

Oldcastle Architectural, Inc.



BELGARD®

Walls & Floors for Your Outdoors™

1. Product Name

- Belgard® Stone Pavers
- Celtik® Curb

2. Manufacturer

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3. Product Description

BASIC USE

Belgard® interlocking concrete pavers are suited to a wide range of design applications, including:

- Patios, porches, entrances, walkways and driveways
- Plazas, pools and roof plaza decks
- Sidewalks, parking lots and streets

Celtik® Curb is designed to follow the tightest curves and the following applications:

- Tree contours
- Paver edge restraint
- Garden and planting bed borders

COMPOSITION & MATERIALS

Belgard interlocking pavers are composed of Portland cement with fine and coarse aggregates. Color or special aggregates are added to create a stone-like appearance. These materials are combined with a small amount of water to produce zero-slump concrete. Admixtures in the concrete mix reduce efflorescence. The units are molded in factories using machines that apply pressure and vibration, resulting in high-density, high-strength units.

TYPES, FINISHES, COLORS

Special distressed architectural finishes are available. Special aggregates and color blends create these architectural finishes. Contact Oldcastle for locally available finishes and colors.

SIZES, SHAPES

Concrete pavers are defined as units having a surface area no greater than 100 in² (0.065 m²) and having a length divided by thickness (aspect ratio) not exceeding 4. Oldcastle produces the following shapes for unique architectural detail:

- Mega Bergerac® - Large format distressed paver. Antique stone-like appearance with dimpled surface
- Bergerac - Medium format. Antique stone-like appearance with dimpled surface
- Dublin® Cobble Modular, Combo or Circle - Smaller format. Antiqued with distressed surfaces and edges
- Cambridge Cobble - Similar to the Dublin without distressed surface
- Holland - Traditional brick-like appearance

LIMITATIONS

Like any pavement, the long-term performance of interlocking concrete pavement relies on the correct materials and an adequately prepared soil subgrade and base. Specific limitations are identified in Belgard technical guides.

Note - For pedestrian applications and residential driveway applications, 2 3/8" (60 mm) thick pavers are recommended. Pavements subject to vehicular traffic typically require pavers that are 3 1/8" (80 mm) thick.

4. Technical Data

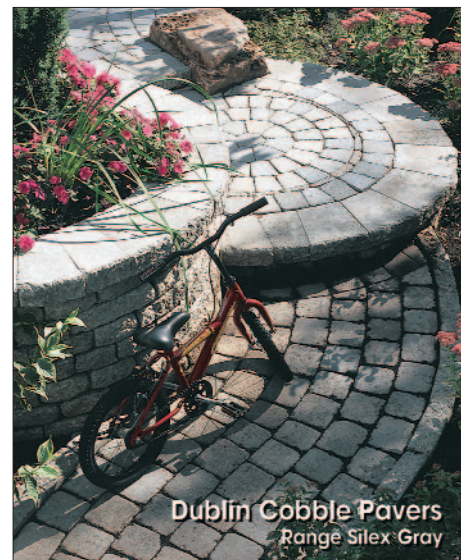
APPLICABLE STANDARDS

ASTM International

- ASTM C33 Standard Specification for Concrete Aggregates
- ASTM C144 Standard Specification for Aggregate for Masonry Mortar
- ASTM C936 Standard Specification for Solid Concrete Interlocking Paving Units
- ASTM D698 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³))
- ASTM D1557 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³))
- ASTM D2940 Standard Specification for Graded Aggregate Material for Bases or Subbases for Highways or Airports

Canadian Standards Association (CSA)

- CSA-A179 Mortar and Grout for Unit Masonry
- CSA-A231.2-95 Precast Concrete Pavers
- CAN/CSA-A23.1-94 Concrete Materials and Methods of Concrete Construction



APPROVALS

Consult manufacturer for current information on compliance with requirements of specific agencies and/or building code jurisdictions.

ENVIRONMENTAL CONSIDERATIONS

Materials are noncorrosive and safe for the environment.

PHYSICAL/CHEMICAL PROPERTIES

Interlocking concrete pavers manufactured in the U.S. should meet the requirements of ASTM C936, Standard Specification for Solid Interlocking Concrete Paving Units. Those produced in Canada should meet the requirements of CSA-A231.2, Precast Concrete Pavers.

