



PRODUCT PROFILE

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Glen-Gery Interlocking Clay Unit Pavers

General

Glen-Gery manufactures interlocking extruded and machine molded clay unit pavers in a multitude of shades to accommodate the visual requirements of most projects. The nominal thickness of Glen-Gery extruded and machine molded clay unit pavers is 2-1/4" with limited availability of 2-3/4" thick units for applicable heavy vehicular applications.

Unit Specifications

Glen-Gery interlocking clay unit pavers are typically manufactured to conform to the requirements of American Society for Testing and Materials (ASTM) Standard Specification C 902, "Standard Specification for Pedestrian and Light Traffic Paving Brick," Class SX. These products also conform to the requirements of ASTM C 902, Classes MX and NX. Inquiries should be made for specific applications or conformance to standards other than ASTM C 902.

When specifying this product, the specifications should cite:

- 1) The product name and state "as manufactured by Glen-Gery Corporation."
- 2) Conformance to the requirements of the appropriate standard, (ASTM C 902, Class SX).
- 3) The actual unit dimensions listed as thickness x width x length. Example: Cocoa as manufactured by Glen-Gery Corporation to conform to the requirements of ASTM C 902, Class SX, Application PS, Type I. The units shall have dimensions of 2-1/4" x 4" X 8".

Glen-Gery also manufactures interlocking extruded clay unit pavers meeting the requirements of ASTM C 1272, "Standard Specification for Heavy Vehicular Paving Brick," Type R, Application PA or PS. Contact your Glen-Gery representative for information about this product.

Design Criteria

Size:

Table 1 provides the sizes in which Glen-Gery manufactures interlocking clay unit pavers.

Dimensional Tolerances:

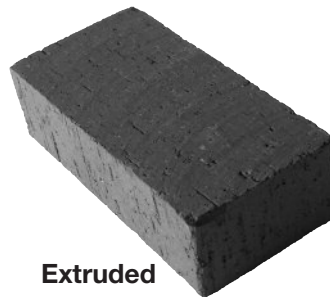
Glen-Gery interlocking clay unit pavers are manufactured to provide specific dimensional tolerances. These dimensional tolerances of the product are typically intended to be within the requirements of ASTM C 902, Application PS, for general use. Certain products also meet the requirements of ASTM C 902, Application PX, or ASTM C 902, Application PA. Consult your local Glen-Gery representative for information about pavers which meet these requirements.

Extruded pavers are available which comply with the requirements of ASTM C 1272 Type R and meet the requirements of Application PA or PS.

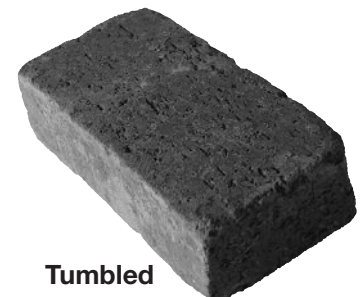
The product ordered will generally contain a number of pavers which are over or under the specified dimensions. The dimensional variations are related to the raw materials, forming, drying and firing processes, and the desired finish and color. Thus, for some products, all the pavers may be slightly over or slightly under the specified dimensions. Inquiries should be made regarding the dimensional variations which might be expected if project detailing requires precise coursing. Specialty products or gauged products may be desirable for such limited applications.

Configurations:

Pavers are manufactured to conform to the requirements of applicable ASTM standards. Most extruded and machine molded pavers have square edges. One bed of each repressed chamfered paver is formed with chamfers on its edges. One bed of a cobble paver is formed



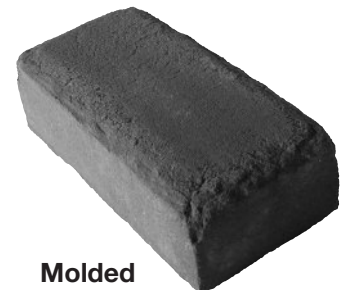
Extruded



Tumbled



Repressed Chamfered



Molded
(Cobblestone)

with irregular edges resembling those found on cobblestones. Machine molded pavers have one finished bed. However, the unfinished bed of the chamfered molded or cobble paver may be used to create an accent color. Check with your local Glen-Gery representative for information about specific configurations.

