



US Army Corps
of Engineers®
Mississippi Valley Division

UPPER MISSISSIPPI RIVER LOCKS & DAMS 2018

The 9-foot Channel Navigation Project

The Upper Mississippi River – Illinois Waterway Navigation System includes 37 locks and 1,200 miles of navigable waterway in Illinois, Iowa, Minnesota, Missouri, and Wisconsin. The U.S. Army Corps of Engineers manages the 37 locks and dams on the Mississippi and Illinois rivers providing a water stairway of travel for commercial and recreational traffic from Minneapolis-St. Paul to St. Louis and from Chicago to the Mississippi River.

The 866 miles of the Upper Mississippi River begin in Minneapolis, Minn., and end at the confluence of the Ohio River at Cairo, Ill. The 333 miles of the Illinois Waterway start in the Chicago Area Waterway and continue downstream to the Illinois River's confluence with the Mississippi River at Grafton, Ill. The Illinois Waterway is composed of seven water systems: Illinois River, Des Plaines River, Chicago Sanitary and Shipping Canal, South Branch Chicago River, Cal-Sag Channel, Little Calumet River and the Calumet River.

There are more than 580 manufacturing facilities, terminals, grain elevators, and docks that ship and receive tonnage in the Upper Mississippi River basin. Grains (corn and soybeans) dominate traffic on the system. Other commodities, mainly cement and concrete products, comprise the second largest group. A modern 15-barge tow transports the equivalent of 1,050 large semi-trucks (26,250 cargo tons, 875,000 bushels, or 17,325,000 gallons). In 2015, the 9-foot channel project generated an estimated \$3 billion of transportation cost savings compared to its approximately \$246 million operation and maintenance cost.

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Front Cover: (2015) An aerial view of Locks and Dam 15 in Rock Island, Illinois. Locks and Dam 15 is one of 29 lock and dam facilities along the Mississippi River managed by the Mississippi Valley Division. Crossing the Mississippi River over the locks is the Government Bridge, connecting Davenport, Iowa, to the Rock Island Arsenal, home of the Rock Island District and the historic Clock Tower Building.

Photo: U.S. Army Corps of Engineers, Rock Island District



Upper St. Anthony Falls

(Minneapolis, Minnesota)
Mississippi River

U.S. ARMY CORPS OF ENGINEERS

BUILDING STRONG.

Construction: Lock: 1959-1963; Dam: 1951

Congressional District: MN-5

Description

Upper St. Anthony Falls (USAF) Lock & Dam is located at Mississippi River Mile 853.9, in Minneapolis, Minnesota; it is the northern-most lock.

USAF Lock is located near the right descending bank and consists of a single lock chamber 56 feet wide by 400 feet long. The upper pool elevation is 799.2 feet, tailwater elevation is 750.1 feet, and the vertical lift is 49.1 feet. In addition to four lock miter gates, there is an upstream lock Tainter gate for passing flow through the lock chamber during high water. There is no auxiliary lock or provisions for one.



On the left descending bank there is a horseshoe dam with a chord dam downstream of the horseshoe and a concrete overflow spillway owned by Xcel Energy Center that ties into the Lock. On the right descending bank the Corps has a short non-overflow concrete dam between the Lock and the bank.

Dam tours can be scheduled for the Upper Saint Anthony Falls Visitor Center in downtown Minneapolis. The Visitor Center, which sits atop the central control station, offers dam tours May 1 to Oct. 1. Tours are offered year round, but are subject to availability Oct. 2 to April 30.

History/Significance

The U.S. Army Corps of Engineers, St. Paul District, closed the Upper St. Anthony Falls Lock to all navigation at 11:59 p.m., June 9, 2015. The action was required by the Water Resources Reform and Development Act of 2014 and ended all use of the lock by commercial, recreation and other navigational uses. Cargo that would normally be transported through the lock by barge must now be moved by truck or other transportation means. The lock's visitor center also closed.

The lock was put into operation in September 1963. In 1937, Congress authorized a 4.6 mile extension of the 9-foot channel at its upstream end and two additional complexes were built in Minneapolis: the Lower St. Anthony Falls Lock and Dam, and the Upper St. Anthony Falls Lock and Dam. The construction of these complexes, also known as the Upper Minneapolis Harbor Development, extended the 9-foot channel over the St. Anthony Falls. Below the St. Anthony Falls, the narrow gorge of the Upper Mississippi River only allowed for a relatively small river terminal. By extending the 9-foot channel, the Upper Mississippi Harbor Development project permitted the construction of larger and more suitable river terminal sites above the falls.

St. Anthony Falls has a fall of 74 feet, and had historically been used to furnish waterpower for sawmills and flour mills in the area. To ascend the falls the Corps needed a 25-foot lift at the lower lock, and a 49.1-foot lift at the upper lock. The Lower St. Anthony Falls Lock and Dam project also replaced the original Northern States Power Company Dam, which had been built in 1897.

U.S. ARMY CORPS OF ENGINEERS – ST. PAUL DISTRICT

180 5TH STREET EAST, SUITE 700, ST. PAUL, MN 55101-1678

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The Upper St. Anthony Falls Lock and Dam fixed concrete dam was built in 1951, when an existing timber dam was destroyed by flood. The timber dam had been constructed in the 1870s in an effort to protect the St. Anthony Falls from upstream progression. Since the concrete dam was in place, the Corps only needed to construct a navigation lock. But, with a rise of 49.1 feet, the lock was the highest lift on the river and an engineering challenge costing the federal government more than \$18 million to build.

Annual Tonnage (20-Year Historical)

<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>
2017	-	2012	815,190	2007	998,770	2002	2,042,700
2016	-	2011	764,851	2006	1,315,770	2001	1,826,375
2015	298,900	2010	663,935	2005	1,154,000	2000	2,238,564
2014	711,959	2009	686,470	2004	1,494,539	1999	2,064,130
2013	821,150	2008	942,300	2003	1,942,747	1998	2,051,540

Commodity Tonnage (2017)

All Units (Ferried Autos, Passengers, Railway Cars)	-	Primary Manufactured Goods	-
Coal, Lignite, and Coal Coke	-	Food and Farm Products	-
Petroleum and Petroleum Products	-	Manufactured Equipment & Machinery	-
Chemicals and Related Products	-	Waste Material	-
Crude Materials, Inedible, Except Fuels	-	Unknown or Not Elsewhere Classified	-

Vessel & Lockage Data (2017)

Average Delay - Tows (Hours)	-	Non-Commercial Vessels	-
Average Processing Time (Hours)	-	Non-Commercial Flotillas	-
Barges Empty	-	Non-Commercial Lockages/Cuts	-
Barges Loaded	-	Percent Vessels Delayed (%)	-
Commercial Vessels	-	Recreational Vessels	-
Commercial Flotillas	-	Recreational Lockages	-
Commercial Lockages/Cuts	-	Total Vessels	-
Non-Vessel Lockages	-	Total Lockages/Cuts	-

The 9-foot Channel Navigation Project

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The maintenance needs of this aging infrastructure have surpassed annual operations and maintenance funding. This limited funding has adversely affected reliability of the system and has primarily resulted in a fix-as-fail strategy, with repairs sometimes requiring days, weeks or months. Depending on the nature of a failure and extent of repairs, shippers, manufacturers, consumers and commodity investors can experience major financial consequences. Additionally, today's 1,200'-long tows must split and lock through in two operations within the Project's 600' chambers. This procedure doubles and triples lockage times, increases costs and wear to lock machinery, and exposes deckhands to higher accident rates.

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UPDATE: August 2018

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Lower St. Anthony Falls

(Minneapolis, Minnesota)
Mississippi River

U.S. ARMY CORPS OF ENGINEERS

BUILDING STRONG.

Construction: 1950-1956

Congressional District: MN-5

Description

Lower St. Anthony Falls (LSAF) Lock and Dam is located at Mississippi River Mile 853.3, in Minneapolis, Minnesota.

LSAF Lock is located along the right descending bank and consists of a single lock chamber 56 feet wide by 400 feet long with an upper pool elevation of 750.1 feet, a tailwater elevation of 725.1 feet, and a vertical lift of 25 feet. The lock uses miter gates on the downstream side and a lock Tainter gate on the upstream side for the purpose of passing flow through the lock chamber during high water. There is a partial auxiliary lock consisting of an upstream Tainter gate and short concrete riverwall section.



The movable dam has three Tainter gates (24 feet high by 56 feet long) and an auxiliary lock submersible Tainter gate (24 feet high by 56 feet long). Completing the dam system is a concrete non-overflow wall owned by the Corps and a short, earth embankment owned by Xcel Energy, both on the left descending bank.

History/Significance

The Lock was put into operation in September 1956. In 2007, the I-35 bridge tragedy occurred at the Lower St. Anthony Falls location.

In 1937, Congress authorized a 4.6 mile extension of the 9-foot channel at its upstream end and two additional complexes were built in Minneapolis: the Lower St. Anthony Falls Lock and Dam, and the Upper St. Anthony Falls Lock and Dam. The construction of these complexes, also known as the Upper Minneapolis Harbor Development, extended the 9-foot channel over the St. Anthony Falls. Below the St. Anthony Falls, the narrow gorge of the Upper Mississippi River only allowed for a relatively small river terminal. By extending the 9-foot channel, the Upper Mississippi Harbor Development project permitted the construction of larger and more suitable river terminal sites above the falls.

St. Anthony Falls has a fall of 74 feet, and had historically been used to furnish waterpower for sawmills and flour mills in the area. To ascend the falls the Corps needed a 25-foot lift at the lower lock, and a 49.1-foot lift at the upper lock. The Lower St. Anthony Falls Lock and Dam project also replaced the original Northern States Power Company Dam, which had been built in 1897.

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Annual Tonnage (20-Year Historical)

<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>
2017	6,000	2012	816,782	2007	993,963	2002	2,041,840
2016	-	2011	759,153	2006	1,316,210	2001	1,814,488
2015	296,235	2010	664,410	2005	1,158,096	2000	2,237,267
2014	716,357	2009	696,470	2004	1,483,317	1999	2,066,980
2013	821,150	2008	929,600	2003	1,933,812	1998	2,057,380

Commodity Tonnage (2017)

All Units (Ferried Autos, Passengers, Railway Cars)	-
Coal, Lignite, and Coal Coke	-
Petroleum and Petroleum Products	-
Chemicals and Related Products	-
Crude Materials, Inedible, Except Fuels	-
Primary Manufactured Goods	-
Food and Farm Products	-
Manufactured Equipment & Machinery	6,000
Waste Material	-
Unknown or Not Elsewhere Classified	-

Vessel & Lockage Data (2017)

Average Delay - Tows (Hours)	0.03	Non-Commercial Vessels	-
Average Processing Time (Hours)	-	Non-Commercial Flotillas	-
Barges Empty	1	Non-Commercial Lockages/Cuts	-
Barges Loaded	3	Percent Vessels Delayed (%)	19
Commercial Vessels	622	Recreational Vessels	725
Commercial Flotillas	608	Recreational Lockages	209
Commercial Lockages/Cuts	608	Total Vessels	1,347
Non-Vessel Lockages	-	Total Lockages/Cuts	817

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Lock & Dam 1

(Minneapolis, Minnesota)
Mississippi River

U.S. ARMY CORPS OF ENGINEERS

BUILDING STRONG.

Construction:

1907-1917 (Original 6-foot Channel lock)
1930-1932 (9-foot Channel lock)

Congressional District: MN-4; MN-5

Description

Lock and Dam 1 is located at Mississippi River Mile 847.9, in Minneapolis, Minnesota, six miles downstream from the famous St. Anthony Falls and two miles upstream of Fort Snelling. The original Lock construction was completed in 1917, reconstructed in 1929 with the main lock completed in May 1932. It is the only twin lock in the St. Paul District.

The main lock is located along the right descending bank and consists of a lock chamber 56 feet wide by 400 feet long with an upper pool elevation of 725.1 feet, a tailwater elevation of 687.2 feet, and a maximum vertical lift of 37.9 feet. The abandoned auxiliary lock is immediately adjacent to the main lock but has only 7.5 feet of clearance over the downstream sill.



The dam consists of an Ambursen concrete overflow structure 574 feet long with a two-foot-high inflatable rubber dam along the top and a hydro power station located at the left descending bank abutment. Under a Federal Energy Regulatory Commission agreement, Brookfield Power Company operates the hydro power facility and rubber dam located at the dam's east end.

The site has a public observation deck and comfort station open from dawn to dusk each day from April to November.

History/Significance

Congress originally authorized the project in 1899 to improve navigation on the river between Minneapolis and St. Paul by providing a 4-1/2 foot channel depth. The project included two locks and dams, the present Lock and Dam No. 1 and another one upstream, completed in 1906. By 1907, Congress authorized the 6-foot channel on the Upper Mississippi River. In 1908, Congress authorized increasing the height of the dam at Lock and Dam No. 1 to allow hydro electrical power generation.

When the present lock and dam went into operation in 1917, the Corps completely abandoned the upstream lock and dam. By 1930, Congress realized the need for a deeper channel and authorized the present 9-foot channel. When completed in 1932, the second lock at Lock and Dam No. 1 provided nine feet of channel depth up to St. Anthony Falls. By the early 1980s, Lock and Dam No. 1 reached the end of its 50-year design life and underwent a major rehabilitation from 1978 to 1983 to carry on another 50 years into the future.

The lock and dam complex is also referred to as the Twin Cities (Ford) Lock and Dam.

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Annual Tonnage (20-Year Historical)

<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>
2017	6,220	2012	818,730	2007	989,706	2002	2,044,395
2016	-	2011	766,898	2006	1,307,590	2001	1,826,855
2015	309,710	2010	673,730	2005	1,159,856	2000	2,254,330
2014	713,384	2009	689,530	2004	1,510,540	1999	2,071,780
2013	827,430	2008	964,681	2003	1,983,170	1998	2,014,000

Commodity Tonnage (2017)

All Units (Ferried Autos, Passengers, Railway Cars)	-
Coal, Lignite, and Coal Coke	-
Petroleum and Petroleum Products	-
Chemicals and Related Products	-
Crude Materials, Inedible, Except Fuels	-
Primary Manufactured Goods	-
Food and Farm Products	-
Manufactured Equipment & Machinery	6,220
Waste Material	-
Unknown or Not Elsewhere Classified	-

Vessel & Lockage Data (2017)

Average Delay - Tows (Hours)	-	Non-Commercial Vessels	-
Average Processing Time (Hours)	-	Non-Commercial Flotillas	-
Barges Empty	3	Non-Commercial Lockages/Cuts	-
Barges Loaded	9	Percent Vessels Delayed (%)	-
Commercial Vessels	130	Recreational Vessels	1,844
Commercial Flotillas	127	Recreational Lockages	879
Commercial Lockages/Cuts	127	Total Vessels	1,974
Non-Vessel Lockages	-	Total Lockages/Cuts	1,006

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UPDATE: August 2018

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Lock & Dam 2

(Hastings, Minnesota)
Mississippi River

U.S. ARMY CORPS OF ENGINEERS

BUILDING STRONG.

Construction: 1928-1930 (Original riverward lock)
1941-1948 (New, landward lock)

Congressional District: MN-2

Description

Lock and Dam 2 is upstream of Hastings, Minnesota, and is 815.2 miles above the confluence of the Mississippi and Ohio rivers.

The lock is 110 feet wide by 600 feet long. The dam consists of a concrete structure 722 feet long with 19 Tainter gates, 30 feet long. The dam has 4.4 megawatt power plant owned and operated by the city of Hastings. The site includes 3,000 feet of earth embankment.

The site includes an observation platform and restrooms open from dawn to dusk each day from April to November.



History/Significance

The Corps remained committed to open-water navigation on the Upper Mississippi in 1925 when plans were made for a lock and dam complex at Hastings, Minnesota. However, this structure did not leave as much room for open-water maneuvering as the Moline and LeClaire installations. The Hastings complex, now known as Lock and Dam 2, only included a 100-foot-wide navigable pass adjacent to the lock. It also included 20 Tainter gates. In narrowing the space reserved for open-river navigation and using Tainter gates for the first time on the Upper Mississippi River, the Hastings Lock and Dam acted “as a sort of engineering link” between the Corps’ 6-foot channel structures and philosophy and its mature 9-foot channel structures and philosophy.

The original, riverward lock chamber was 110 feet by 500 feet and constructed from 1928-1930. Due to foundation conditions, some rotation of the original lock walls took place, which also affected the operation of the miter gates. Due to the foundation settlement problems, wall tilting and that the original lock chamber was of a non standard size, construction of a 110-foot by 600-foot landward lock chamber commenced in 1941. The new lock chamber was not completed until 1948 due to the suspension of all civil construction during World War II.

Annual Tonnage (20-Year Historical)

<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>
2017	10,295,708	2012	6,895,882	2007	7,042,475	2002	10,572,988
2016	10,198,774	2011	6,735,253	2006	7,341,784	2001	8,584,354
2015	7,405,823	2010	7,184,802	2005	7,291,721	2000	10,842,497
2014	6,880,464	2009	7,072,327	2004	7,828,603	1999	11,539,256
2013	6,221,953	2008	4,729,252	2003	8,861,479	1998	10,787,628

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Commodity Tonnage (2017)

All Units (Ferried Autos, Passengers, Railway Cars)	-
Coal, Lignite, and Coal Coke	8,000
Petroleum and Petroleum Products	245,100
Chemicals and Related Products	2,045,524
Crude Materials, Inedible, Except Fuels	1,328,400
Primary Manufactured Goods	837,924
Food and Farm Products	5,816,822
Manufactured Equipment & Machinery	10,738
Waste Material	-
Unknown or Not Elsewhere Classified	3,200

Vessel & Lockage Data (2017)

Average Delay - Tows (Hours)	1.06
Average Processing Time (Hours)	0.4
Barges Empty	2,508
Barges Loaded	6,504
Commercial Vessels	1,433
Commercial Flotillas	1,419
Commercial Lockages/Cuts	1,851
Non-Vessel Lockages	-
Non-Commercial Vessels	23
Non-Commercial Flotillas	23
Non-Commercial Lockages/Cuts	23
Percent Vessels Delayed (%)	30
Recreational Vessels	3,114
Recreational Lockages	1,377
Total Vessels	4,570
Total Lockages/Cuts	3,251

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Lock & Dam 3

(Welch, Minnesota)
Mississippi River

U.S. ARMY CORPS OF ENGINEERS

BUILDING STRONG.

