

COUNTY ROAD 2750 EAST WATER TOWER
East Side of County Road 2750 East, south of Cardiff Drive
Bureau County
Illinois

HAER No. IL-1202

PHOTOGRAPHS
WRITTEN HISTORICAL AND DESCRIPTIVE DATA
REDUCED COPIES OF MEASURED & INTERPRETIVE DRAWINGS

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

HISTORIC AMERICAN ENGINEERING RECORD

COUNTY ROAD 2750 EAST WATER TOWER

HAER No. IL-1202

- Location:** East Side of County Road 2750 East, south of Cardiff Drive
Northwest side, DePue, Bureau County, Illinois
- The County Road 2750 East Water Tower is located at latitude: 41.330797, longitude: -89.325339. The coordinate represents the main riser at the center of the water tower. The coordinate was obtained January 16, 2020 utilizing Google Earth Pro software and the accuracy is estimated at +/- 3 meters. The coordinate's datum is North American Datum 1983. The County Road 2750 East Water Tower location has no restriction on its release to the public.
- Present Owner/Occupant:** Village of DePue
- Present Use:** Elevated Water Tank
- Significance:** Designed and fabricated by the Chicago Bridge and Iron Company which is the primary constructor in the United States. The design is a three column "tripod" design.
- Historian:** Katherine Pohl, Winter 2020
- Project Information:** This recording project is part of the Historic American Engineering Record (HAER), a long-range program to document historically significant engineering, industrial and maritime works in the United States. The HAER program is administered by the Historic American Building Survey/Historic American Engineering Record (HABS/HAER) Division of the National Park Service, U.S. Department of the Interior.
- This documentation project was prepared pursuant to Section 106 of the National Historic Preservation Act (36 CFR 800) to address Stipulation I. MITIGATION of the Memorandum of Agreement (MOA) for the Demolition of the Existing Water Tower and Construction of a New Tower Project (August 07, 2019), Village of DePue, Bureau County, Illinois.
- The County Road 2750 East Water Tower recording project was undertaken during the Fall of 2019 and Winter of 2020 by AltusWorks, Inc. and Dirk Matthews Photography in cooperation with the Village of DePue and Chamlin & Associates, Inc. Key personnel included Scott Utter, project manager and delineator, Ellen Stoner, quality control, Katherine Pohl, historian, and Dirk Matthews, photographer.

Part I. Historical Information

A. Physical History:

1. **Dates of Construction:** Summer 1969. Tower placed into service mid-August 1969.
2. **Engineer of Record:** William L. Etzenbach, Chamlin and Associates Inc., Peru, Illinois.
3. **Builder/Contractor/Supplier:** Tank and Structure Designer and Fabricator - Chicago Bridge and Iron Company, Birmingham, Alabama

Pump and motor supplier - Complete Industrial Enterprises
4. **Original Owner and Use:** Brandon Hill Corporation, Columbus Ohio, Elevated Water Tank
5. **Present Owner and Use:** Village of DePue, Elevated Water Tank
6. **Original plans and construction:** The County Road 2750 East Water Tower has been unaltered from the description and drawings provided in the original construction and fabrication drawings.

From the original contract, dated August 21, 1968, between Brandon Hill Corporation and the Chicago Bridge and Iron Company:

The Contractor shall furnish all material for, and shall fabricate, deliver and erect for the Purchaser at Depue, Illinois, according to the plans No. 9008 dated 7/23/68 and specifications attached hereto and made a part hereof, the following, One – 75,000 Gallon Tripod Elevated Tank x 100' to Low Water Line in accordance with contractor's proposals of July 18, 2968 and July 23, 1968 also attached hereto and made a part hereof.

B. Historical Context:

Urban growth and public health concerns beginning in the late nineteenth century influenced the demand and design of water towers. Industrial production in large cities as well as small towns and villages drove population growth in the decades leading up to 1900. Towns or neighborhoods could not always be located directly adjacent to a water source and water storage was needed to help maintain demand and pressure. Between 1880 and 1890 specifically, the number of pumping systems increased by 217% to approximately 1300.¹ Storing water close to the residents allowed them three different advantages. First, the water could be elevated, therefore providing water pressure even when homes were not located below the water source. Second, the water main could

1. Dubie, Carol Ann. *"The Architecture and Engineering of Water Storage Structures: 1870-1940."* Dissertation, George Washington University, 1980. 5.