Weight:

The weights of interlocking pavers vary with the raw material, sizes, and manufacturing processes. While the actual weight of a specific paver should be confirmed, the average weight of each size of paver manufactured by Glen-Gery is included in Table 1.

Finishes:

Glen-Gery extruded unit pavers have a wirecut finish. Machine molded clay unit pavers have a sanded finish. Repressed and chamfered pavers have a matt (wirecut) finish.

Slip/Skid Resistance:

Because extruded and repressed, chamfered clay unit pavers do not polish in normal service, there is little or no diminution in either slip or skid resistance during the service life of paving systems using these pavers.

When tested in accordance with ASTM C 1028, the dry, uncleaned coefficient of friction of extruded and repressed

Glen-Gery unit pavers is in excess of 0.90 and the wet, uncleaned coefficient of friction is in excess of 0.75.

Colors:

Glen-Gery interlocking pavers are available in a multitude of permanent colors and blends. The permanency of the colors of clay unit pavers is the result of firing clay and shale raw materials at temperatures near 2000 degrees F. The sands applied to five of the faces of machine molded pavers during manufacture add to the pavers their intriguing colors. The availability of a particular color is usually dependent on the specific product.

When constructing an integrated landscape, matching or complementary facing bricks are usually available, allowing the construction of garden walls, other site structures, and building walls that closely match or complement the color of the paving. Alternatively, pavers may be laid in mortar to construct garden walls and other site structures.

Shapes:

Treads, including starters, and risers are available as special shapes. Consult Glen-Gery's "Brick Shapes" catalog for possible sizes and configurations. Some pavers are manufactured with companion 2-1/4" x 4" x 4" starter pieces. Check with your local Glen-Gery representative for availability.

Physical Properties of Units

Compressive Strength:

The average gross compressive strength of interlocking extruded and repressed pavers is at least 8,000 psi when tested with the loads applied normal to the bedding surface. The average gross compressive strength of machine molded pavers, including the cobble-style pavers, is at least 4,000 psi. The actual compressive strength depends upon the specific product selected.

Extruded and repressed pavers meeting the requirements of ASTM C 1272, Type R, also have a minimum average compressive strength of 8,000 psi.

Water Absorption:

The average maximum cold-water absorption of extruded and repressed pavers is less than 6%. The hot water absorption of machine molded pavers, including the cobble-style pavers, is less than 16%.

Extruded pavers meeting the requirements of ASTM C 1272, Type R, have a maximum average cold water absorption of 6%.

Saturation Coefficient:

Since the average cold water absorption of extruded and repressed pavers is

**TABLE 1
Paver Size, Coverage and Weight**

Paver Type	Specified Dimension						Pavers per square foot	Average Weight per unit (kg)	
	Thickness (inches)	Thickness (mm)	Width (inches)	Width (mm)	Length (inches)	Length (mm)			
EXTRUDED STRAIGHT EDGE	2-13/16	71	4	102	8	203	4.50	7.0	3.2
	2-1/4	57	4	102	8	203	4.50	6.0	2.7
	2-1/4	57	3-3/4	95	7-1/2	191	5.12	5.2	2.4
	2-3/4	70	3-3/4	95	7-1/2	191	5.12	6.4	2.9
REPRESSED CHAMFERED	2-3/4	70	4	102	8	203	4.50	7.0	3.2
	2-1/4	57	4	102	8	203	4.50	6.0	2.7
TUMBLLED	2-3/4	70	4	102	8	203	4.50	7.0	3.2
	2-1/4	57	4	102	8	203	4.50	6.0	2.7
	2-1/4	57	4	102	8	203	4.50	6.0	2.7
	2-1/4	57	3-5/8	92	7-5/8	194	5.21	4.7	2.1

less than 6%, requirements for saturation coefficient do not apply. The saturation coefficient of machine molded pavers, including cobble-style pavers is generally less than 0.65.

