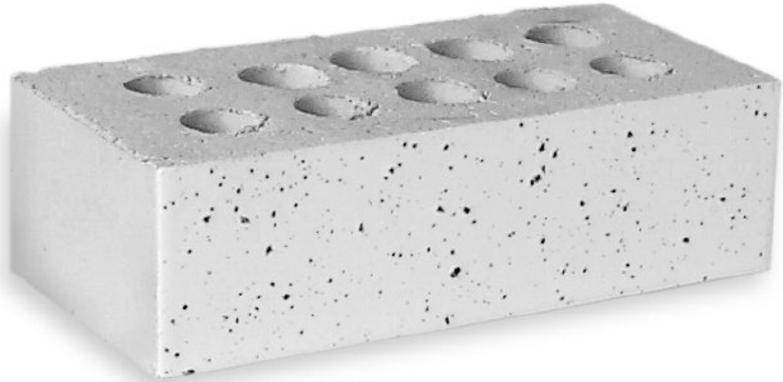




Glen-Gery Glazed Brick

General

Glen-Gery manufactures many sizes of glazed brick in a variety of shades to accommodate the visual requirements of most projects. Unlike structural glazed tile, most glazed brick have an actual 3-5/8" inch bed depth (thickness). Glazes are applied to the brick before firing and become an integral part of the unit during the firing process. This process produces a finished surface which is typically impervious to both liquids and gasses. Brick with engobe coatings such as Glen-Gery Klaycoat brick are not considered to be glazed brick because they are not impervious to liquids and gasses. Glazed brick and glazed brick shapes are typically made specifically for each project.

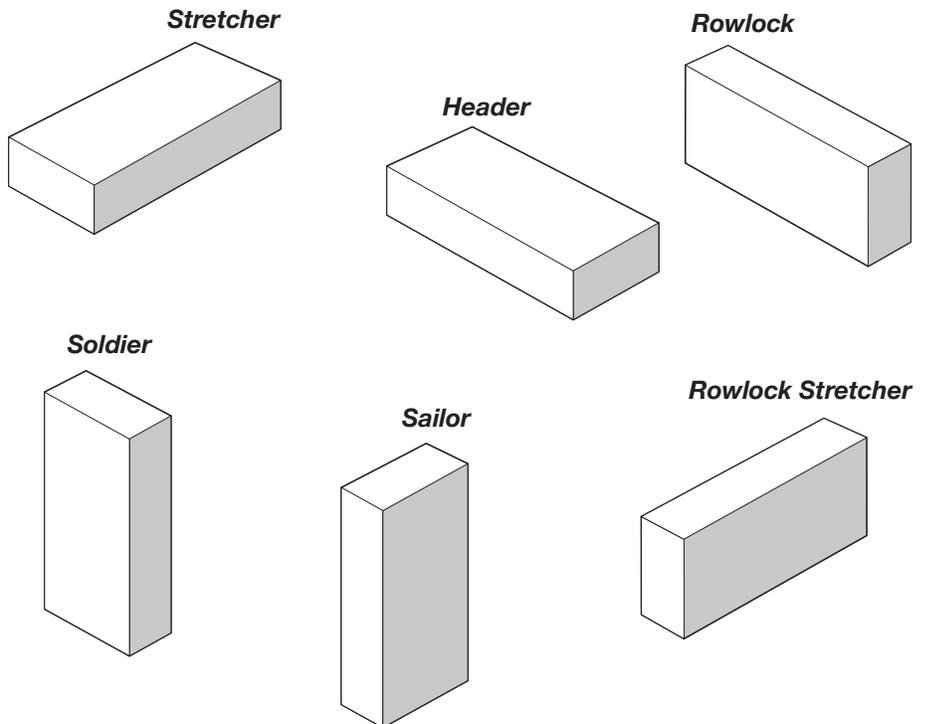


Unit Specifications

Glen-Gery glazed bricks are manufactured to conform to American Society for Testing and Materials (ASTM) Standard Specification C 1405, Class Exterior, Grade S, Type 1, Division Solid ($\leq 25\%$ void). These products also conform to the requirements of ASTM C 1405, Class Interior. Hollow core units meeting the requirements of ASTM C 1405, Division H40V ($> 25\%$, $\leq 40\%$ void), may also be available on special order. Inquiries should be made about the availability of products which conform to the requirements of standards other than ASTM C 1405. When specifying glazed brick, the specification should cite:

- 1) The product name and state "as manufactured by Glen-Gery Corporation."
- 2) Conformance with the requirements of the appropriate specification, including the Class, Grade and Type.

