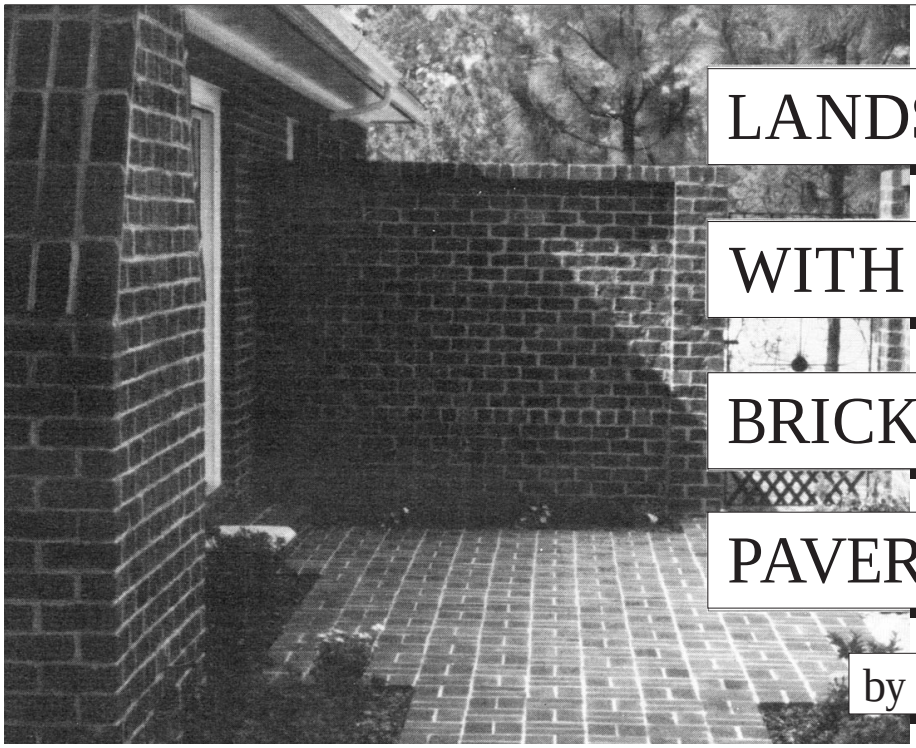


LANDSCAPING WITH BRICK PAVERS

For most light-duty applications, a mortarless system can provide good looks and years of service

by Brian E. Trimble

Brick paving can be installed two ways: as rigid paving or as flexible paving.

Rigid paving is commonly identified by its mortared joints. A properly designed rigid paving system consists of a well-compacted subgrade, a properly prepared base, a reinforced concrete slab, a mortar setting bed, and brick paving with mortar joints between the pavers (see Figure 1). A rigid system is often used where soil conditions are poor, where spaces between pavers are unacceptable, or where the look of mortared brick paving is desirable. Whenever mortar is used between the brick, a rigid concrete slab must be used to support the paving.

Flexible paving has a greater variety of design options. A flexible system consists of a well-compacted subgrade beneath a layer of crushed stone, a sand setting bed, and fine sand between the pavers (see Figure 2). Flexible systems can be used in applications ranging from a light-duty brick patio to a heavily traveled city street. Differing applications, however, may require different designs.

A flexible system has some advantages over a rigid system. First, a flexible system requires fewer materials and less skilled workmanship. It does not require a concrete slab or the mortar of a rigid system. The simplicity of the flexible system is reflected in its only real requirements: a base of the proper depth and a setting bed of the proper sand.

A homeowner concerned about maintenance costs might also like flexible more than mortared. His only real cost will be keeping weeds out of the sand between bricks. Most people simply apply chemicals. Mortar, on the other hand, may need periodic maintenance and, eventually, replacement long before the brick itself.

Masonry Details

Whichever system is used, decisions must be made regarding materials, design, installation, and detailing.

All brick paving units should conform to ASTM C 902, Standard for Pedestrian and Light Traffic Paving Brick. For most exterior applications, a brick unit meeting or exceeding the requirements of Class SX should be used. The requirements include a minimum compressive strength of 8,000 psi, a maximum cold water absorption of 8%, and a maximum saturation coefficient of 0.78.

