



LIME KILN CHRONICLES

Newsletter of the Friends of the Cowell Lime Works Historic District
University of California, Santa Cruz

Kiln Bricks: A Closer Look

By Frank Perry

Over the years I have had the opportunity on several occasions to walk inside the Historic District's three large "pot kilns," once used to make lime. I say "walk," but the arched doorways are not very tall, so it is almost a crawl to get in. Once inside, it is fascinating to see how the kilns were constructed. The interior of each kiln is approximately 30 feet long, 11 feet wide, and 15 feet deep. I estimate that each is lined with approximately 14,000 bricks. Amazingly, there is no mortar between the bricks.

It is especially fun to feel where the bricks were partly melted by the great heat, leaving behind a glassy, irregular surface. Heat converts limerock to lime at around 1,700 degrees Fahrenheit. So the temperature inside the kilns was probably at around 1,700 to 2,000 degrees for most of the five-day burn.

The doorways—where the fuel was added and the finished lime withdrawn—are also lined with firebricks. Each kiln has four doorways, and some of the doorway bricks are trapezoid-shaped to accommodate the curve at the top of the doorway. While the bricks are plainly visible today, originally they would have been hidden behind steel frames that supported heavy steel doors. Each door had upper and lower parts, which could be opened and closed independently to control draft.

If you had asked me about firebricks twenty years ago, I would have had little to say. Most of what I subsequently learned about this fascinating topic has come from my friend Robert W. Piwarzyk (aka "Brickbat Bob"), one of the authors of the book *Lime Kiln Legacies: The History of the Lime Industry in Santa Cruz County* and a local authority on brick history.

Firebricks (also called refractory bricks) are bricks which can withstand much higher temperatures than the common (red) bricks used to build houses, walls, and chimneys. Firebricks are typically used in kilns, fireplaces,

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Cooperage

Breaking News: Cooperage to Be Rehabilitated!

The historic Cooperage building beside Coolidge Drive near the main entrance to the UCSC campus will be rehabilitated. The design phase is expected to begin soon. Located adjacent to the old lime kilns, the Cooperage was built in 1869 and is where barrels were assembled for shipping the lime. It is one of the key buildings in the Cowell Lime Works Historic District. Millions of campus visitors have passed by this campus icon since UCSC opened in 1965.

Although the campus made minor repairs over the years, lack of funding resulted in the building's slow deterioration. One of the early projects of The Friends was to provide funding for documentation of the building and installing supports to prevent collapse. The latter was done with a grant from the S.H. Cowell Foundation.

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In the Newspapers, 100 Years Ago . . .

July 5, 1923. Fourth of July celebration is featured by splendid parade. . . . A special mention could be given to every decorated auto or float in the parade and among these were . . . Cowell Lime and Cement company.

August 10, 1923. S. H. Cowell is down from San Francisco and is at the Cowell Ranch.

August 14, 1923. At the coming state fair to be held at Sacramento, S. H. Cowell of this city will enter several horses in the different trotting events. The Cowell string of horses have figured in fair racing events for years past and invariably have carried off prize honors in the different classic events.

August 18, 1923. Mr. [A.S.T.] Johnson, in his talk to the members [of the Rotary Club], devoted himself to a discussion of the manufacture of lime, with which he is very familiar as local manager for the Henry Cowell Lime and Cement Company.

September 15, 1923. The stretch of beach lying between the Cowell Point and the approach to the wharf is becoming a popular place for picnic parties. Most of the latter are made up of visitors who come over the highway by auto to spend the day.

November 1, 1923. [The company of Steen and Ley has purchased] more than 1,200 acres of fine standing redwood from the Henry Cowell Lime & Cement company. . . . The new company will soon start operations on the 1,300-acre tract and will mill the lumber on the ground and ship it out through Boulder Creek.

December 18, 1923. One of the American Legion members, who is chairman of the decorating committee for the dance at the Casino next Saturday night, called up Mr. Cowell and asked permission to get a tree from his property. Mr. Cowell was very glad to be able to accommodate the Legion. . . .

