An Introduction to Tabby

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Tabby is a type of concrete made of equal proportions of lime, sand, shells, and water, along with incidental quantities of ash. It is molded into various shapes, most frequently walls, and originally was covered with a layer of stucco. The most likely derivation of the word is from the Spanish *tapia*, which refers to earth compacted between boards. Tabby construction was used in the early Spanish settlements along the southeastern coast of the New World. In the early 1700s, the English began using *tabby* or *tappy*. Historical tabby construction was a southeastern U.S. phenomenon, with buildings ranging from North Carolina to Texas.

Tabby construction had several advantages over other types of building materials in the coastal regions. First, it could be made from local materials; nothing had to be imported or shipped in. [The need for the particular local materials did limit the geographical areas where tabby construction was practicable. As settlers proceeded into the interior, the shells and sand were unavailable.] A second advantage was that only unskilled laborers were needed. No craftsmen such as skilled carpenters or masons were required to manufacture the tabby or build a tabby structure. Third, it was inexpensive. The expense in tabby was the heavy labor involved in gathering the materials, mixing them, and then pouring the mixture. The availability of slave labor in the South made tabby a cost-effective building choice. Another major advantage of tabby in the moisture-laden coastal regions was that it was much more durable than wood, which deteriorated rapidly in a humid climate. If tabby is properly maintained, it can last for centuries. Tabby can also be re-used. On St. Simon's Island, GA, much of the tabby structure, Fort Frederica, was cut into blocks and carted away to be used elsewhere, particularly in the foundation of the St. Simon's lighthouse, built in 1872.

Tabby also had the advantage of versatility. The shape and size of a tabby construction were limited by the shape and size of the mold into which it was poured. Tabby bricks were sometimes made, but more often tabby structures were built by pouring the tabby mixture or slurry into a wooden mold called a cradle. The mixture was tamped to eliminate any air pockets. After one layer had hardened, the cradle was moved, and a new layer poured. The cradle mold was rectangular and bottomless, made of 2" thick boards, spaced 10"-12" apart. It was held together with round wooden pins or dowels, which left holes in the tabby. The pin holes were filled in with tabby plugs, or covered over with a coat of stucco or whitewash, which minimized the ability of moisture to seep into the tabby.

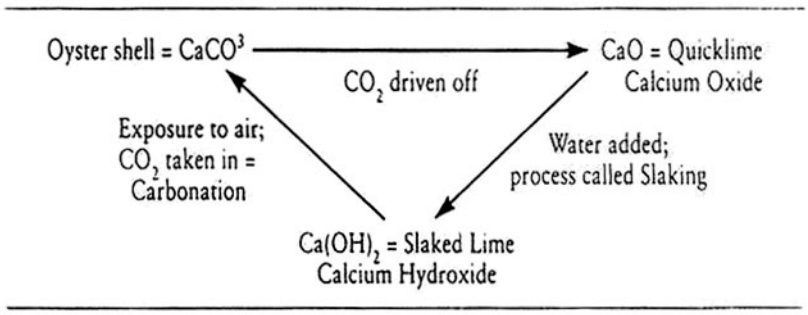
Ingredients

The primary ingredient for tabby is lime, which is the binder or glue that holds the mixture of water, sand, and shells together. Tabby lime was produced locally from oyster shells. The shells were gathered from middens, which were piles of shells that had built up over the years where the Indians dumped their "kitchen waste". Some of the middens originally were as large as several acres. The lime was made by burning the shells, most often in cedar ricks. Few permanent kilns were built for lime production. A rick consisted of layers of shells alternated with layers of wood (usually cedar), which were then set on fire. The entire structure burned for

several days, and the shells were reduced to a white powder called quicklime. The ash from the burned wood that mixed with the quicklime during the burn served as a small, but important ingredient, in the tabby mixture.

Quicklime, in most methods of construction, must be slaked for a long period of time before it can be used. Slaking is the process of adding water to the powder, which releases heat. In ancient Rome, there was a law that quicklime had to be slaked for three years before it could be used in building. However, in tabby construction, the quicklime was used immediately. When mixed with the other tabby ingredients, it turned to hydrated lime.

The chemical formula for the changes in the calcium component throughout the tabby process is seen in the chart below. The original shells are calcium carbonate, $CaCO_3$. Burning drives off carbon dioxide, CO_2, leaving calcium oxide or quicklime, CaO. When the quicklime is mixed with the water in the tabby slurry, the result is calcium hydroxide, $Ca(OH)_2$. The lime in the completed tabby structure continues to react very slowly over time with the carbon dioxide in the atmosphere, transforming back into the original substance, calcium carbonate ($CaCO_3$). This process explains the strength and endurance of tabby as a building material, as long as it is protected from excess moisture.



