



## DESIGN & INSTALLATION CONSIDERATIONS FOR BELGARD® SLABS & PLANKS

Belgard slabs and planks are an excellent choice for a variety of hardscaping solutions. These products come in many different shapes and thicknesses, and in a variety of colors and textures. Large format paving slab units have aspect ratios (length divided by thickness)  $> 4$  and structurally perform differently than traditional pavers. Planks have plan ratios (length divided by width)  $\geq 4$  and perform similar to slabs under loading. Vehicular traffic can crack slabs and planks due to high bending forces or simply movement in a sand setting bed. In general, slabs and planks are not designed for vehicular traffic loading unless a project-specific design is developed. In addition to sand set on dense-graded aggregate (DGA), commercial slab assemblies may include a concrete base for a sand set or bituminous set, and in some cases, an adhered solution. This Technical Note provides design and installation considerations when installing slabs and planks.

### Product Definitions

Paving slabs are defined in ASTM C1782 *Standard Specification for Utility Segmental Concrete Paving Slabs* and in Canada by CSA A231.1 *Precast Concrete Paving Slabs*. Belgard paving units 12" x 12" and larger meet the dimensional requirements of these standards. Both standards require an aspect ratio  $> 4$  and have other requirements including minimum and maximum thickness, and flexural strength requirements. While no product manufacturing specification currently exist for planks, the industry does define a plank as a linear concrete paving unit having an aspect ratio and plan ratio  $\geq 4$ . In addition, a plank has a minimum width of 3" with a maximum width of 6", and a minimum length of 11.75" with a maximum length of 48". Finally, the face area must be  $\leq 288$  in.<sup>2</sup>

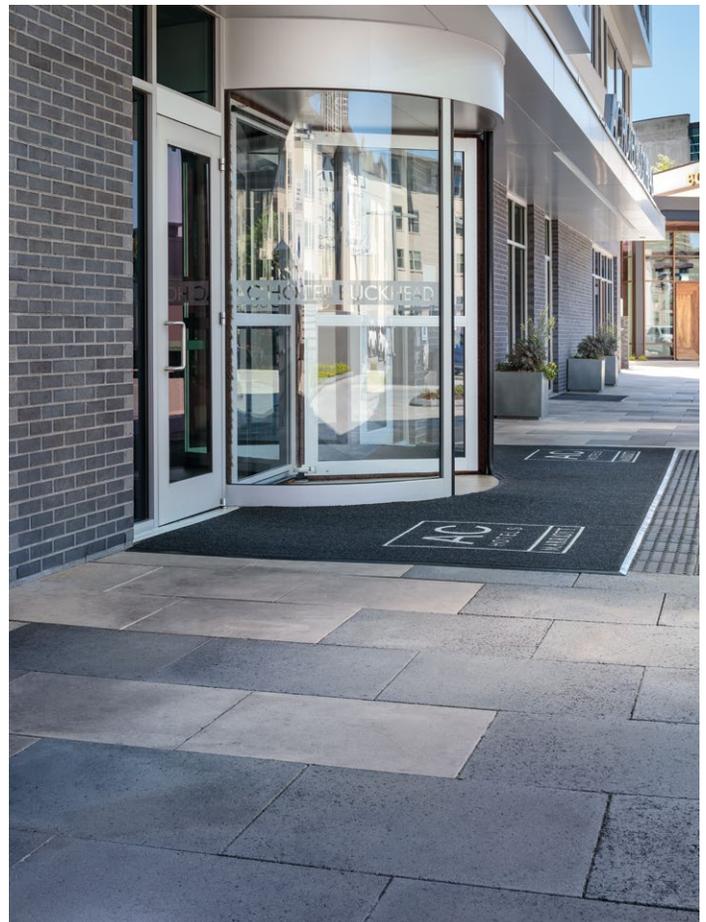
The load limit of paving slabs and planks is much lower than conventional pavers. Due to slabs and planks being relatively thin when compared to their length (aspect ratio), the mode of failure or breakage is different from pavers and is why ASTM C1782 uses a minimum average flexural strength of 725 psi (5 MPa) instead of compressive strength. In addition, the slab or plank must be freeze-thaw durable for cold weather climates. While slabs and planks can be subjected to some vehicular loading, proper design and assembly is required. Contact a Belgard representative if there is any question regarding the suitability of a paver and slab for vehicular use.