New and Renewing Members *Thank you!*

John and Bridget Barnes	Aims McGuinness &
William & Linda Dawson	Jasmine Alinder
Lee & Emily Duffus	Glenn Oppenheim
Mary Gerbic	Joan Parsons
Anne Hayes &	Redtree Partners LP
Daniel Mountjoy	Tom Schreiner &
Rainbow Mitchell-Fox	Jeannette Echenique
Emily Mitchell-Lynn	Helen & Will Webster Foundation

Gerald E. Weber *(1940-2023)*

Geologist Jerry Weber taught field geology at UCSC for many years and ran a local consulting business. He had a deep knowledge of Santa Cruz area geology and enjoyed sharing his love of the subject with students and the public. He co-authored with Richard G. Stanley the geology chapter for *The Natural History of the UC Santa Cruz Campus*, 2nd edition. It includes explanations of the origin and distribution of campus marble and its associated features such as caves and sinkholes. He also wrote the geology chapter for *The Natural History of Año Nuevo* book. We extend our condolences to his family.



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Friends of the Cowell Lime Works Historic District



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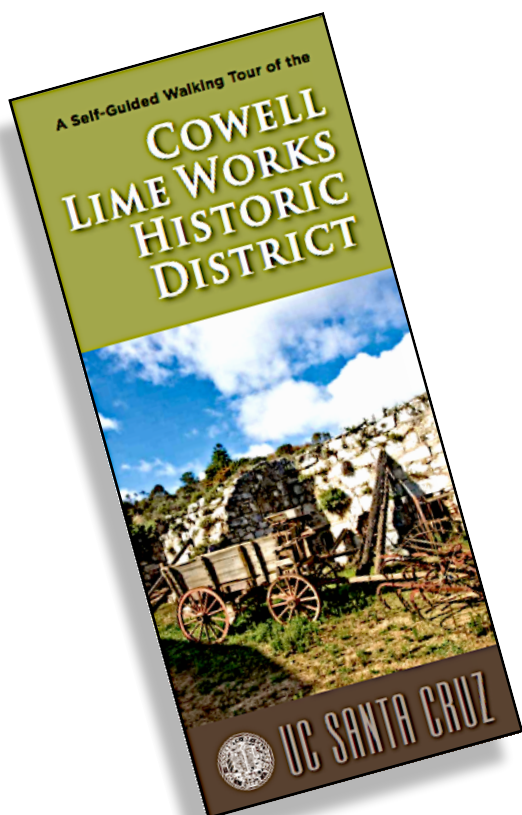
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UCSC archaeology students work on an excavation between the Cooperage and the kilns.

The University anticipates selecting a firm for design services for the Cooperage this Fall. We are thrilled to report this exciting news and look forward to keeping our members informed in upcoming newsletters as the project unfolds.



Historic District and Campus Gateway Visioning Study

This study will be publicly available later this year or in early 2024. Campus faculty, staff, students, alumni, volunteers (including The Friends), and members of the public helped with this study.

It provides a long-term vision of how the Historic District and campus gateway can be improved, and addresses such things as preservation and interpretation of historic structures; pedestrian, bicycle, and motor vehicle flow; landscaping; use of existing buildings; etc.

Membership Renewal

Last year nearly everyone who renewed their membership did so via our website: limeworks.ucsc.edu. Consequently, we have decided not to include membership renewal envelopes with the *Lime Kiln Chronicles*. This saves us considerable time and expense. If however, you would like to renew by sending a check, you can still do so by sending it to:

Friends of the Cowell Lime Works Historic District
Mail Stop PPDO
University of California
1156 High Street
Santa Cruz, CA 95064

Make the check to the UCSC Foundation and put Friends Cowell Lime Works on the memo line.

Membership renewal is once a year, either in the Spring or Fall depending on when you joined. If your address label says F23 (Fall 2023) or older, then please renew. If your address label says S24, then you don't need to renew until then. Of course, additional donations are welcome at any time.

We Need Your Help!

