ILLINOIS WATERWAY, MARSEILLES LOCK AND DAM
1 Hawk Drive
Marseilles
La Salle
Illinois

HAER IL-164-E
IL-164-E

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

REDUCED COPIES OF MEASURED DRAWINGS

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
U.S. Department of the Interior
1849 C Street NW
Washington, DC 20240-0001

HISTORIC AMERICAN ENGINEERING RECORD

ILLINOIS WATERWAY, MARSEILLES LOCK AND DAM

HAER No. IL-164-E

Location:	1 Hawk Drive, Marseilles, La Salle County, Illinois, on Illinois River Dam- Latitude: 41.3259244, Longitude: -88.7082147 Lock- Latitude: 41.3302506, Longitude: -88.7518000
Present Owner:	U.S. Army Corps of Engineers, Rock Island District
Present Use:	Navigation of Illinois Waterway
Significance:	Marseilles Lock and Dam Historic District is significant as a component of the Illinois Waterway, which was developed to provide a navigable route from Lake Michigan to the Mississippi River and beyond. In addition, the south headrace dam features Tainter gates that measured twice as long as any in existence in 1933, making them an important development in the technology of dams. Those in the north headrace dam are also much longer than any built during the same time period.
Historian:	Justine Christianson, HAER Historian, 2008
Project Information:	The Illinois Waterway Recording Project (2007-2008) is part of the Historic American Engineering Record (HAER), a long-range program to document historically significant engineering and industrial works in the United States. HAER is administered by the Heritage Documentation Programs, a division of the National Park Service, U.S. Department of the Interior, Richard O'Connor, Manager. The U.S. Army Corps of Engineers (USACE) funded the project. Ron Deiss, USACE, and Dana Lockett, HAER Architect, served as project managers. Dana Lockett and Anne Kidd produced the measured drawings. Large format photography was done by Brian Grogan. Justine Christianson wrote the historical reports. Research assistance was provided by John Fitzgerald, Archivist, USACE.

Part I. Historical Information

A. Physical History:

1. **Date of Construction:** (1913-1933)
The lock and original control station were designed and built from 1925-33.[1]

The Marseilles Canal was designed from 1913-19 and built from 1920-25.[2]

The north and south headrace dams were designed and built from 1932-33, while the main dam was designed and built from 1929-33.[3]

2. **Architect/Engineer:**
Walter Mickle Smith, engineer with the State of Illinois, is credited with designing the lock and old control station, while the State of Illinois is credited with the design of the canal, dam and dam boiler house.[4] Engineers for the State of Illinois in charge of the site were J. Bassett, Division Engineer, based at Ottawa and Ralph S. Heath, Resident Engineer based at the site.[5]

The north and south headrace dams were originally designed by Orbison & Orbison Company, but the Army Corps ended up using an unknown designer.[6]

3. **Builder/Contractor/Supplier:**
The State of Illinois contracted Green & Sons Company, with Ralph A. Bonnell, Engineer, to build the lock. Schmidt Brothers Construction Company built the control station. The McClintock-Marshall Corporation of Chicago supplied the Tainter gates used in the main dam. Stevens Brothers and Miller-Hutchinson Company of New Orleans, Louisiana built the main and headrace dams.[7]

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[1] Mary Yeater Rathburn, American Resources Group, Ltd., "Architectural and Engineering Resources of the Illinois Waterway between 130th Street in Chicago and La Grange," Volume 2, prepared for U.S. Army Corps of Engineers, Rock Island District, Rock Island, IL, October 1996, pp. 269-272.
[2] Rathburn, "Architectural and Engineering Resources of the Illinois Waterway," Volume 2, pp. 273-274.
[3] Rathburn, "Architectural and Engineering Resources of the Illinois Waterway," Volume 2, pp. 275-280.
[4] Rathburn, "Architectural and Engineering Resources of the Illinois Waterway," Volume 2, pp. 269-274 and 279-282.
[5] "Construction Methods and Plant on the Marseilles Lock," *Engineering News-Record* 89, no. 23 (December 7, 1922): p. 965.
[6] Mary Yeater Rathburn, American Resources Group, Ltd., "Architectural and Engineering Resources of the Illinois Waterway between 130th Street in Chicago and La Grange," Volume 1, prepared for U.S. Army Corps of Engineers, Rock Island District, Rock Island, IL, October 1996, p. 85; Rathburn, " Architectural and Engineering Resources of the Illinois Waterway," Volume 2, pp. 275-278.
[7] "Construction Methods," p. 965; Rathburn, Architectural and Engineering Resources of the Illinois Waterway," Volume 2, pp. 271-272 and 279-280; Folder 821.1 (Marseilles Dam) W-1088-Eng-369, in U.S. Army Corps of Engineers, Chicago District, Record Group 77, National Archives and Records Administration, Great Lakes Region-Chicago (hereafter cited as RG 77, NARA, Chicago).

4. **Original Plans:**
In a 1930 publication, the Army Corps described the extant structures at Marseilles at the time of the transfer of authority from the state to the federal government. The state had let the contract on the Marseilles Lock first, so it was nearly complete at the time of the transfer. Coffer dams had been built in the Bells Island vicinity to divert the river into the Marseilles Canal, a diversion canal built to carry the waterway and avoid the Marseilles rapids. The diversion canal measured 200' wide at the bottom and extended for 2 ½ miles along the left bank of the Illinois River. The original dam at the site had a fixed crest, but was slated for replacement.[8]

A 1931 site plan of Marseilles Lock shows the control house centered on the strip of land located between the Marseilles Canal and the Illinois River. A road accessing the Watchman's House and two Lockkeepers Dwellings is indicated to the north of the control house.[9]

5. **Alterations and Additions:**
The Tainter gates on the main dam were altered, probably in the 1950s, to be fully submergible so ice could pass over.[10]

Although some resurfacing of the lock was done in the 1970s, a major rehabilitation project was not undertaken until 1988. The project included resurfacing the main dam and guidewall, replacing the Tainter gates and operating machinery, and installing remote operating equipment.[11]