If you use mortar, it should be Type M, conforming to ASTM C 270. Portland cement-lime mortars provide greater durability than other cement types. Mix a Type M mortar in these proportions:

- one part Portland cement
- 1/4 part hydrated lime (optional)
- three parts masonry sand.

The mortar ingredients should be mixed and laid by traditional bricklaying methods—setting the bricks in a bed of mortar and buttering the bottom and two sides. This assures proper bonding to all surfaces and retards water penetration to the base.

Building a Pavement That Lasts

When designing your brick paving job, consider the following to ensure a system that stands up under conditions at the site:

Proper base, thickness. The type of traffic you expect should determine which system to use. A driveway may require the use of a rigid base, whereas a patio can be laid on a flexible base. In a public area, although a flexible base would support pedestrian traffic, a rigid concrete slab may be necessary to allow for mortared joints, which are less of a hazard to women's heels.

The thickness of the brick depends on the type of traffic and the paving system. A rigid system may use thinner pavers, since the concrete slab resists the loads. A flexible system generally requires deeper pavers. A patio with typical light loads, however, may require only 1 1/2-inch deep pavers on a flexible base, while a driveway usually requires 2 1/4-inch pavers on either base.

Drainage. A main reason for failure in paving systems is inadequate drainage. You must design a pavement that eliminates standing water on or under the surface. Standing water that saturates the brick paving can lead to failures such as cracking or spalling during freezing.

Paving should be sloped at least 1/8 inch to 1/4 inch per foot to allow proper drainage. Brick paving, even for relatively narrow walks, should slope away from the house or other structure.

A solid membrane can be placed below the brick pavers to aid in drainage. This stops grass and weed growth as well. In a rigid system, 1/8-inch builder's felt will suffice, lapped 6 inches at the seams. (In flexible systems, 15 pound felt is better.) In a driveway, where cars will deliver much more weight to the surface, a geotextile mat is better than a polyethylene sheet or building felt.

Drainage tile is not necessarily used

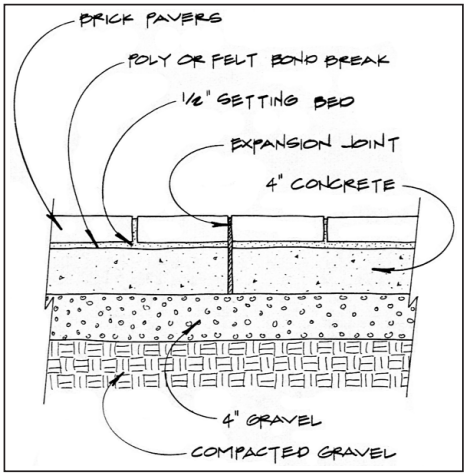


Figure 1. *A rigid system. Mortared pavers lay on top of 1/2 inch of wet mortar, supported by 4 inches of concrete and 4 inches of gravel. Sometimes a bond break (a sheet of poly or felt) is used between the concrete and mortar bed to allow separate movement of the layers. Otherwise, expansion joints in the paver level need to align with the expansion joint in the concrete.*

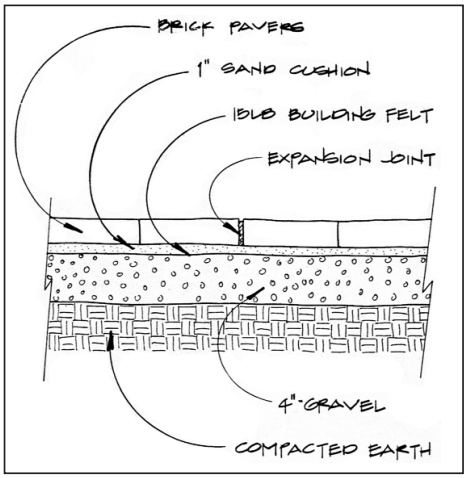


Figure 2. *A flexible system. A flexible system uses no mortar; only sand lies between pavers. Bricks rest atop a 1/2- to 1-inch layer of sand. To prevent the sand from filtering down into the gravel base, 15-pound felt is laid on top of the 4 inches of gravel. The earth should be well compacted. Expansion joints extend only to the depth of the brick.*

PAVING THE WAY

by Gary Mayk

Bricks are typically rectangular, measuring 4x2¼x8 inches. Thinner, light-duty, pedestrian-only bricks can be just 1½ inches thick. Six-inch-square brick pavers and hexagons of 6, 8, and 12 inches also are available. Radiused bricks can be used to add variety to patterns in large paved areas—driveways and courtyards. Special shapes include ogees and bull-nosed pavers for mortared stairways.

