

**Pavers by Ideal® Master Specification for
Aqua-Bric® and Eco-Stone®
Permeable Interlocking Concrete Pavements
Section 02780**

This guide specification should be edited to fit project conditions and requirements. Pavements subject to vehicular traffic should be designed in consultation with a qualified civil engineer, in accordance with established flexible pavement design procedures. Permeable Design Pro software as well as the Interlocking Concrete Pavement Institute (ICPI) Permeable Pavement Manual- Third Edition and ICPI “Tech Spec” series are recommended for technical guidance. Notes are given on the use of a compacted aggregate base under the bedding sand and pavers. Permeable pavements involve analysis of the hydrological design requirements with regard to storm frequency, duration and intensity.

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Concrete paver units.
- B. Bedding/aperture/joint sand.

1.02 RELATED SECTIONS

- A. Section: [] – Curbs and Drains.
- B. Section: [] – Aggregate Base.
- C. Section: [] – Pavements, Asphalt and Concrete.

1.03 REFERENCES

- 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 936 - Specification for Solid Interlocking Concrete Paving Units.
 - 5. C 979 - Specification for Pigments for Integrally Colored Concrete.
 - 6. D 448 – Standard Sizes of Processed Aggregates.
 - 7. D 698 and D 1557 -Test Methods for Moisture Density Relations of Soil and Soil Aggregate Mixtures.
 - 8. D 2940 - Graded Aggregate Material for Bases or Sub bases for Highways or Airports.

1.04 QUALITY ASSURANCE

- A. Paver manufacturer shall be an ICPI Certified Producer.
- B. Installation shall be by a contractor and crew with at least five years experience in placing interlocking concrete pavers on projects of similar size and scope.
- C. Contractor shall conform to all local, state/provincial licensing and bonding requirements and shall have attended the Pavers by Ideal *Advanced Level Course on the Construction of Interlocking Concrete Pavements* or be an ICPI Certified Contractor.

1.05 SUBMITTALS

- A. Concrete paver manufacturer’s literature, product data and color chart.
- B. Five full size samples to indicate color and texture.
- C. Test results from an independent testing laboratory for compliance of paving unit requirements to ASTM C 936 and CSA A231.2-95 for resistance to freeze-thaw and or other applicable requirements.
- D. Sieve analysis for grading of bedding/aperture/joint sand.

1.06 MOCK-UPS

- A. Prior to starting the work, a 10 ft. x 10 ft. area shall be installed as described in Article 3.02.
- B. This area will be used to determine surcharge of the bedding layer, joint sizes, lines, laying pattern(s), and the color(s), and texture of the pavers to be used on the project.
- C. This area shall be the standard from which the work will be judged and shall be left undisturbed until the work is completed. Whenever possible, it shall be incorporated as part of the work.

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1.07 STORAGE AND HANDLING

- A. Protect concrete pavers and accessory materials during shipment, storage, and construction against staining and damage.
- B. Cover sands with waterproof covering to prevent exposure to rainfall or removal by wind.
- C. Coordinate delivery and paving schedule with other trades.

1.08 ENVIRONMENTAL CONDITIONS

- A. Do not install bedding layer or pavers during heavy rain or snowfall.
- B. Do not install bedding layer or pavers over frozen base materials.
- C. Do not place pavers over frozen bedding aggregate.