A second major lock rehabilitation took place in 1995 in which the Army Corps closed down the entire waterway for sixty days. Lock walls were resurfaced and gates were repaired and/or replaced as necessary not only at Marseilles but also at Lockport, Brandon Road, Dresden Island, and Starved Rock.[12]

B. Historical Context:
Construction at the Marseilles site began with the State of Illinois issuing a call for sealed proposals for the construction of a lock at the site on September 23, 1920.[13] In

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[8] U.S. Army Corps of Engineers, "The Illinois Waterway," (Washington, DC: U.S. Government Printing Office, 1930), pp. 50-51.
[9] U.S. Army Corps of Engineers, First District, Chicago, Illinois, "Illinois Waterway, Marseilles Lock Site, Survey of Spoil Bank and Back Fill at North Side of Lock Before Grading," September 17, 1931, available at U.S. Army Corps of Engineers, Rock Island District.
[10] Rathburn, "Architectural and Engineering Resources of the Illinois Waterway," Volume 2, p. 279.
[11] Rathburn, "Architectural and Engineering Resources of the Illinois Waterway," Volume 1, p. 104; Volume 2, pp. 269-270. The valve operating machinery and lock gate operating machinery had been replaced in 1969 and 1984-85, respectively.
[12] Rathburn, "Architectural and Engineering Resources of the Illinois Waterway," Volume 1, p. 105; Volume 2, pp. 269-270.
[13] Legal Notices, *Chicago Daily Tribune*, September 23, 1920, p. 28.

November of that same year, the state started work on a canal to avoid the "Grand Rapids" on the Illinois River in this location. Funding had begun to run out, so in 1929 the state began investigating various cost-saving measures. During an "emergency study," the state engineers devised a plan calling for three dams that would only contain Tainter gates: a main one spanning the river and two others at the end of each headrace.

In 1930, the state transferred authority of the entire waterway to the federal government. The Army Corps completed the lock in early 1931. Contracts were also let to complete the dam and canal (which was 65 percent complete).[14] The Marseilles Land, Water and Power Company, owners of a nearby power plant, proposed having Orbison & Orbison of Appleton, Wisconsin build 80' long Tainter gates in the headrace dams.[15] The Army Corps, however, was not interested in the Orbison plans and turned instead to an unknown contractor. The Orbison & Orbison proposal, however, may have influenced later Corps work, as seen in the design of the Tainter gates used on the Upper Mississippi River 9-Foot Channel project. The final dam design at Marseilles called for shorter Tainter gates (70') designed by McClintock-Marshall Corporation's Chicago Works on the main and headrace dams than originally proposed.[16] Even though the Tainter gates were smaller, they were still "twice as long as the average American Tainter gate in 1933." In fact, the Corps did not build 80' Tainter gates until 1939 at Lock & Dam 24 on the Upper Mississippi River. Thus, these Tainter gates represent an evolution of dam technology as the Army Corps experimented with ever-increasing gate sizes.[17]

By 1932, the Army Corps had begun construction of the permanent control house, watchman and lockkeeper houses, machinery shelters and dam, as well as installation of electrical equipment. A status report revealed that in 1932, the electrical equipment installation was only 12 percent complete, while a mere 18 percent of the dam contract had been finished. Total construction costs in 1932 were $136,274.65 with additional expenditures for preparing the subgrade for a road from the lock to the main road and preparing various surveys.[18]

Labor disputes at the Marseilles construction site slowed work in 1932. On July 20, 1932, the *New York Times* reported that 300 union men visited the site demanding that the contractors (Stevens Brothers and Miller-Hutchinson Company) discharge any non-union men working on the project. The following day, the union picketed the

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[14] Rathburn, "Architectural and Engineering Resources of the Illinois Waterway," Volume 1, pp. 70, 81, 85; U.S. Army Corps of Engineers, "The Illinois Waterway," (Washington, DC: Government Printing Office, 1930), p. 51.
[15] Orbison & Orbison had been established in 1921 by Thomas W. Orbison and his son. They had also designed the Prixley Hydroelectric facility in Price County, Wisconsin. Rathburn, "Architectural and Engineering Resources of the Illinois Waterway," Volume 1, p. 85.
[16] The main dam was built to replace another with a fixed crest located 175' above the new location. Rathburn, "Architectural and Engineering Resources of the Illinois Waterway," Volume 1, p. 85.
[17] Rathburn, "Architectural and Engineering Resources of the Illinois Waterway," Volume 2, p. 277.
[18] U.S. Army Corps of Engineers, *Annual Report of the Chief of Engineers, U.S. Army* (Washington, DC: Government Printing Office, 1932), pp. 1178-79 (hereafter cited as USACE, *Annual Report*, date of publication).

project and a fight broke out. Company officials reportedly shot at the picketers after they seized a man and beat him. When shooting at the picketers failed to stop the beating, other company workers picked up arms and began shooting. An "unemployed union steel worker from Joliet, who had been brought here allegedly to intimidate the foreman and nonunion workers" named Steve Sutton was killed. The sheriff's force showed up at the site and arrested 128 men. This seemed to have ended the beating, but work stopped as 128 men were arrested for their involvement in the incident.[19]

Work continued at the site despite the summer events. The electric equipment installation and dam and stilling basin construction were complete by 1933, in time for the waterway's opening. The lockkeeper housing was still under construction and estimated to be 10 percent complete that year. The total cost of construction in 1933 was $474,263.13. Dredging continued in the Marseilles pool at a cost of $705,691.70.[20]

Even after the waterway's opening, work continued on the site. The dam boiler house and lockkeepers' dwellings were not completed until 1934.[21] Various auxiliary structures have been added to the site and alterations have been made throughout the site's operational history.

