

West Sixth Street Bridge (Kinzie Avenue Bridge)  
Spanning the Root River and Horlick Drive  
at the junction of West Sixth Street and  
Kinzie Avenue  
Racine  
Racine County  
Wisconsin

HAER No. WI-18

HAER  
WIS,  
51-RACI,  
9-

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

REDUCED COPIES OF MEASURED DRAWINGS

Historic American Engineering Record  
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HISTORIC AMERICAN ENGINEERING RECORD

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West Sixth Street Bridge  
(Kinzie Avenue Bridge)

HAER No. WI-18

Location: Spanning the Root River and Horlick Drive at the junction of West Sixth Street and Kinzie Avenue, Racine, Racine County, Wisconsin

UTM: 16.434080.4730490  
Quad: Racine South

Date of Construction: 1928; deck replaced in 1983

Present Owner: City of Racine

Present Use: Vehicular and pedestrian bridge

Significance: The West Sixth Street Bridge is a single open-spandrel, reinforced-concrete barrel-arch bridge. Its flush facade and Art Deco/Moderne style make it one of Wisconsin's most unusual and architecturally significant concrete bridges. The majority of the terra cotta detailing remains intact. Charles S. Whitney (1892-1959), the principal engineer/architect on the project, was world renowned for his innovations in concrete construction. Whitney's firm of Ammann & Whitney is known for its work on Dulles International Airport and the Verrazano Narrows Bridge, as well as numerous highway and large bridge projects.

Historian: Edwin Cordee  
Wisconsin Historic Bridges Project  
Summer 1987

## HISTORY

The West Sixth Street Bridge, also known as the Kinzie Avenue Bridge, in Racine was the first concrete span, but not the earliest bridge at this site. The first bridge was a primitive wooden structure built by James Kinzie around 1850, prior to the city's incorporation. Mr. Kinzie, a local entrepreneur, erected both a saw mill and a grist mill on the river just south of the present site. Kinzie also built a road from the settlement to the mills to transport his goods.<sup>1</sup>

An 1859 City Council resolution authorizing repairs was the first reference to the bridge in city records. This early wooden bridge lasted until 1865, when presumably it was washed out in a spring flood. On June 5th of that year, Horatio G. Winslow petitioned the city council to help in constructing a replacement. Winslow stated that the bridge provided the only convenient access to the Mound Cemetery. After inspection of the site by the city council that afternoon, the member agreed to appropriate \$200 for a new structure.<sup>2</sup> Mr. Winslow and James R. Slausen, both residents of 6th Street, raised an additional \$800 from private parties. After the bridge had been in service for some time, E. O. Hand, the city attorney declared the appropriation of monies illegal. After much discussion and a passionate plea by Mr. Winslow, the council hastily reappropriated the 200 dollars.<sup>3</sup>

The Winslow Bridge lasted until the spring of 1883, when it also was washed out by spring flooding. For seven years, there was not a proper bridge crossing the river at this site. In 1887, the city of Racine granted rights to Samuel Potts to operate a ferry across the stretch and charge a maximum fare of 5 cents. As city development increased, the need for a bridge to the west, at this point, became more evident. In 1889, a contract was awarded to the Milwaukee Bridge and Iron Company to erect an iron Howe truss bridge at the site for a total cost of \$7,375. Opened on June 20, 1890, this truss bridge remained in use until 1928, when the present concrete arch bridge was constructed.<sup>4</sup>

Construction of the reinforced concrete structure took slightly more than seven months, and cost the city \$90,000.<sup>5</sup> The first mention of the bridge in city council records was an authorization given to the City Engineer's office to have construction plans and specifications prepared, in December 1927.<sup>6</sup> Property owners in the area requested that a temporary footbridge be erected while the construction proceeded. The city agreed to construct a wooden footbridge to allow pedestrians to transfer streetcar lines.<sup>7</sup>

By the end of March 1928, Charles Whitney, with help from Joseph P. Schwada, had created plans for an ornate concrete bridge. Their design was submitted and approved, and Whitney was paid 1,228 dollars for his services.<sup>8</sup> The city of Racine then sought bids for constructing the bridge. Eight construction companies submitted estimates on the specifications and the

lowest bidder, the Zendala Construction Company of Manitowoc, Wisconsin, was awarded the contract. The company was formed of a partnership between two brothers, Steve Z. and A. S. Zendala.<sup>9</sup> Subcontractors on the project included the Belle City Milling Company, which supplied the Manitowoc Portland cement and the Northwestern Terra Cotta Company of Chicago, which supplied the ornamental reliefs on the exterior of the bridge. Many local craftsmen were employed in the construction since Zendala Construction Company was a small concern.<sup>10</sup> The contractors were given until December 1 to complete this bridge.