The calcium cycle, showing the chemical formula for converting oyster shells to lime.

Locally-produced lime was used in tabby until the early twentieth century. Hydrated lime in bags became popular around 1904, and was part of the systematic standardization of building materials in the United States that was occurring around that time. The American Society for Testing and Materials was established in 1898 to provide base codes and regulations for quality control. Standardization was to ensure uniformity as well as quality of product.

Lime cannot be used alone in cement because it will shrink and crack as it dries. The sand added to the tabby mixture prevented shrinkage and cracking, and is the second critical component of tabby. There were four types of sand available on the coastal regions of the southeastern United States: beach, dune, pit, and channel (or river) sand. Sand to be used in masonry must be free to dirt and salt, otherwise it will weaken the structure. Thus, despite the fact that they were plentiful and easy to gather, beach and dune sand were not used in tabby construction as the salt content was too high. The best sand was pit sand, but had the major disadvantages of having to first be located, then dug out. Channel or river sand was smooth, and preferred for making stucco. Even though no historic documents record the type of sand in tabby construction during

the 1700s and 1800s, analysis of a large number of samples has shown that predominantly channel sand was used.

The third major ingredient in tabby was shells. Most often these were oyster shells, but conch, tulip, clam, whelk, and bubble shells are also found. The shells supplied the source for the lime, and served as the aggregate for the tabby mixture, playing the same role in tabby as gravel does in concrete.

The fourth ingredient was fresh water. These first four ingredients were mixed in equal parts to create the tabby mixture or slurry.

The fifth ingredient, ash, was initially considered a neutral by-product, an inevitable result of the burnt fuel in the rick where the shell was burned to quicklime. However, modern analysis has determined that ash increases hydraulicity—which is the ability of a substance to harden in the presence of water. The presence of wood ash may explain how tabby has survived, especially in areas where the water table is high.

A sixth ingredient was added to tabby, beginning about 1875: Portland cement. Portland cement is an artificial cement, first developed in England by Joseph Aspdin circa 1824. It was named because of the similarity of its appearance to stone that was quarried in Portland, England. The first Portland cement was made in the United States by David Saylor in Coplay, Pennsylvania, in 1871. Portland cement is a binding agent composed of lime (60-65%), silica (20-25%), iron oxide, and alumina (5-12%). With the added strength of Portland cement, tabby buildings could be taller. The setting time was faster, and no stucco layer over the tabby was required, as Portland cement is waterproof.

History

Rammed earth construction was documented in Roman times by Pliny the Elder (67 CE), when he described earth packed between two boards to form walls. Similar types of construction have been found in various north African and Mediterranean countries. In Morocco, *tabbi* was a clayey earth mixed with lime or stone. The Portuguese built mud walls called *taipa*. In Gullah cultures in West Africa, *tabi* was a building material of cement and oyster shells.

By 1580, the Spanish were using *tapia* for their military installations, and for low-cost housing in their New World settlements. They were also using coquina for finer structures. Coquina is a natural limestone that looks like tabby, being composed of broken shell and coral cemented together. It is light-colored, soft, and porous, and is easily shaped into blocks. Its geographical distribution as a building material is more limited than that of tabby.

There is no evidence of tabby being used in Europe north of Spain, or in any of the non-American British colonies. The first British North American use of tabby occurred from 1703-1713, when a brick-faced tabby powder magazine was constructed in Charleston, South Carolina. It is speculated that the British learned how to construct tabby from the Spanish, having just sacked St. Augustine in 1702. Beaufort, SC had many homes constructed of tabby from 1710 through the 1720s. Fort Prince Frederick was constructed of tabby at Port Royal, SC, in 1732. Its surviving walls today are five feet thick and four feet high. By the late 1780s,

nearly every structure in Beaufort, SC had some tabby—either entirely tabby construction, or wood frame on a tabby foundation. Beaufort's shoreline retaining wall was built of tabby.

In 1733, General James Oglethorpe initiated tabby use in Georgia. His own one-and-a-half story house on St. Simon's Island—Orange Hall—was built of tabby. Tabby was used on St. Simon's Island, Jekyll Island, and in Brunswick. Noble Jones built his plantation, Wormsloe, of tabby.

After this early period of initial tabby construction, it began to fall into disuse. Other building materials took precedence (*e.g.*, wood, brick). It was by the efforts of one man, Thomas Spalding (1774-1851), that tabby was re-introduced and once again became a popular building material in the coastal southeastern United States.