Part II. Structural/Design Information

A. General Description:[22]

Marseilles Lock and Dam site consists of three dams, a lock, a canal and a control station, as well as auxiliary structures like the old control station, fire equipment well, fire pump shelter, emergency generator building, air compressor buildings, control stands, protection piers, tow haulage units, well house, storage buildings, lifeboat crane, and causeway.[23]

At the upstream end of the historic district are the three dams. The 598 ½' long main dam spans the Illinois River between the north shore and an island on which Illini State Park is located. The main dam is made up of a 522' concrete pier dam with eight submergible Tainter gates measuring 35' tall x 30' wide and a 46.5' wide concrete ice

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[19] "1 Man Killed, 22 Shot in Labor Fight at Dam," *New York Times*, July 20, 1932, p. 18; quote from "May Unionize Dam Workers at Scene of Riot," *Chicago Daily Tribune*, July 22, 1932, p. 8.
[20] USACE, *Annual Report*, 1933, p. 728.
[21] USACE, *Annual Report*, 1934, p. 857.
[22] Building descriptions are based on field work conducted by the HAER recording team in 2007-2008 and the inventory by Mary Yeater Rathburn and the American Resources Group, Ltd., "Architectural and Engineering Resources of the Illinois Waterway," Volume 2, pp. 269-332.
[23] The lock, dam, canal, control station, and dam boiler house were determined to be contributing resources while the replacement control station and warehouse were determined to be noncontributing, as well as "landscape elements" like the mooring piers and emergency generator building, see Barbara J. Henning, "Marseilles Lock and Dam Historic District," National Register of Historic Places Nomination Form, 2001, Section 7, Page 1.

chute at the north end. The Tainter gates are remotely operated from the new Marseilles Control Station located down the river at the lock site. The main dam replaced a 100 year old dam built by the State of Illinois in this vicinity.[24]

The dam boiler house is located on the north shore of the river between the main dam and south headrace dam. The State of Illinois designed the 1,537 square foot, one story brick building with metal industrial sash windows and a hip roof. A one story addition is located at the southwest corner of the south facade, and an emergency generator building was built beside the building in 1987. Originally, the crew of the lock and dam could operate the gates for the dam from this building, but those controls have since been located in the new control station at Marseilles Lock. The building still holds the boiler used to thaw out dam gates in the winter and keep them operable even in freezing temperatures. Since the building originally served two purposes, it is larger than the dam boiler houses at Dresden Island and Starved Rock.[25]

To the northeast of the main dam are the south and north channels, separated by a berm. Each channel has a headrace dam at its outlet. The south headrace dam is a 76' long concrete pier dam with one 17' high x 70' wide Tainter gate, which is now remotely operated from the control station at Marseilles Lock. This dam controls the flow of the water in the south channel, which was built for the Nabisco Factory located to the west of the dam.[26] The north headrace dam extends from the east side of the berm to an earthen dike forming the east side of the north headrace. The 144' long concrete dam is made up of a fixed dam and a pier dam with two Tainter gates, which are now remotely controlled from the new control station at Marseilles Lock. This dam controlled water in the north channel, which was built for the Marseilles Hydroelectric Plant located 1,600' west of the dam. The Marseilles Hydroelectric Plant (built 1906-11) was in operation until 1988 when the Illinois Power Company closed it. The plant was listed in the National Register of Historic Places the following year (for more information see HAER No. IL-93).[27] A concrete causeway runs across both the north and south channels, south of the dams, and provides vehicular access to the dam boiler house and the north end of the main dam.[28]

The Marseilles Lock and Dam site is unusual on the waterway because a diversion canal had to be built to carry the waterway and avoid the rapids on the Illinois River in this area. The canal parallels the Illinois River, extending 2 ½ miles from the main

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[24] Rathburn, "Architectural and Engineering Resources of the Illinois Waterway," Volume 2, pp. 279-280.
[25] Rathburn, "Architectural and Engineering Resources of the Illinois Waterway," Volume 2, pp. 281-282; Henning, "Marseilles Lock and Dam Historic District," Section 7, Page 2. For a description of the emergency generator building, see Rathburn, "Architectural and Engineering Resources of the Illinois Waterway," Volume 2, pp. 319-320.
[26] Rathburn, "Architectural and Engineering Resources of the Illinois Waterway," Volume 2, pp. 275-276.
[27] Rathburn, "Architectural and Engineering Resources of the Illinois Waterway," Volume 2, pp. 277-278; Henning, "Marseilles Lock and Dam Historic District," Section 7, Page 2.
[28] Rathburn, "Architectural and Engineering Resources of the Illinois Waterway," Volume 2, pp. 325-326.

dam to a lock. It measures 200' wide at the bottom and 9' deep to accommodate waterway traffic.[29]

The Ohio River Standard Navigation lock has a 24.25' lift and extends across the Marseilles Canal.[30] The lock chamber measures 110' x 600' and has reinforced concrete walls. The lock has steel miter gates at both its upstream and downstream ends that are operated by electric motor assemblies. The chamber is watered by ten rectangular ports measuring 5' x 3'-6" that are located along the bottom of each lock wall. The ports extend from a 12' diameter culvert that runs through the interior of the chamber walls. The difference in size between the openings and the culvert diameter was planned in accordance with the Venturi principle, which states that the pressure of water is increased by movement through a constricted opening. Four valves operated by hydraulic machinery regulate the flow of water through the culverts.[31]

Centered on the north side of the lock chamber on Bells Island is the original control station. The 962 square foot building once served as the "administrative and operational hub" of the lock. The control station is a one story, cross gabled brick building with concrete detailing and four belt courses. It is identical to those at Lockport, Dresden Island, Brand Road, and Starved Rock. The original control station now serves as a storage building after the completion of a replacement one in 1987 on the opposite side of the chamber.[32] The new control station is more easily accessed since it is located on the landward side of the canal rather than the island. The 3,849 square foot, L-shaped brick building stands 1-1/2 stories tall and has an asbestos shingle roof. The south half of the building is used as a workshop.[33]

Other structures associated with the lock include two compressor buildings dating to 1977. One is located just to the southwest of the original control station while the other is on the opposite side of the lock near the new control station. The one room, one story, 140 square foot buildings are identical. The north and south compressor buildings (as they are differentiated) house the machinery necessary to operate the air bubbler systems that keep the lock gates operable even in freezing temperatures.[34] In 1987, an emergency generator building was constructed near the new control station. Measuring approximately 96 square feet, the one room, one story fiberglass building is similar to those at Lockport, Brandon Road, Starved Rock and Dresden Island.[35]

