

Lakeport Plantation Restoration

Technical Report No. 2

Chimneys



Lakeport Plantation house has five large chimneys, each serving two or more of the thirteen fireplaces found throughout the house. Each chimney rests on a large footer that corbels outward eleven courses, providing a solid foundation for each chimney. The chimneys are built with the same handmade bricks as were used to build the foundation walls, dairy and original smokehouse. A lime parge coating, applied when the chimneys were built, lines the interior of the chimney flues. Near the top of each chimney, two rows of bricks have been offset to create a decorative band around each chimney.

At the time that restoration began, the northwest chimney of the house stopped just below the roof and was not visible. Evidence shows that this chimney may have partially collapsed before being taken down to below the roof line. The chimney at the back, or west wing, of the house was noticeably shorter than the other chimneys. When compared with historic photos of the house, it was determined that this chimney had been shortened in years past. The three remaining chimneys all showed evidence of mortar repair, believed to have been made during the 1980's.

Plans are to use the chimneys to conceal the climate control/HVAC system designed for Lakeport Plantation house. The chimney flues will be restored to accommodate the duct liners for the system.



This photo of Lakeport Plantation house shows the four chimneys that were visible at the time restoration began. The fifth chimney had been taken down to below the roof line.

The photo at right shows the corbelled brick foundation that supports one of the chimneys of Lakeport Plantation house. This method of brick laying was also used to build the footers for the house.



Before work began, the flues were examined with a fiberscope, a long fiber-optic cable with a small video camera at the end, to determine the condition inside of each flue. Results showed missing mortar and parge coating in several areas, but the chimneys appeared to be in good condition overall. A report of this procedure, prepared by project architects, WER Architects/Planners, of Little Rock, Arkansas, and a videotape entitled "Lakeport Chimney Flues" are available in the resource room of the Lakeport Plantation Education Center.

The northwest chimney, having already been disassembled to below the roof line before restoration began, was rebuilt to match the existing chimneys. The west wing chimney, shorter than the other chimneys, was disassembled to the roof line and rebuilt, also to match the other chimneys. Both chimneys were rebuilt using original handmade bricks salvaged from the foundation walls when they were rebuilt. Although most of the bricks from the foundation walls were damaged, enough were salvaged to rebuild the two chimneys of Lakeport Plantation house.

When the three remaining chimneys were repointed in the 1980's, a modern portland cement was used for the mortar. Portland cement is much harder than the soft, historic bricks and can cause serious damage to the bricks. Because the portland cement applied in the 1980's had not been applied correctly,



it had not caused damage to the historic bricks, but was cracking and in poor condition. The portland cement was removed and a lime mortar that was compatible with the historic bricks was used to repoint the chimneys.

Portland cement was developed in England in 1824 and was named for its

This photo shows the fiberscope and equipment that was used to examine the inside of the chimneys. The results was viewed on the small television screen as the video camera was lowered down the throat of each flue.



The photo at left shows a comparison of the southwest chimney on the right and the northwest chimney rebuild on the left. The northwest chimney had been taken down to below the roof line before restoration began. The photo below shows a closer view of the northwest chimney after being rebuilt.



The photo above shows the west wing chimney being disassembled by a restoration crew member. Historic photos showed that the chimney had been shortened in previous years. Restoration plans were to disassemble the chimney and rebuild it to match the existing chimneys. The photo at right shows the chimney after being rebuilt.



This photo of an 1850's structure shows the damage caused by a hard portland cement that was used to repoint the soft historic brick. The portland cement mortar was too hard for the soft brick, causing the brick to deteriorate rather than the mortar. This is a good example of why the mortar should be softer than the brick.



resemblance to the limestone found on the Isle of Portland, located in southern England. It was brought to the United States in the latter 1800's but was not widely used here until the early 1900's. Portland cement is made by heating a limestone and clay mixture and then grinding it to a fine powder. When mixed with water, portland cement becomes hard very quickly. Portland cement is widely used today and works well with modern bricks, but is too hard for the historic soft bricks found in older buildings.

Lime mortar was used for many hundreds of years prior to the development of portland cement and is still used today, especially for historic restoration. Lime mortar is softer and more porous than portland cement. Its soft nature allows stresses caused by expansion and contraction or settlement to be relieved through the mortar rather than the bricks. It also protects the bricks from moisture damage by absorbing and releasing moisture through the mortar joints.

Lime mortar is a mixture of lime, sand and water. Historically, lime mortar might also have contained other ingredients such as animal hair, clay or crushed shells. Colored pigments or dyes were sometimes added to give the mortar color. Lime, the primary ingredient of lime mortar, is made from burnt limestone. After the lime is burnt, it is called quicklime. Quicklime is then mixed with water to form lime putty. This process is called slaking the lime. Slaking the lime causes a chemical reaction that results in the mixture reaching very high temperature where it will begin to boil. This can be very dangerous and extreme care should be taken. Historically, this process would have been done on site, but today quicklime is machine slaked and brought on site, ready to be used. This type of lime, called hydrated lime, is what was used to mix the mortar for repointing the chimneys of Lakeport Plantation house.

When repointing historic bricks structures, it is important that new mortar match the



This photo shows a close-up of one of the chimneys that had been repointed with a portland cement mortar that was too hard for the soft historic bricks. Because it had not been applied correctly, it had not caused damage to the bricks. Instead, the mortar was cracking and pulling away from the brick.