Initial Rate of Absorption (IRA):

Note: Initial Rate of Absorption is only a consideration when pavers are laid in mortared systems. The initial rate of absorption (suction) normally does not exceed 30 grams per 30 square inches per minute under laboratory conditions. However, pavers can be checked on the site to determine if wetting is necessary prior to laying unless familiarity with the product has demonstrated that wetting is not required. The procedure for determining wetting requirements is the field test procedure described in ASTM C 67. If this test is not practical, the need for wetting may be estimated by the following field test:

- 1) Place a \$.25 piece on one of the faces of a paver which will be mortared.
- 2) Draw a ring around the quarter with a wax pencil.
- 3) Place twenty drops of water within the ring.
- 4) If unabsorbed water remains after 1-1/2 minutes, the units likely do not require wetting. If all the water is absorbed into the unit, the units should be wetted prior to laying.

Properties of Paving Systems

Compressive Strength:

The load-carrying capacity of a paving system is not limited by the compressive

strength of the pavers in that system: One clay paver meeting the requirements of ASTM C 902, Class SX, can sustain a loading of 4" x 8" x 4,000 psi = 128,000 pounds; 1-1/2 times the weight of a fully-loaded tractor-trailer. The load-carrying capacity of a paving system is determined by the design of the structures supporting the pavers—the setting bed, base, subbase, and underlying soil—and the quality of workmanship available when the pavers and the structures supporting the pavers are installed.

Coefficient of Thermal Expansion:

Glen-Gery interlocking clay unit pavers have a coefficient of thermal expansion of approximately 0.000004 in./in./°F as listed in The Building Code Requirements for Masonry Structures (TMS 402/ACI 530/ASCE 5). A one hundred foot length paving constructed of Glen-Gery extruded and machine molded pavers, and exposed to an annual extreme temperature difference of 100 °F, is expected to experience a total thermal movement of approximately 1/2".

Coefficient of Moisture Expansion:

The coefficient of moisture expansion of Glen-Gery interlocking clay unit pavers is less than 0.0005 in./in. Although most of the moisture expansion of Glen-Gery extruded and machine molded pavers occurs immediately after the brick are fired, before the brick arrive at the job site, the maximum design moisture expansion of one hundred feet of paving constructed of these products is less than 5/8".

Selected Paving System Design Criteria

Structural Design:

The structural design of the earth, sub-base, base, and setting bed underlying unit pavers regularly carrying vehicular traffic should be in accordance with "Flexible Vehicular Brick Paving: A Heavy Duty Applications Guide," available from the BIA.

Interlocking:

