

INTERLOCKING CONCRETE PAVERS

SECTION 02780

NOTE: THIS IS A GUIDE SPECIFICATION FOR THE CONSTRUCTION OF TREMRON INTERLOCKING CONCRETE PAVERS AND BEDDING SAND OVER A DENSE-GRADED, COMPACTED AGGREGATE BASE. THIS SPECIFICATION SHOULD BE EDITED BY AN ENGINEER/ARCHITECT TO CONFORM TO PROJECT CONDITIONS AND LOCATION. NOTES ARE PROVIDED ON THE USE OF A COMPACTED AGGREGATE BASE UNDER THE BEDDING SAND AND PAVERS. OTHER BASE MATERIALS MAY BE USED. THE USER SHOULD REFER TO INTERLOCKING CONCRETE PAVEMENT, INSTITUTE ICPI SOFTWARE, ZAPHERS™ DETAIL AND SPECIFICATIONS FOR INTERLOCKING CONCRETE PAVEMENT, FOR VARIOUS GUIDE SPECIFICATIONS AND DETAILED DRAWINGS.

PART 1 - GENERAL

1.01 Section Includes

- A. Concrete Paver Units**
- B. Bedding and Joint Sand**
- C. Edge Restraints**

1.02 Related Sections

Tech Data:

- A. Glossary of Terms used in the Production, Design, Construction, and Testing of Interlocking Concrete Pavement - ICPI Tech Spec #1**
- B. Construction of Interlocking Concrete Pavement - ICPI Tech Spec #2**
- C. Edge Restraints for Interlocking Concrete Pavement - ICPI Tech Spec #3**
- D. Structural Designing of Interlocking Concrete Pavement for Roads and Parking Lots - ICPI Tech Spec #4**
- E. Cleaning and Sealing - A Maintenance and Protection Guide - ICPI Tech Spec #5**
- F. Application Guide for Interlocking Concrete Pavements - ICPI Tech Spec #10**

1.03 References

NOTE: Pavements subject to vehicles should be designed in consultation with a qualified civil engineer, in accordance with established flexible pavement design procedures, Pavespec Software, and in accordance with the ICPI “Tech Spec” Technical Bulletins.

A. American Society of Testing and Materials (ASTM):

- 1. C 33. Specification for Concrete Aggregates.**
- 2. C 136. Method for Sieve Analysis.**
- 3. C 140. Sampling and Testing Concrete Masonry Units.**
- 4. C 144. Standard Specification for Aggregate for Masonry Mortar.**
- 5. C 936. Specification for Solid Interlocking Concrete Paving Units.**
- 6. C 979. Specification for Pigments for Integrally Colored Concrete.**
- 7. D 698. Test Methods for Moisture Density Relations of Soil and Soil Aggregate Mixtures using a 5.5 lb. (2.49kg) Rammer and 12 in. (305 mm) drop.**
- 8. D 1557. Test Methods for Moisture Density.**
- 9. D 2940. Graded Aggregate Material for Bases or Subbases for Highways or Airports.**

B. Interlocking Concrete Pavement Institute (ICPI):

- 1. Tech Spec Technical Bulletins.**

1.04 Qualify Assurance

- A. Installation shall be by a contractor and crew with at least one year of experience in placing interlocking concrete pavers on projects of similar nature or dollar cost.**
- B. Contractor shall hold a current certificate from the Interlocking Concrete Pavement Institute Concrete Paver Installer Certification program.**
- C. Contractor shall conform to all local, state/provincial licensing and bonding requirements.**

1.05 Submittals

- A. Shop or product drawing and product data.
- B. Full size samples of concrete paving units to indicate color and shape selections. Color will be selected by Architect/Engineer/Landscape Architect/Owner from manufacturer's available colors.
- C. Sieve analysis for grading of bedding and joint sand.
- D. Test result from an independent testing laboratory for compliance of paving unit requirements to (ASTM C 936) (CSA) or other applicable requirements.
- E. Indicate layout, pattern, and relationship of paving joints to fixtures and project formed details.

1.06 Mock-ups

- A. Install a 7 ft. x 7 ft. (2 m x 2 m) paver area as described in Article 3.02.
- B. This area will be used to determine surcharge of the bedding sand layer, joint sizes, lines, laying pattern(s), color(s), and texture of the job.
- C. This area shall be the standard from which the work will be judged and it shall be incorporated into the work.

1.07 Delivery, Storage, and Handling

- A. Deliver concrete pavers to the site in steel banded, or plastic banded, or plastic wrapped cubes capable of transfer by fork lift or clamp lift. Unload pavers at job site in such a manner that no damage occurs to the product.
- B. Cover sand with waterproof covering to prevent exposure to rainfall or removal by wind.
- C. Coordinate delivery and paving schedule to minimize interface with normal use of building adjacent to paving.