Construction: 1935-1940

General Contractors:

Lock: Spencer, White & Prentis, Inc. New York, NY
Dam: A. Guthrie Co., St. Paul, Minn. And Hallett Construction Co., Crosby, Minn.

Congressional District: MN-2; WI-3

Description

Lock and Dam 3 is located at Mississippi River Mile 796.9 six miles upstream from Red Wing, Minnesota.

The main lock is located along the right descending bank and consists of a single lock chamber 110 feet wide by 600 feet long with an upper pool elevation of 675.0 feet, a tailwater elevation of 667.0 feet, and a vertical lift of 8.0 feet. There are miter gates at each end of the lock chamber. There is a partial auxiliary lock consisting of an upstream set of miter gates and a short concrete riverwall section. The lock foundations are set in sand, silt and clay.



The movable dam is 365 feet long and consists of four submersible roller gates (20 feet high by 80 feet long). The gates submerge to a depth of five feet and each gate has its own independent hoist machinery. Completing the dam system is a series of spot dikes along the left descending bank (Wisconsin side) and an earthen embankment approximately 2,200 feet long, located between the main lock and high ground on the Minnesota side. The gates and operating machinery were constructed and delivered to the site by Lakeside Bridge and Steel Company of Milwaukee, Wisconsin. The dam foundations are set in sand. The site has a public observation platform and restrooms open from dawn until dusk each day from April to November.

The lock's position on a bend in the river makes downbound navigation difficult because of an outdraft current that tends to sweep towboats and barges away from the lock and toward the gated part of the dam resulting in many accidents, including 11 incidents since 1968 when tows collided with the gated part of the dam. Low and weak embankments on the Wisconsin side are a related problem. Navigation accidents can render the four roller gates inoperable, resulting in overtopping and erosion of the embankments. Failure of the embankment system could result in an accidental drawdown of Pool 3 with significant economic and environmental consequences.

With 2009 federal and American Recovery and Reinvestment Act contributions, navigation improvements include three construction activities: an 862-foot long guide wall extension that was completed in April 2011, construction of a closure dike to mitigate outdraft conditions near the guide wall that was completed in October 2011, and channel dredging and the placement of approximately 150,000 cubic yards of material which was completed in February 2012. Lower embankment improvements included construction of a series of engineered embankments and spillways totaling several thousand linear feet and associated control structures. Upper embankment improvements included the reconstruction of nine channel closures along the Wisconsin embankment consisting of 1,200 feet of sheet pile and riprap erosion protection placed along the adjacent embankments and improvement to the existing access trail/vehicle roadway. Environmental mitigation included restoration of 313 acres of floodplain.

History/Significance

The lock opened in July 1938. Significant engineering items included exclusive use of submersible roller gates in the movable dam; use of "Z" sheet piling in abutment walls; and replacement of all dam substrata. Approximately

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200,000 cubic yards of unstable substrata were replaced with 130,000 cubic yards of river sand to provide a more stable foundation for the dam. It was completed at a federal cost of \$3,730,000 with 53 injuries and no fatalities.

Annual Tonnage (20-Year Historical)

<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>
2017	10,313,568	2012	6,973,381	2007	7,057,358	2002	10,585,946
2016	10,128,388	2011	6,746,894	2006	7,338,758	2001	8,575,300
2015	7,388,268	2010	7,166,302	2005	7,300,671	2000	10,868,355
2014	6,877,442	2009	7,064,757	2004	7,824,551	1999	11,549,156
2013	6,219,276	2008	4,732,120	2003	8,835,187	1998	10,780,885

Commodity Tonnage (2017)

All Units (Ferried Autos, Passengers, Railway Cars)	-	Primary Manufactured Goods	837,924
Coal, Lignite, and Coal Coke	8,000	Food and Farm Products	5,819,922
Petroleum and Petroleum Products	252,700	Manufactured Equipment & Machinery	9,698
Chemicals and Related Products	2,053,624	Waste Material	-
Crude Materials, Inedible, Except Fuels	1,328,500	Unknown or Not Elsewhere Classified	3,200

Vessel & Lockage Data (2017)

Average Delay - Tows (Hours)	1.37	Non-Commercial Vessels	10
Average Processing Time (Hours)	0.27	Non-Commercial Flotillas	10
Barges Empty	2,497	Non-Commercial Lockages/Cuts	10
Barges Loaded	6,496	Percent Vessels Delayed (%)	22
Commercial Vessels	1,711	Recreational Vessels	7,984
Commercial Flotillas	1,627	Recreational Lockages	2,838
Commercial Lockages/Cuts	2,051	Total Vessels	9,705
Non-Vessel Lockages	-	Total Lockages/Cuts	4,899

The 9-foot Channel Navigation Project

The 9-foot Channel Navigation Project includes 37 lock and dam sites (42 locks) on 1,200 river miles in Illinois, Iowa, Minnesota, Missouri and Wisconsin. Constructed largely in the 1930s, it extends from Minneapolis-St. Paul on the Upper Mississippi River to its confluence with the Ohio River and up the Illinois Waterway to the T.J. O'Brien Lock in Chicago.

The maintenance needs of this aging infrastructure have surpassed annual operations and maintenance funding. This limited funding has adversely affected reliability of the system and has primarily resulted in a fix-as-fail strategy, with repairs sometimes requiring days, weeks or months. Depending on the nature of a failure and extent of repairs, shippers, manufacturers, consumers and commodity investors can experience major financial consequences. Additionally, today's 1,200'-long tows must split and lock through in two operations within the Project's 600' chambers. This procedure doubles and triples lockage times, increases costs and wear to lock machinery, and exposes deckhands to higher accident rates.

More than 580 facilities ship and receive commodities within the Project. Grains (corn and soybeans) dominate traffic; cement and concrete products are the second largest group. A modern 15-barge tow transports the equivalent of 1,050 semi-trucks (26,250 tons, 937,387 bushels of corn, or 240 rail cars). In 2016, the 9-foot channel project generated an estimated \$2 billion of transportation cost savings compared to its approximately \$246 million operation and maintenance cost.

UPDATE: August 2018

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Lock & Dam 4

(Alma, Minnesota)
Mississippi River

U.S. ARMY CORPS OF ENGINEERS

BUILDING STRONG.

Construction: 1931-1938

General Contractors:

Lock: Ouillmette Construction & Engineering Co.,
Chicago, Ill.

Dam: United Construction Co., Winona, Minn.

Congressional District: MN-2; WI-3

Description

Lock and Dam 4 is located at Mississippi River Mile 752.8 in Alma, Wisconsin, about 90 miles below Minneapolis.

The main lock is located along the left descending bank and consists of a single lock chamber, 110 feet wide by 600 feet long with an upper pool elevation of 667.0 feet, a tailwater elevation of 660.0 feet, and a vertical lift of 7.0 feet. There are miter gates at each end of the lock chamber. There is a partial auxiliary lock consisting of an upstream set of miter gates and short concrete riverwall section. The foundation is piles in sand and gravel.



The dam consists of a concrete structure 1,357 feet long with six roller gates and 22 Tainter gates. The movable dam has six roller gates (20 feet high by 60 feet long), 18 non-submersible Tainter gates (15 feet high by 35 feet long), and four submersible Tainter gates (15 feet high by 35 feet long). Completing the dam system is an earthen embankment approximately 5,500 feet long, located between the movable dam and high ground on the Minnesota side of the river. The dam foundation consists of piles in sand and gravel. The site has a public observation platform open from dawn to dusk from April to November.

History/Significance

The lock was put in operation in May 1935. At the time it was built, the dam's combination of roller and Tainter gates was believed to have been the first of its type to be constructed. Cold weather created several problems during construction of the complex. Approximately 120 timber pilings split and had to be pulled and replaced; engineers speculated that sap freezing in the green pilings may have caused the splitting. Ten major injuries, 296 minor injuries, and three deaths were reported during the construction of the dam.

The pool created by Lock and Dam 4 is the longest in river miles (44.1 miles) with the largest water area of all the Mississippi River pools in the St. Paul District. It encompasses Lake Pepin, which was formed in geologic time by sediment deposited in the Mississippi River at the mouth of Wisconsin's Chippewa River. The lake is 22 miles long and up to 2.5 miles wide. It is the only natural lake in the Mississippi River's main channel.

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Annual Tonnage (20-Year Historical)

<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>
2017	11,290,033	2012	7,720,632	2007	7,842,780	2002	11,534,928
2016	11,195,854	2011	7,480,662	2006	8,238,928	2001	9,355,461
2015	8,056,761	2010	7,919,466	2005	8,054,094	2000	11,798,328
2014	7,356,865	2009	7,760,740	2004	8,575,017	1999	12,340,409
2013	6,779,341	2008	5,314,060	2003	9,797,604	1998	11,639,859

Commodity Tonnage (2017)

All Units (Ferried Autos, Passengers, Railway Cars)	-
Coal, Lignite, and Coal Coke	15,800
Petroleum and Petroleum Products	246,370
Chemicals and Related Products	2,048,824
Crude Materials, Inedible, Except Fuels	1,396,900
Primary Manufactured Goods	849,652
Food and Farm Products	6,719,900
Manufactured Equipment & Machinery	9,386
Waste Material	-
Unknown or Not Elsewhere Classified	3,201

Vessel & Lockage Data (2017)

Average Delay - Tows (Hours)	0.88	Non-Commercial Vessels	35
Average Processing Time (Hours)	0.39	Non-Commercial Flotillas	35
Barges Empty	2,910	Non-Commercial Lockages/Cuts	35
Barges Loaded	7,425	Percent Vessels Delayed (%)	13
Commercial Vessels	1,447	Recreational Vessels	4,423
Commercial Flotillas	1,436	Recreational Lockages	1,831
Commercial Lockages/Cuts	1,966	Total Vessels	5,905
Non-Vessel Lockages	-	Total Lockages/Cuts	3,832

The 9-foot Channel Navigation Project

The 9-foot Channel Navigation Project includes 37 lock and dam sites (42 locks) on 1,200 river miles in Illinois, Iowa, Minnesota, Missouri and Wisconsin. Constructed largely in the 1930s, it extends from Minneapolis-St. Paul on the Upper Mississippi River to its confluence with the Ohio River and up the Illinois Waterway to the T.J. O'Brien Lock in Chicago.

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More than 580 facilities ship and receive commodities within the Project. Grains (corn and soybeans) dominate traffic; cement and concrete products are the second largest group. A modern 15-barge tow transports the equivalent of 1,050 semi-trucks (26,250 tons, 937,387 bushels of corn, or 240 rail cars). In 2016, the 9-foot channel project generated an estimated \$2 billion of transportation cost savings compared to its approximately \$246 million operation and maintenance cost.

UPDATE: August 2018

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Lock & Dam 5

(Minnesota City, Minnesota)
Mississippi River

U.S. ARMY CORPS OF ENGINEERS

BUILDING STRONG.

Construction: 1933-1939

General Contractors:

Lock: Edward E. Gillen Co., Milwaukee, Wisc.

Dam: Merritt-Chapman & Whitney Corp., Cleveland, Ohio

Congressional District: MN-1; WI-3

Description

Lock and Dam 5 is located at Mississippi River Mile 738.1 in Minnesota City, Minnesota, 5.5 miles upstream of Fountain City, Wisconsin.

The main lock is located along the right descending bank and consists of a single lock chamber 110 feet wide by 600 feet long with an upper pool elevation of 660.0 feet, a tailwater elevation of 651.0 feet, and a vertical lift of 9.0 feet. There are miter gates at each end of the lock chamber and a partial auxiliary lock consisting of an upstream set of miter gates and short concrete riverwall section. The foundation consists of piles in sand and gravel.



The movable dam has six roller gates (20 feet high by 60 feet long), 24 non-submersible Tainter gates (15 feet high by 35 feet long), and four submersible Tainter gates (15 feet high by 35 feet long). The dam consists of a concrete structure 1,619 feet long and an earthen embankment approximately 18,500 feet long, located between the movable dam and high ground on the Wisconsin side of the river. The dam foundation is set on piles in sand.

The site has a public observation platform and restrooms open from dawn to dusk from April to November.

History/Significance

The lock was put into operation in May 1935. Lock and Dam 5 was a group "A" priority, and the second installation completed in the St. Paul District. Typical of other 9-foot channel installations, the roller gates on Dam 5 were located in the main channel, where they could handle the greatest flooding and heavy ice flow conditions. One fatal accident, involving a private craft, occurred during the construction of the dam. In 1934, the site hosted a presidential visit by Franklin Roosevelt.

Annual Tonnage (20-Year Historical)

<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>
2017	11,322,412	2012	7,851,166	2007	8,490,491	2002	11,785,323
2016	11,202,324	2011	7,543,650	2006	8,864,957	2001	9,487,157
2015	8,080,646	2010	7,974,264	2005	8,496,606	2000	12,048,853
2014	7,387,985	2009	8,019,206	2004	9,066,765	1999	12,770,886
2013	6,790,545	2008	5,741,647	2003	10,083,659	1998	11,966,982

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Commodity Tonnage (2017)

All Units (Ferried Autos, Passengers, Railway Cars)	-
Coal, Lignite, and Coal Coke	15,800
Petroleum and Petroleum Products	252,470
Chemicals and Related Products	2,055,224
Crude Materials, Inedible, Except Fuels	1,396,900
Primary Manufactured Goods	852,652
Food and Farm Products	6,734,500
Manufactured Equipment & Machinery	11,666
Waste Material	-
Unknown or Not Elsewhere Classified	3,200

Vessel & Lockage Data (2017)

Average Delay - Tows (Hours)	1.09
Average Processing Time (Hours)	0.44
Barges Empty	2,904
Barges Loaded	7,455
Commercial Vessels	1,454
Commercial Flotillas	1,442
Commercial Lockages/Cuts	1,975
Non-Vessel Lockages	-
Non-Commercial Vessels	31
Non-Commercial Flotillas	31
Non-Commercial Lockages/Cuts	31
Percent Vessels Delayed (%)	33
Recreational Vessels	2,854
Recreational Lockages	1,290
Total Vessels	4,339
Total Lockages/Cuts	3,296

The 9-foot Channel Navigation Project

The 9-foot Channel Navigation Project includes 37 lock and dam sites (42 locks) on 1,200 river miles in Illinois, Iowa, Minnesota, Missouri and Wisconsin. Constructed largely in the 1930s, it extends from Minneapolis-St. Paul on the Upper Mississippi River to its confluence with the Ohio River and up the Illinois Waterway to the T.J. O'Brien Lock in Chicago.

The maintenance needs of this aging infrastructure have surpassed annual operations and maintenance funding. This limited funding has adversely affected reliability of the system and has primarily resulted in a fix-as-fail strategy, with repairs sometimes requiring days, weeks or months. Depending on the nature of a failure and extent of repairs, shippers, manufacturers, consumers and commodity investors can experience major financial consequences. Additionally, today's 1,200'-long tows must split and lock through in two operations within the Project's 600' chambers. This procedure doubles and triples lockage times, increases costs and wear to lock machinery, and exposes deckhands to higher accident rates.

More than 580 facilities ship and receive commodities within the Project. Grains (corn and soybeans) dominate traffic; cement and concrete products are the second largest group. A modern 15-barge tow transports the equivalent of 1,050 semi-trucks (26,250 tons, 937,387 bushels of corn, or 240 rail cars). In 2016, the 9-foot channel project generated an estimated \$2 billion of transportation cost savings compared to its approximately \$246 million operation and maintenance cost.

UPDATE: August 2018

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Lock & Dam 5A

(Fountain City, Wisconsin)
Mississippi River

U.S. ARMY CORPS OF ENGINEERS

BUILDING STRONG.

Construction: 1934-1938

General Contractors:

Lock: McCarthy Improvement Co., Davenport, Iowa

Dam: United Construction Co. Winona, Minn.

Congressional District: MN-1: WI-3

Description

Lock and Dam No. 5A is located at Mississippi River Mile 728.5 below Fountain City, Wisconsin, three miles above Winona, Minnesota.

The main lock is located along the right-descending bank and consists of a single lock chamber 110 feet wide by 600 feet long with an upper pool elevation of 651.0 feet, a tailwater elevation of 645.5 feet, and a vertical lift of 5.5 feet. Miter gates are at each end of the lock chamber. A partial auxiliary lock consists of an upstream set of miter gates and a short concrete riverwall.



The concrete, 682-foot-long movable dam has five roller gates (20 feet high by 80 feet long) and five non-submersible Tainter gates (15 feet high by 35 feet long), located between the main lock and the railroad line along the left-descending bank. Completing the dam system is an earthen embankment approximately 22,000 feet long, between the main lock and high ground on the Minnesota side, with a 1,000-foot-long concrete overflow spillway.

The site has no public facilities.

History/Significance

The lock was put in operation in 1936. At the time of construction, the site consisted of low, swampy ground separated by three sloughs: Blackbird, Straight and Crooked sloughs. Many small lakes were in the area, interrupted by sections of relatively high ground. The site, located in the middle of the river channel, incorporated a number of islands into its earth dike system. The location of the complex in a slough in the left side of Islands 67 and 68 allowed for the main channel to serve an exclusive spillway function.

The original plan for the 9-foot channel system did not include this installation. However, due to pooling problems projected as a result of the construction of Lock and Dam No. 6 in conjunction with the City of Winona, this installation was designed and given a "B" priority.

