

CHICAGO SANITARY AND SHIP CANAL, LOCKPORT
CONTROLLING WORKS
Illinois Waterway River Mile 293.2
Lockport vicinity
Will County
Illinois

HAER IL-197-A
IL-197-A

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

REDUCED COPIES OF MEASURED DRAWINGS

HISTORIC AMERICAN ENGINEERING RECORD
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HISTORIC AMERICAN ENGINEERING RECORD

CHICAGO SANITARY AND SHIP CANAL, LOCKPORT CONTROLLING WORKS

HAER IL-197-A

- Location:** Illinois Waterway River Mile 293.2, Lockport vicinity, Will County, Illinois
UTM—Latitude: 41.597622; Longitude: -88.066081
- Present Owner:** Metropolitan Water Reclamation District, Chicago
- Present Use:** Regulation of water in Chicago Sanitary and Ship Canal
- Significance:** The Lockport Controlling Works, originally consisting of a bear-trap dam and sluice gates, allowed the Sanitary District to discharge water from the Chicago Sanitary and Ship Canal into the Des Plaines River channel when necessary. The 160' bear-trap dam was reportedly the largest of its type in the world when built.
- Historian:** Justine Christianson, HAER, 2009
- Project Information:** The Chicago Sanitary and Ship Canal Recording Project was undertaken during the summer of 2009. The project focused on a 2.2-mile-long section between Illinois Waterway River Miles 291.1 to 293.3. The U.S. Army Corps of Engineers sponsored the project with research assistance and access provided by the Metropolitan Water Reclamation District of Greater Chicago. The field team consisted of Dana Lockett, HAER Architect and Project Leader; Nicole Martineau, HAER Intern, and Justine Christianson, HAER Historian. Jet Lowe, HAER Photographer, produced the large format photographs.

For additional information see:

Chicago Sanitary and Ship Canal	HAER No. IL-197
Chicago Sanitary and Ship Canal, Butterfly Dam	HAER No. IL-197-B
Chicago Sanitary and Ship Canal, Lockport Power House and Dam	HAER No. IL-197-C
Chicago Sanitary and Ship Canal, Lockport Lock	HAER No. IL-197-D

Part I. Historical Information

A. Physical History:

- 1. Date of Construction:** August 1895-July 1896
- 2. Architect/Engineer:** Thomas T. Johnston, Assistant Civil Engineer with the Chicago Sanitary District, designed the Lockport Controlling Works. Alfred Noble was responsible for the metal details.¹
- 3. Builder/Contractor/Supplier:** Christie & Lowe of Chicago, Illinois, won the overall construction contract, while Griffiths & McDermott Construction Company was responsible for the foundation of the bear-trap dam. Materials were furnished by various companies, including Lassig Bridge & Iron Works of Chicago. American Steel Casting Company of Thurlow, Pennsylvania, provided the steel castings while J.H. Bass of Chicago manufactured the iron castings. Trenton Iron Company of Trenton, New Jersey, supplied the wire rope, and the chains came from S.G. Taylor & Sons of Chicago. The Pittsburgh Testing Laboratory inspected all materials and shop work.²
- 4. Original Plans:**

Drawings, historic photographs, and descriptions of the Controlling Works as built reveal its original design and construction.³ The Controlling Works originally had a bear-trap dam at the south end and fifteen sluice gate openings, seven of which were equipped with gates, at the north end. The bear-trap dam was located between concrete abutments. The dam had a 160' crest and a 17' range of oscillation, although the Sanitary District's Chief Engineer, Isham Randolph, noted the range was 12'.⁴ As described by Randolph, "the dam is essentially two great metal leaves hinged together and working between masonry bulkheads. The down-stream leaf is securely hinged to a very heavy foundation,

¹ "Bear Trap Dam—Chicago Drainage Canal," *The Railroad Gazette* (February 12, 1897), 111; "Bear Trap Dam for Regulating Works, Chicago Drainage Canal," *Engineering News* XXXIX, no. 12 (March 24, 1898): 189. "Bear Trap Dam for Regulating Works," designates Noble as the designing engineer.

² "Bear Trap Dam—Chicago Drainage Canal," 111, *Proceedings of the Board of Trustees of the Sanitary District of Chicago from January 1, 1895 to December 31, 1895* (Chicago: John F. Higgins, Printer, 1896), 2944, 3042-43; *Proceedings of the Board of Trustees of the Sanitary District of Chicago from January 1, 1897 to December 31, 1897* (Chicago: John F. Higgins, Printer, 1898), 3795, 3992-93; "Bear Trap Dam for Regulating Works," 189.