Pedestrians were allowed to cross the bridge two weeks before the official opening, while the cement deck was curing. One week before the city's acceptance, the bridge was subjected to a thirty ton weight test by the City Engineer driving a large steam roller. After passing the test, which far exceeded the expected weight loads, the city accepted the bridge and authorized the final payments to the contractor.<sup>11</sup> The present West Sixth Street Bridge was completed and opened to automotive traffic on December 4, 1928. Although no public ceremony accompanied its opening, the new bridge did receive a large written account in the local papers.

Concrete as a material is architecturally important because of both its plasticity and its compressive strength. The material's compressive strength makes it ideal for large arch structures. However, very few engineers and architects have explored its other significant attribute, plasticity, and its use in architectural expression. Often, there is an attempt to imitate the look of cut stone. David Plowden, in his book entitled Bridge, went as far as to say that in America concrete has not been used to its full potential, and "...the inherent plasticity of the material has been obscured by the traditionalism of masonry construction."<sup>12</sup> For this reason, the West Sixth Street Bridge is important. Charles Whitney attempted to explore fully the limits of the material and its expression in this bridge.

Whitney spoke of the proper use of the material concrete in his book on bridges. The dimensioning of the arch was felt to be one of the most important considerations in the design. The current reinforced concrete technology allowed the material to resist tension quite well. Using this technology, engineers, in order to reduce the total cost, often designed the arch much narrower than the roadway. Whitney found the resulting overhang objectionable. The engineer felt that the top of a bridge should be proportioned as carefully as the cornice line on a building.<sup>13</sup>

The West Sixth Street Bridge expresses the structural form as simply as possible, avoiding all uses of meaningless ornament. The conventional cornice was omitted entirely and replaced with terra cotta figures. The bridge draws its precedents from many earlier bridges including ancient examples from which gargoyles are borrowed to mark the line of the sidewalk.<sup>14</sup> Whitney stated that the ornamental terra cotta shield and steel trolley pole at the center of the bridge emphasized the vertical axis of the bridge and was suggestive of

18th century French bridges.<sup>15</sup> Except for the lamp standards, moldings were not used in the bridge construction. Curved corbels were placed at the column heads to soften the structural lines. "Inside the plain concrete parapets, above the sidewalks were placed panels of colored faience tile which added greatly to the beauty of the bridge from the roadway."<sup>16</sup>

The West Sixth Street Bridge crosses the Root River, forming the connection between Sixth Street to the east and Kinzie Avenue to the west. Shortly after it opened, the Racine Times-Call called the single span reinforced concrete bridge the city's most beautiful structure.<sup>17</sup> It measures 179 feet long and 56 feet wide; the arch spans 131 feet. Reinforced concrete was the primary building material; however, terra cotta and concrete block were also used.

The bridge is not heavily ornamented, but does contain a number of interesting architectural details. Two pairs of large terra cotta lamp standards once marked the entrances to the bridge. Ornate bronze lanterns were mounted on these posts. The standards were removed in 1969 due to deterioration and replaced with vapor lights.<sup>18</sup> Two of the original lanterns survive today and can be found at the entrance to the Racine County Historical Society. Two steel streetcar poles with bronze ornamentation stood in the center of the bridge and have also been removed.

The Northwestern Terra Cotta Company of Chicago produced numerous ornate figures and shields which were mounted to the exterior of the bridge. Hand painted terra cotta gargoyles line the exterior of the bridge at a line representative of the street height. A large terra cotta shield of wingspread eagles is mounted in the center of the bridge. A crest, comprised of farm products and a buffalo, is mounted on the approach span above Horlick Drive.