be sized to meet the peak demand on an average day, rather than the peak day of the year, resulting in more efficient and cost-effective systems. Third, depending on the design, the storage could be used in the event of a pump failure or to regulate during peak periods flow. Pumps could not immediately speed up or slow down to meet demand and so the tanks provided either a reserve to pull from or storage for excess water to until demand increased again.² This water storage often took the form of water towers, elevated tanks or standpipes. Standpipes were vertical pipes filled with water for the entire height. They were clad with stone or wood to protect the underlying metal and to create an architectural aesthetic. Standpipes were commonly between twenty-five and one hundred and twenty-five feet tall and fifteen to thirty feet in diameter. One such example is the standpipe at Asbury Park, New Jersey in 1886. The standpipe is approximately one hundred and twenty-five feet tall with a rusticated base and decorative top. Although building standpipes was very economical, the proportions of the standpipe made it susceptible to freezing and wind pressure which caused physical damage.³

The concepts of water towers and elevated tanks are similar. A water storage tank is elevated in both, however a tank supported by brick, stone, or concrete is referred to as a water tower. When the tank is supported by an open structural system it is referred to as an elevated tank.⁴ The water tower was developed first, one example in Illinois was the Pullman water tower, designed in 1882 by S.S. Beman to support 550,000 gallons. The tank was flat bottomed and rested on trusses which carried the weight to wrought iron columns. It was enclosed in load bearing masonry and the lower floors were usable for manufacturing.⁵ The elevated tank design became more popular in the 1890's as the technology developed to support the tank and resist wind loading through a steel or iron structure. Elevated tanks had cost advantages, as the bottom of the tank supports itself, and were often used by the railroad to help supply steam engines at regular intervals. Although similar structures were used for windmills and small wooden tanks, the development of the curved bottom tank spurred development of the elevated tank and relative abandonment of the standpipe and water tower configurations. By 1928, steel construction technology had advanced to allow tanks to be constructed using welds in place of riveted and bolted connections.⁶ These advances allowed experimentation in tank shapes as well as structural support configurations to increase efficiency and improve aesthetics.

Elevated tanks are often referred to as water towers, therefore this paper will continue to call the subject by its name, DePue Water Tower, even though it would be classified as an elevated tank.

History of DePue, Illinois

The first industry in the area of DePue started with the construction of a steamboat landing and warehouse. This expanded to include some mills and other related businesses and the town of DePue was laid out in 1853 to accommodate the businesses and their employees.⁷ Along with the

2. Burton, William Kinninmond. *The Water Supply of Towns and the Construction of Waterworks: a Practical Treatise for the Use of Engineers and Students of Engineering*. London: Lockwood, 1894. 127-128.

3. Dubie, Carol Ann. *"The Architecture and Engineering of Water Storage Structures: 1870-1940."* Dissertation, George Washington University, 1980. 39-42.

4. *"The Architecture and Engineering of Water Storage Structures"* 10.

5. *"The Architecture and Engineering of Water Storage Structure"*. 29-30.

6. Mathis, Gregory R. John Chleback. "Steel Water Towers Associated with South Dakota Water Systems, 1894-1967." South Dakota State Historic Preservation Office, 2012.

7. *By the Bend of the River*; DePue, Illinois 1861-2011. 11.

steamboat landing, other businesses developed along the lake such as fishing, clamming, and ice harvesting. Since 1961 the American Power Boat Association Nation Championship races have been held on Lake DePue, excluding the years between 1974-1982. The village population more than doubled in the early twentieth century with the building of the Mineral Point Zinc Company plant. Construction began on the plant in 1903 and, while the company changed, some form of industrial work occupied the site until the 1980s. These works included zinc smelting, lithopone production, sulfuric acid production, and fertilizer production.⁸ All industrial plants were closed and demolished between 1897 and 1991.⁹ In 1997 The United States Environmental Protection Agency listed the DePue/New Jersey Zinc/Mobil Chemical Corp. on the National Priorities List.¹⁰ This site includes Lake DePue as well as the former plant sites and associated land.

The first water supply for the village was built in 1899. To keep up with demand of a growing population, a water well was drilled on the bank of Lake DePue in 1909.¹¹ The village suffered a typhoid outbreak in 1924 which hastened the completion of the sewer system, first surveyed in 1920. During the Depression, DePue received Works Progress Administration funds which they used to help improve their water works system.¹² As part of this, improvements were made to the well and a second well, Well No. 2, was built in 1938 at a depth of 1,487 feet approximately 150 feet away from the first. In 1964 a third well, Well No.3, was drilled a short distance away from Well No.2. The Village of DePue still uses Wells 2 and 3, which are supplied by an underground spring.¹³