³ Photographs and historic drawings are available at the Metropolitan Water Reclamation District of Greater Chicago's Archives in Chicago.

⁴ Sanitary District of Chicago, "Regulating Works, General Plan Showing Location, Elevation and Sundry Details of Foundations of Bear-Trap Dam and Collateral Work Mentioned in the Specifications," February 1897; Sanitary District of Chicago, "Regulating Works, Plan and Section of Foundations and Abutments of Bear Trap Dam Showing General Details and Certain Details Mentioned in the Specifications," February 1897, Sheet 3, both available at Metropolitan Water Reclamation District archives, Chicago (hereafter cited as MWRD). See also, The Sanitary District of Chicago, "Engineering Data on the Sanitary District of Chicago," (June 1910), 7; "Bear Trap Dam—Chicago Drainage Canal," 110.

and the upstream leaf is so placed as to present a barrier to the water.”⁵ The two leaves of the dam were hinged at the downstream end and in operation were reminiscent of claws or a bear trap (hence the name).

The downstream leaf, including the timber floor, weighed over 500,000 pounds while the leaf itself weighed 299,000 pounds.⁶ This leaf was made up of forty-one girders, with the upper end of each girder attached to a steel casting that created a “pin joint with the opposite girder of the up-stream leaf.” A similar steel casting at the lower end of the leaf created a pin joint with a steel casting affixed to the masonry of the dam chamber. The upstream leaf weighed 338,000 pounds and consisted of forty-one vertical plate girders. At the lower end of the leaf were vertical I-beams situated between the girders and to which cast-iron wheels and steel castings were attached. These wheels ran on tracks in the masonry abutments.⁷

Each of the upper corners of the upstream leaf attached to hangers that connected to a hydraulic jack and wheel located on the concrete abutments. The hangers consisted of three posts built of two 10”, 20-pound steel channels and lacing. Attached to each hanger were four steel locked ropes manufactured by Trenton Iron Company that measured 2” in diameter. Also extending from the hangers were wrought-iron chains forming a rigid attachment to the hydraulic jacks. The ropes passed over four cast-iron sheaves measuring 12’-3 ½” in diameter that were supported on girders spanning pits in the abutments. These pits housed the counterbalances consisting of counterweight buckets that attached to the steel ropes. The counterweights themselves were cylindrical buckets measuring 16’ in diameter and 26’ tall with a center post of two 15’, 41-pound steel channels and lacing.⁸ The rigid construction of these counterweights was necessary to “resist the water pressure and to sustain the iron weights with which they will be partly filled. The weight of each counterweight bucket without ballast was 55,000 pounds; with ballast, the bucket weight totaled 325,000 lbs.”⁹

The dam chamber was equipped with a conduit extending its full length. Nineteen outlets, each measuring 2’-6” in diameter, were ranged along the conduit, and valves at either end controlled the flow of the water.¹⁰ Concrete abutments flanked either side of the chamber and contained various pits and wells, all of which worked together to control the level of water in the dam chamber. Each abutment contained a weir tube pit, which held the weir tube (a

⁵ Isham Randolph, “The Sanitary District of Chicago, and the Chicago District Canal: A Review of Twenty Years of Engineering Work,” 1909, 5.

⁶ “Bear Trap Dam for Regulating Works,” gives the total weight of the downstream leaf as 509,000 pounds (p. 189) while “Bear Trap Dam—Chicago Drainage Canal,” gives it as 505,000 pounds (p. 4).

⁷ “Bear Trap Dam—Chicago Drainage Canal,” 110.

⁸ “Bear Trap Dam—Chicago Drainage Canal,” 110.

⁹ “Bear Trap Dam for Regulating Works,” 190.

