

Archival Resources on the Web

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Great Lakes Engineering Ingenuity Found in Glass-Plate Photographs

By Bryan Whitlege, Central Michigan University

Seven years ago, in 2012, the United States Army Corps of Engineers (USACE) reached out to staff at the Clarke Historical Library at Central Michigan University in Mt. Pleasant for help with a historic undertaking. The USACE kept nearly 1,700 glass-plate negatives documenting the construction of one of the most important engineering works in North America. It wanted digital copies of the images and to rehouse the originals and send them to the National Archives and Records Administration. The Clarke was in an excellent position to make all of this happen for the corps. And from that point, a relationship was formed that continues to this day.

History of the Soo Locks and the Photographs that Document Their Construction

Separating the abundance of iron and other minerals of the Lake Superior region from the refineries, forges, mills, and factories found along the lower Great Lakes is a stretch of the St. Marys River at Sault Ste. Marie where the river drops 21 feet in less than a mile. Before engineering projects allowed ships to bypass the Soo Rapids, large-scale shipping between Lake Superior and Lake Huron was impossible; goods could be portaged to bypass the rapids, but portaging is not efficient for multiple tons of goods, let alone single freighters carrying 70,000 tons of cargo as they do on the Great Lakes today. In 1855, engineers opened the first modern lock allowing ships to bypass the Soo Rapids. In 1881, the United States Army Corps of Engineers took over operations and maintenance of the Locks from the State of Michigan. Since that time, six different locks have been constructed, enabling larger and larger ships to transport cargo into and out of Lake Superior.

This impressive engineering feat has a major impact on the US economy. More than 70 million tons of freight (mostly iron down from the iron ranges of Minnesota to Great Lakes ports and coal up to the northern Great Lakes and Canada) pass through the Locks each year. A report from the United States Department of Homeland Security in 2016 noted that 11 million jobs and over \$1 trillion would be lost from the US economy if there were a six-month interruption in the operations of the Locks.¹ Because of the Locks' importance, the US Congress has authorized, though not yet appropriated, funds to construct a new lock capable of handling the largest ships on the Great Lakes.

Engineers at the Soo have been steadfast in documenting any and every event that has occurred at the Locks. From the 1880s to 1941, that documentation included 1,700 glass-plate negatives. Engineers during that time photographed everything the USACE did to ensure safe navigation of the St. Marys River—from ice surveys and cutting through rock to locking ships through the canal and responding to accidents.

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70		71	
Number	Date	Number	Date
964	April 18, 1914	978	Oct 15, 1914
965	May 18, 1914	979	" 17 "
966	" " "	980	" 18 "
967	June 1, 1914	981	" " "
968	" 22 "	982	" 21 "
969	July 18, 1914	983	" 21 "
970	" 26 "	984	" 21 "
971	Sept 7, 1914	985	" 21 "
972	Oct 2, 1914	986	" 21 "
973	" " "	987	" 21 "
974	" " "	988	" 21 "
975	" 3 "	989	" 21 "
976	" 15 "	990	" 21 "
977	" 15 "	991	" 21 "

The handwritten log kept by engineers at the Locks details the date and description of each glass-plate negative.

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The Photographic Record at the Soo Locks

For decades, glass and nitrate photographic negatives were stored in a filing cabinet in the administrative building at the Soo Locks complex. Each negative was stored in an envelope with its unique image ID written on the exterior. Descriptive control was in the form of a handwritten log documenting each photograph with its ID number, the date the photograph was shot, and a brief description. Engineers produced a typed copy of this log in subsequent years.

As one might expect with a large set of decades-old glass-plate negatives, especially those that were not stored under ideal conditions, some negatives were lost (49, or 2.75%). Another 40, or 2.25%, sustained some sort of substantial damage (i.e., greater than a chipped corner). Fortunately, 95% of the images remained in good condition.