In the late 1960s a new subdivision, named Oakbrook, was planned northwest of the village proper. Originally intended as retirement housing, lack of market demand led to the homes being available for all buyers. Oakbrook is approximately 200 feet above the rest of the village and requires extra infrastructure to maintain service and water pressure. To achieve this, a 75,000-gallon elevated water tank and a pump station were built beginning in 1968. Chicago Bridge & Iron Company designed the tank, under contact with the Oakbrook subdivision developer, Brandon Hill Corporation of Columbus, Ohio. Two additional tanks are located in DePue. The first in the east part of the village, a neighborhood named 'White City'. This tank holds 150,000 gallons and was installed in 1964 as part of the same project as well No.3. The last tank built was in 1976, south of County Road 1300N and east of East Street. This tank holds 346,000 gallons.¹⁴

History of Chicago Bridge and Iron Company

The Chicago Bridge & Iron Company was founded in 1889 as a merger between Horace E. Horton and Kansas City Bridge and Iron Company. Horton had extensive experience working in the Midwest, mostly building wooden bridges, while Kansas City Bridge and Iron worked primarily with iron around Kansas, Missouri, and Nebraska. Chicago Bridge & Iron (CBI) began working in water storage in 1893, when they designed and built their first standpipe in Lake City, Iowa. At the

8. E² Inc., and D.I.R.T. studio. "DePue / New Jersey Zinc / Mobil Chemical Corporation Superfund Site." United States Environmental Protection Agency, August 2004. <https://www.epa.gov/superfund-redevelopment-initiative/superfund-sites-reuse-illinois>. 17.

9. *By the Bend of the River*. 67.

10. E² Inc., and D.I.R.T. studio. "DePue / New Jersey Zinc / Mobil Chemical Corporation Superfund Site." 2

11. *By the Bend of the River*. 55.

12. *By the Bend of the River*. 48-49.

13. *By the Bend of the River*. 55-60.

14. *By the Bend of the River*. 55.

time, the market was growing, and CBI found it profitable to bid on such structures as many communities were replacing old wooden and masonry tanks due to health concerns. In 1894 they built their first elevated tank at Fort Dodge, Iowa. This tank was the first to use Horace Horton's design for an elevated tank with a hemispherical bottom. This innovative design was inspired by the partial-sphere design used by Edward Flad, of St. Louis, Missouri, at least a year earlier.¹⁵ As they took on more contracts for elevated tanks, CBI also looked for more ways to improve up on their designs. George Horton, Horace's son, joined the office and issued several patents related to water towers. Among them are designs for tanks with different bottom shapes, such as ellipsoidal and cone bottoms, as well as leg supports, such as tripod arrangements.^{16,17} Water towers were a substantial portion of their business for several decades. Their experimentation with single pedestal towers with spherical or spheroid tanks began in the middle of the twentieth century. The first spheroid water tower was built in Illinois by CBI in 1953 in Northbrook.¹⁸ Spheroid towers were built because of their economy in construction and maintenance for larger tanks while more traditional cone bottom tanks were utilized for smaller capacities and improved upon with more efficient support systems. An advertisement in *The American City* from 1960 for the Horton tripod elevated water tank shows a picture of an elevated tank similar in style to the DePue water tower. It states that the design is 'easy and economical to paint and maintain and does not require elaborate foundations.'¹⁹ CBI also has an advertisement in following issue for a spherical gas storage tank it markets as the Hortonsphere.²⁰ Besides experimenting with different tank styles for efficiency, they were also contracted to make different tank styles for advertising. An early example of these being an elevated tank in the shape of a pineapple in Honolulu, Hawaii in 1927.²¹

Chicago Bridge & Iron used their tank experience to branch into other markets. Around 1920, for example, CBI began more seriously pursue designing tanks for the oil industry, which would eventually become a large share of the business.²² They also made tanks for agriculture and natural gas companies. Eventually their work was being constructed across the United States as well as in foreign markets such as Canada, Mexico, Cuba, Japan, France, and Saudi Arabia. CBI remained in existence under the same name until 2018, when they combined with McDermott.²³

Part II. Structural/Design Information

A. General Statement:

-
15. *The Bridge Works: a History of Chicago Bridge & Iron Company*. Chicago: Mobium Press, 1987. 14-15.
16. Horton, George. 'Elevated Tank'. U.S. Patent 2,358,805 filed November 2, 1942 and issued September 26, 1944.
17. *The Bridge Works*, CBI Industries, Inc. 1987. 27.
18. *Steel Water Towers Associated with South Dakota Water Systems, 1894-1967*, 31.
19. Chicago Bridge & Iron Company. "Horton Tripod Elevated Water Tank." *The American City*, January 1960:32.
20. Chicago Bridge & Iron Company. "Horton Tripod Elevated Water Tank." *The American City*, February 1960:24.
21. *The Bridge Works*, CBI Industries, Inc. 1987. 67.
22. *The Bridge Works: a History of Chicago Bridge & Iron Company*. Chicago: Mobium Press, 1987. 23.
23. "Years of Excellence." MDR, 2018. <https://www.mcdermott.com/Who-We-Are/125-Years-of-Excellence>.