Bricks come in sizes that allow for mortared joints, such as 3¾x7½ inches. Patterns to be laid without mortar, such as basketweave, herringbone, and running/stack bond combinations, require bricks exactly twice as long as they are wide. Other patterns can be laid without mortar using nominal size bricks.

Concrete pavers vary in shapes and surface area but also are sized, for the most part, for laying with one hand. Light-duty concrete pavers, suitable for walks and driveways, are 2⅜ inches thick. Many of the designs, since they are not rectangular, are interlocking, and some are chamfered at the edges or grooved to resemble more than one block when laid.

In general, consider these factors in a design:

Pattern. This can be achieved either by arranging the bricks in a pattern or by using concrete pavers that create a pattern due to their shape. Patterns that require brick cutting will be more time-consuming. Some concrete designs offer smaller-sized end units to eliminate the need for cutting. Herringbone and running bond are less susceptible to horizontal movement.

Texture. Pavers can be as smooth as tile—often placed in entryways or around pools—or coarse for better footing.

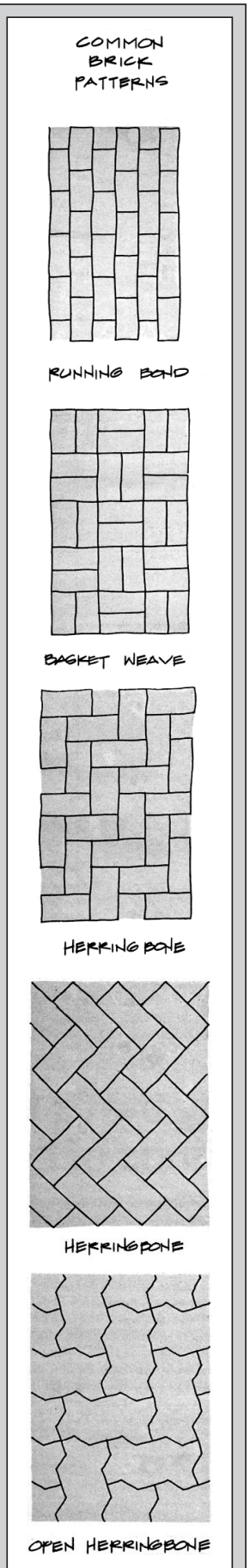
Grade. Mortarless systems can be applied on grade. Mortared blocks or some other transition such as wood may be required between grades.

Drainage. Proper slope must be maintained, always away from buildings. Poorly draining subgrades, such as clay, and large paved areas, such as patios or a commercial plaza, may require drainage tile along the lower edge of the drained pavement.

Climate. Freeze-thaw cycles may require extra precautions against standing water, and proper footers for mortared systems.

Coordination with the home. Pavers and their borders should complement exterior and interior materials, in color, function, and formality.

Gary Mayk is editor of the eastern edition of The Journal of Light Construction.



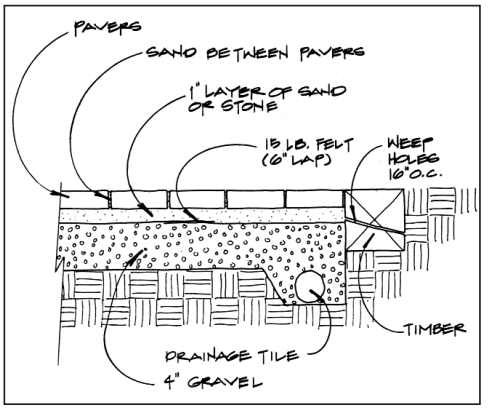


Figure 3. *Drainage. Weep holes 16 inches on-center help drain water that may be trapped by timber or concrete edging. Drain tile can be installed along the lower edge of sloped pavement to help carry water away from large paved areas or from walks laid on top of poorly draining soils. The tile requires deepening the gravel base by about 3 inches.*

in all applications. Two cases do call for it: Poorly draining soils, such as clay, and large expanses of pavement, as in large patios or commercial plazas. Where tile is installed, gravel may have to extend to a depth of 8 inches. The tile should drain well away from basements and foundations.

