

Essay #5 of a series written by Alabama preservationists to supplement the *Handbook for Owners of Alabama's Historic Houses*, Alabama Historical Commission, 2001

## **MASONRY**

Harvie Jones, F.A.I.A.

An excellent single-source reference to this subject is the booklet "Introduction to Early American Masonry" (Stone, Brick, Mortar and Plaster) by Harley J. McKee, F.A.I.A., published by and currently available at modest cost from the National Trust for Historic Preservation Bookstore, 740-748 Jackson Place N.W., Washington, D.C., 20006. This booklet goes into considerable detail on original techniques, materials and sources, problems and restoration techniques.

The best sources of concise information on restoration do's and don'ts are the National Park Service's "Preservation Briefs" numbers 1 ("The Cleaning & Waterproof Coating of Masonry Buildings"), 2 ("Repointing Mortar Joints in Historic Buildings"), 6 ("Dangers of Abrasive Cleaning to Historic Buildings"), and 7 ("The Preservation of Historic Glazed Terra-Cotta"), which are reprinted in this section. An additional information source is the American Association for State and Local History Technical Leaflet 81 "Restoring Brick & Stone", 50 cents each at 1315 Eighth Avenue South, Nashville, Tennessee 37203.

The final "best resource" is careful observation of unweathered (under porch roofs, etc.) areas of the existing masonry, analyzing the type of joint-tool marks present and how the tool was held and moved to produce those marks, and other factors discussed below.

### **Alabama Brick Masonry - Historical Notes**

Almost every historic building one visits in Alabama has its story about the brick being made "right on the place" and undoubtedly this is true in many cases, for "scove-kilns" were easy to set up and it was expensive and difficult to transport thousands of heavy bricks for much distance. However, we also know of instances such as the fact that the architect/builder George Steele had a large and successful brickyard going by the early 1820s in Huntsville, and such brickyards must have been in numerous towns throughout the state by 1830.

### **Brickmaking Prior to Circa 1870**

The weathered, screened and tempered moist clay was molded in a wood box slightly larger than the desired size of the final brick, dumped out on the ground to air-dry, and then stacked to be fired in an open "scove-kiln" or an enclosed round or beehive kiln. The air-drying on the ground explains the dog, pig, and other animal tracks sometimes found on the top surface of early 19<sup>th</sup> century bricks.

These processes produced bricks fired to varying degrees. The brick surfaces nearest the heat frequently had a glass-like, grayish-green partial ceramic glaze as a result of the intense heat, while those farthest from the heat were "salmons" - an underbaked pinkish, salmon-flesh color and of soft composition, sometimes soft enough to carve with a fingernail. These "salmons" would not hold up in the weather, but they were suitable for use on the inner protected wythes (layers) of walls or chimneys that were usually 3 or 4 wythes thick; or in the interior partitions of brick houses which normally had solid brick partitions of 2 or 3 wythes thickness.

The care used in weathering, screening, tempering, molding and firing the clay also determined whether the brick was of “number-one” (stock) or “number-two” (common) grade. The vast majority of pre-1860 brick houses and other buildings in Alabama (and elsewhere) had number-one brick fronts with number-two’s on the sides and rear, even when all sides were well-exposed. Furthermore, the fronts were usually laid in a more elaborate, expensive bond-pattern than the “common bond” used on the other sides.

The favorite for fronts in the Federal Period (up to about 1835) was Flemish Bond, where every other brick is turned endways (alternating “stretchers” and “headers”). All-running bond or all-stretcher bond (called “American Stretcher Bond” by McKee) was also seen for fronts in the Federal Period. The outer wythe was tied to the inner wythes by incorporating a course of square bricks about every seventh course which tied the wythes of bricks together but presented a uniform stretcher-face appearance. A second method involved cutting the back diagonal corners off some face bricks to allow the placement of diagonal tie-bricks inside the wall.

In the Greek Revival Period the Flemish Bond lost favor since its delicate pattern was not esthetically suited to this severe, large-scale masculine style. All-running bond (stretcher-bond) was favored for the Greek Revival.