### Installation

The following information addresses the most important considerations when installing Belgard slabs and planks. For a detailed overview of slab and plank construction review ICPI's Tech Spec 25 *Construction Guidelines for Segmental Concrete Paving Slabs and Planks in Non-Vehicular Residential Applications*.

### Assembly Options

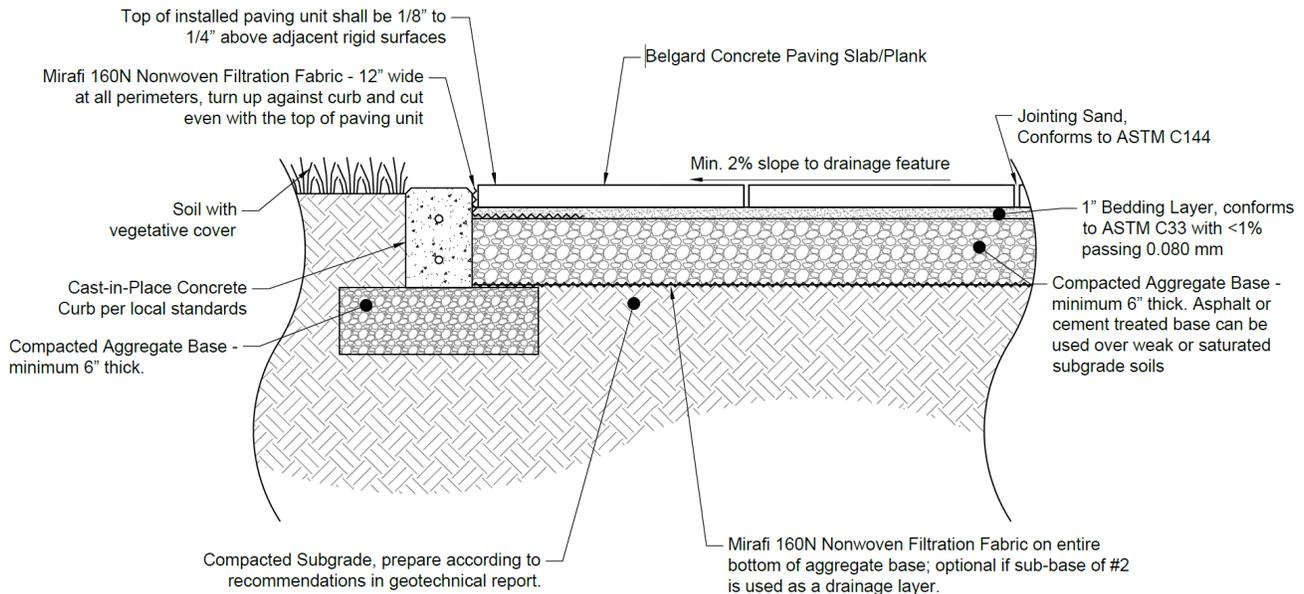
Belgard slabs and planks require different design solutions and installation methods compared to traditional pavers. Site-specific conditions dictate the appropriate shape, unit thickness, and overall assembly including base thickness design.



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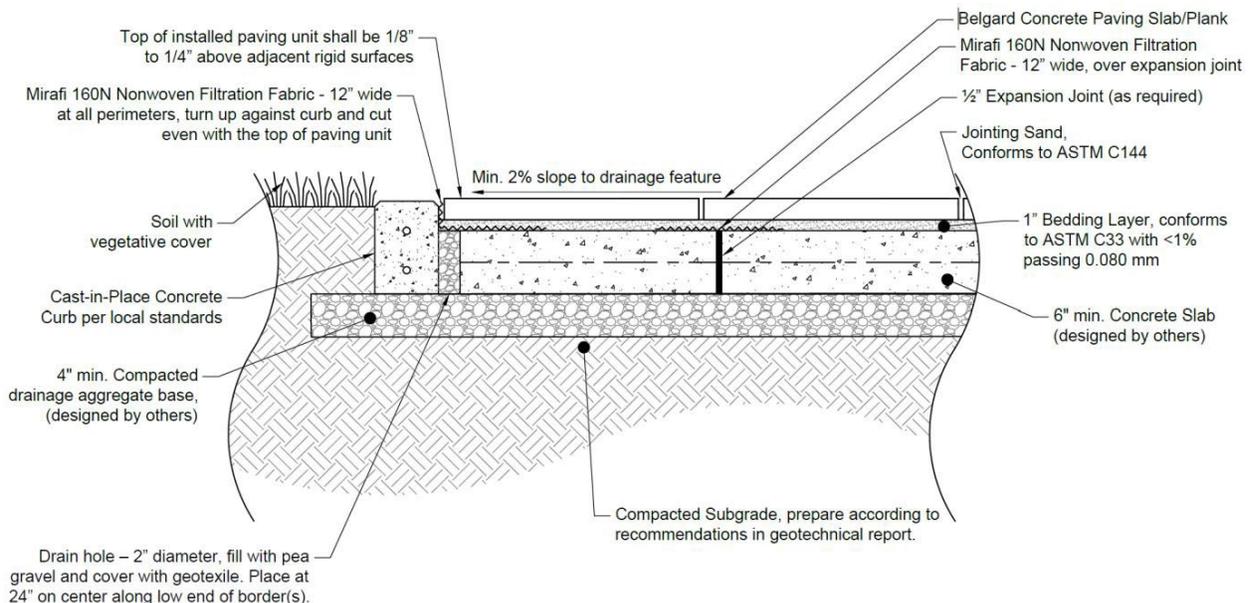
**Sand-set on Dense-graded Aggregate**

