

Upper Mississippi River Nine-Foot Channel Project,
Lock and Dam Number 5
Minnieska, Minnesota, vicinity
Winona County, Minnesota
Buffalo County, Wisconsin

HAER No. MN-22

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PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

Historic American Engineering Record
National Park Service
Department of the Interior
Rocky Mountain Regional Office
P.O. Box 25287
Denver, Colorado 80225

HISTORIC AMERICAN ENGINEERING RECORD

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Location: 5.5 miles upstream of Fountain City, Wisconsin; below Minnieska, Minnesota, at mile 114.75 downstream from Minneapolis, Minnesota, and 738.25 miles upstream from Cairo, Illinois. Minnieska vicinity, Winona County, Minnesota.

At the time of construction of Lock and Dam Number 5, the river was about 2 to 2-1/2 miles wide, with the main channel at the foot of the bluff. The river normally maintained a width of 800 feet, widening to 2 miles in flood stages. Prior to construction, the river bottom rose gently from the river to the Wisconsin bluffs and was overgrown with brush and timber. See Corps drawing number 5-10-17; HAER photographs MN-22-1 through MN-22-92.

Date of Erection: 1933-1939
Architect/Engineer: U. S. Corps of Engineers
Present Owner: United States Government
U. S. Army Corps of Engineers
St. Paul District

Present Use: River navigation/hydrology control

Significance: The Upper Mississippi Lock and Dam Project represents one of the largest and most ambitious of such undertakings. With roots in the Progressive Era, the project was adopted by New Deal proponents to serve the needs of public employment during the Great Depression. Its successful completion turned the upper reaches of one of the world's largest rivers into a intra-continental canal and settled the question of a fully navigable interior river system through the Midwest.

Completion of the system helped allay economic inequities in commercial rail and water freight rates brought about as a result of the opening of the Panama Canal. Although significantly altering the environment of the upper Mississippi, the project also

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served as an impetus for the upgrading of municipal drinking water and sewage disposal systems, as well as providing new recreational opportunities, thus, in the end, proving generally beneficial to public welfare.

Historian: William Patrick O'Brien
October 1987

NOTE: For a complete history, footnotes and bibliography, see HAER No. MN-20.

LOCKS AND DAMS 3 THROUGH 10--INDIVIDUAL SIGNIFICANCE AND INVENTORIES

The following outlines document specific significant technologies reflected in the construction of the individual lock and dam complexes, calling attention to unique engineering design items. Changes made to various systems since their initial completion are also a part of this section. A number of maintenance changes have occurred at various times since their completion. Changes made before 1970 are not well documented; many are superficial. Complete documentation to system changes is contained in the monthly condition reports filed with the St. Paul District Office by the various installations. Some changes may have been made over the years without benefit of documentation. Therefore, the following tables should not be interpreted as entirely inclusive.

It should be noted that architectural and engineering components vary significantly from site to site. Architectural styles for gate pier design fall into two categories: those completed prior to 1935-1936 (1a, 1b) and those completed after those dates (2a, 2b). Only one 1a structure exists in the entire Nine-Foot Channel system and is located at Rock Island, Illinois. As such, it is not a part of this study. The 1b structures are characterized by large, multipane windows, hip roofs, and engaged buttress detailing on the gate house piers. The 2a structures are more streamlined in style with slit, three-pane windows, flat roofs, and no buttress detail. The 2b structures are identical to 2a elements except for addition of a metal panel in the Roller gate track section of the gate piers that does not occur in 2a structures. Only 1b and 2a architectural types occur in the St. Paul District. Other elements, such as central control stations, lockkeepers' residences, and associated structures, are standardized, unless otherwise noted.

Dates for the construction of each complex are given from the beginning of initial work to the end of the project and do not necessarily reflect the construction dates of any single element. Complete construction histories for each complex containing exhaustive documentation for the building of the lock, dam, esplanade features, and other attendant installations are on file with the St. Paul District Office. These histories contain comprehensive listings

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for all general contractors and subcontractors involved in the project as well as a listing for all material suppliers. For the purposes of this study, information regarding contractors and subcontractors has been reproduced as it appears in the construction histories. As a result, certain inconsistencies appear as a matter of course. For example, in some histories the contractor's business location is cited by city; in others, this information is not included. In addition, approximately 10,000 separate construction drawings and illustrations were produced during the project and during the course of maintenance since its completion. Drawings were selected from among these materials to illustrate both standardized elements as well as those pertaining to specific sites. Drawing numbers are noted at the end of entries where applicable: "()" indicates standardized elements illustrated elsewhere in the system, "*" indicates elements for which drawings are not readily available. General index sheets have also been reproduced at the beginning of each lock and dam illustration collection for a complete reference. Contemporary photographic documentation, including 16mm film footage, served to document the project. Photographs are on file in the St. Paul District Office and at each individual installation. Sixteen millimeter film footage is available in video cassette format from the St. Paul Office.

