

CROTON HYDROELECTRIC PLANT, SPILLWAY  
Croton Dam Road, at the Muskegon River  
Croton vicinity  
Newaygo County  
Michigan

HAER No. MI-81-C

HAER  
MICH  
62-CROTON  
IC-

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD  
National Park Service  
Northeast Region  
Philadelphia Support Office  
U.S. Custom House  
200 Chestnut Street  
Philadelphia, P.A. 19106

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HISTORIC AMERICAN ENGINEERING RECORD  
CROTON HYDROELECTRIC PLANT, SPILLWAY

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Location: Croton Dam Road, at the Muskegon River,  
Croton Vicinity, Newaygo County, Michigan

UTM: 16.608010.4810000

Quad: Croton, MI, 1:24,000

Dates of  
Construction: 1906-1908, 1991

Engineer: William G. Fargo and others

Present Owner: Consumers Power Company, 212 West  
Michigan Avenue, Jackson, Michigan 49201

Present Use: Spillway for hydroelectric generating  
plant

Significance: The Croton Hydroelectric Plant spillway  
was a key design feature of this  
electrical generation complex, an  
important example of the work of William  
G. Fargo, a Jackson, Michigan civil  
engineer who specialized in the design of  
small and mid-sized hydroelectric plants  
in the Midwest in the early Twentieth  
Century. The spillway gates permitted  
the plant operators to control and  
regulate the flow of the Muskegon  
River and the level of Croton Pond.

Project  
Information: This documentation is the result of a  
May 9, 1994 consultation meeting between  
the Consumers Power Company (CPCo) and  
the State Historic Preservation Office  
(SHPO). This meeting took place in  
response to CPCo's desire to rehabilitate  
the plant's spillway. As a result of the  
meeting, CPCo and the SHPO agreed to the  
recordation of the entire Croton  
Hydroelectric plant in accordance with  
Historic American Engineering guidelines.  
The documentation was completed in 1994  
by Dr. Charles K. Hyde, Wayne State  
University, under contract to CPCo.

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HISTORY

The overall spillway design, with a central shutter gate (beartrap gate) designed primarily for rapid release of large volumes of water, flanked by a total of eight Tainter (radial) gates, four on each side, is an example of standard engineering practice of that era. When the spillway was completed in 1908, a travelling gate hoist, commonly called a "crab," served each set of four Tainter gates. Each of the two travelling gate hoists moved on tracks along the deck of the spillway. The shutter gate (beartrap gate) was raised by an electric motor housed in a small, gable-roofed timber building situated above the east end of the gate. In addition, the shutter gate had a manually-operated backup system operated with a large cast iron wheel resembling a ship's steering wheel. Cast into the wheel is the inscription, "Frost Gear & Machine Company, Jackson, Mich., Builders." The original plans called for building a timber-framed "Runway House," which would run the entire length of the spillway crest and protect all the gate hoists from the elements. The Runway House, however, was never built.

The spillway remained essentially unchanged until 1991, when it was significantly modified. The height of the dam, corewall, and spillway was increased 18 inches to improve flood control. The two travelling gate hoists which served the Tainter gates were removed and relocated to the Rogers Dam, a nearby hydroelectric facility operated by Consumers Power Company. The original deck structure was also removed and replaced with a new steel deck structure, with steel grating, which was elevated an additional 18 inches. The travelling gate hoists were replaced with stationary hoists, one for each Tainter gate.

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PHYSICAL DESCRIPTION

The reinforced concrete spillway abuts the western end of the powerhouse and extends 238 feet 9 inches to the west bank of the Muskegon River. The spillway is 43.50 feet high overall, 89 feet 9 inches wide, and rests on round timber piles, with sheet steel piling cutoffs at the upstream and downstream faces. The system of gates which control the level of Croton Pond and the flow of water in the Muskegon River include a steel shutter gate ("beartrap" gate) situated in the middle of the spillway, and two sets of four Tainter (radial) gates, one set on each side of the shutter gate.

The shutter gate, 40 feet wide and 3 feet 6 inches high is supported and flanked by two large concrete log chute walls (piers), each 4.50 feet thick, 110 feet long, and 42 feet high at the bottom of the gate, with a concrete apron descending to the tumble bay on the downstream side. The gate is constructed of structural steel with a metal skinned facing and is convex in shape on the upstream side. The gate itself is connected, with chains, to the ends of a worm drive shaft, driven by an electric motor. When extra spilling capacity was needed, the shaft was turned and the gate lowered into the pond.