The “common bond” usually used on the sides and rear of pre-1870 buildings (and frequently up until the advent of veneered brick in the 20<sup>th</sup> Century) consisted of six courses of stretchers alternating with a bond-course of headers, laid in a number-two brick. After the Civil War it was more common in houses and better buildings to use the same bond and brick grade on all sides of the building.

A few country houses of pre-1840 have been observed with Flemish bond and number-one bricks on either four or three sides but these are rare. Sometimes in these cases the bricks above the main floor-joist line are number-one grade, with number-two grade bricks at the foundation wall below the main floor-joists.

### **Brick Sizes**

Early 19<sup>th</sup> Century Alabama bricks were produced in a wide variety of sizes, although the proportions were typically dimensioned so that the short side (header) was about one-half of the long side (stretcher) and the height was about one-third the stretcher side. This is so that the various bonding patterns would readily fit with little cutting or breaking of the bricks to fit. Lengths (stretchers) have been measured as short as 7 inches and as long as 9 inches, the typical bricks being about 8 inches long, as they still are made today and have been for thousands of years. This is a dimension and weight that comfortably can be picked up by the mason in one hand.

### **Brick Flooring, Hearths & Paving**

The aforementioned square bricks (both sides are about 8 inches, a “stretcher” length) are found before the Civil War not only as wythe-ties but as floor and hearth paving, terrace and walks. Kitchen floors were usually of brick for fire-safety, laid directly on sand or cinders on the earth. If square bricks were used, they were typically laid half-bond. Rectangular bricks might be half-bond, 45-degree herringbone or 90-degree herringbone.

Brick hearths were typical before the Civil War, only a few of stone have been seen. Most were of rectangular brick laid in a pattern that was ubiquitous; a half-bond (running bond) pattern that followed the three front edges of the hearth, the pattern turning at the two front corners. In brick-floored kitchens this pattern sometimes extended from the fireplace out into the room.

Paving bricks were laid flat, never on-edge. The borders of brick walks were laid on-edge, plus a few leveling-courses in walls, and this seems to be about the only such use prior to the late 19<sup>th</sup> Century when various decorative patterns of brickwork came into use.

Paving and floor-bricks were not laid in mortar or with mortar joints. The bricks were laid with tight butt joints on sand, soil or sometimes cinders. As a result the surfaces usually undulate due to uneven settlement, tree-root displacement and wear. This undulation and the mortarless tight butt-joints should be retained in any restoration work.

#### **Federal Period Brick Arches**

Bricks laid on-end were frequently used in Federal Period flat-arches (“jack arches”) over door and window openings. Sometimes these arch bricks were “gauged” (tapered) to fit the angles of a flat arch, elliptical arch or round arch, these latter two being frequently used at Federal Period entrances. Lee frequently the arch bricks were not only gauged but “rubbed”, their faces rubbed against another brick to produce a smooth surface, sharp corners and a deeper coloration due to the exposure of the inner material of the brick. This is an attractive decorative device, and rare in Alabama.

#### **Moulded-Shape Bricks**

Bricks with moulded-shape ends or edges were sometimes used in Alabama in the Federal Period to form exterior brick wall-cornices, water-tables and wall-caps. In the Greek Revival Period, moulded bricks were used to make the base-moulds and capitals of large classical columns, each brick-end being formed in a moulded radial section and the bricks laid in a circle to form a continuous mould interrupted only by mortar joints. The shafts of large masonry columns were laid upward in radial pattern bricks and then stuccoed to form either a smooth-faced column or a fluted column.

The flutes were made by dragging a metal profile tool up and down guidelines on the wet stucco to scoop out the flutes. The profile tool was hinged in the center and gradually folded as the tool progressed up the entasis (taper) of the shaft to keep the flutes in proportion to the diminishing diameter of the shaft. A recent example of the use of the technique can be seen at the portico of the Alabama State Capitol in Montgomery, whose exterior was restored in 1983 by Holmes & Holmes, Architects of Mobile.