The most common base option is the use of locally available road base material over compacted subgrade. A minimum thickness of 6" DGA base course compacted to 98% standard Proctor density is required. Actual base thickness should be designed based on site-specific subgrade properties, climatic conditions, and application. A 1" thick bedding layer of washed concrete sand is used to seat the slabs or planks. A nonwoven filtration fabric is recommended on the bottom and sides of the excavation, and in many applications, for setting bed containment at the perimeters. Pre-compaction of the bedding sand is an option for slabs and planks. However, it is recommended to seat the units in uncompacted sand with a vibratory roller compactor.



**Sand-set on Concrete Base**

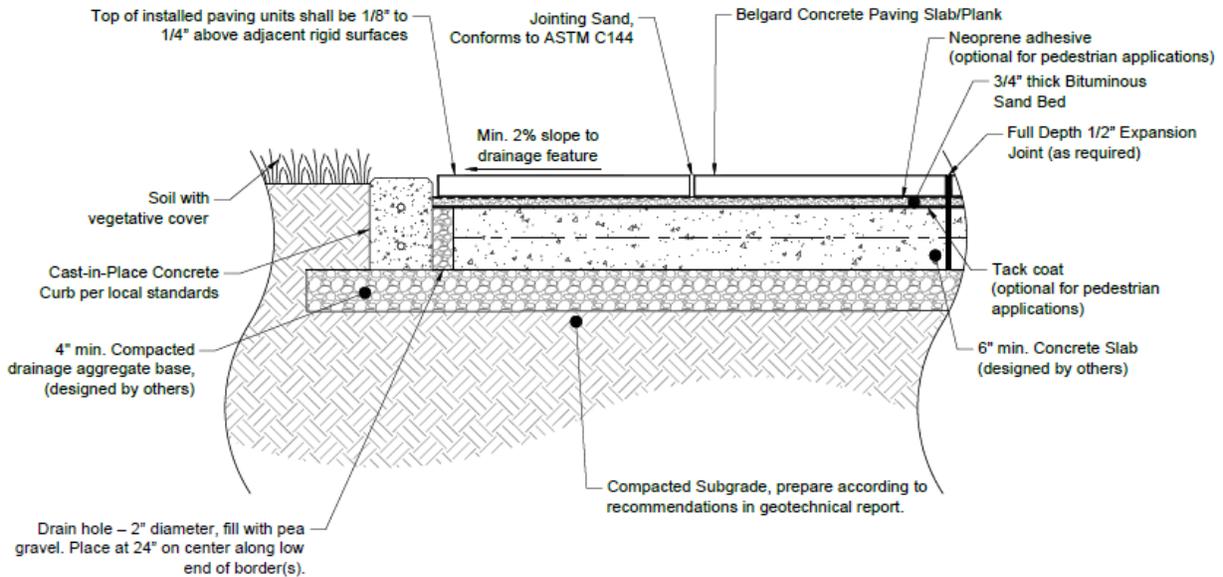
A minimum 6" thick concrete base over a minimum of 4" thick drainage aggregate is recommended above subgrade prepared based on site-specific conditions. A 1" thick bedding layer of washed concrete sand is used to seat the slabs and planks. Drain holes in the concrete base are required at low spots to allow water to escape.



