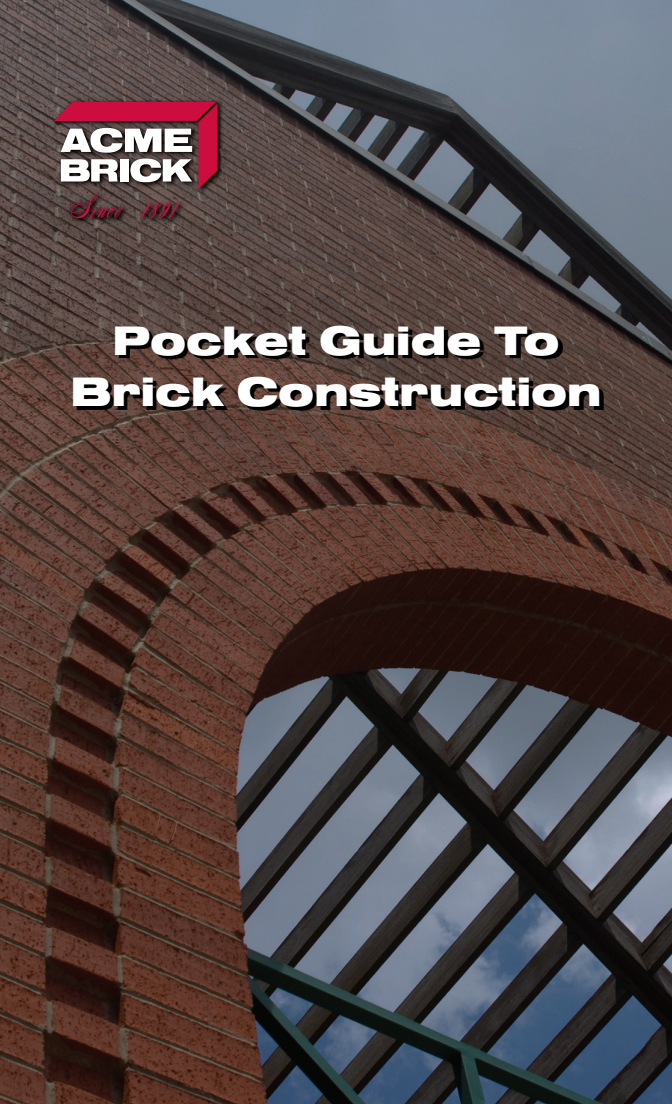
ACME BRICK

Since 1891

Pocket Guide To Brick Construction



ACME BRICK COMPANY

POCKET GUIDE TO BRICK CONSTRUCTION

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ACME BRICK
Since 1891

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Table of Contents

Table of Contents (continued)

GLOSSARY

Absorption - The amount of water that a solid or hollow clay or concrete masonry unit absorbs when either immersed in cold or boiling water for a specified length of time; expressed as a percentage of the dry unit weight. Usually the lower the percentage the more dense the masonry unit.

Abutment - The supporting wall or pier that receives the thrust of, or dispersed load imposed on an arch.

Accelerator - An ingredient added to mortar to speed hydration of cementitious components to hasten set time.

Acid Resistant Brick - Brick which do not deteriorate in strong acids. Brick which will not display adverse effects of corrosion or general structural deterioration when subjected to chemicals found to have a high positive or negative ph factor. Commonly installed with like resistant mortars.

Actual Dimension - The real measured size of a particular unit, not accounting for including any adjacent or expected thickness of mortar joints, which is typical for expressions of nominal thicknesses.

Adhesion Bond - The physical binding of adjacent masonry units or masonry units to a substrate by means of an applied mortar or other cementitious material by being drawn into the microscopic surface irregularities (pores) of the masonry units by means of capillary action water absorbed from the mortar by the masonry units thereby creating a somewhat homogeneous interface between mortar and masonry units.

Admixtures - Ingredients added to impart special properties to mortar or grout. Traditional materials other than water, aggregates, masonry lime, masonry cement, and Portland cement used as an ingredient of concrete, mortar or grout and added to the mix immediately before or during mixing are admixtures.

Adobe Brick - Large, roughly molded, sun-dried clay brick of various sizes. May be fired to improve strength characteristics and color variety. Sometimes referred to as "burned" adobe.

Aggregates - An inert granular material such as sand, gravel, crushed stone, vermiculite, perlite, and blast furnace slag, which are bound together with cement in concrete, grout and/or mortar.

Air Entraining - The capability of material or process to develop a system of disbursing of minute bubbles of air in the cement paste of mortar or concrete during mixing.

Allowable Loads - The permitted and projected safe load capacity through testing or calculations for a given structural element, including an acceptable safety factor for a given material.

Anchor - Device used to attach masonry to a structural support.

Angle Brick - Any brick or masonry unit shaped to an oblique angle to fit a salient corner.

Angle Closer - A closure unit.

Apron Wall - The portion of a wall between a sill and the wall below.

Arch - A vertically curved compressive structural member spanning openings or recesses.

Arch Brick - Wedge-shaped brick for special use in an arch. Also refers to the hard burned brick units found in the arch section of a scove kiln.

Arching Action - Ability of a deep masonry section to carry vertical loads through an arc-shaped compression region within its depth. Lintels are often designed to support only a 45-degree triangular portion of masonry above them, because the remaining masonry is supported by arching action.

Artificial Stone - A mixture of stone chips or fragments embedded in a matrix of cement or plaster with the surface either ground, polished or molded into slabs of varying size and dimension to lend the appearance and feel of real stone.

Ashlar Masonry - Generally square or rectangular masonry units having sawed or dressed bedding and joint surfaces, typically laid in mortar. Units may be set in wall in either a stacked, coursed or random coursing pattern.

Ashlar, Pattern - Masonry composed of bonded blocks of concrete, either rectangular or square, always of two or more sizes; if the pattern is repeated, it is patterned ashlar; if the pattern is not repeated, it is random ashlar.

Autoclave - In the production of concrete masonry units a curing chamber which utilizes steam under pressure to accelerate hydration of concrete masonry units.

Axial Load - Load exerted along the longitudinal axis of a member.

Backup - That part of a multi-wythe masonry wall which is behind the facing wythe.

Band Course - A continuous, horizontal band of masonry marking a division in the wall elevation. Sometimes called belt course, string course, or sill course.

Bat - A piece of brick, usually half the full size or smaller.

Batter - Masonry that is receding or sloping back in successive courses; the opposite of a corbel.

Beam - A structural member designed to resist flexure (bending).

Bearing Wall - A wall that supports vertical loads in addition to its own weight.

Bed - (1) A layer (stratum) of rock between two bedding planes. (2) In layered stone used for building, a surface parallel to the stratification. (3) In construction, the bottom surface of the masonry unit as it lies in the wall or other structure.

Bed Joint - The horizontal layer of mortar on which a masonry unit is set.

Bedded Area - The area of the surface of a masonry unit which is in contact with the bed joint.

Belt Course - A band course.

Bevel - An inclined surface of a solid object which connects two orthogonal sides.

Bond - (1) The arrangement of units to provide strength, stability, and pattern. (2) Adhesion between mortar or grout and masonry units or reinforcement. (3) To connect wythes or units. (4) Tying various parts of a masonry wall by lapping units one over another or with metal ties or reinforcing.

Bond Beam - (1) The course or courses of masonry units reinforced with longitudinal bars and designed to resist the longitudinal flexural and tensile forces in a masonry wall. (2) A horizontal grouted element within masonry in which reinforcement is embedded.

Bond Breaker - A material used to prevent adhesion between two surfaces.

Bond Course - A course consisting of units that overlap more than one wythe of masonry.

Bond Pattern - The pattern formed by the masonry units and the mortar joints on the face of a wall. The pattern may result from the type of structural bond used or may be purely a decorative one unrelated to the structural bonding.

Bond Strength - Resistance to separation of mortar from masonry units, grout, reinforcing steel or other materials.

Bonded Wall - A masonry wall in which two or more wythes are bonded to act as a unit.

Bonder - A masonry unit that overlaps two or more adjacent wythes of masonry to bond or tie them together. Also called a bond header.

Brick - A solid or hollow manufactured masonry unit, usually formed into a small rectangular prism.

Brick Type - Designation for facing brick that indicates tolerance, chippage, and distortion. Expressed as face brick standard (FBS), face brick extra (FBX), and face brick architectural (FBA) for solid brick, and hollow brick standard (HBS), hollow brick extra (HBX), hollow brick architectural (HBA), and hollow brick basic (HBB) for hollow brick.

Buttress - A projecting mass of masonry set at an angle to or bonded into a wall that it strengthens or supports. A buttress decreases in its cross-sectional area from top to base.

C/B Ratio - Saturation coefficient.

Calcite - A mineral form of calcium carbonate, principal constituent of most limestones.

Calcium Silicate Brick - Brick made primarily from sand and lime.

Cantilever - A structural member, supported at only one end, that projects from its support.

Capacity Insulation - The ability of masonry to resist heat transfer by storing.

Capstone - Any single stone at the top of a masonry structure.

Carbonation - Reaction between carbon dioxide and calcium compounds, especially in cement paste, mortar, or concrete, to produce calcium carbonate.

Cast Stone - (1) A precast building material manufactured from concrete. (2) A refined architectural precast concrete product manufactured to resemble cut and dressed natural stone.

Caulking - Sealing joints in masonry with a resilient compound such as silicones or rubber-based materials.

Cavity Wall - A wall built of masonry units arranged to provide a continuous air space within the wall (with or without insulating material) and in which the inner and outer wythes of the wall are tied together with metal ties or headers.

Cavity Wall Tie - A rigid, corrosion-resistant metal tie that bonds two wythes of a cavity wall together.

Cell - (1) A void space with cross-sectional area greater than 1 square inches. (2) A hollow space within a masonry unit bounded by face shells and webs.

Cementitious Material - When proportioning masonry mortars the following are considered cementitious material: Portland cement, blended hydraulic cement, masonry cement, and hydrated lime.

Centering - Temporary formwork for the support of masonry arches or lintels during construction. Also called centers.

Ceramic - A broad term for products made from heat-resistant, non-metallic, inorganic materials such as clay, bauxite, alumina, silica magnesia, silicone carbide, and the like which have been fired to incipient fusion.

Ceramic Color Glaze - An opaque colored coating which forms a thin layer of glass fused inseparably into the surface of a ceramic when it is fired.

Chamfer - To bevel an arris or edge.

Chase - A continuous recess in a wall to receive pipes, ducts, conduits, etc. The recess is usually vertical.

Chimney - A shaft built to carry off smoke.

Chimney Breast - The projection of the interior or exterior face of a wall caused by fireplaces or flues.

Chimney Lining - Fire clay or terra cotta material or refractory cement made to be built inside a chimney throat.

Clay - A natural mineral consisting essentially of hydrous aluminum silicate. It is plastic when moistened, stiff when dried, and vitrified when fired beyond maturing temperature.

Clay Brick - A ceramic brick of clay or shale, formed while plastic and fired in a kiln.

Clay Mortar Mix - Finely ground clay used as a plasticizer for masonry mortars.

Cleanout / Cleanout Holes - (1) An opening in the first course of masonry for removing mortar droppings prior to grout placement. Required in high lift grouting. (2) An opening to the bottom of a grout space of sufficient size and spacing to allow the removal of debris.

Clear Ceramic Glaze - Same as ceramic color glaze except that it is transparent or slightly tinted.

Clinker Brick - A very hard-burned brick whose shape is distorted or bloated due to nearly complete vitrification.

Closer - (1) The last masonry or portion of a unit laid in a course. (2) A stone course running from one window sill to another (a variety of string course).

Closure Unit - Supplementary or shorter length units used at corners or jambs to maintain bond patterns.

Coatings - Material applied to a surface by brushing, dipping, mopping, spraying, toweling, etc., to preserve, protect, decorate, seal, or smooth the substrate; also refers to foreign or deleterious substances found adhering to aggregate particles.

Collar Joint - Vertical longitudinal joint between wythes of masonry or between masonry wythe and back up construction which is permitted to be filled with mortar or grout.

Column - A relatively long, slender structural compression member supporting loads along its axis.

Common Brick - Brick for building purposes not especially treated for texture or color.

Composite Action - Transfer of stress between components of a member designed so that in resisting loads, the combined components act together as a single member.

Composite Masonry - Multi-component masonry members acting together as a unit.

Composite Wall - A multiple wythe wall in which at least one of the wythes is dissimilar to the other wythe with respect to type or grade of units or mortar.

Compressive Strength - The maximum compressive load which a specimen will support divided by the cross sectional area of the specimen.

Connector, Fastener - Device used to attach other materials to masonry.

Connector, Tie - Device used to join wythes of masonry in a multiwythe wall.

Control Joint - (1) A groove that is formed, sawed, or tooled, in a masonry structure to regulate the location and amount of cracking and separation resulting from the shrinkage of different parts of the structure, thereby avoiding the development of high stresses. (2) A continuous unbonded masonry joint to regulate the location and amount of separation resulting from the shrinkage of different parts of a structure so as to avoid the development of excessively high stresses.

Coping - The materials of masonry units used to form a cap or a finish on top of a wall, pier, chimney, or pilaster to protect the masonry below from water penetration. Commonly extended beyond the wall face and cut with a drip.

Corbel - (1) The projection of successive courses of masonry out from the face of the wall to increase the wall thickness or to form a shelf or ledge. (2) A shelf or ledge formed by successive courses of masonry projecting out from the face of a wall, pier, or column.

Core - A hollow space within a concrete masonry unit formed by the face shells and webs. The holes in clay units.

Cornice - The molding or series of moldings forming the top member of a facade, door or window frame, or interior wall.

Course - A layer (range) of masonry units running horizontally in a wall or, much less commonly, curved over an arch.

Crazing - The development of fine cracks in a web-like pattern on a surface.

Creep - Time-dependent deformation due to sustained load.

Cryptoflorescence - Concealed, interstitial salt crystals within masonry.

Culls - Masonry units that do not meet the standards or specifications and that have been rejected.

Curing - The maintenance of proper conditions of moisture and temperature during hydration to develop required strength and reduce shrinkage in products containing Portland cement.

Curtain Wall - An exterior non-loadbearing wall in skeleton frame construction. Such walls may be anchored to columns, spandrel beams or floors.

Damp-Proof Course - Treatment of masonry to retard the passage or absorption of water, or water vapor, either by application of a suitable coating to exposed surfaces, or by use of a suitable admixture or treated cement.

Dampproofing - Prevention of moisture penetration due to capillary action by the addition of one or more coatings of a compound that is impervious to water.

Dead Load - Any load caused by the weight of building materials which are a permanent part of a structure or element, as defined by the building code.

Degree Day - A unit, based upon temperature difference and time, used in estimating fuel consumption and specifying nominal heating load of a building in winter. For any one day, when the mean temperature is less than 65° F, there exist as many degree days as there are Fahrenheit degrees difference in temperature between the mean temperature for the day and 65° F.

Diaphragm - A roof or floor system designed to transmit lateral forces to shear walls or other vertical resisting elements.

Dolomitic Lime - A trade term for high-magnesium lime. Also a misnomer as the product does not contain dolomite.

Dovetail Anchor - A splayed tenon that is shaped like a dove's tail.

Drip - Groove or slot cut beneath and slightly behind the forward edge of a projecting member, such as a sill, lintel, or coping, to cause rainwater to drip off and prevent it from penetrating the wall.

Dry Press Brick - Brick formed in molds under high pressures from relatively dry clay (5% to 7% moisture content).

Durability - The ability of a material to resist weathering action, chemical attack, abrasion, and other conditions of service.

Eccentricity - The normal distance between the centroidal axis of a member and the parallel resultant load.

Edgeset - A brick set on its narrow side instead of on its flat side, especially during drying and firing.

Effective Height - (1) The height of a member that is assumed when calculating the slenderness ratio. (2) Clear height of a braced member between lateral supports and used for calculating the slenderness ratio of a member.

Effective Thickness - The thickness of a member that is assumed when calculating the slenderness ratio.

Effective Width - That part of a width of a member taken into account when designing T- or L-beams.

Efflorescence - A deposit of water soluble salts or alkalis, usually white, which form on the surface of masonry when a moisture solution migrates from the interior and evaporates. Efflorescence is often caused by free alkalis or salts leached from mortar, grout, adjacent concrete, or soil.

Empirical Design - A design based on the application of physical limitations learned from experience or observations gained through experience, without a structural analysis.

Engineered Masonry - Masonry which has been analyzed for vertical and lateral load resistance and whose members have been proportioned to resist design loads in accordance with working stress or strength design principles.

Equivalent Thickness - The solid thickness to which a hollow unit would be reduced if there were no voids and the same face dimensions. The percent solid volume times the actual width divided by 100.

Expansion Joint - (1) A joint or space to allow for expansion or contraction movement due to temperature changes or other conditions without rupture or damage. (2) A separation between adjoining parts of a masonry structure which is provided to allow small relative movements, such as those caused by thermal changes, to occur without one part affecting an adjacent part.

Face - The exposed surface of a wall or masonry unit.

Face Shell Bedding - Mortar is applied only to the face shells of hollow masonry units to a depth equal to the thickness of the face shell.

Facing - Any material, forming a part of a wall, used as a finished surface.

Facing Brick - Brick made especially for facing, or exposure purposes, and often treated to produce special surface textures. These bricks are made of selected clays, or treated, to produce the desired color.

Fascia - A flat horizontal band that appears as a vertical face. The fascia is used decoratively, alone or in combination with moldings.

Fat Mortar - Mortar containing a high ratio of binder to aggregate; sufficiently sticky to adhere to a steel trowel.

Fire Brick - Brick made of refractory ceramic material that will resist high temperatures.

Fire Clay - A clay that is highly resistant to heat without deforming and used for making brick.

Fireproofing - Any material or combination protecting structural members and increasing their fire resistance.

Fire Wall - Any wall which subdivides a building so as to resist the spread of fire, by starting at the foundation and extending continuously through all stories to, or above, the roof.

Flashing - (1) An impervious material placed in mortar joints and between wythes in masonry to prevent water penetration and provide water drainage. (2) Manufacturing method to produce specific color tones in clay units.

Flow - A laboratory measured property of mortar that indicates the percent increase in diameter of the base of the truncated cone of mortar when it is placed on a flow table and mechanically raised an dropped specified times under specified conditions.

Flush Joint - A mortar joint in which excess mortar is struck off flush with the face of masonry units.

Fly Ash - The finely divided residue resulting from the combustion of ground or powdered coal.

Foundation Wall - Walls below the floor nearest grade serving as a support for a wall, pier, column, or other structural part of a building.

Freeze-Thaw - Freezing and thawing of moisture in materials and the resultant effects on these materials and on structures of which they are a part or with which they are in contact.

Frog - A depression in the bed surface of a brick, sometimes called a panel.

Furring - Fastening wood or metal strips to a wall at regular intervals to attach sheet boards or siding.

Furrowing - Striking a "V" in a bed of mortar with the point of the trowel.

Gargoyle - (1) A spout, commonly of stone but may be metal, tile, or other material, to discharge water outward from gutters, especially those behind parapets. (2) By usage, the carved or molded ornamentation, generally in the form of a grotesque figure, of a projecting gutter spout.

Gauged Brick - (1) Brick that has been ground or otherwise produced with accurate dimensions. (2) A tapered arch brick.

Glass Block - Hollow or solid glass masonry unit.

Glazed Coatings - A ceramic coating, usually thin, glossy, and glass-like, formed on the surface of a masonry unit; the material from which the ceramic coating is made; the burning of a ceramic coating at high temperatures and fusing it to the body.

Gradation - The particle size distribution of aggregate as determined by separation with standard screens. Sieve analysis, screen analysis, and mechanical analysis are terms used synonymously in referring to gradation of aggregate. Gradation of aggregate is expressed in terms of the individual percentages passing standard screens.

Granite - (1) In technical geologic terms, igneous rock with crystals or grains of visible size and consisting mainly of quartz and the sodium or potassium feldspars. (2) In building stone, crystalline silicate rock with visible grains. The commercial term thus includes gneiss (a metamorphic rock) and igneous rocks that are not granite in strict sense.