1.08 Environmental Conditions

- A. Do not install sand or pavers during heavy rain or snowfall.
- B. Do not install sand or pavers over frozen base materials.
- C. Do not install frozen sand.

PART 2 • PRODUCTS

2.01 Concrete Pavers

A. Manufacturer:

2885 St. Clair Street Jacksonville, FL 32254 866.358.5900 or 904.359.5900 Fax 904.359.5901	11321 NW 112th Court Medley, FL 33178 800.567.1480 or 305.825.9000 Fax 305.823.6614	3144 Highway 17 NE Arcadia, FL 34266 877.490.0990 or 863.491.0990 Fax 863.491.8990
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B. Meet the following requirements set forth in ASTM C 938, Standard Specification for Interlocking Concrete Paving Units:



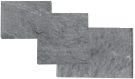



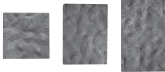
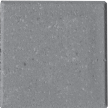

Note: If 3-1/8 in. (80 mm) thick pavers are specified, their compressive strength test results should be adjusted by multiplying them by 1.18 to equate the results to that from 2-3/8 in. (60 mm) thick pavers.

1. Average compressive strength of 8,000 psi (55 MPa) with no individual unit under 7,200 psi (50 MPa).
2. Average absorption of 5% with no unit greater than 7% when tested in accordance with ASTM C 140.
3. Resistance to 50 freeze-thaw cycles when tested according to ASTM C 67.

C. Pigment shall conform to ASTM C 979.








D. Product name(s), shape(s), overall dimensions, and thickness:

2 3/8" Pavers

STONE SHAPE	NAME	WEIGHT/ CUBE (LB.)	SQ. FT./ CUBE	DIMENSIONS
	OLDE TOWNE 3 PC OLDE TOWNE 2 PC (6X6, 6X9) OLDE TOWNE 6X6 OLDE TOWNE 6X9	2756 2964 3146 3146 2522 2912 2756 2964	106 114 121 121 97 112 106 114	4X6 = 4-3/4" X 6-1/4" 6X6 = 6-1/4" X 6-1/4" 6X9 = 6-1/4" X 9-1/2"
	MEGA OLDE TOWNE 3 PC MEGA OLDE TOWNE 3-1/8 3 PC	2964 2964 3128 3128	114 114 92 92	6X9 = 6-1/4" X 9-1/2" 9X9 = 9-1/2" X 9-1/2" 9X12 = 9-1/2" X 12-1/4"
	STONEHURST 3 PC STONEHURST 3-1/8 3 PC	2964 2964 3128 3128	114 114 92 92	6X9 = 6-1/4" X 9-1/2" 9X9 = 9-1/2" X 9-1/2" 9X12 = 9-1/2" X 12-1/4"
	ROMANESQUE CIRCLES	2444 2444	94 94	ALL PIECES 6-1/4" IN WIDTH
	ROMANESQUE FANS	2444 2444	94 94	ALL PIECES 6-1/4" IN WIDTH
	BRICK 4X8 BRICK 4X8 (3-1/8)	2756 3120 2584 3264	106 120 76 96	4X8"
	VIENNA 2-3/4 3 PC	2760 2760	92 92	9" X 9" 9" X 12" 9" X 15"
	PARK PLAZA 6X6 PARK PLAZA 8X8 PARK PLAZA 12X12 ¹ PARK PLAZA 16X16 ¹	2200 3120 2756 2756 3120 3120 2782 2782	88 120 106 106 120 120 104 104	6X6 = 6" X 6" 8X8 = 8" X 8" 12X12 = 12" X 12" 16X16 = 16" X 16"
	ESTATE PAVER	2496 2730	96 105	11-3/8" X 11-3/8"

1. Classified a paver slab rather than a paver.

2 3/8" Pavers Continued

STONE SHAPE	NAME	WEIGHT/ CUBE (LB.)	SQ. FT./ CUBE	DIMENSIONS
	COBBLESTONE	2444 2860	94 110	4-5/8" X 9-3/8"
	DÉCOR DÉCOR (3-1/8)	2678 2964 2550 2550	103 114 74 74	5-3/8" X 9"
	HEXAGON 16 ¹	2366 2366	91 91	16"
	BISHOP HAT	2184 2470	84 95	11-3/8" X 8" X 4"
	MINI-BRICK	2350 2550	92 100	2-3/8" X 8"
	SHELLSTONE 4X8 ¹ SHELLSTONE 12X12 ¹ SHELLSTONE 16X16 ¹	3120 3120 3120 2782 2782	120 120 120 120 104 104	4X8 = 4" X 8" 12X12 = 12" X 12" 16X16 = 16" X 16"
	SQUARES AND RECTANGLES	2550 3016	98 116	4-1/2" X 4-1/2" 4-1/2" X 6-3/4"