#### **Penciling**

“Penciling” is the technique of painting narrow, straight white paint stripes on brick, stone or stucco walls to emphasize and visually straighten the mortar joints or to simulate mortar joints as on marbleized stucco. Most Federal Period and Greek Revival brick houses were “penciled.” The best place to look for traces is under porch roofs, or other protected areas, for weathering or repointing will have usually removed most of it elsewhere. According to an article in the “APT Bulletin” and some observed evidence this penciling was usually done as part of the original construction rather than as a later touch-up. One evidence of this is that in the 1819 Weeden House in Huntsville, the penciling runs behind some of the original door facing trim at the back porch. This seems logical in that the 19<sup>th</sup> Century practice was to complete all the masonry work prior to installing the wood trim, inasmuch as the trim was attached to wood blocks embedded in the solid brick walls.

Where penciling was present, it is desirable to restore it. An excellent example of the example of the striking effect of penciled brick joints on dark brown brick is at “The Hermitage” in Nashville. One extreme example of penciling seen on the circa 1820 Kelly House in Madison County was the use of straight, square “ashlar” penciled joints overlaid on an uncoursed rough limestone foundation wall. It’s impossible to believe that the owner assumed anyone was being fooled that the penciling represented the true jointing when the real joints elsewhere were so prominent.

On “marbleized” stucco, of course, no one was being fooled either, but written accounts from the period indicate that the marbleizing was considered to be a conversation piece as much as anything. “Fool-the-eye” paintings were also popular in the 19<sup>th</sup> Century for the same reason. Marbleizing was most frequently used on stucco under porticos, but is sometimes found on the entire house or at verandahs. It is also found in interiors, on baseboards in the early 19<sup>th</sup> Century and on walls later in the century in institutional buildings.

Marbelizing can be reproduced, with the proper skill. Excellent recent examples can be seen in Demopolis at the recently restored “Gaineswood,” whose graining is also reproduced.

### **Pressed Brick**

In the last two decades of the 19<sup>th</sup> Century many of the better houses, churches, and commercial buildings were faced with “pressed brick”, made by mechanically compressing refined clay with a low moisture content in moulds, rather than the usual procedure of using wet clay and little or no compression. This “pressed brick” method resulted in a brick of a precise size and shape which could be laid with very tight (1/8 to ¼ inch) mortar joints. These tight joints were usually of mortar tinted the same color as the brick which gave the wall surface a monolithic appearance, desirable in the Eastlake, Romanesque and other styles popular in 1880-1900. Some of these walls have been ruined by gouging out the joints to double their original width with mechanical grinders and repointing the joints with stark-white mortar.

### **Mortar & Mortar Joints**

Prior to the manufacture of Portland cement in the United States beginning in 1871, most mortar was lime and sand. This produced a somewhat resilient mortar which moves with the temperature expansion changes in the brick. Therefore, 19<sup>th</sup> Century brick should not be repointed with Portland cement (modern) mortar which is hard and non-resilient and can consequently cause spalling of the brick faces in temperature movements. Lime is still available. See “Preservation Brief 2”, which follows.

In repointing it is not only important to follow the advice of “Preservation Brief 2,” but to carefully study and analyze how the joints were tooled. Find an unweathered area under a roof overhand. By far the most typical 19<sup>th</sup> Century method was to hold a trowel along the joint so the tip drags and shapes the joint almost vertical but tapering inward about 1/16 inch toward the bottom. The trowel tip bumps along the irregularities of the brick faces leaving corresponding blips in the joint surfaces. The joint is not “brushed down” to roughen the surface as in current practice. The joint tapers slightly inward to the bottom which by-the-book is not as good for shedding water as the reverse would be. However, this is the way they were done and they have been with us for up to 170 years. For historical accuracy, this is the way they should be repointed.

A few examples of string-mould or bead-mold profile mortar joints have been seen on early 19<sup>th</sup> Century Alabama brick buildings, but they apparently were rare even then.

See “Preservation Brief 2” for the control of joint width, mortar color, and proper tuck-pointing preparation and techniques. Do not use power grinders for cutting out old mortar. Do not use sand or water blast. These techniques have ruined many 19<sup>th</sup> Century masonry walls.