Green Mortar - Mortar that has set but not hardened.

Gross Area - The total cross-sectional area of a specified section.

Ground - Nailing strips placed in masonry walls as a means of attaching trim or furring.

Grout - A mixture of cementitious material and aggregate to which sufficient water is added to produce pouring consistency without segregation of the constituents.

Grout Lift - The height to which grout is placed in a wall in a continuous pour.

Grouted Cell Masonry - Construction made with hollow units in which all cells and voids are filled with grout.

Grouted Hollow-Unit Masonry - That form of grouted masonry construction in which certain designated cells of hollow units are continuously filled with grout. Partially grouted masonry.

Grouted Masonry - (1) Concrete masonry construction composed of hollow units where hollow cells are filled with grout, or multi-wythe construction in which space between wythes is solidly filled with grout. (2) Masonry construction made with solid masonry units in which the interior joints and voids are filled with grout.

Hacking - (1) The procedure of stacking brick in a kiln or on a kiln car. (2) Laying brick with the bottom edge set in from the plane surface of the wall.

Hard-Burned - Nearly vitrified clay products that have been fired at high temperatures.

Head Joint - The vertical mortar joint between ends of masonry units. Also called a cross joint or vertical joint.

Header - A masonry unit that overlaps two or more adjacent wythes of masonry to tie them together. Also called a bonder.

Header Course - A continuous bonding course of header brick. Also called a heading course.

Hydraulic Cement - An inorganic material or a mixture of inorganic materials, which sets and develops strength by chemical reaction with water by formation of hydrates and is capable of doing so under water.

Initial Rate of Absorption (IRA) - The weight of water absorbed when a brick is partially immersed in water for one minute, expressed in grams per 30 square inches of contact surface. Also called suction.

Intrados - The concave curve that bounds the lower side of the arch.

Jack Arch - An arch that has little or no curvature.

Joint - The surface at which two members join or butt. If they are held together by mortar, the mortar-filled space is the joint.

Joint Reinforcement - Welded steel wire reinforcement that is placed in mortar bed joints.

Jointing - The finishing of joints between courses of masonry units before the mortar has hardened.

Jumbo Brick - A generic term indicating a brick larger in size than the standard. Some producers use this term to describe oversize brick of specific dimensions manufactured by them.

Kerf - A cut or removal of material in a unit to facilitate breaking the unit to a desired shape or length.

Kiln - A furnace, oven, or heated enclosure used for burning or firing brick or other clay material.

Kiln Run - Bricks from one kiln that have not yet been sorted or graded for size or color variations.

Lap - The distance one masonry unit extends over another.

Lateral Support - Means whereby structural members are braced in the horizontal span by columns, buttresses, pilasters, cross walls, or in the vertical span by beams, floors or roof construction.

Lead - The section of a wall built up and racked back on successive courses. A line is attached to leads as a guide for constructing a wall between them.

Lean Mortar - Mortar which is deficient in cementitious components. It is usually harsh and difficult to spread. Oversanded mortar.

Lime - Calcium oxide (CaO); A general term for the various chemical and physical forms of quicklime, hydrated lime, and hydraulic lime.

Hydrated Lime - Calcium hydroxide. A dry powder obtained by treating quicklime with water.

Limestone - Rock of sedimentary origin composed principally of calcite or dolomite or both.

Lintel - A beam placed or constructed over an opening in a wall to carry masonry above it.

Live Load - Any load added to a structure or element by building occupants or movable contents as specified by the building code.

Load-Bearing Wall - A wall that supports vertical load in addition to its own weight.

Loadbearing - A structural system or element designed to carry loads in addition to its own dead load.

Load Combination - A series of loads which cumulatively applied through tests or calculations to an element or structure for code compliance. The series of loads are a projection of loads anticipated to be applied to the structure for its prescribed usage in an effort to create the worst possible loading for any given element, connection or combination.

Major Arch - Arch with span greater than six feet.

Marble - (1) In geology, a metamorphic rock made up largely of calcite or dolomite. (2) In dimension stone, a rock that will polish and that is composed mainly of calcite or dolomite, or rarely, serpentine.

Masonry - (1) Strictly speaking, the art of building in stone. By extension, masonry has come to mean the practice of the mason's craft with brick, tile, concrete masonry units and other materials. (2) The work resulting from the practice of the mason's craft - structures built of stone, brick, or other materials set as units in patterns and amenable to assembly with mortar, whether or not mortar is actually used. (3) The type of construction made up of masonry units laid up with mortar or grout or other accepted method of jointing. (4) An assemblage of masonry units.

Masonry Bond - To connect wythes of masonry with overlapping header units.

Masonry Cement - A mill-mixed cementitious material to which sand and water is added to make mortar.

Masonry Prism - An assemblage of masonry units and mortar with or without grout used as a test specimen for determining properties of the masonry.

Masonry Unit - Natural or manufactured building units of burned clay, concrete, stone, glass, gypsum, etc.

Masonry Veneer - A non-loadbearing facing of masonry attached to its structural backing but not relied upon to strengthen the wall.

Mechanical Bond - Tying masonry units together with metal ties, reinforcing steel or keys.

Metal Tie Bond - To connect wythes of masonry together with metal ties or joint reinforcement.

Minor Arch - Arch with a span of less than 6 feet.

Mix Design - The proportions of ingredients to produce mortar, grout or concrete.

Mixer - A machine employed for blending constituents of concrete, grout, mortar or other mixtures.

Modular Coordination - A dimensional system affording more efficient assembly of buildings from standard building products by correlating the dimensions of a structure and the unit sizes of the materials going into it, through reference to a four inch cubical module. Efficient use eliminates extra work hours and waste of materials.

Modular Design - Constructed with standardized units or dimensions for flexibility and variety in use.

Modulus of Elasticity - Ratio of normal stress to corresponding strain for tensile or compressive stresses below proportional limit of material.

Modulus of Rigidity - Ratio of unit shear stress to unit shear strain for unit shear stress below the proportional limit of the material.

Moisture Meter - Electrical meter for determining the moisture content of masonry, which generally measures only the moisture content of the surface material.

Mold - A device containing a cavity into which neat cement, mortar, or concrete test specimens are cast. Also, form used in the fabrication of concrete and clay masonry units.

Mortar - A plastic mixture of cementitious materials, fine aggregate and water used to bond masonry or other structural units.

Mortar Bed - A thick layer of mortar used to seat a structural member.

Mortar Bond - Adhesion between mortar and masonry units or reinforcement.

Net Section - Minimum cross section of the member under consideration.

Net Cross-Sectional Area - Average gross cross-sectional area of the masonry unit minus the area of ungrouted cores or cells.

Nominal Dimension - A dimension which may vary from the actual dimension by the thickness of a mortar joint but not more than 1/2 inch. The actual dimension is usually 3/8 inch less than nominal in most concrete masonry units.

Noncombustible - Any material that will neither ignite nor actively support combustion in air at a temperature of 1200° F when exposed to fire.

Non-Loadbearing Wall - A wall that supports no vertical load other than its own weight.

Nonstaining Mortar - A mortar with low free alkali content to avoid efflorescence or staining of adjacent masonry units by migration of soluble materials.

Parapet - A low wall around the perimeter of a building at roof level or around balconies.

Parging - (1) Plastering a coating of mortar, which may contain damp-proofing ingredients, over the back of masonry veneer, the face of the backup, or on underground exterior masonry (sometimes referred to as pargeting).

Partition - An interior wall one story or less in height. It is generally non-loadbearing. In Canada a partition is never loadbearing.

Paving Brick - Vitrified brick especially suitable for use in pavements where resistance to abrasion is important.

Perlite - A volcanic glass having a perlitic structure, usually having a higher water content than obsidian; when expanded by heating, used as an insulating material and as a lightweight aggregate in concretes, mortars, and plasters.

Pick and Dip - A method of laying brick whereby the bricklayer simultaneously picks up a brick with one hand, and with the other hand, has enough mortar on a trowel to lay the brick. Sometimes called the Eastern or New England method.

Pier - An isolated column of masonry, not bonded to associated masonry.

Pierced Wall - A masonry wall in which an ornamental pierced effect is achieved by alternating rectangular or shaped blocks with open spaces.

Pilaster - (1) A bonded or keyed column of masonry built as part of a wall. It may be flush or projected from either or both surfaces and has uniform cross section throughout its height. It serves as either a vertical beam or a column or both. (2) A flat engaged pier, extending less than half its width from a wall.

Plain Masonry - Masonry constructed without steel reinforcement, except that which may be used for bonding or reducing the effects of dimensional changes due to variations in moisture content or temperature.

Plaster - Any mixture of fine aggregates with cementitious materials, such as lime or plaster of Paris, used to coat interior walls and produce a smooth or textured finish.

Plasticizer - An additive to mortar, grout, or concrete to increase its workability, flexibility or extensibility.

Plumb Bob - A shaped metal weight suspended from a line to determine vertical.

Pointing - (1) Troweling mortar into a joint after masonry units are laid. (2) Final treatment of joints in cut stonework. Mortar or a putty-like filler is forced into the joint after the stone is set. (3) In stone carving, creating points from a model and establishing their position on the stone that is to be carved.

Portland Cement - (1) Hydraulic cement produced by pulverizing clinkers consisting of hydraulic calcium silicates, usually containing one or more of the forms of calcium sulfate as an interground material. (2) Product obtained by pulverizing clinker consisting of hydraulic calcium silicates meeting the requirements of ASTM C 150.

Pozzolans - Siliceous or a siliceous and aluminum material, which in itself possesses little or no cementitious value but will, in finely divided form and in the presence of moisture, chemically react with calcium hydroxide at ordinary temperatures to form compounds possessing cementitious properties.

Prefabricated Masonry - Masonry fabricated in a location other than its final location in the structure. Also known as preassembled, panelized, and sectionalized masonry.

Pressure-Relieving Joint - An open joint left at stated horizontal intervals to allow for expansion and contraction, commonly below horizontal supporting elements. Such joints are sealed with flexible caulking to prevent moisture penetration.

Prestressed - Materials in which a significant controlled degree of compressive stress has been deliberately produced.

Prism - Any solid shape with only vertical and horizontal faces.

Prism Strength - Maximum compressive strength (force) resisted per unit of net cross-sectional area of masonry, determined by testing masonry prisms.

Prism Testing - Testing of at least 3 masonry prisms in accordance with ASTM E 447 to determine the compressive strength of the masonry.

Progressive Collapse - Spread of an initial local failure from one building element to another resulting in the collapse of an entire structure or a disproportionately large part of it. Usually the result of gross misuse of design of an element, abnormal loading or impact loads.

Quality Assurance - Planned system of activities whose purpose is to provide assurance that the overall quality control program is in fact being effectively implemented. This system also involves the evaluation of corrective action initiated where necessary.

Quality Control - Planned system of activities whose purpose is to provide a level of quality that meets the needs of the users and the use of such a system. The objective of quality control is to provide quality that is safe, adequate, dependable and economic. The overall system involves integrating the factors of several related steps including: the proper specification, production to meet the full intent of the specification, inspection to determine whether the resulting material, product, or service is in accordance with the specifications and review of usage to determine necessary revision to the specifications.

Quoin - (1) One of a series of masonry corner blocks, differing in size, finish, or material from the adjacent walling. (2) A wedge-shaped piece of stone. May be used in either the corner treatment described above (although most quoin stones are not wedge-shaped) or as a chock, a shim, or a device for leveling or aligning.

R-Value - The thermal resistance which is an indication of the heat flow through a material.

Racking - Stepping back successive courses of masonry.

Radon - A heavy, gaseous element resembling argon, but radioactive.

Raggle - Slot or groove cut in masonry to receive mortared-in flashing.

Raked Joint - A mortar joint where " to " of mortar is removed from the outside of the joint.

Reglet - A recess to receive and secure metal flashing.

Reinforced Beams - Horizontal structural members designed to carry floor loads and composed of concrete or masonry with reinforcement to support tensile and shear stresses.

Reinforced Column - A vertical structural member in which both the steel and masonry resist the imposed load.

Reinforced Masonry - (1) Masonry containing reinforcement in the grouted joints or grouted cores to resist shearing and tensile stresses. (2) Unit masonry in which reinforcement is embedded in such a manner that the component materials act together in resisting shearing and tensile forces.

Relieving Arch - An arch, usually blind, built into the wall above a lintel or flat arch to carry the load to walls or other supporting members.

Repointing - Replacing mortar in masonry.

Retarding Agent - A chemical additive in mortar that slows setting or hardening.

Retempering - To moisten mortar and re-mix, after original mixing, to the proper consistency for use.

Reveal - In the side of a door or window opening that is rebated for a frame, the surface extending from the slot (or frame) to the outer surface of the wall.

Roman Arch - A semicircular arch. If built of stone, all units are wedge-shaped.

Rowlock - A brick laid on its face edge with the end surface visible in the wall face. Frequently spelled rolok.

Running Bond - Units in successive courses are placed so that the vertical mortar joints centered over the unit below is called a center or half bond, while lapping one-third of the way is called a third bond and one-fourth of the way is called a quarter bond.

Rustic - (1) A term describing masonry, generally of local stone, that is roughly hand dressed, and intentionally laid with high relief in relatively modest structures of rural character. (2) A grade of building limestone, characterized by coarse texture.

Rustic Joint - A deeply sunk mortar joint that has been emphasized by having the edges of the adjacent stones chamfered or recessed below the surface of the face.

Salmon Brick - Generic term for underburned brick that is more porous and lighter colored than hard-burned brick. Usually pinkish-orange in color.

Salt Glaze - A gloss finish obtained by a thermochemical reaction between silicates of clay and vapors of salt or chemicals.

Sand Blasting - A system of cutting or abrading a surface of masonry by a stream of sand ejected from a nozzle at high speed by compressed air; often used for cleanup of horizontal construction joints or for exposure of aggregate in architectural concrete.

Sand-Size - Grains between 1/16 millimeter (0.002 inch) and 2 millimeters (0.125 inch) in largest cross section.

Saturation Coefficient - The ratio of the weight of water absorbed by a masonry unit following immersion in cold water for 24 hours to weight absorbed following immersion in boiling water for five hours.

Score - (1) To rout a channel or groove in stone finishing with hand tools or a circular saw to interrupt the visual effect of a surface or to otherwise decorate. (2) To roughen the surface of stone or concrete with straight gouges so that stucco or plaster will adhere.

Sealants - A fluid of plastic consistency laid at the outside of a joint to exclude water.

Service Load - Load expected in the life of a structure as specified by the building code.

Sewer Brick - Low absorption, abrasive-resistant brick intended for use in drainage structures.

Shale - Clay that has been subjected to high pressures until it has hardened rock-like.

Shelf Angles - Structural angles bolted to the structure to support masonry.

Shoring - Props or posts used for temporary support of members during construction.

Shoved Joints - Head joints filled by shoving the unit against the next unit when it is being laid in a bed of mortar.

Shrinkage - Volume change due to loss of moisture or decrease in temperature.

Sill - A flat or slightly beveled stone set horizontally at the base of an opening in a wall.

Skew Back - The incline surface on which the arch joins the supporting wall.

Slenderness Ratio - The ratio of the effective height of a wall or column to its effective thickness. Used as a means of assessing the stability of a masonry wall or column.

Slump - The drop in the height of a wet cementitious material when its mold is removed. Slump test is a test used to measure the workability of cementitious materials.

Slump Block - Concrete masonry units produced so that they "slump" or sag in irregular fashion before they harden.

Slushed Joints - Head or collar joints filled after units are laid by "throwing" mortar in with the edge of a trowel.

Soap - A masonry unit of normal face dimension, having a nominal two-inch thickness.

Soffit - The exposed lower surface of any overhead component of a building such as a lintel, vault, or cornice, or an arch or entablature.

Soft-Burned - Clay products that have been fired at low temperature ranges, producing units of relatively high absorptions and low compressive strengths.

Soft Mud Brick - Brick produced by molding (often by a hand process) with relatively wet clay (20 to 30 percent moisture). When the insides of the molds are sanded to prevent the clay from sticking, the product is sand-struck brick. When the molds are wetted to prevent sticking, the product is water-struck brick.

Solar Screens - Perforated walls used as a sunshade.

Soldier - A brick set on end with its face showing on the wall surface.

Solid Masonry Unit - A masonry unit whose net cross-sectional area in every plane parallel to the bearing surface is 75 percent or more of its gross cross-sectional area.

Spall - To flake or split away from a surface.

Specified Compressive Strength of Masonry - Minimum compressive strength expressed as force per unit of net cross-sectional area required of the masonry used in construction by the project documents, and upon which the project design is based. Whenever the quantity f'm is under the radical sign, the square root of numerical value only is intended and the result has units of pounds per square inch.

Spring Line - The lowest point of an arch or dome, where it intersects an abutment or wall.

Stack - Any structure or part thereof that contains a flue or flues for the discharge of gases. Also called a chimney.

Standard - An accepted measure of comparison for a quantitative or qualitative value.

Story Pole - A marked pole used for marking masonry coursing during construction.

Stretcher - A masonry unit laid with its greatest dimension horizontal and its face parallel to the wall face.

Strike - To finish a mortar joint with a stroke of the trowel, simultaneously removing extruding mortar and smoothing the surface of the mortar remaining in the joint.

Stringing Mortar - Spreading enough mortar on a bed to lay several masonry units.

Stucco - A cement plaster used for coating exterior walls and other exterior surfaces of buildings.

Suction - Initial Rate of Absorption.

Temper - To moisten and mix mortar to a proper consistency.

Terra Cotta - A hard, semi-fired, waterproof ceramic clay used in pottery and building construction.

Terrazzo - Marble-aggregate concrete that is cast in place or precast and ground smooth; used as a decorative surfacing on floors and walls.

Texture - The pattern or configuration apparent in an exposed surface, as in concrete and mortar, including roughness, streaking, striation, or departure from flatness.

Thermal Conductivity - The amount of heat that flows through a flat material when its opposing surfaces differ in temperature by one degree.

Thermal Expansion - Expansion of a material due to the increase in temperature.

Thermal Inertia - Resistance of materials to temperature change.

Thermal Mass - The heat capacity of a building material (ability to store or accumulate heat).

Thermal Resistance - The reciprocal of thermal conductivity expressed by the symbol R.

Thinsets - Tile systems that can be applied in a thin cross-section, 3/4 of an inch or less.

Tie - Any unit of material that connects masonry to masonry or other materials.

Tile, Structural Clay - Hollow clay masonry units composed of burned clay, shale, fire clay, or mixtures thereof with parallel cells, cores, or both.

Tolerance - Specified allowance of variation from a size specification.

Tooling - Compressing and shaping the face of a mortar joint with a special tool other than a trowel.

Toothing - Constructing the temporary end of a wall with the end stretcher of every alternate course projecting. Projecting units are called toothers.

Transformed Section - An assumed section of one material having the same elastic properties as the section of two or more materials.

Trig - The bricks laid in the middle of a course for a guide to eliminate sag in the line and to reduce the effect of wind blowing the line out of plane.

Trimmer Arch - An arch, usually a low-rise arch of brick, used for supporting a fireplace hearth.

Trombe Wall - (1978) A masonry wall that is usually behind glazing is designed to absorb solar heat and release it into the interior of a building.

Tuck Pointing - Tightly filling cut out or defective mortar joints with fresh mortar.

U Factor - A measurement of thermal conductivity (Btu/SF/hr/°F).

Veneer - A single facing wythe of masonry units or similar materials securely attached to a wall for the purpose of providing ornamentation, protection, insulation, etc., but not adding strength to the wall.

Veneer Tie - A strip or piece of metal used to tie a facing veneer to the backing.

Vermiculite - A natural mica expanded by heat to form a lightweight aggregate, used in the expanded state as a heat insulating material or an aggregate.

Virtual Eccentricity - The eccentricity of a resultant axial load required to produce axial and bending stresses equivalent to those produced by applied axial loads and moments. It is normally found by dividing the moment at a section by the summation of axial loads occurring at that section.

Vitrification - The condition resulting when kiln temperatures are so high as to fuse grains and close pores of a clay product, making the mass impervious.