1. Classified a paver slab rather than a paver.

Colors

<p>SOLIDS:</p>	<p>GREY CEMENT BASE</p>	<p>NATURAL CHARCOAL TAUPE TAN DARK BROWN</p>
	<p>WHITE CEMENT BASE</p>	<p>WHITE SANDSTONE CORAL SALMON GOLDENROD</p>
<p>BLENDS:</p>	<p>GREY CEMENT BASE</p>	<p>HERITAGE SANTA FE ORTEGA RUSTIC DRIFTWOOD GRANITE COFFEE REDWOOD BURNT OAK</p>
	<p>WHITE CEMENT BASE</p>	<p>OAK RUN SOUTH BEACH CAPPUCCINO RIVERWOOD OLD CHICAGO SIERRA SAND DUNE MAHOGANY ASH TIMBERWOOD</p>

2.02 Bedding and Joint Sand

Note: The type of sand used for bedding is often called concrete sand. Sands vary regionally. Screenings and stone dust can be unevenly graded and have material passing the No. 200 (0.075mm) sieve. Bedding sands with these characteristics should not be used. Contact paver contractors or manufacturers local to the project and confirm sand(s) successfully used in previous similar applications.

A. Clean, non-plastic, free from deleterious or foreign matter, natural or manufactured from crushed rock. Do not use limestone screenings or stone dust that do not conform to the grading requirements in Table 1. When concrete pavers are subject to vehicle traffic, the sands shall be as hard as practically available.

Note: If the hardness of the bedding sand is not sufficient or questionable for the application (usually a heavily trafficked thoroughfare) contact the ICPI for information and specifications on assessing bedding sand durability under heavy traffic loads.

B. Sieve according to (ASTM C 136) (CSA-A-A23.2A).

C. Conform to the grading requirements as shown in Table 1.

Note: Use ASTM or CSA standards as applicable.

Table 1
Grading Requirements for Bedding Sand

ASTM C 33

CSA A23. 1-M94

SIEVE SIZE	PERCENT PASSING	SIEVE SIZE	PERCENT PASSING
3/8 IN. (9.5 MM)	100	10 MM	100
NO. 4 (4.75 MM)	95 TO 100	5 MM	95 TO 100
NO. 8 (2.36 MM)	85 TO 100	2.5 MM	80 TO 100
NO. 16 (1.18 MM)	50 TO 85	1.25 MM	50 TO 90
NO. 30 (0.600 MM)	25 TO 60	0.630 MM	25 TO 65
NO. 50 (0.300 MM)	10 TO 30	0.315 MM	10 TO 35
NO. 100 (0.150 MM)	2 TO 10	0.160 MM	2 TO 10

Note: Bedding sand may be used for joint sand. However, some extra effort in sweeping and compacting the pavers may be required in order to completely fill the joints. If joint sand other than bedding sand is used, the gradations shown in Table 2 are recommended. Joint sand should never be used for bedding sand.

D. The joint sand shall conform to the grading requirements as shown in Table 2 below:

Note: Use ASTM or CSA standards as applicable.

Table 2
Grading Requirements for Joint Sand

ASTM C 33
Natural Sand

ASTM C 144
Manufactured Sand

CSA A23. 1-M94

SIEVE SIZE	PERCENT PASSING	PERCENT PASSING	SIEVE SIZE	PERCENT PASSING
NO. 4 (4.75 MM)	100	100	5 MM	100
NO. 8 (2.36 MM)	95 TO 100	95 TO 100	2.5 MM	95 TO 100
NO. 16 (1.18 MM)	70 TO 100	70 TO 100	1.25 MM	90 TO 100
NO. 30 (0.600 MM)	40 TO 75	40 TO 100	0.600 MM	35 TO 80
NO. 50 (0.300 MM)	10 TO 35	20 TO 40	0.300 MM	15 TO 50
NO. 100 (0.150 MM)	2 TO 15	10 TO 25	0.150 MM	2 TO 15
NO. 200 (0.075 MM)	0	0 TO 10		

2.03 Edge Restraints

A. See ICPI Tech Spec #3. Edge Restraints for Interlocking Concrete Pavements (Included In Tech Data Section) for guidance on selecting edge restraints for various applications.

B. See Details / Design Considerations in Tech Data Section.

PART 3 - EXECUTION

3.01 Examination

Note: For installation on a compact aggregate base and soil subgrade, the specifier should be aware that the top surface of the pavers may be 1/8 to 1/4 in. (3 to 6 mm) above the final elevations after compaction. This difference in initial and final elevation is to compensate for possible minor settling.

