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. Specific items of engineering significance include the exclusive use of submersible roller gates in the movable dam; the use of "Z" sheet piling in the abutment walls; and the replacement of all dam substrata. Prior to the construction of the dam, the Corps replaced approximately 200,000 cubic yards of unstable substrata with 130,000 cubic yards of river sand in order to provide a more stable foundation for the dam structure. The lock and dam elements of the complex were completed at a cost of $3,730,000. Fifty-three injuries took place during construction; no fatalities occurred.

Annual Tonnage (20-Year Historical)

Year	Tons	Year	Tons	Year	Tons	Year	Tons
1992	9,261,980	1997	9795603	2002	10,591,946	2007	7,057,358
1993	7,711,590	1998	10,543,500	2003	8,835,187	2008	4,732,120
1994	9,603,923	1999	11,549,600	2004	7,824,551	2009	7,064,757
1995	9,548,599	2000	10,865,655	2005	7,300,671	2010	7,166,302
1996	10,546,759	2001	8,545,300	2006	7,338,218	2011	6,746,894

Commodity Tonnage & Lockages (2011)

Coal	292,286
Petroleum	283,810
Chemicals	1,363,153
Crude Materials	1,480,129
Manufactured Goods	721,727
Farm Products	2,578,670
Manufactured Machinery	11,419
Waste Material	0
Unknown	15,700

Subtotals:	Grain	2,378,828
	Steel	28,300
Lockages:	Commercial Boats:	959
	Recreation Boats:	8,266
	Light Boats:	129
	Other Boats:	42
	Total Boats:	9,396
	Total Cuts:	4,406

The 9-Foot Channel Project

Lock and Dam 3 is one of 29 locks and dams on the Upper Mississippi River that provide a water stairway of travel for commercial and recreational traffic from Minneapolis to the Gulf of Mexico.

The existing 9-foot Channel Navigation Project was largely constructed in the 1930s and extends down the Upper Mississippi River from Minneapolis-St. Paul to its confluence with the Ohio River and up the Illinois Waterway to the Thomas J. O'Brien Lock in Chicago. It includes 37 Locks and approximately 1,200 miles of navigable waterway in Illinois, Iowa, Minnesota, Missouri and Wisconsin.

The maintenance needs of the aging infrastructure are increasing at a rate much greater than the operations and maintenance funding provided for the system which adversely affects reliability of the system. Long-established programs for preventive maintenance of major lock components have essentially given way to a fix-as-fail strategy, with repairs sometimes requiring weeks or months to complete. Depending on the malfunction, extended repairs can have major consequences for shippers, manufacturers, consumers, and commodities investors.

Additionally, the system's 600-foot locks do not accommodate today's modern tows without splitting and passing through the lock in two operations. This procedure requires uncoupling barges at midpoint which triples lockage times and exposes deckhands to increased accident rates.

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). Annually, the 9-foot project generates an estimated $1 billion of transportation cost savings compared with the operation and maintenance costs of approximately $115 million.

UPDATE: October 2012