Wall - A vertical planar member of a structure, enclosing or dividing space.

Wall Plate - A horizontal member anchored to a masonry wall to which other structural elements may be attached. Also called a head plate.

Wall, Prestressed - Reinforced concrete or masonry walls in which internal stresses have been introduced to reduce potential tensile stresses in the wall resulting from imposed loads.

Wall, Reinforced - A masonry wall reinforced with embedded steel so that the two materials act together in resisting forces on the wall.

Wall, Retaining - A wall designed to prevent the movement of soils and structures placed on one side of it.

Wall, Screen - A masonry solar shading wall usually made of decorative bricks or tile.

Wall, Serpentine - A single-wythe wall built with curves in plan to strengthen it.

Wall, Shear - A wall which carries shear loads in its own plane.

Wall, Single Wythe - A wall of only one masonry unit in thickness.

Wall, Spandrel - That portion of a panel or curtain wall above the head of a window or door in one story and below the sill of the window in the story above.

Wall Tie - A bonder or metal piece that connects wythes of masonry to each other or to other materials.

Water Permeance - The ability of water to permeate through a wall.

Water Retentivity - That property of mortar which prevents the rapid loss of water to masonry units of high suction. It also prevents bleeding or water gain when mortar is in contact with relatively impervious units.

Water Table - A projection of lower masonry on the outside of the wall slightly above the ground. Often a damp course is placed at the level of the water table to prevent upward penetration of ground water. Generally near grade and having a beveled top and a drip cut in the projecting underside to deflect water.

Waterproofing - Prevention of moisture flow through masonry.

Watertightness - Of such tight construction as to be impermeable to water except when under sufficient pressure to produce structural discontinuity.

Weathering - The action of elements in altering the color, texture, composition or form of exposed objects. The effects of nature physically and chemically upon masonry construction.

Web - The cross wall connecting the face shells of a hollow concrete masonry unit.

Weep Hole - Opening in mortar joint or face of masonry units to permit escape of moisture, usually located immediately above flashing.

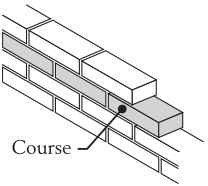
Wind Loads - Load on a building caused by wind pressure and/or suction.

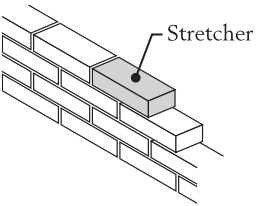
Workability - The ability of mortar to be easily placed and spread.

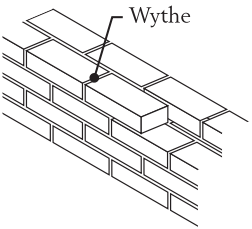
Workmanship - The art or skill of a workman. Craftsmanship. Quality imparted to a masonry wall or floor in the process of building it.

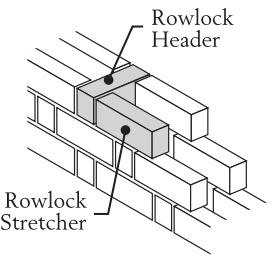
Wythe - Each continuous vertical section of a wall, one masonry unit in thickness, and tied to its adjacent vertical section or sections by bonders, metal ties, or grout.

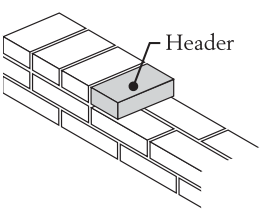
Brick Position Nomenclature

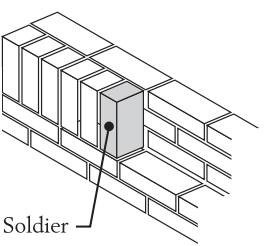




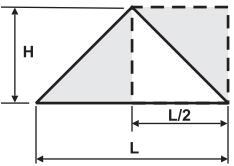




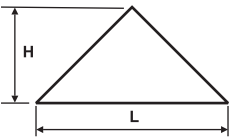




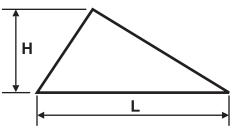
Estimating Area and Volume



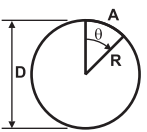
L/2 H = Area (ft^2)



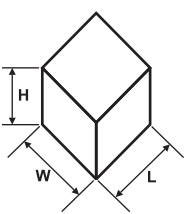
L/2 H = Area (ft^2)



L/2 H = Area (ft^2)



Arc Length



Volume = L W H (ft^3)

C = D π
π = 3.14
A = θ/360° C
A = θ/360° 3.14 D

where:
A = arc length
θ = angle of radius intersections
R = radius
D = diameter

Example:
If D = 20 ft. and θ = 40°:
A = 40°/360° 3.14 20 ft.
A = 7 ft

Length Unit Conversion Tables

Decimals of a Foot for Each 1/16 of an Inch

Inch	0"	1"	2"	3"	4"	5"	6"	7"	8"	9"	10"	11"
0"	.0000	.0833	.1667	.2500	.3333	.4167	.5000	.5833	.6667	.7500	.8333	.9167
1/16"	.0052	.0885	.1719	.2552	.3385	.4219	.5052	.5885	.6719	.7552	.8385	.9219
1/8"	.0104	.0938	.1771	.2604	.3438	.4271	.5104	.5938	.6771	.7604	.8438	.9271
3/16"	.0156	.0990	.1823	.2656	.3490	.4323	.5156	.5990	.6823	.7656	.8490	.9323
1/4"	.0208	.1042	.1875	.2708	.3542	.4375	.5208	.6042	.6875	.7708	.8542	.9375
5/16"	.0260	.1094	.1927	.2760	.3594	.4427	.5260	.6094	.6927	.7760	.8594	.9427
3/8"	.0313	.1146	.1979	.2813	.3646	.4479	.5313	.6146	.6979	.7813	.8646	.9479
7/16"	.0365	.1198	.2031	.2865	.3698	.4531	.5365	.6198	.7031	.7865	.8698	.9531
1/2"	.0417	.1250	.2083	.2917	.3750	.4583	.5417	.6250	.7083	.7917	.8750	.9583
9/16"	.0469	.1302	.2135	.2969	.3802	.4635	.5469	.6302	.7135	.7969	.8802	.9635
5/8"	.0521	.1354	.2188	.3021	.3854	.4688	.5521	.6354	.7188	.8021	.8854	.9688
11/16"	.0573	.1406	.2240	.3073	.3906	.4740	.5573	.6406	.7240	.8073	.8906	.9740
3/4"	.0625	.1458	.2292	.3125	.3958	.4792	.5625	.6458	.7292	.8125	.8958	.9792
13/16"	.0677	.1510	.2344	.3177	.4010	.4844	.5677	.6510	.7344	.8177	.9010	.9844
7/8"	.0729	.1563	.2396	.3229	.4063	.4896	.5729	.6563	.7396	.8229	.9063	.9896
15/16"	.0781	.1615	.2448	.3281	.4115	.4948	.5781	.6615	.7448	.8281	.9115	.9948

Decimals of an Inch for Each 1/16 of an Inch

Frac.	Dec.	Frac.	Dec.	Frac.	Dec.	Frac.	Dec.
1/16"	.0625	5/16"	.3125	9/16"	.5625	13/16"	.8125
1/8"	.125	3/8"	.375	5/8"	.625	7/8"	.875
3/16"	.1875	7/16"	.4375	11/16"	.6875	15/16"	.9375
1/4"	.25	1/2"	.5	3/4"	.75	1	1

Metric Conversion Table

To Convert From	To	Multiply By
foot	meter (m)	0.3048
inch	centimeter (cm)	2.54
yard	meter (m)	0.9144
sq. foot	sq. meter (m)	0.0929
sq. inch	sq. centimeter (cm)	6.451
cubic foot	cubic meter (m)	0.02832
gallon	cubic meter (m)	0.003785
fluid ounce	cubic centimeter (cm)	29.57
kilogram-force	newton (N)	9.807
kip	kilogram-force (kgf)	453.6
kip	newton (N)	4448
pound-force	kilogram-force (kgf)	0.4536
pound-force	newton (N)	4.448
kilogram-force/ sq. meter	newton/sq. meter (N/m)	9.807
kip/sq. in. (ksi)	kilogram-force/sq. centimeter (kgf/cm)	70.31
pound-force/sq. foot	kilogram-force/sq. centimeter (kgf/cm)	4.882
pound-force/sq. foot	newton/sq. meter (N/m)	47.88
pound-force/sq. in. (psi)	newton/sq. millimeter (N/mm)	0.006895
pound-force/sq. in (psi)	megapascals (MPa)	0.006895

Common Brick Sizes

Unit Name		Actual Size (inches)	Equivalent (mm)	Modular Metric Size (mm)	Equivalent (Inches)	Vertical Coursing
Modular	Thk H L	3 5/8 2 1/4 7 5/8	92 57 194	90 57 190	3 9/16 2 1/4 7 1/2	2 2/3" 67 mm
Economy Modular (Closure)	Thk H L	3 5/8 3 5/8 7 5/8	92 92 194	90 90 190	3 9/16 3 9/16 7 1/2	4" 100 mm
Roman	Thk H L	3 5/8 1 5/8 11 5/8	92 41 295	90 40 290	3 9/16 1 9/16 11 7/16	2" 50 mm
Norman	Thk H L	3 5/8 2 1/4 11 5/8	92 57 295	90 57 290	3 9/16 2 1/4 11 7/16	2 2/3" 67 mm
Utility	Thk H L	3 5/8 3 5/8 11 5/8	92 92 295	90 90 290	3 9/16 3 9/16 11 7/16	4" 100 mm
Standard*	Thk H L	3 5/8 2 1/4 8	92 57 203	90 57 200	3 9/16 2 1/4 7 7/8	2 2/3" 67 mm
Engineer Modular	Thk H L	3 5/8 2 3/4 7 5/8	92 70 194	90 70 190	3 9/16 2 3/4 7 1/2	3.2" 80 mm
King*	Thk H L	2 3/4 2 5/8 9 5/8	70 67 244	NA	NA	3" 76 mm
Builders Special*	Thk H L	2 3/4 2 5/8 8 5/8	70 67 219	NA	NA	3" 76 mm
Colonial	Thk H L	3 2 7/8 8 3/4	76 73 222	NA	NA	3 1/4" 83 mm
Queen* DVP	Thk H L	2 13/16 2 13/16 8 5/8	71 71 219	NA	NA	3.2" 81 mm
Queen* HSP	Thk H L	2 3/4 2 3/4 7 5/8	70 70 194	NA	NA	3.2" 80 mm

* Queen Size brick have different dimensions depending on the market area in which they are produced. These are two examples from Acme Brick plants.

Brick in the metric system should conform to a 200mm module for modular construction. In the above table, the first six units can match 200mm vertical dimensions at multiples of their coursing (50mm, 67mm, or 100mm) when laid with a 10mm bed joint. Queen and engineer modular brick will match 400mm coursing with 10mm joints. To match 200mm modules in horizontal dimension, use metric sizes only.

ASTM Standard Specifications for Brick and Applicable Standard Testing for Units and Masonry Assemblages

Definitions of Terms:

ASTM	C 43	Standard Terminology of Structural Clay Products
ASTM	C 51	Definition of Terms Relating to Lime and Limestone
ASTM	C 119	Definition of Terms Relating to Natural Building Stone
ASTM	C 1232	Standard Terminology of Masonry

Units

Brick:

ASTM	C 32	Sewer and Manhole Brick
ASTM	C 55	Concrete Building Brick
ASTM	C 62	Building Brick (Solid Units)
ASTM	C 73	Calcium Silicate Face Brick (Sand-Lime Brick)
ASTM	C 126	Ceramic Glazed Structural Clay Facing Tile, Facing Brick, and Solid Masonry Units
ASTM	C 216	Brick, and Solid Masonry Units Facing Brick (Solid Units)
ASTM	C 279	Standard Specification for Chemical-Resistant Masonry Units
ASTM	C 410	Industrial Floor Brick
ASTM	C 652	Hollow Brick
ASTM	C 902	Pedestrian and Light Traffic Paving Brick
ASTM	C 980	Industrial Chimney Lining Brick
ASTM	C 1088	Standard Specification for Thin Veneer Brick Units Made from Clay or Shale
ASTM	C 1261	Standard Specification for Firebox Brick for Residential Fireplaces
ASTM	C 1272	Standard Specification for Heavy Vehicular Paving Brick

Tile:

ASTM	C 34	Structural Clay Load-Bearing Wall Tile
ASTM	C 56	Structural Clay Non-Load-Bearing Tile
ASTM	C 57	Structural Clay Floor Tile
ASTM	C 126	Ceramic Glazed Structural Clay Facing Tile, Facing Brick, and Solid Masonry Units
ASTM	C 212	Structural Clay Facing Tile
ASTM	C 315	Clay Flue Linings
ASTM	C 530	Structural Clay Non-Load-Bearing Screen Tile

Block:

ASTM	C 90	Standard Specification for Load-Bearing Concrete Masonry Units
ASTM	C 129	Standard Specification for Non-Load-Bearing Masonry Units
ASTM	C 139	Concrete Masonry Units for Construction of Catch Basins and Manholes
ASTM	C 331	Lightweight Aggregates for Concrete Masonry Units
ASTM	C 744	Prefaced Concrete and Calcium Silicate Masonry Units
ASTM	C 936	Solid Concrete Interlocking Paving Units

Stone:

ASTM	C 503	Marble Building Stone
ASTM	C 568	Limestone Building Stone
ASTM	C 615	Granite Building Stone
ASTM	C 616	Sandstone Building Stone
ASTM	C 629	Slate Building Stone

Mortar and Grout

ASTM	C 5	Quicklime for Structural Purposes
ASTM	C 91	Masonry Cement
ASTM	C 144	Aggregate for Masonry Mortar
ASTM	C 150	Portland Cement
ASTM	C 207	Hydrated Lime for Structural Purposes
ASTM	C 270	Mortar for Unit Masonry
ASTM	C 395	Standard Specification for Chemical-Resistant Resin Mortars
ASTM	C 404	Aggregates for Masonry Grout
ASTM	C 476	Grout for Masonry
ASTM	C 887	Package, Dry, Combined Materials for Surface Bonding Mortar
ASTM	C1329	Mortar Cement

Metal Connections

Base Metals:

ASTM	A 82	Cold Drawn Steel Wire for Concrete Reinforcement
ASTM	A 167	Stainless Steel Plate, Sheet, and Strip
ASTM	A 496	Deformed Steel Wire for Concrete Reinforcement
ASTM	A 615	Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
ASTM	A 616	Rail-Steel Deformed and Plain Bars for Concrete Reinforcement
ASTM	A 617	Axle-Steel Deformed and Plain Bars for Concrete Reinforcement
ASTM	A 706	Deformed Low-Alloy Bars
ASTM	B 1	Hard Drawn Copper Wire
ASTM	B 227	Hard Drawn Copper Clad Steel Wire

Coatings:

ASTM	A 116	Zinc-Coated (Galvanized) Steel Woven Wire Fence Fabric
ASTM	A 153	Zinc-Coating (Hot Dip) on Iron and Steel Hardware
ASTM	A 386	Stainless and Heat Resisting Steel Wire Strand
ASTM	A 641	Zinc-Coated (Galvanized) Carbon Steel Wire
ASTM	A 525	Steel Sheet Zinc-Coated (Galvanized) by the Hot Dip Process

Insulation

ASTM	C 516	Vermiculite Loose Fill Insulation
ASTM	C 549	Perlite Loose Fill Insulation

Masonry

ACI ASCE TMS	530/ 5/ 402	Building Code Requirements for Masonry Structures
ACI ASCE TMS	530.1/ 6/ 602	Specifications for Masonry Structures
ASTM	C 901	Prefabricated Masonry Products
MIC		Hot and Cold Weather Masonry Construction (1999)

Samples and Testing

Brick and Tile:

ASTM	C 67	Sampling and Testing Brick and Structural Clay Tile

ASTM Specifications (continued)

Concrete Masonry Units:

ASTM	C 140	Sampling and Testing Concrete Masonry Units
ASTM	C 426	Test for Drying Shrinkage of Concrete Block
ASTM	C 1006	Splitting Tensile Strength of Masonry Units

Mortar:

ASTM	C 75	Sampling Aggregates
ASTM	C 136	Test Method for Sieve Analysis of Fine and Coarse Aggregate
ASTM	C 780	Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry
ASTM	C 1324	Standard Test Method for Examination and Analysis of Hardened Masonry Mortar

Connectors:

ASTM	E 488	Strength of Anchors in Concrete and Masonry Elements
ASTM	A 90	Test for Weight of Coating on Zinc-Coated Masonry (Galvanized) Iron or Steel Articles

Masonry:

ASTM	E 72	Conducting Strength Tests of Panels for Building Construction
ASTM	E 119	Fire Tests of Building Construction and Materials
ASTM	E 447	Tests for Compressive Strength of Masonry Prisms
ASTM	E 514	Water Penetration and Leakage Through Masonry
ASTM	E 518	Flexural Bond Strength of Masonry
ASTM	E 519	Diagonal Tension (Shear) in Masonry Assemblages
ASTM	C 952	Bond Strength of Mortar to Masonry Units
ASTM	C 1072	Measurement of Masonry Flexural Bond Strength
ASTM	C 1093	Accreditation of Testing Agencies for Unit Masonry

ASTM C216 Standard Specification for Facing Brick and ASTM C652 Standard Specification for Hollow Brick

	Min. Compressive Strength (Brick Flatwise) PSI (MPa) Gross Area		Maximum Water Absorption 5-Hr Boiling (Percent)		Maximum Saturation Coefficient*	
Designation	Avg 5 brick	Individual	Avg 5 brick	Individual	Avg 5 brick	Individual
Grade SW	3000 (20.7)	2500 (17.2)	17	20	0.78	0.80
Grade MW	2500 (17.2)	2200 (15.2)	22	25	0.88	0.90

** The saturation coefficient requirement can be waived if the cold water absorption of any single unit of a random sample of five brick does not exceed 8%.*

There are three types of brick in each of two grades covered in ASTM C 216 and four types in each of two grades in ASTM C 652. Grades classify brick according to their resistance to damage by freezing when wet. The two grades of facing brick are covered and the requirements are shown in the table above.

Grade SW: Brick intended for use where high and uniform resistance to damage caused by cyclic freezing is desired and where the brick may be frozen when saturated with water.

Grades MW: Brick which may be used where moderate resistance to cyclic freezing damage is permissible or where the brick may be damp but not saturated with water when freezing occurs. Physical requirements for these two grades are identical for C2 16 and C652 and are as shown in the above table.

Types of Brick Regarding Appearance & Dimensional Tolerance

Three types of facing brick are covered:

Type FBS and HBS: Brick for general use in masonry.

Type FBX and HBX: Brick for general use in masonry where a higher degree of precision and lower permissible variation in size than permitted for Type FBS and HBS are required.

Type FBA, HBA, and HBB: Brick for general use in masonry selected to produce characteristic architectural effects resulting from nonuniformity in size and texture of the individual units.

When the type is not specified, the requirements for Type FBS or HBS shall govern.

Brick Size and Weight Information

(Current packaging for Acme's Denton Plant. Exact packaging may vary between plants.)