How a Regional State University Special Collections Library Got Involved

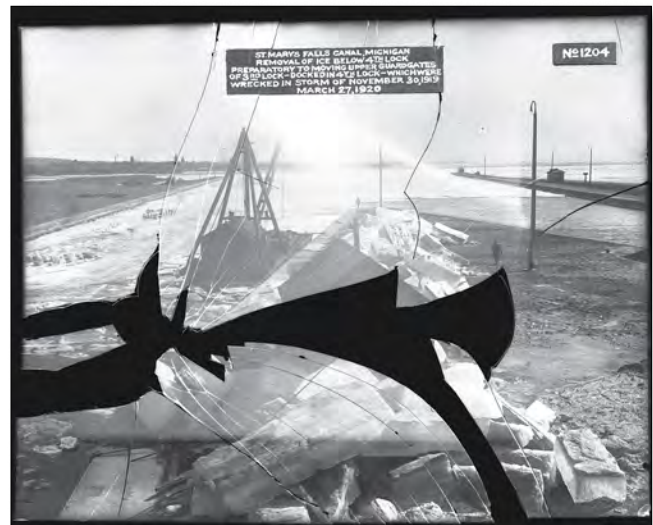
Beginning in 2012, staff at the Clarke Historical Library at Central Michigan University were in contact with staff at the Soo Locks about the organization and preservation of their historical documents. As part of their consultation, the Clarke suggested that the 1,700+ glass-plate negatives were in dire need of attention, including reformatting and preservation. In the fall of 2015, the USACE contracted the Clarke to digitize the negatives, rehouse them in archival storage, and digitally preserve the resulting scans.

Scanning 1,731 Glass Plates

The USACE contract stipulated that the negatives could not leave the Soo Locks administration building. This meant all scanning operations would have to take place at the Soo, and the Clarke staff would have to bring all necessary equipment to the Locks. The contract also called for the negatives to be scanned as 1,200 dpi gray-scale TIFFs.

In scanner tests, staff found that it took about four to five minutes to scan each 8"-x-10" negative at 1,200 dpi. With the time needed for additional tasks such as inventorying the scans, rehousing the negatives, and adjusting the image output levels for each negative, the Clarke estimated that staff could scan eight to nine images per hour—or about 200 scanner hours for the whole project.

To be as efficient as possible and complete all of the scanning work in one extended visit, Clarke staff took three computers and scanners to the Locks. One staff member stayed in Sault Ste. Marie for 11 days in January 2016. All three scanners were put to use, and each scanner setup was assigned a letter (A, B, C), with each scan produced then carrying the prefix and arbitrary sequential number. While the process ran smoothly for the most part, the occasional shattered negative required jigsaw puzzle skills to piece the fragments of glass together on the scanner bed.



A small number of negatives were significantly damaged and required reconstruction prior to digitization.

After returning to the Clarke, the images were processed to their final specifications—rotating images and flipping them from their reversed orientation as well as assigning the correct USACE identifier to each image and creating a robust inventory of physical and digital metadata about each file. The result was 191 GB of images—1,731 preservation copies (1,200 dpi TIFFs) and 3,462 access copies (300 dpi JPEGs)—one batch of toned images and one batch with their original exposure. These digital files were delivered to the Corps of Engineers, who then shipped the rehoused glass plates to the Still Picture unit of the National Archives and Records Administration in College Park, Maryland.

