HURSTVILLE LIME KILN STRUCTURAL IMPROVEMENTS

Carson Schuler, Samantha Olson, and Caden Fedeler

Department of Civil and Environmental Engineering

The University of Iowa

Project Location and Background

The Hurstville Lime Kilns are located approximately 2 miles north of Maquoketa, IA, in the Hurstville Historic District and the site is listed on the National Register of Historic Place. Alfred Hurst constructed the first kiln in 1871 for the purpose of breaking limestone down into quicklime, which was a main component of mortar. A company town grew from the success of the lime kilns. The kilns were last fired in 1930 and the company went out of business due to the invention of Portland cement. The kilns were donated to the Jackson County Historical society in 1979 and underwent restorative work in the years of 1981 to 1985.

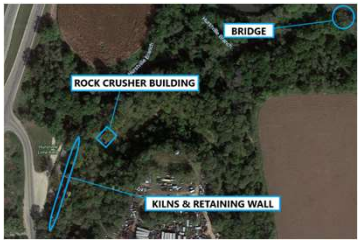

Figure 1 (left) – Original Lime Kilns in Operation
Figure 2 (right) – Location of Design Components

Kiln Viewing Platforms

Kiln platform:
The overhead viewing platform will be placed over Kiln 3. The platform is designed so that visitors can view the inside of the kilns through the glass section of the floor without having access to the inside of the kilns.

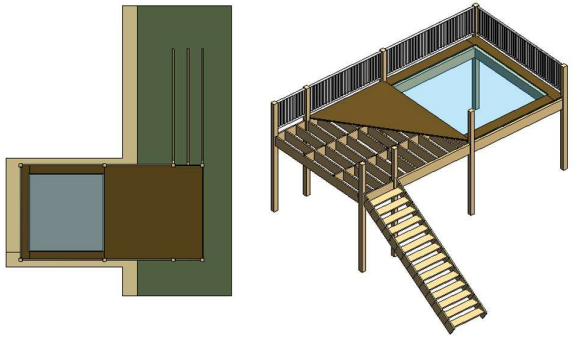

Figure 3 – Renderings of Kiln Platforms

Glass etching platforms:
Installation of viewing platforms along the trail route will provide a walking history for patrons of the site with etched glass showing how the site looked when active. The drawings are taken from historic photos of the site. The base of the platform will be constructed from limestone in the area and convey a "stand where they used to stand" idea.

Figure 4 – Viewing Platform

Retaining Wall and Soil Nailing Plan

To counteract the stresses in the soil that the new trail will impose, soil nails are to be inserted into the soil behind each retaining wall. The holes that are drilled out in the wall will be covered with decorative star cap anchors, as seen on historic brick buildings.

Figure 5 – Soil Nailing Layout

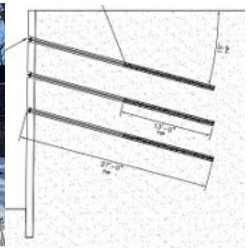

Figure 6 – Soil Nail Cross Section

Rock Crusher and Bridge Stabilization

Rock Crusher Building Stabilization: The old building that once held the rock crusher is in poor condition. In an effort to keep the building standing, both temporary and permanent supports will be installed. These supports will help reinforce and repair the most critical members of the structure.

Bridge Stabilization: The lateral bracing in the bridge is damaged and needs to be replaced. While replacing it, temporary lumber cross bracing can be placed throughout the span.

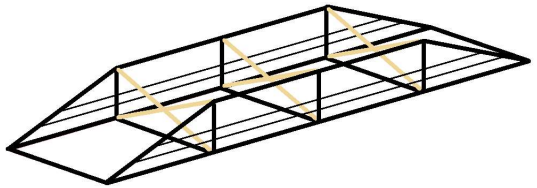

Figure 7 – Temporary Cross Bracing of Bridge

Figure 8 – Temporary Lumber Supports for Rock Crusher Columns

Recommendations and Construction Cost Estimate

We believe that these additions will improve the safety and accessibility of the site while maintaining the historic authenticity. The platforms will help tell the story of the kilns while the supports will ensure that structures stay standing for years to come.

Total Project Cost

Component	Construcion Subtotal	Contingencies	Administration	TOTAL COST
Rock Crusher and Bridge Stabilization	$ 15,500.00	$ 1,600.00	$ 3,100.00	$ 20,200.00
Grates / Side Openings	$ 1,400.00	$ 200.00	$ 300.00	$ 1,900.00
Kiln Platforms	$ 48,900.00	$ 4,900.00	$ 9,800.00	$ 63,600.00
Soil Nailing	$ 23,300.00	$ 2,400.00	$ 4,700.00	$ 30,400.00
Glass Etching Platforms	$ 2,900.00	$ 300.00	$ 600.00	$ 3,800.00

Figure 9 – Estimated Cost of Materials and Labor

References

ASCE/SEI 7-16 Design Loading Criteria, International Building Code 2015 (IBC), Iowa Statewide Urban Design and Specifications (SUDAS), Iowa DOT's Bridge Design Manual, National Design Specification for Wood Construction (NDS)