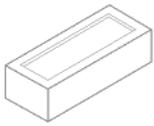
Brick Positions in a Wall



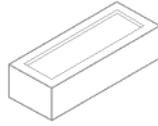
- 3) The actual unit dimensions listed as thickness x height x length. For example: #G957 (Maroon) as manufactured by Glen-Gery Corporation to conform to

the requirements of ASTM C1405, Class Exterior, Grade S, Type 1, Division Solid. The actual size of the brick shall be 3-5/8" x 2-1/4" x 7-5/8".

Glen-Gery Brick Sizes



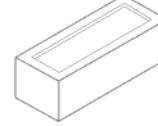
Modular
3-5/8 x 2-1/4 x 7-5/8
6.75 units/sq. ft.



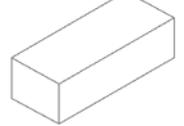
Standard
3-5/8 x 2-1/4 x 8
6.55 units/sq. ft.



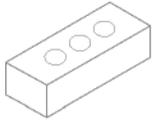
Engineer Modular
3-5/8 x 2-3/4 x 7-5/8
5.63 units/sq. ft.



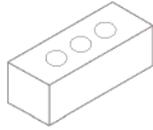
Engineer Standard
3-5/8 x 2-3/4 x 8
5.39 units/sq. ft.



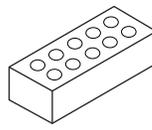
Handmade Oversized
4 x 2-3/4 x 8-1/2
5.00 units/sq. ft.



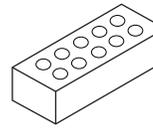
Lightweight Modular
3-1/2 x 2-1/4 x 7-5/8
6.75 units/sq. ft.



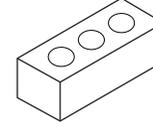
Lightweight Engineer Modular
3-1/2 x 2-3/4 x 7-5/8
5.63 units/sq. ft.



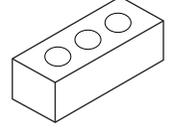
Modular
3-5/8 x 2-1/4 x 7-5/8
6.75 units/sq. ft.



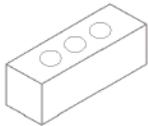
Standard
3-5/8 x 2-1/4 x 8
6.55 units/sq. ft.



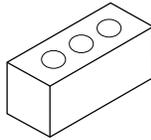
Engineer Modular
3-5/8 x 2-3/4 x 7-5/8
5.63 units/sq. ft.



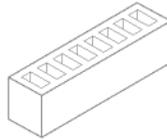
Engineer Standard
3-5/8 x 2-3/4 x 8
5.39 units/sq. ft.



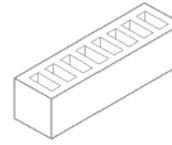
Queen
3 x 2-3/4 x 7-5/8
5.63 units/sq. ft.



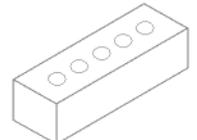
Econo
3-5/8 x 3-5/8 x 7-5/8
4.50 units/sq. ft.



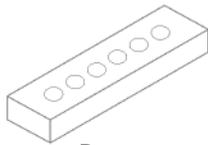
Engineer King
2-13/16 x 2-13/16 x 9-5/8
4.55 units/sq. ft.



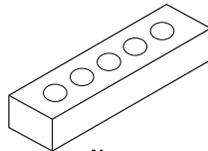
King Narrow-Bed
3-1/8 x 2-3/4 x 9-5/8
4.55 units/sq. ft.



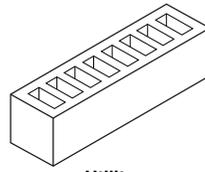
King
3-5/8 x 2-3/4 x 9-5/8
4.55 units/sq. ft.



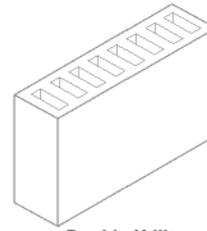
Roman
3-5/8 x 1-5/8 x 11-5/8
6.00 units/sq. ft.