Dimensions for the movable gate sections are given in approximate figures based on the general notations as found in official Corps publications. For example, Roller gates are generally cited as being standardized as either 60 by 20 feet or 80 by 20 feet. However, in the construction history notations, gate lengths are often given exactly as 88 feet 10-1/2 inches long and 15 feet in diameter. Similar approximations apply to information concerning Tainter gate elements. Measurements in both instances should be taken only as approximations for use in categorizing the various sizes and styles of installations and not as an exact measure per se.

PART I. HISTORICAL INFORMATION

A. Physical History:

1. Dates of Erection: 1933-1939
2. Architect/Engineer: U. S. Army Corps of Engineers
3. Original and Subsequent Owners: U. S. Government
4. Builders, Contractors, Suppliers:
 - a. General contractor--lock construction:
Edward E. Gillen Company, Milwaukee, Wisconsin

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b. Subcontractors--lock construction:

Lakeside Bridge and Steel Company, Milwaukee, Wisconsin
(construction of lock gates, Tainter valves, and metal parts)
Whiting Corporation, Harvey, Illinois (construction of operating
machinery)
J. C. Thielacker and Company, Milwaukee, Wisconsin (erection of
structural steel and operating machinery)
Ferd J. Robers, Burlington, Wisconsin (excavation and fill)
Uihlein Electric Company, Milwaukee, Wisconsin (conduits and
electrical work)
H. Knudson and Company, Chicago, Illinois (painting)
Miller, Keller and Fugina, Winona, Minnesota (protection stone)

c. General contractor--dam construction:

Merritt-Chapman and Whitney Corporation, Cleveland, Ohio

d. Subcontractors--dam construction:

I. S. Ofstie, Menominee, Wisconsin (grading for railroad spur)
Winona Sand and Gravel, Winona, Minnesota (excavation)
Worden-Allen Company, Milwaukee, Wisconsin (supplier and erector
of all metal work)
Allis-Chalmers Manufacturing Company, West Allis, Wisconsin
(employed by Worden-Allen for design and construction of Roller
gates)
H. Knudson and Company, Chicago, Illinois (subcontractor under
Worden-Allen for all field painting)
Fred R. Combs Company (with eight sub-subcontractors),
Minneapolis, Minnesota (power house construction)
Pittsburg Plate Glass Company, Minneapolis, Minnesota (glazing of
operating houses)
Winona Heating and Ventilating Company, Winona, Minnesota
(roofing of operating houses)

5. Original Plans and Construction: U. S. Army Corps of Engineers

6. Alterations and Additions:

<u>Item</u>	<u>Year</u>
Scour repair--lower end of guide wall	1944
Repair bridge pedestals on Tainter gate 13, 14	1946
Scour repair above Roller gate 2	1952

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<u>Item</u>	<u>Year</u>
Roller and Tainter gate painting	1956
Painting interior of Roller gates	1956
Slough aeration culvert	1957
Central control station reroofing	1968
Upper landward Miter gate repair	1971
Repair bridge pedestals	1974
New sewage sewer	1975
Reroof pier houses on dam	1977
Aeration culverts	1977
Paint dam gates	1977-78
Dewater lock	1977-78
Lower guide wall foundation repair	1980
New crane on dam	1981
Scour repair--lock and guide wall	1982
Scour repair--dam	Awarded 1983
Upper approach modification	Awarded 1983
Further information not available	

B. Historical Context

Lock and Dam Number 5 were members of the Priority "A" group, scheduled for completion as the second installation, due to problems with flooding and dredging. The lock and dam were completed in 1934 and 1935, respectively. Other work, such as an earth dike, power, control and lighting systems, locomotive crane, access roads, gate hoists, lockkeepers' dwellings and a garage pumphouse were completed at the end of May 1935.

The main lock consists of the standard 110 by 600 feet dimensions with the upper gate of a future auxiliary lock located in the main channel next to the Minnesota shoreline. The movable dam consists of 24 non-submersible Tainter gates measuring 15 by 35 feet, four Tainter gates of the same dimensions being submersible for three feet, and six Roller gates measuring 60 by 20 feet, submersible for three feet. The movable gate section of the dam is 1,619 feet wide. All are located between concrete piers topped with a steel service deck. The Roller gates at Dam Number 5 are a good example of their use in conjunction with flooding and heavy ice flow conditions. Their placement in the main channel was based on these attributes. As in the other projects, foundations are underpinned with both steel sheet and wood pilings. Foundations for the lock consist of piles in sand and gravel; dam foundations consist of piles in sand only.