¹⁰ Randolph, “The Sanitary District of Chicago, and the Chicago District Canal,” 5; “Bear Trap Dam—Chicago Drainage Canal,” 111.

cylinder) that moved up and down the pit in a guide, and the counterweight pit. Other pits held trombone valves and their counterweight pits. The southern dam abutment was also the site of the boiler room.¹¹

The sluice gate structure was flanked by ashlar masonry abutments with Portland cement mortar pointing and a rubble backing. On the south abutment was the brick tower house that housed a stairway used to access the tower bridge and gate operating machinery. The tower house had full-length glass block windows.¹² There were fifteen sluice gate openings, but only seven gates were actually installed. The seven gates were modified Stoney sluice gates each measuring 30' wide with a vertical range of 20'. The gates were suspended on 1-½" chains hanging from a shaft that extended between the masonry towers flanking each gate opening. Each gate had a counterbalance consisting of a box spanning the gate opening that would rise when the gate was lowered and descend when the gate was raised. The operating machinery, consisting of spur gears, pinions, ratchet wheels, and chains, was located on the tower bridge spanning the top of the gate openings. This bridge was constructed of I-beams with 2"-wide iron pipe railings. On the west side of the concrete pier between each gate rested a wagon bridge with macadam road approaches at each end. This was presumably built to provide access over the discharge of the Controlling Works into the Des Plaines River channel.¹³

5. Alterations and Additions:

The Sanitary District had auxiliary structures erected at the Controlling Works from 1900 to 1902, including brick buildings to house and protect the dam's operating machinery, a machine shop, and a frame office. The contracts for these buildings were awarded to John A. Larson. The machine buildings, delineated as north and south, were situated on the dam's concrete abutments and were constructed of iron columns, concrete, and No. 1 Buff Bedford stone. Both buildings were faced in brick (specified as Chicago Hydraulic-Press Brick Company's 'No. 12 Hydraulic Common'). Interior finishes included timber

¹¹ Sanitary District of Chicago, "Regulating Works, Plan and Sections of South Foundations and Abutment Showing Certain Regulating Devices," February 1897; Sanitary District of Chicago, "Regulating Works, General Plan"; Sanitary District of Chicago, "Regulating Works, Plan and Section of Foundations and Abutments of Bear-Trap Dam Showing General Details and Certain Details Mentioned in the Specifications," all available from MWRD.

¹² Sanitary District of Chicago, "Regulating Works, Plan and Elevation of Piers, North Abutment, Tower Bridge, Gate Mechanism and Certain Details Showing Gates in Position," September 1895, Sheet No. 2; Sanitary District of Chicago, "Regulating Works, Plan, Elevation and Section of Tower House and Stairway at South End," September 1895, Sheet No. 3, both available from MWRD.

¹³ Sanitary District of Chicago, "Engineering Data," 7; "Bear Trap Dam for Regulating Works," 186; "Bear Trap Dam—Chicago Drainage Canal," 110. Drawings include: Sanitary District of Chicago, "Regulating Works, Plan and Elevation of Piers, North Abutment, Tower Bridge, Gate Mechanism and Certain Details Showing Gates in Position"; Sanitary District of Chicago, "Regulating Works, Plan, Elevation and Section of Mechanism for Raising and Lowering Gates, Spur Gear and Pinion, Pocketed Chain Wheel and Chain, Ratchet Wheel and Lever Device, and Certain Details," September 1897, Sheet 7, both available from MWRD.

floors in the offices, lath and plaster with a “white hard finish, made of plaster of Paris, putty and white sand” on the walls, and double thick window glass.¹⁴

The Sanitary District’s Board of Trustees had twice invited “proposals for the harness of the water power plant at the controlling works” but only received one bid from Allis-Chalmers. The Committee on Engineering recommended accepting the bid, and the board followed the recommendation in 1902.¹⁵ The machine shop is no longer extant, but textual evidence and a drawing provide information as to what it contained. The shop was equipped with two friction clutch pulleys and gears that were powered by a pair of 39” McCormick turbines and a 15” McCormick turbine. The Allis-Chalmers Company had completed the work by April 1903.¹⁶

As part of Sanitary District Project No. 25 (a Works Progress Administration undertaking), significant alterations were made to the Controlling Works in 1938. Originally the project called for removing the bear-trap dam and installing a concrete dam in its place, but for some reason, the bear-trap dam was instead replaced by an earth dam. This may have been due to the construction of the Chicago Harbor Lock at the junction of Lake Michigan and the Chicago River from 1936-38. The lock helped control the flow of lake water into the river. The auxiliary structures and operating machinery at the bear-trap dam were also removed.¹⁷

The sluice gates were altered in 1959 and the late 1990s. During the 1959 alterations, three new sluice gates were installed.¹⁸ In the late 1990s, the remaining sluice gates (numbers 4 through 7) were reduced in height by 4’. To allow for both local and remote operation, new operating machinery, including pocket chain wheels, gear reducers and motors, along with new grating and gate position indicators were installed.¹⁹ The Sanitary District also had an addition