The County Road 2750 East Water Tower (Tower) rises above the adjacent county road and Oak Brook subdivision located on a bluff above the central business district in DePue, Illinois. The Tower is composed of steel with an elevated tank supported by three tubular posts. The tank has a 75, 000-gallon capacity and is cylindrical with domed roof and cone bottom. The overall height of the structure is 128'-1 1/2" tall and is triangular in plan circumscribed at a radius of 22'-1 31/32" to the center line of the piers. The legs of the triangle plan of the post to foundation connection are 38'-4 11/16."

1. Character:

The DePue water tower is an example of the Horton tripod tank designed by the Chicago Bridge and Iron Company. The elevated tank is unchanged from its completion in 1969 and is representative of the development of tanks to improve efficiency of material usage.

2. Conditions of Fabric:

The Tower is in good condition. Surface corrosion and peeling paint were observed throughout the steel tank, posts, lateral bracing, and ladder. The exposed portions of the concrete footings were in good condition with only minimal hairline cracks observed. Insulation on the central riser pipe is missing just below the midpoint of its height at the top of the riser and where exposed the riser pipe was corroded.

B. Description:

The foundation of the Tower is composed of three cast in place concrete piers supported by concrete spread footings. Piers and footings are reinforced with steel reinforcement bars. Individual piers are linked together by below grade horizontal pier ties of steel reinforcement bars cast in concrete. Foundations were designed to a 4000 PSF soil boring pressure determined by geotechnical testing by Dames and Moore Consulting Engineers. The anchor to post connection is made through four anchor bolts per location embedded and hooked in the concrete pier. The anchor bolts secure a steel base plate that is welded to the circular post.

The three tubular posts of the Tower extend at an angle from the foundations to a circular stub at the base of the tank. The columns are spliced with a field weld approximately 49'-4" above the post base which is approximately mid height of the post. Located just below the splice are three c-channel built up struts which provide lateral support and riser support. The struts are mechanically anchored with anchor bolts to gusset plates which are welded to each post. Cross bracing rods used to provide lateral support extend from the between the gusset plates down to the base of the posts. Cross bracing is not provided at the upper half of the post assembly. A maintenance ring is installed at the circular stub to be used for anchorage for personnel to access the area below the tank.

Supported by the three posts is a water tank 24'-10" high with a 25'-4" diameter. The water tank is composed of welded steel plates between 3/16" and 13/32" thick depending on the loads imposed by the water within the tank. The tank is topped with a cone roofed vent. The interior of the tank is accessed through a 24" diameter hatch at the base of the dome. A ladder extends from grade to the underside of the tank at the out face of the east post. At the cone base of the tank the ladder extends at an angle and then runs vertical to the base of the dome. A final ladder follows the arc of the dome to the vent at the top.

The Tower is painted with a green tint with block lettering “DEPUE” painted at the tank on the north and south facing portion.

Water is supplied and extracted from the 10” riser through the center of the tower. The riser terminates within the tank and at a concrete vault at grade. The riser elbows and runs south horizontally out of the vault. The riser elbow rests on a concrete thrust block and is laterally supported by rods at the mid height of the posts.

C. Mechanicals/Operation:

The water tower is fed from the water treatment plant located within the central business district and adjacent to Lake DePue. The Princeton Street Booster Pump sends water up roughly 200’ to service the Tower, Oakbrook Subdivision, and the Lakeview Trailer Park. The booster pump was constructed at the same time as the Tower and is located west of the intersection of Princeton Street and 1268 North Avenue. The booster pump contains two 7.5 horsepower pumps and provides the water at 105 gallons per minute. The single riser on the Tower both fills the tank and supplies water based upon the demand of the areas serviced.

D. Site Information:

The County Road 2750 East Water Tower (Tower) is located on a triangular lot Owned by the Village of DePue between the Road and two residential lots. The Tower is set back approximately 39’ feet to the east of County Road 2750 East and 705’ north of 1245 North Avenue. West of the road is an open field used for agriculture production. The Tower is located to the southwest of the Oak Brook Terrace subdivision, which is composed of 1-story residences. The site adjacent is relatively level and rises at the road. The elevation of the tower base is approximately 200’ higher than Lake DePue and the Water Treatment Plant.

Part III. Sources of Information

A. Primary Sources

Horton, George. 'Elevated Tank'. U.S. Patent 2,358,805 filed November 2, 1942, and issued September 26, 1944.

Chicago Bridge & Iron Company. “Horton Tripod Elevated Water Tank.” *The American City*, January 1960:32.

Reviewed drawings include,

Design Drawings – Chamlin and Associates, Inc – Water Tank Details – DWG No. 671 – October 11, 1968.

