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Construction Tolerances for ICP

PAV-MAN-006-20



**MASONRY &
HARDSCAPES**

Construction Tolerances and Recommendations for Interlocking Concrete Pavements

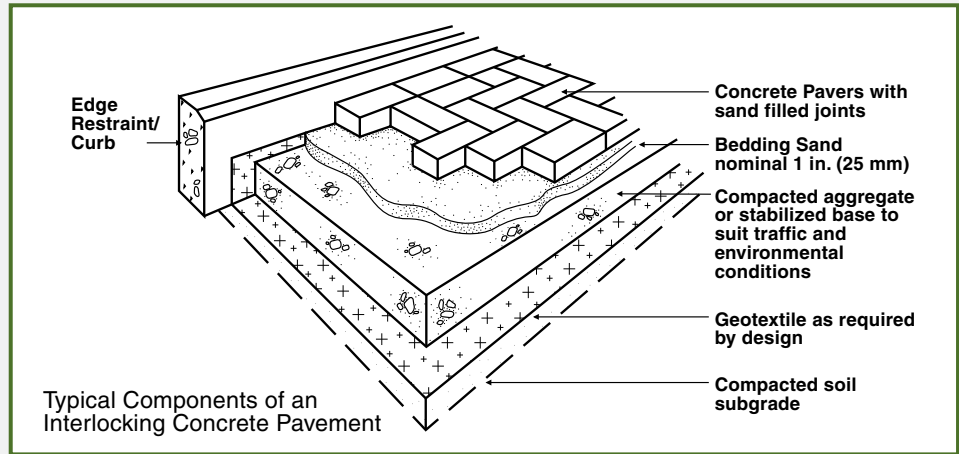


icpi

Interlocking Concrete Pavement Institute®

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

These are the basic guidelines. Review related Tech Specs for specific details. These tolerance and recommendations are applicable to most products, but allowances may be required for tumbled, embossed or other unique products. Consult manufactures recommendations.



| Paver and bedding layer | | Base and subbase layer | | | | | | | | | | | |
|--|--|---|---|-------------------------|-------------------------|---------------|---------|----------------------|-----------------------|-----------------------|----------|---------------------|--------------------|
| Attribute | Tolerance* | Attribute | Tolerance* | | | | | | | | | | |
| Paver joint width | 1/16 in. (2 mm) to max. 3/16 in. (5 mm) | Top of base surface variation | ± 3/8 in. (10 mm) over 10 ft. (3 m) (non cumulative) | | | | | | | | | | |
| Paver surface flatness | ± 3/8 in. (10 mm) in 10 ft. (3 m) (non cum.) | Attribute | ICPI recommendation | | | | | | | | | | |
| Lippage at catch basins/drains | 1/8 in. to 3/8 in. (3 to 10 mm) (non ADA) | Base thickness variation ³ | + 3/4 in. to -1/2 in. (+20 mm to -13 mm) | | | | | | | | | | |
| <i>Lippage between individual pavers maximum 1/8 in. (3 mm) for pedestrian access routes</i> | | Compaction | min. 98% standard Proctor | | | | | | | | | | |
| Attribute | ICPI recommendation | Base Extensions | <table border="1"> <thead> <tr> <th>Base Thickness in. (mm)</th> <th>Base Extension in. (mm)</th> </tr> </thead> <tbody> <tr> <td>Up to 6 (150)</td> <td>6 (150)</td> </tr> <tr> <td>6 to 10 (150 to 250)</td> <td>equals base thickness</td> </tr> <tr> <td>10 to 20 (200 to 500)</td> <td>10 (250)</td> </tr> <tr> <td>20 (500) or greater</td> <td>1/2 base thickness</td> </tr> </tbody> </table> | Base Thickness in. (mm) | Base Extension in. (mm) | Up to 6 (150) | 6 (150) | 6 to 10 (150 to 250) | equals base thickness | 10 to 20 (200 to 500) | 10 (250) | 20 (500) or greater | 1/2 base thickness |
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| 6 to 10 (150 to 250) | equals base thickness | | | | | | | | | | | | |
| 10 to 20 (200 to 500) | 10 (250) | | | | | | | | | | | | |
| 20 (500) or greater | 1/2 base thickness | | | | | | | | | | | | |
| Paver aspect ratio (l:t) (length divided by thickness) | max. 4:1 for pedestrian & driveways max. 3:1 for street/parking | Geotextile | as needed | | | | | | | | | | |
| Joint fill depth | max. depth of 1/4 in. measured from the bottom of the chamfer or the top surface of the paver if there is no chamfer at the time of final inspection | Minimum base thickness⁴ | | | | | | | | | | | |
| Bond lines ¹ | ± 1/2 in. (13 mm) max. over 50 ft. (16 m) | Sidewalks, patios, pedestrian | 4 in. (100 mm) | | | | | | | | | | |
| Slope for drainage | min. 2% | Residential driveways | 6 in. (150 mm) | | | | | | | | | | |
| Cut pavers ⁵ | No less than 1/3 for vehicular application No less than 3/8 in. (10 mm) for all other applications | Parking lot/residential street | 8 in. (200 mm) | | | | | | | | | | |
| Paver laying pattern ² | Acceptable for application | Edge restraint/curb edge | | | | | | | | | | | |
| Minimum paver thickness | 3 1/8 in. (8 cm) for street/parking 2 3/8 in. (6 cm) for pedestrian & driveways | Attribute | ICPI recommendation | | | | | | | | | | |
| Bedding layer thickness | 1 in. (25 mm) nominal | No movement | firmly in place | | | | | | | | | | |
| Joint sand gradation | ASTM C144 or C33 | Proper restraint | acceptable for application (see "Guide References" on reverse) | | | | | | | | | | |
| Bedding sand gradation | CSA A23.1 FA1 or CSA A179 ASTM C33 or CSA A23.1 FA1 | | | | | | | | | | | | |

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 1/2 in. to 8 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 less than 1/3 paver size. 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.