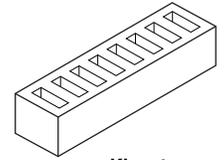
Norman
3-5/8 x 2-1/4 x 11-5/8
4.50 units/sq. ft.



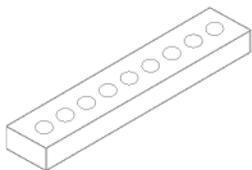
Utility
3-5/8 x 3-5/8 x 11-5/8
3.00 units/sq. ft.



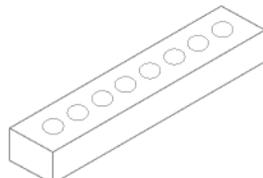
Double Utility
3-5/8 x 7-5/8 x 11-5/8
1.50 units/sq. ft.



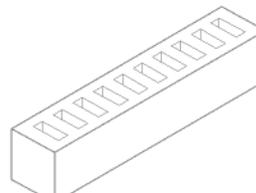
Kingston
3-5/8 x 2-3/4 x 11-5/8
3.75 units/sq. ft.



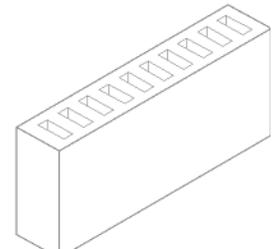
Viking
3-1/2 x 1-5/8 x 15-5/8
4.50 units/sq. ft.



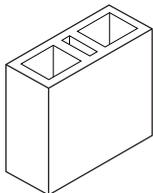
Saxon
3-5/8 x 2-1/4 x 15-5/8
3.38 units/sq. ft.



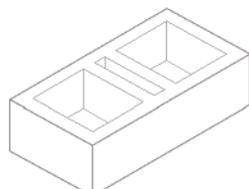
Titan
3-5/8 x 3-5/8 x 15-5/8
2.25 units/sq. ft.



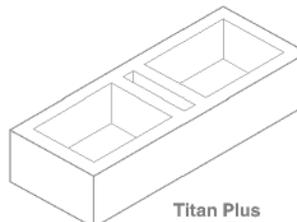
Double Titan
3-5/8 x 7-5/8 x 15-5/8
2.25 units/sq. ft.



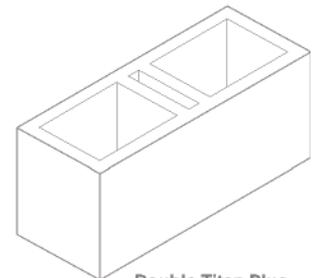
8-Square
3-5/8 x 7-5/8 x 7-5/8
2.25 units/sq. ft.



Regent
7-5/8 x 3-5/8 x 11-5/8
3.00 units/sq. ft.



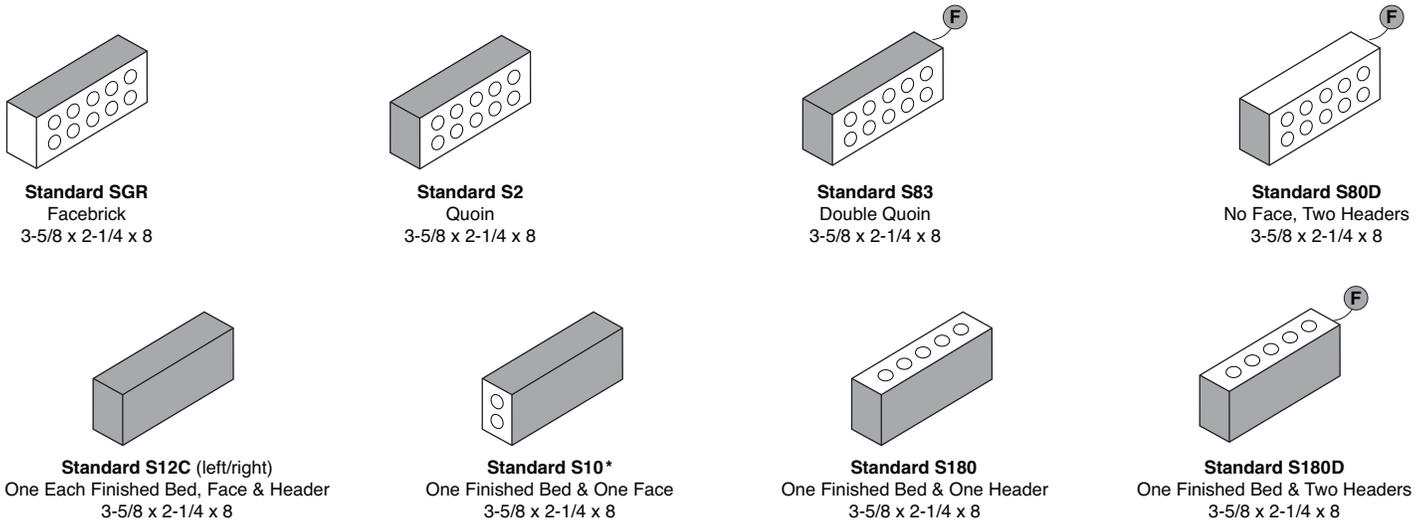
Titan Plus
7-5/8 x 3-5/8 x 15-5/8
2.25 units/sq. ft.