Fabrication Drawing – Chicago Bridge and Iron – Elevation – DWG No. 1 – September 6, 1968.

Fabrication Drawing – Chicago Bridge and Iron – Foundation Plan – DWG No. F1 – September 6, 1968.

Fabrication Drawing – Chicago Bridge and Iron – Outside Pier Details – DWG No. F2 – September 6, 1968.

Fabrication Drawing – Chicago Bridge and Iron – Valve Vault Details – DWG No. F3 – September 6, 1968.

B. Secondary Sources

Burton, William Kinninmond. *The Water Supply of Towns and the Construction of Waterworks: a Practical Treatise for the Use of Engineers and Students of Engineering*. London: Lockwood, 1894.

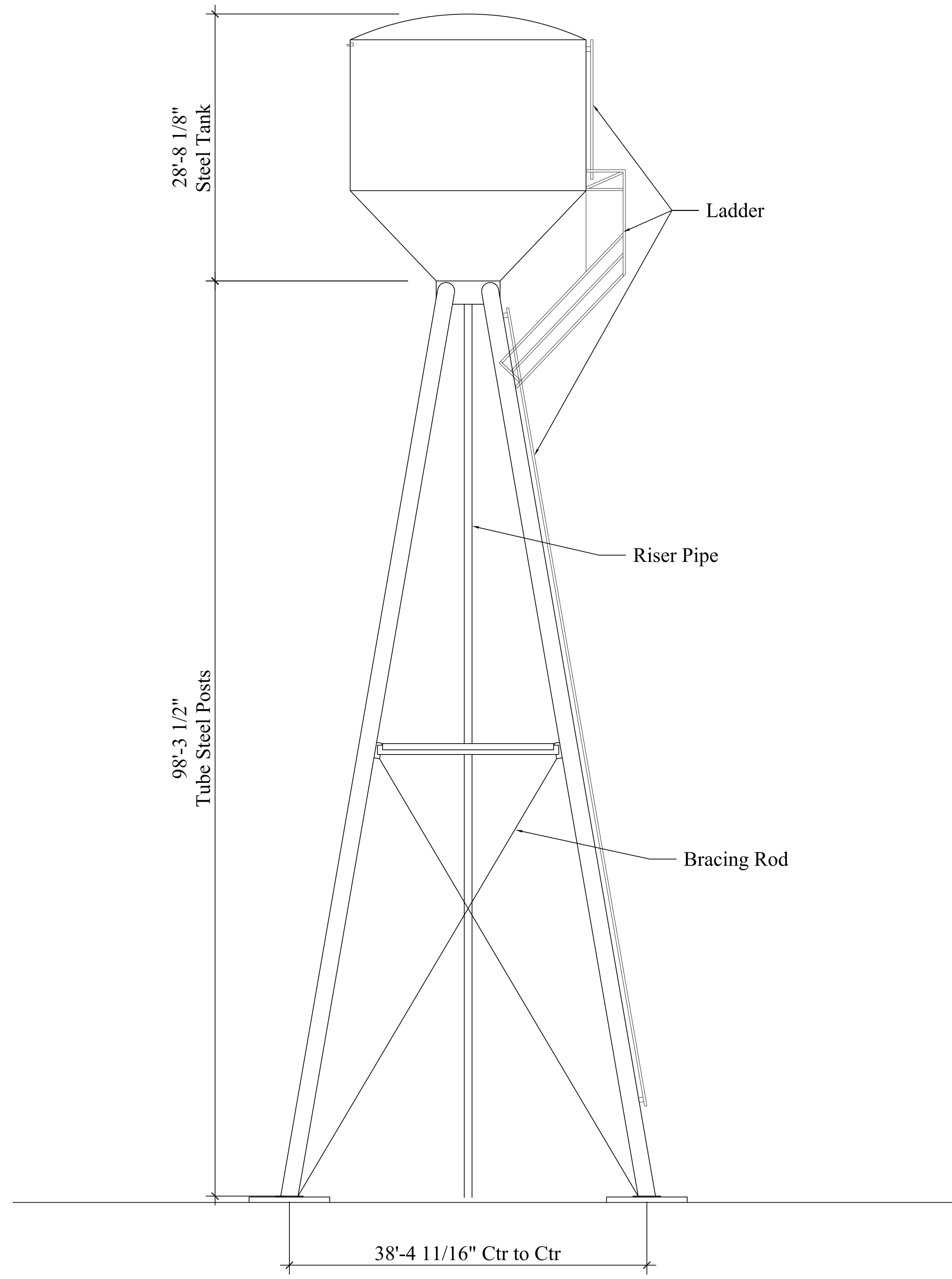
By the Bend of the River DePue, Illinois 1861-2011.