PART 2 PRODUCTS

2.01 CONCRETE PAVERS

- A. The pavers shall be manufactured by Ideal Concrete Block Company, Inc. PO Box 747, Westford, MA 01886 Phone: 781-894-3200 Fax: 978-692-0817 E-mail: info@IdealConcreteBlock.com or approved Interlocking Concrete Pavement Institute (ICPI) Certified Producer.
- B. The unit pavers for the field shall be:
 - 1. **Aqua-Bric®** permeable pavers.
 - a. The thickness shall be 6 cm.
 - b. Overall dimension 4" x 8".
 - c. The units shall possess 2mm chamfers around the top surface.
 - d. The spacer bars shall be 4.5 mm.
 - e. The units shall be molded with a notch in each corner to provide an overall void space not less than 9.5% per square foot.
 - f. Color shall be _____.
 - 2. **Aqua-Bric® IV** permeable pavers.
 - a. The thickness shall be 8 cm.
 - b. The overall dimension of 4½" x 9".
 - c. The units shall possess 2mm chamfers around the top surface.
 - d. The spacer bars shall be 5 mm.
 - e. The units shall be molded with a notch in each corner to provide an overall void space not less than 10% per square foot.
 - f. Color shall be _____.
 - 3. **Eco-Stone®** permeable pavers.
 - a. The thickness shall be 8 cm.
 - b. The overall dimension of 4½" x 9".
 - c. The apertures shall possess a void space not less than 12% per square foot.
 - d. Color shall be _____.
- C. Unit pavers for the soldier/sailor course shall be **Boston Colonial Pavers®**.
 - 1. The thickness shall be 6cm or 8cm.
 - 2. The overall dimensions of 4" x 8".
 - 3. The color shall be _____.
- D. Pavers shall meet the following requirements set forth in ASTM C 936, Standard Specification for Interlocking Concrete Paving Units.
 - 1. Minimum compressive strength of 8,500 psi with no individual unit less than 7,200 psi.
 - 2. Maximum water absorption of 5% with no unit greater than 7% when tested in accordance with ASTM C140.
 - 3. Freeze-thaw resistance according to CSA A231.2-95.

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2.02 BEDDING/APERTURE/ JOINT AGGREGATE

- A. #8 stone or 3/8 crushed stone conforming to ASTM #8 clean graded stone shall be used as the bedding, aperture, and joint material for Eco-Stone® Pavers
- B. #8 stone or 3/8 crushed stone conforming to ASTM #8 clean graded stone shall be used as the bedding material for Aqua-Bric® and Aqua-Bric® IV. 1/4" stone shall be used for aperture and joint material for Aqua-Bric® and Aqua-Bric® IV.
- C. #8 stone or 3/8 crushed stone shall be used as the bedding material for the Boston Colonial Pavers® in the soldier/sailor course. Concrete sand conforming to ASTM C 33 shall be used as the joint sand for the Boston Colonial Pavers®.
- D. The aggregate sand shall be clean, washed natural or manufactured. It shall be non-plastic and free from deleterious or foreign matter. In no case shall the use of limestone screenings be permitted.

2.03 EDGE RESTRAINTS

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

- A. Edge restraints shall be PaveEDGE®, SnapEdge®, granite, pre-cast concrete or existing structures.

2.04 BASE AGGREGATE

Note: Permeable interlocking concrete pavements require site specific design as determined by the structural and hydrological requirements of the pavement. In many cases, 1½" processed gravel aggregate conforming to ASTM D 2940 for highway flexible pavements is sufficient to accommodate the first flush and rainfall of a 2 year – 24 hour storm. Where greater infiltration capacity and storage is desired due to higher rainfall intensity, a 1½" open-graded aggregate similar to ASTM #467 is more appropriate. If ASTM #467 stone is not available, ASTM #57 stone may be used when the thickness of the base is not greater than 6". For base thicknesses exceeding 6", #57 stone should be used in combination with ASTM #2 stone where the #2 stone comprises the majority of the base thickness. (See appendix for Tables)

2.05 WOVEN GEOTEXTILE

- A. Woven geotextile shall be Strata Micro grid or Mirafi Filterweave high modulus, woven polypropylene fabric with a minimum Mullen Burst Strength not less than 450 psi in accordance with ASTM D 3786.

PART 3 EXECUTION

3.01 EXAMINATION

Note: For installation on a compacted aggregate base and soil sub grade, the specifier should be aware that the top surface of the pavers may be set 1/8 in. 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 minor settling during the initial lock-up period.

A. SUB GRADE

- 1. Verify that sub grade preparation, surface tolerances and compacted density conform to the specifications.
- 2. Verify that woven geotextile fabric has been placed according to specifications and drawings.

