Paver Systems Master Specification for
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. Lockpave Pro 2002® and Uni_Info-CAD design software as well as the Interlocking Concrete Pavement Institute (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. Other base materials may be used. Permeable pavements involve analysis of the hydraulic design requirements and utilize aggregates for the base, setting bed and joints different from the materials recommended herein. Please contact our office for more information on the design considerations for permeable pavements.

PART 1 - GENERAL

1.01 SECTION INCLUDES
A. Concrete paver units.
B. Bedding and joint sand.

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

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 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 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. 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.
B. Contractor shall conform to all local, state/provincial licensing and bonding requirements and shall hold a, or have received training according to, the ICPI Contractor Certification program.

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 or other applicable requirements.
D. Sieve analysis for grading of bedding and 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 sand 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.

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. 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 or pavers over frozen base materials.

C. Do not place pavers over frozen sand.

PART 2 PRODUCTS

2.01 CONCRETE PAVERS

A. Concrete pavers shall be supplied by a Certified Producer member of the Interlocking Concrete Pavement Institute (ICPI). The ICPI Supplier shall be:

Paver Systems, LLC
West Palm Beach, FL (800) 226-90004
Orlando, FL (800) 226-9117
Tampa, FL (800) 356-7283

B. Product name(s)/shape(s), color(s), overall dimensions and thickness shall be:

NAME		SIZE	THICKNESS
Traditional Shapes/Finishes			
Holland Stone Paver ™		4”x 8”	7/8”, 2 3/8”, 3 1/8”
Uni-Decor®		5.5”x 9”	7/8”, 2 3/8”, 3 1/8”
Uni-Stone®		4.5” x 9”	2 3/8”, 3 1/8”
Uni-Anchorlock®		8.9” x 8.87”	3 1/8”
City Series™			
	4x4 City Series	4” x 4”	7/8”, 2 3/8”
	6x6 City Series	6” x 6”	2 3/8”
	8x8 City Series	8” x 8”	2 3/8”
	12x12 City Series	12” x 12”	2 3/8”
	City Diamond	11” x 9.25”	2 3/8”
Symetry Square™		6.3” x 6.3”	2 3/8”
Symetry Stone™		4.4” x 10.8”	2 3/8”
Classico®	Large Rectangle	4.5” x 6.75”	2 3/8”
	Square	4.5” x 4.5”	2 3/8”
	Circle & Fans	N/A	2 3/8”
MultiLock™		5.5” x 6.37”	2 3/8”
Appian-Stone®	Square	6.3” x 6.3”	7/8”, 2 3/8”
	Large Rectangle	6.3” x 9.4”	7/8”, 2 3/8”
Jericho™	Small Rectangle	5.75” x 5”	2 3/8”
	Square	5.75" x 5.75"	2 3/8"
	Large Rectangle	5.75" x 7.25"	2 3/8"
	Medium Rectangle	5.75" x 6.625"	2 3/8"
Hexagon™		12”x 12”	2 3/8”
Cobble-Lock™		7.37” x 9.5”	7/8”, 2 3/8”
Key Largo™		6.5” x 8.875”	2 3/8”
Environmental Pavers			
Turfstone		24" x 16"	3 1/8", 4"
Ecostone		4.5" x 9"	3 1/8"
Bullnose Coping Paver		4” x 12”	2 3/8”

C. Pavers shall be ICPI Certified to meet the following requirements set forth in ASTM C 936, Standard Specification for Interlocking Concrete Paving Units.

1. Minimum compressive strength of 8,000 psi with no individual unit under 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.

1.02 BEDDING AND JOINT SAND

Note: The type of sand used for bedding is often called concrete sand. Stone sand that passes the following gradation requirements are also acceptable. Limestone screenings and stone dust generally are not acceptable and should not be used because they can be unevenly graded and have an excess amount of material passing the No. 200 (0.075 mm) sieve. ***Uni-Ecostone pavements require EcoGrade Filtration Sand conforming to No.8 to No.4 (2mm to 5mm) clean graded stone for the bedding and jointing material.***

A. The bedding sand shall be clean, washed natural or manufactured concrete sand conforming to Table 1. It shall be non-plastic and free from deleterious or foreign matter. Do not use limestone screenings or stone dust that do not conform to the grading requirements in Table 1.

Note: When concrete pavers are subject to vehicular traffic, the sands shall be as hard as practically available. If the hardness is questionable for the application (usually heavily trafficked thoroughfare), contact the ICPI for information and specifications on assessing bedding sand durability under heavy traffic loads.