Double Titan Plus
7-5/8 x 7-5/8 x 15-5/8
1.13 units/sq. ft.

Coring and frogs are at the manufacturer's option. Actual coring patterns may not match the illustrations. Contact plant for specific information on sizing and coring.

Glen-Gery Glazed Brick Finished Sizes



*Horizontal coring utilized as a substitute for solids.
Actual coring patterns may not match the illustrations.

TABLE 1
Brick Size, Coverage and Weight

Brick Size	Specified Dimension						Brick per square foot	Average Weight	
	Thickness (inches) (mm)		Height (inches) (mm)		Length (inches) (mm)			per unit	(kg)
Modular	3-5/8	92	2-1/4	57	7-5/8	194	6.75	4.0	1.8
Engineer Modular	3-5/8	92	2-3/4	70	7-5/8	194	5.63	4.9	2.2
Econo	3-5/8	92	3-5/8	92	7-5/8	194	4.50	6.7	3.0
8-Square	3-5/8	92	7-5/8	194	7-5/8	194	2.25	14.1	6.4
Standard	3-5/8	92	2-1/4	57	8	203	6.55	4.4	2.0
Engineer Standard	3-5/8	92	2-3/4	70	8	203	5.39	5.2	2.4
Norman	3-5/8	92	2-1/4	57	11-5/8	295	4.50	5.7	2.6
Utility	3-5/8	92	3-5/8	92	11-5/8	295	3.00	9.2	4.2

Design Criteria

Size:

Table 1 provides the many sizes in which Glen-Gery manufacturers glazed brick.

Dimensional Tolerances:

Glen-Gery solid glazed brick are manufactured to meet the tolerances cited in ASTM C 1405, Grade S. Generally, the average size of the brick delivered to the site will be greater or lesser than the specified dimension. These differences are caused by the inherent variations in the raw materials and the day-to-day variations of the forming, drying, and firing processes. If the project detailing requires precise vertical or horizontal coursing, inquiries

should be made regarding the dimensional variations which might be expected. It may be necessary to gauge the brick one or more times in these circumstances.

Configuration:

All solid glazed bricks are manufactured to meet the coring requirements of ASTM C 1405, Division Solid. These brick have multiple cores which will create a void space which will not exceed 25% of the gross cross-sectional area in every plane parallel to the bedding surface. Other cores sizes and configurations may be available on special order. Note that Glen-Gery glazed brick must contain cores; 100% solid units cannot be manufactured.

Weight:

The weights of bricks vary with the specific raw material, size, manufacturing process and the amount of coring. Average weight of glazed brick meeting the requirements of ASTM C 1405, Division Solid is listed in Table 1.

Finishes:

Glen-Gery glazed brick are manufactured with a smooth (die-skin) body with only smooth, mottled, or speckled finishes. Note that only one face of each glazed brick is finished. If both a finished stretcher face (standard production) and a finished header are required on the same brick, a quoin (S2 shape) must be

specially ordered. Other combinations of finished faces are also available on special order. Many of these combinations are shown in Glen-Gery's Brick Shapes Catalog (and on page 3 of this document).

Color:

Glen-Gery glazed brick are available in a number of standard color blends. Please consult Glen-Gery's Price List for the specific colors available. Other colors may be available on special order. Since the glazes can only be applied to the surfaces of the brick, through body colors are not possible. There is some range to all glazed brick colors.