Annual Tonnage (20-Year Historical)

<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>
2017	11,388,295	2012	7,660,368	2007	8,534,287	2002	11,764,068
2016	11,194,783	2011	7,546,428	2006	8,845,481	2001	9,482,382
2015	8,054,837	2010	7,981,410	2005	8,495,316	2000	12,109,247
2014	7,370,962	2009	7,995,081	2004	9,056,299	1999	12,760,903
2013	6,781,454	2008	5,720,567	2003	10,098,734	1998	11,895,991

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Commodity Tonnage (2017)

All Units (Ferried Autos, Passengers, Railway Cars)	-
Coal, Lignite, and Coal Coke	15,800
Petroleum and Petroleum Products	252,505
Chemicals and Related Products	2,088,924
Crude Materials, Inedible, Except Fuels	1,426,210
Primary Manufactured Goods	862,296
Food and Farm Products	6,706,100
Manufactured Equipment & Machinery	33,260
Waste Material	-
Unknown or Not Elsewhere Classified	3,200

Vessel & Lockage Data (2017)

Average Delay - Tows (Hours)	0.93
Average Processing Time (Hours)	0.38
Barges Empty	3,108
Barges Loaded	7,450
Commercial Vessels	1,534
Commercial Flotillas	1,523
Commercial Lockages/Cuts	2,053
Non-Vessel Lockages	-
Non-Commercial Vessels	78
Non-Commercial Flotillas	78
Non-Commercial Lockages/Cuts	78
Percent Vessels Delayed (%)	32
Recreational Vessels	3,640
Recreational Lockages	1,327
Total Vessels	5,252
Total Lockages/Cuts	3,458

The 9-foot Channel Navigation Project

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More than 580 facilities ship and receive commodities within the Project. Grains (corn and soybeans) dominate traffic; cement and concrete products are the second largest group. A modern 15-barge tow transports the equivalent of 1,050 semi-trucks (26,250 tons, 937,387 bushels of corn, or 240 rail cars). In 2016, the 9-foot channel project generated an estimated \$2 billion of transportation cost savings compared to its approximately \$246 million operation and maintenance cost.

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Lock & Dam 6

(Trempealeau, Wisconsin)
Mississippi River

U.S. ARMY CORPS OF ENGINEERS

BUILDING STRONG.

Construction: 1933-1938

General Contractors:

Lock and Dam: Spencer, White & Prentix, Inc., NY, NY

Congressional District: MN-1; WI-3

Description

Lock and Dam 6 is located at Mississippi River Mile 714.1 at Trempealeau, Wisconsin, 139 miles below Minneapolis.

The main lock is located along the left descending bank and consists of one lock chamber 110 feet wide by 600 feet long with an upper pool elevation of 645.5 feet, a tailwater elevation of 639.0 feet, and a vertical lift of 6.5 feet. Miter gates are at each end of the lock chamber. A partial auxiliary lock consists of an upstream set of miter gates and a short concrete riverwall section.



The movable dam consists of an 893-foot-long concrete structure with five roller gates (20 feet high by 80 feet long) and 10 non-submersible Tainter gates (15 feet high by 35 feet long), and is located adjacent to the auxiliary lock. Completing the dam system is an earthen embankment approximately 1,600 feet long, located between the movable dam and high ground on the Minnesota side of the river, with a 1,000-foot-long concrete overflow spillway.

The site has a public observation platform and restrooms open from dawn to dusk from April to November.

History/Significance

The lock was put in operation in June of 1936. The Tainter gates in Dam 6 were the first in the St. Paul District to employ independent operating machinery instead of hoist car systems. During construction, the frozen river was sometimes used as a work base, as the ice was often 12 to 18 inches thick. Piles were dragged over the ice by teams of draft animals. The construction of Lock and Dam 6 also resulted in innovations in pile driving. Timber pilings – elm, maple, hickory, ash, oak, yellow birch, and pine – were driven by new, skid-type, pile drivers built on the job site by a contractor. A new method of keeping the pile drivers level was also developed by the contractor.

Annual Tonnage (20-Year Historical)

<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>
2017	13,828,631	2012	9,397,600	2007	10,409,260	2002	14,449,692
2016	13,502,558	2011	9,466,577	2006	10,965,857	2001	11,956,278
2015	9,809,195	2010	9,674,907	2005	10,381,229	2000	14,877,036
2014	9,089,319	2009	9,484,567	2004	10,754,999	1999	15,793,578
2013	8,064,999	2008	7,240,756	2003	12,232,401	1998	14,468,324

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Commodity Tonnage (2017)

All Units (Ferried Autos, Passengers, Railway Cars)	-
Coal, Lignite, and Coal Coke	19,000
Petroleum and Petroleum Products	252,500
Chemicals and Related Products	2,547,148
Crude Materials, Inedible, Except Fuels	1,523,600
Primary Manufactured Goods	903,120
Food and Farm Products	8,540,900
Manufactured Equipment & Machinery	39,163
Waste Material	-
Unknown or Not Elsewhere Classified	3,200

Vessel & Lockage Data (2017)

Average Delay - Tows (Hours)	1.34
Average Processing Time (Hours)	0.44
Barges Empty	3,784
Barges Loaded	8,978
Commercial Vessels	1,646
Commercial Flotillas	1,591
Commercial Lockages/Cuts	2,305
Non-Vessel Lockages	-
Non-Commercial Vessels	45
Non-Commercial Flotillas	45
Non-Commercial Lockages/Cuts	45
Percent Vessels Delayed (%)	34
Recreational Vessels	2,742
Recreational Lockages	1,235
Total Vessels	4,433
Total Lockages/Cuts	3,585

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Lock & Dam 7

(La Crescent, Minnesota)
Mississippi River

U.S. ARMY CORPS OF ENGINEERS

BUILDING STRONG.

Construction: 1933-1940

General Contractors:

Lock: Nolan Brothers and Minneapolis Dredging Co.,
Minneapolis, Minn., and Dearborn Electrical
Construction Co., Chicago, Ill.

Dam: Warner Construction Co., Chicago, Ill.

Congressional District: MN-1; WI-3

Description

Lock and Dam 7 is located at Mississippi River Mile 702.5 near La Crescent, Minnesota, 4.5 miles above LaCrosse, Wisconsin.

The main lock is located along the right descending bank and consists of a single lock chamber 110 feet wide by 600 feet long with an upper pool elevation of 639.0 feet, a tailwater elevation of 631.0 feet, and a vertical lift of 8.0 feet. There are miter gates at each end of the lock chamber. There is a partial auxiliary lock consisting of an upstream set of miter gates and short concrete riverwall section.



The movable dam consists of a concrete structure 940 feet long with five roller gates (20 feet high by 80 feet long), nine non-submersible Tainter gates (15 feet high by 35 feet long), and two submersible Tainter gates (15 feet high by 35 feet long), and is located adjacent to the auxiliary lock. Completing the dam system are two earthen embankment segments: the French Island embankment approximately 7,000 feet long, located between the movable dam and French Island, with a concrete overflow spillway 1,000 feet long; and the Onalaska embankment approximately 1,600 feet long, located between French Island and Onalaska, with a concrete overflow spillway 677 feet long.

The site has a public observation platform, outside displays, a visitors center, and restrooms open from dawn to dusk from April through mid-October.

History/Significance

The Lock was put in operation in April 1937. Originally scheduled to be nearer to La Crosse, this complex was relocated because of water level problems connected with the La Crosse site. The design of the complex was heavily influenced by French Island, which was incorporated into the design as a natural dike, and the Dresbach Slough, which was reopened to provide the upper approach to the lock.

At the completion of its major rehabilitation, the Corps restored the original control building into a visitors center, which is on the National Historic Register. The displays interpret the Corps role in assisting with management of the river resources.

The complex was built at a federal cost of \$6,776,000.

U.S. ARMY CORPS OF ENGINEERS – ST. PAUL DISTRICT

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Annual Tonnage (20-Year Historical)

<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>
2017	13,801,330	2012	9,282,753	2007	10,429,410	2002	14,460,872
2016	13,484,006	2011	9,477,117	2006	10,913,536	2001	12,000,987
2015	9,833,174	2010	9,732,976	2005	10,391,612	2000	14,816,119
2014	9,359,996	2009	9,546,522	2004	10,786,169	1999	15,856,894
2013	8,234,572	2008	7,258,768	2003	12,297,081	1998	14,454,177

Commodity Tonnage (2017)

All Units (Ferried Autos, Passengers, Railway Cars)	-
Coal, Lignite, and Coal Coke	9,600
Petroleum and Petroleum Products	252,500
Chemicals and Related Products	2,561,568
Crude Materials, Inedible, Except Fuels	1,536,300
Primary Manufactured Goods	888,202
Food and Farm Products	8,534,200
Manufactured Equipment & Machinery	15,760
Waste Material	-
Unknown or Not Elsewhere Classified	3,200

Vessel & Lockage Data (2017)

Average Delay - Tows (Hours)	1.31	Non-Commercial Vessels	36
Average Processing Time (Hours)	0.43	Non-Commercial Flotillas	35
Barges Empty	3,769	Non-Commercial Lockages/Cuts	35
Barges Loaded	8,910	Percent Vessels Delayed (%)	28
Commercial Vessels	2,189	Recreational Vessels	3,754
Commercial Flotillas	2,098	Recreational Lockages	1,207
Commercial Lockages/Cuts	2,654	Total Vessels	5,979
Non-Vessel Lockages	-	Total Lockages/Cuts	3,896

The 9-foot Channel Navigation Project

The 9-foot Channel Navigation Project includes 37 lock and dam sites (42 locks) on 1,200 river miles in Illinois, Iowa, Minnesota, Missouri and Wisconsin. Constructed largely in the 1930s, it extends from Minneapolis-St. Paul on the Upper Mississippi River to its confluence with the Ohio River and up the Illinois Waterway to the T.J. O'Brien Lock in Chicago.

The maintenance needs of this aging infrastructure have surpassed annual operations and maintenance funding. This limited funding has adversely affected reliability of the system and has primarily resulted in a fix-as-fail strategy, with repairs sometimes requiring days, weeks or months. Depending on the nature of a failure and extent of repairs, shippers, manufacturers, consumers and commodity investors can experience major financial consequences. Additionally, today's 1,200'-long tows must split and lock through in two operations within the Project's 600' chambers. This procedure doubles and triples lockage times, increases costs and wear to lock machinery, and exposes deckhands to higher accident rates.

More than 580 facilities ship and receive commodities within the Project. Grains (corn and soybeans) dominate traffic; cement and concrete products are the second largest group. A modern 15-barge tow transports the equivalent of 1,050 semi-trucks (26,250 tons, 937,387 bushels of corn, or 240 rail cars). In 2016, the 9-foot channel project generated an estimated \$2 billion of transportation cost savings compared to its approximately \$246 million operation and maintenance cost.

UPDATE: August 2018

U.S. ARMY CORPS OF ENGINEERS – ST. PAUL DISTRICT

180 5TH STREET EAST, SUITE 700, ST. PAUL, MN 55101-1678
Public Affairs Office, (651) 290-5200, www.mvp.usace.army.mil



Lock & Dam 8

(Genoa, Wisconsin)
Mississippi River

U.S. ARMY CORPS OF ENGINEERS

BUILDING STRONG.

Construction: 1933-1938

General Contractors:

Lock: Jutton-Kelly Company, Milwaukee, Wisc.

Dam: Siems-Helmets, Inc., St. Paul, Minn.

Congressional District: MN-1; WI-3

Description

Lock and Dam 8 is located at Mississippi River Mile 679.2 near Genoa, Wisconsin, 173.4 miles below Minneapolis.

The main lock is located along the left descending bank and consists of one lock chamber 110 feet wide by 600 feet long with an upper pool elevation of 631.0 feet, a tailwater elevation of 620.0 feet, and a vertical lift of 11.0 feet. There are miter gates at each end of the lock chamber. There is a partial auxiliary lock consisting of an upstream set of miter gates and short concrete riverwall section. The foundation material consists of piles in sand, gravel and broken clay.



The movable dam consists of a concrete structure 934 feet long with five roller gates (20 feet high by 80 feet long), eight non-submersible Tainter gates (15 feet high by 35 feet long), and two submersible Tainter gates (15 feet high by 35 feet long), and is located adjacent to the auxiliary lock. Completing the dam system is an earthen embankment approximately 15,000 feet long, located between the movable dam and high ground on the Minnesota side of the river, with two submersible sheetpile cell spillways, 938 and 1,338 feet long, respectively. The foundation consists of piles in sand and gravel.

The site has a public observation platform and restrooms open from dawn to dusk from April to November.

History/Significance

The Lock was put in operation in April 1937. The design of Lock and Dam 8 was not dictated by unusual river hydrology so much as for the need for a lock and dam system at that point of the river so that the 9-foot channel system might function properly. Eighty-six accidents and one fatality occurred during dam construction; no accidents or fatalities were reported during construction of the lock. The complex was completed at an estimated federal cost of \$7,728,000.

Annual Tonnage (20-Year Historical)

<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>
2017	14,729,342	2012	10,118,566	2007	11,077,630	2002	15,331,794
2016	14,554,997	2011	10,277,231	2006	11,712,327	2001	12,755,176
2015	10,671,661	2010	10,442,426	2005	11,090,000	2000	15,870,548
2014	9,754,119	2009	10,085,073	2004	12,569,495	1999	16,826,021
2013	8,660,029	2008	7,928,446	2003	13,160,824	1998	15,295,618

U.S. ARMY CORPS OF ENGINEERS – ST. PAUL DISTRICT

180 5TH STREET EAST, SUITE 700, ST. PAUL, MN 55101-1678

Public Affairs Office, (651) 290-5200, www.mvp.usace.army.mil

Commodity Tonnage (2017)

All Units (Ferried Autos, Passengers, Railway Cars)	-
Coal, Lignite, and Coal Coke	25,500
Petroleum and Petroleum Products	237,500
Chemicals and Related Products	2,614,568
Crude Materials, Inedible, Except Fuels	1,586,800
Primary Manufactured Goods	1,125,680
Food and Farm Products	9,119,300
Manufactured Equipment & Machinery	16,794
Waste Material	-
Unknown or Not Elsewhere Classified	3,200

Vessel & Lockage Data (2017)

Average Delay - Tows (Hours)	1.2
Average Processing Time (Hours)	0.57
Barges Empty	4,016
Barges Loaded	9,402
Commercial Vessels	1,571
Commercial Flotillas	1,553
Commercial Lockages/Cuts	2,353
Non-Vessel Lockages	-
Non-Commercial Vessels	24
Non-Commercial Flotillas	24
Non-Commercial Lockages/Cuts	24
Percent Vessels Delayed (%)	38
Recreational Vessels	2,769
Recreational Lockages	985
Total Vessels	4,364
Total Lockages/Cuts	3,362

The 9-foot Channel Navigation Project

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The maintenance needs of this aging infrastructure have surpassed annual operations and maintenance funding. This limited funding has adversely affected reliability of the system and has primarily resulted in a fix-as-fail strategy, with repairs sometimes requiring days, weeks or months. Depending on the nature of a failure and extent of repairs, shippers, manufacturers, consumers and commodity investors can experience major financial consequences. Additionally, today's 1,200'-long tows must split and lock through in two operations within the Project's 600' chambers. This procedure doubles and triples lockage times, increases costs and wear to lock machinery, and exposes deckhands to higher accident rates.

More than 580 facilities ship and receive commodities within the Project. Grains (corn and soybeans) dominate traffic; cement and concrete products are the second largest group. A modern 15-barge tow transports the equivalent of 1,050 semi-trucks (26,250 tons, 937,387 bushels of corn, or 240 rail cars). In 2016, the 9-foot channel project generated an estimated \$2 billion of transportation cost savings compared to its approximately \$246 million operation and maintenance cost.

UPDATE: August 2018

U.S. ARMY CORPS OF ENGINEERS – ST. PAUL DISTRICT

180 5TH STREET EAST, SUITE 700, ST. PAUL, MN 55101-1678
Public Affairs Office, (651) 290-5200, www.mvp.usace.army.mil



Lock & Dam 9

(Lynxville, Wisconsin)
Mississippi River

U.S. ARMY CORPS OF ENGINEERS

BUILDING STRONG.

Construction: 1936-1940

General Contractors:

Lock: Walter W. Magee Company, St. Paul, Minn.

Dam: United Construction Company, Winona, Minn.

Congressional District: IA-1; WI-3

Description

Lock and Dam 9 is located at Mississippi River Mile 647.9 near Lynxville, Wisconsin, 205.1 miles below Minneapolis.

The main lock is located along the left descending bank and consists of a single lock chamber 110 feet wide by 600 feet long with an upper pool elevation of 620.0 feet, a tailwater elevation of 611.0 feet, and a vertical lift of 9.0 feet. There are miter gates at each end of the lock chamber. There is a partial auxiliary lock consisting of an upstream set of miter gates and short concrete riverwall section.



The movable dam consists of concrete structure 811 feet long with five roller gates (20-feet high by 80-feet long), six non-submersible Tainter gates (15 feet high by 35 feet long), and two submersible Tainter gates (15 feet high by 35 feet long), and is located adjacent to the auxiliary lock. Completing the dam system is an earthen embankment approximately 7,200 feet long, located between the movable dam and high ground on the Iowa side of the river, with a submersible sheetpile cell spillway 1,350 feet long.

The site has a public observation platform and restrooms open from dawn to dusk from April to November.

History/Significance

The Lock was put in operation in July 1937.

Due to a good 6-foot channel and relatively trouble-free engineering and environmental characteristics, Lock and Dam 9 was a group "B" priority, and the second-to-last complex built by the St. Paul District. The complex was completed at an estimated federal cost of \$8,287,000.