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[29] Rathburn, "Architectural and Engineering Resources of the Illinois Waterway," Volume 2, pp. 273-274.
[30] Rathburn gives lift as 25' (p. 269) but a 1930 Army Corps publication says 21.5'. See Army Corps, "The Illinois Waterway," p. 50.
[31] Rathburn, "Architectural and Engineering Resources of the Illinois Waterway," Volume 2, pp. 269-270.
[32] Rathburn, "Architectural and Engineering Resources of the Illinois Waterway," Volume 2, pp. 271-272; Henning, "Marseilles Lock and Dam Historic District," Section 7, Page 3.
[33] Rathburn, "Architectural and Engineering Resources of the Illinois Waterway," Volume 2, pp. 315-316; Henning, "Marseilles Lock and Dam Historic District," Section 7, Page 3.
[34] Rathburn, "Architectural and Engineering Resources of the Illinois Waterway," Volume 2, pp. 291-294.
[35] Rathburn, "Architectural and Engineering Resources of the Illinois Waterway," Volume 2, pp. 289-290.

A cluster of buildings accessed by a road that paralleled the canal was located to the north of the original control station. A driveway branched off from this access road and extended to two lockkeepers' houses and a garage. Now a number of service buildings are located to the north of this access road, including a storage building situated behind the old control station. This 1,200 square foot, one room, one story metal building with a low pitched gable roof and metal industrial sash windows dates to 1977.[36] To the northeast of the storage building is the well house, in operation in the 1960s. This 16 square foot pit in the esplanade is covered with a metal hip roof.[37] Additional storage for facility operations was provided by the construction in the 1970s of a 120 square foot lawn equipment storage building at the northeastern edge of Bells Island.[38]

Various structures related to the lock's operation have been added throughout the site's operational history. In 1969, a roof was erected over a pit in the upstream landward wall of the chamber to create a fire equipment well. This modification was also made at Starved Rock and Brandon Road.[39] During the 1960s, a fire pump shelter was located in a pit in the esplanade. This sunken, circular room is covered by a metal, low pitched gable roof.[40] Another modification made in the 1960s was the construction of two weather proof metal cabinets, one at each of the upstream ends of the lock walls. The cabinets contain the controls, fuses, circuit breakers and other components necessary to power sections of the lock. They were built to replace the original cabinets dating to 1933 and are similar to those at Lockport, Brandon Road, Dresden Island, Starved Rock, Peoria and La Grange.[41] The original machinery operating the lock valves was replaced at some point in the 1960s with hydraulic machinery. Originally, the valve operating machinery had been housed in wells sunk within the lock walls, but the new hydraulic machinery was housed in metal cases located at the corners of the lock atop the chamber walls. Identical machinery was also installed at Lockport, Brandon Road, Dresden Island, and Starved Rock.[42]

Additions to the site in the 1970s included the construction of four identical control stands (also known as "dog houses") in 1975 to house the switches operating the lock gates and valves. The 52 square foot, one room, one story metal buildings have large windows on all four walls to provide unobstructed views of the lock chamber.[43] Replacement tow haulage units were added in the 1970s. The two identical motorized winch assemblies allow "parts of a fleet of barges to be locked through while not attached to their tow boat, thus making it possible to lock large modern units through without repeatedly detaching tow from the barges immediately in front of it." The

[36] Rathburn, "Architectural and Engineering Resources of the Illinois Waterway," Volume 2, pp. 289-290.
[37] Rathburn, "Architectural and Engineering Resources of the Illinois Waterway," Volume 2, pp. 311-312.
[38] Rathburn, "Architectural and Engineering Resources of the Illinois Waterway," Volume 2, pp. 313-314.
[39] Rathburn, "Architectural and Engineering Resources of the Illinois Waterway," Volume 2, pp. 283-284.
[40] Rathburn, "Architectural and Engineering Resources of the Illinois Waterway," Volume 2, pp. 287-288.
[41] Rathburn, "Architectural and Engineering Resources of the Illinois Waterway," Volume 2, pp. 285-286.
[42] Rathburn, "Architectural and Engineering Resources of the Illinois Waterway," Volume 2, pp. 303-304.
[43] Rathburn, "Architectural and Engineering Resources of the Illinois Waterway," Volume 2, pp. 295-302.

units are identical to those at Lockport, Brandon Road, Marseilles, Starved Rock, Peoria and La Grange as well as sites on the Upper Mississippi River.[44] A single-arm derrick was also installed in this same time period and is similar to those at Dresden Island, Starved Rock and Peoria as well as those on the Upper Mississippi River. The crane is used to load/unload materials and launch life boats.[45]

In 1984 the original machinery operating the lock gates was removed. The machinery had been housed in pits in the lock walls, but the replacement electric motor assemblies are located on top of the lock walls adjacent to the miter gate it controls. This modification was also made at Lockport, Brandon Road, Dresden Island, and Starved Rock.[46]

In 1980, mooring piers, also called protection piers, were installed in the canal and river. Thirteen concrete piers with metal rub bars and protective coverings extending from the river bottom to above the pool surface were located at various points along the river. Two piers (measuring 20'-4" in diameter) sit downstream from the riverwall of the lock; four are in the canal upstream from the guidewall extension; four are in the Illinois River about 1500' downstream of lock; one (measuring 31' in diameter) is at the upstream end of the landwall of the lock; and two (measuring 20'-4" in diameter) are upstream in the canal and landward of the lock. The piers were installed at other lock and dam sites on the Illinois Waterway as well as the Upper Mississippi River. They provide a place for crews to tie their barges while waiting to be locked through.[47] Two cylindrical protection piers each measuring about 31'-9" in diameter and made of concrete with metal rub bars are located downstream of the south end of the dam. These two piers help keep vessels entering the canal from bumping the dam gates.[48]

B. Construction:

The *Engineering News-Record* detailed the challenging construction conditions at the site in its December 7, 1922 edition. The challenges were partly due to the layout of the site (the Illinois River separated the railroad from the proposed lock location) and partly due to the geologic conditions (the foundation rock was blue shale and thus subject to disintegration into clay). The conditions were overcome by the careful planning and set up of the construction plant.