Seven of the eight Tainter gates are 20 feet wide, but the gate immediately west of the shutter gate is 22 feet 9 inches wide. All are 13 feet 6 inches high and are supported by reinforced concrete piers 4.50 feet thick, 42 feet high, and 35 feet long. Each set of four Tainter gates discharge water into a reinforced concrete tumble bay, measuring 30 feet wide and 90 feet long. The south (downstream) edge of the tumble bay is defined by a concrete weir, 95 feet long, 20 feet high, and 12.50 feet thick at the base. South of the tumble bays and shutter gate apron is an inclined reinforced concrete apron running the entire length of the spillway, extending downstream an additional 180 feet.

The Tainter gates are steel-framed structures with a section resembling a slice of pie turned on its side. The face of the gate, which blocks the water when in a closed position, has a convex configuration on the water side and is supported by steel I-beams with lateral bracing and rivetted connections. The structural steel framework connects to a cast iron bearing that moves about a 6-inch diameter steel trunion pin, which serves as the rotation point for the gate. The gates have a 14 foot radius between the face of the gate and the center of the pin.

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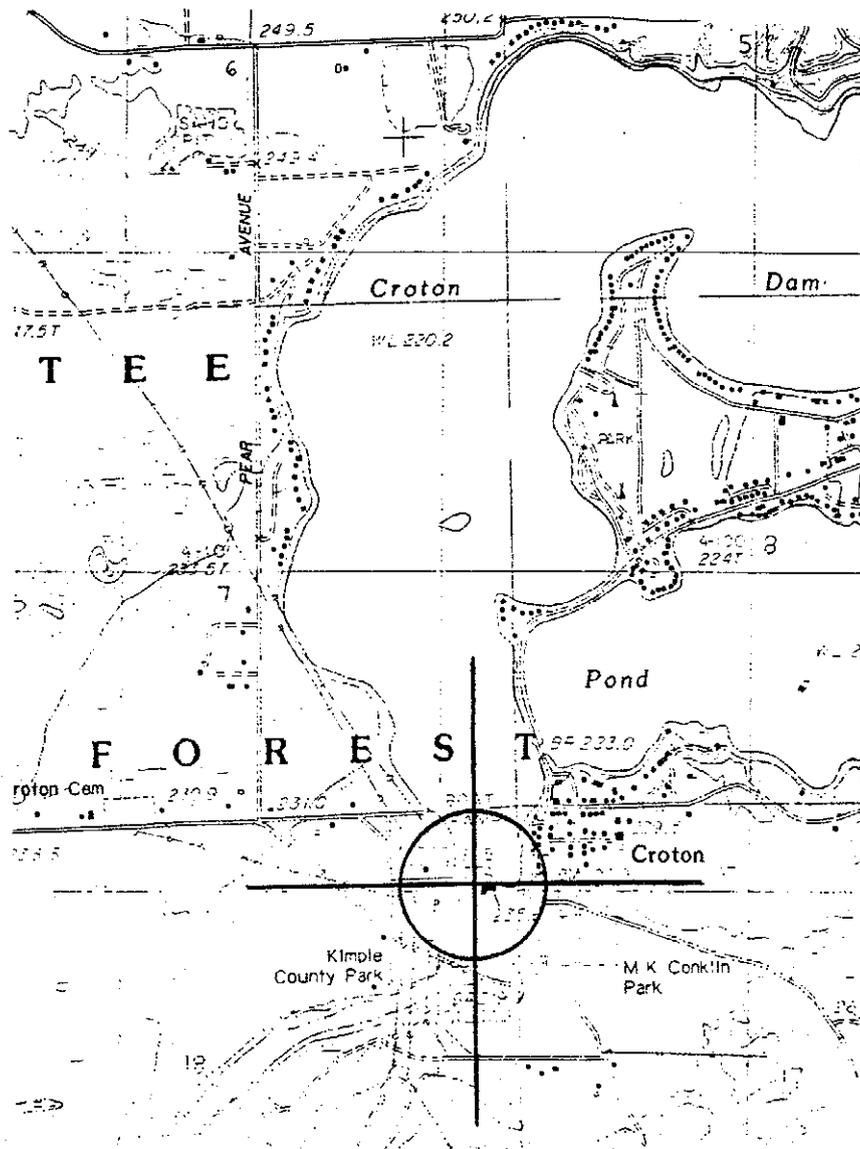
SOURCES OF INFORMATION

- A. Engineering Drawings: The Consumers Power Company Engineering Department, 1945 West Parnall, Jackson, MI 49201, has over one hundred sheets of drawings produced by Fargo Engineering between 1906 and 1920. This collection of drawings is likely to be preserved well into the future.
- B. Historic Views: Four historic views are in the office building at the Croton Hydroelectric Plant.