Our popular walking tour brochure, published a dozen years ago, is out of date. Since first printed, the Hay Barn has been restored, the Cardiff Shed rebuilt, and we've learned many new things about the district's history. We give these brochures to prospective students touring the campus and to the public at events such as the History Fair. It is also available online. Alas, the printed copies are all gone. **Will you please help us update and reprint it?** Please send us your donation on Giving Day, November 8th. You can make your donation at limeworks.ucsc.edu. We hope to raise \$1,000.

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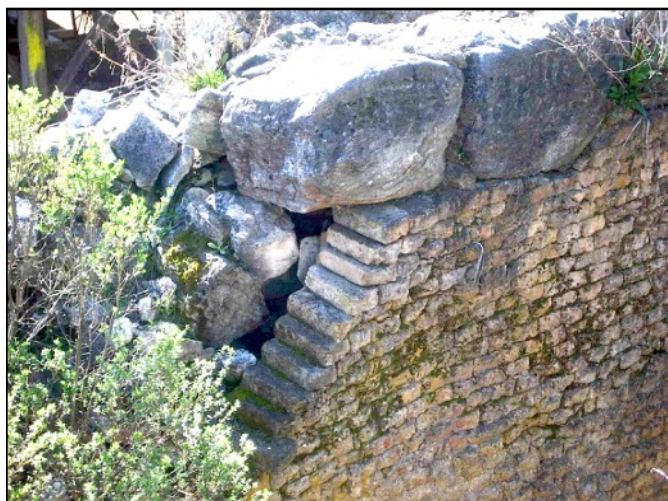
ovens, industrial furnaces, and other places where the brick must withstand high temperatures. Firebricks are usually yellowish or buff in color (instead of red) and are made from a different kind of clay than that used for common brick.

Firebricks are also larger than common bricks. Ones I have measured are about $9 \times 4\frac{1}{2} \times 2\frac{1}{2}$ inches. By contrast, a common brick I examined from an 1860s Santa Cruz building is about $8 \times 4 \times 2$ inches. This is similar to the size of present-day common bricks which are $8 \times 3\frac{3}{4} \times 2\frac{1}{4}$. Brick sizes can vary by time period, use, and country of manufacture.

Fortunately for historians who study old industrial sites, firebricks (unlike common bricks) are usually stamped with the name of the manufacturer. This can reveal old trade routes and can help date a site, since each manufacturer was only in business for a certain period of time.

The name on the bricks lining our lime kilns show they were manufactured by companies along the River Tyne in northern England. They had to be brought around Cape Horn by ship. Shipping this way was cheap because the bricks could serve as ballast. Of course, they were also cargo. Bob Piwarzyk likes to refer to them as ballast-cargo.

For the *Lime Kiln Legacies* book, Bob compiled a table of names he discovered over the years at various lime kiln localities in Santa Cruz County. Ones he recorded in the historic district include COWEN, T. CARR, and SNOWBALL. COWEN bricks were made by Joseph Cowen & Company, Blaydon-on-Tyne, between 1823 and 1904. They have been found at old industrial sites throughout the western United States. The T. CARR bricks



Damaged inner wall of the middle kiln showing orientation of its firebricks with limerock capstones above.

were made by the firm of Thomas Carr & Son, Newcastle-upon-Tyne, between 1827 and 1918. These have also been found at lime kiln sites in Washington state. The SNOWBALL bricks were made by the firm of James and George H. Snowball, Stalwell, County Durham, between about 1854 and 1935. The firebricks made by these companies in the 1800s and early 1900s were among the finest in the world, which is why they were exported to many different countries.

The special clay used to make the firebricks occurred underground between coal measures. This was most fortuitous. The clay needed to make bricks for the furnaces of the Industrial Revolution occurred with the coal needed to fuel the very same furnaces. Because the clay was mined underground, it was more expensive to obtain than clay from open pits, however, so this added to the cost of the bricks.

Once removed from the ground, the clay was processed to make sure it had an even texture. Sometimes ingredients were added to make the clay easier to mold or to reduce shrinkage when it dried. After the bricks were molded, they were left to dry and harden. They were then fired in a kiln to further harden them.

