



# Construction Tolerances for PICP

• *Design* • *Specifications* • *Construction* • *Maintenance*



**MASONRY &  
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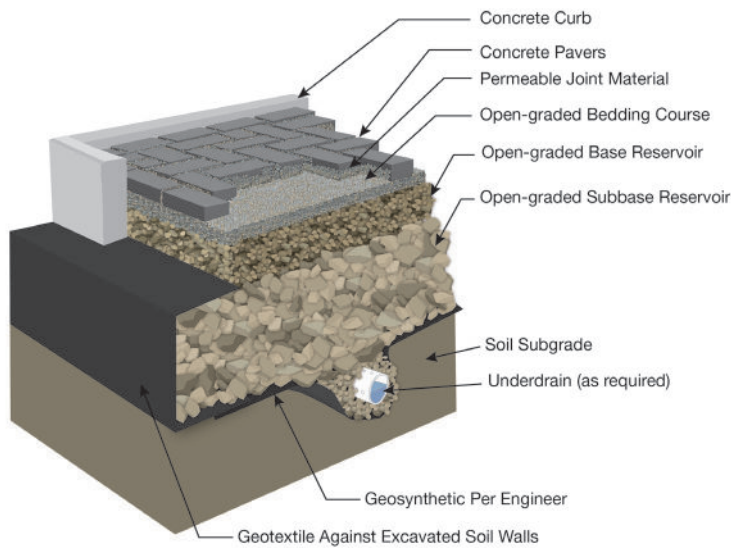


# Recommended Construction Tolerances for Permeable Interlocking Concrete Pavements

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)  
  
Paver thickness  
  
Bond lines  
Surface Slope  
Cut pavers<sup>1</sup>  
  
Paver laying pattern<sup>2</sup>  
Joint fill depth  
  
Joint aggregate gradation  
Bedding layer thickness  
Bedding aggregate gradation  
Infiltration rate

### ICPI recommendation

Max. 3:1 for streets, parking and driveways  
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  
Max.  $\pm\frac{1}{2}$  in. (13 mm) over a 50 ft. (16 m) taut stringline  
Typically 0% to 5%  
Min.  $\frac{1}{3}$  of full-size unit for vehicular application  
Min. 2 in. (50 mm) long for all other applications  
Acceptable for application  
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  
Washed ASTM No. 8, 89 or 9 stone or CSA Group II 10-5 or 5-2.5 Coarse Aggregate  
2 in. (50 mm) nominal  
Washed ASTM No. 8 stone or CSA Group II 10-5 Coarse Aggregate  
Minimum 100 in./hr (2,540 mm/hr) at the time of final inspection per ASTM C1781

<sup>1</sup> 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.

<sup>2</sup> Paving layer pattern: ICPI recommends herringbone laying patterns for all vehicular applications.

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## 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 variation<sup>3</sup>  
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)

### Base Extension

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

Subbase layer thickness<sup>4</sup>  
Subbase aggregate gradation  
Geosynthetics

Minimum 6 in. (150 mm)  
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

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## 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.

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## 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)

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## Site Details

Surrounding Area  
Signage

Stabilize soil and prevent washing onto PICP  
As specified

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## Maintenance

### Attribute

Routine Maintenance  
Restorative Maintenance  
Other Surface Distresses

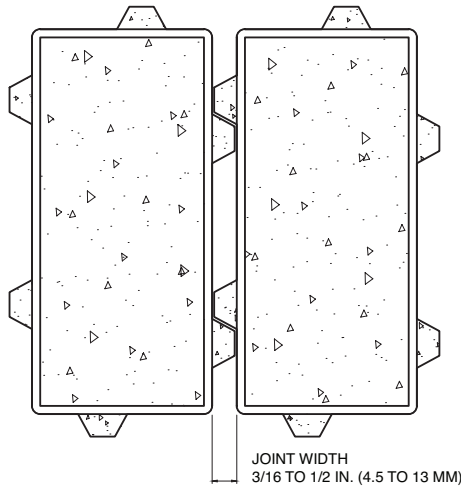
### ICPI recommendation

To prevent clogging. See ICPI Tech Spec 23 on PICP Maintenance  
Restore clogged surfaces. See ICPI Tech Spec 23 on PICP Maintenance  
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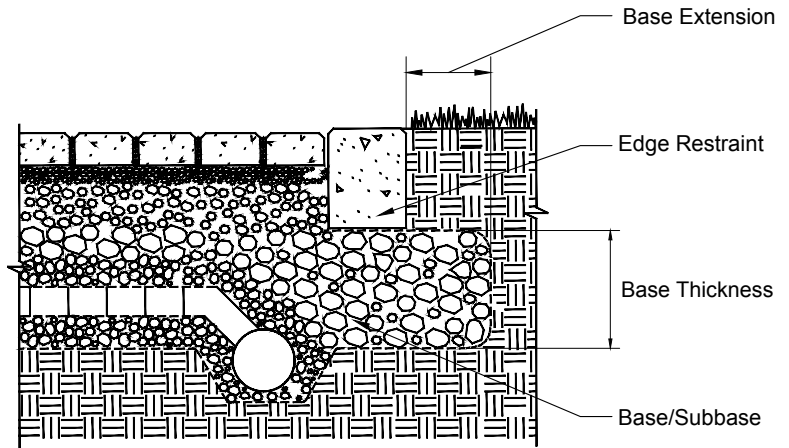
<sup>3</sup>Base thickness variation: An example of an acceptable variation is 3 1/2 in. to 4 3/4 in. (90 to 120 mm) for a 4 in. (100 mm) required base thickness. The surface of the excavated soil subgrade should have the same slope and contouring as the final surface profile.

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

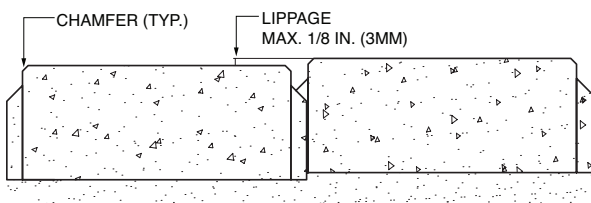
## Tolerance Measurement Guidance



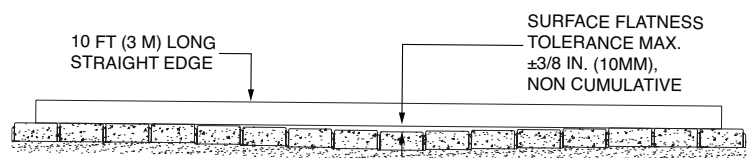
Joint widths are measured with a ruler from inside edge of paver to inside edge paver between adjacent pavers



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* (5<sup>th</sup> 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* (5<sup>th</sup> 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*