Annual Tonnage (20-Year Historical)

<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>
2017	16,374,241	2012	11,753,980	2007	13,354,186	2002	17,352,121
2016	15,995,343	2011	11,526,240	2006	13,923,104	2001	14,570,356
2015	12,541,853	2010	12,107,482	2005	13,395,636	2000	17,742,027
2014	11,125,301	2009	12,009,688	2004	13,256,894	1999	18,820,219
2013	10,046,747	2008	10,368,822	2003	14,995,775	1998	17,053,268

U.S. ARMY CORPS OF ENGINEERS – ST. PAUL DISTRICT

180 5TH STREET EAST, SUITE 700, ST. PAUL, MN 55101-1678

Public Affairs Office, (651) 290-5200, www.mvp.usace.army.mil

Commodity Tonnage (2017)

All Units (Ferried Autos, Passengers, Railway Cars)	-
Coal, Lignite, and Coal Coke	1,580,900
Petroleum and Petroleum Products	236,525
Chemicals and Related Products	2,620,668
Crude Materials, Inedible, Except Fuels	1,594,200
Primary Manufactured Goods	1,138,704
Food and Farm Products	9,169,300
Manufactured Equipment & Machinery	30,744
Waste Material	-
Unknown or Not Elsewhere Classified	3,200

Vessel & Lockage Data (2017)

Average Delay - Tows (Hours)	1.02
Average Processing Time (Hours)	0.5
Barges Empty	3,519
Barges Loaded	10,432
Commercial Vessels	1,596
Commercial Flotillas	1,586
Commercial Lockages/Cuts	2,416
Non-Vessel Lockages	-
Non-Commercial Vessels	27
Non-Commercial Flotillas	27
Non-Commercial Lockages/Cuts	27
Percent Vessels Delayed (%)	39
Recreational Vessels	3,601
Recreational Lockages	1,397
Total Vessels	5,224
Total Lockages/Cuts	3,840

The 9-foot Channel Navigation Project

The 9-foot Channel Navigation Project includes 37 lock and dam sites (42 locks) on 1,200 river miles in Illinois, Iowa, Minnesota, Missouri and Wisconsin. Constructed largely in the 1930s, it extends from Minneapolis-St. Paul on the Upper Mississippi River to its confluence with the Ohio River and up the Illinois Waterway to the T.J. O'Brien Lock in Chicago.

The maintenance needs of this aging infrastructure have surpassed annual operations and maintenance funding. This limited funding has adversely affected reliability of the system and has primarily resulted in a fix-as-fail strategy, with repairs sometimes requiring days, weeks or months. Depending on the nature of a failure and extent of repairs, shippers, manufacturers, consumers and commodity investors can experience major financial consequences. Additionally, today's 1,200'-long tows must split and lock through in two operations within the Project's 600' chambers. This procedure doubles and triples lockage times, increases costs and wear to lock machinery, and exposes deckhands to higher accident rates.

More than 580 facilities ship and receive commodities within the Project. Grains (corn and soybeans) dominate traffic; cement and concrete products are the second largest group. A modern 15-barge tow transports the equivalent of 1,050 semi-trucks (26,250 tons, 937,387 bushels of corn, or 240 rail cars). In 2016, the 9-foot channel project generated an estimated \$2 billion of transportation cost savings compared to its approximately \$246 million operation and maintenance cost.

UPDATE: August 2018

U.S. ARMY CORPS OF ENGINEERS – ST. PAUL DISTRICT

180 5TH STREET EAST, SUITE 700, ST. PAUL, MN 55101-1678
Public Affairs Office, (651) 290-5200, www.mvp.usace.army.mil



Lock & Dam 10

(Guttenberg, Iowa)
Mississippi River

U.S. ARMY CORPS OF ENGINEERS

BUILDING STRONG.

Construction: 1934-1937

General Contractors:

Lock: Hanlon and Oakes, St. Paul, Minnesota

Dam: McCarthy Improvement Company, Davenport, Iowa

Congressional District: IA-1; WI-3

Description

Lock and Dam 10 is located at Mississippi River Mile 615.0 in Guttenberg, Iowa.

The main lock is located along the right descending bank and consists of one lock chamber 110 feet wide by 600 feet long with an upper pool elevation of 611.0 feet, a tailwater elevation of 603.0 feet, and a vertical lift of 8.0 feet. Miter gates are at each end of the lock chamber. There is a partial auxiliary lock consisting of an upstream set of miter gates and a short concrete riverwall section.



The movable dam consists of a concrete dam 763 feet long with four roller gates (20 feet high by 80 feet long), six non-submersible Tainter gates (20 feet high by 40 feet long), and two submersible Tainter gates (20 feet high by 40 feet long), and is located adjacent to the auxiliary lock. Completing the dam system is an earthen embankment approximately 4,600 feet long, located between the movable dam and high ground on the Wisconsin side of the river, with a concrete overflow spillway 1,200 feet long.

The site has a public observation platform and restrooms open from dawn to dusk from April to November.

History/Significance

The Lock was put in operation in November 1937.

Built under the supervision and direction of the Rock Island District, Lock and Dam 10 was transferred to St. Paul District's jurisdiction on October 1, 1939. The complex was completed at an estimated federal cost of \$6,647,000.

Annual Tonnage (20-Year Historical)

<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>
2017	18,877,442	2012	13,494,592	2007	15,642,174	2002	20,528,892
2016	18,909,783	2011	13,158,081	2006	16,429,337	2001	16,529,414
2015	14,338,743	2010	13,914,432	2005	15,820,138	2000	19,956,214
2014	12,506,261	2009	13,800,501	2004	15,185,622	1999	22,005,796
2013	10,971,970	2008	11,851,569	2003	17,624,731	1998	19,417,877

U.S. ARMY CORPS OF ENGINEERS – ST. PAUL DISTRICT

180 5TH STREET EAST, SUITE 700, ST. PAUL, MN 55101-1678

Public Affairs Office, (651) 290-5200, www.mvp.usace.army.mil

Commodity Tonnage (2017)

All Units (Ferried Autos, Passengers, Railway Cars)	-
Coal, Lignite, and Coal Coke	1,600,024
Petroleum and Petroleum Products	238,100
Chemicals and Related Products	2,860,448
Crude Materials, Inedible, Except Fuels	1,739,000
Primary Manufactured Goods	1,134,912
Food and Farm Products	11,247,544
Manufactured Equipment & Machinery	39,814
Waste Material	14,400
Unknown or Not Elsewhere Classified	3,200

Vessel & Lockage Data (2017)

Average Delay - Tows (Hours)	1.37
Average Processing Time (Hours)	0.53
Barges Empty	4,515
Barges Loaded	12,004
Commercial Vessels	1,922
Commercial Flotillas	1,908
Commercial Lockages/Cuts	2,877
Non-Vessel Lockages	-
Non-Commercial Vessels	18
Non-Commercial Flotillas	18
Non-Commercial Lockages/Cuts	18
Percent Vessels Delayed (%)	52
Recreational Vessels	1,627
Recreational Lockages	713
Total Vessels	3,567
Total Lockages/Cuts	3,608

The 9-foot Channel Navigation Project

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More than 580 facilities ship and receive commodities within the Project. Grains (corn and soybeans) dominate traffic; cement and concrete products are the second largest group. A modern 15-barge tow transports the equivalent of 1,050 semi-trucks (26,250 tons, 937,387 bushels of corn, or 240 rail cars). In 2016, the 9-foot channel project generated an estimated \$2 billion of transportation cost savings compared to its approximately \$246 million operation and maintenance cost.

UPDATE: August 2018

U.S. ARMY CORPS OF ENGINEERS – ST. PAUL DISTRICT

180 5TH STREET EAST, SUITE 700, ST. PAUL, MN 55101-1678

Public Affairs Office, (651) 290-5200, www.mvp.usace.army.mil



Lock & Dam 11

(Dubuque, Iowa)
Mississippi River

U.S. ARMY CORPS OF ENGINEERS

BUILDING STRONG.

Construction: 1934-1937

General Contractors:

Lock: Warner Construction Company, Chicago, Ill.

Dam: Maxon Construction Company, Inc., Dayton, Ohio

Congressional District: IA-1; WI-3

Description

Lock and Dam 11 borders on the northern edge of Dubuque, Iowa, and is 583 miles above the confluence of the Mississippi and Ohio rivers. A complex of islands and sloughs extends three-quarters of the way across the river from the Wisconsin shore. The Upper Mississippi River Wildlife and Fish Refuge occupies the land adjacent to the Wisconsin shore, both upstream and downstream from the dam.



Lock dimensions are 110 feet wide by 600 feet long with additional provisions for an auxiliary lock. The maximum lift is 11 feet with an average lift of 9.4 feet. It takes approximately seven minutes to fill or empty the lock chamber.

The movable dam has 13 submersible Tainter gates (20-feet high by 60-feet long) and three submersible roller gates (20-feet high by 100-feet long). The roller gates submerge eight feet. The dam system also includes a 3,540-foot long, curved, non-overflow, earth and sand-filled dike. It takes nine hours for water to travel from Lock and Dam 10, in Guttenberg, Iowa, to Lock and Dam 11.

History/Significance

Construction of Lock 11 began in February 1934 and was completed in August 1936. Construction of Dam 11 began in September 1935 and was completed in May 1937. The structure was placed in operation on September 14, 1937. Dams 11 and 18 were designed concurrently, and were the first dams in the Rock Island District to employ submersible, elliptical Tainter gates. They were also the first dams in the District to use submersible roller gates.

Lock and Dam 11 was scheduled to be above Sprecht's Ferry, Iowa, but in 1933 was relocated to Dubuque. The acute unemployment in Dubuque led the government to begin construction on this complex before others of its class. During the peak of construction, the complex employed 901 people.

River stages both aided and hindered the contractor in his work. The contractor had difficulty with cofferdam failures. The cofferdams failed three times and, in addition, the inside row of piling in two cells bulged inward, necessitating emergency repairs to the cofferdams. During the spring of 1936, when the snowmelt flood passed through the Dubuque area, the cofferdams were overtopped. During the spring of 1937, work was completed prior to overtopping; thus work was not halted due to flood conditions. The contractor was granted an extension of 37 days for extreme temperatures of -33 degrees during the winter of 1936 and +106 degrees in July 1936. The lock and dam elements of the complex were completed at a federal cost of \$7,430,000.

U.S. ARMY CORPS OF ENGINEERS – ROCK ISLAND DISTRICT

CLOCK TOWER BUILDING, P.O. BOX 2004, ROCK ISLAND, IL 61204-2004

Corporate Communications Office, (309) 794-5729, www.mvr.usace.army.mil

Annual Tonnage (20-Year Historical)

<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>
2017	18,829,908	2012	13,863,116	2007	16,228,148	2002	20,943,649
2016	18,903,366	2011	13,562,537	2006	17,048,863	2001	17,316,615
2015	14,746,202	2010	14,456,677	2005	16,347,999	2000	20,756,882
2014	13,154,371	2009	14,226,366	2004	15,769,587	1999	22,495,873
2013	11,609,540	2008	12,413,007	2003	18,276,060	1998	19,800,694

Commodity Tonnage (2017)

All Units (Ferried Autos, Passengers, Railway Cars)	-
Coal, Lignite, and Coal Coke	1,567,824
Petroleum and Petroleum Products	231,700
Chemicals and Related Products	2,882,249
Crude Materials, Inedible, Except Fuels	1,735,800
Primary Manufactured Goods	1,141,296
Food and Farm Products	11,215,894
Manufactured Equipment & Machinery	37,545
Waste Material	14,400
Unknown or Not Elsewhere Classified	3,200

Vessel & Lockage Data (2017)

Average Delay - Tows (Hours)	1.18	Non-Commercial Vessels	23
Average Processing Time (Hours)	0.5	Non-Commercial Flotillas	23
Barges Empty	4,499	Non-Commercial Lockages/Cuts	23
Barges Loaded	11,857	Percent Vessels Delayed (%)	56
Commercial Vessels	1,952	Recreational Vessels	2,745
Commercial Flotillas	1,926	Recreational Lockages	935
Commercial Lockages/Cuts	2,888	Total Vessels	4,720
Non-Vessel Lockages	-	Total Lockages/Cuts	3,846

The 9-foot Channel Navigation Project

The 9-foot Channel Navigation Project includes 37 lock and dam sites (42 locks) on 1,200 river miles in Illinois, Iowa, Minnesota, Missouri and Wisconsin. Constructed largely in the 1930s, it extends from Minneapolis-St. Paul on the Upper Mississippi River to its confluence with the Ohio River and up the Illinois Waterway to the T.J. O'Brien Lock in Chicago.

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UPDATE: August 2018

U.S. ARMY CORPS OF ENGINEERS – ROCK ISLAND DISTRICT

CLOCK TOWER BUILDING, P.O. BOX 2004, ROCK ISLAND, IL 61204-2004
Corporate Communications Office, (309) 794-5729, www.mvr.usace.army.mil



Lock & Dam 12

(Bellevue, Iowa)
Mississippi River

U.S. ARMY CORPS OF ENGINEERS

BUILDING STRONG.

Construction: 1934-1938

General Contractors:

Lock: James Stewart Corporation, Chicago, Ill.

Dam: Warner Construction Company, Chicago, Ill.

Congressional District: IA-1; IL-17

Description

Lock and Dam 12 is 556.7 miles above the confluence of the Mississippi and Ohio rivers. The complex stretches across the river where the bluffs on the Iowa side are very close to the river; a complex of islands and sloughs extends nearly three-quarters of the way across the river from the Illinois side. Bellevue State Park occupies the high ground on the Iowa side, while the urbanized area of Bellevue extends to the government-owned property on the flat land below the bluff. The Lost Mound Unit of Upper Mississippi River National Wildlife and Fish Refuge occupies the islands, slough and small flat bottom areas on the Illinois side.



Lock dimensions are 110 feet wide by 600 feet long with additional provisions for an auxiliary lock. The maximum lift is 9 feet with an average lift of 6 feet. It takes approximately 10 minutes to fill or empty the lock chamber.

The movable dam consists of seven submersible Tainter gates (20 feet high by 64 feet long) and three submersible roller gates (20 feet high by 100 feet long). The dam system includes two, non-overflow, earth and sand-filled dikes; two transitional dikes; and a concrete-covered, ogee spillway, submersible earth and sand-filled dike. The foundation is set in sand, gravel and silt. It takes eight hours for water to travel from Lock & Dam 11, in Dubuque, Iowa, to Lock & Dam 12.

History/Significance

Construction of Lock 12 began in February 1934 and was completed in November 1935. Construction of Dam 12 began in September 1936 and was completed in July 1938. The structure was placed in operation on May 14, 1939. During the peak of construction, a maximum of 1,217 men were employed at one time.

There were two time extensions given to the contractor during construction of the lock. Work was shut down and pumping of the cofferdam stopped on March 26, 1935, as the U.S. Government Weather Bureau forecasts indicated that the river stage would flood the cofferdam. The maximum river stage reached and exceeded the elevation required by the specifications for the top of the cofferdam by one-half foot. Construction was resumed on May 4, 1935. A 39-calendar-day time extension was granted for time lost from March 26 through May 4, 1935.

The second time extension was from June 29 through July 23, 1935. The river stage from Oct. 2, 1934, to Aug. 6, 1935, prevented the placing of concrete in the downstream guide wall without cofferdam protection. The contractor delayed the construction of a temporary cofferdam in anticipation that, prior to the completion of other work, the river would recede to a stage where building of a cofferdam would not be necessary. The river did not fall to this stage by July 11, 1935, so a temporary cofferdam was constructed and work on the guidewall resumed on July 24, 1935. The contractor was granted an extension of 25 days. While the winter of 1934-1935 was severe at times, the contractor took advantage of the recurrent mild weather to place concrete.

U.S. ARMY CORPS OF ENGINEERS – ROCK ISLAND DISTRICT

CLOCK TOWER BUILDING, P.O. BOX 2004, ROCK ISLAND, IL 61204-2004

Corporate Communications Office, (309) 794-5729, www.mvr.usace.army.mil

The lock and dam elements of the complex were completed at a federal cost of \$5,581,000.

Annual Tonnage (20-Year Historical)

<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>
2017	20,506,749	2012	14,560,495	2007	17,681,771	2002	23,031,159
2016	20,864,971	2011	14,326,574	2006	18,655,930	2001	19,098,873
2015	16,069,017	2010	15,300,161	2005	17,672,950	2000	22,280,448
2014	13,904,294	2009	15,164,599	2004	17,350,486	1999	24,426,919
2013	11,972,140	2008	13,299,444	2003	19,620,541	1998	21,352,999

Commodity Tonnage (2017)

All Units (Ferried Autos, Passengers, Railway Cars)	-
Coal, Lignite, and Coal Coke	1,569,424
Petroleum and Petroleum Products	209,400
Chemicals and Related Products	3,237,419
Crude Materials, Inedible, Except Fuels	1,806,276
Primary Manufactured Goods	1,206,420
Food and Farm Products	12,440,750
Manufactured Equipment & Machinery	32,530
Waste Material	-
Unknown or Not Elsewhere Classified	4,800

Vessel & Lockage Data (2017)

Average Delay - Tows (Hours)	1.12	Non-Commercial Vessels	34
Average Processing Time (Hours)	0.64	Non-Commercial Flotillas	34
Barges Empty	4,960	Non-Commercial Lockages/Cuts	34
Barges Loaded	12,967	Percent Vessels Delayed (%)	47
Commercial Vessels	2,157	Recreational Vessels	1,088
Commercial Flotillas	2,115	Recreational Lockages	513
Commercial Lockages/Cuts	3,193	Total Vessels	3,279
Non-Vessel Lockages	-	Total Lockages/Cuts	3,740

The 9-foot Channel Navigation Project

The 9-foot Channel Navigation Project includes 37 lock and dam sites (42 locks) on 1,200 river miles in Illinois, Iowa, Minnesota, Missouri and Wisconsin. Constructed largely in the 1930s, it extends from Minneapolis-St. Paul on the Upper Mississippi River to its confluence with the Ohio River and up the Illinois Waterway to the T.J. O'Brien Lock in Chicago.

The maintenance needs of this aging infrastructure have surpassed annual operations and maintenance funding. This limited funding has adversely affected reliability of the system and has primarily resulted in a fix-as-fail strategy, with repairs sometimes requiring days, weeks or months. Depending on the nature of a failure and extent of repairs, shippers, manufacturers, consumers and commodity investors can experience major financial consequences. Additionally, today's 1,200'-long tows must split and lock through in two operations within the Project's 600' chambers. This procedure doubles and triples lockage times, increases costs and wear to lock machinery, and exposes deckhands to higher accident rates.