James Spalding, Thomas' father, owned Orange Hall, the old tabby home of James Oglethorpe. Thomas was born at Orange Hall, and grew up familiar with the qualities of tabby construction. Educated as a lawyer, Thomas served in the Georgia House and Senate, and was also a representative for the state of Georgia in the U.S. House. He purchased 5000 acres on Sapelo Island in 1802, and became a scientific farmer. Eventually owning more than 350 slaves (and most of Sapelo Island), Spalding grew sea island cotton, and introduced the production of sugar to the Georgia coast. His main house on Sapelo was constructed of tabby, and took five years to build.

In 1830, he published "On the Mode of Constructing Tabby Buildings." In it, he wrote that he had seen time destroy everything except tabby walls, and strongly advocated the use of tabby for coastal structures. The first quarter of the nineteenth century was a time of peak use of this re-introduced tabby. Included among tabby structures from this time period are plantation houses, outbuildings, townhouses, slave quarters, hotels, warehouses, theatres, sugarhouses, distilleries, chapels, hospitals, burial vaults, and architectural elements such as foundations and chimneys. The area around Darien, Georgia had many tabby structures. The Tabby House on Cumberland Island was built in 1800. Two of the best surviving tabby complexes are Kingsley Plantation on Fort George Island near Jacksonville, Florida, and Chocolate on Sapelo Island, Georgia.

Kingsley Plantation was founded in 1814 by Zephaniah Kingsley. His 60 slaves grew cotton, citrus, sugar cane, and corn. The main house at Kingsley had tabby foundations. The kitchen had a tabby floor and walls. The barn was built of a combination of poured tabby and tabby brick. The slave cabins were of tabby construction, as were the posts at the plantation's main entrance.

Chocolate Plantation was established ca. 1802 by Edward Swarbreck. The two-story main house had poured tabby walls and chimneys. Some of its walls are poured tabby, while others are tabby brick. Of the outbuildings, the barn, dairy, and smokehouse were tabby construction.

With the advent of the Civil War, most building construction in the South stopped. Post-war, the loss of slave-labor was a major factor leading to the cessation of tabby construction. Other contributing factors were depletion of the oyster shell middens, and the introduction of Portland cement (by the early 1870s).

In the 1880s and 1890s, many of the very wealthy were building homes on Georgia's Golden Isles, particularly Jekyll and Cumberland. Some of these new mansions incorporated tabby, but of a different type than previous tabby. For one thing, the lime used was pre-made, bagged lime that was not of local manufacture. Another major difference was that Portland cement was

incorporated into the tabby slurry. This had the advantage of eliminating the need for a stucco coating over the tabby to preserve it from moisture. This period of Tabby Revival lasted approximately from 1875 until 1930. Henry Flagler, intent on recreating an appearance of historic St. Augustine architecture, built many tabby buildings there, including the Ponce de Leon Hotel in 1885, the Alcazan Hotel in 1889, and the Memorial Presbyterian Church in 1889. Charles Maurice built the tabby Hollybourne Cottage on Jekyll Island in 1890.

Traditional tabby construction virtually disappeared after 1930. However, an imitative tabby, called Pseudo-Tabby, is still in use today. These are usually veneer walls (not load-bearing) made of panels of Portland cement, which are anchored to the main structural framework of the building using a mesh system. Shells of any kind (most often scalloped oysters) are then embedded into the surface of the still-wet cement. This form is decorative veneer is seen today in homes, shopping malls, and even sidewalks. It is not truly tabby.

Types of Tabby

Tabby can be divided into four distinct types that were employed at different historical periods. The earliest type is called Oglethorpe tabby, and built in the nineteenth century. Oglethorpe tabby is distinguished by the pour height of the layers: usually about 22" tall. Within the 22" pour level, mold marks can be distinguished, because more than one board was used to create each side of the cradle or mold into which the tabby was poured. Oglethorpe tabby buildings were never more than two stories in height. This is probably due to the fact that the higher pour level (22") was less strong, and apt to fail structurally. Another characteristic of Oglethorpe tabby is that the pin holes in the tabby (created from the wooden pins or dowels which held the sides of the cradle together) are irregularly spaced. Oglethorpe tabby was often covered with a coat of stucco or whitewash to protect the tabby from moisture.