B. BASE

Thickness: For structural design the minimum thickness, over well-draining sub grade soils, is typically 6" to 8" for pedestrian use, 12" for vehicular traffic subject to passenger type vehicles and up to 18" for street and industrial pavements. Pavements subject to vehicular traffic should be designed in consultation with a qualified civil engineer, in accordance with established flexible pavement design procedures. Lockpave Pro design software as well as the Interlocking Concrete Pavement Institute (ICPI) "Tech Spec" series are recommended for technical guidance

The final thickness of the base also may be influenced by the hydrological requirements for the site. How much water will flow into the pavement system and what will be done with it once it enters the base layer must be determined. Factors such as: type of sub grade soil and its infiltration capacity, depth to bedrock and the depth of the seasonable high of the water table, must be considered to determine if the water can be allowed to soak into the sub grade soil or is it necessary to divert it to another location. In the case of the latter, it is necessary to install perforated drainage pipe. The condition of the site, such as the terrain, the area of impervious surfaces including structures, and location to wetland areas, are some other aspects that also must be evaluated.

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1. Verify that aggregate base materials, thickness, compaction, surface tolerances, and elevations conform to specifications.
2. Recommended base surface tolerance should be +/- 3/8 in. (10 mm) over a 10 ft. (3 m) straight edge.
3. The base shall extend 6" beyond the area to be paved when using Pav Edge or directly to curbing or suitable established structures.
4. Verify that base is dry, uniform, even, and ready to support sand, pavers, and imposed loads.
5. See ICPI Tech Spec 2, "Construction of Interlocking Concrete Pavements" for further guidance on construction practices.

C. EDGE RESTRAINTS

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

3.02 INSTALLATION

A. **SUBGRADE:** All organic or unsuitable material shall be removed. The soil shall be graded uniform and flat and, if required, compacted to a minimum 95% standard Proctor density per ASTM D 698, or compaction to ASTM D 1557, may be necessary for areas subject to continual vehicular traffic. Filterweave woven geotextile fabric shall be rolled over the entire area overlapping all seams by no less than 24". The fabric shall be extended up the sides of the excavated area. *(Note: Except where the CBR is <5 avoid compacting subgrade under PICIP installations whenever possible. Consult engineer to determine if compaction of sub-grade is desirable.)*

B. BASE:

1. Compaction shall not be less than 95% Standard Proctor Density in accordance with ASTM D 698 for areas subject to pedestrian use only. All pavement subject to vehicular traffic shall be compacted to not less than 98% Modified Proctor density according to ASTM D 1557.
2. The base shall be placed in layers uniformly spread and compacted. For vehicular areas, the material shall be placed in 4" to 6" thick lifts and compacted using a plate rammer or vibratory roller. Base material for pedestrian areas may be placed in 4" thick lifts and compacted using a plate compactor capable of exerting no less than a 5000 lbs. force.
3. In areas not accessible to roller compaction equipment, compact to specified density with hand operated equipment..

C. SETTING BED

1. Spread the bedding aggregate evenly over the base course and screed to a nominal 2 in. thickness.
2. Once screeded, the bedding material should not be disturbed or pre-compacted.
3. Do not use the bedding aggregate to fill depressions in the base surface.

D. PAVERS

1. Ensure that pavers are free of foreign material before installation.
2. Set concrete pavers in accordance with patterns shown on the drawings. Units shall be installed straight and true to the required lines. Maintain straight pattern lines.
3. Typical joints between the pavers shall be between 1/16 in. and 3/16 in. (2 mm to 5 mm) wide on average.
4. Cut as necessary to accommodate field conditions and to achieve an accurate and consistent fit to pattern as indicated on plans and details. Concrete pavers shall be free from stain, dirt, or dust after cutting.
5. Install "soldier/sailor" course as shown on the Plans or 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

6. Work shall proceed by moving forward on top of the previously installed units. On sloped areas, work shall proceed uphill.
7. Pavers shall be taken from 3 or more pallets at the same time by working vertically through the cubes to blend color evenly.
8. Care shall be taken when transporting material over uncompacted pavement in order to prevent damage or pre-compaction.