¹⁴ Other companies submitting bids for the construction of these auxiliary structures included The Warner Construction Co. of Chicago; C.S. Walin of Chicago; Page & Shnable of Chicago; and Hanson Brothers of Chicago. See *Proceedings of the Board of Trustees of the Sanitary District of Chicago from January 1, 1900 to December 31, 1900* (Chicago: John F. Higgins, Printer, 1901), 6721-22, 6744, 6757-61, 6795; *Proceedings of the Board of Trustees of the Sanitary District of Chicago from January 1, 1902 to December 31, 1902* (Chicago: John F. Higgins, Printer, 1903), 7776.

¹⁵ *Proceedings of the Board of Trustees of the Sanitary District of Chicago*, 1902, 8018.

¹⁶ *Proceedings of the Board of Trustees of the Sanitary District of Chicago*, 1900, 6757-6760; *Proceedings of the Board of Trustees of the Sanitary District of Chicago from January 1, 1903 to December 31, 1903* (Chicago: John F. Higgins, Printer, 1904), 9293; Sanitary District of Chicago, “Water Power Plant at the Controlling Works, General Plan of Harness for Pair of 39 Inch Turbine Wheels and for 15 Inch Turbine Wheel,” November 12, 1901, Sheet No. 1, available from MWRD.

¹⁷ *Proceedings of the Board of Trustees of the Sanitary District of Chicago, January 1, 1938 to December 31, 1938* (Chicago, F.J. Riley Printing Company, 1939), 1315, 1953-1954.

¹⁸ “Sluice Gates Won’t Change River Level,” *Chicago Daily Tribune*, May 28, 1959, S2.

¹⁹ Metropolitan Water Reclamation District of Greater Chicago, “Plan-Removal Work, Miscellaneous Improvements at the Lockport Controlling Works—Lockport, Illinois,” Contract 96-882-2M, Sheet M-2; Metropolitan Water Reclamation District of Greater Chicago, “Piers K, L, M & N—New Work, Miscellaneous Improvements at the

constructed around and on top of the original “tower house” on the south abutment. This addition, clad in corrugated insulated panels, houses the stairway to the control room overlooking the sluice gates and tower bridge. A doorway and existing window altered with the installation of a louver in the top portion and salvaged glass blocks at the bottom punctuate the tower walls.²⁰

B. Historical Context:

Sanitary District officials realized that having a large amount of water impounded above the city of Joliet could be catastrophic since the Chicago Sanitary and Ship Canal was basically at the same elevation as Lake Michigan until Lockport, where there was a nearly 40' elevation change. In addition, excessive water resulting from heavy rainfalls could cause the canal to reverse and flow back into Lake Michigan. As a result, the Sanitary District developed safeguards to control the flow and volume of water in the canal, including the Controlling Works, which was designed to discharge excess water from the channel into a tailrace leading to the Des Plaines River channel paralleling the canal. The Controlling Works were situated on the west bank of the canal and near the original terminus of the Main Channel (as the original section of the Chicago Sanitary and Ship Canal was known). The location on the edge of the canal ensured the structure would not impede navigation.²¹

Chief Engineer Isham Randolph submitted a report to the Board of Trustees on August 28, 1895, detailing the plans and specifications for the Lockport Controlling Works. Randolph advised the board: “As there is a large amount of iron work involved it seems to me desirable to place it under contract this season and let the masonry be done during the next season.”²² The Board of Trustees forwarded Randolph’s report to the Joint Committee on Engineering Finance, who authorized advertisement of the project and acceptance of bids on September 18, 1895. In addition, the board followed Randolph’s recommendation that the work be advertised in separate contracts. The first contract was for the sluice gate metal and woodwork, followed by the contract covering the sluice gate masonry, and finally the bear-trap dam metal and woodwork.²³

Randolph noted that various gate types, including the Parker-Tainter and vertical sliding gates, had been considered for the sluice gates. The Stoney sluice gate was ultimately chosen because of the “facility of operating the gate and of the stability of the structure

Lockport Controlling Works—Lockport, Illinois,” Contract 96-882-2M, Sheet No. M-5; Metropolitan Water Reclamation District of Greater Chicago, “New Operating Machinery-Schematic, Miscellaneous Improvements at the Lockport Controlling Works-Lockport, Illinois,” Contract 96-882-2M, Sheet M-6, all available from MWRD.