This photo shows the northeast chimney of Lakeport Plantation house after the mortar had been removed to prepare the chimney for repointing.

original mortar as closely as possible. This may require having the original mortar analyzed by an expert. Mortar analysis will tell the ingredients of the original mortar and how much was used of each ingredient, how much lime to sand, for example. It will also tell the characteristics of the sand, which is very important. Larger grains of sand will produce a courser mortar while finer grains of sand will produce a finer mortar. The color of the sand will also help to determine the color of the mortar and is important in color matching the mortar. Mortar analysis will also tell the hardness of the mortar. The new mortar should be as soft or softer than the original mortar. Samples of the original mortar used on the brickwork of Lakeport Plantation house were sent to Wollenberg Building Conservation, LLC, in St. Louis, Missouri, for analysis. Results of the analysis can be found in the Historic Structures Report for Lakeport Plantation. While it may not be possible to reproduce the original material exactly, mortar analysis can help to determine an appropriate mixture for the replacement mortar.

Removal of historic lime mortar should be done by hand, with a chisel, being careful not to damage the edges of the brick. Power tools should not be used as they can cause serious damage to the soft bricks. The old mortar should be removed to about two to two and one-half times the width of the joint and deeper if necessary. Joints should be cleaned by rinsing with water to remove any loose mortar. Dampening the bricks prior to repointing will prevent the bricks from pulling the moisture from the mortar, allowing the mortar to cure properly. It is best to fill the mortar joints a layer at a time allowing each layer to harden before applying the next layer. Allow the final layer to dry to thumbprint hardness before cutting the joint profile. Due to mortar deterioration and repair, it was difficult to determine the existing joint profile for the brickwork on Lakeport Plantation house.



This photo shows the mortar being removed with a hand chisel. Power tools can damage historic brick and should not be used to remove mortar on historic masonry.

Plans were to match the existing joint profiles as closely as possible.

The chimneys should be examined regularly as a maintenance procedure. While joints should last for many years, they should not be seen as permanent. Cracked or deteriorating mortar should be repaired immediately to prevent moisture from penetrating the bricks and causing damage. It is much easier to repair mortar joints than to repair or replace historic brick.

When working with historic brick masonry, it is important to use experienced craftsmen who have the knowledge and skills necessary for the special requirements of historic brick. Applying modern principles to historic brick can often cause further damage rather than the intended purpose of preserving a historic building. Historic bricks were damaged when removing mortar from the chimneys on Lakeport Plantation house. The mortar was removed with power tools rather than hand tools. Although removing mortar with hand tools can be a very slow process, it will protect the historic bricks. Power tools should only be used on extremely rare occasion and by experienced craftsmen with exceptional skill. Damaged bricks had to be removed and replaced, resulting in loss of more historic brick.



The above photo shows the southwest chimney after being repointed. A lime mortar compatible with the soft historic bricks was used to repoint the chimneys.

Inexperience and lack of knowledge can also cause a loss of valuable time and money. When the northwest chimney was rebuilt, several problems made it necessary for the chimney to be torn down and rebuilt a second time. The mortar joints of the new chimney were wider and did not match the other chimneys. Nor were they prepared well, having either too much mortar in the joints with excess mortar dropping down into the flues or not having enough mortar in the joints. Finally, some of the salvaged bricks used to rebuild the chimney had the portland cement parge coating on them. These bricks,



This photo shows the damage that was done to the historic bricks when the mortar was removed with power tools rather than hand tools. Damaged bricks had to be removed and replaced.

salvaged from the foundation wall rebuild, were not considered salvageable and should not have been used.

There has been an increasing number of restoration projects in recent years as people have become aware of historic structures and their importance. The shortage of skilled craftsmen with the knowledge of how to work on historic buildings, using traditional materials and techniques, is one of the biggest problems facing restoration projects today. The schools that offer education and training in historic preservation and restoration are few and far between.

Belmont Technical College in St. Clairesville, Ohio, has one of the most recognized historic preservation programs in the United States. Not only do they offer an academic curriculum on preservation technology and theory but also the hands on experience that is so important to any restoration project. Other prominent schools that offer similar programs are American College of the Building Arts in Charleston, South Carolina, and North Bennet Street School in Boston, Massachusetts.

Historic preservation workshops are also offered by various companies that specialize in historic restoration and preservation. Abstract Masonry Restoration, which specializes in restoring historic masonry, offers such classes as cleaning and repointing historic masonry, mortar analysis as well as others. Their offices are located in Salt Lake City, Utah and Boston, Massachusetts. Virginia Lime Works, makers of traditional lime mortar, offers workshops on working with lime and lime products such as mortars, plasters and paints. These workshops provide hands on training as well as education and stress the importance of using the right techniques and materials for restoring historic structures.

These educational opportunities, while good for the areas in which they are located, are not as beneficial to the state of Arkansas. Until we are able to promote the need for skilled craftsmen and provide the education and training necessary, the shortage of skilled craftsmen will continue to be a problem for historic restoration projects in the future.

Resources:

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Historic Preservation Websites:

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Lakeport Plantation is an Arkansas State University Heritage Site located in Chicot County, Arkansas. The *Lakeport Plantation Restoration Technical Reports* were compiled by Ronnie and Sonya Walker to document the restoration of Lakeport Plantation.