

BELGARD INTERLOCKING CONCRETE PAVERS

Section 2780

INTERLOCKING CONCRETE PAVEMENT

PART 1: GENERAL SPECIFICATIONS

Note: This guide specification for concrete paver applications in the U.S. and Canada should be edited to fit 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™ Details & Specifications for Interlocking Concrete Pavement*, for various guide specifications and detail drawings.

1.01 Section Includes

- A. Concrete paver units (Concrete paver edge units)
- B. Bedding and joint sand
- C. Edge restraints

1.02 Related Sections

- A. Section: [-] – Curbs and Drains
- B. Section: [-] – Aggregate Base
- C. Section: [-] – Cement Treated Base
- D. Section: [-] – Asphalt Treated Base
- E. Section: [-] – Pavements, Asphalt and Concrete
- F. Section: [-] – Roofing Materials
- G. Section: [-] – Bitumen and Neoprene Setting Bed, Acrylic Fortified Mortar Setting Bed
- H. Section: [-] – Geotextiles

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 for Fine and Coarse Aggregate
 - 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 (2.49 kg) Rammer and 12 in. (305 mm) drop
 - 8. D 1557, Test Methods for Moisture Density Relations of Soil and Soil Aggregate Mixtures Using a 10-lb (4.54 kg) Rammer and 18 in. (457 mm) drop
 - 9. D 2940, Graded Aggregate Material for Bases or Subbases for Highways or Airports.
- B. Canadian Standards Association (CSA):
 - 1. CSA-A231.2-95, Precast Concrete Pavers.
 - 2. CSA-A23.2A, Sieve Analysis of Fine and Coarse Aggregates.
 - 3. CAN/CSA-A23.1-94, Concrete Materials and Methods of Concrete Construction.
 - 4. CAN/CSA-A82.56M-1976, Aggregate for Masonry Mortar.
- C. Interlocking Concrete Pavement Institute (ICPI)
 - 1. Tech Spec Technical Bulletins.

1.04 Quality 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 current Basic Level Certificate from the Interlocking Concrete Pavement Institute contractor certification program.
- C. Contractor shall conform to all local, state/provincial licensing and bonding requirements.

1.05 Submittals

- A. Shop or product drawings, 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 results from an independent testing laboratory for compliance of paving unit requirements to [ASTM C 936] [CSA] or other applicable requirements.
- E. Manufacturer's certification of concrete pavers by ICPI as having passed applicable ASTM or CSA standards.
- F. 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 shall it be incorporated into the work.

1.07 Delivery, Storage, And Handling

- A. Deliver concrete pavers to the site in steel banded, 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. Secure the covering in place.
- C. Coordinate delivery and paving schedule to minimize interference with normal use of buildings adjacent to paving.

1.08 Environmental Conditions

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

PART 2: PRODUCTS

2.01 Concrete Pavers

Note: Concrete pavers may have spacer bars on each unit. They are recommended for mechanically installed pavers.

Manually installed pavers may be installed with or without spacer bars.

A. Supplied by a Belgard manufacturer:

Akron Brick and Block, 3225 Mogadore Rd, Akron, OH 44312
330-628-2603, fax: 330-628-4467

Amcors Utah Block, 333 S. Redwood Rd, North Salt Lake, UT 85054
801-936-7628, fax: 801-295-5470

Balcon, 2630 Conway Rd, Crofton, MD 21114
410-721-1900, fax: 410-793-0657

Big Rock Building Products, 600 Cardiff Valley Rd, Rockwood, TN 37854
865-354-6660, fax: 865-354-6661

Bosse Concrete Products, 1443 Battle Creek Rd, Jonesboro, GA 30236
770-478-8817, fax: 770-471-2128

Domine Building Products, 735 Wangum Rd, Fishers, NY 14453
716-924-2103, fax: 716-924-2141

Eagle-Cordell Concrete Products, 6414 W Hardy St, Houston, TX 77022
713-691-0022, fax: 713-697-8125

Easton, 800 Uhler Rd, Easton, PA 18040
610-923-5000, fax: 610-923-5005

Foster- Southeastern, Inc, 46 Spring St, Hollbrook, MA 02343
781-767-2202, fax: 781-767-2991

Goria Enterprises, 108 Buchanan Church Rd, Greensboro, NC 27405
336-375-5656, fax: 336-375-8259

Jewell Concrete Products, 400 Jewell Dr, Waco, TX 76712
254-772-3440, fax: 254-772-6999

Miller Material Co, 2405 E 85th St, Kansas City, MO 64132
816-444-2244, fax: 816-444-8736

Schuster's Building Products, 901 E Troy Ave, Indianapolis, IN 46203
317-787-3201, fax: 317-788-5906

Sierra Building Products, 10714 Poplar Ave, Fontana, CA 92335
909-355-6422, fax 909-355-6444

Superlite Block, 4150 W Turney, Phoenix, AZ 85019
602-352-3500, fax: 602-352-0101