More than 580 facilities ship and receive commodities within the Project. Grains (corn and soybeans) dominate traffic; cement and concrete products are the second largest group. A modern 15-barge tow transports the equivalent of 1,050 semi-trucks (26,250 tons, 937,387 bushels of corn, or 240 rail cars). In 2016, the 9-foot channel project generated an estimated \$2 billion of transportation cost savings compared to its approximately \$246 million operation and maintenance cost.

UPDATE: August 2018



Lock & Dam 13

(Fulton, Illinois)
Mississippi River

U.S. ARMY CORPS OF ENGINEERS

BUILDING STRONG.

Construction: 1935-1939

General Contractors:

Lock and Dam: McCarthy Improvement Company,
Davenport, Iowa

Congressional District: IA-2: IL-17

Description

Lock and Dam 13 is 522.5 miles above the confluence of the Mississippi and Ohio rivers. The complex stretches across the river at a point where the bluffs on the Iowa side are very close to the river; islands and chutes dot the river beneath the bluffs. Eagle Point Nature Center occupies the high bluff immediately above the lock and dam. A dense group of sloughs and islands extend out from the Illinois shore. Lock dimensions are 110 by 600 feet with additional provisions for an auxiliary lock. The maximum lift is 11 feet with an average lift of 8.6 feet. It takes approximately 10 minutes to fill or empty the lock chamber.



The movable dam consists of 10 submersible Tainter gates, 20-feet high by 64-feet long; and three submersible roller gates, 20-feet high by 100-feet long. The Tainter gates are elliptical. The dam system also includes three non-overflow earth and sand-filled dikes; two transitional dikes; and a submersible earth and sand-filled dike. It takes 10 hours for water to travel from Lock and Dam 12, in Bellevue, Iowa, to Lock and Dam 13.

History/Significance

Construction of Lock 13 began in July 1935 and was completed in December 1936. Construction on Dam 13 began in January 1937 and was completed in December 1938. The structure was placed in operation on May 13, 1939.

Locks and Dams 13, 14 and 17 were designed and built concurrently. The lock site was inaccessible from the nearest highway which required the contractor to construct a dike road through the Illinois shore's sloughs, islands, and marshy bottom lands. A ferry had to be operated during construction of the dam and central control station. It was also necessary to divert Johnson Creek to enter the river downstream from the site.

During the first several months of the contract, the weather allowed rapid progress on the construction of the dike and diversion ditch. The small amount of precipitation did not greatly interfere with the handling, hauling and placement of material. Short periods of severe weather during the winter months did not seriously handicap the operation. Very moderate rainfall during the summer months provided advantages for concrete operations.

The contractor was given a one-time extension during lock construction. The Mississippi River began rising steadily so that by April 1, 1936, the cofferdam pumps were inadequate to keep the water level low enough to place concrete. On April 4, the contractor permitted the cofferdam to flood. The river stage exceeded flood stage by 0.04 feet during the night of April 6-7. The contractor began dewatering on May 9, but pumping was stopped on May 13 due to a river rise. On May 19, dewatering began again and operations in the cofferdam resumed on June 1, 1936.

U.S. ARMY CORPS OF ENGINEERS – ROCK ISLAND DISTRICT

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While working on the earth dike, the contractor was granted a 25-day time extension on the dam contract due to high water from Sept. 13 through Oct. 7, 1938. Contract work was completed and accepted 12 days prior to the fixed completion date. The lock and dam elements of the complex were completed at a federal cost of \$7,503,000.

Annual Tonnage (20-Year Historical)

<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>
2017	20,695,575	2012	14,780,948	2007	18,030,735	2002	23,495,472
2016	21,166,241	2011	14,545,373	2006	19,078,754	2001	19,277,553
2015	16,305,207	2010	15,551,521	2005	18,028,251	2000	22,722,882
2014	14,133,454	2009	15,543,114	2004	17,707,145	1999	24,803,042
2013	12,117,290	2008	13,595,495	2003	19,990,636	1998	21,633,824

Commodity Tonnage (2017)

All Units (Ferried Autos, Passengers, Railway Cars)	-	Primary Manufactured Goods	1,192,196
Coal, Lignite, and Coal Coke	1,569,424	Food and Farm Products	12,657,650
Petroleum and Petroleum Products	209,400	Manufactured Equipment & Machinery	31,080
Chemicals and Related Products	3,214,849	Waste Material	-
Crude Materials, Inedible, Except Fuels	1,816,176	Unknown or Not Elsewhere Classified	4,800

Vessel & Lockage Data (2017)

Average Delay - Tows (Hours)	1.79	Non-Commercial Vessels	87
Average Processing Time (Hours)	0.64	Non-Commercial Flotillas	75
Barges Empty	5,075	Non-Commercial Lockages/Cuts	75
Barges Loaded	13,084	Percent Vessels Delayed (%)	55
Commercial Vessels	2,213	Recreational Vessels	1,133
Commercial Flotillas	2,168	Recreational Lockages	527
Commercial Lockages/Cuts	3,266	Total Vessels	3,433
Non-Vessel Lockages	1	Total Lockages/Cuts	3,869

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UPDATE: August 2018



Locks & Dam 14

(Pleasant Valley, Iowa)
Mississippi River

U.S. ARMY CORPS OF ENGINEERS

BUILDING STRONG.

Construction: 1935-1940

General Contractors:

Lock and Dam: Central Engineering Company,
Davenport, Iowa

Congressional District: IA-2; IL-17

Description

Locks and Dam 14 is four miles below LeClaire, Iowa, and 493.3 miles above the confluence of the Mississippi and Ohio rivers. The site is also 3.6 miles below the head of the notorious, rock-bedded, Rock Island Rapids. The LeClaire Lock and the remains of the LeClaire Lateral Canal, built in 1921-1924 to bypass this treacherous stretch of river, are located along the Iowa shore.

The main lock's dimensions are 110 by 600 feet. The dimensions of the LeClaire Lock, which is used as an auxiliary lock, are 80 by 320 feet, with a low-water depth of eight feet at the upper sill and seven feet at the lower sill. The main lock's maximum lift is 11 feet with an average lift of 9.8 feet. It takes approximately eight minutes to fill or empty the main lock.

The movable dam has 13 non-submersible Tainter gates (20 feet high by 60 feet long) and four submersible roller gates (20 feet high by 100 feet long). The dam system also includes an earth and sand-filled dike. It takes nine hours for water to travel from Lock and Dam 13, in Fulton, Iowa, to Lock and Dam 14.

History/Significance

Construction of Lock 14 was begun in August 1935, and was completed on December 22, 1936. Construction of Dam 14 was begun in November 1936, and was completed in December 1938. The structure was placed in operation on June 14, 1939.

The Corps built the oldest elements of this complex between 1921 and 1924, during the six-foot channel project. As part of that channelization, the Corps built a longitudinal dam paralleling the Iowa shore from the head of the Rock Island Rapids at LeClaire, to the head of Smith's Island. The dam formed the riverward wall of the LeClaire Canal, by which vessels could bypass the rapids. The Iowa shore served as the canal's landwall. Most of the longitudinal dam was submerged when Dam 14 was built; however, a portion of the original canal near the dam is still used as a mooring and storage site.

The Hunter Steel Company plant, subcontractor for structural steel, miscellaneous metal, and operating machinery was located at Neville Island, Pennsylvania, immediately below Pittsburgh. During the extreme high water on the Ohio River in March 1936, this island was flooded, necessitating closing down the steel plant. A time extension of 12 days was granted to compensate for delays in gate erection due to time lost in the fabrication of structural steel.

Extremely cold weather halted lock construction for 18 days during the winter of 1936, and excessively high temperatures shortened work shifts during the summer but no extensions of time were granted due to weather.

The lock and dam elements of the complex were completed at a federal cost of \$5,472,000.



U.S. ARMY CORPS OF ENGINEERS – ROCK ISLAND DISTRICT

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Annual Tonnage (20-Year Historical)

<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>
2017	23,056,081	2012	16,549,369	2007	20,653,317	2002	28,428,345
2016	23,453,055	2011	17,012,596	2006	21,934,232	2001	24,264,635
2015	18,754,072	2010	17,737,023	2005	20,811,684	2000	28,328,486
2014	16,102,838	2009	17,921,487	2004	20,626,075	1999	30,839,734
2013	13,534,616	2008	15,612,451	2003	24,224,248	1998	27,061,431

Commodity Tonnage (2017)

All Units (Ferried Autos, Passengers, Railway Cars)	-
Coal, Lignite, and Coal Coke	1,562,824
Petroleum and Petroleum Products	204,400
Chemicals and Related Products	3,915,510
Crude Materials, Inedible, Except Fuels	2,183,762
Primary Manufactured Goods	1,230,896
Food and Farm Products	13,892,089
Manufactured Equipment & Machinery	56,800
Waste Material	-
Unknown or Not Elsewhere Classified	9,800

Vessel & Lockage Data (2017)

Average Delay - Tows (Hours)	3.35	Non-Commercial Vessels	65
Average Processing Time (Hours)	0.64	Non-Commercial Flotillas	61
Barges Empty	6,373	Non-Commercial Lockages/Cuts	63
Barges Loaded	15,001	Percent Vessels Delayed (%)	62
Commercial Vessels	2,534	Recreational Vessels	2,488
Commercial Flotillas	2,513	Recreational Lockages	1,134
Commercial Lockages/Cuts	3,744	Total Vessels	5,087
Non-Vessel Lockages	-	Total Lockages/Cuts	4,941

The 9-foot Channel Navigation Project

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UPDATE: August 2018

U.S. ARMY CORPS OF ENGINEERS – ROCK ISLAND DISTRICT

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Locks & Dam 15

(Rock Island, Illinois)
Mississippi River

U.S. ARMY CORPS OF ENGINEERS

BUILDING STRONG.

Construction: 1931-1934

General Contractors:

Lock: Merritt-Chapman & Whitney Corp., Duluth, Minn.

Dam: D.A. Healy Company, Detroit, Mich.

Congressional District: IA-2; IL-17

Description

In the heart of the Quad Cities, Locks and Dam 15 is 483 miles above the confluence of the Mississippi and Ohio rivers. The complex stretches across the Mississippi River at one of its narrowest points at the foot of the Rock Island Rapids. The complex extends from the northwest tip of the Army's Arsenal Island on the Illinois side, to a small area of flat-bottom land on the Iowa side. A roadway and railroad bridge, joining Davenport and Rock Island, spans the site.



The main lock is 110 feet wide by 600 feet long; the auxiliary lock is 110 by 360 feet. Both have a maximum chamber lift of 16 feet with an average of 13 feet and takes about seven minutes to fill or empty. Each lock gate weighs nearly 82 tons. The 1,203-foot-long movable dam is the largest roller dam in the world consisting of 11 non-submersible 100-foot-long roller gates with 11 control houses. Nine gates are 19 feet 4 inches in diameter and two are 16 feet 2 inches. It takes three hours for water to travel from Lock and Dam 14, in Pleasant Valley, Iowa, to Lock and Dam 15.

History/Significance

Construction on Lock 15 began on April 9, 1931, and was completed in December 1932. Construction on Dam 15 began in 1932 and was completed in May 1934. The structure was placed in operation on March 7, 1934.

The complex was the first 9-Foot Channel Project complex which served as a prototype for the whole system. Dam 15 is unusual among the Project as it is the only dam on the River made entirely of roller gates as it was constructed at the narrowest part of the channel and is subject to ice and debris jams; is built at a 16-1/2 degree angle to gain additional dam area for maintaining the nine foot navigation channel; employs roller gates that are non-submersible, of differing sizes, and of non-standard length; is not at a right angle to the river; includes no earthen embankment dike section; incorporates a power plant that generates electricity to operate its gates and valves; and uses an open-truss service bridge with a bulkhead-lifting crane on its lower chord. The complex is also unusual because the intermediate locks' wall encases a bridge swing span.

The contractor for the lock construction was favored with low river stages, a mild winter of 1931-1932 and satisfactory labor conditions. No serious difficulties were encountered in the construction of the locks. The average number of men employed was 221. For construction of the dam, the maximum number of men employed was 280 during the latter part of November 1933.

The lock and dam elements of the complex were completed at a federal cost of \$7,480,000.

U.S. ARMY CORPS OF ENGINEERS – ROCK ISLAND DISTRICT

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Annual Tonnage (20-Year Historical)

<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>
2017	23,268,394	2012	16,835,910	2007	20,880,043	2002	28,829,063
2016	23,803,628	2011	17,250,083	2006	21,942,068	2001	24,708,731
2015	19,148,356	2010	17,923,333	2005	20,991,007	2000	28,753,278
2014	16,453,426	2009	18,274,953	2004	20,948,490	1999	31,209,760
2013	13,705,556	2008	15,635,867	2003	25,019,206	1998	27,168,117

Commodity Tonnage (2017)

All Units (Ferried Autos, Passengers, Railway Cars)	-
Coal, Lignite, and Coal Coke	1,536,324
Petroleum and Petroleum Products	199,400
Chemicals and Related Products	3,947,084
Crude Materials, Inedible, Except Fuels	2,101,347
Primary Manufactured Goods	1,343,496
Food and Farm Products	14,073,438
Manufactured Equipment & Machinery	57,505
Waste Material	-
Unknown or Not Elsewhere Classified	9,800

Vessel & Lockage Data (2017)

Average Delay - Tows (Hours)	2.74	Non-Commercial Vessels	56
Average Processing Time (Hours)	0.75	Non-Commercial Flotillas	52
Barges Empty	6,108	Non-Commercial Lockages/Cuts	52
Barges Loaded	14,759	Percent Vessels Delayed (%)	91
Commercial Vessels	2,609	Recreational Vessels	407
Commercial Flotillas	2,567	Recreational Lockages	258
Commercial Lockages/Cuts	3,779	Total Vessels	3,072
Non-Vessel Lockages	-	Total Lockages/Cuts	4,089

The 9-foot Channel Navigation Project

The 9-foot Channel Navigation Project includes 37 lock and dam sites (42 locks) on 1,200 river miles in Illinois, Iowa, Minnesota, Missouri and Wisconsin. Constructed largely in the 1930s, it extends from Minneapolis-St. Paul on the Upper Mississippi River to its confluence with the Ohio River and up the Illinois Waterway to the T.J. O'Brien Lock in Chicago.

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UPDATE: August 2018

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Lock & Dam 16

(Illinois City, Illinois)
Mississippi River

U.S. ARMY CORPS OF ENGINEERS

BUILDING STRONG.

Construction: 1933-1937

General Contractors:

Lock and Dam: Central Engineering Company,
Davenport, Iowa

Congressional District: IA-2; IL-17

Description

Lock and Dam 16 is about one mile upstream from Muscatine, Iowa, and 457.2 miles above the confluence of the Mississippi and Ohio rivers. The complex stretches across the river at a point where the valley is wide. The earthen embankment section of the dam straddles portions of Hog Island in the main channel.

The lock dimensions are 110 feet wide by 600 feet long with additional provisions for an auxiliary lock. The maximum lift is nine feet with an average lift of 6.5 feet. It takes approximately seven minutes to fill or empty the lock chamber.



The movable dam has 12 non-submersible Tainter gates (20 feet high and 40 feet long), three submersible Tainter gates of the same dimensions, and four non-submersible roller gates (20 feet high and 80 feet long). The dam system also includes a linear, concrete capped, ogee spillway; and a submersible earth and sand-filled dike. It takes eight hours for water to travel from Lock and Dam 15, in Davenport, Iowa, to Lock and Dam 16.

History/Significance

Construction on Lock 16 began on Nov. 17, 1933, and completed in February 1937. Construction on Dam 16 began in January 1935 and completed in February 1937. The structure was placed in operation on July 10, 1937.

Dam 16 was the last dam in the Rock Island District to employ non-submersible roller gates, as well as Tainter gates (submersible and non-submersible), which had steel sheeting on only one side. It was also the first dam in the District in which all the Tainter gates were operated by line shafts and motors housed in installations above each gate, rather than from locomotive hoist cars running on the dam's service bridge.

Funds for the design and construction of Lock 16 were provided by the National Industrial Recovery Act and the Public Works Act Appropriation. Four sites were investigated for the location of Lock and Dam No. 16: roughly 2,500 feet below the Muscatine High Bridge, at Muscatine, near Fairport and the selected site at Hog Island.

Below-normal river stages and mild winters for the entire construction period were advantageous to the contractor. The river stages ranged from a low of 531.2 to a high of 541.9 feet (mean seal level). During late 1933 and early 1934 the water surface elevations were at times lower than any previously recorded since 1864. Decisions by the contractor on the procedure to completely dewater cofferdams caused a 30-day delay in construction. Because of change orders and certain weather conditions, a total extension of 110 days was needed by the contractor for completion of the lock facility. The average daily number of employees on the lock facility was 335 with a peak of 735 employees on September 1, 1934. The lock and dam elements of the complex were completed at a federal cost of \$3,682,000.

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2017	24,303,783	2012	17,530,646	2007	21,598,027	2002	30,323,912
2016	24,855,286	2011	18,085,452	2006	22,708,972	2001	26,451,754
2015	19,851,212	2010	18,453,809	2005	21,328,240	2000	30,583,395
2014	16,832,178	2009	19,417,486	2004	21,279,884	1999	33,139,184
2013	13,900,123	2008	16,494,518	2003	25,912,587	1998	28,790,247

Commodity Tonnage (2017)

All Units (Ferried Autos, Passengers, Railway Cars)	-
Coal, Lignite, and Coal Coke	1,682,224
Petroleum and Petroleum Products	205,300
Chemicals and Related Products	4,198,184
Crude Materials, Inedible, Except Fuels	1,879,692
Primary Manufactured Goods	1,292,448
Food and Farm Products	14,963,657
Manufactured Equipment & Machinery	77,480
Waste Material	-
Unknown or Not Elsewhere Classified	4,800

Vessel & Lockage Data (2017)

Average Delay - Tows (Hours)	1.1	Non-Commercial Vessels	49
Average Processing Time (Hours)	0.62	Non-Commercial Flotillas	47
Barges Empty	6,643	Non-Commercial Lockages/Cuts	47
Barges Loaded	15,448	Percent Vessels Delayed (%)	63
Commercial Vessels	2,853	Recreational Vessels	468
Commercial Flotillas	2,680	Recreational Lockages	319
Commercial Lockages/Cuts	4,033	Total Vessels	3,370
Non-Vessel Lockages	1	Total Lockages/Cuts	4,400

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UPDATE: August 2018



Lock & Dam 17

(New Boston, Illinois)
Mississippi River

U.S. ARMY CORPS OF ENGINEERS

BUILDING STRONG.