²⁰ Metropolitan Water Reclamation District of Greater Chicago, “Building Sections, Miscellaneous Improvements at the Lockport Controlling Works-Lockport, Illinois,” Contract 96-882-2M, revised October 21, 1998, Sheet No. M-41; Metropolitan Water Reclamation District of Greater Chicago, “Building Elevations, Miscellaneous Improvements at the Lockport Controlling Works-Lockport, Illinois,” contract 96-882-2M, revised October 21, 1998, Sheet No. M-40, both available from MWRD.

²¹ “Bear Trap Dam—Chicago Drainage Canal,” 110; “Bear Trap Dam for Regulating Works,” 187; *Proceedings of the Board of Trustees of the Sanitary District of Chicago*, 1895, 2840.

²² *Proceedings of the Board of Trustees of the Sanitary District of Chicago*, 1895, 2809.

²³ *Proceedings of the Board of Trustees of the Sanitary District of Chicago*, 1895, 2838-2840.

when passing large volumes of water under high velocity when the stream is throttled by the gate.²⁴ The gate was named for its inventor, F.G.M. Stoney of London, who developed it in 1883 for use at the Lough Erne Drainage Works in Ireland. The gates could be easily operated by one man and were particularly effective in closing large openings ranging from 30' to 80'.²⁵ Since the district did not anticipate having to operate the gates frequently, they were designed to be operated by the hand power of two men rather than mechanically.²⁶

The contract for the sluice gate masonry specified that Portland cement concrete foundations be constructed, on top of which would be the piers, abutments, and gate sills. The piers and abutments were to be built of dimension stones, granite paving stones, and bricks, with Portland and natural cement concrete and mortar. The floors were to be constructed of granite paving blocks set in Portland cement mortar.²⁷

Finally, the Sanitary District provided minimal details about the bear-trap dam, giving the contractor leeway to develop the plans. For example, the call for bids noted “the dam is to be operated by admitting and exhausting the water to and from the under side or interior of the dam, but the arrangement for accomplishing this operation forms no part of the work to be done under this specification.”²⁸ The Sanitary District specified the foundation was to be masonry on solid rock, with the dam itself built of structural steel, steel castings, cast iron, Tobin bronze, chain, and white oak. Other materials included dimension stone masonry (specifically “what is known commercially as Bedford or Animosa stone” with ½” thick Portland cement joints), granite paving blocks (specified as being in the shape of a “parallelepipedon” with 5”-thick courses and Portland cement mortar joints), brick (specifically first class sewer bricks with cement mortar joints), sand, broken stone, Portland and natural cements and cement mortars, and Portland and natural cement concrete.²⁹

The call for bids for the construction of the Controlling Works closed on November 20, 1895. The contract was awarded to the lowest bidder, Christie & Lowe, in December 1895.³⁰ The following summer, the Sanitary District advertised the contract to build the foundation for the bear-trap dam and install the metalwork. The board only received one

²⁴ “Bear Trap Dam for Regulating Works, Chicago Drainage Canal,” 188.

²⁵ Edward Wegmann, *The Design and Construction of Dams, Including Masonry, Earth, Rock-Fill, Timber, and Steel Structures, also the Principal Types of Movable Dams* (New York: John Wiley & Sons, Inc., 1922), 357. Wegmann notes on page 358 that the Stoney gates had been built at the head-works of a canal built by the Michigan-Lake Superior Power Company at Sault Ste. Marie, Michigan, and regulating works on the Sault Ste. Marie River.

²⁶ “Bear Trap Dam for Regulating Works,” 188.

²⁷ *Proceedings of the Board of Trustees of the Sanitary District of Chicago*, 1895, 2842-43.

²⁸ *Proceedings of the Board of Trustees of the Sanitary District of Chicago*, 1895, 2843.

²⁹ *Proceedings of the Board of Trustees of the Sanitary District of Chicago*, 1895, 2843.