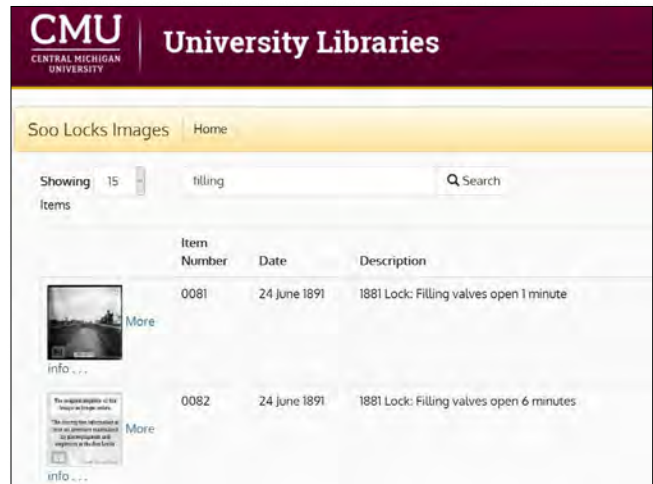


The images in the collection capture the engineering, economic, and cultural history of the Locks and the Great Lakes.

Making the Images Publicly Available

Due to security concerns, the USACE was not in a position to host these historic images online. The Clarke expressed an interest in doing so and negotiated an agreement to host the images as a contracted partner. Clarke staff produced watermarked, low-resolution copies of the images and then uploaded each image and its descriptive metadata into a searchable database interface—essentially a custom-built table on the Clarke’s web server with hyperlinked images and text.

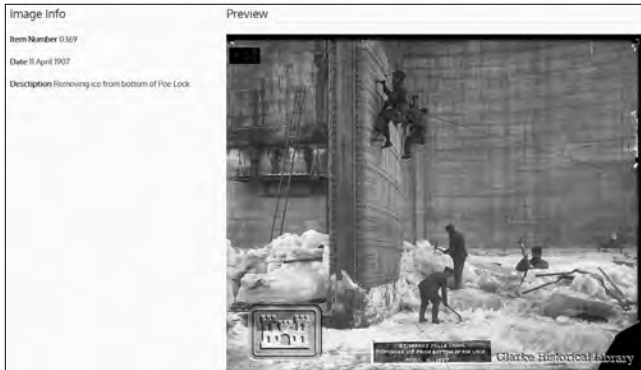
At that point, in October 2016, nearly 50 years of photographic history of one of North America’s greatest engineering feats were made available at no cost to anyone with an Internet connection via the Historic Soo Locks Image Database at <http://clarke.cmich.edu/SooLocks>. The database displays as a simple four-column table with a thumbnail of the image and three columns of information found in the USACE’s century-old handwritten log—the identification number, the date of the image, and the description. A keyword search box enables researchers to search a keyword across all three descriptive fields. When users find an image they would like to see more of, a simple mouse click on the thumbnail takes the viewer to a larger, watermarked version of the image. And, of course, researchers can request a high-resolution copy of any of the images in the database.



The custom interface on the Clarke Library website allows users to browse and search the entire collection of digitized glass-plate negatives and cultural history of the Locks and the Great Lakes.

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A detailed view of an image in the database with descriptive metadata based on the original handwritten logs.

With the public release of the database, the contract was complete, the Clarke had done the job, and people throughout the Great Lakes were regularly visiting the Clarke’s website to view the images.

More Soo Locks Scanning

Two years after completion of the first project, in October 2018, the USACE contacted the Clarke again. It had

approximately 725 acetate negatives dating from 1941 to 1943 that document the construction of the MacArthur Lock, the second biggest of the locks at the Soo complex. Again, the corps wanted the images scanned at 1,200 dpi and rehouse, along with an inventory of physical and technical metadata. This time, the negatives could be transferred to Mt. Pleasant, Michigan, and the work could all be done at the Clarke. In June 2019, the second batch of scans was delivered to USACE. At the time of publication, the Clarke is negotiating with USACE to post the second batch of images online. Be sure to follow the Clarke site in the coming months, where you will be able to find nearly 2,500 images documenting one of the most important, but rarely discussed, infrastructures in the Midwest.

NOTE

1. Todd Spangler, “Report: U.S., Michigan Face Dire Consequences if Soo Locks Fail,” *Detroit Free Press*, March 5, 2016, <http://www.freep.com/story/news/politics/2016/03/03/us-michigan-face-dire-consequences-if-soo-locks-fail/81261608>.

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