Construction: 1935-1939

General Contractors:

Lock: Massman Construction Co. and
Massman-Peterman Co., Kansas City, Mo.
Dam: Maxon Construction, Dayton, Ohio

Congressional District: IA-2; IL-17

Description

Lock and Dam 17 is 437.1 miles above the confluence of the Mississippi and Ohio rivers. The complex stretches across a wide portion of river where there are several marshy islands. The Port Louisa National Wildlife Refuge and Odessa State Wildlife Management Area occupy the islands, marshes, and sloughs on the Iowa shore both upstream and downstream from the dam.



The lock dimensions are 110 feet wide by 600 feet long with additional provisions for an auxiliary lock. The maximum lift is eight feet with an average lift of four feet. It takes approximately seven minutes to fill or empty the lock chamber.

The movable dam has eight submersible Tainter gates (20 feet high by 64 feet long) and three submersible roller gates (20 feet high by 100 feet long). The dam system also includes one non-overflow earth and sand-filled dike; two transitional dikes; and a submersible earth and sand-filled dike. It takes six hours for water to travel from Lock and Dam 16 in Muscatine, Iowa, to Lock and Dam 17.

History/Significance

Construction on Lock 17 began on Aug. 7, 1935 and was completed in February 1937. Construction on Dam 17 began in February 1937 and was completed in January 1939. The structure was placed in operation on May 14, 1939.

The site was inaccessible from the nearest highway. As a result, the contractors for the lock had to construct a 3.7-mile-long entrance road. The remoteness of the site caused other problems. Not enough workers could commute to the job site from their homes. As a result, the Massman Construction Company and the Massman-Peterman Company built a workers' camp near the lock and dam site. This camp consisted of eleven 16-man bunk houses and a large mess hall. A total of 1,573 men were employed on the lock construction at one time or another, with 626 men working on the peak day of construction which was July 8, 1936.

Favorable river stages and weather conditions were advantageous to the contractors. Only 18 days of extremely cold weather, seven days of hot weather, and a 30-day delay due to a flood on the Ohio River at a steel fabricators plant for a total of 55 days extension beyond the scheduled completion date of time were required for completing the lock. The average monthly precipitation for the construction period of the lock was below the previously established normal by over one inch. A contract for \$32,250 was issued in 1937 to a second contractor for clearing the trees on the islands extending about two miles upstream from Dam 17. The lock and dam elements of the complex were completed at a federal cost of \$4,164,000.

U.S. ARMY CORPS OF ENGINEERS – ROCK ISLAND DISTRICT

CLOCK TOWER BUILDING, P.O. BOX 2004, ROCK ISLAND, IL 61204-2004
Corporate Communications Office, (309) 794-5729, www.mvr.usace.army.mil

Annual Tonnage (20-Year Historical)

<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>
2017	24,937,503	2012	18,357,280	2007	22,843,570	2002	31,631,819
2016	25,776,550	2011	18,918,020	2006	24,046,856	2001	27,451,332
2015	20,469,969	2010	19,513,395	2005	22,596,983	2000	31,375,823
2014	17,651,636	2009	20,519,517	2004	22,107,520	1999	34,170,210
2013	14,664,956	2008	17,338,830	2003	27,171,584	1998	29,922,523

Commodity Tonnage (2017)

All Units (Ferried Autos, Passengers, Railway Cars)	-
Coal, Lignite, and Coal Coke	1,742,524
Petroleum and Petroleum Products	222,700
Chemicals and Related Products	4,310,032
Crude Materials, Inedible, Except Fuels	1,775,092
Primary Manufactured Goods	1,295,246
Food and Farm Products	15,513,379
Manufactured Equipment & Machinery	70,530
Waste Material	-
Unknown or Not Elsewhere Classified	8,000

Vessel & Lockage Data (2017)

Average Delay - Tows (Hours)	1.42	Non-Commercial Vessels	50
Average Processing Time (Hours)	0.88	Non-Commercial Flotillas	48
Barges Empty	6,817	Non-Commercial Lockages/Cuts	48
Barges Loaded	15,861	Percent Vessels Delayed (%)	58
Commercial Vessels	2,232	Recreational Vessels	295
Commercial Flotillas	2,215	Recreational Lockages	252
Commercial Lockages/Cuts	3,629	Total Vessels	2,577
Non-Vessel Lockages	-	Total Lockages/Cuts	3,929

The 9-foot Channel Navigation Project

The 9-foot Channel Navigation Project includes 37 lock and dam sites (42 locks) on 1,200 river miles in Illinois, Iowa, Minnesota, Missouri and Wisconsin. Constructed largely in the 1930s, it extends from Minneapolis-St. Paul on the Upper Mississippi River to its confluence with the Ohio River and up the Illinois Waterway to the T.J. O'Brien Lock in Chicago.

The maintenance needs of this aging infrastructure have surpassed annual operations and maintenance funding. This limited funding has adversely affected reliability of the system and has primarily resulted in a fix-as-fail strategy, with repairs sometimes requiring days, weeks or months. Depending on the nature of a failure and extent of repairs, shippers, manufacturers, consumers and commodity investors can experience major financial consequences. Additionally, today's 1,200'-long tows must split and lock through in two operations within the Project's 600' chambers. This procedure doubles and triples lockage times, increases costs and wear to lock machinery, and exposes deckhands to higher accident rates.

More than 580 facilities ship and receive commodities within the Project. Grains (corn and soybeans) dominate traffic; cement and concrete products are the second largest group. A modern 15-barge tow transports the equivalent of 1,050 semi-trucks (26,250 tons, 937,387 bushels of corn, or 240 rail cars). In 2016, the 9-foot channel project generated an estimated \$2 billion of transportation cost savings compared to its approximately \$246 million operation and maintenance cost.

UPDATE: August 2018

U.S. ARMY CORPS OF ENGINEERS – ROCK ISLAND DISTRICT

CLOCK TOWER BUILDING, P.O. BOX 2004, ROCK ISLAND, IL 61204-2004
Corporate Communications Office, (309) 794-5729, www.mvr.usace.army.mil



Lock & Dam 18

(Gladstone, Illinois)
Mississippi River

U.S. ARMY CORPS OF ENGINEERS

BUILDING STRONG.

Construction: 1934-1937

General Contractors:

Lock: Maxon Construction Company, Dayton, Ohio

Dam: S.A. Healy Company, Chicago, Ill.

Congressional District: IA-2; IL-17

Description

Lock and Dam 18 is 410.5 miles above the confluence of the Mississippi and Ohio rivers. The bottom lands on both shores are flat and punctuated by sloughs, marshes, and reefs. The river is dotted with low islands of various sizes. The Oquawka State Wildlife Refuge is adjacent to the lock and dam complex on the Illinois shore. The installation's esplanade interrupts a levee and functions as part of the Henderson River diversion that converted Turkey Island into an extension of the Illinois shore.



Lock dimensions are 110 feet wide by 600 feet long with additional provisions for an auxiliary lock. Maximum lift is 9.8 feet with an average lift of 6.9 feet. It takes approximately 10 minutes to fill or empty the lock.

The dam is composed of 14 submersible Tainter gates (20 feet high by 60 feet long) and three submersible roller gates (20 feet high by 100 feet long). All gates submerge to a depth of eight feet. The dam includes a submersible earth and sand-filled dike, a non-overflow earth and sand-filled dike, and two transition dikes. It takes eight hours for water to travel from Lock and Dam 17, in New Boston, Illinois, to Lock and Dam 18.

History/Significance

Construction on Lock 18 began on Jan. 26, 1934, and was completed in April 1935. Construction on Dam 18 began in September 1935 and was completed in May 1937. The structure was placed in operation on September 8, 1937.

Dams 11 and 18 were the first in the Rock Island District to employ submersible, elliptical Tainter gates. They were also the first dams in the District to use submersible roller gates. Four sites were considered for Dam 18: just below the foot of Otter Island at mile 406.5, immediately above the old mouth of the Henderson River at mile 412.0, near Oquawka and at the current site. The selected site called for diversion of the Henderson River to a point below the dam. The final site was partially selected because the Iowa River Flint Creek Levee and Drainage District No. 16 drainage pumps discharged into the lower pool and were unaffected by raising of the water level for the upper pool.

Due to heavy ice conditions, the contractor for lock construction was delayed at the offset of the project by two months. The following winter of 1934-1935 was also so severe that little work was accomplished during January and February. The draft of the barges engaged in the construction activities was limited during the summer of 1934 due to the low river stages. During the peak of construction in September 1934, the project employed 960 men as laborers and 74 men as supervisors. Average employment was 478 laborers and 44 supervisors.

The contractor completed lock construction almost one month before the contract time limit. Construction of the Henderson River cut-off channel was included in the dam and associated appurtenances construction contract.

The lock and dam elements of the complex were completed at a federal cost of \$4,122,400.

U.S. ARMY CORPS OF ENGINEERS – ROCK ISLAND DISTRICT

CLOCK TOWER BUILDING, P.O. BOX 2004, ROCK ISLAND, IL 61204-2004

Corporate Communications Office, (309) 794-5729, www.mvr.usace.army.mil

Annual Tonnage (20-Year Historical)

<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>
2017	26,167,552	2012	19,486,067	2007	24,193,022	2002	32,951,597
2016	27,192,132	2011	19,850,238	2006	25,262,995	2001	28,546,243
2015	21,606,967	2010	20,471,068	2005	23,602,042	2000	32,864,097
2014	18,583,677	2009	21,812,990	2004	23,015,891	1999	35,707,505
2013	15,258,710	2008	18,661,036	2003	28,366,984	1998	31,060,799

Commodity Tonnage (2017)

All Units (Ferried Autos, Passengers, Railway Cars)	-
Coal, Lignite, and Coal Coke	1,744,624
Petroleum and Petroleum Products	220,000
Chemicals and Related Products	4,285,252
Crude Materials, Inedible, Except Fuels	1,793,442
Primary Manufactured Goods	1,273,246
Food and Farm Products	16,797,998
Manufactured Equipment & Machinery	44,900
Waste Material	-
Unknown or Not Elsewhere Classified	8,000

Vessel & Lockage Data (2017)

Average Delay - Tows (Hours)	1.78	Non-Commercial Vessels	47
Average Processing Time (Hours)	0.68	Non-Commercial Flotillas	47
Barges Empty	7,493	Non-Commercial Lockages/Cuts	47
Barges Loaded	16,650	Percent Vessels Delayed (%)	88
Commercial Vessels	2,640	Recreational Vessels	516
Commercial Flotillas	2,525	Recreational Lockages	267
Commercial Lockages/Cuts	4,004	Total Vessels	3,203
Non-Vessel Lockages	-	Total Lockages/Cuts	4,318

The 9-foot Channel Navigation Project

The 9-foot Channel Navigation Project includes 37 lock and dam sites (42 locks) on 1,200 river miles in Illinois, Iowa, Minnesota, Missouri and Wisconsin. Constructed largely in the 1930s, it extends from Minneapolis-St. Paul on the Upper Mississippi River to its confluence with the Ohio River and up the Illinois Waterway to the T.J. O'Brien Lock in Chicago.

The maintenance needs of this aging infrastructure have surpassed annual operations and maintenance funding. This limited funding has adversely affected reliability of the system and has primarily resulted in a fix-as-fail strategy, with repairs sometimes requiring days, weeks or months. Depending on the nature of a failure and extent of repairs, shippers, manufacturers, consumers and commodity investors can experience major financial consequences. Additionally, today's 1,200'-long tows must split and lock through in two operations within the Project's 600' chambers. This procedure doubles and triples lockage times, increases costs and wear to lock machinery, and exposes deckhands to higher accident rates.

More than 580 facilities ship and receive commodities within the Project. Grains (corn and soybeans) dominate traffic; cement and concrete products are the second largest group. A modern 15-barge tow transports the equivalent of 1,050 semi-trucks (26,250 tons, 937,387 bushels of corn, or 240 rail cars). In 2016, the 9-foot channel project generated an estimated \$2 billion of transportation cost savings compared to its approximately \$246 million operation and maintenance cost.

UPDATE: August 2018

U.S. ARMY CORPS OF ENGINEERS – ROCK ISLAND DISTRICT

CLOCK TOWER BUILDING, P.O. BOX 2004, ROCK ISLAND, IL 61204-2004
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Lock 19

(Keokuk, Iowa)
Mississippi River

U.S. ARMY CORPS OF ENGINEERS

BUILDING STRONG.

Construction: 1952-1957

General Contractors:

- Stage I: McCarthy Improvement Company, Davenport, Iowa
- Stage II: Jones Construction Company, Charlotte, N.C.
- Stage III: Oil Gear Company, Milwaukee, Wis.
- Stage IV: Evans Electrical Construction Co., Omaha, Neb.

Congressional District: IA-2; IL-18

Description

Lock 19 is 364.2 miles above the confluence of the Mississippi and Ohio rivers.

The lock, located on the Iowa shore, is 110 feet wide and 1,200 feet long, twice the size of the standard 9-Foot Channel Project lock. The upper lock gates consist of 23-foot high vertical lift gates, and the lower gates are miter gates, 53-feet 2-inches high. The lower lock gates are conventional miter gates, while the upper service gate is a submergible lift gate. Upstream from the upper service gate is a submergible vertical-lift guard gate which serves as an emergency gate in case of failure of the service gate. This gate also serves as a bridge in the roadway to the old dry dock, old lock, powerhouse and dam.



The lock's land wall is 2,161 feet long, consisting of an upper 237-foot and lower 605-foot guidewall, and a 1,319-foot main lock wall. The river wall is 1,936 feet, which includes a 532-foot wall downstream of the lower gate pintles.

Maximum lift is 38.2 feet with an average of 36.3 feet, the second highest on the Mississippi River. The highest lift of any lock on the River is at the Upper St. Anthony Falls in the St. Paul District. Filling the lock takes approximately 10 minutes; 9.25 minutes to empty. It takes 12 hours for water to travel from Lock and Dam 18, in Gladstone, Ill., to Lock and Dam 19. Pool 19 is the longest of the nine-foot channel navigation system.

An auxiliary lock, which was the original lock completed on June 12 1913, is 110 feet wide by 358 feet long. This lock is no longer in service. The dry dock, also no longer in use, measures 150 feet wide by 463 feet long. The dam, privately built in 1913, includes 119 rectangular sliding gates. The dam is privately owned and operated by Ameren Missouri. The U.S. Army Corps of Engineers has no oversight or control of the dam's operation.

History/Significance

The lock opened on May 14, 1957. The complex was not built as part of the original 9-foot channel project. After the turn of the 19th century, the Mississippi River Power Company asked Congress for permission to build a dam across the River at Keokuk, Iowa. In 1905 Congress authorized the design and construction of the project. Construction began in 1910 and the completed lock was turned over to the federal government on June 12, 1913. The new lock was 110 feet wide by 400-feet long. The entire facility was constructed without government subsidy.

Due to significant growth of commercial river traffic and long waits by tows, Congress appropriated \$994,000 in 1952 to begin construction of a new lock. In October 1952, the peak number of men employed during Stage I construction was 147 with a peak employment of 415 in 1955 and 1956. Due to abnormally good weather and low

water stages, Stage I work was always ahead of schedule. Some high water stages in fall 1954 caused Stage II construction to fall behind schedule by approximately 30 days. All contracts were completed approximately four months behind schedule, primarily due to excessive amounts of rain occurring in May, June and July 1957. The new Lock 19 was completed at a cost of \$13,500,000. The U.S. Army Corps of Engineers and the Union Electric Company completed the entire complex at a federal cost of \$37,909,000.

Annual Tonnage (20-Year Historical)

<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>
2017	26,725,805	2012	19,662,995	2007	25,504,854	2002	34,914,721
2016	27,691,130	2011	20,521,750	2006	26,386,156	2001	30,109,392
2015	21,273,045	2010	21,353,305	2005	24,697,974	2000	34,097,581
2014	18,497,615	2009	23,060,379	2004	24,176,831	1999	35,803,139
2013	14,944,801	2008	19,275,225	2003	29,827,673	1998	31,335,013

Commodity Tonnage (2017)

All Units (Ferried Autos, Passengers, Railway Cars)	-	Primary Manufactured Goods	1,284,346
Coal, Lignite, and Coal Coke	221,924	Food and Farm Products	18,654,755
Petroleum and Petroleum Products	225,200	Manufactured Equipment & Machinery	51,590
Chemicals and Related Products	4,502,998	Waste Material	-
Crude Materials, Inedible, Except Fuels	1,776,992	Unknown or Not Elsewhere Classified	8,000

Vessel & Lockage Data (2017)

Average Delay - Tows (Hours)	1.21	Non-Commercial Vessels	38
Average Processing Time (Hours)	1.02	Non-Commercial Flotillas	34
Barges Empty	9,170	Non-Commercial Lockages/Cuts	34
Barges Loaded	16,983	Percent Vessels Delayed (%)	93
Commercial Vessels	2,321	Recreational Vessels	440
Commercial Flotillas	2,292	Recreational Lockages	316
Commercial Lockages/Cuts	2,292	Total Vessels	2,799
Non-Vessel Lockages	2	Total Lockages/Cuts	2,644

The 9-foot Channel Navigation Project

The 9-foot Channel Navigation Project includes 37 lock and dam sites (42 locks) on 1,200 river miles in Illinois, Iowa, Minnesota, Missouri and Wisconsin. Constructed largely in the 1930s, it extends from Minneapolis-St. Paul on the Upper Mississippi River to its confluence with the Ohio River and up the Illinois Waterway to the T.J. O'Brien Lock in Chicago.