Lock lift is nine feet. Upper normal pool elevation is 660 feet. Depth on upper Miter sill is 18 feet; lower Miter sill is 12 feet. The complex was opened to navigation in 1935. The site hosted a presidential visit by Franklin Delano Roosevelt in 1934.

No serious accidents were encountered while constructing the dam. However, one fatal accident involving a private craft occurred during the course of construction; no fatalities occurred during lock construction.

PART II. TECHNOLOGICAL INFORMATION--LOCK

A. General Statement:

1. Architectural character: standardized Ohio-Mississippi lock design. Drawing numbers (5-10-1, 5-10-1), 5-20-(A), 5-20-1.
2. Condition of fabric: good.

B. Description of General Layout and Principal Elements:

1. Overall dimensions: 110 by 600 feet. Drawing number 5-20-1.
2. Foundations: wood and steel sheet pilings in sand and gravel. Drawing number (5-20-2).
3. Walls: reinforced monolithic concrete. Drawing number (5-20-A).
4. Structural system:*
5. Bulkheads: concrete bulkhead configurations occur at each end of the riverward lock wall.*
6. Upper and lower guide walls: monolithic reinforced concrete walls extending out from the lock chamber at either end to assist in the guiding of barge traffic into the lock. Drawing number (5-20-1).
7. Stage recorder: small concrete housing located at the end of the lock guide wall. Equipment housed for the recording of river stages. Drawing number (5-77-1).

C. Mechanical Equipment:

1. Operating house: controls for lock gates and Tainter valves housed in small buildings on lockwall. Drawing number (5-41-1).
2. Tainter valves: cable drive lock valve of steel construction with electric motorized assembly. Drawing number (5-25-1).

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3. Gates: two miter gates balanced on stainless steel pintels operated by gear arm system and electric motor assemblies. Bumper lines on interior of lock also of stainless steel. All other associated metal parts are of steel, stainless steel, or steel/nickel alloy. Drawing numbers (5-21-1, 5-21-17, 5-22-1).
4. Lighting: various freestanding single and double head lighting standards, ca. 1935.*
5. Plumbing: lock is watered by four cable-drive Tainter valves serving a system of cast-in-place tunnels that enable the water level to be controlled on the interior of the lock. Drawing numbers 5-20-1, (5-25-1, 5-28-A, 5-28-1).
6. Winch: motorized assembly to assist towing of barges through lockage.

D. Other Elements:

1. Auxiliary lock: fixed Miter gate without machinery and partial walls located to the riverward side of the lock complex. Equipped with wells for machinery placement. Never completed or put into service.*

PART III. TECHNOLOGICAL INFORMATION--MOVABLE DAM

A. General Statement:

1. Architectural character: type 1b Roller gate piers have multipane windows, low hip roofs, and engaged buttress detailing. Drawing numbers (5-40-1, 5-40-2); 5-41-1.
2. Condition of fabric: good.

B. Description of Exterior:

1. Overall dimensions: 1,619 feet in length. Drawing number 5-40-1.
2. Foundations: wood and steel piling in sand. Drawing numbers (5-40-2), 5-40-4, (5-40-20).
3. Operating house walls and piers/Tainter gate piers: monolithic reinforced concrete. Drawing numbers (5-40-C, 5-40-1, 5-40-2, 5-40-3, 5-41-1).
4. Structural system: monolithic concrete/structural steel.*

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5. Bulkheads: concrete bulkheads are located at the base of each gate pier.*
6. Operating house openings: one doorway and seven 6-pane industrial sash windows for each Roller gate operating house. Drawing numbers 5-40-2, 5-41-1.
 - a. Doorways and doors: 6
 - b. Windows: 42
7. Operating house roof. Drawing number 5-41-1.
 - a. Shape, covering: low hip roof in concrete shingle. Drawing number 504101.
 - b. Towers: six Roller gate piers and operating house towers; one access pier. Drawing number 5-41-1.
9. Access bridges:
 - a. Shape: linear span without arching. Drawing numbers (5-53-2, 5-53-6).
 - b. Materials: structural steel.*

C. Description of General Layout and Principal Elements:

1. Access plans: plan of access consists of a simple stairway attached to the landward side of the access pier. Each operating house from that point is connected by an access bridge/rail track in a linear series. Drawing number 5-40-1.
2. Stairways: poured concrete/structural steel.*
3. Flooring: reinforced concrete.*
4. Wall and ceiling finish: reinforced concrete.*
5. Hardware: brass.*