Dubie, Carol Ann. "The Architecture and Engineering of Water Storage Structures: 1870-1940." Dissertation, George Washington University, 1980.

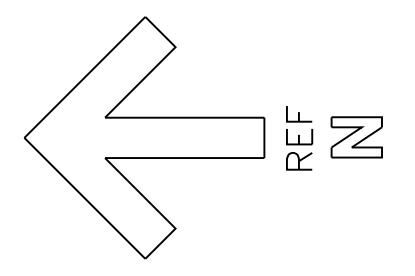
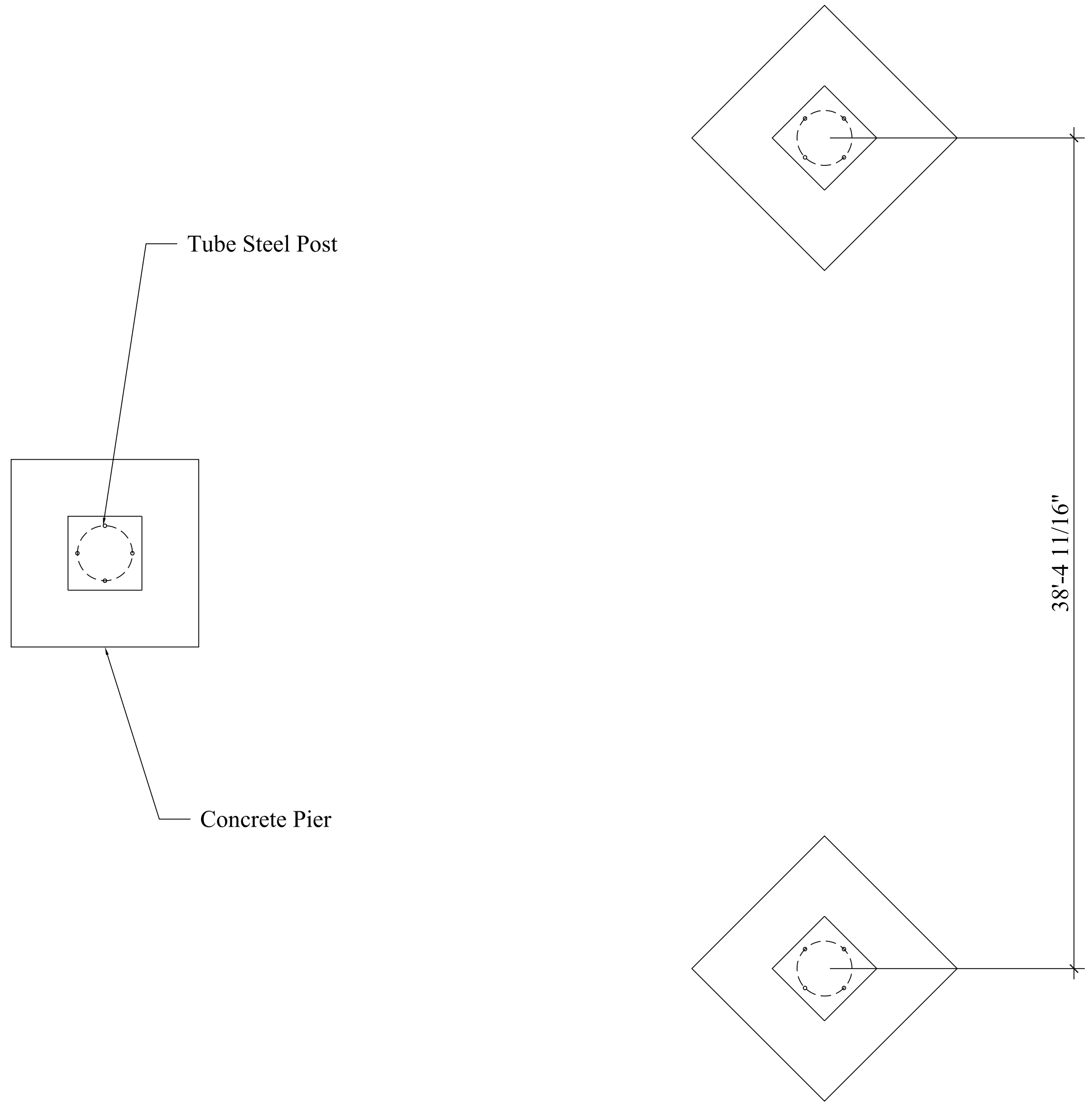
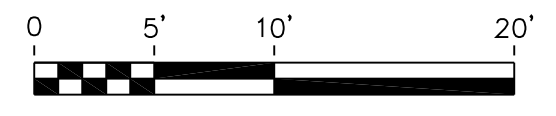
E2 Inc., and D.I.R.T. studio. "DePue / New Jersey Zinc / Mobil Chemical Corporation Superfund Site." United States Environmental Protection Agency, August 2004.
<https://www.epa.gov/superfund-redevelopment-initiative/superfund-sites-reuse-illinois>.