Excavation of the lock required removal of 116,000 cubic yards of dirt and 127 cubic yards of rock and had to be controlled so the foundation bed was not left uncovered for any significant period of time. Teams and graders removed most of the earth with the assistance of a small steam shovel that loaded earth into wagons. Well drills and jackhammers were used to break up the rock, which was then loaded onto dump cars

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[44] Rathburn, "Architectural and Engineering Resources of the Illinois Waterway," Volume 2, pp. 309-310.
[45] Rathburn, "Architectural and Engineering Resources of the Illinois Waterway," Volume 2, pp. 321-322.
[46] Rathburn, "Architectural and Engineering Resources of the Illinois Waterway," Volume 2, pp. 305-306.
[47] Rathburn, "Architectural and Engineering Resources of the Illinois Waterway," Volume 2, pp. 307-308.
[48] Rathburn, "Architectural and Engineering Resources of the Illinois Waterway," Volume 2, pp. 331-332. The eastern one was replaced in the 1980s.

by a "railroad-type steam shovel." Since the shale was so fragile if left exposed, the final shaping of the rock prior to the concrete work was done in sections.[49]

At first, trucks delivered construction materials to the south bank of the river. Then an electric railway was built along the north bank of the river, with a spur extending to the south that forked. Once the material had been unloaded from the rail cars, it still had to be transported across the river, which was first done by ferry. Then the contractor set up a "stationary cableway of about eight tons capacity and a span of 1,300 ft." on 100' towers with a movable 700' long, wooden bridge located underneath it.[50] Since the primary material being moved was concrete, the contractor decided it would be most efficient to mix the concrete at the yard and then move it to the site using trucks and the bridge.[51]

In November 1920, construction began on the concrete mixing plant, located at the terminus of one of the tracks. The gravel was stored in bins and moved via an inclined trestle with 24" belt conveyor to the mixing plant.[52] A bucket elevator brought the cement to a bin located above the mixer. The mixing plant itself, according to the *Engineering News-Record* "is a notably compact structure with a duplicate mixer installation" that allowed each mixer with a 1 cubic yard wet batch capacity to work independently.[53] Once the concrete had been produced, twelve trucks transported the concrete in "1-cu yd self-dumping bodies" across the 700' bridge over the Illinois River "onto plank runways which end at the lock in the platform and hopper." Chutes extended from the hopper to the sections where the concrete needed to be poured. Steel forms were used for the wall culverts only; all other forms were wood.[54] There were notable features of this system, according to the article. The use of "small handling units" allowed one to be taken out of service if necessary without a negative impact on the rest of the operation. Another noteworthy aspect of the operation was that the concrete did not suffer from being transported, probably because "seldom more than 10 minutes elapsed from the time the mixer was discharged until the concrete was deposited in the forms." The contractor could take advantage of the greater amount of space available farther away from the construction site as a result of using "wet-batch" hauling.[55]

When the Army Corps of Engineers assumed authority over the Illinois Waterway, the navigation structures and large components of the Marseilles Lock and Dam had been built, except for Marseilles Dam. The Army Corps stationed guards onsite who lived in temporary housing to safeguard the property since no construction work was then

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[49] "Construction Methods and Plant on the Marseilles Lock," *Engineering News-Record* 89, no. 23 (December 7, 1922): pp. 962-63.
[50] "Construction Methods," p. 962.
[51] "Construction Methods," p. 962.
[52] "Construction Methods," p. 962-64.
[53] "Construction Methods," p. 964.
[54] "Construction Methods," p. 964.
[55] "Construction Methods," p. 965.

underway at the site. In addition, in 1932, William Grohne Company of Joliet, Illinois built eight frame buildings to serve as machinery shelters, which were necessary to protect the machinery left out in the open.[56] The Army Corps contracted with Schmidt Brothers Construction Company to build control stations at Marseilles, Lockport and Starved Rock in 1932.[57] The lockkeepers' housing at the lock site was built in 1933 along with two "modest cottages" for the Chief Electricians.[58]

Since the state had only completed about 12 percent of the electrical work prior to the transfer, the Army Corps contracted Wadeford Electric Company of Chicago to install the control and indicating equipment and lock signals, as well as the illuminating equipment for the exterior of the lock, lock gallery recesses, and shelters. Other items for installation included electric cables, connection boxes, and "other appurtenances."[59] At the downstream end of the lock, the Joliet Bridge Construction Company installed a lock signal, four lock lamps and wiring, backfilled the approach wall with coarse gravel or crushed rock, and altered the existing handrail.[60]

The main project remaining to be completed in 1932 was the construction of the dam, estimated to be 18 percent complete. The land for the headgates and dam had been obtained from the Marseilles Land and Power Company for $1. Steven Brothers and the Miller-Hutchinson Company of New Orleans, Louisiana, were contracted by the Army Corps to build a masonry dam across the Illinois River consisting of a concrete weir, piers, eight steel Tainter gates and operating bridges, one ice chute, a gate and operating bridge, as well as any necessary anchorages, counterweights, and machinery. They were also contracted to build a gravity guide wall next to the dam abutment on the south bank of the river, complete the north end of the lock canal approach, build an earth dike on the north riverbank, remove concrete from the existing wall and install a new concrete cap. Headraces built across the north and south channels at the north bank of the Illinois River would each have a concrete weir, piers, three steel Tainter gates, operating bridges. Finally, the contract called for removing the existing dam

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[56] Folder 821.1 (Lockport, Marseilles & Starved Rock Locks) Machinery Shelters W-1088-Eng-243 in Army Corps of Engineers, Chicago District, RG 77, NARA, Chicago; C.R. Andrew, Memorandum for the Files, Subject: Illinois Waterway—Some Items of Historical Interest which are Buried in the Files, June 15, 1949, p. 3-4, in Folder 285/68b (Ill Wwy) State of Illinois 1932-49, File #5 in Army Corps of Engineers, Chicago District, RG 77, NARA, Chicago.