Table 1
Grading Requirements for Bedding Sand
ASTM C 33

Sieve Size	Percent Passing
3/8 in. (9.5 mm)	100
No. 4 (4.75 mm)	95 to 100
No. 8 (2.36 mm)	85 to 100
No. 16 (1.18 mm)	50 to 85
No. 30 (0.600 mm)	25 to 60
No. 50 (0.300 mm)	10 to 30
No. 100 (0.150 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.

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

Table 2
Grading Requirements for Joint Sand
ASTM C 144

	Natural Sand	Manufactured Sand
Sieve Size	Percent Passing	Percent Passing
No. 4 (4.75mm)	100	100
No. 8 (2.36 mm)	95 to 100	95 to 100
No. 16 (1.18 mm)	70 to 100	70 to 100
No. 30 (0.600 mm)	40 to 75	40 to 100
No. 50 (0.300 mm)	10 to 35	20 to 40
No. 100 (0.150 mm)	2 to 15	10 to 25
No. 200 (0.075 mm)	0	0 to 10

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®, granite, pre-cast concrete or existing structures.

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 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

Note: Compaction of the soil subgrade is recommended to at least 95% Standard Proctor Density per ASTM D 698. Higher density, or compaction to ASTM D 1557, may be necessary for areas subject to continual 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.

1. Verify that subgrade preparation, compacted density and elevations conform to the specifications.
2. Verify that geotextiles, if applicable, have been placed according to specifications and drawings.

B. Base

Note: Local aggregate base materials typical to those used for highway flexible pavements are recommended, or those conforming to ASTM D 2940. (The base may also be asphalt, concrete or flowable fill.) Compaction to not less than 95% Proctor Density in accordance with ASTM D 698 is recommended for pedestrian areas. Compaction to not less than 98% Modified Proctor Density according to ASTM D 1557 is recommended for vehicular areas. The aggregate base should be spread and compacted in uniform layer not exceeding 4 in. (150 mm) thickness. 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: Uni-Ecostone pavements require site specific base materials as determined by the structural and hydraulic design requirements of the pavement****.*

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. Verify that base is dry, uniform, even, and ready to support sand, pavers, and imposed loads.

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 roller compaction equipment, compact to specified density with hand operated equipment..

C. Edge Restraints

1. Verify location, type, installation and elevations of edge restraints around the perimeter area to be paved.
2. The base shall extend 6" beyond the area to be paved when using Pave Edge or directly to curbing or suitable established structures.

3.02 INSTALLATION

A. Setting Bed

1. Spread the sand evenly over the base course and screed to a nominal 1 in. (25 mm) thickness, not exceeding 1½ in. (40 mm) thickness. The actual thickness shall be determined at the job site based on field trials in order to achieve a uniform depth not less than ¾" and not greater than 1" after compaction.
2. The screeded sand should not be disturbed or pre-compacted.
3. Do not use the bedding sand to fill depressions in the base surface.

B. 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.

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

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.

C. Compaction

1. After a substantial area of pavers has been placed, use low amplitude, high frequency plate vibrator to vibrate the pavers into the sand. Use Table 3 below to select size of compaction equipment:

Table 3 – Minimum Centrifugal Compaction Force

Paver Thickness	Compaction Force
60 mm	3000 lbs. (13 kN)
80 mm	5000 lbs. (22kN)

D. Completion

1. Sweep dry sand over the pavers. If more than one type of sand is to be used, the initial sweeping shall be with the coarse material used for the bedding layer. Subsequent sweeping shall use masonry sand conforming to Table 2 and shall continue until the joints are full and the pavers fully seated. This will require at least two or three passes with the vibrator. Do not vibrate within 3 ft. of the unrestrained edges of the paving units.
2. 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.
3. Sweep off excess sand when the job is complete.
4. The final surface elevations shall not deviate more than 3/8 in. under a 10 ft. long straightedge.
5. The surface elevation of pavers shall be 1/8 in. to ¼ 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. Remove pavers that are loose, chipped, broken, stained or otherwise damaged, with fresh units and re-set units that do not match adjoining units. Provide new units to match adjoining units and install in same manner as original units with same joint treatment to eliminate evidence of replacement.
C. Clean exposed surfaces with potable water and stiff fiber brushes until all dirt, stains, efflorescence, asphalt, and other blemishes are removed. Use cleaner and procedures recommended by paver manufacturer. Test small sample areas for acceptance of cleaning procedures. Do not use wire brushes, metal scrapers or acids. Protect adjacent surfaces from damage during cleaning and operations.
D. After cleaning, examine work and repair unacceptable conditions and correct as required.
E. After installation and cleaning, protect work from damage during subsequent construction activities until work is accepted.

END OF SECTION