Mathis, Gregory R. and John Chleback. "Steel Water Towers Associated with South Dakota Water Systems, 1894-1967." South Dakota State Historic Preservation Office, 2012.

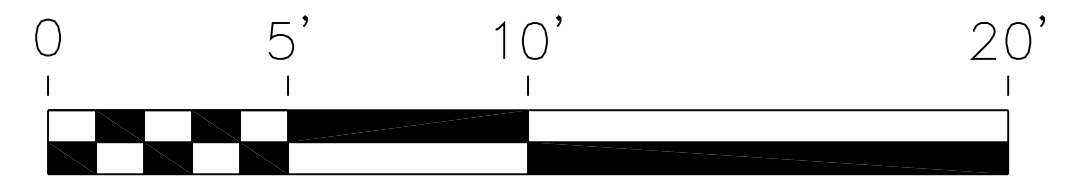
The Bridge Works: a History of Chicago Bridge & Iron Company. Chicago: Mobium Press, 1987.



TOWER SOUTH ELEVATION SKETCH
SCALE: 1/8" = 1'-0"



TOWER PLAN SKETCH
SCALE: 1/4" = 1'-0"



- NOTE:
1. Sketch is based upon 1968 drawings by Chicago Bridge and Iron, Drawing 1 and F1.
 2. Overall field measurements were confirmed for the plan at grade.

HISTORIC AMERICAN ENGINEERING RECORD

INDEX TO PHOTOGRAPHS

COUNTY ROAD 2750 EAST WATER TOWER
East Side of County Road 2750 East, south of Cardiff Drive
Bureau County
Illinois

HAER No. IL-1202

INDEX TO BLACK AND WHITE PHOTOGRAPHS

Dirk Matthews, Photographer, 2019-20

- IL-1202-1 Looking northeast from 125 North Avenue (29). Representative of the landscape around the DePue water tower. The full height of the tower is visible.
- IL-1202-2 Looking north along County Road 2750 East. The DePue water tower is situated on the east side of the road. The painted letters spelling 'DEPUE' are visible on the south of the tower.
- IL-1202-3 Looking south along County Road 2750 East. The DePue water tower is situated on the east side of the road. The painted letters spelling 'DEPUE' are visible on the north side of the tower. A fence encloses the base of the tower. A wooden fence and roof from the adjacent subdivision is visible to the north of the tower.
- IL-1202-4 View from below the tower, looking up towards the south face of the tower. The connection of the three columns to the water tank is visible. In the center, the water riser pipe is seen entering the tank.
- IL-1202-5 Close up view of the tank on the north side. The painted letters spelling 'DEPUE' are visible. The cone shape of the water tank and the column connections can also be seen.
- IL-1202-6 Close up of the southwest column base. The bolt connections to the concrete pier are visible. The bracing connections can also be seen.
- IL-1202-7 Looking northeast from across County Road 2750 East, focusing on mid-height of the columns. Struts laterally connect each of the columns. They are also supported by bracing rods, as is the riser pipe. The struts and rods connect to the columns using the same gusset plates.