[57] Rathburn, "Architectural and Engineering Resources of the Illinois Waterway," Volume 1, p. 87; Folder 821.1 (Marseilles, Starved Rock, Lockport) Wells and Control Houses W-1088-Eng-302, 1931-33, in Army Corps of Engineers, Chicago District, RG 77, NARA, Chicago.

[58] Folder 624, Lockkeepers Buildings-General (1933-1941), in Army Corps of Engineers, Chicago District, RG 77, NARA, Chicago. Another contract with Emery Louis Anderson of Ottawa dates to 1931 and specified frame houses with outhouses. The use of these buildings is unknown, although they may have simply been temporary structures. See Folder 624 (Marseilles and Starved Rock) Lockkeepers Dwellings, W-1088-Eng-244-1931-32, in Army Corps of Engineers, Chicago District, RG 77, NARA, Chicago.

[59] USACE, *Annual Report*, 1932, p. 1178; Folder 821.1 (Marseilles-Starved Rock-Lockport) Electrical Equipment W-1088-Eng-309, 1931-32; Folder 821.1 (Marseilles-Starved Rock-Lockport) Electrical Equipment W-1088-Eng-309, 1932-33; Folder 821.1 (Marseilles-Starved Rock-Lockport) Electrical Equipment, W-1088-Eng-309, 1931-33, all in Army Corps of Engineers, Chicago District, RG 77, NARA, Chicago.

[60] Folder 821.1 (Marseilles & Starved Rock) Raising Approach Walls W-1088-Eng-588 1932-34, in Army Corps of Engineers, Chicago District, RG 77, NARA, Chicago.

and the submerged wall in the south headrace as well as building and removing any cofferdams needed to complete the construction.[61] (See Appendix A, Figure 1)

The Marseilles Dam had its own mixing plant, which required ten men for operation. The construction materials came by rail. A spur track in front of the mixing plant carried the cement cars. The sand and gravel cars ran on a spur track located to the rear of the mixing plant. A crane moved the sand and gravel from the cars to the mixing plant, where the materials were deposited in a receiving hopper. The materials next traveled through a weighing hopper before being moved by a belt conveyor to one of the two mixers. After the sand and gravel had been deposited in the mixer, the cement was deposited from the cement hopper via a 10" pipe equipped with a two-way valve. Water was then added to the mixer, which ran for 1 ½ minutes. Six trucks were available for transporting the buckets holding the just-mixed concrete to the dam site. Once at the site, a crane picked up the buckets of concrete and dumped them into hoppers with flexible spouting that led to the sectional wood forms built onsite by the carpenter's shop.[62]

Another component of the dam was the boiler house, built by E.L. Archibald Company of Chicago, Illinois. Located on the north bank of the river near the south headrace and main dams, this concrete and brick building was furnished with a steam boiler and plant, an air compressor and plant, piping a deep well pump, and water supply tank.[63]

The Army Corps made alterations to the original design and construction work done by the state. From 1931-32, Powers-Thompson Construction Company of Joliet, Illinois altered the lower miter sills to better accommodate upward water pressure. The sills were strengthened at Marseilles by "drilling the floor above the lower miter sill to relieve the pressure" while the "miter sill was strengthened by drilling diagonal holes through the concrete and into the rock, inserting heavy bolts, grouting the bolts into the rock and then placing the bolts under an initial tension of 23,000 pounds per bolt."[64]

From 1934-35, the Army Corps undertook a "Winter Program" in which alterations and repairs were made to the waterway's locks prior to the opening of the waterway using Public Works funds. At Marseilles, this involved purchasing and installing a steel arch emergency dam with steel support bents, castings, plates, bolts and

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[61] USACE, *Annual Report*, 1932, p. 1178; Folder 821.1 (Marseilles Dam) W-1088-Eng-369, in Army Corps of Engineers, Chicago District, RG 77, NARA, Chicago; Andrew, Memorandum, p. 3.
[62] "Mixing Plant for Marseilles Dam Project," pp. 1-2, in Folder 285/68b (Ill Wwy) State of Illinois 1932-49, File #5, in Army Corps of Engineers, Chicago District, RG 77, NARA, Chicago.
[63] The boiler feed pump and deep well pump had General Electric Company Type K, Squirrel Cage Induction Motors, while the water supply tank was specified as a Pneumatic Water Supply Tank. See Folder 821.1 (Marseilles) Boiler House W-1088-Eng-578, 1932-34, in Army Corps of Engineers, Chicago District, RG 77, NARA, Chicago.
[64] Folder 821.1 (Marseilles-Starved Rock-Lockport-Dresden Island) Alterations W-1088-Eng-303, 1931-32, in Army Corps of Engineers, Chicago District, RG 77, NARA, Chicago; Andrew, Memorandum, p. 5.

reinforcing bars, as well as at Starved Rock, Dresden Island, Brandon Road and Lockport. In order to accommodate this dam, the lock floor had to be altered. Stop log recesses were also cut in the lock chamber at Marseilles by Paschen Brothers Inc. for use in dewatering the lock gates when necessary. The "existing spring-steel seals from both leaves of lower service gates" were replaced with steel and rubber seals. Finally, the lighting system at the dam and the sewer and fire protection/water distribution systems were completed.[65]

The Army Corps studied the lower gates of Marseilles Lock and experimented with different parts and materials. Originally, the state's specifications called for Monel metal to be used in the various pins, pintles, and bushings of both the lock and Tainter gates, but testing had revealed that Monel metal had a tendency to seize (despite the fact that Monel was successfully used in the pins and bushings of the Tainter gates). "Extensive experiments" were done on the lower gates at Marseilles, with Army Corps engineers determining that nickel steel and phosphor bronze bushings would be the best choices. At first engineers doubted the steel/bronze combination was the best material since testing by the Sanitary District had shown that bronze could crystallize and then fail due to a reaction with the metal and the water. Later it was discovered that although Sanitary District had specified using bronze bearings without zinc, the parts were actually a copper/zinc combination, leading to failure. Other modifications to the gate included replacing the original 8" diameter pintles in the upper gate with 16" steel pintles, despite the fact that they were operating well. In addition, air compartments were welded to the gate "to relieve the pressure on the pintle," a modification used elsewhere on the system.[66]