#### CHARLES S. WHITNEY

Charles Smith Whitney (1892-1959), who served as the principle engineer-architect for the West Sixth Street Bridge project, developed a worldwide reputation as an expert on reinforced concrete construction. His theories and innovations in thin shell concrete design and blast resistant structures earned him worldwide recognition. After completing his Masters of Engineering at Cornell University in 1915, Mr. Whitney took a job as an inspector on the Hell Gate Bridge and Bronx Viaduct projects in New York. After only a year, he left New York and took a job with a local architect in Los Angeles. Although his work on the West Coast was cut short by a tour of duty during World War I, Whitney made important contacts with the A. C. Eschweiler Company based in Milwaukee, Wisconsin. After returning from duty with the 25th Engineering Corps in France, he began employment with Eschweiler. This was the beginning of his life-long career in Wisconsin. By 1922, Whitney had established a private consulting practice and was doing a considerable amount of work for the city.<sup>19</sup>

Charles Whitney received the contract for the West Sixth Street Bridge in Racine in late March 1928. This design, which was of the popular Art Deco/Modern style, differed greatly from both his earlier and later works. Whitney seemed to prefer the rusticated medieval stone look for his other bridges. This rusticated style can be seen in his 1927 Lakeside Park Bridge in Fond du Lac and his 1935 Range Line Road Bridge in River Hills Village. Both bridges were concrete arch structure covered with an intricately-cut stone veneer.<sup>20</sup>

The year after Whitney completed the Racine bridge, he published what he considered his masterpiece, Bridgee: A Study In Their Art, Science and Evolution.<sup>21</sup> In this book, the author makes his argument for the use of architectural design in what is primarily an engineering field. The development of different bridge types, their evolution, and construction are examined. Many of Charles Whitney's beliefs on concrete construction are expressed. The author talks of both external and internal harmony of a structure which can be seen as "the relations between the bridge and all around it, land, road, water, buildings, other bridges, and even the hills and valley."<sup>22</sup> Achieving internal unity of the structure demanded "individuality, continuity, balance, similarity of parts, proportion, scale and harmony in color and texture of materials."<sup>23</sup>

When Whitney discusses concrete bridge construction, the reasons for some of his design ideas in the Racine bridge become more evident. Efficiency and honesty were the most important aspects of concrete construction. "Monolithic concrete should not be marked with joints to represent stone masonry, although it may be desirable to use some lines to add interest to large plain surfaces, or to indicate construction joints."<sup>24</sup> In general, Whitney emphasized the avoidance of unnecessary details in concrete construction, when he felt they detracted from the structural expression of the bridge.<sup>25</sup>

While Whitney felt very strongly about his role as an esthetic designer, his engineering ability were more widely known among his peers. Besides his book on bridges, he wrote numerous trade articles including many on the thermal effects of reinforced concrete arches. He was one of the world's experts on the plastic theory of reinforced concrete design and the design of both earthquake and bomb-resistant concrete structures.<sup>26</sup> Whitney is also known as the originator of the long span, thin shell method of concrete construction which allowed buildings with extensive clear space, such as airplane hangars, to be constructed of reinforced concrete.<sup>27</sup>

In 1946, a partnership was formed between Whitney and a long-time friend from New York, Othmar H. Ammann, also a prominent bridge builder. By this time, Whitney had begun to take on increasingly larger projects. Whitney opened a second office in New York and, eventually, field offices were created in France and the Middle East. Whitney was responsible for the engineering on a number of large scale projects in the Milwaukee area. He helped plan the new Milwaukee freeway system in the early 1950s and was responsible for most of its

bridges.<sup>28</sup> Mr. Whitney also served as either consulting or designing engineer on the Milwaukee Area, the Milwaukee Gas and Light Company building, the Milwaukee Telephone Company building, and the Milwaukee Children's Hospital.<sup>29</sup>

On the national level, Charles Whitney was associated with some of the United States' most prominent architectural firms. Shortly before his death, Whitney worked with Eero Saarinen on the construction of Dulles International Airport outside of Washington, D. C., and the Trans World Airlines terminal at Kennedy Airport in New York.<sup>30</sup> He also worked on numerous smaller projects with the Saarinen office. Whitney was instrumental in the early planning and design of the \$300,000,000 Verrazano Narrows Bridge in New York, one of the world's longest suspension bridges.<sup>31</sup> The offices of Skidmore Owings & Merrill and Minuro Yamasaki also employed the firm on various projects.<sup>32</sup> Charles Whitney died in Paris on October 25, 1959, while on a trip to his French office. The firm of Ammann & Whitney survives today with offices in Milwaukee and New York. Charles Whitney received numerous national awards and recognitions, including:

- James R. Cross Medal - American Society of Civil Engineers, 1925
- Fuertes Graduate Medal - Cornell University, 1925, 1927
- The Watson Medal - American Concrete Institute, 1932, 1952, 1955
- Alfred E. Lindau Medal - American Concrete Institute, 1951
- Vice President, American Concrete Institute, 1953-1954
- President, American Concrete Institute, 1955
- Honorary Member, American Institute of Architects, Wisconsin Chapter
- Registered Professional Engineer: Wisconsin, New York, Ohio
- Registered Civil Engineer: Michigan
- Registered Structural Engineer: Illinois
- Chairman, American Concrete Institute Committee on Plain and Reinforced Concrete Arches
- Chairman, American Society of Civil Engineers Committee on Thin Shell Design

