Thickness

12 in. (300 mm) or less
Greater than 12 in. (300 mm)
Minimum 6 in. (150 mm)

Base Extension

6 in. (150 mm)
1/2 base thickness

Subbase layer thickness⁴
Subbase aggregate gradation
Geosynthetics

Washed ASTM No. 2, 3 or 4 stone or CSA Group II 80-40, 56-28, 40-20 coarse aggregate
Geotextile, geocells, geogrids or geomembrane as specified

Subgrade

Attribute

Subgrade compaction
Subgrade slope

ICPI recommendation

As specified
0% to 2% without check dams. 2% to 5% may require check dams. Greater than 5% requires check dams.

Edge restraint/curb

Attribute

No movement
Proper restraint

ICPI recommendation

Firmly secured in place to resist anticipated loads
Acceptable for application (see "Guide References" on reverse)

Site Details

Surrounding Area
Signage

Stabilize soil and prevent washing onto PICP
As specified

Maintenance

Attribute

Routine Maintenance
Restorative Maintenance
Other Surface Distresses

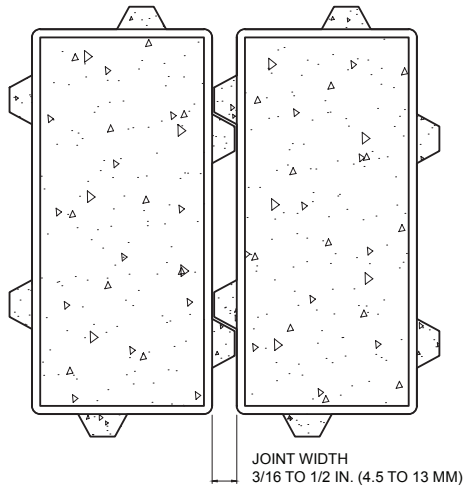
ICPI recommendation

To prevent clogging. See ICPI Tech Spec 23 on PICP Maintenance
Restore clogged surfaces. See ICPI Tech Spec 23 on PICP Maintenance
See ICPI Tech Spec 23 on PICP Maintenance

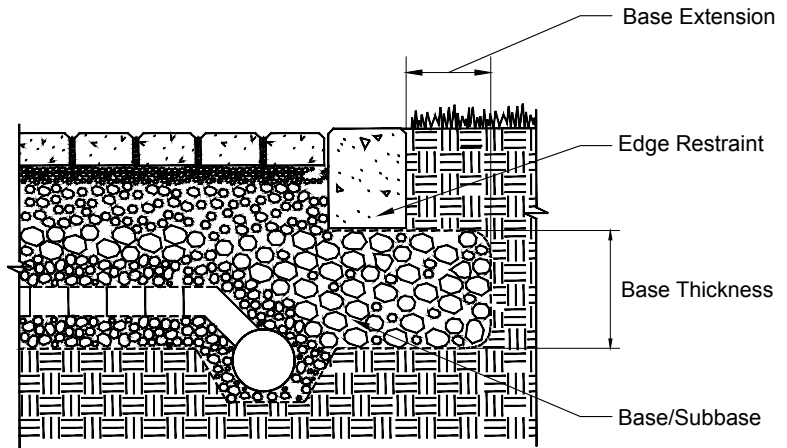
³Base thickness variation: An example of an acceptable variation is 3 1/2 in. to 4 3/4 in. (90 to 120 mm) for a 4 in. (100 mm) required base thickness. The surface of the excavated soil subgrade should have the same slope and contouring as the final surface profile.

⁴Subbase thickness: Structural and hydrologic analysis may require thicker subbases for weaker soils or greater storage volumes.

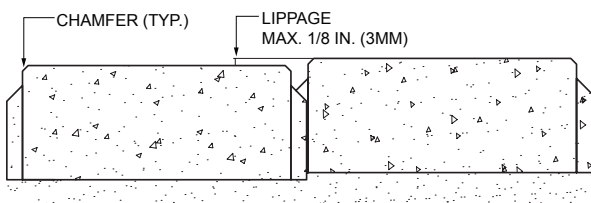
Tolerance Measurement Guidance



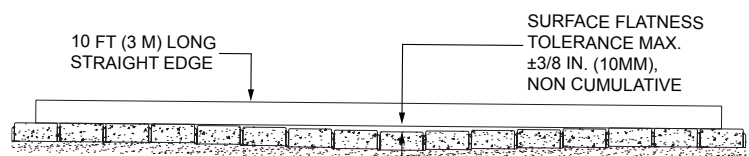
Joint widths are measured with a ruler from inside edge of paver to inside edge paver between adjacent pavers



Base extension is measured from the outside of the edge restraint to the edge of the base/subbase



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

Guide References

Specification and design references

ASCE 68-18 *Design, Construction and Maintenance of Permeable Interlocking Concrete Pavement*

ICPI *Permeable Interlocking Concrete Pavements* (5th Edition): Design, Specifications, Construction, Maintenance

Pavement system references

ASTM C936 *Standard Specification for Solid Interlocking Concrete Paving Units*

ASTM C1781 *Standard Test Method for Surface Infiltration Rate of Permeable Unit Pavement Systems*

CSA A231.2 *Precast Concrete Pavers*

ICPI Tech Spec 1—*Glossary of Terms for Segmental Concrete Pavement*

ICPI Tech Spec 18—*Construction of Permeable Interlocking Concrete Pavement*

ICPI Tech Spec 23—*Maintenance Guide for Permeable Interlocking Concrete Pavements*

Base, subbase, bedding and joint aggregate references

ASTM D448 *Standard Classification for Sizes of Aggregate for Road and Bridge Construction*

(Note: Gradations in AASHTO M-43 *Sizes of Aggregate for Road and Bridge Construction* are identical to ASTM D448.)

ASTM E2835 *Standard Test Method for Measuring Deflections using a Portable Impulse Plate Load Test Device*

CSA 23.1/23.2 *Concrete materials and methods of concrete construction / Test methods and standard practices for concrete*

Edge restraint references

ICPI *Permeable Interlocking Concrete Pavements* (5th Edition): Design, Specifications, Construction, Maintenance

Geosynthetics references

AASHTO M-288—*Standard Specification for Geosynthetic Specification for Highway Applications*

Tech Spec 22—*Geosynthetics for Segmental Concrete Pavements*