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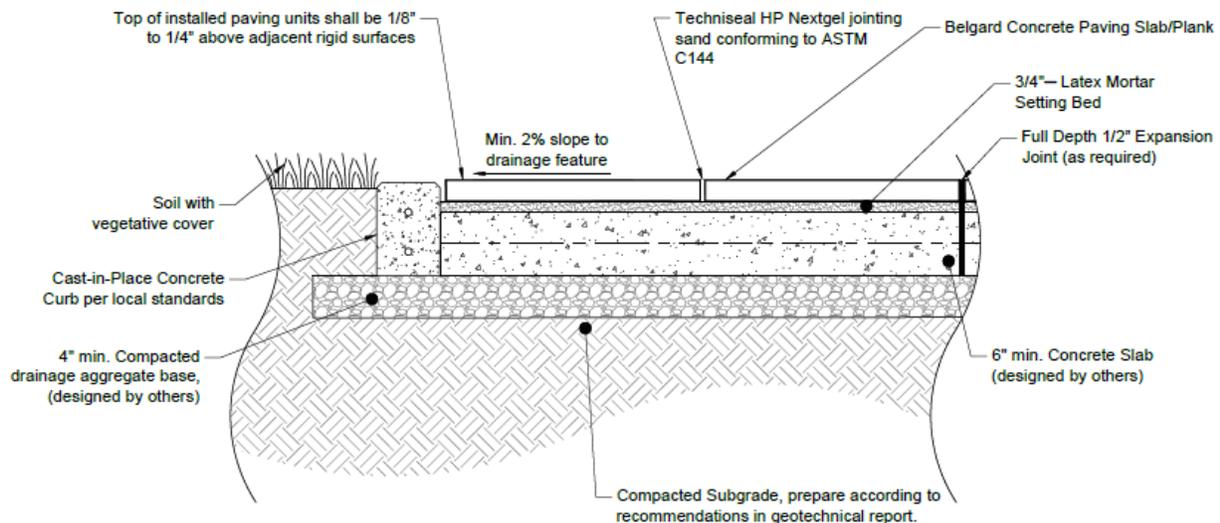
**Bituminous Set on Concrete Base**

Similar to the sand-set on concrete base except a bituminous binder is added to the bedding sand, which adheres the pavers to the underlying concrete. For vehicular applications, a tack coat and neoprene adhesive is applied to the concrete base. This assembly requires that the slabs or planks be manufactured to a height tolerance of +/- 1/16". ICPI's Tech Spec 20 *Construction of Bituminous-Sand Set Interlocking Concrete Pavement* provides a detailed description of the materials and construction procedures.



**Adhered on Concrete Base**

Slabs and planks can be installed using a mortar set on a concrete base design. Factors to consider when designing an adhered solution include: climate, product application, product dimensions, subgrade conditions and slope. Full depth expansion joints and paver alignment with joints is important. Other considerations include: type of joint infill, unit size, and pattern. Laticrete's polymer fortified products are recommended because they can be used in a variety of applications and climatic conditions. Laticrete's Belgard Paver Adhered Installation Guide provides details, specifications and product information for this solution. The project engineer must consider site-specific conditions, including any potential vehicular loading, to develop an applicable construction detail.



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**Product Selection**

Slabs and planks can be used for a variety of standard applications, however, slabs 16 x 16 in. (400 x 400 mm) and larger should be limited to pedestrian uses only. A plank paver should have a minimum thickness of 3.125 in. (80 mm) for vehicular applications. In general, slabs and planks should be used in limited vehicular applications only. A qualified engineer should review parking lot and roadway applications based on the type and number of heavy vehicles along with lifetime ESALs for the pavement structure.

**Installation Tips**

Large format slabs and planks can be heavy and larger units require at least two persons to install. Serious injury can be avoided by using specialized lifting and placing equipment.

Confirm laying pattern with construction plans or project designer. If used in vehicular commercial applications or roadways, a herringbone or running bond is recommended, with traffic running perpendicular to any running bond.

Compaction of slabs and planks should be done with roller compactor or with a roller attachment on the plate compactor.

To minimize damage during construction, the preferred compaction method is to run the compactor on a 45-degree angle to the long length of the slab or plank when installing a running bond pattern as shown below.



**IMPORTANT: assemble Moduline slabs and planks with an installed joint width of 1/8". Moduline spacer bars are 1/16" so it is important that the installer maintain an opening that can allow for easy jointing sand penetration including polymeric sand products. Moduline's true dimensions are based on installing with a 1/8" joint.**



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