Depue Water Tower

HAER Documentation

Legend

HAER IL 1202-3

HAER IL 1202-5

HAER IL 1202-6

TOWER LOCATION

HAER IL 1202-7

HAER IL 1202-4

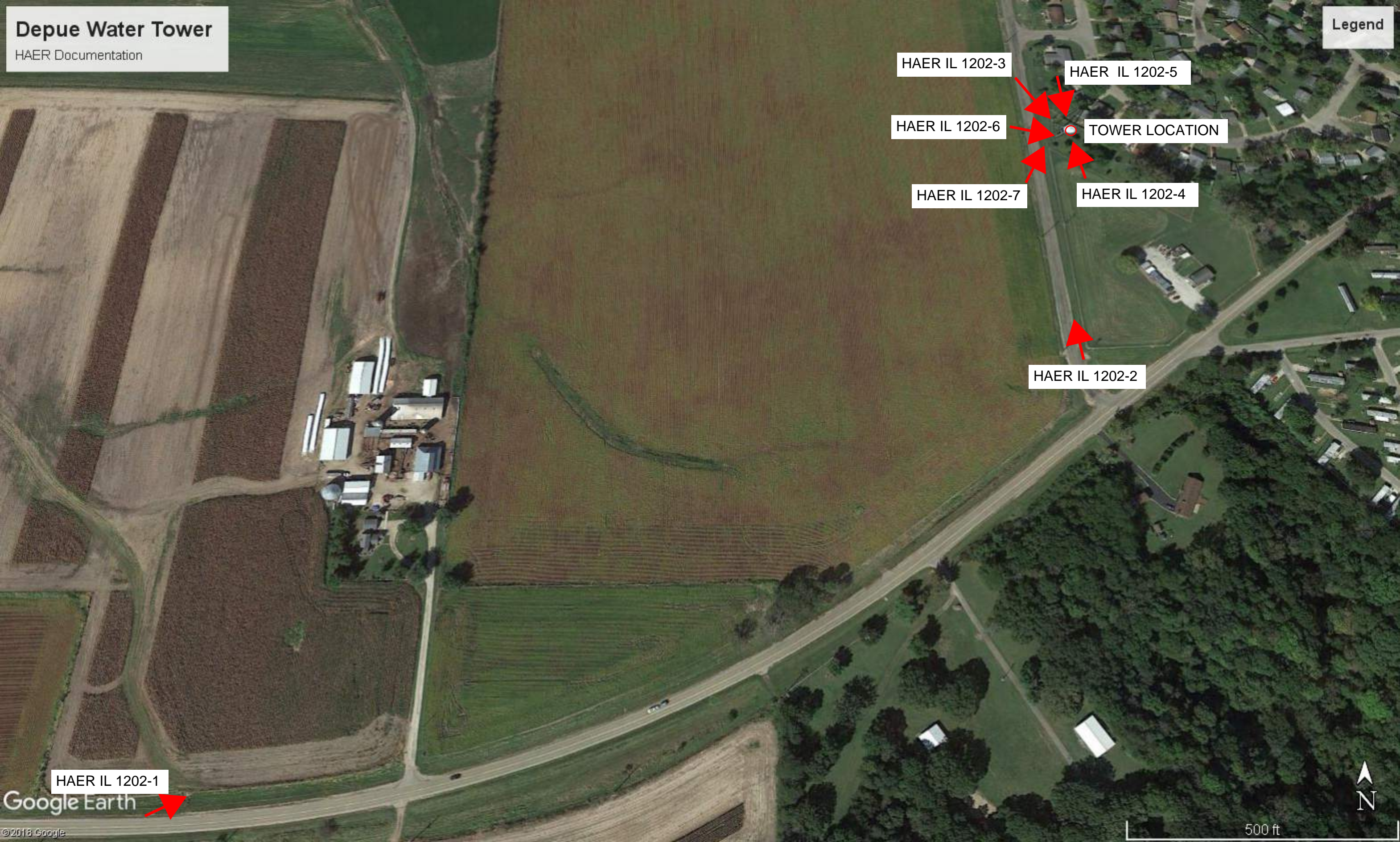
HAER IL 1202-2

HAER IL 1202-1

Google Earth

©2018 Google

500 ft



HAER-1L-1202-1



HAER-IL-1202-2



DEPLE



HAER-IL-1202-4



HAER-14-1202-5

A black and white photograph of a water tower. The tower consists of a large, cylindrical tank supported by three legs. The word "DEPUE" is painted in large, bold, black letters on the side of the tank. A metal ladder and walkway are visible on the left side of the tower. The background is a clear, light sky. The photograph is framed by a black border.

DEPUE

HAER-1202-6



HAER-1L-1202-7



Bibliography

Horton, George. 'Elevated Tank'. U.S. Patent 2,358,805 filed November 2, 1942, and issued September 26, 1944.

Chicago Bridge & Iron Company. "Horton Tripod Elevated Water Tank." *The American City*, January 1960:32.

Dubie, Carol Ann. "The Architecture and Engineering of Water Storage Structures: 1870-1940." Dissertation, George Washington University, 1980.

Burton, William Kinninmond. *The Water Supply of Towns and the Construction of Waterworks: a Practical Treatise for the Use of Engineers and Students of Engineering*. London: Lockwood, 1894.

The Bridge Works: a History of Chicago Bridge & Iron Company. Chicago: Mobium Press, 1987.

By the Bend of the River DePue, Illinois 1861-2011.

Reviewed Drawings

Design Drawings – Chamlin and Associates, Inc – Water Tank Details – DWG No. 671 – October 11, 1968.

Fabrication Drawing – Chicago Bridge and Iron – Elevation – DWG No. 1 – September 6, 1968.

Fabrication Drawing – Chicago Bridge and Iron – Foundation Plan – DWG No. F1 – September 6, 1968.

Fabrication Drawing – Chicago Bridge and Iron – Outside Pier Details – DWG No. F2 – September 6, 1968.

Fabrication Drawing – Chicago Bridge and Iron – Valve Vault Details – DWG No. F3 – September 6, 1968.