5. Installation

Installation should be performed by experienced contractors who have been instructed and tested on knowledge of interlocking concrete pavement construction.

Subgrade Preparation

Belgard interlocking concrete pavements typically consist of a soil subgrade, an aggregate base, bedding sand, concrete pavers, edge restraints and drainage. Geotextiles may be used under the base or over clay and silt subgrade soils to extend the life of the base and reduce the likelihood of deformation. The installation guidelines below apply to pedestrian and many vehicular applications. For street, industrial, port and airport pavement designs, consult with a qualified civil engineer familiar with local soils, pavement design methods, materials and construction practices.

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Once excavation and grading are complete, compact the soil subgrade prior to placing the geotextile (if applicable) and aggregate base. Soil compaction should be at least 98% Proctor density (per ASTM D698) for pedestrian areas, and at least 98% modified Proctor density (per ASTM D1557) for areas under continual traffic. Some soils may not achieve these levels of density and compaction due to a low bearing capacity or from continual moisture. If such soils are under a base that will receive constant vehicular traffic, the soils may need to be stabilized or have drainage designed to remove excess water.

Base Material Preparation

Aggregate base materials should conform to those used under asphalt. If no local standards exist, then requirements for aggregate base in ASTM D2940 are recommended. The thickness of the base depends on the strength of the soil, drainage, climate and traffic loads.

Base thickness under asphalt can typically be used under interlocking concrete pavers. Aggregate bases for patios and walks are 4" - 6" (100 - 150 mm), driveways 6" - 8" (150 - 200 mm), and streets 8" (200 mm) or greater thickness. These thicknesses may be adjusted according to climate, site conditions and traffic. The base should be compacted in maximum 6" (150 mm) lifts. The aggregate base should be compacted to at least 98% Proctor density for patios, walkways and residential driveways. Compaction next to curbs, utility structures, lamp base and other protrusions in the pavement is essential to minimize settlement.

Site inspection and testing of the compacted soil and base materials are recommended to ensure that compaction requirements have been met. Compacted base materials stabilized with asphalt or cement may be used in heavy load applications or over weak soil subgrades. The finished surface of the compacted base should have tolerance of $\pm 3/8"$ (± 10 mm) over 10' (3 m).

Bedding Sand

Bedding sand should conform to the grading requirements of ASTM C33 or CSA A23.1. Do not use mason sand. Stone dust or waste screenings should not be used, as they can have an excessive amount of material passing the No. 200 (0.075 mm) sieve. The sand should be screeded to a consistent, even thickness between 1" and 1 1/2" (25 and 40 mm).

Do not use the sand to fill depressions in the base since these eventually will be reflected in the surface of the finished pavement. Fill any depressions with base material and compact. Geotextile may be applied under the bedding sand adjacent to curbs, roof parapets, drains, utility structures and over asphalt or cement-stabilized bases to prevent migration of the bedding sand into joints or cracks. When applied in these locations, the fabric should be turned up against vertical surfaces to contain the bedding sand.

Shapes and Patterns

The concrete pavers' shape determines the type of laying patterns. Forty-five and 90 degree herringbone patterns are recommended in areas subject to continual vehicular traffic. They will give the maximum interlock and structural performance. Some patterns have "edge" pavers specifically designed to fit against the edge restraints. Concrete pavers can be cut with a splitter or masonry saw to fit along the edge of the pavement. For driveways, parking lots and streets, cut pavers no smaller than one-third of a unit are recommended in areas exposed to tire traffic.

Compaction

Once the pavers are placed in their specified pattern(s), they are compacted into the bedding sand with a plate compactor. The compactor should have a minimum force of 4000 lb (18 kN) and frequency of 75 - 100 Hz. After the pavers are compacted, sand is swept and vibrated into the joints until they are full. Joint sand should conform to the grading requirements of ASTM C144 or CSA-A179. The coarser bedding sand can be used in the

joints also, but extra effort may be required in sweeping and compaction to fill the joints. All pavers within 3' (1 m) of unfinished edges should have the joints full and be compacted at the end of each day.

Edge Restraints

Edge restraints around interlocking concrete pavement are essential to their performance. They hold the pavers and sand together, enabling the system to remain interlocked. For walks, patios and driveways, edge restraints can be Celtik Curb, steel, aluminum, troweled (hidden) concrete curb (recommended for non-freeze/thaw climates), or plastic edging specifically designed for concrete pavers. Formed or precast concrete restraints are required for crosswalks, parking lots, drives, streets, and industrial, port and airport pavements.