### **Exterior Steps**

Many pre-Civil War houses now have brick steps up to the portico and porches. If any of these were originally brick they must be very rare. Typically ante-bellum exterior steps were of finished wood construction with rounded nosings and closed risers much like interior stairs, or were built of cut or

chiseled stone. Brick steps now present are typically found to be of 20<sup>th</sup> Century origin, as are the concrete steps sometimes found.

Concrete steps began to be used around the turn of the 20<sup>th</sup> Century. They were usually of a well-formed and finished construction and design. Brick steps seem to have come in as replacements for wood steps in the early to mid 20<sup>th</sup> Century. An examination of the mortar, bricks and design will usually readily confirm that they are not of 19<sup>th</sup> Century construction. For this reason brick steps should not be constructed at 19<sup>th</sup> Century buildings unless there is good evidence supporting their original use.

Cheek-walls by exterior stairs seem to have come in with the Greek Revival where they are sometimes appropriate. They are not appropriate in the Federal Period. Apparently most Federal Period and Greek Revival exterior steps had no handrails based on surviving documentation.

### **Terra Cotta**

Terra Cotta is an ancient material (“cooked earth” in Latin) “rediscovered” in the latter part of the 19<sup>th</sup> Century and now being rediscovered by architects again for it can be found on numerous prize-winning new and restored buildings. Frequently it requires only soap-and-water cleaning and minor repointing. See “Preservation Brief 7”, attached.

### **Painted Brick**

Conclusive evidence of brick having been painted as early as circa 1850 has been found on one 1814 house when a Classical Revival portico was added. Therefore the painted brick is an integral part of the history of that house and should not be removed. There must be many such cases of early painted brick, so paint removal should sometimes not be considered.

In any event, paint can rarely be removed from brick to an extent greater than 95% without significant damage to both the brick faces and the mortar joints, even if only chemical solvents and low-pressure washing are employed. Water-blast or sand-blast techniques should not be used. In many cases the best option therefore is to leave the paint on the brick. If it is appropriate to remove it, call for small test patches first. Some companies such as “Pro-So-Co” specializes in this, and most paint companies have some products in this line.

In some cases the bricks have been reversed one by one in the wall to present unpainted and unworn faces. This is of course an expensive measure.

### **Replacement Bricks**

Where not enough bricks are available to repair missing areas, the best technique is to try to find hidden areas in the same building as a “borrow” source. The borrowed bricks can be replaced with modern bricks. If the borrowed bricks came from inner wythes they will be “seconds”, and underbaked “salmons” must not be used as they will quickly deteriorate in the weather. However, this borrowing will usually be a better match than trying to find a new or used brick of the proper size, color and texture.

Some brick companies will custom-make bricks (at a price) to attempt to match a particular old brick. This should be investigated if the above technique is not applicable.

### **Stone**

Some sections of Alabama have little or no building stone. Other sections have various types, usually limestone or sandstone. Therefore some areas of the state have little stonework in buildings that predate the development of the railway system in the mid-19<sup>th</sup> Century. Decorative stone for steps,

trim and columns, however, was sometimes transported long distances by water. The Greek Revival limestone columns and trim for the 1836 bank building in Huntsville by the architect George Steele were shipped most of the way by water from Baltimore. Alabama and the North Tennessee Valley have abundant limestone, but in 1836 probably did not have the tools and skills to fabricate large and complex carvings such as the Ionic capitals of about 3 foot width on the building.

### **Pre-1860 Stonework**

Pre-1860 stonework was usually roughly squared with chisels, not only for neatness but to provide relatively horizontal, thin mortar beds. This would provide the greatest wall strength since the lime mortar was not strong, and would minimize the amount of mortar needed. The stone was typically laid on its “natural bed”, that is with the stratum planes horizontal, to provide the greatest strength and weather resistance. Water will enter vertical stratum planes and freeze-spall the stone. This is an important technical and historical point usually overlooked in repairing or reconstructing historic stone walls since it is easier to get a flat wall-plane by turning the stratum lines to the vertical.