³⁰ *Proceedings of the Board of Trustees of the Sanitary District of Chicago*, 1895, 2944, 3042-43. Other bidders for the contract included Campbell, Dennis & Company of Joliet, Illinois; Shailer & Schniglau Company of Chicago; E.D. Smith & Company of Summit, Illinois; American Bridge Works of Chicago, Illinois; L.L. Leach & Son of Chicago; The Griffiths & McDermott Construction Company of Chicago; and Detroit Bridge & Iron Works of Detroit, Michigan.

bid in response (from Benezette Williams of Chicago), so they re-advertised in February 1897. The second advertisement resulted in several bids, and the Sanitary District awarded the contract to Griffiths & McDermott Construction Company, who submitted the lowest bid at \$60,335. Griffiths & McDermott had completed the work by August 1899.³¹

The Lockport Controlling Works cost a total of \$373,000 to build.³² The magnitude of the structure was extolled in contemporary accounts. A souvenir booklet of the canal produced in 1900 stated, “The controlling works, a triumph of modern engineering, were built for the sole object of regulating the flow of the lake water into the Desplaines river.”³³ *Engineering News* reported in 1898 that the Controlling Works was “one of the most elaborate constructions for controlling the flow of large volumes of water which the history of hydraulic engineering exhibits,” and that the “dam will be recognized as the largest structure of its kind in the world.”³⁴

In 1938, the bear-trap dam was removed as part of a Works Progress Administration project. This was probably due to a number of factors, including the construction of the Chicago Harbor Lock from 1936-38 at the junction of the Chicago River and Lake Michigan and the construction of the powerhouse at Lockport. New sluice gates and operating machinery to allow both local and remote operation were installed in 1959 and the 1990s. The Metropolitan Water Reclamation District (as the Sanitary District is now called) continues operating the sluice gates when necessary.

Part II. Structural/Design Information

A. General Description:

A gravel drive provides access to the Controlling Works, which is located on the west side of the Chicago Sanitary and Ship Canal. The bear-trap dam has been replaced by an earthen dam with a concrete core. Traces of the original structure are visible, including the concrete abutments, which are severely spalling, as well as riveted metal tracks and portions of the hydraulic jacks. The curved “closing wall” located between the north dam abutment and the sluice gate superstructure is also extant.

The sluice gates are located north of the bear-trap dam remnants. The superstructure consists of concrete foundations on which brick towers are located. In between these towers are the vertical-lift sluice gates. The towers support an operating bridge on which

³¹ *Proceedings of the Board of Trustees of the Sanitary District of Chicago from January 1, 1896 to December 31, 1896* (Chicago: John F. Higgins, Printer, 1897) 3444-3450, 3540; *Proceedings of the Board of Trustees of the Sanitary District of Chicago from January 1, 1897 to December 31, 1897* (Chicago: John F. Higgins, Printer, 1898), 3794-95, 3992-93. Other bidders included Jonathan Clark & Sons Company, Benezette Williams & Company (again), Campbell & Brown, and Christie & Lowe, all of Chicago.

³² Sanitary District of Chicago, “Engineering Data,” 7.

³³ I.W. Powell, Photographer, Kankakee, IL, “Souvenir of the Chicago Drainage Canal” (Brooklyn, NY: The Albertype Company, 1900).

³⁴ “Bear Trap Dam for Regulating Works,” 186.

the machinery and light standards are located. Running along the west façade of the structure is a metal foot bridge that rests on the concrete towers flanking each gate.

At the south end of the sluice gate structure is the former tower house, a brick structure that extends to the same height as the brick towers flanking each sluice gate. In the late 1990s, an addition was built on top of and to the east of the original structure. The addition is clad in metal siding. A doorway on the south façade provides access to the tower, which contains a stairway leading to the control room at the top. Windows in the control room gives the operator with views of the channel, gates, and tailrace. A door on the north wall of the control room provides access to the operating bridge where the gate operating machinery is located. To the north of the sluice gate superstructure are the foundations for additional sluice gates that were never built. To the east of the Controlling Works on the channel's edge are a series of concrete dolphins to keep boats from coming too close to the structure.

1. Character:

The Controlling Works has been extensively altered since its original construction, primarily by the removal of the bear-trap dam and the construction of an addition to the tower house. While some the sluice gates have been replaced, others have been altered, and the operating machinery has been replaced, the form of the superstructure remains the same.

2. Condition of Fabric:

The bear-trap dam remnants are in extremely poor condition as the concrete is so heavily spalled that the reinforcing rods have been exposed. The sluice gates and superstructure are still operational and thus in good condition, although heavily altered.

B. Construction:

No information has been found on the construction of the Lockport Controlling Works.