*See reverse for tolerance measurement guidance

Guide References

Specification and design references

ASCE 58-16 *Structural Design of Interlocking Concrete Pavements for Municipal Streets and Roadways*
 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*

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

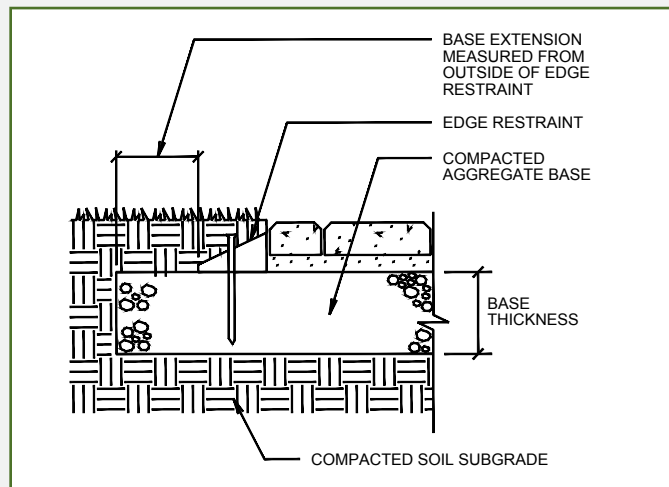
ASTM D 2940 *Standard Specification for Graded Aggregate Material For Bases or Subbases for Highways or Airports*
 ICPI Tech Spec 2—*Construction of Interlocking Concrete Pavements*
 ASTM D698 *Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort*

Edge restraint references

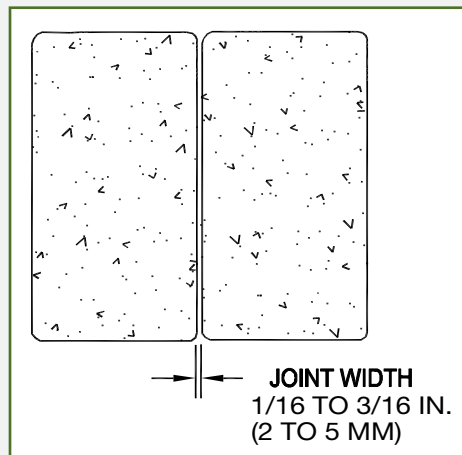
ICPI Tech Spec 3—*Edge Restraints for Interlocking Concrete Pavements*

Geosynthetics reference

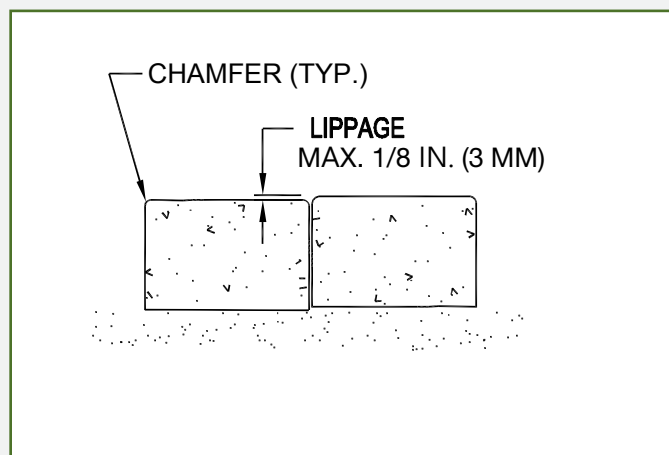
Tech Spec 22—*Geosynthetics for Segmental Concrete Pavements*



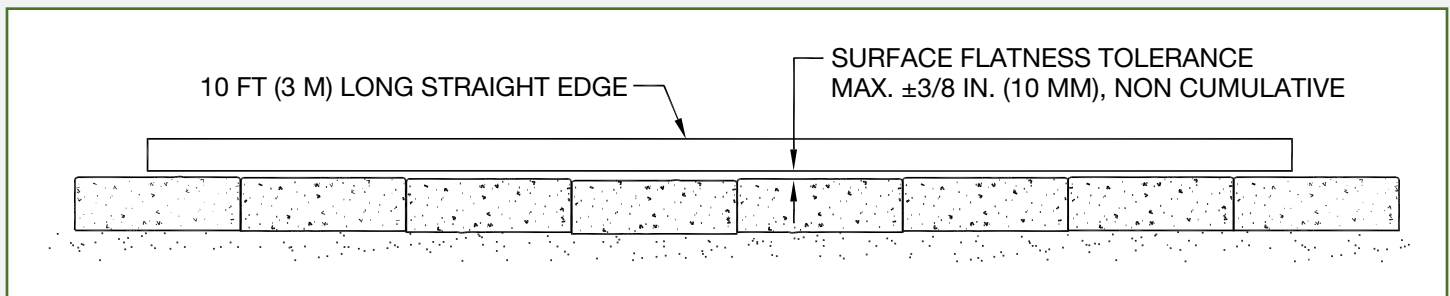
Tolerance Measurement Guidance



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