In 1937 tow haulage units manufactured by the American Heist & Derrick Company were installed. In a memorandum to the Army Corps District Engineer, Capt. R. L. Dean, Assistant to the Division Engineer, noted that a lack of power tow haulage units made "hand towing" necessary during double lockages. He advised, "in view of the tremendous increase in Illinois River traffic in recent years, with a corresponding increase in number of lockages which must also include an increase in double lockages, inquiry is made as to whether installation of power tow-haulage units at such

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[65] Dan I. Sultan, Lt. Col., Corps of Engineers, District Engineer to Area Engineer, U.S. Engineer Area Office, Joliet, Illinois, Subject: Winter Program for Lock Maintenance and Repairs, July 20, 1933, in Folder 821.13 (Lock Gates & Machinery) Unwatering 1932-33; Folder 821.1 (Marseilles, Lockport, Brandon Road, Starved Rock) Stop Log Recesses, W-1088-Eng-591 1933-34; Folder 821.1 (Marseilles Lock) Alterations and Repair, W-1088-Eng-622 1933-34, all in Army Corps of Engineers, Chicago District, RG 77, NARA, Chicago. See also USACE, *Annual Report*, 1934, pp. 857-58 and 1935, pp. 947-49. The 1934 *Annual Report* reported expenditures: cutting the stop-log recesses cost $11,782.80; completing altering the lower approach wall cost $13,664.17; lighting for the lock and dam cost $6,933.20; installing the sewer and water distribution/fire protection system cost $7,528.07. The standby power unit costs were $4,165.23. The winter program was the most expensive at $52,457. Dredging totaled $34,195.04.

[66] Andrew, Memorandum, p. 5.

locks as are now without them is not now economically justified."[67] The Army Corps installed the units at locks along the waterway. Various other buildings have been added and alterations made to the operating equipment throughout the site's operational history.

C. Operation:

The waterway had been designed for use by "towboats pushing eight jumbo hopper barges." The jumbo barges each measured 35' x 195'. The configuration of the eight barge tow with a towboat consisted of two rows of three barges tied together followed by a row of two barges tied together. The towboat pushed the three rows into position in the lock chamber, then moved alongside the first row (made up of two barges) during the lockage. The resulting configuration measured 105' x 600', which allowed all the barges to be locked through in one pass since the lock chamber conformed to the Ohio River Standard size of 110' x 600'. By the 1950s, the fourteen barge tow had become the standard. While the Thomas J. O'Brien lock with its 110' x 1000' chamber could handle this larger tow configuration, the earlier locks could not. The fourteen barge tow measured 105' x 985', requiring that the tow be broken into two, known as "cuts," on the other locks. The first cut was made up of two rows of three barges tied together. The second cut followed the standard configuration used in the eight barge tow. Rathburn describes the locking through process with the fourteen barge tow configuration.

> After breaking the two into these two cuts, the towboat pushed the first cut of barges through the lock, locked through with it, pushed the cut out of the lock, locked back through to get the second cut of barges, pushed it into the lock, moved over into the 'third barge slot' in the last row of the eight-barge configuration, locked through with the second cut, and then reassembled the two cuts into one united configuration and moved back into its pushing position.[68]

This process was time consuming and caused congestion along the waterway, so the Army Corps installed replacement tow haulage units in the 1970s at all the locks except Thomas J. O'Brien. These units allowed the first cut to be pulled through the lock without the towboat, which remained in its position in the second cut. This minimized some of the time spent locking through. The installation of the new tow haulage units facilitated the use of the seventeen barge tow configuration, measuring 105' x 1118'. In this configuration, the first cut is made up of three rows of three barges. The second cut has two rows of three barges while the last row has two barges and an open slot for the towboat.[69]

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[67] R.L. Dean, Captain, Corps of Engineers, Assistant to Division Engineer to The District Engineer, Subject: Power tow-haulage units, September 11, 1937, in Folder 821.13 (Locks-Machinery), Army Corps of Engineers, Chicago District, RG 77, NARA, Chicago.

[68] Rathburn, "Architectural and Engineering Resources of the Illinois Waterway," Volume 1, p. 99.

[69] Rathburn, "Architectural and Engineering Resources of the Illinois Waterway," Volume 1, pp. 100-102.

From the 1930s to the 1970s, the amount and size of the vessels using the Illinois Waterway increased. In 1934, commercial traffic on the waterway amounted to 104,750, which had increased by 1953 to 20 million.[70] Traffic on the waterway leveled in the 1970s but congestion on both the Illinois Waterway and the Upper Mississippi River continues. According to a recently released study of the two systems dating to 2005, 51.6 million tons of commercial cargo worth $9.5 billion was transported on the Illinois Waterway. Together the two systems move 60 percent of corn exports and 45 percent of soybean exports, in addition to coal, chemicals and petroleum.[71]

The Marseilles Lock and Dam remains a vital component on the Illinois Waterway. The site is significant for its Tainter gates. The south headrace dam had Tainter gates that measured twice as long as any in existence in 1933 and those in the north headrace dam were also much longer than any built at that time. The main dam has submergible Tainter gates, unusual on the waterway. The dams represent an important evolution in dam technology in the early twentieth century.