C. Operation:

As described in 1895, the general form of the bear-trap dam was “a downstream leaf A, hinged at a, and an upstream leaf B, hinged to the downstream leaf at b, and both leaves work up and down between two abutments, C and D, 160 ft. apart.”³⁵ The bear-trap dam was probably a modification known as the DuBois Gate, which had been patented in 1862 by a Mr. DuBois of Williamsport, Pennsylvania. His design modified the traditional bear-trap dam design by joining the leaves with a hinge and connecting the lower leaf to the dam foundation by a hinge.³⁶ The Sanitary District left the details of how the dam would operate to the contractor, who installed a conduit that extended the full length of the dam chamber and was equipped with outlets. Valves in the concrete abutments flanking the dam controlled the flow of water into the conduit and finally into

³⁵ “Chicago Main Drainage Channel, XXII,” *Engineering News* XXXIV, no. 24 (December 12, 1895): 388.

³⁶ Wegmann, *Design and Construction of Dams*, 347.

the dam chamber. Water entered the dam chamber from the upstream side and could be shut off when the appropriate dam height had been reached. To lower the dam, water was let out of the chamber and discharged into the tailrace downstream.³⁷ *Engineering News* reported that Sanitary District engineers had the idea that counterweights consisting of a series of disks suspended above one another with about 1" between them would maintain the position of the dam for extended periods. If the dam was being raised, the counterweights dropped until they rested on top of one another.³⁸ As built, however, the counterweights were made up of a "cylindrical bucket, 16 ft. in diameter by 26 ft. high," that consisted "of a center post, built up of two 15-in. 41-lb. steel channels and 2 1/2-in. x 8/8-in. lacing" hanging from the end of chains in the counterweight pits.³⁹ The other ends of the chains connected to the upstream dam leaf corners. In addition, the dam was equipped with hydraulic cylinders measuring 7-1/2" in diameter that could be used in emergency situations to move the dam.⁴⁰

Originally the sluice gates were operated by hand, with an operator "placed at the hand level operating the ratchet at each end of the 4-in. shaft, and by working the levers up and down, like a pump handle, the gates are raised."⁴¹ Pumping the ratchet lever caused the ratchet wheel, 4" steel shaft, and pinion to revolve. This activated the spur wheel and then the chain wheel, which resulted in the lowering and raising of the gate depending on the direction of the revolution. The gates are now operated by an electric motor that powers a configuration consisting of gear reducers, pinion gears, pocket chain wheels, and a shaft that raises and lowers the gates via a chain. Pocket wheels are located at either end of the 6 1/2"-shaft, which spans the gate opening. These are connected to pinion gears, which in turn connect to gear reducers and a 1760-rpm motor. Counterbalances consisting of a box span the gate opening and are raised and lowered according to the position of the gate; these were part of the original design as well.⁴²

D. Site Information:

The Controlling Works are located on the west side of the Chicago Sanitary and Ship Canal, near the terminus of the Main Channel. The Controlling Works discharge into the artificial Des Plaines River channel, constructed as part of the Chicago Sanitary and Ship Canal work that parallels the canal.

³⁷ Randolph, "The Sanitary District of Chicago, and the Chicago Drainage Canal," 5; "Bear Trap Dam—Chicago Drainage Canal," 111.

³⁸ "Chicago Main Drainage Channel, XXII," 387.

³⁹ "Bear-Trap Dam—Chicago Drainage Canal," 110.

⁴⁰ "Bear-Trap Dam—Chicago Drainage Canal," 111.

⁴¹ "Chicago Main Drainage Channel, XXII," 387.

⁴² Chicago Main Drainage Channel, XXII," 387; Metropolitan Water Reclamation District of Greater Chicago, "New Operating Machinery-Schematic, Miscellaneous Improvements at the Lockport Controlling Works-Lockport, Illinois"; Metropolitan Water Reclamation District of Greater Chicago, "Schedule and Misc. Details, Miscellaneous Improvements at Lockport Controlling Works-Lockport, Illinois," Contract 96-882-2D, Revised September 30, 1998, Sheet M-10, both drawings available from MWRD.

Part III. Sources of Information

A. Primary Sources

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Research was conducted at the Metropolitan Water Reclamation District’s library and archives, but the engineer reports had been subpoenaed and were not available at the time of the research trip in summer 2009. Those reports may contain more information concerning the design and construction of the Controlling Works.