The maintenance needs of this aging infrastructure have surpassed annual operations and maintenance funding. This limited funding has adversely affected reliability of the system and has primarily resulted in a fix-as-fail strategy, with repairs sometimes requiring days, weeks or months. Depending on the nature of a failure and extent of repairs, shippers, manufacturers, consumers and commodity investors can experience major financial consequences. Additionally, today's 1,200'-long tows must split and lock through in two operations within the Project's 600' chambers. This procedure doubles and triples lockage times, increases costs and wear to lock machinery, and exposes deckhands to higher accident rates.

More than 580 facilities ship and receive commodities within the Project. Grains (corn and soybeans) dominate traffic; cement and concrete products are the second largest group. A modern 15-barge tow transports the equivalent of 1,050 semi-trucks (26,250 tons, 937,387 bushels of corn, or 240 rail cars). In 2016, the 9-foot channel project generated an estimated \$2 billion of transportation cost savings compared to its approximately \$246 million operation and maintenance cost.

UPDATE: August 2018

U.S. ARMY CORPS OF ENGINEERS – ROCK ISLAND DISTRICT
 CLOCK TOWER BUILDING, P.O. BOX 2004, ROCK ISLAND, IL 61204-2004
 Corporate Communications Office, (309) 794-5729, www.mvr.usace.army.mil



Lock & Dam 20

(Canton, Missouri)
Mississippi River

U.S. ARMY CORPS OF ENGINEERS

BUILDING STRONG.

Construction: 1932-1935

General Contractors:

Lock: Maxon Construction, Dayton, Ohio

Dam: S.A. Healy Co., Detroit, Mich., & Davenport, Iowa

Congressional District: MO-6; IL-18

Description

Lock and Dam 20 is 343.2 miles above the confluence of the Mississippi and Ohio rivers. The complex stretches across the river at a point where the valley is quite wide, about five-miles wide at the level of the lock and dam. A levee and the Gregory Diversion Ditch separate the complex from the town of Canton.

The lock dimensions are 110 feet wide by 600 feet long with additional provisions for an auxiliary lock. The maximum lift is 10.5 feet with an average lift of 5.3 feet. It takes approximately seven minutes to fill or empty the lock chamber.

The movable dam has three non-submersible roller gates (20 feet high by 60 feet long), 34 non-submersible Tainter gates (20 feet high by 40 feet long), and six submersible Tainter gates (20 feet high by 40 feet long). The submersible Tainter gates submerge three feet. It takes six hours for water to travel from Lock and Dam 19, in Keokuk, Iowa, to Lock and Dam 20.

History/Significance

Lock construction began on Nov. 1, 1932 and was completed in November 1933. Dam construction began on Oct. 31, 1933 and was completed in November 1935. The structure was placed in operation on June 9, 1936.

Dam 20 was the first dam in the Rock Island District to include Tainter gates. The plans originally called for all of the Tainter gates to be operated by hoist cars traveling on the dam's service bridge. However, the District modified two Tainter gates so they were individually operated by line shafts and motors housed in installations above each gate. This operating machinery worked so well that all subsequent Tainter gates in the 9-Foot Channel Project, regardless of which district they were in, used line shafts and motors.

In November 1932, the lock contractor began construction of temporary buildings and assembly of equipment. Due to severe cold, approximately 33 working days were lost during the winter of 1932-33. Low water stages during the construction expedited the contractor's work. The average number of men employed by the contractor on the Lock was approximately 320, with a maximum of approximately 570. The dam contractor experienced generally favorable weather conditions throughout the contract period. Forty days of lost time on the dam construction can be attributed to periods of high water.

The lock and dam elements of the complex were completed at a federal cost of \$3,363,500. Lock and Dam 20 was the first complex in the Rock Island District on the Upper Mississippi River to undergo major rehabilitation. Major rehabilitation work began in the late 1980s and was completed in 1991.



U.S. ARMY CORPS OF ENGINEERS – ROCK ISLAND DISTRICT

CLOCK TOWER BUILDING, P.O. BOX 2004, ROCK ISLAND, IL 61204-2004

Corporate Communications Office, (309) 794-5729, www.mvr.usace.army.mil

Annual Tonnage (20-Year Historical)

<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>
2017	27,523,234	2012	20,095,864	2007	26,423,478	2002	35,883,522
2016	28,511,936	2011	20,828,408	2006	27,571,829	2001	31,089,774
2015	22,064,644	2010	21,861,365	2005	25,540,530	2000	35,015,410
2014	19,097,488	2009	23,910,675	2004	25,228,357	1999	36,512,515
2013	15,215,349	2008	20,080,492	2003	30,811,633	1998	32,021,440

Commodity Tonnage (2017)

All Units (Ferried Autos, Passengers, Railway Cars)	-
Coal, Lignite, and Coal Coke	286,624
Petroleum and Petroleum Products	255,200
Chemicals and Related Products	4,499,038
Crude Materials, Inedible, Except Fuels	1,812,992
Primary Manufactured Goods	1,269,346
Food and Farm Products	19,358,034
Manufactured Equipment & Machinery	34,000
Waste Material	-
Unknown or Not Elsewhere Classified	8,000

Vessel & Lockage Data (2017)

Average Delay - Tows (Hours)	2.43	Non-Commercial Vessels	50
Average Processing Time (Hours)	0.83	Non-Commercial Flotillas	49
Barges Empty	9,470	Non-Commercial Lockages/Cuts	49
Barges Loaded	17,491	Percent Vessels Delayed (%)	94
Commercial Vessels	3,123	Recreational Vessels	360
Commercial Flotillas	3,063	Recreational Lockages	232
Commercial Lockages/Cuts	4,732	Total Vessels	3,533
Non-Vessel Lockages	-	Total Lockages/Cuts	5,013

The 9-foot Channel Navigation Project

The 9-foot Channel Navigation Project includes 37 lock and dam sites (42 locks) on 1,200 river miles in Illinois, Iowa, Minnesota, Missouri and Wisconsin. Constructed largely in the 1930s, it extends from Minneapolis-St. Paul on the Upper Mississippi River to its confluence with the Ohio River and up the Illinois Waterway to the T.J. O'Brien Lock in Chicago.

The maintenance needs of this aging infrastructure have surpassed annual operations and maintenance funding. This limited funding has adversely affected reliability of the system and has primarily resulted in a fix-as-fail strategy, with repairs sometimes requiring days, weeks or months. Depending on the nature of a failure and extent of repairs, shippers, manufacturers, consumers and commodity investors can experience major financial consequences. Additionally, today's 1,200'-long tows must split and lock through in two operations within the Project's 600' chambers. This procedure doubles and triples lockage times, increases costs and wear to lock machinery, and exposes deckhands to higher accident rates.

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UPDATE: August 2018

U.S. ARMY CORPS OF ENGINEERS – ROCK ISLAND DISTRICT

CLOCK TOWER BUILDING, P.O. BOX 2004, ROCK ISLAND, IL 61204-2004
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Lock & Dam 21

(Quincy, Illinois)
Mississippi River

U.S. ARMY CORPS OF ENGINEERS

BUILDING STRONG.

Construction: 1933-1938

General Contractors:

Lock: Joseph Meltzer, Inc., New York, N.Y.

Dam: McCarthy Improvement Co., Davenport, Iowa

Congressional District: MO-6; IL-18

Description

Lock and Dam 21 is 324.9 miles above the confluence of the Mississippi and Ohio Rivers. The complex stretches across the river at a point where the valley is wide with flat bottom land on either side of the river. The city of Quincy, Illinois, lies on the low bluffs along the river just upstream from the complex.

Lock dimensions are 110-feet wide by 600-feet long with provisions for an auxiliary lock. The maximum lift is 10.5 feet with an average lift of 6.55 feet. It takes approximately seven minutes to fill or empty the lock chamber.



The movable dam has 10 submersible, elliptical Tainter gates (20 feet high by 64 feet long) and three submersible roller gates (20 feet high by 100 feet long). The dam system also includes two earth and sand-filled transitional dikes, and a submersible earth dike. It takes five hours for water to travel from Lock and Dam 20, in Canton, Missouri, to Lock and Dam 21.

History/Significance

Lock 21 construction began December 11, 1933, with completion in August 1935. Construction on the dam began in August 1936 with completion in February 1938. The structure was placed in operation on July 23, 1938.

Because Lock and Dam 21 was located adjacent to Quincy, which had acute unemployment, the complex was built before some of the other, higher priority locks and dams. The lock, central control station, and esplanade were completed by August 1935. At that point, however, no money was available to begin the dam. As a result, representatives from Quincy vigorously, and successfully, lobbied for federal money to construct the dam as a work relief project.

A cofferdam failure on April 24, 1934, caused a one month delay in work on the lock. River conditions were favorable for construction from December 1933 to January 1935. However, the presence of ice in January and February 1935, and high river stages during spring 1935 delayed the cofferdam removal. Temperatures were unusually high between June 15 and Aug. 15, 1934, and rainfall was heavy during the latter part of May and first part of June 1935. A total of 1,000,078 man hours were expended on the project. The contractor employed an average of approximately 520 men, with a peak employment of more than 1,000 at the end of October 1934. The lowest river stage during construction occurred in 1934 at an elevation of 454.9 feet mean sea level.

The lock and dam elements of the complex were completed at a federal cost of \$4,155,000.

U.S. ARMY CORPS OF ENGINEERS – ROCK ISLAND DISTRICT

CLOCK TOWER BUILDING, P.O. BOX 2004, ROCK ISLAND, IL 61204-2004

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Annual Tonnage (20-Year Historical)

<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>
2017	30,248,055	2012	21,508,998	2007	28,546,672	2002	37,208,243
2016	30,759,812	2011	22,220,636	2006	29,497,577	2001	32,874,457
2015	24,236,266	2010	23,431,362	2005	27,123,388	2000	36,449,116
2014	20,924,543	2009	25,623,076	2004	26,556,326	1999	37,863,139
2013	16,883,089	2008	21,939,658	2003	32,011,667	1998	33,734,539

Commodity Tonnage (2017)

All Units (Ferried Autos, Passengers, Railway Cars)	-	Primary Manufactured Goods	1,287,276
Coal, Lignite, and Coal Coke	292,724	Food and Farm Products	21,578,509
Petroleum and Petroleum Products	290,200	Manufactured Equipment & Machinery	31,400
Chemicals and Related Products	4,780,054	Waste Material	-
Crude Materials, Inedible, Except Fuels	1,979,892	Unknown or Not Elsewhere Classified	8,000

Vessel & Lockage Data (2017)

Average Delay - Tows (Hours)	1.73	Non-Commercial Vessels	58
Average Processing Time (Hours)	0.8	Non-Commercial Flotillas	57
Barges Empty	10,637	Non-Commercial Lockages/Cuts	57
Barges Loaded	19,218	Percent Vessels Delayed (%)	77
Commercial Vessels	2,924	Recreational Vessels	358
Commercial Flotillas	2,867	Recreational Lockages	240
Commercial Lockages/Cuts	4,789	Total Vessels	3,340
Non-Vessel Lockages	-	Total Lockages/Cuts	5,086

The 9-foot Channel Navigation Project

The 9-foot Channel Navigation Project includes 37 lock and dam sites (42 locks) on 1,200 river miles in Illinois, Iowa, Minnesota, Missouri and Wisconsin. Constructed largely in the 1930s, it extends from Minneapolis-St. Paul on the Upper Mississippi River to its confluence with the Ohio River and up the Illinois Waterway to the T.J. O'Brien Lock in Chicago.

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UPDATE: August 2018

U.S. ARMY CORPS OF ENGINEERS – ROCK ISLAND DISTRICT
 CLOCK TOWER BUILDING, P.O. BOX 2004, ROCK ISLAND, IL 61204-2004
 Corporate Communications Office, (309) 794-5729, www.mvr.usace.army.mil



Lock & Dam 22

(Saverton, Missouri)
Mississippi River

U.S. ARMY CORPS OF ENGINEERS

BUILDING STRONG.

Construction: 1934-1939

General Contractors:

Lock: Joseph Meltzer, Inc., New York, N.Y.

Dam: Massman Construction Co., Kansas City, Mo.

Congressional District: MO-6; IL-18

Description

Lock and Dam 22 is 301.2 miles above the confluence of the Mississippi and Ohio rivers. Bluffs rise more than 200 feet above the river west of the lock; the valley is quite wide east of the complex.

Lock dimensions are 110 feet wide by 600 feet long with provisions for an auxiliary lock. The maximum lift is 10.5 feet with an average lift of 7.5 feet. It takes approximately seven minutes to fill or empty the lock chamber.



The movable dam has nine non-submersible Tainter gates (25 feet high by 60 feet long), one submersible Tainter gate (25 feet high by 60 feet long), and three submersible roller gates (25 feet high by 100 feet long). Completing the dam system are two transition dikes and a submersible earth and sand-filled dike. It takes seven hours for water to travel from Lock and Dam 21, in Quincy, Illinois, to Lock and Dam 22.

History/Significance

Construction on Lock 22 began Dec. 28, 1933, and was completed in May 1935. Construction on Dam 22 began Sept. 21, 1936, and was completed in July 1938. The structure was placed in operation on July 22, 1938.

Two sites were investigated for the location of Lock and Dam 22. The first site at 5.3 miles downstream of Hannibal had unfavorable sub-soil conditions. Thus, the existing site 7.8 miles downstream of Hannibal was selected.

It was on the submersible roller gates at Dam 22 that the Rock Island District introduced the Poiree dam trestles to mitigate scour problems. The trestles were subsequently used as a retrofit solution on other Project dams. The District also incorporated an experimental design for a submersible roller gate with end shields and introduced a new type of non-submersible, truss-type Tainter gate. It was also on this dam's submersible roller gates that the St. Paul District Hydraulic Laboratory conducted tests that led to the design of stilling basins for roller gates.

Extreme hot weather during the summer 1934 caused construction delays. A record high 116°F was recorded on July 20, 1934. However, winter temperatures were mild for the most part. Favorable river stages existed during the entire construction period. Rainfall was considerably below normal due to the drought during summer 1934. From Nov. 30 to Dec. 10, 1934, construction progress was practically stopped due to accidental flooding of the cofferdam area. The average daily number of men employed by the contractor on the lock was 327 with a maximum of 959 on Oct. 31, 1934. Due to high river stages in April 1937, the dam construction was delayed for six days.

The lock and dam elements of the complex were completed at a federal cost of \$3,943,000.

U.S. ARMY CORPS OF ENGINEERS – ROCK ISLAND DISTRICT

CLOCK TOWER BUILDING, P.O. BOX 2004, ROCK ISLAND, IL 61204-2004

Corporate Communications Office, (309) 794-5729, www.mvr.usace.army.mil

Annual Tonnage (20-Year Historical)

<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>
2017	31,062,315	2012	21,834,782	2007	28,908,447	2002	37,567,046
2016	31,468,758	2011	22,475,759	2006	29,789,804	2001	33,315,392
2015	24,643,731	2010	23,643,750	2005	27,371,325	2000	36,812,642
2014	21,345,591	2009	26,043,486	2004	26,731,864	1999	38,074,304
2013	16,996,396	2008	22,264,425	2003	32,210,205	1998	34,086,190

Commodity Tonnage (2017)

All Units (Ferried Autos, Passengers, Railway Cars)	-
Coal, Lignite, and Coal Coke	292,924
Petroleum and Petroleum Products	292,800
Chemicals and Related Products	4,754,864
Crude Materials, Inedible, Except Fuels	1,969,792
Primary Manufactured Goods	1,713,196
Food and Farm Products	21,978,859
Manufactured Equipment & Machinery	51,880
Waste Material	-
Unknown or Not Elsewhere Classified	8,000

Vessel & Lockage Data (2017)

Average Delay - Tows (Hours)	2.78	Non-Commercial Vessels	39
Average Processing Time (Hours)	0.78	Non-Commercial Flotillas	39
Barges Empty	10,980	Non-Commercial Lockages/Cuts	39
Barges Loaded	19,751	Percent Vessels Delayed (%)	97
Commercial Vessels	2,738	Recreational Vessels	209
Commercial Flotillas	2,712	Recreational Lockages	161
Commercial Lockages/Cuts	4,681	Total Vessels	2,986
Non-Vessel Lockages	-	Total Lockages/Cuts	4,881

The 9-foot Channel Navigation Project

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UPDATE: August 2018

U.S. ARMY CORPS OF ENGINEERS – ROCK ISLAND DISTRICT

CLOCK TOWER BUILDING, P.O. BOX 2004, ROCK ISLAND, IL 61204-2004
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Lock & Dam 23

(Somewhere between Saverton & Clarksville, Missouri)
Mississippi River

U.S. ARMY CORPS OF ENGINEERS

BUILDING STRONG.

Construction: Not Applicable

Description

The final survey report of the 9-Foot Channel Project, published in January 1932 as House Document 137, included a plan for the construction of Lock and Dam 23 at a cost estimate of \$4,842,500.

However, during construction of the Project, it was determined that Lock and Dam 23 was not necessary to maintain the navigation channel and it was eliminated from the plan.