FOOTNOTES

- 1 "Kinzie avenue Bridge History," Racine Journal News, June 26, 1928
- 2 Ibid.
- 3 Ibid.
- 4 Ibid.
- 5 "West Sixth Street Bridge Opens," Racine Journal News, December 12, 1928.
- 6 Official Journal, City of Racine, Proceedings, Vol. 1927-28,  
December 6, 1927, p. 268.
- 7 Ibid., February 21, 1928, p. 335.
- 8 Ibid., March 20, 1928, p. 363.
- 9 Proceedings, Vol. 1928-29, May 1, 1928, p. 25.
- 10 "Some Facts About The City's Handsomest Bridge," Racine Journal News,  
December 3, 1928.
- 11 "Sixth Street Bridge Passes Test of City Engineers," Racine Times-Call,  
November 20, 1928.
- 12 David Plowden, Bridges: The Spans of North America  
(New York: W. W. Norton & Company, 1974), p. 297
- 13 Charles S. Whitney, Bridges: A Study in Their Art, Science and Evolution  
(New York: W. E. Rudge, 1929); reprinted New York: Greenwich House,  
1983, with a new foreword by Larry N. Spiller, p. 219.
- 14 Ibid., p. 222.
- 15 Ibid.
- 16 Ibid.
- 17 "New Kinzie Ave. Bridge Opens," Racine Times-Call, December 1, 1928.
- 18 Photo Caption, Racine Journal-Times, March 18, 1969.



- 19 Gertrude S. Whitney, The Life of Charles Smith Whitney (An unpublished biography by the engineer's wife, including appendices covering his professional records and awards. A copy can be found in the Milwaukee office of Amman & Whitney.)
- 20 Jeffrey A. Hess, Historic Highway Bridges in Wisconsin-Stone and Concrete Arch Bridges (Wisconsin Department of Transportation Publications 1986), Vol. 1, pp. 226-227.
- 21 Life of C. S. Whitney, p. 56.
- 22 Bridges: A Study in Their Art, Science and Evolution, p. 33.
- 23 Ibid., p. 38.
- 24 Ibid., p. 30.
- 25 Ibid., pp. 217-218.
- 26 Who Was Who in American History - Science and Technology (New York: Who's Who Inc., 1976), p. 659.
- 27 Carl W. Condit, American Building (Chicago: The University of Chicago Press, 1982), p. 279.
- 28 'C. S. Whitney Services Set," The Milwaukee Sentinel, October 27, 1959.
- 29 "Death Comes To Whitney in Paris Hospital," The Milwaukee Journal, October 27, 1959.
- 30 Life of C. S. Whitney, p. 45.
- 31 American Building, p. 239.
- 32 Ibid., p. 48.

BIBLIOGRAPHY OF SOURCES

- Burckel, Nicholas C. Racine: Growth and Change in a Wisconsin County.  
Racine: Racine County Board of Supervisors, 1977.
- Condit, Carl W. American Building. Chicago: The University of Chicago Press,  
1982
- Hess, Jeffrey A. & Frame, Robert. Historic Highway Bridges in Wisconsin-  
Stone and Concrete Arch Bridges. Wisconsin Department of Transportation  
Publications, 1986. Volumes 1 & 2.
- Official Journal, City of Racine. Proceedings. Volumes 1927-28, 1928-29.
- Plowden, David. Bridges, The Spans of North America. New York: W. W. Morton  
Company, Inc., 1974.
- Whitney, Charles S. Bridges: A Study in Their Art, Science and Evolution.  
New York: W. E. Rudge, 1929 - reprinted New York: Greenwich House, 1983.
- Whitney, Gertrude S. The Life of Charles Smith Whitney. An unpublished  
biography done by the engineer's wife. A copy is located at the Milwaukee  
office of Ammann & Whitney.
- Who Was Who in American History - Science and Technology. New York:  
Who's Who Inc., 1976.
- The Milwaukee Journal. October 27, 1959.
- The Milwaukee Sentinel. October 27, 1959.
- The Racine Journal News. June 26, 1928 - December 12, 1928.
- The Racine Times-Call. November 20, 1928 - December 1, 1928.