



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. Gutherie 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

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

180 5TH STREET EAST, SUITE 700, ST. PAUL, MN 55101-1678
Public Affairs Office, (651) 290-5807, www.mvp.usace.army.mil

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