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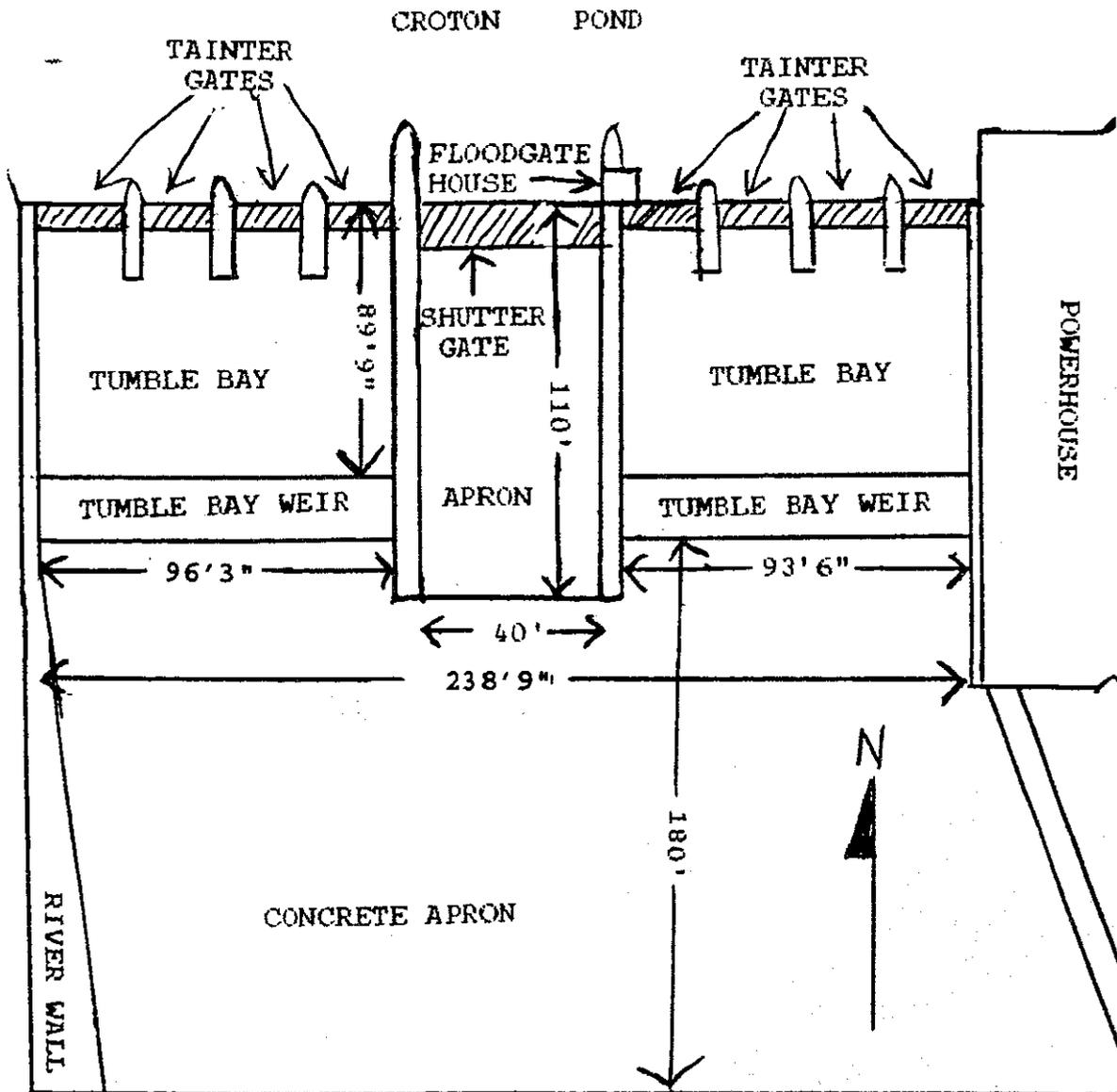
CROTON, MICHIGAN QUADRANGLE, 1:24,000

UTM: 16.608010.4810000



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PLAN OF SPILLWAY



ADDENDUM TO:  
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Croton Dam Road at Muskegon River  
Croton vicinity  
Newaygo County  
Michigan

HAER MI-81-C  
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FIELD RECORDS

HISTORIC AMERICAN ENGINEERING RECORD  
National Park Service  
U.S. Department of the Interior  
1849 C Street NW  
Washington, DC 20240-0001