Construction Tolerances and Recommendations for Interlocking Concrete Pavements

Note: This guide does not apply to permeable interlocking concrete pavements or tumbled pavers

### Typical Components of an Interlocking Concrete Pavement

- **Concrete Pavers with sand filled joints**
- **Bedding Sand nominal 1 in. (25 mm)**
- **Compacted aggregate or stabilized base to suit traffic and environmental conditions**
- **Geotextile as required by design**
- **Compacted soil subgrade**

### Paver and bedding layer

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Tolerance*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paver joint width</td>
<td>1/16 in. (2 mm) to max. 3/16 in. (5 mm)</td>
</tr>
<tr>
<td>Paver surface flatness</td>
<td>±3/32 in. (10 mm) in 10 ft. (3 m) (non cum.)</td>
</tr>
<tr>
<td>Lippage at catch basins/drain</td>
<td>1/8 in. to 3/8 in. (3 to 10 mm) (non ADA)</td>
</tr>
<tr>
<td>Lippage between individual pavers</td>
<td>Maximum 1/8 in. (3 mm) for pedestrian access routes</td>
</tr>
</tbody>
</table>

**ICPI recommendation**

- **Paver aspect ratio (l:t)**
  - max. 4:1 for pedestrian & driveways
  - max. 3:1 for street/parking
- **Joint fill depth**
  - max. 1/2 in. (13 mm) measured from top of pavement
  - ±1/2 in. (13 mm) max. over 50 ft. (16 m)

**Bond lines**

- No less than 1/2 in. (13 mm) for vehicular application
- No less than 1/8 in. (10 mm) for all other applications

**Slope for drainage**

- min. 2%.

**Cut pavers**

- No movement
- Firmly in place

**Paver laying pattern**

- Acceptable for application

**Minimum paver thickness**

- 31/8 in. (8 cm) for street/parking
- 23/8 in. (6 cm) for pedestrian & driveways

**Bedding layer thickness**

- 1 in. (25 mm) nominal

**Joint sand gradation**

- ASTM C144 or C33
- CSA A23.1 FA1 or CSA A179

**Bedding sand gradation**

- ASTM C33 or CSA A23.1 FA1

### Base and subbase layer

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Tolerance*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top of base surface variation</td>
<td>±3/32 in. (10 mm) over 10 ft. (3 m) (non cumulative)</td>
</tr>
</tbody>
</table>

**ICPI recommendation**

- **Base thickness variation**
  - +3/4 in. to -1/2 in. (+20 mm to -13 mm)
  - min. 98% standard Proctor
  - greater of 6 in. (150 m) or equal to base thickness as needed

**Minimum base thickness**

- 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

<table>
<thead>
<tr>
<th>Attribute</th>
<th>ICPI recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>No movement</td>
<td>Firmly in place</td>
</tr>
<tr>
<td>Proper restraint</td>
<td>Acceptable for application</td>
</tr>
</tbody>
</table>

**See reverse for tolerance measurement guidance**

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**Notes:**

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

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

3. **Base thickness variation:** An example of an acceptable variation is 71/2 in. to 83/4 in. (190 to 220 mm) for an 8 in. (200 mm) required total base thickness.

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

5. **Cut pavers:** Sometimes it is not possible to adjust the cuts to less than 1/3 paver size without adjusting laying pattern, and sometimes it is not possible to adjust laying pattern with certain shapes.

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Interlocking Concrete Pavement Institute • 13921 Park Center Road, Suite 270 • Herndon, VA 20171
Tel: (703) 657-6900 • Fax: (703) 657-6901 • Email: icpi@icpi.org • Web: icpi.org
Guide References

Specification and design references
ASCE/ANSI Structural Design of Interlocking Concrete Pavements – pre-standard
ICPI Tech Spec 4–Structural Design of Interlocking Concrete Pavement for Roads and Parking Lots
ICPI Tech Spec 9–Guide Specification for the Construction of Interlocking Concrete Pavement
ICPI Lockpave software www.icpi.org

Pavement system references
ASTM C936 Standard Specification for Solid Interlocking Concrete Paving Units
CSA A231.2 Precast Concrete Pavers
ICPI Tech Spec 1–Glossary of Terms for Segmental Concrete Pavement
ICPI Tech Spec 2–Construction of Interlocking Concrete Pavements
ICPI Tech Spec 4–Structural Design of Interlocking Concrete Pavement for Roads and Parking Lots
ICPI Tech Spec 5–Cleaning, Sealing and Joint Sand Stabilization of Interlocking Concrete Pavement

Bedding and joint sand references
ASTM C33 Standard Specification for Concrete Aggregates
CSA A23.1 Concrete Materials and Methods of Construction
ASTM C144 Standard Specification for Aggregate for Masonry Mortar
CSA A179 Mortar and Grout for Unit Masonry
ICPI Tech Spec 17–Bedding Sand Selection for Interlocking Concrete Pavements in Vehicular Applications

Base, subbase and subgrade layer references
ASTM D 2940 Standard Specification for Graded Aggregate Material For Bases or Subbases for Highways or Airports
ICPI Tech Spec 2–Construction of Interlocking Concrete Pavements
ASTM D698 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort

Edge restraint references
ICPI Tech Spec 3–Edge Restraints for Interlocking Concrete Pavements

Tolerance Measurement Guidance

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