Shapes:

"Standard" brick shapes are shapes dimensioned to course properly with bricks with 4" thick brick sizes and are described in the Glen-Gery's Brick Shapes Catalog. These shapes include the S2 quoin and the S80 single header. Like glazed stretchers, standard brick shapes are not stock items and must be specially ordered in the quantities required. Other brick shapes are described in Glen-Gery's "Brick Shapes" Catalog and include various configurations of bullnose, watertable, corner, radial, and shelf angle units. Shapes dimensioned for coursing with other brick sizes and shapes having configurations to fit specific project requirements are also available. As with all shapes, approved shop drawings must be received before stretcher and/or shapes production will be scheduled.

All shapes must be identified early in the project because certain shape configurations may require special forming, drying, or firing procedures. These procedures may require more time or different scheduling than the glazed stretchers. In order to achieve the effects desired by the designer, some shape designs may require coring which does not meet the requirements of ASTM C 1405.

Avoid sawing glazed bricks or glazed shapes. While field cutting of the glazed surface is possible, such cutting is not recommended due to the potential chipping of the surface.

This damage cannot be repaired. For this reason, it is important to specify and detail dedicated left-handed and right-handed units, inside and outside corner units, glazed headers and rowlocks, shorter than standard units, and all similar bricks.

Physical Properties of Units

Compressive Strength:

The average gross compressive strength of Glen-Gery glazed bricks exceeds 8,000 psi when tested with the load applied normal to the bedding surfaces. The actual compressive strength will depend upon the specific product tested. Bricks with this characteristic comply with the requirements of ASTM C1405, Class Exterior.

Water Absorption:

The cold water absorption of an individual brick is less than or equal to 7%. The average saturation coefficient of such brick will often exceed 0.78. When the average saturation coefficient exceeds 0.78, the individual cold water absorption is less than or equal to 6% and is usually less than 4%. Bricks with these characteristics comply with the requirements of ASTM C 1405, Class Exterior.

Initial Rate of Absorption (IRA):

The initial rate of absorption (suction) of Glen-Gery glazed bricks normally does not exceed 10 grams per 30 square inches per minute under laboratory conditions. Because of the low suctions of glazed bricks, wetting is rarely, if ever, necessary.

Properties of Walls

Compressive Strength:

The minimum assumed compressive strength of a brick wall constructed of a wall, using good workmanship and ASTM C270 Type N Mortar, will typically exceed 1,000 psi. Assemblies including Glen-Gery glazed brick may provide minimum assumed compressive strengths over 2,500 psi when used with good workmanship and Type N Mortar. Reference: Specification for Masonry Structures (TMS 602/ACI 530.1/ASCE 6).

Thermal Performances:

The thermal resistivity of Glen-Gery's extruded bricks is approximately 0.11 (hr. • sq. ft. • deg F) / (Btu • in.). A nominal four-inch wythe, excluding air films, will provide a thermal resistance of approximately 0.40 (hr. • sq. ft. • deg F) / Btu. The thermal resistivity is used to predict the thermal performance of wall elements under steady-state conditions. The mass and specific heat of this product provide additional benefits when subjected to the dynamic conditions of the natural environment. As described in the American Society of Heating Refrigerating and Air Conditioning Engineers (ASHRAE) Standard 90.1, the effects of mass, specific heat and the color of the brick should be considered. Reference: BIA Technical Notes on Brick Construction: 4, Revised, "Heat Transmission Coefficient for Brick Masonry Walls"; and 4B Revised – "Energy Code Compliance of Brick Masonry Walls."

Sound Transmission:

A nominal four-inch wythe of brickwork has a sound transmission classification (STC) of approximately 45. Reference: BIA Technical Notes on Brick Construction: 5A "Sound Insulation – Clay Masonry Walls."

Fire Resistance:

Fire resistance ratings are directly related to wall assembly including the equivalent thickness of masonry. A nominal four-inch wythe of clay masonry has an ultimate fire resistance period of 1-1/4 hours which provides a one-hour fire rating. Fire ratings can be determined through Testing (per ASTM E119) or calculated in accordance with the International Building Code (IBC) or Code Requirements for Determining Fire Resistance of Concrete Masonry Construction Assemblies (ACI 216.1/TMS 0216). Reference: BIA Technical Notes on Brick Construction: 16 Revised, "Fire Resistance of Brick Masonry."