The second type of tabby is called Spalding tabby, and dates from the 1790s up until about 1870. Spalding tabby has a shorter pour height, ranging from 10"-12". This meant a building with Spalding tabby walls book longer to construct, but could be taller, as the walls were stronger. The set time was also shorter. Because the pour level was shorter, only one board was used in the side of the cradle, eliminating the mold marks that can sometimes be seen in Oglethorpe tabby. Spalding tabby's pin holes often lined up, though not always. Spalding tabby was sometimes covered with a coat of stucco or whitewash. The distinctions between Spalding and Oglethorpe tabbies, besides the dates, are the construction characteristics of the tabby structures. The tabby itself was identical in ingredients and methods of manufacture.

The third type of tabby is Tabby Revival, and dates from about 1875 until 1930. It is a true tabby, manufactured with the methods of the past, but with a few innovations. The lime was not locally produced quicklime, but was pre-made hydrated lime, shipped from other locations in bags. The most important distinction, however, was the addition of Portland cement to the tabby mixture. The inclusion of Portland cement made tabby walls much stronger, so these buildings could be much taller. Iron reinforcing bars (rebar) were often added to the walls to increase strength. There are no pin holes in Tabby Revival because clamps were used to hold the sides of the cradle together instead of pins. Tabby Revival virtually never has an outer coat of stucco or whitewash.

The fourth type of tabby is not really tabby. Pseudo-Tabby dates from the post-World War II era and is used in so-called tabby construction today. Pseudo-Tabby is usually a 1½"-thick cement

slab. A wood framing is covered with heavy mesh (often stapled over the wood frame). A scratch coat of cement is applied, then a final cement coat. Shells are then pressed or shot into the final coat as an appliqué. Expansion joints are included about every 400 feet. There are no pin holes in Pseudo-Tabby, nor is a stucco finish coat applied.

The following chart shows the different characteristics and dates of the various types of tabby.

Characteristic	Oglethorpe	Spalding	Tabby Revival	Pseudo-Tabby
Dates	1703 1795	1795 1875	1880 1925	1950+
Pinhole Spacing	20 22" *	10 12" *	no pinholes, 10 12" *	no pinholes
Pinholes	round; square (1)	round; square (2)	none	none
Pinhole Alignment	irregular	regular	no pinholes	no pinholes
Mold Marks	yes	no	no	no
Tabby Color	tan	tan	grey (pc)	grey
Aggregate	oystershell	oystershell, stone, other	oystershell, coquina	any broken shell: scallop, oyster
Stucco	yes	yes	no	no
Brick Size	n/a	9 x 4-1/2 x 2-1/2"	8-3/8 x 4 x 2-3/8"	n/a

Uses of Tabby

Tabby is easy to work with, once it has been mixed. Because it is poured, its shape is limited only by the shape of its mold, making columns and arches possible. A tabby column was usually made by using four wedge-shaped molds (with one curved and two straight boards), which were put together to form a circular layer. The layers were then built up into columns.

Tabby bricks were sometimes made. Their size was usually 9" x 4½" x 2½", which is slightly larger than the standard 8⅜" x 4" x 2⅜" brick of today. They were usually used to construct chimneys or foundation piers, and were rarely used to construct walls. They were cemented together with tabby mortar, which was made with very finely crushed shells.

Tabby foundations were generally 12" thick and 14" deep. They were either walls poured below ground or piers that were either poured or built of tabby bricks. Wooden foundation posts were sometimes reinforced with tabby.

Tabby walls are the most common use. They were load-bearing, typically 10"-12" thick. Fort walls were about 60" thick.

Tabby was sometimes used for floors, poured either directly on top of tamped earth or onto a layer of shell rubble. The tabby layer was usually 3"-6" deep, and was tamped down, then brushed with a coat of linseed oil. A tabby floor required three days of good weather to harden

completely. Because the tabby easily became rough and pitted, it lasted only about 10 years. A new floor would be poured on top of the old one.

Tabby was sometimes used for ceilings or roofs. Tabby was sometimes poured over boards laid over joists, and would serve as a second-floor loft floor, usually in slave cabins. Tabby roofs were usually flat, and are found only on minor structures. A sand and tar coating make them waterproof.

Tabby stucco was made by leaving out the shell aggregate. The pitted surface of a tabby wall made an excellent surface for bonding with stucco. A single coat, ⅛" to ¼" thick, served as the traditional scratch, brown, and finish coats, all in one. The stucco made the tabby surface impenetrable, and covered up the pin holes.

Tabby plugs have been found, especially in slave cabins, which often were not stuccoed or whitewashed. A small amount of tabby was used to plug up the pin holes—keeping the weather and the wildlife out of the house.

Because of the versatility of the material, tabby houses were built in many different architectural styles, including Federal, Greek Revival, Queen Anne, Italian Renaissance Revival, and Mission.