Description	Actual Units/SF	No. of Brick		Weight	
		Strap	Cube	Strap	Cube
King Size	4.8	136	544	571	2285
Modular	6.75	104	520	364	1820
Builders Special	5.33				
Queen Size	5.0				
Utility	3.0	66	198	535	1040
Norman	4.5	104	312	546	1638

Cost Comparison: King Size versus Modular Brick

King Size

3" 10" = 30 in /brick

$$\frac{144\text{ in}}{\text{ft}} \quad \frac{1\text{ brick}}{30\text{ in}} = \frac{4.8\text{ brick}}{\text{ft}}$$

Modular Brick

2 2/3" 8" = 21.33 in /brick

$$\frac{144\text{ in}}{\text{ft}} \quad \frac{1\text{ brick}}{21.3\text{ in}} = \frac{6.75\text{ brick}}{\text{ft}}$$

Material Cost

$$\frac{4.8\text{ brick}}{\text{ft}} \quad \frac{\$375}{1000\text{ brick}} = \frac{\$1.80}{\text{ft}} \qquad \frac{6.75\text{ brick}}{\text{ft}} \quad \frac{\$340}{1000\text{ brick}} = \frac{\$2.30}{\text{ft}}$$

Labor Cost: Mason and Helper = $700/day

$$\frac{650\text{ brick}}{\text{day}} \quad \frac{1\text{ ft}}{4.8\text{ brick}} = \frac{135\text{ ft}}{\text{day}} \qquad \frac{700\text{ brick}}{\text{day}} \quad \frac{1\text{ ft}}{6.75\text{ brick}} = \frac{104\text{ ft}}{\text{day}}$$

$$\frac{\$700}{\text{day}} \quad \frac{\text{day}}{135\text{ ft}} = \frac{\$5.19}{\text{ft}} \qquad \frac{\$700}{\text{day}} \quad \frac{\text{day}}{104\text{ ft}} = \frac{\$6.73}{\text{ft}}$$

Savings

Material Savings .....$2.30/ft - $1.80/ft .= $0.50/ft
Labor Savings.....$6.73/ft - $5.19/ft .= $1.54/ft
Mortar Savings ..... = $0.05/ft

Total Savings ..... .= $2.09/ft

The manufacturing process has six stages:

I. Mining and storage of raw materials
II. Preparing raw materials
III. Forming units
IV. Drying
V. Burning and cooling
VI. Drawing and storing finished products

Three principal forms of clay:

I. Surface Clay
    A. Found near surface of Earth
    B. Upthrusts of older deposits or more recent sedimentary formations
II. Shales
    A. Clays that have been subjected to high pressures
    B. Hardened almost to the form of slate
III. Fire Clays
    A. Mined at deep levels
    B. Few impurities
    C. Have refractory qualities

Brick Manufacturing (continued)

Three principal processes for forming brick:

I. Stiff-mud process
   A. 12% to 15% water by weight
   B. Extruded through die
   C. Wire cut
      1. End cut
      2. Side cut

II. Soft-mud process
   A. 20% to 30% water by weight
   B. Formed in molds
      1. Sand struck
      2. Water struck

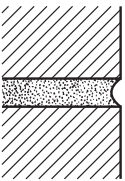
III. Dry-press process
   A. Up to 10% water by weight
   B. Formed in steel molds under pressures from 500 to 1500 psi.

Brick are dried 24 to 48 hours at 100° to 400° F.
Brick are burned 2 to 4 days at 1800° to 2200° F.

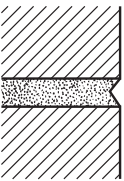
Size variation due to loss of moisture:

Air Shrinkage:	2 to 8 percent
Fire Shrinkage:	2.5 to 10 percent
Total Shrinkage:	4.5 to 15 percent

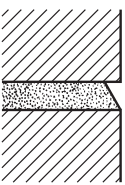
The concave and the V joints are the two most watertight joints. The weather joint, struck joint and flush joint fall in the middle, with the raked joint being the least weathertight.



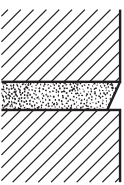
Concave Joints



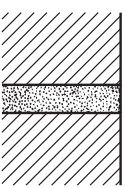
V Joints



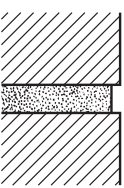
Weather Joints



Struck Joints



Flush Joints



Raked Joints

Mortar Proportions By Volume

PORTLAND CEMENT LIME MORTAR

Type	Portland Cement	Hydrated Lime or Lime Putty	Maximum Damp Loose Aggregate
M	1		3
S	1		4
N	1	1	6
O	1	2	9
K	1	3	12

MASONRY CEMENT MORTAR

Type	Portland Cement	Masonry Cement	Hydrated Lime	Maximum Damp Loose Aggregate
M	1	1 (type N)	---	6
M	---	1 (type M)	---	3
S		1 (type N)	---	4
S	---	1 (type S)	---	3
N	---	1 (type N)	---	3

GROUT PROPORTIONS BY VOLUME

Type	Parts By Volume of Portland or Blended Cement	Parts By Volume of Hydrated Lime or Lime Putty	Aggregate, Measured in a Damp, Loose Condition	
			Fine	Coarse
Fine Grout	1	0 to 1/10	2 to 3 times the sum of the cementitious materials	
Coarse Grout	1	0 to 1/10	2 to 3 times the sum of the cementitious materials	1 to 2 times the sum of the cementitious materials

(Shovel contents vary, approximately 6 to 8 per cubic foot.)

Property Method for Specifying Mortar

There is much confusion concerning property specifications of mortar. Property specifications contain requirements for compression strength testing of mortar, but these strengths are only to be used for qualifying alternate mix proportions for field mixed mortar. THERE IS NO PROVISION FOR STRENGTH TESTING OF JOB SITE MORTAR.

ASTM C 270 specifically states that "The compressive strength values resulting from field tested mortars do not represent the compressive strength of mortar as tested in the laboratory nor that of the mortar in the wall. Physical properties of field sampled mortar shall not be used to determine compliance to this specification and are not intended as criteria to determine the acceptance or rejection of the mortar," (3.3)

Property method strength requirements are as follows but are for LABORATORY PREPARED SPECIMEN ONLY

Mortar Type	28 Day Compressive Strength
M	2500 psi
S	1800 psi
N	750 psi
O	350 psi
K*	75 psi

*Type K mortar is no longer included in ASTM C 270. It is included here for historical reference.

Both the National Concrete Masonry Association and the Brick Industry Association recommend using the weakest MORTAR THAT WILL MEET STRENGTH REQUIREMENTS.

TYPE N MORTAR IS BEST FOR MOST MASONRY VENEER.

Proportion specifications are preferred to property specifications.

Mortar Cost Calculations
Commercial Construction

How to Calculate Mortar Cost

Use local costs when calculating for your area. Use the following as an example:

	Cost
1 bag portland cement (94 lb. = 1 CF)	$10.75/bag = $10.75/CF
1 bag type "S" hydrated lime (50 lb. = 1.25 CF)	$6.50/bag = $5.20/CF
1 bag masonry cement type "N" (70 lb. = 1 CF)	$6.75/bag = $6.75/CF
1 cubic yard of sand (27 CF)	$18.00/CY = $0.67/CF

19.0 CF of mortar per 1,000 modular brick
22.0 CF of mortar per 1,000 king size brick
32.0 CF of mortar per 1,000 utility brick

(Actual Size)	Modular (3 5/8 2 1/4 7 5/8)	King Size (2 3/4 2 5/8 9 5/8)	Utility (3 5/8 3 5/8 11 5/8)
Nominal size (inches) (includes mortar joint)	2 2/3 8	3 10	4 12
Nominal area per brick in wall (inches)	21.33	30.00	48.00
Brick used per ft of wall	6.75	4.80	3.00
Brick used per 100 ft of wall	675	480	300
Nominal wall area covered by 1,000 brick (ft H)	148.1	208.3	333.3

Type "M" Mortar
Mix 1P:0.25L:3S

.333 CF Cement / CF Mortar	$10.75 / CF Cement	=	$3.58/CF Mortar
.083 CF Lime / CF Mortar	$5.20 / CF Lime	=	$0.43/CF Mortar
1 CF Sand / CF Mortar	$0.67 / CF Sand	=	$0.67/CF Mortar
	Mortar Cost	=	$4.68/CF $126.36/CY

Mortar Cost Per 1,000 Brick

Modular	19.0 CF $4.68/CF	=	$88.92
King Size	22.0 CF $4.68/CF	=	$102.96
Utility	32.0 CF $4.68/CF	=	$149.76

Mortar Cost Per Square Foot

Modular Brick	$88.92 / 148.1 SF	=	$0.60/SF
King Size Brick	$102.96 / 208.3 SF	=	$0.49/SF
Utility Brick	$149.76 / 333.3 SF	=	$0.45/SF

Mortar Cost Calculations (continued)

Type "S" Mortar
Mix 1P:0.5L:4.5S

.222 CF Cement / CF Mortar	$10.75 / CF Cement	=	$2.39/CF Mortar
.111 CF Lime / CF Mortar	$5.20 / CF Lime	=	$0.58/CF Mortar
1 CF Sand / CF Mortar	$0.67 / CF Sand	=	$0.67/CF Mortar
	Mortar Cost	=	$3.64/CF $98.28/CY

Mortar Cost Per 1,000 Brick

Modular	19.0 CF $3.64/CF	=	$69.16
King Size	22.0 CF $3.64/CF	=	$80.08
Utility	32.0 CF $3.64/CF	=	$116.48

Mortar Cost Per Square Foot

Modular Brick	$69.16 / 148.1 SF	=	$0.47/SF
King Size Brick	$80.08 / 208.3 SF	=	$0.38/SF
Utility Brick	$116.48 / 333.3 SF	=	$0.35/SF

Type "N" Mortar
Mix 1P:1L:6S

.167 CF Cement / CF Mortar	$10.75 / CF Cement	=	$1.79/CF Mortar
.167 CF Lime / CF Mortar	$5.20 / CF Lime	=	$0.87/CF Mortar
1 CF Sand / CF Mortar	$0.67 / CF Sand	=	$0.67/CF Mortar
	Mortar Cost	=	$3.33/CF $89.91/CY

Mortar Cost Per 1,000 Brick

Modular	19.0 CF $3.33/CF	=	$63.27
King Size	22.0 CF $3.33/CF	=	$73.26
Utility	32.0 CF $3.33/CF	=	$106.56

Mortar Cost Per Square Foot

Modular Brick	$63.27 / 148.1 SF	=	$0.43/SF
King Size Brick	$73.26 / 208.3 SF	=	$0.35/SF
Utility Brick	$106.56 / 333.3 SF	=	$0.32/SF

Mortar Cost Calculations (continued)

Type "N" Mortar: Masonry Cement
Mix 1MC:3S

.333 CF Cement / CF Mortar	$6.00 / CF Cement	=	$2.00/CF Mortar
1 CF Sand / CF Mortar	$0.67 / CF Sand	=	$0.67/CF Mortar
	Mortar Cost	=	$2.67/CF $72.09/CY

Mortar Cost Per 1,000 Brick

Modular	19.0 CF	$2.67/CF	=	$50.73
King Size	22.0 CF	$2.67/CF	=	$58.74
Utility	32.0 CF	$2.67/CF	=	$85.44

Mortar Cost Per Square Foot

Modular Brick	$50.73 / 148.1 SF	=	$0.34/SF
King Size Brick	$58.74 / 208.3 SF	=	$0.28/SF
Utility Brick	$85.44 / 333.3 SF	=	$0.26/SF

Guide for the Selection of Masonry Mortars[a]

Location	Building Segment	Mortar Type[a]	
		Recommended	Alternative[b]
Exterior Above Grade	Loadbearing Walls,	N	S or M
	Non-Loadbearing Walls,	N	S
	Parapet Walls	N	S
Exterior At or Below Grade	Foundation Walls, Retaining Walls, Manholes, Sewers, Pavements, Walks, and Patios	M[c]	S[c]
Interior	Loadbearing Walls,	N	S or M
	Non-Loadbearing Partitions	N	S

A. This table does not provide for any specialized mortar uses, such as high bond and acid resistant mortars.

B. Alternatives are presented as suitable for use where design conditions or exposures are other than normal.

C. Masonry exposed to weather in a nominal horizontal surface is extremely vulnerable to weathering. Mortar for such masonry should be selected with caution.

Mortar Color

To obtain the best representation of the color the final mix will represent, the mix must contain the sand, cement, and water to be used at the job site. Colors can vary between different combinations of cement, lime, and sand.

Blend the sand, cement, and mortar color in a mixer for four minutes prior to adding the mixing water. Then add the water and mix for an additional seven minutes. Flatten a small amount of mortar under the trowel to check for completed mixing. If streaks occur, continue mixing.

To avoid a blotched surface and to obtain a uniform appearance in the mortar joints, all joints should be tooled when set to the same degree of hardness.

Special care should be taken when troweling light colors. Black spots may appear unless the mason constantly cleans the face of the trowel. Oxidation of the trowel face causes spots on the mortar.

Do not use muriatic acid to clean colored masonry joints. A commercially prepared cleaner is preferred if it is necessary to use an acidic product.

Adding more color than is recommended will not improve or deepen the color. Less color will lighten the mix.

Each case of SGS/H mortar color contains twelve premeasured boxes. Use one bag for each bag of mason's cement, portland cement, or lime.

Custom colors can be ordered with no additional built-in charges. The following applies to custom orders:

1. Minimum quantity 1500#, 10% plus or minus of order to be allowed by manufacturer.
2. Order may not be cancelled once in process.
3. Return of custom colors prohibited.

Custom packaging can be requested at a minimal additional charge.

Approximately 20% of the wall surface is mortar.

Residential Wall Cost Calculations

	Modular	King Size	Builders Special
Size	2.66" 8"	3" 10"	3" 9"
Quantity (Brick/Ft)	6.75	4.8	5.3
Brick Cost	$0.44	$0.47	$0.47
Mortar Cost	0.06	0.07	0.08
Labor Cost	0.40	0.40	0.40
Total Cost Per Brick	0.90	0.94	0.95
Total Cost/Ft	$6.08	$4.51	$5.04

Note: Cost figures are approximations only and will vary by area, season, product, and general market conditions.

Special Shapes

I. Acme's Philosophy

It is our desire to promote the use of special shapes in architecturally designed buildings. Observation over the past few years has shown not only a trend toward more brick use in commercial and institutional buildings but a decided desire on the part of design professionals to get away from rectangular buildings and to express themselves with angle corners, deep reveals at soffits, lintels, and sills, etc., providing depth and shadows in building openings. Presently, we have largely been allowing these designs to take place, and at the last minute, asking our Production Department to manufacture a variety of shapes in a variety of colors, many of which are impractical from a production standpoint and are costly beyond belief to produce.

Our sales representatives should do all they can to consult with architects in the early design phase and to encourage the use of shapes. Acme should provide the designers with information as to what standard shapes are available, the various ways they can be used, and what the limitations are in the way of sizes, colors, textures, etc.

A color brochure of buildings showing the various uses of standard brick shapes including dimensions and explanatory notes is available. Pricing may vary considerably from plant to plant and from blend to blend; quantities may also affect pricing, so it will be necessary to follow the procedure outlined for pricing.

II. Procedures While Job Is in Design Stage

A. Provide the architect with information as to what shapes are easily made and are considered standard. This information is to be transmitted both verbally and through our special shapes brochure.

B. Ask the architect to include drawings of special shape(s) in architectural plans and to designate whether brick can be cored. Also ask that the architect designate on the architectural drawings which faces of the shapes will be exposed and to show typical coursing so bonding can be determined.

C. The architect should be made aware of the difficulty in manufacturing sanded or heritage textures on special shapes. Extra cost will be involved for textures, sandings, or coatings on reverse faces on flat sides.

III. Procedures When Job Is in Bidding Stage and Being Quoted

A. Sales representatives will stay in touch with general contractors and masonry contractors bidding the project in an effort to determine quantities of each shape and to be certain that we are aware of all the shapes involved and to not overlook an isolated shape that may be required in order to avoid a job delay at a later date.

B. Transmit prior to quoting a drawing of the shape(s) required with approximate quantities of each to the Regional Plant Manager involved to be certain that we can manufacture the item(s). Information will also be shown as to how the shape will be used (a sketch of a detail showing in-the-wall use). This can be a drawing from the architectural plans done locally providing all dimensions are shown. The blend number must also be included. If you feel the shapes are too complicated and you need assistance, this can be obtained by contacting the Engineering Department in Fort Worth. They will make the necessary drawings for you and transmit them to the Regional Plant Manager. For good communications, copies should also be sent to your Regional Sales Manager.

   It is best if all this could be done prior to the project being advertised for bids in order that we have as much lead time as possible, but certainly it should be done as soon as the project is advertised for bids, so that we may get our quotation out on time. The Regional Plant Manager will then consult with the Regional Sales Manager, and it will be the Regional Sales Manager's responsibility to provide the price for the quotation.

C. Quote the project in accordance with our standard quotation procedure. However, add the following notation immediately below the shape(s) price:

   "Acme Brick Company assumes no liability for any additional shapes that may be required and are not listed above."

D. Solicit the order from the successful general contractor or masonry contractor in an attempt to get the order as far in advance of job requirements as possible. Naturally, your order must include quantities.

IV. Procedures When an Order Has Been Obtained

A. Submit to Acme's Engineering Department either copies of the architect's special shape drawings or a complete set of the architectural plans with a letter of transmittal referring to the order by job name, contractor's name, and architect's name, and with a request for a scale drawing to be prepared showing each shape.

   The Engineering Department will prepare these drawings, which will show the plan of each shape, along with elevations with dimensions shown. All exposed faces will be clearly identified by an arrow pointing to each face and the words, "This face finished." Also, the drawing will show the coring of the unit, and the architectural drawings will be inspected to see if the shape must be solid. If the shape is required to be solid, this will also be designated on the drawing. Our drawing will also include a plan of the brick course in the area where the shape is to be used showing the coursing with dotted lines indicating the course below.

B. The above drawing, when completed, shall be transmitted back to the sales rep handling the order with the customer. The representative will use a copy of the attached transmittal letter to submit the drawing to the contractor for approval. The contractor will normally forward Acme shape drawings to the architect for inspection and approval or amendment.

C. Occasionally, a general contractor or masonry subcontractor may contract to have a portion of the masonry precast which might include special shapes. If this is the case, it will be the Acme sales representative's responsibility to see that our customer is notified of the advisability to give a copy of our drawings to the precaster so that he may have an opportunity also to check it for accuracy for his portion of the work.

D. It is the sales representative's responsibility to suspense these transmittals for periodic review to be certain that we have no undue delay in getting the approval of Acme's drawings, which if not obtained could result in a delay in the manufacture and a delay in the job, causing a hardship both on our customer and on our Production Department.

E. Immediately upon approval of the shapes, it will be the sales representative's responsibility to forward a copy of the approved drawings to the plant involved with a letter of transmittal (retaining a copy in the branch order file) asking that shapes be scheduled for manufacture along with the face brick required at whatever schedule the contractor has given us for delivery.

Special Shapes Considerations

1. Determine that the plant producing the face brick can manufacture the Special Shapes.
2. Make sure that the Special Shape may be extruded through a standard die.
3. Make sure that the desired texture of the Special Shape can be provided. A velour texture is best.
4. Try to minimize the number of different configurations (dimensions and angles) of Special Shaped Brick required.
5. Be sure to allow time for engineering, pricing, and manufacturing of the Special Shaped Brick.

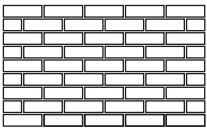
Note

Special Shaped Radial Brick may not be required for curved walls if the radius is not less than the minimums shown below:

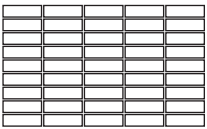
Modular Brick	Radius 8'0" or larger
King Size Brick	Radius 10'0" or larger
Utility and Norman Brick	Radius 12'0" or larger

For pictures of Acme's Standard Special Shapes, please reference Acme's Special Shapes Brochure.