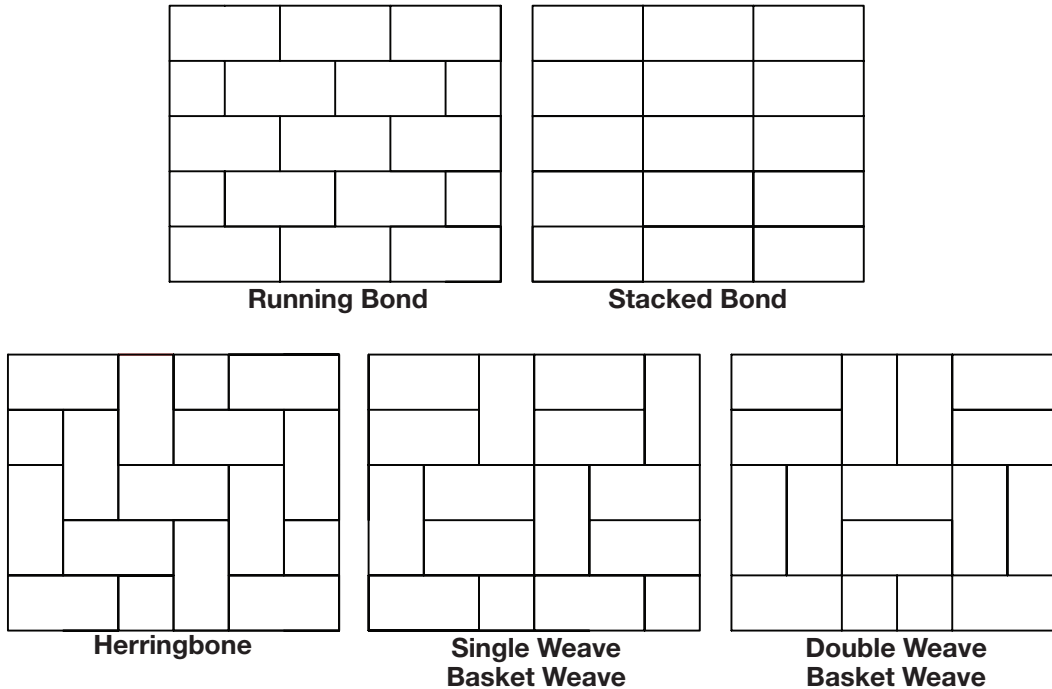
Pavers in an interlocking system share the loads applied to the system. The keys to achieving interlock are 1) designing and installing the subbase, base, and setting bed in a manner which will support the applied loads, 2) spacing adjacent pavers properly and uniformly, 3) filling the spaces between pavers with properly graded sand, and 4) compacting the sand into the joints between the pavers with sufficient force. When these conditions are met, an interlocking system can be constructed with pavers of any regular shape, including rectangular unit pavers.

Once interlock has been established, the paving system must not be allowed to shift in any horizontal direction. Shifting is prevented by containing the paving system with relatively rigid edge restraints. The best edge restraints are building and site walls and concrete and stone curbs since they are least likely to move under heavy or repetitive loading. Almost as good are the many proprietary extruded plastic edging systems. Although metal edging systems have been used for many years, they generally have been supplanted by extruded plastic systems. In some designs, railroad ties or pressure-treated timbers are used.

**TABLE 2
Paver Quantities – Flexible System¹**

Specified Dimension						Name	Pavers per square foot	Square feet per 1000 pavers
Thickness (inches)	Thickness (mm)	Width (inches)	Width (mm)	Length (inches)	Length (mm)			
2-1/4	57	3-5/8	92	7-5/8	194	3-5/8 x 7-5/8 paver	5.21	192
2-1/4	57	3-3/4	95	7-1/2	191	3-3/4 x 7-1/2 paver	5.12	195
2-1/4	57	4	102	8	203	4 x 8 paver	4.50	222

¹ These values are actual quantities and must be increased for waste and possible construction requirements which may necessitate additional quantities.



When paving systems are exposed to vehicular traffic, particularly turning vehicles (intersections), paving systems have shown the best performance when laid in a herringbone pattern. When the system is exposed to less repetitive turning, pavers laid in running bond with the long dimension of the pavers laid perpendicular to the flow of traffic have proven to perform.

Drainage:

Interlocking paving systems should be pitched at least 1/4" per foot so that water drains from the surface quickly. Over long distances, this pitch may create less than desirable differences in elevation and it may be necessary to install internal drains to maintain a relatively flat surface.

When systems without mortar between pavers are laid over an impervious surface, consideration must be given to draining water between the impervious surface and the top of the brick surface.

Construction

Storage and Protection:

Store pavers off ground to avoid contamination by water, mud, or dust and materials likely to cause staining or

other defects. Do not use cubes of pavers as supports or work surfaces. To avoid staining, cover cubes with a weather resistant membrane held securely in place or otherwise protect the cubes.

Wetting:

Note: Wetting is only a consideration when pavers are laid in mortared systems. As deemed necessary (see IRA), wet units prior to laying. Wetting typically consists of saturating the units three to twenty four hours before laying the units. Units should be saturated but surface dry when laid with mortar.