- A. Verify that subgrade preparation, compacted density and elevations conform to the specifications.

Note: Compaction of the soil subgrade is recommended to at least 95% standard Proctor density per ASTM D 698 for pedestrian areas and residential driveways. Compaction to at least 95% modified Proctor density per ASTM D 1557 is recommended for areas subject to heavy vehicular traffic. Stabilization of the subgrade and/or base material may be necessary with weak or saturated subgrade soils. The Architect/Engineer should inspect subgrade preparation, elevation, and conduct density tests for conformance to specifications.

- B. Verify that geotextiles, if applicable, have been placed according to specifications and drawings.
C. Verify that aggregate base materials, thickness, compaction, surface tolerances, and elevations conform to the specifications.

Note: Local aggregate base materials typical to those used for highway flexible pavements are recommended for those conforming to ASTM D 2940. Compaction is recommended to not less than 95% Proctor density in accordance with ASTM D 698 for pedestrian areas and residential driveways. Compaction is recommended to not less than 98% modified Proctor density according to ASTM D 1557 for vehicular areas.

Note: Tile aggregate base should be spread and compacted in uniform layers not exceeding 6 in. (150 mm) thickness. Recommended base surface tolerance should be plus or minus 3/8 in. (10 mm) over a 10 ft. (3 m) straight edge. The Architect/Engineer should inspect geotextile materials and placement (if applicable), base preparation, surface tolerances, elevation, and conduct density tests for conformance to specifications. See ICPI Tech Spec 2, "Construction of Interlocking Concrete Pavement" for further guidance on construction practices.

Note: Mechanical tampers are recommended for compaction of soil subgrade and aggregate base around lamp standards, utility structures, building edges, curbs, tree wells and other protrusions. In areas not accessible to large compaction equipment, compact to specified density with mechanical tampers.

- D. Verify location, type, installation and elevations of edge restraints around the perimeter area to be paved.

---OR---

- E. Install edge restraints per the drawings [and manufacturer's recommendations] at the indicated elevations.
F. Verify that base is dry, uniform, even, and ready to support sand, pavers, and imposed loads.
G. Beginning of bedding sand and paver installation means acceptance of base and edge restraints.

3.02 Installation

- A. Spread the bedding sand evenly over the base course and screed to a nominal 1 in. (25 mm) thickness, not exceeding 1-1/2 in. (40 mm) thickness. The screeded sand should not be disturbed. Place sufficient sand to stay ahead of the laid pavers. Do not use the bedding sand to fill depressions in the base surface.
- B. Ensure that pavers are free of foreign material before installation.
- C. Lay the pavers in the pattern(s) as shown on the drawings. Maintain straight pattern and joint lines.
- D. Joints between the pavers shall be between 1/16 in. and 3/16 in. (2 mm to 5 mm) wide.

Note: Some paver shapes require a larger joint. Consult manufacturer for recommended joint widths.

- E. Fill gaps at the edges of the paved area with cut pavers or edge units.

Note: Units cut no smaller than one-third of a whole paver are recommended along edges subject to vehicular traffic.

- F. Cut pavers to be placed along the edge with (a double blade paver splitter or) masonry saw.
- G. Use a low-amplitude plate compactor capable of at least 5,000 lbf (22 kN) at a frequency of 75 hz - 100hz to vibrate the pavers into the sand.
- H. Compact the pavers again, sweeping dry joint sand into the joints and vibrating until they are full. This will require at least two or three passes with the compactor. Do not compact within 3 ft. (1 m) of the unrestrained edges of the paving units.
- I. All work to within 3 ft. (1 m) of the laying lace must be left fully compacted with sand-filled joints at the end of each day. Cover the laying face with plastic sheets overnight if not closed with cut and compacted pavers.
- J. Sweep off excess sand when the job is complete.
- K. The final surface elevations shall not deviate more than 3/8 in. (10 mm) under a 10 ft. (3 m) long straight edge.
- L. The surface elevation of pavers shall be 1/8 to 1/4 in. (3 to 6 mm) above adjacent drainage inlets, concrete collars or channels.

3.03 Field Quality Control

- A. After removal of excess sand, check final elevations for conformance to the drawings.

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www.tremrongroup.com

2885 St. Clair Street
Jacksonville, FL 32254
866.358.5900 or
904.359.5900
Fax 904.359.5901

11321 NW 112th Court
Medley, FL 33178
800.567.1480 or
305.825.9000
Fax 305.823.6614

3144 Highway 17 NE
Arcadia, FL 34266
877.490.0990 or
863.491.0990
Fax 863.491.8990