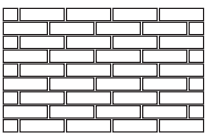
Traditional Bond Patterns



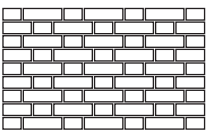
Running Bond



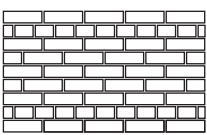
Stack Bond



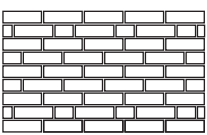
1/3 Running Bond



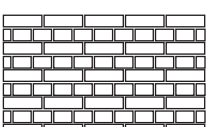
Flemish Bond



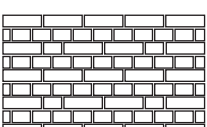
Common Bond
6th Course Header



Common Bond
6th Course
Flemish Header

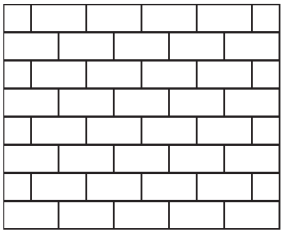


English Bond

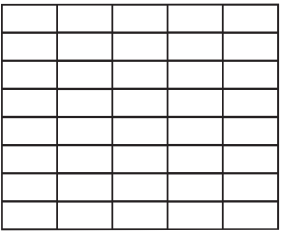


English Cross
or Dutch Bond

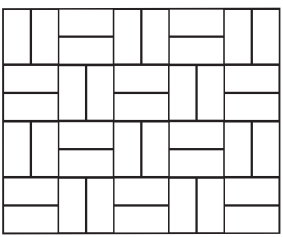
Brick Paving Bond Patterns



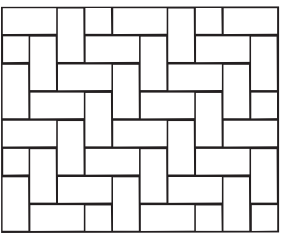
Running



Stacked



Basketweave



Herringbone

NOTE: For patterns other than running or stacked bond, a full 4" x 8" unit must be used unless the joints are grouted.

Cleaning and Sealing Pavers

Cleaning Organic Growth (Molds & Mosses):

1. Mold and other growths can be removed from masonry surfaces by applying proprietary biocides, or sometimes household cleaners like Lysol or bleach.
2. A solution of 2.5% (4 oz per gallon) of zinc of magnesium silico-fluoride will also remove some organic growth. Repeat as required.
3. Provide adequate drainage to keep pavers dry and prevent future growth.

Maintenance Floor Cleaning:

1. Sweep and remove all loose dirt.
2. Wash with a neutral detergent in water.
3. Exceptionally dirty floors may require stronger proprietary cleaners – follow manufacturer's instructions.
4. Soaps should not be used with hard water, because they can form slippery scums.
5. Rough textured brick floors may require special cleaning.

Sealing Brick Floors *(interior floors only)*:

1. Floors must be dry before application or sealer may cloud from moisture trapped below the sealer. Up to six months may be required to properly dry floor.
2. Do not seal pavers that are expected to become wet periodically
3. Some sealers, including penetrating repellent types are vapor permeable and will allow moisture in the brick to dry out. Consult sealer manufacturer.
4. Other types of sealers can help bond sand in the joints of mortarless paving.
5. Hand-pumped low-pressure sprayers are normally best for applying sealers.
6. Water emulsion floor waxes may be used, but are not as durable as acrylic sealers.
7. Waxes that make paver surfaces slippery should never be used.
8. Biodegradable vegetable oil finishes, such as tung and linseed oils, may soak into brick and provide a food source for mold and bacteria. They also may yellow or darken with aging. These can cause staining which is difficult to remove.

NOTE: Proper sealing of brick floors is critical to the finished appearance and requires careful planning and supervision. The above recommendations are general guidelines. Carefully follow sealer manufacturers' instructions throughout application.

Cleaning and Product Recommendations
New Brick Construction

New Brick Construction	Clean					Protect									
	101 Lime Solvent	600 Detergent	Vana Trol®	Concrete Brick Cleaner	Safety Klean	Weather Seal Siloxane WB	Weather Seal Siloxane PD	Weather Seal SL100	Deep Sheen WB	Weather Seal GP	Paver Enhancer/Gloss 'N Guard	Stone, Tile & Masonry Protector	SLX100 Water & Oil Repellent	Blok-Guard® & Graffiti Control III	Sacrificial Coating SC-1
	Excess Mortar, Job Dirt and Efflorescence					Water Repellent						Water, Oil Repellent		Graffiti Resistant	
Fired Clay Brick Red	1	1	2	3	1	1	1	2	E	3	E	1	1	1	2
Light Colored	3	3	1	2	2	1	1	2	E	3	E	1	1	1	2
Chocolate/Brown/Gray	3	3	1	2	2	1	1	2	E	3	E	1	1	1	2
Pavers	2	1	1	1	1	1	2	1	E	3	1	1	1		
Glazed	3	2	1	1	1			1					1		
Pigmented Mortar	2	2	1	2	2	1	1	2	E	3	E	1	1	1	2
Sand-lime Brick	3	3	2	1	1	1	1	2	E	3	E	1	1	1	2
Slurry Face	3	3	2	1	2	1	1	2		3		1	1	1	2
Structural Tile	2	1	1	1	1	1	2	1		3		1	1	1	2
Ceramic Tile*	3	3	2	1	1			1				2	1		

1 - First Choice
2 - Second Choice
3 - Third Choice
E - Color Enhancing

If brick is prone to staining from metallic oxidation, use Vana Trol®.

Always test to ensure desired results and proper dilution where appropriate.

Cleaning and Product Recommendations
New Construction: Concrete

New Construction Concrete		Clean							Protect							
		Vana Trol®	600 Detergent	Custom Masonry Cleaner	Burnished Custom Masonry Cleaner	Safety Klean	Light Duty Concrete Cleaner	Heavy Duty Concrete Cleaner	Weather Seal Siloxane WB Concentrate	Weather Seal Siloxane PD	Custom Masonry Sealer	SL100 Water Repellent	Stone, Tile & Masonry Protector (STMP)	SLX100 Water & Oil Repellent	Blok-Guard® & Graffiti Control II/ Custom Masonry Sealer	Sacrificial Coating SC-1
		Excess Mortar, Job Dirt and Efflorescence							Water Repellent				Water, Oil Repellent		Graffiti Resistant	
Cast in Place	Smooth				1		1		2	1		1	2	1	1	1
	Sandblast	2	2	1	3	2	3	1	2	1		1	2	1	1	1
	Textures	3	3	1	2	2	2	1	1	1	2	2	2	1	1	1
	Exposed Aggregate	2	3	1	3	2	3	1	1	1	2	2	2	1	1	1
Precast	Smooth				1		1		2	1		1	2	1	1	1
	Sandblast	2	2	1	3	2	3	1	2	1		1	2	1	1	1
	Textures	3	3	1	2	2	2	1	1	1	2	1	2	1	1	1
	Exposed Aggregate*	2	3	1	3	2	3	1	1	1	2	2	2	1	1	1
Glass Fiber Reinforced	Smooth				1		1		2	2		1	2	1	1	1
	Sandblast	3	3	2	1	2	1	2	2	2		1	2	1	1	1
	Textures	3	3	2	1	2	1	2	2	2		1	2	1	1	1

1 - First Choice 2 - Second Choice 3 - Third Choice E - Color Enhancing

*Limestone or marble aggregate/matrix: protect with Natural Stone Treatment or Limestone & Marble Protector.

Always test to ensure desired results and proper dilution where appropriate.

Cleaning and Product Recommendations
New Construction: Concrete Block

New Construction Concrete Block	Clean							Protect						
	600 Detergent	Vana Trol®	Custom Masonry Cleaner	Burnished Custom Masonry Cleaner	Safety Klean	Light Duty Concrete Cleaner	Heavy Duty Concrete Cleaner	Weather Seal Siloxane WB	Custom Masonry Sealer	Burnished Block Sealer	Blok-Guard® & Graffiti Control* II	Sand Joint Stabilizer	Blok-Guard® & Graffiti Control II/ Custom Masonry Sealer	Sacrificial Coating SC-1*
	Excess Mortar, Job Dirt and Efflorescence							Water Repellent					Graffiti Resistant	
Lightweight	3	2	1		2		1	2	1		1		1	2
Mediumweight	3	2	1		2		1	1	1		1		1	2
Heavyweight	3	2	1		2		1	1	1		1		1	2
Burnished/Ground-faced				1		2		1	2	1	2		1	2
Pavers	3	2	1		2		1	2				1		

1 - First Choice 2 - Second Choice 3 - Third Choice E - Color Enhancing

Contact PROSOCO for information on Stand Off™ products.

* Not suitable for horizontal, traffic-bearing or pedestrian surface.

Always test to ensure desired results and proper dilution where appropriate.

Brick Stain Removal

Stain	Product
Acid Burn	800 Stain Remover
Algae, Lichen	BioKlean™ BioWash
Asphalt, Tar, Oil	Degreaser Asphalt & Tar Remover
Copper Stain	800 Stain Remover Limestone Restorer
Efflorescence	600 Detergent Safety Klean Light Duty Concrete Cleaner
Job Dirt/Dust	Heavy Duty Detergent Vana Trol® 600 Detergent 2010 All Surface Cleaner Safety Klean
Graffiti - Protected Surface	Graffiti Wipe
Graffiti - Unprotected Surface	Heavy Duty Paint Stripper Safety Peel 1, 2, 3
Lime Run	Custom Masonry Cleaner Heavy Duty Concrete Cleaner
Manganese	800 Stain Remover Ferrous Stain Remover
Mud	Restoration Cleaner Custom Masonry Cleaner Light Duty Restoration Cleaner 2010 All Surface Cleaner
Oil & Grease Stain	Asphalt & Tar Remover Degreaser
Paint	Fast Acting Stripper Heavy Duty Paint Stripper Safety Peel 1, 2, 3
Rust Stains	Ferrous Stain Remover Light Duty Restoration Cleaner 800 Stain Remover
Silicone Sealants	Dicone NC9 Dicone NC15 Gel
Vanadium Stains	800 Stain Remover
White Scum	White Scum Remover

Concrete Block Stain Removal

Stain	Product
Acid Burn	Custom Masonry Cleaner
Algae, Lichen	BioKlean™ BioWash
Asphalt, Tar, Oil	Asphalt & Tar Remover SafStrip®
Form Oil	Asphalt & Tar Remover Degreaser, SafStrip®
Job Dirt/Dust	Burnished Custom Masonry Cleaner 600 Detergent Custom Masonry Cleaner 2010 All Surface Cleaner Safety Klean
Graffiti - Protected Surface	Graffiti Wipe
Graffiti - Unprotected Surface	Heavy Duty Paint Stripper Safety Peel 1, 2, 3
Lime Run	Custom Masonry Cleaner Heavy Duty Concrete Cleaner
Oil & Grease Stain	Asphalt & Tar Remover Degreaser, SafStrip®
Paint	Safety Peel 1, 2, 3, SafStrip® Fast Acting Stripper Heavy Duty Paint Stripper
Rust Stains	Burnished Custom Masonry Cleaner Custom Masonry Cleaner Heavy Duty Concrete Cleaner
Rubber Tire Marks	Asphalt & Tar Remover Degreaser Fast Acting Stripper
Secondary Efflorescence	Light Duty Concrete Cleaner Burnished Custom Masonry Cleaner Safety Klean
Silicone Sealants	Dicone NC9 Dicone NC15 Gel

Always test to ensure desired results and proper dilution where appropriate.

Additional specialized stain removers are available. Contact your PROSOCO representative or Customer Care at 1-800-255-4255.

Cleaning and Product Recommendations
Restoration Cleaning

Restoration Cleaning	Clean									Interior				Protection										
	BioWash	BioKlean®	Light Duty Restoration Cleaner	EK Restoration Cleaner	Restoration Cleaner	Heavy Duty Restoration Cleaner	Limestone Restorer	746 Limestone & Masonry Prewash/Afterwash	2010 All Surface Cleaner	942 Limestone & Marble Cleaner		Liquid Marble Cleaner	Marble Poultice	Weather Seal Siloxane WB	Weather Seal Siloxane PD	Natural Stone Treatment WB	Weather Seal SL100	Weather Seal H40	Limestone & Marble Protector	Stone, Tile & Masonry Protector (STMP)	SLX100 Water & Oil Repellent	Blok-Guard® & Graffiti Control*	Sacrificial Coating SC-1*	
	Exterior Atmospheric Soiling								Interior					Water Repellent					Water, Oil Repellent			Graffiti Resistant		
Brick	L-M	M-H	L-M	M-H	M	H	M	H	L-M	L-M			H-D	1	1	2	2	S	2	1	1	1	2	
Terra Cotta	L-M	M-H	L-M	M-H	M	H	M	H	L-M	L-M	L-M	H-D		2	2		1	S		2	1	2	1	
Tile	L-M	M-H	L-M		M			H	L-M	L-M	L-M	H-D		2			1			2	1	2	1	
Bluestone	L-M	M-H	L-M	M-H	M-H		M	H	L-M	L-M			H-D	2	2	2	1	S	2	1	1	1	2	
Cast Stone	L-M	M-H	L-M				M	H	L-M	L-M			H-D	1	1	2	1	S	1	1	2	2	1	
Field Stone	L-M	M-H	L-M				M	H	L-M	L-M			H-D			1		S	1	1	2	1	2	
Granite (polished)	L-M	M-H	L-M					H	L-M	L-M	L-M	H-D					1			2	1			
Granite (unpolished)	L-M	M-H	L-M	M	M-H	H	M	H	L-M	L-M	L-M	H-D			2		1		2	2	1		1	
Limestone (polished)	L-M								L-M		L	H-D								1				
Limestone (unpolished)	L-M	M-H	L-M				L-M	M-H	L-M	L-M	L-M	H-D				1		S	1	1		1	2	
Marble (polished)	L-M								L-M		L-M	H-D								1				
Marble (unpolished)	L-M	M-H	L-M				L-M	H	L-M	L-M	L-M	H-D				1		S	1	1		1	2	
Sandstone	L-M	M-H	L-M	L-M	M	H		H	L-M	L-M	L-M	H-D		1	1	1	2	S	1	1	2	1	1	
Simulated Stone	L-M	M-H	L-M				M	H	L-M	L-M	L-M	H-D		2	2	1	1	S	2	1	1	1	2	
Slate	L-M	M-H	L-M	M-H	M	H	M	H	L-M	L-M			H-D	2	2		1		2	1	1		1	
Cast Concrete	L-M	M-H	L-M				M	H	L-M	L-M			H-D	1	1	2	2		2	1	2	1	2	
Concrete Block	L-M	M-H	L-M				L-M	H	L-M	L-M			H-D	1					1	2		1	2	
Exposed Aggregate	L-M	M-H	L-M				M	H	L-M	L-M			H-D	2	2	2	1	S	2	1	1	1	2	
Precast Concrete	L-M	M-H	L-M				M	H	L-M	L-M			H-D	2	1	2	1		2	1	1	1	2	

L-Light soiling M-Moderate soiling H-Heavy soiling D-Deep-seated stains
1-First Choice 2-Second Choice S-Surface strengthening

Always test to ensure desired results and proper dilution where appropriate.

* Note: Not for horizontal surfaces.

Restoration Cleaning

Stain	Product
Algae, lichen	BioKlean™ BioWash
Asphalt, tar	Asphalt & Tar Remover SafStrip
Carbon crust	766 Limestone & Masonry Prewash/Afterwash Safety Peel 2
Clear coatings	Fast Acting Stripper Heavy Duty Paint Stripper SafStrip
General light soiling	2010 All Surface Cleaner Light Duty Restoration Cleaner Restoration Cleaner
Graffiti	Graffiti Wipe Heavy Duty Paint Stripper Safety Peel 1, 2, 3
Lime run	Heavy Duty Concrete Cleaner (unpolished surfaces) Custom Masonry Cleaner
Moderate to heavy carbon	Restoration Cleaner Heavy Duty Restoration Cleaner EK Restoration Cleaner 766 Limestone & Masonry Prewash/Afterwash
Oil, grease	Degreaser Asphalt & Tar Remover Oil & Grease Remover 2010 All Surface Cleaner
Paint splatters	Fast Acting Stripper Graffiti Wipe SafStrip
Rubber tire marks	Asphalt & Tar Remover Degreaser
Rust stains	Ferrous Stain Remover (unpolished surfaces) 800 Stain Remover
Urine stains	BioWash 2010 All Surface Cleaner
Wax-heavy accumulation	Fast Acting Stripper

Paint & Coatings Removal

Coating	Product
Elastomeric coatings	Fast Acting Stripper Heavy Duty Paint Stripper Safety Peel 1, 2, 3
Graffiti-resistant coatings	Fast Acting Stripper Heavy Duty Paint Stripper SafStrip
Latex/house paint	Fast Acting Stripper Heavy Duty Paint Stripper SafStrip
Lead-based paint	Heavy Duty Paint Stripper SafStrip
Multiple layers/ heavy accumulation	Heavy Duty Paint Stripper Safety Peel 2, SafStrip
Oil-based paint	Fast Acting Stripper Heavy Duty Paint Stripper

Graffiti Removal
Unprotected surfaces

Stain	Product
Graffiti shadows	Graffiti Wipe SafStrip
House paint	Graffiti Wipe SafStrip
Lipstick	Graffiti Wipe Heavy Duty Paint Stripper
Marking pen	Graffiti Wipe (dense surfaces)
Paint-over & heavy graffiti accumulations	Heavy Duty Paint Stripper SafStrip
Shoe polish	Graffiti Wipe SafStrip
Spray paint	Heavy Duty Paint Stripper Graffiti Wipe (dense surfaces) SafStrip

Always test to ensure desired results and proper dilution where appropriate.

Additional specialized stain removers are available. Contact your PROSOCO representative or Customer Care at 1-800-255-4255.

Cleaning and Product Recommendations
Water Repellents

Vertical Water Repellents

Product	Generic Description	% Active Content	Recommended Surfaces	Service Life	Average Aesthetic Change
Siloxane PD	Silane/ Siloxane	7%	Precast concrete, GFRC, architectural concrete, brick, stucco	10-15 yrs	None
Siloxane WB Concentrate	Silane/ Siloxane	100% (undiluted)	Architectural concrete, concrete block, clay brick, non-calcareous natural stone, stucco	10-15 yrs	None
SL100	Silane	98%	Precast concrete, brick, non-calcareous natural stone and cast stone	10-15 yrs	None
Weather Seal GP	Silane/ Siloxane	2%	Precast concrete, GFC, architectural concrete, brick, stucco	5 yrs	None
Natural Stone Treatment	Modified Silane	11%	Clay brick, limestone, natural stone	10-15 yrs	Slight Darkening
Natural Stone Treatment WB	Modified Silliconate	3%	Unpolished, natural stone	5-10 yrs	None
H40	Ethyl Silicate/ Silane	23%	Brick, porous or deteriorating stone, most natural stone	10-15 yrs	Slight Darkening
Custom Masonry Sealer	RTV-Silicone	9%	Precast concrete, concrete block, clay brick, porous stone, stucco	5-10 yrs	Slight Darkening
Blok-Guard® & Graffiti Control	RTV-Silicone	9%	Precast concrete, concrete block, clay brick, porous stone, stucco	5-10 yrs	Slight Darkening
Blok-Guard® & Graffiti Control II	Silicone Emulsion	6%	Precast concrete, concrete block, clay brick, porous stone, stucco	5-10 yrs	None

Horizontal Water Repellents/Chloride Ion Screen

Product	Generic Description	% Active Content	Recommended Surfaces	Service Life	Average Aesthetic Change
Saltguard-WB®	Silane/ Siloxane	10%	Steel reinforced concrete, concrete paving, clay pavers, non-calcareous natural stone	10-15 yrs	None
Siloxane WB Concentrate	Silane/ Siloxane	100% (undiluted)	Steel reinforced concrete, concrete paving, clay pavers, non-calcareous natural stone	10-15 yrs	None
SL100	Silane	98%	Steel reinforced concrete, concrete paving, clay pavers, non-calcareous natural stone	10-15 yrs	None
DuraSheen	Polymer Blend	30%	Decorative concrete, concrete paving	3-5 yrs	Enhancement/ Gloss
Gloss 'N Guard	Modified Acrylic	19%	Clay pavers, architectural concrete pavers, natural stone	5 yrs	Enhancement/ Gloss
Gloss 'N Guard WB	Polyurethane	36%	Clay pavers, architectural concrete pavers, natural stone	5 yrs	Enhancement/ Gloss
Sand Joint Stabilizer	Polymer Blend	18%	Concrete pavers, clay pavers, natural stone pavers	3-5 yrs	Enhancement
Paver Enhancer	Modified Siloxane	25%	Clay pavers, architectural concrete pavers, natural stone	3-5 yrs	Enhancement
Deep Sheen	Polymer Blend	32%	Concrete pavers, clay pavers, natural stone pavers	3-5 yrs	Enhancement/ Gloss
Deep Sheen WB	Polymer Blend	36%	Concrete pavers, clay pavers, natural stone pavers	3-5 yrs	Enhancement/ Gloss
Penetrating Water Repellent	Silane/ Siloxane	10%	Concrete pavers, clay pavers, natural stone pavers	10-15 yrs	None

Always test to ensure desired results and proper dilution where appropriate.