According to brick historian (and former Santa Cruz resident) Karl Gurcke, in his book *Bricks and Brickmaking*, firebricks were first manufactured along the River Tyne in 1764. He says that by 1863, 80 million firebricks were produced there annually—all handmade. Of these, $9\frac{1}{2}$ million were exported. By 1910 bricks from this region were being sent to most of the industrialized nations of Europe as well as to Canada, the United States, Mexico, China, and Japan.



These loose firebricks photographed near the kilns in 2006 show all three brands: two SNOWBALL bricks (upper right), one COWEN (lower right), and two T. CARR (left, one incomplete). The bricks are about 9 inches long.



Each pot kiln has four doorways for inserting the wood fuel and for removing ashes and the finished chunks of lime. This one contains a mixture of COWEN and SNOWBALL bricks.

Henry Cowell, besides manufacturing lime, sold firebricks and a wide assortment of masonry supplies. So, presumably he acquired the bricks for his kilns at the wholesale price. They were not very expensive by today's standards—retailing for about 10¢ each. Cowell company ledgers (preserved at the UCSC library) mention COWEN, T. CARR, and SNOWBALL bricks.

The bricks used in the lime kilns should have been able to withstand the high temperatures without melting. Modern firebricks typically withstand temperatures up to around 2,500 degrees F, and some kinds can withstand even higher temperatures. But the lime workers had no way to precisely measure temperature, so had to go by experience and guesswork. It is possible that sometimes the kilns got too hot. Also, the lime is said to have lowered the melting point of the bricks.

Occasionally, a kiln had to be re-bricked. Examination of the kiln interiors suggests that this was not necessarily done all at once. Some parts of the kilns have fresher bricks that show little in the way of damage. Other parts have bricks that have partly melted and are in poor condition.

Interestingly, the 1870 census lists the occupation for one of the lime workers as “brick mason.” It is not known if this was a permanent or temporary job.

The oldest lime kilns in the Santa Cruz area that contain firebricks date from the 1860s and 1870s. There is a record of COWEN firebricks being imported to San Francisco as early as 1860. The Historic District's continuous kiln dates from 1861, so it probably always had firebricks in it. The oldest kilns on the UCSC campus (located on the upper campus) are lined with schist instead. This is a local metamorphic rock common in the

area. A kiln near Felton appears to have never used any kind of lining and worked just fine.

So why line the kilns with firebricks? It turns out that the main reason was energy conservation. One of the major expenses in producing lime was the wood for fuel. So, lime-makers were always looking for ways to save on fuel costs. Firebricks are good insulators and reduce heat loss into the walls of the kiln.

The three pot kilns of the Historic District were remodeled or rebuilt in the 1890s. In 1908 Cowell built new kilns beside the railroad tracks at Rincon (next to Highway 9 at the south edge of what is now Henry Cowell Redwoods State Park). Lime-making operations were soon concentrated there. According to at least one account, however, the kilns of the Historic District were still in use as late as about 1920.

Today, the kilns are behind fences and not accessible to the public. Yet, they remain important reminders of what was once a major local industry. Santa Cruz lime was shipped up and down the West Coast and even as far away as Hawaii. I hope that someday a tour program can be established so that others can see the kilns up close while learning about the history of the site. Were it not for the lime industry, UCSC would not exist.

A useful resource for anyone wanting to know more about firebrick history is the book *Bricks and Brickmaking: A Handbook for Industrial Archaeology* by Karl Gurcke. The information on the three British brickmakers is from that source. There is also a website called *California Bricks* by geologist and historian Dan Mosier (californiabricks.com), which focuses on bricks manufactured in California.



Portion of an interior kiln wall showing bricks badly damaged by the heat of the fires. Some bricks have been dislodged, and others have shifted position, giving a rather jumbled appearance.



Interior of the Cooperage in 2006 showing some of the old lime barrels. Staff, students, and volunteers relocated the artifacts after this picture was taken so that the interior framing could be documented and bracing installed.

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