The final survey report of the 9-Foot Channel Project, published in January 1932 as House Document 137, included the following cost estimates for the 9-Foot Channel Project:



1932 9-Foot Channel Project Cost Estimate

Purchase of Three Large Modern Dredges	\$1,500,000
Additional Survey and Studies	\$600,000
Dredging, Washington Avenue Bridge to Northern Pacific Bridge	\$356,000
Dredging, Pool 1, Below Washington Avenue Bridge	\$94,000
Second Lock, Twin Cities Lock and Dam	\$1,300,000
Dredging, Head of Hastings Pool	\$290,000
Second Lock at Hastings	\$1,500,000
Lock And Dam No. 3	\$3,502,487
Lock And Dam No. 4	\$3,910,821
Lock And Dam No. 5	\$3,921,413
Lock And Dam No. 5A	\$3,863,772
Lock And Dam No. 6	\$3,017,063
Lock And Dam No. 7	\$4,445,934
Lock And Dam No. 8	\$4,551,613
Lock And Dam No. 9	\$4,158,294
Lock And Dam No. 10	\$3,721,800
Lock And Dam No. 11	\$3,775,850
Lock And Dam No. 12	\$3,673,800
Lock And Dam No. 13	\$4,165,400
Lock And Dam No. 14	\$3,437,300
Lock And Dam No. 15 (Rock Island--including flowage damage and removal of old lock)	\$6,416,000

U.S. ARMY CORPS OF ENGINEERS – ROCK ISLAND DISTRICT

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Lock And Dam No. 16	\$4,889,100
Lock And Dam No. 17	\$4,381,400
Lock And Dam No. 18	\$5,456,400
Dredging at head of pool 19, including removal of standing timber	\$33,000
Second lock at No. 19, Keokuk	\$1,500,000
Lock And Dam No. 20	\$4,850,500
Lock And Dam No. 21	\$4,837,600
Lock And Dam No. 22	\$4,583,000
Lock And Dam No. 23	\$4,842,500
Lock And Dam No. 24	\$5,179,200
Lock And Dam No. 25	\$4,050,500
Lock And Dam No. 26	\$4,577,600
Removal of Wing Dams	\$228,700
Flowage Damages	<u>\$12,395,092</u>
Total Estimated Cost:	\$124,006,139

1932 Estimated Annual Operating and Maintenance Costs

Operation and Care of Locks and Dams	\$750,000
Channel Stabilization and Maintenance	<u>\$1,000,000</u>
Total Estimated Annual Cost:	\$1,750,000

The 9-foot Channel Navigation Project

Lock and Dam 23 was never constructed as U.S. Army Corps of Engineers' engineers determined it would not be needed to maintain a 9-foot-deep navigation channel between Locks and Dams 22 and 24.

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UPDATE: August 2018

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Lock & Dam 24

(Clarksville, Missouri)
Mississippi River

U.S. ARMY CORPS OF ENGINEERS

BUILDING STRONG.

Construction: 1936-1940

General Contractor:

Lock and Dam: Central Engineering Company, Davenport, Iowa

Congressional District: MO-6; IL-13

Description

Lock and Dam 24 is located at Mississippi River mile 273.4, 93.5 miles upstream of St. Louis. Its 13,000-acre pool is 27.8 miles long.

Lock dimensions are the standard 110 by 600 feet, with the upper gate bay section of an auxiliary lock. Average lift is 15 feet. Unlike Locks 25 and Old Locks 26, which are pile-founded structures built atop sand and gravel, Lock 24 is founded on durable shale. Because of the presence of a firm foundation material, the lock chamber is not floored and no lateral struts were provided to stabilize the intermediate and river walls.



Because of the presence of a firm foundation material, the lock chamber is not floored and no lateral struts were provided to stabilize the intermediate and river walls.

The 1,340-foot long movable dam has 15 fully submersible Tainter gates, 25 feet high by 80 feet long, which pivot vertically to control water flow. The gates are raised and lowered by individual electric motors, connected by line shafting to link-chain hoists, located beneath the dam service bridge. The piers provide support for the Tainter gates and the steel deck girder service bridge that extends the length of the dam. The dam includes a 2,720-foot submersible dike.

A major rehab of Lock and Dam 24 was completed in 2005. This work consisted of replacing a large portion of the concrete in the lock chamber walls, walkways and work areas. Also, new gate and valve machinery was installed elevating the electrical components above the 1993 flood levels.

History/Significance

The lock was put into operation on May 12, 1940. This was the first dam on the 9-Foot Channel Project constructed without roller gates. The submersible, elliptical Tainter gates of Dam 24 represent the apex of gate design achieved during the project. At the time of their construction, the Corps believed these gates to be the largest Tainter gates ever constructed. Because of the large size of the Tainter gates, and the relatively ice-free conditions of this stretch of river, roller gates were eliminated entirely from the dam design. These Tainter gates were innovative that they rendered roller gate technology, the principle engineering feature in dam construction at the time, obsolete.

Annual Tonnage (20-Year Historical)

<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>
2017	31,423,005	2012	22,426,843	2007	30,145,700	2002	38,862,614
2016	31,827,450	2011	22,927,332	2006	31,026,288	2001	34,785,352
2015	25,111,442	2010	24,127,530	2005	28,932,976	2000	38,697,993
2014	21,785,226	2009	26,682,701	2004	27,883,604	1999	39,296,994
2013	17,295,846	2008	23,133,551	2003	33,761,938	1998	35,289,630

U.S. ARMY CORPS OF ENGINEERS – ST. LOUIS DISTRICT

1222 SPRUCE STREET, ST. LOUIS, MO 63103-2833

Public Affairs Office, (314) 331-8068, www.mvs.usace.army.mil

Commodity Tonnage (2017)

All Units (Ferried Autos, Passengers, Railway Cars)	-
Coal, Lignite, and Coal Coke	293,324
Petroleum and Petroleum Products	284,800
Chemicals and Related Products	4,784,964
Crude Materials, Inedible, Except Fuels	2,016,892
Primary Manufactured Goods	1,702,996
Food and Farm Products	22,271,399
Manufactured Equipment & Machinery	60,630
Waste Material	-
Unknown or Not Elsewhere Classified	8,000

Vessel & Lockage Data (2017)

Average Delay - Tows (Hours)	2.32
Average Processing Time (Hours)	0.96
Barges Empty	11,183
Barges Loaded	19,997
Commercial Vessels	2,750
Commercial Flotillas	2,722
Commercial Lockages/Cuts	4,702
Non-Vessel Lockages	1
Non-Commercial Vessels	42
Non-Commercial Flotillas	41
Non-Commercial Lockages/Cuts	41
Percent Vessels Delayed (%)	67
Recreational Vessels	355
Recreational Lockages	234
Total Vessels	3,147
Total Lockages/Cuts	4,978

The 9-foot Channel Navigation Project

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Lock & Dam 25

(Winfield, Missouri)
Mississippi River

U.S. ARMY CORPS OF ENGINEERS

BUILDING STRONG.

Construction: 1935-1939

General Contractor:

Lock and Dam: United Construction Company,
Winona, Minn.

Congressional District: MO-3; IL-13

Description

Lock and Dam 25 is located at Upper Mississippi River mile 241.4. It is the third southern-most dam in the system on the Upper Mississippi River. The pool length is 32 miles and accounts for 18,000 acres.

The lock consists of a main lock, located against the east bank of Bradley Island, and the upper gate bay of an auxiliary lock. The main lock has the standard 110-foot-wide by 600-foot-long chamber. The average lift is 15 feet. Both the lock and the movable dam are pile-founded structures.

The 1,296-foot long movable portion of the dam has three submersible roller gate, 25 feet high by 100 feet long, and 14 submersible Tainter gates, 25 feet high by 60 feet long. The overflow dike length for is 2,566 feet.

Lock and Dam 25 consists of 14 Tainter gates which pivot vertically and are raised or lowered to control the depth of the water in the pool upstream of the dam. In times of high water, these gates are raised completely and the river flows almost unimpeded, allowing a more natural flow of the river. The three roller gates, located near the center of the dam, also restrict the water flow, but in a manner meant to reduce erosion.

A \$52 million major rehabilitation was completed at Lock and Dam 25 in 1999.

History/Significance

The lock was put into operation on May 18, 1939. The Tainter gates of Dam 25 represented a marked advance over those installed at Old Dam 26. The gates were fully submersible to a depth of nearly eight feet, more than twice that attained at Dam 26. Additionally, the streamlined spillway that characterized the dam gates was replaced by a riveted steel sheet that entirely covered the gate's steel framework, protecting it from ice damage and providing a smooth unobstructed surface for the water to pass over the gate in its submerged position.

Annual Tonnage (20-Year Historical)

<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>
2017	31,570,323	2012	22,163,268	2007	30,204,744	2002	38,916,145
2016	31,756,635	2011	23,033,059	2006	31,061,559	2001	34,855,844
2015	24,920,093	2010	24,117,099	2005	29,043,655	2000	39,161,898
2014	21,673,519	2009	26,926,504	2004	27,870,702	1999	39,536,830
2013	17,315,949	2008	23,244,934	2003	33,749,527	1998	35,440,234

U.S. ARMY CORPS OF ENGINEERS – ST. LOUIS DISTRICT

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Commodity Tonnage (2017)

All Units (Ferried Autos, Passengers, Railway Cars)	-
Coal, Lignite, and Coal Coke	304,024
Petroleum and Petroleum Products	286,800
Chemicals and Related Products	4,785,763
Crude Materials, Inedible, Except Fuels	2,052,792
Primary Manufactured Goods	1,721,596
Food and Farm Products	22,319,718
Manufactured Equipment & Machinery	91,630
Waste Material	-
Unknown or Not Elsewhere Classified	8,000

Vessel & Lockage Data (2017)

Average Delay - Tows (Hours)	3.83
Average Processing Time (Hours)	1
Barges Empty	11,198
Barges Loaded	20,112
Commercial Vessels	2,744
Commercial Flotillas	2,725
Commercial Lockages/Cuts	4,700
Non-Vessel Lockages	-
Non-Commercial Vessels	49
Non-Commercial Flotillas	48
Non-Commercial Lockages/Cuts	48
Percent Vessels Delayed (%)	79
Recreational Vessels	390
Recreational Lockages	230
Total Vessels	3,183
Total Lockages/Cuts	4,978

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Melvin Price - Locks & Dam 26

(Alton, Illinois)
Mississippi River

U.S. ARMY CORPS OF ENGINEERS

BUILDING STRONG.

Construction: 1979-1990

General Contractors:

Lock: Joint venture of S.J. Groves & Sons, Minneapolis, Minn.;
Guy F. Atkinson Company, South San Francisco, Calif.; and
Dillingham Corporation, Pleasanton, Calif.

Dam: Joint venture of S.J. Groves & Sons, Minneapolis, Minn.;
Guy F. Atkinson Company, South San Francisco, Calif.;
Ball Construction Company; and Black & Veatch

Congressional District: MO-3; IL-12

Description

Melvin Price Locks and Dam, located at Mississippi River mile 200.5, is two miles below the site of the old Locks and Dam 26 which was razed in 1990. It is approximately 20 miles above St. Louis. Its 31,000-acre pool is 40.6 miles long.



The complex has twin locks. The main lock is 110 by 1,200 feet; the auxiliary lock is 100 feet by 600 feet. The locks are U-shaped and supported on steel H-piles. The maximum lift is 24 feet.

The movable dam has nine, open-frame, non-submersible Tainter gates, each 42 feet high by 110 feet long. Individual, electrically operated, cable hoists are housed in pier-top operating houses. The 1,160-foot-long movable dam is supported by steel H-piles driven into bedrock.

History/Significance

The lock was put into operation on October 10, 1989. The complex is also known as Locks and Dam 26R and constitutes the first replacement of an original installation of the 9-Foot Channel Project.

The basic components of the complex are similar to those built in the 1930s. The most striking difference is the immense size of the new structure, which dwarfs the older installations. But the significance of the new installation is not limited to its colossal size. Throughout its design and construction, the Corps and various contractors engaged in an extensive program of computer-assisted design, testing, and evaluation to create a structure that represents the present state-of-the-art in river navigation control works.

Co-located on the site is the Corps' National Great Rivers Museum.

Annual Tonnage (20-Year Historical)

<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>
2017	63,059,956	2012	28,953,338	2007	65,248,495	2002	79,037,946
2016	63,707,314	2011	51,587,941	2006	70,759,977	2001	75,867,386
2015	53,686,893	2010	53,502,569	2005	66,512,090	2000	77,110,017
2014	53,660,699	2009	56,403,848	2004	67,670,539	1999	77,580,836
2013	40,098,295	2008	56,295,661	2003	72,413,323	1998	73,913,375

U.S. ARMY CORPS OF ENGINEERS – ST. LOUIS DISTRICT

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Commodity Tonnage (2017)

All Units (Ferried Autos, Passengers, Railway Cars)	-
Coal, Lignite, and Coal Coke	1,087,950
Petroleum and Petroleum Products	4,222,473
Chemicals and Related Products	11,265,496
Crude Materials, Inedible, Except Fuels	5,058,656
Primary Manufactured Goods	5,140,762
Food and Farm Products	36,127,729
Manufactured Equipment & Machinery	109,740
Waste Material	11,400
Unknown or Not Elsewhere Classified	35,750

Vessel & Lockage Data (2017)

Average Delay - Tows (Hours)	2.69
Average Processing Time (Hours)	0.87
Barges Empty	20,637
Barges Loaded	38,967
Commercial Vessels	5,584
Commercial Flotillas	5,511
Commercial Lockages/Cuts	5,583
Non-Vessel Lockages	-
Non-Commercial Vessels	58
Non-Commercial Flotillas	52
Non-Commercial Lockages/Cuts	52
Percent Vessels Delayed (%)	71
Recreational Vessels	718
Recreational Lockages	348
Total Vessels	6,360
Total Lockages/Cuts	5,983

The 9-foot Channel Navigation Project

The 9-foot Channel Navigation Project includes 37 lock and dam sites (42 locks) on 1,200 river miles in Illinois, Iowa, Minnesota, Missouri and Wisconsin. Constructed largely in the 1930s, it extends from Minneapolis-St. Paul on the Upper Mississippi River to its confluence with the Ohio River and up the Illinois Waterway to the T.J. O'Brien Lock in Chicago.

The maintenance needs of this aging infrastructure have surpassed annual operations and maintenance funding. This limited funding has adversely affected reliability of the system and has primarily resulted in a fix-as-fail strategy, with repairs sometimes requiring days, weeks or months. Depending on the nature of a failure and extent of repairs, shippers, manufacturers, consumers and commodity investors can experience major financial consequences. Additionally, today's 1,200'-long tows must split and lock through in two operations within the Project's 600' chambers. This procedure doubles and triples lockage times, increases costs and wear to lock machinery, and exposes deckhands to higher accident rates.

More than 580 facilities ship and receive commodities within the Project. Grains (corn and soybeans) dominate traffic; cement and concrete products are the second largest group. A modern 15-barge tow transports the equivalent of 1,050 semi-trucks (26,250 tons, 937,387 bushels of corn, or 240 rail cars). In 2016, the 9-foot channel project generated an estimated \$2 billion of transportation cost savings compared to its approximately \$246 million operation and maintenance cost.

UPDATE: August 2018

U.S. ARMY CORPS OF ENGINEERS – ST. LOUIS DISTRICT

1222 SPRUCE STREET, ST. LOUIS, MO 63103-2833
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Chain of Rocks - Locks & Dam 27

(Granite City, Illinois)
Mississippi River

U.S. ARMY CORPS OF ENGINEERS

BUILDING STRONG.

Construction: 1947-1964

General Contractors:

Lock: River Construction Corporation

Dam: Unknown

Congressional District: MO-1; IL-12

Description

Locks and Dam 27's locks are located at Mississippi River mile 185.5 near the southern end of the 8.4-mile long Chain of Rocks Canal. The dam is located at Mississippi River mile 190.2 immediately downstream from Homer Dike, Intake Towers 1 and 2 of the St. Louis Water Works, the Chain of Rocks Highway Bridge, and the Interstate Highway 270 Bridge. Its 489-acre pool (canal) is 15.6 miles long.



Locks and Dam 27 has twin locks, a main chamber and an auxiliary chamber. The main lock chamber is 1,200 feet long by 110 feet wide. The auxiliary chamber measures 600 feet long by 110 feet wide. Both locks were excavated to bedrock, which serves as the lock chamber floors.

The dam is 2,500 feet in length and is a non-movable low-water dam which extends entirely across the river.

History/Significance

The canal and locks were put into operation on February 7, 1953. Locks and Dam 27 is unique for several reasons. Constructed between 1946 and 1953, these locks are the only locks on the upper Mississippi River that are not directly attached to their respective dam. The dam is located several miles away on the river, whereas the locks are within the Chain of Rocks Canal. The dam itself is also unlike any other dams in the system. All other dams were built to be moveable, so they could be adjusted according to the changing water level. Dam 27 is not so complex; it is a 2,500-foot non-movable, low-water, fixed-crest rock dam extending across the river and designed to provide additional water depth at the lower gate sills of Lock 26. Constructed between 1959 and 1964, the dam has virtually no impact upon operations within the Chain of Rocks Canal or at Locks 27.

The locks are the last on the upper Mississippi River, therefore more cargo moves through its lock than any other navigation structure on the River.

Annual Tonnage (20-Year Historical)

<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>	<u>Year</u>	<u>Tons</u>
2017	67,032,777	2012	56,612,966	2007	67,712,832	2002	83,825,396
2016	68,153,794	2011	59,059,081	2006	73,361,655	2001	81,090,628
2015	60,311,824	2010	58,479,522	2005	68,345,297	2000	82,633,959
2014	62,074,905	2009	60,534,314	2004	71,166,714	1999	83,378,714
2013	49,833,766	2008	58,544,060	2003	77,454,308	1998	81,337,479

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Commodity Tonnage (2017)

All Units (Ferried Autos, Passengers, Railway Cars)	-
Coal, Lignite, and Coal Coke	1,130,500
Petroleum and Petroleum Products	6,156,695
Chemicals and Related Products	12,315,534
Crude Materials, Inedible, Except Fuels	5,138,958
Primary Manufactured Goods	5,364,775
Food and Farm Products	36,758,420
Manufactured Equipment & Machinery	128,095
Waste Material	9,400
Unknown or Not Elsewhere Classified	30,400

Vessel & Lockage Data (2017)

Average Delay - Tows (Hours)	2.55
Average Processing Time (Hours)	0.69
Barges Empty	22,064
Barges Loaded	40,754
Commercial Vessels	7,235
Commercial Flotillas	7,022
Commercial Lockages/Cuts	7,064
Non-Vessel Lockages	-
Non-Commercial Vessels	88
Non-Commercial Flotillas	85
Non-Commercial Lockages/Cuts	85
Percent Vessels Delayed (%)	87
Recreational Vessels	576
Recreational Lockages	320
Total Vessels	7,899
Total Lockages/Cuts	7,469

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