Young Block, 2200 W Garden Ln, Tucson, AZ 85705
520-887-1234

4D Incorporated, 136 E. Munger Rd, Munger, MI 48747
800-646-5546, fax: 517-659-2818

B. Product name(s)/shape(s), color(s), overall dimensions, and thickness:
Note to specifier: Pick one

1. Holland Stone:
 - a. 8" x 4" x 2 3/8"
 - b. 8" x 4" x 3 1/8"

2. Color:

OR

1. Keyloc
 - a. 9" x 5 1/2" x 2 3/8"
2. Color:

OR

1. Cambridge Cobble
 - a. Rectangle 9" x 6" x 2 3/8"
 - b. Square 6" x 6" x 2 3/8"
2. Color:

OR

1. Cambridge Cobble Fan
 - a. Center Stone 3" x 6" x 2 3/8"
 - b. Half Stone 3" x 6" x 2 3/8"
 - c. 3/4 Stone 4 1/2" x 6" x 2 3/8"
 - d. Large Circle 5" x 6" x 2 3/8"
 - e. Small Circle 7" x 6" x 2 3/8"
2. Color:

OR

1. Dublin Cobble
 - a. 6" x 7 3/8" x 2 3/8"
 - b. 6" x 6 3/4" x 2 3/8"
 - c. 6" x 6" x 2 3/8"
 - d. 6" x 5 1/8" x 2 3/8"
2. Color:

OR

1. Dublin Circle
 - a. 5 7/8" x 5 1/8" x 2 3/8"
 - b. 5 7/8" x 5 7/8" x 2 3/8"
 - c. 5 7/8" x (6 3/4" - 2 3/8") x 2 3/8"
 - d. 5 7/8" x (5 3/8" - 3 1/2") x 2 3/8"
2. Color:

OR

1. Mega Bergerac
 - a. 4 3/4" x 9 1/2" x 3 1/8"
 - b. 9 1/2" x 9 1/2" x 3 1/8"
 - c. 9 1/2" x 14 1/4" x 3 1/8"
 - d. 14 1/4" x 14 1/4" x 3 1/8"
2. Color:

[_in./mm x_in./mm x_in./mm thick.]

[_in./mm x_in./mm x_in./mm thick.]

[_in./mm x_in./mm x_in./mm thick.]

- C. Meet the following requirements set forth in ASTM C 936, 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.

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- C. Meet the following requirements set forth in CSA-A231.2-95, Precast Concrete Pavers:
1. Minimum average cube compressive strength of 7,250 psi (50 MPa).
 2. Resistance to 50 freeze-thaw cycles while immersed in a 3% saline solution.
- D. Pigment shall conform to ASTM C 979.

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 (0.075 mm) sieve. Bedding sands with these characteristics should not be used. Contact paver contractors local or manufacturers 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 vehicular 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-A23.2A].
- C. Conform to the grading requirements of as shown in Table 1.

Note: Use ASTM or CSA standards as applicable.

Table 1
Grading Requirements for Joint Sand
ASTM C 144 ASTM C 144 CSA A82.56M
Natural Sand Manufactured Sand

Sieve Size	Percent Passing	Sieve Size	Percent Passing
No. 4 (4.75 mm)	100	5 mm	100
No. 8 (2.36 mm)	95 to 100	2.5 mm	95 to 100
No. 16 (1.18 mm)	70 to 100	1.25 mm	90 to 100
No. 30 (0.600 mm)	40 to 100	0.600 mm	35 to 80
No. 50 (0.300 mm)	20 to 40	0.300 mm	15 to 50
No. 100 (0.150 mm)	10 to 25	0.150 mm	2 to 15
No. 200 (0.075 mm)	0 to 10		

Table 2
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, 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.

2.03 Edge Restraints

Note: See ICPI Tech Spec 3, "Edge Restraints for Interlocking Concrete Pavements," for guidance selecting on edge restraints for various applications.

- A. Edge restraints shall be [timber][plastic][concrete][aluminum][steel][pre-cast concrete][cut stone][concrete] [as manufactured by] [and shall conform to the following standards:]

PART 3: EXECUTION

3.01 Examination

Note: For installation on a compacted 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, elevations, 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, or those conforming to ASTM D 2940. Compaction is recommended to not less than 95% Proctor density in accordance with ASTM D 698 is recommended for pedestrian areas and residential driveways. Compaction is recommended to not less than 98% modified Proctor density according to ASTM D 1557 is recommended for vehicular areas.

Note: The 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, elevations, and conduct density tests for conformance to specifications. See ICPI Tech Spec 2, "Construction of Interlocking Concrete Pavements" 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.

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

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- C. Install edge restraints per the drawings [and manufacturer's recommendations][at the indicated elevations].
- D. Verify that base is dry, uniform, even, and ready to support sand, pavers, and imposed loads.
- E. 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 lines.
- D. Points between the pavers on average 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) compaction at a frequency of 75 hz –100 hz.
- H. Compact the pavers, 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 face 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 straightedge.
- 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.