Weather Extremes:

Do not lay ice-coated pavers. Do not lay pavers on setting beds which contain ice. Do not use jointing sand that contains ice.

Note: Weather extremes are generally only a concern when pavers are laid in mortared systems. Follow the procedures required by developed by The International Building Code (IBC) references cold and hot weather construction provisions for masonry that are based on those found in

Specification for Masonry Structures (TMS 602/ACI 530.1/ASCE 6) and required by Building Code Requirements for Masonry Structures (TMS 402/ACI 530/ASCE 5). While specific cold and hot weather provisions are not included within the International Residential Code (IRC) the IRC states that mortar for use in masonry construction shall comply with ASTM C 270, which requires mortar for other than masonry veneer to be prepared in accordance with the Masonry Industry Council's "Hot and Cold Weather Masonry Construction Manual." Further information is also available in the BIA Technical Notes on Brick Construction 1, "Cold and Hot Weather Construction."

Installation of Unit Pavers

There are many excellent methods which can be used to install unit pavers. Outlined below are two methods commonly used through-out North America. Additional information about these and other methods can be found in Brick Industry Association Tech Notes 14 and 14A and at www.glenerybrick.com.

TABLE 3
Paver and Mortar Quantities – Mortared System¹
 Nominal 3/8 Inch Mortar Joints

Specified Dimension						Name	Pavers per square foot	Cubic Foot of Mortar per 1000 square feet		Quantity of Mortar per 1000 pavers	
Thickness (inches) (mm)	Width (inches) (mm)	Length (inches) (mm)		without setting bed	with 1/2" setting bed			without setting bed	with 1/2" setting bed		
2-1/4	57	3-5/8	92	7-5/8	194	3-5/8 x 7-5/8 paver	4.50	1.94	6.11	3.72	11.73
2-1/4	57	3-3/4	95	7-1/2	191	3-3/4 x 7-1/2 paver	4.43	1.88	6.05	3.66	11.81
2-1/4	57	4	102	8	203	4 x 8 paver	3.93	1.76	5.93	3.91	13.17

¹ These values are actual quantities and must be increased for waste and possible construction requirements which may necessitate additional quantities.

Installation of Flexible Systems

Preparation:

Excavate to virgin soil. Install and compact subbase and base materials according to the contract documents. If there are differences in elevation, correct these differences in the subbase and base and not in the setting bed. Do not start work until the stone base is dry.

Edge Restraint:

Install edge restraint around the perimeter of the paving system.

Setting Bed:

Confirm that the top of the stone base is flat and at the proper elevation. Use sand that meets the requirements of ASTM C 33 to form the setting bed. Place and screed the sand to a uniform thickness of 3/4" to 1-1/2". Do not disturb or compact the setting bed. Limit the size of the screeded area to that which will be covered with pavers that day.

Laying:

Working off adjacent surfaces or already laid pavers, place the pavers in the setting bed. Lay the pavers in the desired bond pattern. Set the pavers so that edges of adjacent pavers are 1/16" to 1/8" apart. Do not lay pavers from the center out; lay pavers from a restrained edge and move toward an opposite restrained edge. Fill gaps at

edges with sawcut or snapped pavers.

Jointing Sand:

Jointing sand should meet the requirements of ASTM C 144. Cast jointing sand over the surface of the paving and brush the sand into the joints. Cover the paving system with plywood (or similar) and run a plate compactor with a force of 16 to 22 kN at 75 to 100 Hertz over the paving to force the sand into the joints. Alternatively, use a plate compactor with a rubber pad. Cast more jointing sand over the surface and brush the sand into the joints. Resume compacting. Cast more sand and compact until the joints are solidly filled, usually four to six passes. Compaction is easiest when the pavers and sand are dry.

Do not compact paving within six feet of a free (uncompleted) edge.

Remove excess sand when compaction is complete. Surface should be broom clean.