ACI 530 – BUILDING CODE REQUIREMENTS FOR MASONRY STRUCTURES

The information in this document is furnished by Acme Brick Company based on our understanding of Chapters 6 and 7 of 2005 ACI 530-05 Building Code Requirements for Masonry Structures. ***This is not a legal document.*** Refer to the edition of ACI 530 currently adopted by your local building authorities for required design criteria.

Chapter 6 – Veneer

General Design

Design backup wall to resist water penetration. Cover sheathing with water resistant membrane, unless sheathing is water resistant and joints are sealed. Provide flashing and weep holes in veneer to resist water penetration into building interior. Veneer design and details shall accommodate differential movement

Anchored Masonry Veneer

Alternative Design Of Anchored Veneer

Most of the veneer requirements in this chapter are prescriptive, which allows them to be used without rational design of all loads and connections. Rational design may be used instead, if special design requirements outlined in the code are met. See ACI 530 for more information on alternative designs.

Prescriptive Requirements For Anchored Veneer

These are limited to areas where basic wind speed is less than or equal to 110 mph as given in ASCE 7-02.

Vertical Support

Weight of anchored veneer shall be supported vertically by concrete or masonry foundations or other noncombustible structural supports, except as allowed below:

Maximum veneer weight is 40 psf.

Maximum height above supporting wood framing is 12 ft.

Maximum height of anchored veneer above concrete or masonry foundations or other noncombustible structural supports is as follows:

With Wood Stud Backup Wall

30 ft at plate 38 ft at gable

With Steel Stud Backup Wall

30 ft at plate 38 ft at gable

Anchored masonry veneer above these limits must be supported by non-combustible construction for each story above 30 ft.

With Masonry or Concrete Backup Wall

Height is not limited, but consideration must be given for differential movements between veneer and other building elements.

Movement Joints

A vertical movement joint is required to separate exterior veneer supported on framing from that supported on a foundation.

Vertical Deflections

Horizontal members, including floors, beams, shelf angles and lintels supporting vertical loads from masonry veneer shall be designed for a total deflection not to exceed either L/600 or 0.3" (7.62 mm).

Veneer Anchors

All anchors shall be embedded in mortar or grout at least 1 1/2" (38 mm) and have a minimum cover of 5/8" (16 mm).

Veneer Cavity

Masonry and concrete backup walls –

- Inside face of veneer to outside face of backup wall: 4 1/2" (114 mm) maximum and 1" (25 mm) minimum air space.

Wood or steel stud backup walls with adjustable ties –

- Inside face of veneer to outside face of stud: 4 1/2 " (114 mm) maximum
- Air space: 1" (25 mm) minimum from inside face of veneer to outside face of sheathing.

Wood stud backup walls with corrugated metal ties –

- Air space from inside face of veneer and outside face of sheathing: 1" (25 mm) for corrugated sheet metal anchors.

Corrugated Sheet-Metal Anchors

Corrugated sheet metal anchors are allowed only with wood-framed backup walls. Base metal must be at least 0.03" (0.762 mm = 22 gage) thick x 7/8" (22 mm) wide and corrugated as specified in ACI 530. Fasten anchor to wood stud (not sheathing) with 8d common nail or other fastener with equal pull-out resistance and bend anchor straight out into bed joint. Bend must be within 1/2" (13 mm) of fastener.

Other Sheet-Metal Anchors

Other sheet metal anchors with base metal thickness of at least 0.06" (16 gage = 1.5 mm) shall be corrugated per ACI 530 requirements or be punched, notched, or bent for equivalent pull-out or push-through capacity.

Wire Anchors And Joint Reinforcement

Wire anchors shall be at least wire size W1.7 (MW 11 = 0.148" = 9 gage = 3.76 mm). Each end shall have 2" minimum hooks for anchorage. Ladder or tab type joint reinforcement of same wire size is also allowed.

Adjustable Anchors

Adjustable anchors shall be detailed to prevent disengagement and have a maximum clearance between connecting parts of 1/16" (1.6 mm). Pintle anchors shall have at least two pintle legs of wire size W2.8 (MW18 = 0.188" = 3/16" = 4.8 mm) each with an offset not exceeding 1 1/4" (32 mm). Other requirements in ACI 530 must also be met by anchor manufacturer.

Anchor Spacing

For 22 gage corrugated sheet metal anchors, adjustable 2-piece anchors, and anchors of wire size W1.7 (MW11 = 0.148" = 9 gage = 3.76 mm) provide at least one anchor for each 2.67 ft^2 (0.25 m^2) of wall area. For other anchors provide at least one anchor for each 3.5 ft^2 (0.33 m^2) of wall area.

Maximum spacing is 32" (813 mm) horizontal and 18" (457 mm) vertical.

Provide additional anchors around openings greater than 16" (406 mm) in either dimension spaced around the perimeter no more than 3 feet (914 mm) apart and within 12" (305 mm) of opening.

Note: For residential construction International Residential Code allows a maximum anchor spacing of 24" each way with a maximum supported area of 2.67 sq ft per anchor. (IRC 2006 R703.7.4.1)

Mortar Bed Thickness

Mortar bed thickness shall be at least twice thickness of embedded anchor.

Masonry Veneer Anchored to Steel Stud Backup

Masonry veneer anchored to steel backup shall be attached with adjustable anchors. (Corrugated sheet metal anchors are not allowed.)

Attach anchors to steel framing with corrosion resistant screws with minimum shank diameter of 0.190" (4.8 mm).

Cold-formed steel framing shall be corrosion resistant with minimum base metal thickness of 0.0430" (1.1 mm) (18 gage).

Veneer Laid in Other Than Running Bond

Minimum joint reinforcing equal to one W1.7 (MW11 = 0.148" = 9 gage = 3.76 mm) wire at 18" (457 mm) maximum vertical spacing.

Anchored Veneer in Seismic Areas

Seismic Category C

Meet all above requirements and isolate sides and top from structure so seismic forces from structure not carried by veneer.

Seismic Category D

Meet all above requirements and reduce maximum wall area supported by each tie by 25%. (2.0 ft^2 per anchor for corrugated sheet metal anchors, adjustable anchors, and anchors of wire size W1.7)

Seismic Category E and F

Meet all above requirements and provide continuous joint reinforcing of one wire, size W1.7 (MW11 = 0.148" = 9 gage = 3.76 mm) at 18" (457 mm) maximum vertical spacing.

Mechanically attach joint reinforcing to anchors.

Support weight of anchored veneer for each story independently from other stories.

High Wind Areas

Above prescriptive designs are for basic wind speeds no greater than 110 mph (177 km/hr) and mean roof height not more than 60 ft (18.3 m).

For basic wind speeds more than 110 mph and up to 130 mph (177–209 km/hr) and mean roof height not more than 60 feet (18.3 m):

- Reduce maximum wall area supported by each anchor by 30%.
- Space anchors no more than 18" (457 mm) horizontally and vertically.
- Add anchors around openings larger than 16" (406 mm) in either direction (see ACI 530).

For basic wind speed over 130 mph (209 km/hr) or with mean roof height over 60 ft (18.3 m), alternative design of anchored masonry veneer is required (see ACI 530).

Adhered Veneer

For alternative design provisions, see ACI 530.

Adhered Veneer Prescriptive Requirements

Maximum unit thickness of units = 2 5/8" (67 mm).

Maximum unit face dimension = 36" (914 mm).

Maximum unit face area = 5 ft^2 (0.46 m^2).

Maximum unit weight = 15 psf (73 kg/m^2).

Note: 718 Pa metric conversion in ACI 530 is incorrect.

Height, length and area of adhered veneer are limited only as required to control cracking or debonding.

Backing shall be moisture resistant and may be masonry, concrete, or metal lath and portland cement plaster over masonry, concrete, steel or wood framing.

Required adhesion = 50 psi in shear, when tested per ASTM C 482, or shall be adhered in compliance with Article 3.3 C of ACI 530.1.

Chapter 7 - Glass Unit Masonry

This chapter allows empirical design of glass block masonry that is non load-bearing. Standard units are normally 3 7/8" thick. Thin units are normally 3 1/8" thick for hollow units and 3" thick for solid units.

Design and detail to accommodate differential movement.

Standard Glass Block Panels

Standard glass block panels can be designed based on area of glass in Fig 7.2-1 of ACI 530. Refer to that figure for exact design information. The figure allows maximum area of each panel as follows:

Design Wind Pressure	Area of Panel
40 psf	78 sq ft
30 psf	102 sq ft
20 psf	144 sq ft
15 psf	165 sq ft

Maximum spans are 25 ft horizontal and 20 ft vertical.

Maximum area of interior panels is 250 sq ft.

Exterior Thin Unit Panels

Maximum span = 15 ft horizontal and 10 ft vertical

Maximum area = 85 sq ft.

Maximum wind pressure = 20 psf.

Interior Thin Unit Panels

Maximum span = 25 ft horizontal and 20 ft vertical

Maximum area = 150 sq ft.

For complete design information, including curved panels, see ACI 530.

Isolate glass masonry panels with an expansion joint so that loads from building structure are not transferred to the panel.

Vertical deflection of members supporting glass block panels is limited to L/600.

Glass unit masonry weighing 40 psf or less and 12 feet high or less may be supported on wood framing.

Separate panel supported at different levels with a vertical expansion joint.

Provide lateral support of panels at sides and top with either panel anchors spaced not more than 16" on center or channels, oversized to accommodate expansion material. 1" min. recess into channels or chases.

Lateral supports shall be designed to support a minimum of 200 plf of panel or the applied load, whichever is greater.

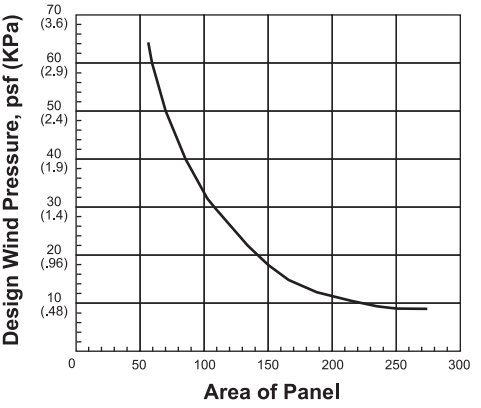
Provide expansion joints along top and sides to allow 3/8" movement and fill with compressible material.

Coat surfaces on which glass masonry panels are to be built with elastic waterproofing before laying the first course.

Use Type S or Type N mortar.

Reinforce horizontal joints in glass unit masonry with 9 gage (0.148") ladder type joint reinforcing spaced not more than 16" c/c. Lap splices 6" minimum. Reinforce first bed joints top and bottom of panel.

Fig. 7.2-1 Glass Unit Masonry Design Wind Load Resistance



Brick Veneer – Steel Studs

Satisfactory performance of Brick Veneer–Steel Stud Curtain Walls necessitates a design which addresses:

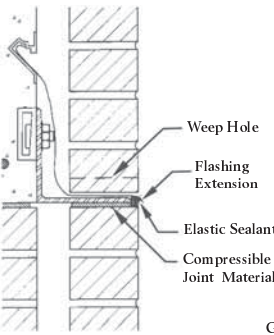
1. The movements that can be expected with the materials and the system.
2. The forces involved and the behavior of the brick veneer.
3. The proper type of ties and their adequate spacing.
4. The design and detailing factors to prevent water penetration of the wall: a) flashing and weepholes. b) sealant joints. c) clean, open air spaces.
5. Strength and stiffness (deflection characteristics) of the wall system.
6. Corrosion resistance and protection for the several metal components of the wall.
7. Selection of proper materials for strength, durability, and ease of construction.
8. Climatic conditions and exposures, as well as interior conditions.
9. Good field practices and construction techniques.

The resulting design may dictate the following requirements:

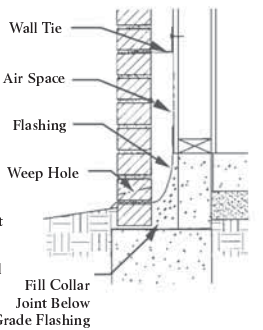
1. Limit the maximum allowable deflection of the back-up system to L/600 or L/720.
2. Attach the sheathing securely to both sides of the studs.
3. Brace the studs horizontally at mid-height.
4. Studs at all jambs, headers and sills of windows, doors and other openings should be designed with loads based on the tributary area of the opening, with adequate transfer of loads to the structure within the deflection/stiffness criteria.
5. Use one tie for each 2.67 ft of wall area, spaced a maximum 18 inches on center vertically and 32 inches on center horizontally.
6. The air space between the back of the brick and the sheathing should be a minimum of 2 inches.
7. Use Portland Cement Lime Mortar (no masonry cement).
8. Steel studs should not be used as backup for parapet walls.
9. Use minimum 18 gage studs.
10. Steel studs should be zinc-coated to conform to ASTM A-525, Grade G 90.
11. Do not allow calcium chloride to be added to mortar.

Notes:

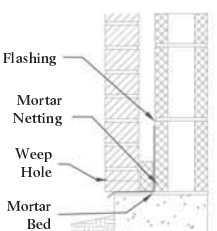
1. Use good quality materials – see TN 7A
2. Install flashing and weep holes when the cavity is interrupted.
3. Weep holes 24" O.C. maximum at flashing
4. All flashing should extend beyond the face of the wall to form a drip.



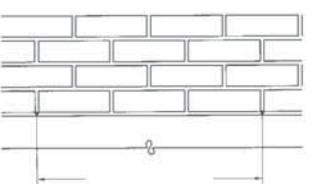
Steel Shelf Angle



Foundation Detail



Mortar Netting



Elevation at Flashing

Tie Spacing Recommendations: BIA Tech. Note 44B[1]

Wall Type	Anchor System		Max Cavity Width	Max. Area Per Anchor	Max. Vert. Spacing	Max Horiz. Spacing
Cavity Wall (both wythes designed to resist out-of-plane loads)	Unit Anchor	9ga/W1.7	4 "	2.67 sf	24"	36"
		3/16"/W2.8		4.50 sf		
	Std. Joint Reinf.	9ga/W1.7	4 "	2.67 sf	24"	16"
		3/16"/W2.8		4.50 sf		
	Unit Adj Dbl Eye and Pintle, Adj Joint Reinf.		4 "	1.77 sf	16"	16"
Brick Veneer on Wood Stud	22 Gage Corrugated	Res. IRC	1 inch	2.67[2]	24"	24"
		IBC		2.67[3]	18"	32"
	Other Than Corrugated	9ga/W1.7	4 " max. 2" min. Rec	2.67	18"	32"
		3/16"/W2.8		3.5		
Veneer on Steel Stud	Unit Adjustable	9ga/W1.7	4 " max 2" min Rec.	2.67 max	18"	32"
	Veneer Anchors	3/16"/W2.8		2.0 sf (Rec.)		24" (Rec.)
Veneer on Concrete or CMU Backup	Unit Adjustable	9ga/W1.7	4 "	2.67	18"	32"
	Veneer Anchors	3/16"/W2.8		3.5		
Multi-wythe Masonry only Composite	Unit Anchors	9ga/W1.7	No Cavity	2.67[4]	24"	36"
		3/16"/W2.8		4.5		
	Joint Reinf	9ga/W1.7		2.67	24"	36"
		3/16"/W2.8		4.5		

[1] Based on minimum tie diameters and gages in tables on page 96. All veneer laid in running bond. See building code and ACI 530 masonry code for special requirements for other than running bond.

[2] One- and two-family wood frame construction not over two stories high.

[3] Other wood frame construction.

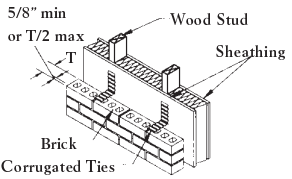
[4] For high-lift grouted walls laid in running bond.

Table 2: Recommended Minimum Corrosion Protection

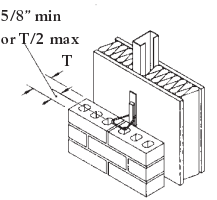
BIA Technical Note 44B

Application	Corrosion Protection
Unit Wire Ties	
1. Completely embedded in mortar or grout	ASTM A 641, Class 3, or ASTM B 227, Grade 30 HS
2. Exposed in air spaces or cavities	ASTM A 153, Class B-3, or ASTM B 227, Grade 30 HS
3. Exposed to corrosive elements	ASTM A 167, Type 304
Sheet Steel Ties	
1. Completely embedded in mortar or grout	ASTM A 525, Class G 60
2. Exposed in air spaces or cavities	ASTM A 153, Class B-3
3. Exposed to corrosive elements	ASTM A 167, Type 304
Joint Reinforcement	
1. Completely embedded in mortar or grout	ASTM A 641, Class 3
2. Exposed in air spaces or cavities	ASTM A 153, Class B-2
3. Exposed to corrosive elements	ASTM A 167, Type 304

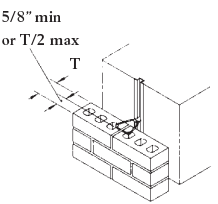
Wall Ties



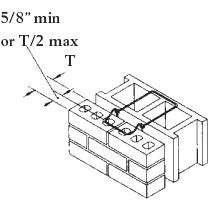
Wood Stud Backup



Steel Stud Backup



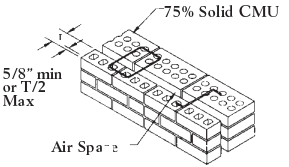
Concrete Backup



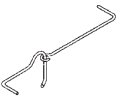
Masonry Backup

Unit Tie Details

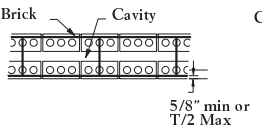
Wall Ties (continued)



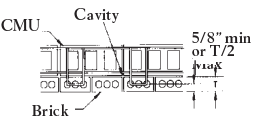
Soild Masonry Backup



Single Eye Pintle



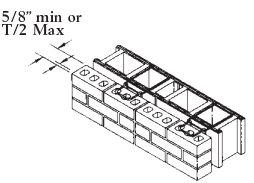
Ladder-Type Cavity Wall*



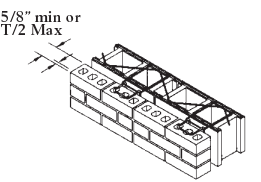
Tab-Type Cavity Wall Soild

** For insulated walls – use ladder type*

Cavity Walls



Ladder Type



Truss Type

Adjustable Assembly Details

Fireplaces

The size of a fireplace is determined mainly by the size of the room which it is intended to heat. For a room with 300 sq. ft. of floor area a fireplace with an opening of 30 to 36 in. wide is sufficient. Once the width and type of opening have been selected, the approximate dimensions of a fireplace can be determined by using the table "Fireplace Dimensions."

The shape of the combustion chamber influences both the draft and the amount of heat which is radiated into the room. Brick Industry Association Tech Notes 19 and 19a give more detailed guidance on the shape and slope of fireplace combustion chambers. These figures may be varied slightly to correspond with brick coursing, but no major changes should be attempted. BIA Tech Notes may be downloaded at www.bia.org.

The combustion chamber, unless it is of the metal preformed type, should be lined with fire brick laid in fire clay mortar. The back and end walls should be at least 8 in. thick to support the weight of the chimney above.

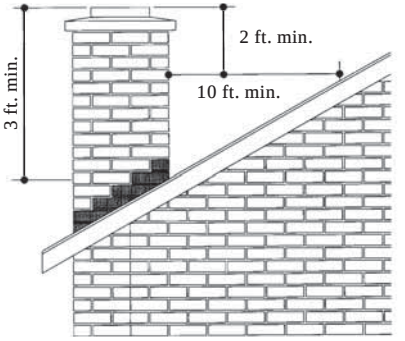
Because of its effect on the draft, the throat of the fireplace must be carefully designed. It should not be less than 6 in. and preferably 8 in. above the highest point of the fireplace opening. The sloping back should extend to the same height and form the support for the back of the damper. A metal damper should be placed in the throat and extend the full width of the fireplace opening, preferably of a design in which the valve plate will open upward and toward the back. This plate when open will form a barrier for downdrafts and will deflect them upward with the ascending column of smoke. When the fireplace is not in use, the damper should be kept closed to prevent heat loss from the room and to keep out dirt from the flue.