In country houses it was frequent practice to build chimneys up to the “shoulders” (where the chimney necks down to a narrow flue just below the roof) in stone available on the site, and then to build the top part of the flue in brick, which was easier to haul up the greater height involved, and easier to work into the narrow flue that was usual for the top portion of the chimney. These chimneys present a strange sight at first, but they are entirely pragmatic, and should be left as constructed.

Single stones weighing 300 pounds are common. Some single foundation stones of 6 to 8 feet long weighing about 1,000 pounds have been observed in early 19<sup>th</sup> Century Alabama houses. McKee’s book “Introduction to Early American Masonry” has an excellent section on how such stones were quarried, worked and transported.

Foundation stones would be usually tooled only on the exterior side if there was no cellar. The inner surface of these walls is a random stack of stone-ends which may vary 2 or more feet in their projection into the crawl-space.

### **Latter 19<sup>th</sup> Century Stonework**

After the Civil War, buildings built completely of stone and with elaborate carved stone trim became more common. The Romantic Revival styles then prevailing encouraged this trend, and more mechanized transportation, stone-handling and carving equipment made it more economical. Rock-faced ashlar, appropriate to the Romantic Revival styles, became popular.

### **Stone Repointing & Restoration**

The techniques described above for brick masonry generally apply to stonework. It should not be sandblasted and lime mortar should be used in repointing, being careful to duplicate the original tooling, joint widths and profiles.

### **Concrete Block**

This material is older than we might think. Concrete blocks, usually in the form of imitation stone, began to be made in the United States shortly after the Civil War. The “casting machines” were simple, inexpensive cast-iron hand-operated devices. The blocks were cast one at a time by the operator in the cast-iron forms which contained a negative pattern of the stone faces. The cement was only slightly moist and was tamped tightly in the form for fidelity of pattern and so the finished damp block could be quickly removed from the collapsible form. The blocks were solid, without the hollow cells that are now normal.

By the late 19<sup>th</sup> Century, “rock face” concrete blocks were fairly common in Alabama. They were frequently used as porches of late Victorian houses. Their use on early 20<sup>th</sup> Century bungalows is common.

Therefore, before assuming that the rock-face concrete block porch on a Victorian period house a later feature, do some careful checking for evidences of earlier construction. That concrete block porch may be original and should be retained if so.

Rock-face concrete block can be distinguished from real stone by looking for “repeats” in its surface pattern. The blocks will usually be laid on different edges for pattern variation, and there may be 2 or 3 face patterns, but “repeats” will be found if the material is concrete block.

### **Rising Damp**

“Rising Damp” is the entrance of moisture from the ground up into a masonry wall by capillary action inside the masonry. If this is occurring it can sometimes be stopped or reduced by improving the surface or subsurface drainage away from the walls, or by checking the roof drainage system to make sure stopped-up gutters and downspouts are not dumping roof water down the side of the building.

If these measures do not solve the problem, consider removing a short section at a time of the wall masonry just above grade and installing a horizontal layer of a through-wall flashing material so that the ends of the sections overlap when the masonry is replaced, thus forming a continuous moisture barrier through the base of the wall. The moisture barrier must be a type which will not deteriorate and which will support the heavy weight of the masonry about without puncturing.

The yards of most old buildings have risen over the decades as much as 12 inches per century due to the natural formation of topsoil from leaves, roots, etc. or from landscaping changes, creating ponding next to the building walls. Restoring the original finish grade and drainage away from the building frequently solves “rising damp” or wet basement problems. Look first for this simple solution before considering more extreme and expensive measures.

### **Oxide Jacking**

“Oxide Jacking” is the spalling of masonry surfaces due to rust and its accompanying expansion of metal embedded in the masonry, such as ties, cramps, reinforcing, etc. Rust stains also occur in such situations. Preventing water from entering the walls is the best way to avoid or arrest this problem. Removal of the rusted metal is desirable and may be necessary. Replacement with stainless steel devices will help, although stainless steel will eventually rust. Water needs to be kept out of the walls if possible, not only to prevent oxide jacking and staining but also freeze-spalling and deterioration of the mortar and masonry due to constant wetting and drying.