Vertical miss-alignment of adjacent pavers should not exceed 1/8".

Jointing Sand Retention:

Use extreme care when considering products intended to bond the jointing sand in the joints e.g. polymeric sand. Improper use of these materials can cause staining that is extremely difficult to remove. When laying machine molded pavers, bonding products can bond to the sand on the pavers. Therefore, Glen-Gery does not recommend the use of polymeric sand when installing Glen-Gery

clay pavers.

Movement Joints:

To avoid loss of interlock, expansion joints are typically not installed in flexible systems.

Cleaning:

At the end of each shift, remove excess sand and any dirt with a broom. Final cleaning should also be done with a broom. Do not scrub machine molded pavers. If a pressure washer is used to remove persistent stains, do not blast jointing sand from the joints. If a pressure washer is used to remove persistent stains, limit the pressure at the pump to 100 psi when cleaning molded pavers.

Installation of Mortared Systems

Preparation:

Install a poured-in-place Portland cement concrete slab according the contract documents. Finish the surface with a stiff broom. Remove all dirt and other debris from the surface of the concrete slab before placing the mortar setting bed.

Laying:

Wet the concrete slab so that it is damp but surface dry. Create a mortar setting bed that is at least 3/4-inch thick. Butter one head and one long edge of each

paver immediately before laying. Shove a paver buttered with mortar into the mortar setting bed. Take special care to assure that all vertical joints are full. Use a Type M or Type S Portland cement lime mortar conforming to ASTM C 270. A prepackaged mortar mix conforming to these specifications is Glen-Gery Color Mortar Blend. Reference: Glen-Gery Product Profile "Glen-Gery Color Mortar Blend."

Movement Joints:

Install expansion joints in mortared paving wherever there are movement or control joints in the concrete slab, but no more than 15 feet apart. Install expansion joints where the paving abuts rigid structures. Install expansion joints where there are changes in cross-section and where the paving is penetrated by signs, benches, valve boxes, and similar objects.

Tooling:

When the mortar is thumbprint hard, tool all joints to produce a concave or grapevine joint finish.

Protection of Work:

At the end of each day or shut down period, cover freshly-laid paving with a

strong, weather resistant membrane which is held in place securely. Do not apply design or construction loads to completed paving for seven calendar days. Care should also be taken to protect paving from mud and dirt. If completed paving is to receive construction traffic, protect the traffic paths with sheets of plywood (or similar).

Cleaning:

At the end of each shift, remove excess mortar with a stiff bristle brush. Clean with wooden paddles and stiff fiber brushes using clean water. If a cleaning agent is necessary, presoak the paving with clean water prior to applying the cleaning agent and thoroughly rinse the paving with clean water after cleaning. Prior to determining a final cleaning solution, test the procedure and cleaning agent on a small sample area to observe the effectiveness of the cleaning solution and, most importantly, to detect any possible deleterious effects or changes in appearance of the paving. If a pressure washer is used to either wet or rinse, limit the pressure at the pump to 100 psi when cleaning machine molded pavers. Additional information is available in the Glen-Gery Technical Profile "Cleaning New Brickwork." Check with your local Glen-Gery

representative prior to making a final selection of a cleaning procedure and solution. When using Type S or M mortars, clean down should never occur prior to 3 days after work is completed to assure appropriate curing of the mortar. Reference: BIA Technical Notes on Brick Construction 20, "Cleaning Brickwork."

Estimating:

The quantity of pavers required for a project varies with the size of the paver, the bond pattern, the number of field cuts necessary, the workmanship, and whether the pavers will be laid in a flexible or a mortared system. The area-to-quantity factors found in Table 2 will aid estimating the quantities of pavers required when constructing a flexible system. When constructing a mortared system, use Table 3 to estimate the quantity or mortar required per 1,000 brick units. The values provided are estimates of the quantities in the finished paving system and do not account for waste. Reference: BIA Technical Notes on Brick Construction 10, "Dimensioning and Estimating Brick Masonry."

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