Edge restraints. You must use a rigid edge restraint to prevent creep—the horizontal movement of pavers. Different edgings create different looks, and labor and cost will vary as well. Edging may be a concrete curb, brick soldiers set in sand or mortar (edge-to-edge, with flat side against the edge of pavers), pressure-treated lumber supported by reinforcing rods, or rigid steel or plastic edging. Edging that requires less specialized labor or equipment—flexible edging, timbers, or brick soldiers—generally costs less than poured concrete curbing.

All curbs or edging that could prevent drainage of surface water must be weeped 16 inches on-center (see Figure 3). Concrete curbs should go below the frost line. Brick soldiers standing on end, however, do not have to go that deep. Edge bricks are more stable the deeper they go; therefore, set the top edge even with the paver surface so that the soldiers go deeper.

Steel and plastic edgings, which can bend to change direction, have foot-long stakes to resist shifting.

Expansion joints. Brick paving will expand due to temperature changes. Include expansion joints every 20 feet for rigid paving and every 30 feet for flexible paving. Also include them where different materials meet, where bonds change, and at walls and pillars.

At the bottom of each expansion joint, use a flexible filler, such as cork or foam padding. A backer rod, which is a ⅜-inch-diameter polyethylene rope, goes next and is sandwiched in place with a top layer of urethane caulk.

Slip resistance. The coarser the texture, the better the traction. A wire-cut surface is more slip-resistant than a die-skin surface. On wire-cut brick, the surface is broken by a tiny arc-like pattern. On die-skin brick, the surface will more closely resemble indoor ceramic tile.

Installation

Shortcuts in laying brick will only shorten the life of the installation, and this is true even for aspects of the job you'll never see once the pavers are in.

Soil should be uniformly compacted to produce a stable layer. Uncompacted soil can result in differential settlement that telegraphs to the paver surface. Soil can be adequately compacted with a plate compacter for larger jobs or a hand tamper for smaller jobs. For occasional jobs where a subcontractor is not used, you can rent a plate compacter.

The gravel or crushed stone base and the sand setting bed should also be compacted and should be free of salts or alkaline material. You don't want unwashed sand from near a beach area, which is likely to contain salts. Their presence will lead to efflorescence, a white discoloration that probably will last about a year. Using salt-free sand will save you from a certain callback later from a homeowner upset about the white deposit on his walks.

You can assure the owner that efflorescence is temporary. (It is permanent only if you failed to allow for proper drainage.) Dry-brush it off and rinse it away. You may want to warn the owner before work begins that efflorescence is possible and of no great concern.

To install mortared brick, lay wet mortar on the crushed stone for use as a setting bed. A bond break between the mortar and stone is recommended, particularly where temperature swings will be great. Butter the pavers with mortar on the bottom and two sides and push them into place. This ensures that you'll fill all joints.

Not as durable, but quicker, is a dry cement/sand mixture between the bricks. You will still need a wet-mortar setting bed. But the mortar that is applied between cracks is swept in dry and then soaked with a spray for at least two hours (up to four hours in hot weather). Before dry-mortaring, you must coat the top surface of the pavers with a wax, just as you would coat unglazed ceramic tile with grout release. The wax allows you to clean excess mortar off the bricks after curing. Failure to use the wax allows mortar into pores in the brick, where it will harden and remain.

If you use this method, mix one part cement to three parts sand—*not* one part cement to six parts sand. But even the stronger mixture will not hold up as well as wet-mortared joints.

Flexible brick paving is installed with sand only—not a sand-cement mix—between the joints. Pavers should be spaced 1/16 to ⅛ inch to prohibit the pavers from bumping together and chipping the edges. ■

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For More Information

For more information contact the Brick Institute of America (BIA) (11490 Commerce Park Drive, Suite 300, Reston, VA 22091-1532; 703/620-0010); the National Association of Brick Distributors (212 South Henry St., Alexandria, VA 22314; 703-549-2555); or the National Precast Concrete Association (825 E. 64th St., Indianapolis, IN 46220; 317/253-0486).