Coefficient of Thermal Expansion:

Brick walls constructed of Glen-Gery glazed bricks have a coefficient of thermal expansion of approximately 0.000004 in./in./deg F as listed in The Building Code Requirements for Masonry

TABLE 2
Brick and Mortar Quantities¹
 Nominal 3/8 Inch Mortar Joints

Brick Size	Vertical Coursing in courses per inch	Units per square foot	Cubic Foot per 100 square foot	Quantity of Mortar per 1000 units
Modular	3 Courses per 8"	6.75	5.46	8.10
Engineer Modular	5 Courses per 16"	5.63	4.79	8.52
Econo	1 Course per 4"	4.50	4.12	9.15
8-Square	1 Course per 8"	2.25	2.77	12.29
Standard	3 Courses per 8"	6.55	4.12	6.29
Engineer Standard	5 Courses per 16"	5.39	4.75	8.81
Norman	3 Courses per 8"	4.50	5.06	11.24
Utility	1 Course per 4"	3.00	3.69	12.29

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

Structures (TMS 402/ACI 530/ASCE 5). A wall one-hundred feet long exposed to an annual extreme temperature difference of 100F° is expected to experience a total thermal movement of approximately one-half of an inch.

Coefficient of Moisture Expansion:

The coefficient of moisture expansion of Glen-Gery glazed bricks is typically less than 0.0005 in./in. Although most moisture expansion for any clay brick occurs immediately after the brick are fired, and before the brick arrive on the job site, the maximum design moisture expansion of a wall 100 feet long (or high) is less than five-eighths of an inch.

Construction

Storage and Protection:

Store glazed brick and glazed shapes off of the ground to avoid contamination by water, mud, dust, or materials likely to cause staining or other defects. Store glazed brick in a protected area to avoid impact damage. Do not use cubes of glazed brick as supports or work areas or surfaces. Cover glazed brick with a weather resistant membrane held securely in place or otherwise protect the units from the elements.

Handling:

Handle glazed bricks with care. Maintain them in their protective packaging for as

long as possible. The glaze is similar to glass in that contact with metal objects (tongs, trowels, scaffolding) or adjacent brick will likely cause chipping of the glaze. Chipped glazes cannot be repaired.

Wetting:

Because of the low initial rate of absorption of glazed bricks, wetting is rarely, if ever, necessary.

Weather Extremes:

Follow the procedures 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."

Laying and Mortars:

Place units with head and bed joints full of mortar. The mortar used to lay glazed brick should be mixed from ASTM C 150 Portland cement, ASTM C 207, Type S, hydrated lime, and ASTM C144 sand. Except for pigments meeting the requirements of ASTM C 979, mineral aggregate pigments, there should be no substitutions, additions or deletions to this list of ingredients. Depending upon the design assumptions and the installation conditions, such as weather, the mortar may be proportioned to meet the requirements of ASTM C 270, Types N or S. Type N mortars tend to produce walls with the best water penetration resistance. Type S mortars provide greater flexural tensile strength. When glazed bricks are used in areas where sanitary conditions must be maintained, special mortars must be used. These special mortars are beyond the scope of this publication. A prepackaged mortar mix conforming to the ASTM C 270, Type N, proportion specification is Glen-Gery Color Mortar Blend. Reference: Glen-Gery Product Profile "Glen-Gery Color Mortar Blend."

Designing Structures Clad with Glazed Bricks:

Because the finished (glazed) faces of glazed bricks are impervious to water,

other liquids, water vapor, and other gasses, water which may find its way into the wall system cannot evaporate through the glazed face of the brick. Thus, excess water must be prevented from entering the air space (cavity) and water that does enter the air space must be eliminated quickly. This can be accomplished by following the recommendations contained in Brick Industry Association Technical Notes on Bricks Construction #13, "Ceramic Glazed Brick Exterior Walls," #21, "Brick Masonry Cavity Walls," #28, "Anchored Brick Veneer, Wood Frame Construction," and #28B, "Brick Veneer/Steel Stud Walls" in addition to the following recommendations:

1. Cavity wall or veneer wall construction (Tech Notes #21, #28, or #28B) is mandatory. The clear width of all air spaces must be at least two inches.
2. Detail flashings at all window, louver, and door heads and sills, at the bases of air spaces, at lintels and shelf angles, at brick shelves, at the tops of walls, at any change in cross-section or construction and at all similar points in the construction.
3. In addition to detailing open-head-joint/weepvent/louvered insert weepholes twenty-four inches on center above every flashing, vent the tops of all air spaces to assist in dissipating the moisture within the airspace. Use open head-joints/vents spaced no more than twenty-four inches apart a course or two below horizontal interruptions of the air space such as shelf angles and flashing locations. Stagger these openings to reduce the possibility of water exiting the weephole above the flashing and entering the vent below the flashing. Weepholes must remain open at the base of the wall to allow air circulation.
4. Detail expansion joints (movement joints) in accordance with Technical Notes #18 "Volume Changes – Analysis and Effects of Movement" and #18A "Accommodating Expansion of Brickwork" Utilizing the coefficient of moisture expansion listed above. Expansion joint spacing in parapets should be limited to approximately 15 feet.

TABLE 3
Units Per Linear Foot in Various Positions
Nominal 3/8 Inch Mortar Joints

Brick Size	Stretcher	Rowlock	Soldier	Header
Modular	1.50	4.50	4.50	3.00
Engineer Modular	1.50	3.75	3.75	3.00
Econo	1.50	3.00	3.00	3.00
8-Square	1.50	1.50	1.50	3.00
Standard	1.43	4.50	4.50	3.00
Engineer Standard	1.43	3.75	3.75	3.00
Norman	1.00	4.50	4.50	3.00
Utility	1.00	3.00	3.00	3.00

5. Consider the occupancy: Gymnasiums, locker rooms, kitchens, laundries, swimming pools, and similar occupancies may require the installation of a vapor barrier on the heated side of the back-up and may require special HVAC systems.
6. Special attention must be paid to the proper detailing and installation of walls exposed to the exterior on two sides. When possible, avoid using glazed brick in freestanding walls, garden walls, wing walls, and parapet walls.
7. Do not use glazed brick to form sills for windows, louvers, wainscots, or in similar situations.
8. Do not use glazed brick to cap walls.
9. Do not use glazed brick below or in contact with grade.
10. Note that the use of full-height drainage mats in the air space may prevent the flow of air necessary for the drying of a wall clad with glazed bricks.

Tooling:

When thumbprint hard, tool mortar joints to produce a concave or vee joint finish. Do not use raked joints with glazed brick exposed to the weather.

Protection of Work:

At the end of each day or shut-down period, cover all work with a strong,

weather resistant membrane which is held in place securely. Scaffold boards closest to the wall should be tilted up at days end to prevent splatter during rain. Care should be taken to protect brickwork located near the ground from mud and dirt.

Cleaning:

Immediately after tooling the joints, wipe the masonry units with a wet sponge to remove soft mortar. If necessary, remove mortar with a stiff bristle brush at the end of each shift. Clean with wooden paddles and a stiff bristle brush, using clean water. Metal tools and broken bricks will damage the glaze. If a cleaning agent is used, test the cleaning agent on a small sample area to observe the effectiveness of the cleaning agent and to determine if the cleaning agent damages the glaze, the mortar, or the brick body. Always presoak the wall prior to applying the cleaning agent and thoroughly rinse the wall after cleaning is completed. 202V Vana-Stop®, manufactured by Diedrich Technologies, Inc., will generally perform well. Detailed cleaning instructions are available from Glen-Gery distributors, factories, sales offices, and Glen-Gery Brickwork Design Profile, "Cleaning New Brickwork."

Estimating:

The quantities of glazed bricks, shapes, and mortar required for a project will vary

with the size of the brick, the wall construction, specific detailing, the size and location of shapes, the coring of the units, and workmanship. Because the glaze will likely be damaged if the bricks are sawn, do not assume glazed bricks may be sawn to form shapes. Order shapes when they are needed. Table 1 provides the quantities of brick and mortar per square foot of wall and mortar quantities per 1000 bricks. These figures are based on the units being placed in the wall as stretchers in stack or running

bond. The quantities are provided for a single wythe of brickwork. The values provided are estimates of the quantities in the finished wall and do not account for waste. The factors provided in Table 3 may be useful for approximating the number of units for bands and accents. These factors represent the actual number of units per linear foot for the various brick sizes placed on the four most frequently used positions in the wall. The factors are based upon a mortar joint which has a nominal

width of three-eighth inch. The factors do not include waste. Reference: BIA Technical Notes on Brick Construction 10, "Dimensioning and Estimating Brick Masonry."

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