The location of the throat will determine the location of the smoke or downdraft shelf. This shelf should be directly under the bottom of the flue and extend horizontally the full width of the throat. The space above the shelf is the smoke chamber. The back wall of the chimney is built straight, while the other three sides are sloped uniformly toward the center to meet the bottom of the flue lining.

The fireplace should have an independent flue entirely free from other openings or connections. The flue lining should be supported on at least three sides by a ledge of protecting brick, finishing flush with the inside of the lining.

The usual practice in hearth construction has been to form an arch of brick from the chimney base to the floor construction and fill over this arch to a level surface to receive the finished hearth. Instead of such an arch, a cantilevered slab may be constructed. Ribbed metal lath serves as the form and is laid in the mortar bed on top of the brick walls of the chimney base and supported at the projecting end by a temporary form.

On the metal lath is placed a bed of type M mortar of sufficient depth to cover the ribs. This is followed at once by the placement of the brick on edge 1/2 in. apart without mortar. The joints should then be filled with cement mortar grout and the reinforcing bars set in place, pressing them down into their proper position approximately 1 1/2 in. below the top surface.



Building code requirements for chimneys may vary on a local basis. Several, however, are accepted nearly everywhere. They include:

1. Chimney wall thickness should be a nominal 4 in. (100 mm) unless no flue liner is used, in which case a nominal 8 in. (200 mm) is required.
2. Neither chimney nor flue liner may change size or shape within 6 in. (150 mm) of either floor components, ceiling components or rafters.
3. The minimum chimney height for fire safety is the greater of 3 ft. (1.0 m) above the highest point where the chimney penetrates the roofline, or 2 ft. (600 mm) higher than any portion of the structure or adjoining structures within 10 ft. (3.0 m) of the chimney. See figure above.
4. Chimney clearance from combustible material is a minimum of 2 in. (50 mm) except where the chimney is located entirely outside the structure, in which case 1 in. (25 mm) is acceptable.
5. The spaces between a chimney and combustible material should be firestopped using a minimum of 1-in. (25 mm) thick noncombustible material.
6. All exterior spaces between the chimney and adjacent components should be sealed. This is most commonly accomplished by flashing and caulking.
7. Masonry chimneys should not be corbeled more than 6 in. (150 mm) from a wall or foundation nor should a chimney be corbeled from a wall or foundation which is less than 12 in. (300 mm) in thickness unless it projects equally on each side of the wall, except that on the second story of two-story dwellings corbeling of chimneys or the exterior of the enclosing walls may equal the wall thickness. Corbeling may not exceed 1-in. (25 mm) projection for each course of brick projected.

Steel Lintels

Allowable Uniform Superimposed Load (in lb. per foot), A-36 Steel Lintels 3 5/8" Brick, 36 psf

		CLEAR SPAN IN FEET									
Angle Size	Wt*	3'	4'	5'	6'	7'	8'	9'	10'	11'	12'
L3 3 1/4	5.0	25.5	13.7	7.0	4.0	2.4	1.6	1.1			
L3 3 5/16	6.0		16.7	8.5	4.8	3.0	1.9	1.3			
L3 3 3/8	7.0		19.5	9.9	5.6	3.5	2.3	1.5	1.1		
L3.5 3.5 1/4	5.8			11.4	6.5	4.0	2.6	1.8	1.3		
L3.5 3.5 5/16	7.2			13.8	7.9	4.9	3.2	2.2	1.6	1.1	
L3.5 3.5 3/8	8.5			16.2	9.3	5.8	3.8	2.6	1.8	1.3	
L4 3 1/4	6.0			15.7	9.0	5.6	3.7	2.6	1.8	1.3	
L4 3 5/16	7.0				11.0	6.9	4.5	3.1	2.2	1.6	
L4 3 3/8	8.0				12.9	8.0	5.3	3.7	2.6	1.9	
L4 3.5 1/4	6.2				9.5	5.9	3.9	2.7	1.9	1.4	1.0
L4 3.5 5/16	7.7				11.6	7.2	4.8	3.3	2.3	1.7	1.3
L4 3.5 3/8	9.1				13.6	8.5	5.6	3.9	2.7	2.0	1.5
L5 3 1/4	7.0				16.7	10.5	7.0	4.8	3.5	2.6	1.9
L5 3 5/16	8.0					12.8	8.5	5.9	4.3	3.1	2.4
L5 3 3/8	10.0					15.1	10.0	7.0	5.0	3.7	2.8
L5 3.5 1/4	7.0					11.1	7.3	5.1	3.7	2.7	2.0
L5 3.5 5/16	8.7					13.5	9.0	6.2	4.5	3.3	2.5
L5 3.5 3/8	10.4					16.0	10.6	7.4	5.3	3.9	2.9
L6 4 5/16	10.0						15.7	10.9	7.9	5.9	4.4
L6 4 3/8	12.0						18.5	12.9	9.3	6.9	5.3

Allowable height of 3 5/8" brick in feet for various sizes of steel angle lintels.

** includes lintel weight*

Structural steel shapes are, perhaps, the most commonly used material for spanning masonry openings. Steel angles are the simplest shapes and are suitable for spanning openings of moderate widths. For steel angles the outstanding or horizontal leg should be at least 3 " wide to adequately support a nominal 4" wythe. Many local and model building codes require that exterior steel members exposed to weather be a minimum of " in thickness. Code requirements for fireproofing of lintels should be checked. For spans exceeding 12'0" we recommend using L5 3 5/16 (LLV) bolted to wood header designed by a structural engineer to carry brick and other loads. Header manufacturers often provide this service.

Steel Lintels

Allowable Uniform Superimposed Load (in lb. per foot), A-36 Steel Lintels
3" Brick, 30 psf

Angle Size	Wt*	CLEAR SPAN IN FEET									
		3'	4'	5'	6'	7'	8'	9'	10'	11'	12'
L3 3 1/4	5.0	30.6	16.5	8.4	4.8	2.9	1.9	1.3			
L3 3 5/16	6.0		20.1	10.2	5.8	3.6	2.3	1.6	1.1		
L3 3 3/8	7.0			11.9	6.8	4.2	2.7	1.8	1.3		
L3.5 3.5 1/4	5.8			13.6	7.8	4.8	3.2	2.2	1.5	1.1	
L3.5 3.5 5/16	7.2			16.6	9.5	5.9	3.9	2.6	1.9	1.3	
L3.5 3.5 3/8	8.5			19.4	11.1	6.9	4.5	3.1	2.2	1.6	
L4 3 1/4	6.0			18.8	10.8	6.7	4.4	3.1	2.2	1.6	1.2
L4 3 5/16	7.0				13.2	8.2	5.4	3.8	2.7	1.9	1.4
L4 3 3/8	8.0				15.5	9.7	6.4	4.4	3.1	2.3	1.7
L4 3.5 1/4	6.2				11.4	7.1	4.7	3.2	2.3	1.7	1.2
L4 3.5 5/16	7.7				13.9	8.7	5.7	3.9	2.8	2.0	1.5
L4 3.5 3/8	9.1				16.3	10.2	6.7	4.6	3.3	2.4	1.8
L5 3 1/4	7.0				20.1	12.6	8.3	5.8	4.2	3.1	2.3
L5 3 5/16	8.0					15.4	10.2	7.1	5.1	3.8	2.8
L5 3 3/8	10.0					18.1	12.0	8.4	6.0	4.4	3.3
L5 3.5 1/4	7.0					13.3	8.8	6.1	4.4	3.2	2.4
L5 3.5 5/16	8.7					16.2	10.8	7.5	5.4	4.0	3.0
L5 3.5 3/8	10.4					19.1	12.7	8.8	6.3	4.7	3.5
L6 4 5/16	10.0						18.8	13.1	9.5	7.0	5.3
L6 4 3/8	12.0							15.5	11.2	8.3	6.3

Allowable height of 3" brick in feet for various sizes of steel angle lintels.

** includes lintel weight*

Structural steel shapes are, perhaps, the most commonly used material for spanning masonry openings. Steel angles are the simplest shapes and are suitable for spanning openings of moderate widths. For steel angles the outstanding or horizontal leg should be at least 3 " wide to adequately support a nominal 4" wythe. Many local and model building codes require that exterior steel members exposed to weather be a minimum of " in thickness. Code requirements for fireproofing of lintels should be checked. For spans exceeding 12'0" we recommend using L5 3 5/16 (LLV) bolted to wood header designed by a structural engineer to carry brick and other loads. Header manufacturers often provide this service.

Galvanized-Sheet Gage, Reinforcing Bars, And Wire Information

PROPERTIES OF STEEL REINFORCING WIRE		
STEEL WIRE GAGE	DIAMETER INCHES	AREA SQUARE INCHES
14	0.0800	0.0050
13	0.0915	0.0066
12	0.1055	0.0087
11	0.1205	0.0114
10	0.1350	0.0143
9	0.1483	0.0173
8	0.1620	0.0206
7	0.1770	0.0246
3/16"	0.1875	0.0276
6	0.1920	0.0289
5	0.2070	0.0336
4	0.2253	0.0399
3	0.2437	0.0466
1/4"	0.2500	0.0491
2	0.2625	0.0541
1	0.2830	0.0629
1--0	0.3065	0.0738
5/16"	0.3125	0.0767
2--0	0.3310	0.0860
3--0	0.3625	0.1032

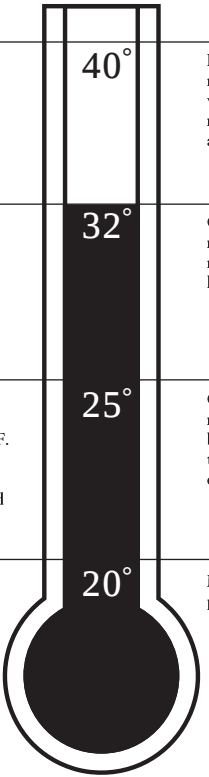
PROPERTIES OF STANDARD ASTM A 615 STEEL REINFORCING BARS		
BAR DESIGNATION NUMBER	DIAMETER INCHES	AREA SQUARE INCHES
2	0.250	0.05
3	0.375	0.11
4	0.500	0.20
5	0.625	0.31
6	0.750	0.44
7	0.875	0.60
8	1.000	0.79
9	1.128	1.00
10	1.270	1.27
11	1.410	1.56
14	1.693	2.25
18	2.257	4.00

Galvanized-Sheet Gage

Galvanized Sheet Gage	Mean Thickness (Inches)	Galvanized Sheet Gage	Mean Thickness (Inches)
8	0.1681	20	0.0396
9	0.1532	21	0.0366
10	0.1382	22	0.0336
11	0.1233	23	0.0306
12	0.1084	24	0.0276
13	0.0934	25	0.0247
14	0.0785	26	0.0217
15	0.0710	27	0.0202
16	0.0635	28	0.0187
17	0.0575	29	0.0172
18	0.0516	30	0.0157
19	0.0456	31	0.0142
		32	0.0134

Cold Weather Masonry

Construction Requirements (air temperature)		Protection Requirements (avg. daily temperature)
Heat sand or mixing water to minimum of 40° F. and maximum of 120° F. at time of mixing.	40°	Protect masonry from rain or snow by covering with a weather resistive membrane for 24 hours after construction.
Heat sand or mixing water to produce mortar temperatures between 40° and 120° F. at time of mixing. Maintain mortar above freezing until used in masonry.	32°	Completely cover masonry with a weather resistive membrane for 24 hours after construction
Heat sand and mixing water to minimum of 40° F. and maximum of 120° F. Use heat on both sides of walls under construction. Employ windbreak if wind exceeds 15 mph.	25°	Completely cover masonry with insulating blankets or equal protection for 24 hours after construction.
Heat sand and mixing water to minimum of 40° F. and maximum of 120° F. Enclose work and heat to above 32° F. Units being laid should be at least 20° F.	20°	Maintain masonry temperature above 32° F. for 24 hours by enclosure and heat.



Thermal Movement

MATERIAL	Avg. Coeff. of Thermal Expansion, Millionths/°F.	Thermal Expansion (in./100 ft. @ 100° F. Increase)	
CLAY MASONRY			
Clay or shale brick	3.6	0.43	7/16
Fire clay brick or tile	2.5	0.30	5/16
Clay or shale tile	3.3	0.40	3/8
CONCRETE BRICK			
Dense aggregate	5.2	0.62	5/8
Cinder aggregate	3.1	0.37	3/8
Expanded-shale aggregate	4.3	0.52	1/2
Expanded-slag aggregate	4.6	0.55	9/16
Pumice or cinder aggregate	4.1	0.49	1/2
STONE			
Granite	4.7	0.56	9/16
Limestone	4.4	0.53	1/2
Marble	7.3	0.88	7/8
CONCRETE			
Gravel aggregate	6.0	0.72	3/4
Lightweight, structural	4.5	0.54	9/16
METAL			
Aluminum	12.8	1.54	1 9/16
Bronze	10.1	1.21	1 3/16
Stainless Steel	9.6	1.15	1 1/8
Structural Steel	6.7	0.80	13/16
WOOD, PARALLEL TO FIBER			
Fir	2.1	0.25	1/4
Maple	3.6	0.43	7/16
Oak	2.7	0.32	5/16
Pine	3.6	0.43	7/16
WOOD, PERPENDICULAR TO FIBER			
Fir	32.0	3.84	3 13/16
Maple	27.0	3.24	3 1/4
Oak	30.0	3.60	3 5/8
Pine	19.0	2.28	2 1/4
PLASTER			
Gypsum aggregate	7.6	0.91	15/16
Perlite aggregate	5.2	0.62	5/8
Vermiculite aggregate	5.9	0.708	11/16

Note: Clay brick also expands slightly due to moisture: 0.0003 in / in.

Loadbearing Walls

Loadbearing walls support all dead, live and wind loads. Using the loadbearing wall system eliminates the need for an additional framing system.

Loadbearing walls fit best in buildings with:

1. Repeating floor plans
2. Permanent room dividers
3. No large open areas
4. Continuous walls starting at the roof line and continuing through to the ground level.

Where to use loadbearing:

1. Schools
2. Motels
3. Hotels
4. Hospitals
5. Jails
6. Dormitories
7. Nursing Homes

Loadbearing walls are multi-function walls. They provide:

1. Structure
2. Enclosure
3. Finished interior walls
4. Fire barriers
5. Sound control
6. Low maintenance
7. Energy savings

1. Weight (LB./SQ. FT.)
Weight for 1 square foot of wall area

2. Fire Ratings
Building codes are quite specific in the degree of fire protection required in various areas of buildings. This protection is derived from the fire resistance of walls, partitions, and floors and is measured according to the Standard Methods of Fire Tests of Building Construction and Materials, ASTM E-119. Tests are conducted at Underwriters Laboratories, The National Bureau of Standards, or other recognized laboratories.

The ratings indicate a component's ability to withstand controlled fire intensities for a time equal to or in excess of the rating. They are expressed in whole hour increments up to four hours, which is usually the maximum rating required by building codes.

The fire rating required for a building component becomes the function of design as well as the appropriate building code. Based upon actual experience, masonry walls have proven superior to other wall types when subjected to fire. Their excellent stability and load carrying capacity make them outstanding wall values.

3. U-Factors
Much attention today is given to human comfort in designing structures. An important consideration given to design of structural components (walls, floor, or ceiling) is that of heat loss or transmission. We know this quality as the U-factor of a wall. Expressed as a coefficient, it is defined as the amount of heat in Btu transmitted in one hour through one square foot of wall for each degree F. of temperature difference between air on the warm side and air on the cool side of the wall.

Also of importance is the heat gain quality of a wall, which has a profound effect on air-conditioning requirements. We note that the ability of walls to absorb rather than transmit heat is very important. We find masonry walls possessing excellent values in both insulation and heat storage thus satisfying heating and air-conditioning requirements.

It is important to note that . . .

"Research conducted by The Brick Industry Association indicates that the actual rate of heat transfer through typical building walls may be 0-20% less for masonry walls, 10-20% greater for wood frame walls, and 30-60% greater for metal panel walls, than the calculated rates based on published U values. This is due to the greater heat storage capacity of the masonry walls, which is sometimes referred to as capacity insulation."

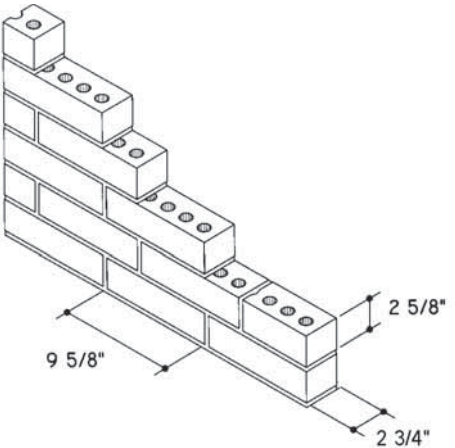
4. The R Factor
The reciprocal of the U value.

5. Sound Transmission Class (STC)
Although considerable attention is given to a wall's ability to absorb or reflect sound, we find a greater concern for the amount of sound passage through walls. We identify the rating of the ability to resist passage as the Sound Transmission Class. Briefly, the STC is a single number rating derived from the measured sound transmission loss of 16 standard frequencies through a wall. The values are expressed in decibels.

6. Sound Transmission Loss (STL)
A rating system for sound loss through a wall. It is the average transmission loss at nine specific frequencies.

Where Should Expansion Joints Or Differential Movement Be Considered?

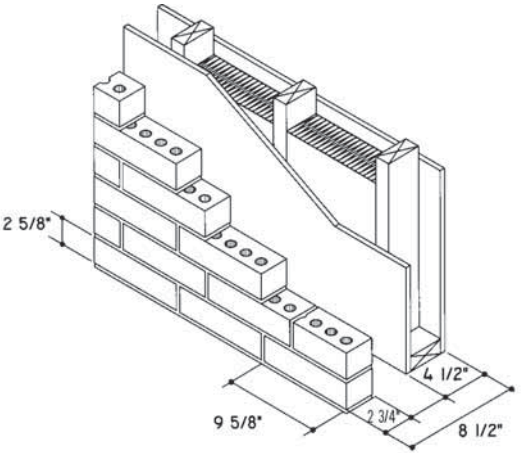
1. At shelf angles.
2. At several locations along long walls (25 ft. maximum).
3. At offsets in walls.
4. At intersections of walls.
5. Where short runs of masonry interface with long runs of masonry.
6. Near corners (10 ft. maximum).
7. At columns.
8. At foundations (bond break).
9. At floor or roof wall connection.
10. At parapet walls.
11. Where materials with different coefficients of thermal expansion are joined.