Precast concrete and cut stone curbs are suitable for streets, drives and parking lots. Edge restraints are typically placed before installing the bedding sand and concrete pavers. Some edge restraints such as Celtik Curb, plastic, steel and aluminum can be installed after placing the concrete pavers. Surface and subsurface drainage should conform to that used for any other flexible pavement.

Roof Plaza/Parking Decks

Belgard interlocking concrete pavements can be placed on parking garage roofs and pedestrian roof plazas. Concrete pavers provide attractive ballast for waterproof membrane. As a heat sink, the pavers reduce thermal stress on the membrane. The roof deck structure should be waterproofed, designed to withstand loads and be sloped at least 2% to drain. Protection board should be applied according to the recommendations of the waterproof membrane manufacturer. Geotextile is applied around roof drains to prevent the migration of bedding sand. The drains should have holes at the level of the waterproof membrane to allow removal of subsurface water. Drainage mat should not be used with vehicular pavements.

Pavement Overlay/Inlay

New or existing asphalt or concrete pavements can be overlaid with concrete pavers. The surface of the existing pavement can be milled out and bedding sand and pavers placed in the milled area. Consideration should be given to drainage of excess moisture in the bedding sand during the early life of the pavement overlay/inlay.

Drainage can be achieved by drilling/casting vertical holes at the lowest elevations of

the pavement or directing drain holes to catch basins, especially if there is a high watertable. The drain holes should be covered with geotextile to prevent loss of bedding sand. Geotextile may need to be applied at pavement joints and cracks. Cracks larger than 3/8" (9.5 mm) width should be patched prior to placing geotextile, bedding sand and pavers.

Concrete pavers can be set on a bituminous setting bed with neoprene modified asphalt mastic for pedestrian or vehicular applications. The base under the bituminous sand setting bed is typically concrete. Pavers can be mortared directly to a concrete base using an acrylic fortified mortar bed. Mortared applications are recommended in non-freeze/thaw regions and for pedestrian applications only.

Bitumen and mortar-set pavers are expensive compared to sand-set paving and slow to construct. Polymer adhesives specially designed for adhering concrete pavers to concrete enable faster installation without the chance of accidentally staining the surface of the pavers with mortar. Polymer adhesives are not recommended for vehicular areas.

Celtik Curb Installation

Aggregate base thickness must be consistent with paver base material and extend 12" (305 mm) beyond curb for adequate anchoring. Install the curb on the same laying bed as the abutting pavers. Alternate the angled curb modules for straightline curbs. Install the angled curb modules in the same direction for curves. Secure plastic anchors outside of each unit and insert spikes into well-compacted base material.

PRECAUTIONS

- Do not install sand or pavers during heavy rain or snowfall
- Do not install sand and pavers over frozen base materials
- Do not install frozen sand
- Do not install pavers on frozen or saturated sand

6. Availability & Cost

AVAILABILITY

Belgard interlocking concrete pavers are available from Oldcastle companies throughout the U.S. and Canada. Visit the Belgard website to locate local companies.



Mega Bergerac Pavers
Range Brittany Beige

COST

Installed cost information may be obtained from a local Belgard manufacturing facility.

7. Warranty

Oldcastle certifies that the specified product meets the requirements of ASTM C936 or CSA A231.2, as applicable. Belgard offers a lifetime product warranty against manufacturing defects, provided the product is installed by an authorized Belgard contractor.

8. Maintenance

When properly designed and installed, concrete pavers require little maintenance. If there is a need to remove dirt or stains, or if there is a need to protect the surface from stains, cleaners and sealers specifically designed for concrete pavers should be used.

9. Technical Services

Oldcastle offers design assistance and technical support. The support is delivered through publications, software, public relations, the Internet, audio/visual presentations, educational seminars, AIA and ASLA continuing education programs and certification for paver installers.

Oldcastle also provides resources for homeowners interested in patios, walkways, pool decks and driveways. Oldcastle offers marketing and technical resources for sale on its website.

10. Filing Systems

- First Source
- MANU-SPEC™
- Additional product information is available from the manufacturer upon request.