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E. COMPACTION

1. After a substantial area of pavers has been placed, the pavers shall be vibrated into the setting bed using a low amplitude, high frequency plate vibrator capable of applying a minimum force of 4000-5000 lbs. using overlapping passes.
2. Replace broken or cracked pavers with new units to match adjoining pavers.
3. Sweep into the joints and apertures.
4. Compact the entire pavement in overlapping passes to insure the pavement surface is true to grade. Do not vibrate within 3 ft. of the unrestrained edges of the paving units.
5. Sweep additional #8 stone or 3/8 stone over Eco-Stone® pavement surface or 1/4" stone over Aqua-Brick® and Aqua-Bric® IV pavement surfaces and compact until the joints and apertures are completely full.
6. All work to within 3 ft. of the laying face must be left fully compacted with sand-filled joints at the end of each day.

F. COMPLETION

1. Sweep off excess sand when the job is complete.
2. The final surface elevations shall not deviate more than 3/8 in. under a 10 ft. long straightedge.
3. The surface elevation of pavers shall be 1/8 in. to 1/4 in. above adjacent drainage inlets, concrete collars or channels.

3.03 QUALITY CONTROL

- A. After removal of excess sand, check final elevations for conformance to the drawings.
- B. Replace pavers that are chipped, broken, stained, or otherwise damaged.
- C. If necessary, redistribute units to achieve uniform color blending.
- D. Clean exposed surfaces to remove asphalt, dirt and stains.
 1. If using a commercial cleaner, follow procedures recommended by chemical company and paver manufacturer.
 2. Test small sample areas for acceptance of cleaning procedures.
 3. Protect adjacent surfaces from damage during cleaning and operations.
- E. After cleaning, examine work and repair unacceptable conditions and correct as required.
- F. Do not permit construction vehicles to traffic the pavement during installation and after completion.
 1. Keep the pavement free of construction debris and run-on from adjacent areas of exposed soil.

4. MAINTENANCE

Note: Proper design and installation, including the use of the correct aggregates to fill the voids, coupled with a scheduled maintenance program can prevent the loss of porosity over time. The frequency of cleaning is determined by rate of sedimentation which depends on the amount and type of traffic the pavement receives as well as the residue collected in the run-off. Periodic sweeping with street cleaning is recommended. Properly installed, Aqua-Bric and Eco-Stone pavements can be plowed with conventional snow removal equipment. Blade height adjustment is not required.

- A. The pavement should be kept clean of leaves and debris. Use sand sparingly in the winter. When necessary to restore infiltration, sweep and clean the pavement with equipment similar to a Johnson 605 vacuum. Add material as required to refill apertures in the pavement.
- B. For commercial parking areas, the cleaning should be performed when porosity reaches a reduced level of _____%.

END OF SECTION

Table Appendix

<i>Ideal Eco-Grade Filtration Stone: Joint/Void</i>	
Sieve Size	Percent Passing
# 4	100
# 8	49
# 16	7.3
# 60	3.6
# 100	3.5
# 200	1.6

<i>ASTM # 9 (1/4") Stone – Joint/Void</i>	
Sieve Size	Percent Passing
3/8"	100
No. 4	85 to 100
No. 8	10 to 40
No. 16	0 to 10
No. 50	0 to 5

<i>ASTM # 8 (3/8") Stone – Setting Bedding</i>	
Sieve Size	Percent Passing
1/2"	100
3/8"	85 to 100
No. 4	10 to 30
No. 8	0 to 10
No. 16	0 to 5

<i>ASTM # 57 (3/4") Open Graded Stone – Base</i>	
Sieve Size	Percent Passing
1 1/2"	100
1"	95 to 100
1/2"	25 to 60
No. 4	0 to 10
No. 8	0 to 5

<i>ASTM # 467 1 1/2" Open Graded Stone – Base</i>	
Sieve Size	Percent Passing
2"	100
1 1/2"	95 to 100
1"	35 to 70
3/4"	0 to 25

<i>ASTM # 2 (2 1/2") Open Graded Stone – Base/Sub base</i>	
Sieve Size	Percent Passing
3"	100
2 1/2"	90 to 100
2"	35 to 70
1 1/2"	0 to 15
3/4"	0 to 5