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D. Mechanical Equipment:

1. Movable gates--Roller type: six 3-foot submersible units, approximately 20 by 60 feet, operating on tooth track and chain-driven hoist machinery with position gauge located on interior of headhouse. Drawing numbers (5-47-1, 5-47-2, 5-47-4, 5-56-5).
2. Movable gates--Tainter type: 24 non-submersible and 4 submersible Tainter gates, 15 by 35 feet, with gauges operating on hoist car and portable chain driven hoist car machinery. Four gates are submersible for three feet. Drawing numbers (5-48-1, 5-48-5, 5-55-0, 5-55-2).
3. Lighting: some fixtures extant from ca. 1935 period. Rewiring may have taken place over the years. Extent is unknown.*

E. Other Elements:

1. Earth dike: linear non-submersible 18,219-foot dike with riprap revetment topped with a clay and gravel road. Earth dike is located at the end of the movable dam section and extends to the west to the Wisconsin riverbank.*
2. Roller gate and Tainter gate bulkheads: temporary blocking units of structural steel girder construction placed in gate openings in period of emergency or repair.*
3. Bulkhead car/tracks: cars designed to store and access bulkheads. Located in storage yard.
4. Flatcar assembly: car for the transport of gate bulkheads and repair materials.*
5. Movable crane: vertical lift crane (replaced ca. 1980) used for the moving of parts and equipment. Operates on track system attached to girder spans. Original "A" type unit. Drawings of replacement unit available from St. Paul District Office. Drawing number 5-57-1.
6. Storage yard: area surrounding the last Roller gate pier on the Wisconsin side. Contains replacement parts for gates, bulkheads on track cars, and related repair items. Drawing number 5-40-1.
7. Winch: motorized assembly to assist towing of barges through lockage.*

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8. Boat launch: singled-armed launch of metal construction. Installed ca. 1985.*
9. Hoist car: car containing portable machinery for the raising and lowering of Tainter gates. Originally equipped with gasoline-powered hoists, the installation was converted to electric systems in the 1950s. Two car types: Lakeside and American. Drawing numbers 5-55-(0), 5-55-2.

PART IV. TECHNOLOGICAL INFORMATION--ESPLANADE AREA

a. Description of Esplanade--General Layout:

1. Design character: standardized park/service area component. The esplanade area was originally designed to accommodate the central control station and various service-related functions. Major site alterations have occurred since that time and are noted in the following items. Drawing numbers: 5-38-(9), 5-38-10, 5-38-(17).
2. Historic landscape design: based on standardized designs--see drawings for esplanade. Drawing number: (5-38-17).

B. Condition of Site and Structure: Altered.

1. Central control station--exterior: standardized construction. Hip roof; concrete stucco finish. Drawing numbers (5-70-0, 5-70-1, 5-70-2, 5-70-5, 5-70-6), 5-71-1.
 - a. First floor contains central control panel and room, bathroom, main office, and basement stairway access. Drawing numbers 5-29-1, 5-29-33, 5-39-40, 5-70-2, 5-71-1.
 - b. Basement contains storage and equipment room. All interior finishes altered from original construction. Drawing numbers (5-70-20), 5-71-1.
2. Lockkeeper's/assistant lockkeeper's residences: standardized Colonial Revival two-story frame construction with side porches. Residences have been moved off site and are in the general area of the lock and dam site on County Road 9. Drawing numbers 5-10-10, (5-74-20, 5-74-21).

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3. Outbuildings: various sheds and service buildings have been erected from time to time as demands required--none have particular significance or contribute to the site. A new garage structure of brick and steel was erected on the old site of the lockkeeper's residence ca. 1985. The element is standardized. Drawing numbers (5-72-1, 5-72-2).

PART V. SOURCES OF INFORMATION

- A. Original Architectural Drawings: St. Paul District Office, Construction Drawings--9-Foot Channel Project 1927-1984. Passim.
- B. Early Views: Construction Photographs: Lock and Dam 5--Photograph Log Books
- C. Interviews: Personnel, Lock and Dam 5
- D. Bibliography:
 1. Primary and unpublished sources: National Archives, Record Group 77; Construction Histories--Lock and Dam 5; see bibliography, HAER No. MN-20.
 2. Secondary and published sources: see bibliography, HAER No. MN-20.
- E. Likely Sources Not Yet Investigated: National Archives, Record Group 77, Suitland, Maryland; St. Louis, Missouri.
- F. Supplemental Material: Aerial Photographs, U. S. Army Corps of Engineers, St. Paul District.