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[70] Department of Public Works & Buildings, "132 Years of Public Service: The History and Duties of the Division of Waterways," (State of Illinois, 1955), p. 15.
Illinois Waterway traffic statistics are provided in the U.S. Army Corps of Engineers' annual reports. The information is presented in various ways throughout the 1930s. In 1931, upbound traffic on the Illinois River (from La Salle to Grafton, IL) consisted of 128 steamers, 609 motor vessels, 21 sailing vessels, and 457 barges for a total of 1,215 vessels. The downbound traffic included 140 steamers, 515 motor vessels, 21 sailing vessels, and 400 barges for a total of 1,076 vessels. (USACE, *Annual Report*, Part II, 1932, p. 696.) By 1933 traffic had increased to a total of 2,140 upbound vessels at 341,760 tons, consisting of 50 steamers, 1,251 motor vessels, 772 barges, and 67 other types. Downbound traffic numbered 2,290 vessels at 344,249 tons, including 50 steamers, 1,282 motor vessels, 756 barges and 202 other types. In 1934 the total number of vessels had declined but tonnages increased, with upbound tonnage at 642,715 and downbound at 682,214. (USACE, *Annual Report*, Part II, 1934, p. 670 and Part II, 1935, p. 710.) In 1935, the statistics for the Illinois Waterway also included the Chicago Sanitary & Ship Canal and the Calumet-Sag Canal. The total tonnage was 1,361,280. On the South Branch of the Chicago River, 215,107 tons were carried. Total tonnage, including rafted traffic, was 1,584,428 tons worth $48,710,394. (USACE, *Annual Report*, Part II, 1936, p. 747.) In 1936, 1,537,759 tons were transported on the Illinois Waterway and 507,805 tons were moved on the South Branch of the Chicago River. The total tonnage was 2,048,057, including rafted traffic for a total value of $54,725,585. (Army Corps, *Annual Report*, Part II, 1937, p. 781.) In 1937, 2,874,864 tons were transported on the Illinois Waterway and 698,329 tons on the South Branch of the Chicago River. The total tonnage, plus rafted traffic, equaled 3,575,299 tons worth $65,604,398. (USACE, *Annual Report*, Part II, 1938, p. 803.) By 1938, the total tonnage on the Illinois Waterway (which included the Chicago Sanitary & Ship Canal, Calumet-Sag Canal, and South Branch of the Chicago River) was 4,446,493, including rafted traffic, at a total worth of $109,008,794. (USACE, *Annual Report*, Part II, 1939, p. 863.) From 1975-86, the amount of goods shipped on the waterway decreased from 48.5 million to 42.3 million. (Rathburn, "Architectural and Engineering Resources of the Illinois Waterway," Volume 1, p. 103.)

[71] See Final Draft "Re-Evaluation of the Recommended Plan: UMR-IWW System Navigation Study, Interim Report," Issued March 2008, available at http://www2.mvr.usace.army.mil/UMRS/NESP/ (accessed March 2009).

Part III. Sources of Information

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C. Likely Sources Not Yet Investigated

Research was conducted in the Army Corps of Engineers records (Record Group 77) at the National Archives and Records Administration, Great Lakes Region, Chicago, but time constraints prevented thorough research into all available records. Additional information may be available in this record group.

The State of Illinois' archives in Springfield, Illinois, contain the Annual Reports of the Division of Waterways, which could provide additional information on the state's construction activities. This archive was consulted by the American Resources Group with Mary Yeater Rathburn as Principal Investigator for the "Architectural and Engineering Resources of the Illinois Waterway between 130th Street in Chicago and La Grange" publication.

Appendix A: Image

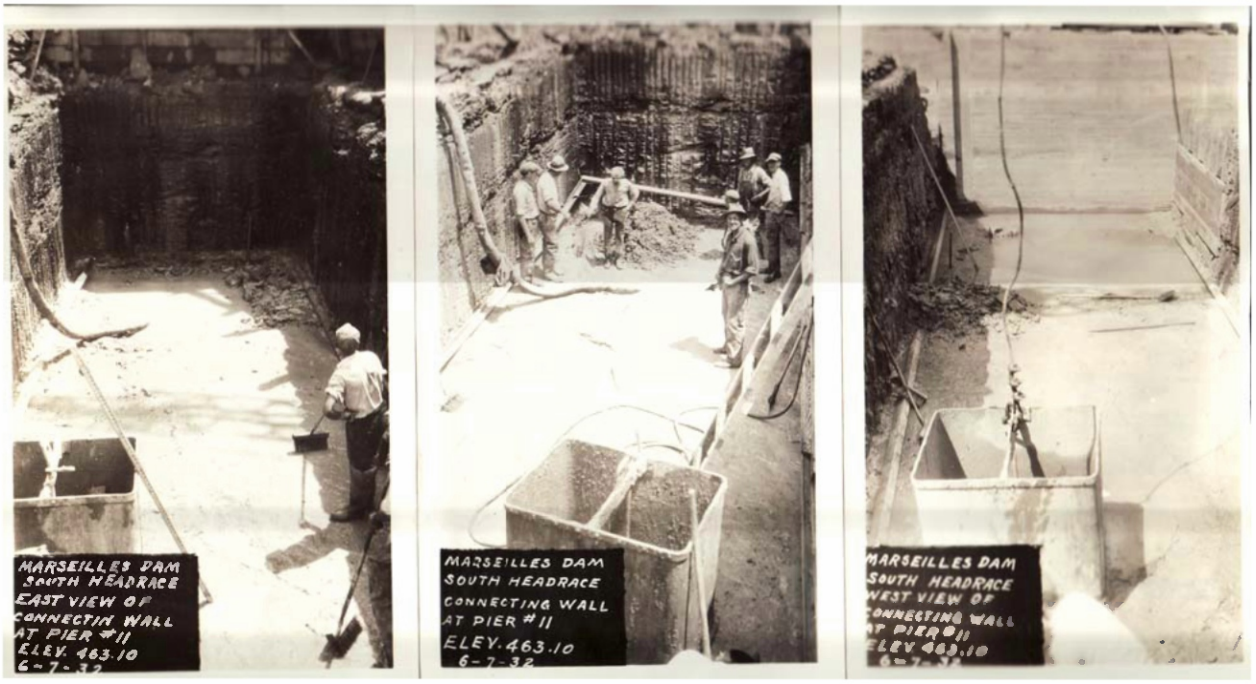

Figure 1: South Headrace Dam foundation, June 1932. From Foundation Reports 1932 in Folder 821.1 (Marseilles Dam), Contract W-1088-Eng-369, Record Group 77, National Archives and Records Administration, Great Lakes Region-Chicago.