King Size Brick Wall

Insulation	Weight lb/sq.ft.	U	R	Fire rating*	STC	STL	Cost per sq.ft
No insulation	30	.85	1.18	.75 hr	36		

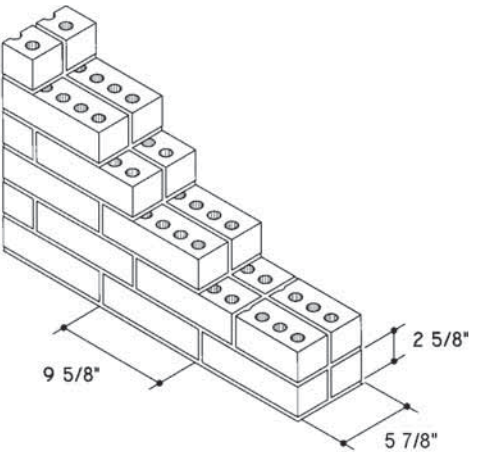
* calculated fire rating



King Size Brick Veneer Wall

Insulation	Weight lb/sq.ft.	U	R	Fire rating*	STC	STL	Cost per sq.ft
No insulation	39	.19	5.21	.75 hr	36	--	
4" Bat	39	.09	10.67	.75 hr	36	--	

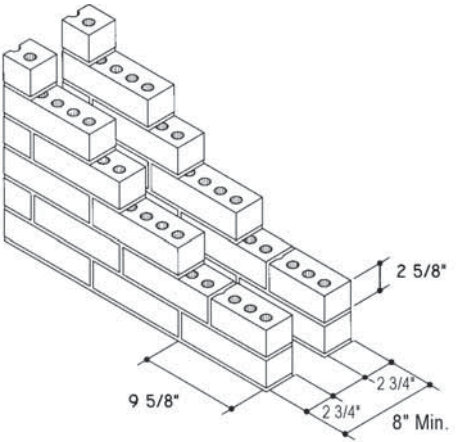
* calculated fire rating



King Size Brick, 2 Wythes

Insulation	Weight lb/sq.ft.	U	R	Fire rating*	STC	STL	Cost per sq.ft
No insulation	65	.60	1.67	3 hour	51	44	

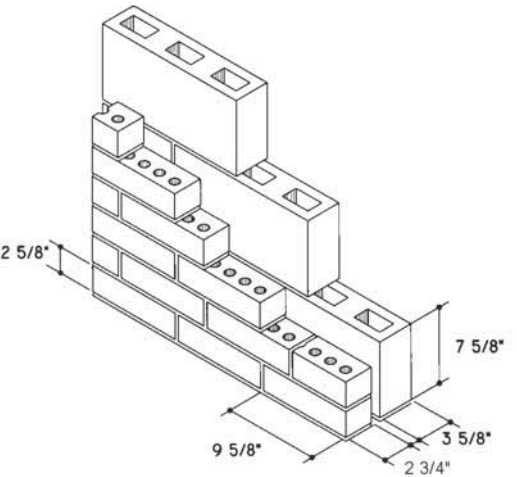
* calculated fire rating



King Size Brick, 2 Wythes, Cavity Wall

Insulation	Weight lb/sq.ft.	U	R	Fire rating*	STC	STL	Cost per sq.ft
No insulation	60	.38	2.63	3 hour	50	--	
1" polystyrene board	60	.13	7.63	3 hour	50	--	
1" polyurethane board	60	.11	8.88	3 hour	50	--	
2" polystyrene board	60	.08	12.63	3 hour	50	--	
2" polyurethane board	60	.07	15.13	3 hour	50	--	
4" vermiculite fill	60	.10	9.89	3 hour	50	--	
4" perlite fill	60	.09	11.45	3 hour	50	--	

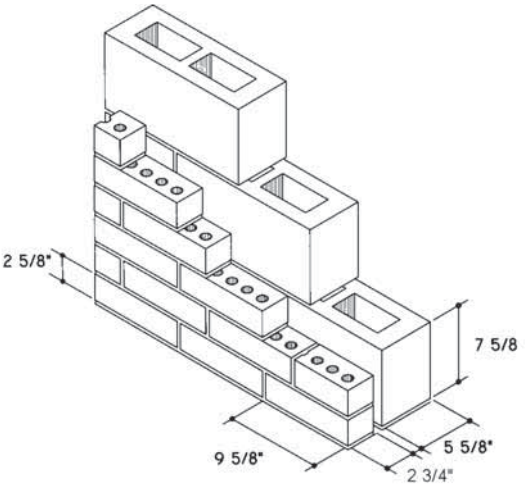
* Fire rating by test: Report No. E.S. 6975, October 1968, Structural Research Laboratory, Richmond Field Station, University of California



King Size Brick and 4" Light Weight Block

Insulation	Weight lb/sq.ft.	U	R	Fire rating*	STC	STL	Cost per sq.ft
No insulation	52	.28	3.55	3 hour	--	49	
1" polystyrene board	52	.13	7.58	3 hour	--	49	
1" polyurethane board	52	.11	8.83	3 hour	--	49	

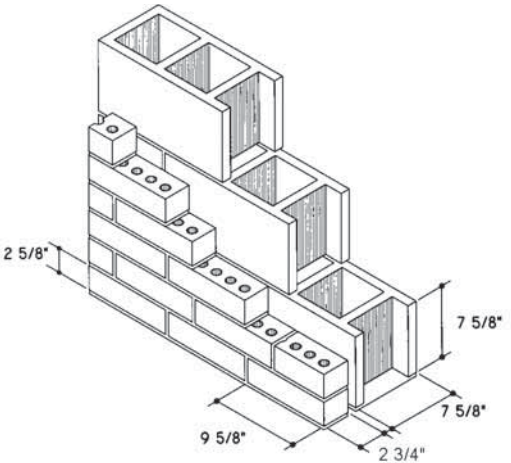
* calculated fire rating



King Size Brick and 6" Light Weight Block

Insulation	Weight lb/sq.ft.	U	R	Fire rating*	STC	STL	Cost per sq.ft
No insulation	63	.27	3.68	4 hour	50	--	

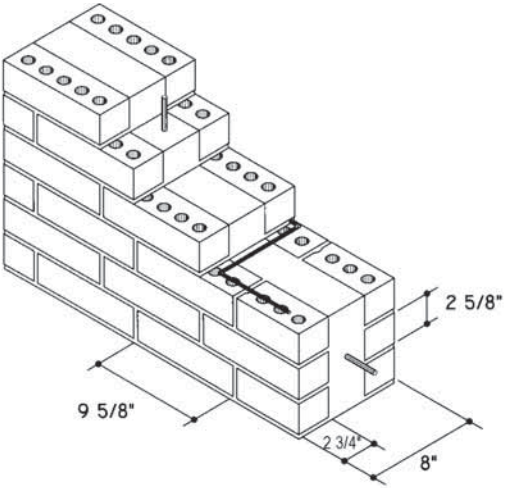
* calculated fire rating



King Size Brick and 8" Light Weight Block

Insulation	Weight lb/sq.ft.	U	R	Fire rating*	STC	STL	Cost per sq.ft
No insulation	70	.26	3.90	4 hour	50	--	
1" polystyrene board	70	.13	7.93	4 hour	50	--	
1" polyurethane board	70	.11	9.18	4 hour	50	--	
Vermiculite filled core	70	.14	7.00	4 hour	50	--	

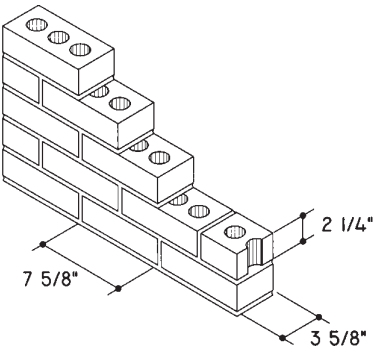
* calculated fire rating



King Size Brick, 2 Wythes, Grouted + Reinforced

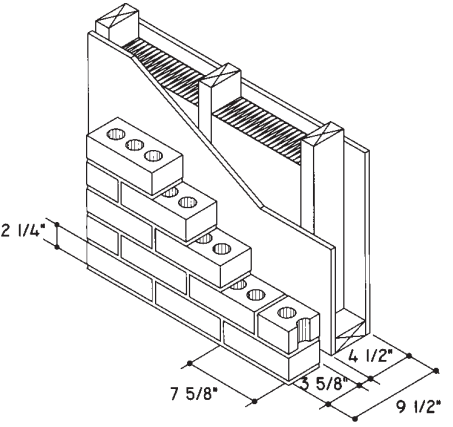
Insulation	Weight lb/sq.ft.	U	R	Fire rating*	STC	STL	Cost per sq.ft
No insulation	85	.54	1.85	4 hour	52	54	

* calculated fire rating



Modular Face Brick

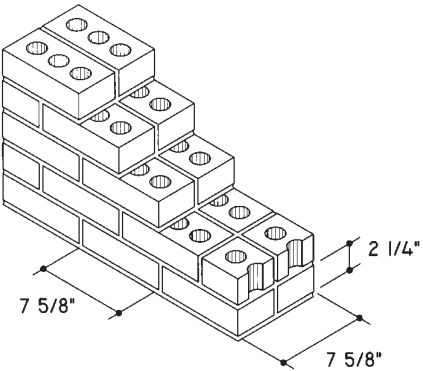
Insulation	Weight lb/sq.ft.	U	R	Fire rating	STC	STL	Cost per sq.ft
No insulation	40	.76	1.32	1 hour	45	47	



Modular Face Brick

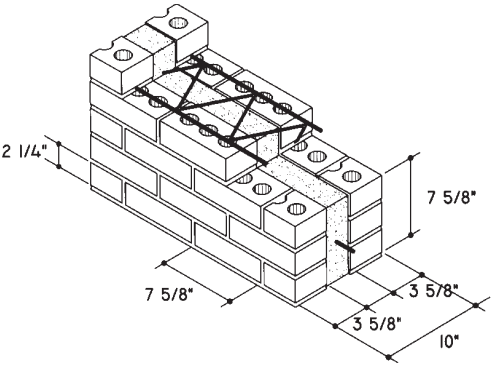
Insulation	Weight lb/sq.ft.	U	R	Fire rating*	STC	STL	Cost per sq.ft
No insulation	40	.19	5.32	1 hour	45	47	
4" Bat	49	.07	14.41	1 hour	45	47	

* calculated fire rating



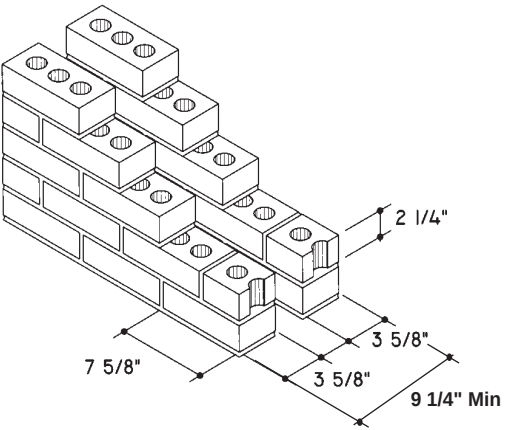
Modular Face Brick, 2 Wythes

Insulation	Weight lb/sq.ft.	U	R	Fire rating	STC	STL	Cost per sq.ft
No insulation	80	.54	1.85	4 hour	52	--	



Modular Face Brick, Grouted and Reinforced

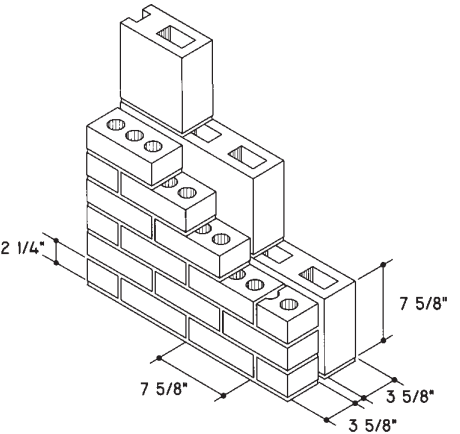
Insulation	Weight lb/sq.ft.	U	R	Fire rating	STC	STL	Cost per sq.ft
No insulation	105	.49	2.04	4 hour	59	--	



Modular Face Brick, 2 Wythes, Cavity Wall

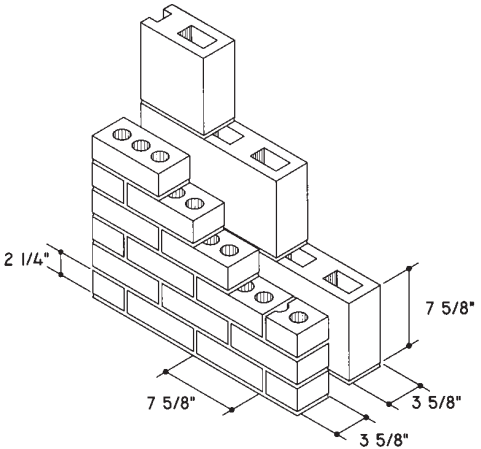
Insulation	Weight lb/sq.ft.	U	R	Fire rating*	STC	STL	Cost per sq.ft
No insulation	80	.36	2.78	4 hour	50	58	
1" polystyrene board	80	.13	7.78	4 hour	50	58	
1" polyurethane board	80	.11	9.03	4 hour	50	58	
2" polystyrene board	80	.09	11.81	4 hour	50	58	
2" polyurethane board	80	.07	14.31	4 hour	50	58	
2" vermiculite fill	80	.16	6.35	4 hour	50	58	
2" perlite fill	80	.14	7.21	4 hour	50	58	

* Fire rating by test: Report No. E.S. 6975, October 1968, Structural Research Laboratory, Richmond Field Station, University of California



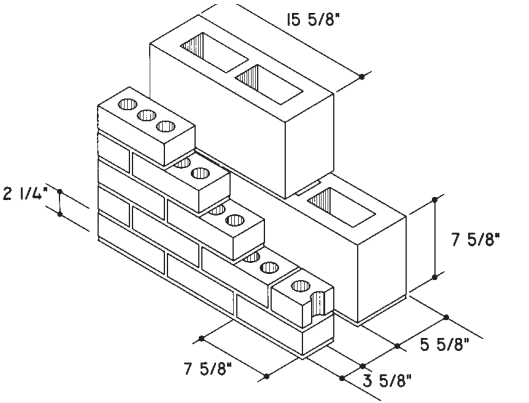
Modular Face Brick and 4” Light Weight Block

Insulation	Weight lb/sq.ft.	U	R	Fire rating	STC	STL	Cost per sq.ft
No insulation	62	.37	2.69	3 hour	--	55	



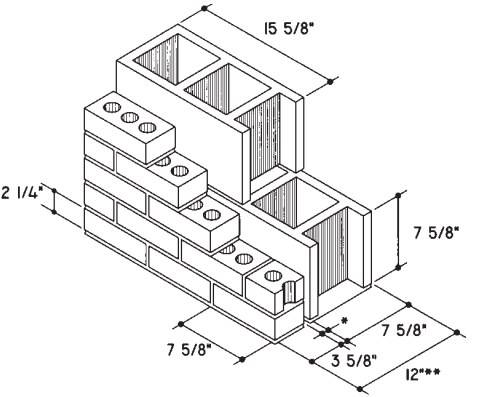
Modular Face Brick and 4" Light Weight Block, Cavity Wall

Insulation	Weight lb/sq.ft.	U	R	Fire rating	STC	STL	Cost per sq.ft
No insulation	62	.27	3.76	4 hour	50	55	
1" polystyrene board	62	.11	8.66	4 hour	50	55	
1" polyurethane board	62	.10	9.91	4 hour	50	55	
2" polystyrene board	62	.08	12.69	4 hour	50	55	
2" polyurethane board	62	.07	15.19	4 hour	50	55	
2" vermiculite fill	62	.14	7.23	4 hour	50	55	
2" perlite fill	62	.12	8.09	4 hour	50	55	



Modular Face Brick and 6” Light Weight Block, Cavity Wall

Insulation	Weight lb/sq.ft.	U	R	Fire rating	STC	STL	Cost per sq.ft
No insulation	73	.26	3.79	4 hour	58	58	
1" polystyrene board	73	.11	8.79	4 hour	58	58	
1" polyurethane board	73	.10	10.04	4 hour	58	58	
2" polystyrene board	73	.08	12.82	4 hour	58	58	
2" polyurethane board	73	.07	15.32	4 hour	58	58	
2" vermiculite fill	73	.14	7.39	4 hour	58	58	
2" perlite fill	73	.12	8.22	4 hour	58	58	

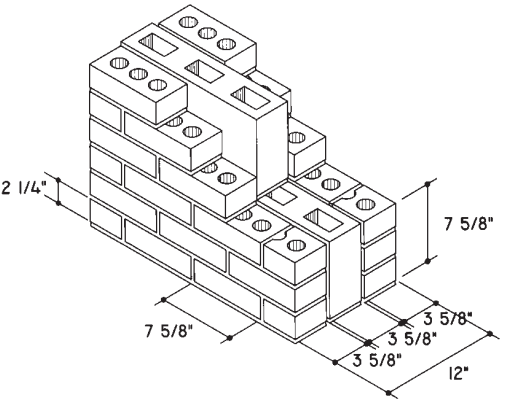


Modular Face Brick and 8" Light Weight Block

Insulation	Weight lb/sq.ft.	U	R	Fire rating	STC	STL	Cost per sq.ft
No insulation	80	.28	3.59	4 hour	50	50	
Vermiculite filled core	80	.16	6.14	4 hour	50	50	

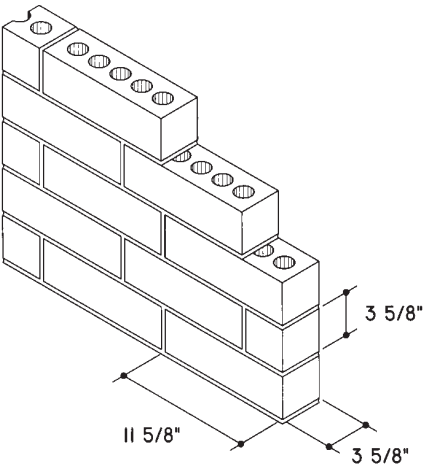
* A cavity less than 2" wide is not recommended.

** Not recommended



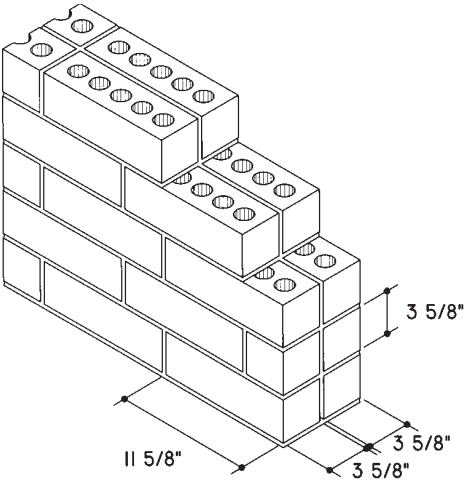
Modular Face Brick, 4" Light Weight Block, Modular Brick

Insulation	Weight lb/sq.ft.	U	R	Fire rating	STC	STL	Cost per sq.ft
No insulation	102	.32	3.13	4 hour	60	60	



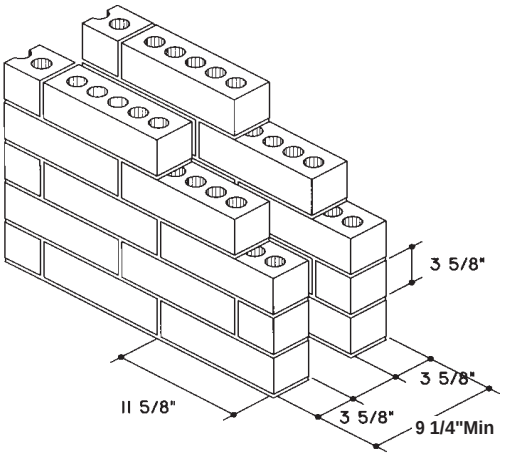
Utility Brick Wall

Insulation	Weight lb/sq.ft.	U	R	Fire rating	STC	STL	Cost per sq.ft
No insulation	40	.76	1.32	1 hour	45	47	



Utility Brick Wall, 2 Wythes

Insulation	Weight lb/sq.ft.	U	R	Fire rating	STC	STL	Cost per sq.ft
No insulation	80	.54	1.85	4 hour	52	53	



Utility Brick, 2 Wythes, Cavity Wall

Insulation	Weight lb/sq.ft.	U	R	Fire rating	STC	STL	Cost per sq.ft
No insulation	80	.36	2.78	4 hour	50	58	
1" polystyrene board	80	.13	7.78	4 hour	50	58	
1" polyurethane board	80	.11	9.03	4 hour	50	58	
2" polystyrene board	80	.08	12.78	4 hour	50	58	
2" polyurethane board	80	.07	15.28	4 hour	50	58	
4" vermiculite fill	80	.09	10.89	4 hour	50	58	
4" perlite fill	80	.08	12.69	4 hour	50	58	

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Download this free online tool at brick.com, and use it to visualize your next project—as architect James Childers did for the award-winning Koweta Indian Health Facility, in Coweta, Okla. His Masonry Designer rendering appears at left.