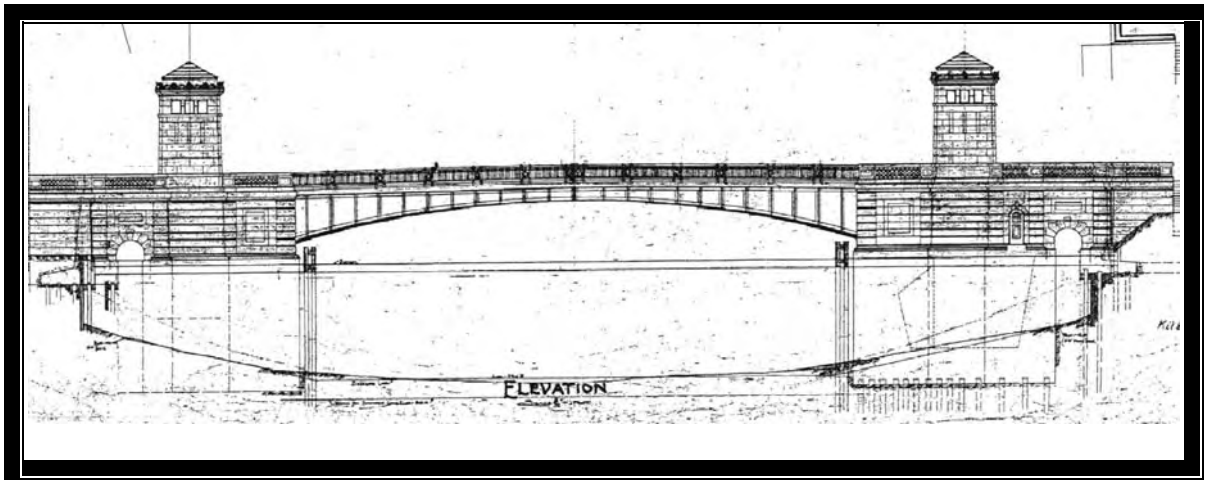

HISTORIC DESIGNATION STUDY REPORT

KILBOURN AVENUE BASCULE BRIDGE
KILBOURN AVENUE
OVER THE MILWAUKEE RIVER
SECTION 28 TOWN 7 NORTH RANGE 22 EAST
WisDOT P-40-881

HISTORIC DESIGNATION STUDY REPORT

KILBOURN AVENUE BASCULE BRIDGE

I. NAME

Historic: Kilbourn Avenue Bascule Bridge

Common: Kilbourn Avenue Bridge

II. LOCATION

Milwaukee River at Kilbourn Avenue, City of Milwaukee, Milwaukee County

WisDOT Designation: P-40-881

Legal Description: Section 28, Town 7N, Range 22E

III. CLASSIFICATION

Structure

IV. OWNER

City of Milwaukee

NOMINATOR

Robert M. Frame III and Katy Holmer, Mead & Hunt Inc.

ALDERMANIC DISTRICT

Fourth Aldermanic District

V. YEAR BUILT

1929[1]

ARCHITECT

Charles Malig, Milwaukee Bureau of Bridges & Buildings[2]

CONTRACTOR/FABRICATOR

Milwaukee Bridge Company (Fabricator, superstructure)
Edward E. Gillen Company, Milwaukee (Contractor, substructure)[3]

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[1] Plaque on the Kilbourn Avenue Bridge. Jeffrey A. Hess and Robert M. Frame III, Historic Highway Bridges in Wisconsin, Movable Bridges, Vol. 3,(Wisconsin Department of Transportation, 1996), p.78.
[2] Ibid.; Original plans located in the Infrastructure Division of the City of Milwaukee.
[3] Frame and Hess, p. 78.

VI. PHYSICAL DESCRIPTION

The Kilbourn Avenue Bridge, as its name implies, links the east and west banks of the Milwaukee River at Kilbourn Avenue. A bascule bridge is a form of movable bridge in which one or two portions of the roadbed, called leaves, rotate up vertically to allow for the passage of river traffic. To quote from the Draft Historic Structures Report prepared by Mead & Hunt, the Kilbourn Avenue Bridge:

> is a double leaf, plate-girder, bascule span with two approach spans. The bascule span is a simple trunnion-type with a counterweight mounted below street level. The overall length of the structure, including the approach spans and reinforced-concrete abutments, is approximately 250 feet. City records state the overall length of the bascule span as 141 feet. The out-to-out width of the bascule leaves is 84 feet, including two cantilevered 12-foot sidewalks. The center-to center span between the trunnions is 151 feet. The channel between fender piers (dolphins) is 120 feet and the clear navigation channel between opposing fender piers is 100 feet. The bridge was designed to provide 12 feet of vertical clearance for navigation with the leaves in the closed position. Beneath each approach span, perpendicular to the roadway, is a 6-foot wide, by 6-foot high (above datum) bypass tunnel with round-arch openings.
>
> The 1986 Intensive Survey Form identified the West Kilbourn Avenue Bridge as “the most ornate of the Milwaukee bascule bridges,” and “an excellent expression of the early twentieth-century ‘City Beautiful’ movement.” The bridge structure, other than the two bascule leaves, is clad in ashlar Bedford limestone. The bridge has ornamental metal railings on the bascule leaves and limestone balustrades on the approaches.
>
> The most prominent architectural feature of the bridge is the design and symmetrical placement of the four identical two-story structures at the outside corners of the leaves. The northwest and southeast structures originally contained the controls for their respective leaves and were termed “operator’s houses.” The southwest and northeast buildings, included for architectural symmetry in the Neoclassical scheme, contained no equipment and were termed “pylons.”
>
> Each house and pylon is 15’ 4” square at the base (sidewalk level), with battered walls tapering to 14’ 2” square at the edge of the roof, and is 29’ high from sidewalk level to roof point. Each is constructed of poured reinforced-concrete with a Bedford limestone veneer. The pyramidal roofs are also constructed of reinforced concrete with a limestone veneer and a carved, crested limestone cornice. On the roof of each operator’s house is a pole for a navigational signal ball (ball up, bridge closed to vessels; ball down, bridge open to vessels). Centered in the roof of each operator’s house (but not the pylons) is a rectangular chimney cap added in 1941.
>
> The four facades of each structure are nearly identical, each with three one-over-one double-hung metal sash at the second (operator’s room) level. Centered below each window is a vertical inset panel in the otherwise flat exterior stone surface. Each structure has a single entrance doorway with replacement door at the sidewalk level, centered on the façade facing the roadway. Above the doorways of the two operator’s houses are large metal bells to alert motorists and pedestrians of a bridge opening. A pair of automatic safety gates and housings is mounted on each end of the bridge in

the area of the operator's houses and pylons. City staff report that although the gate equipment is not original, it is from an earlier period and is not modern. At the pier level below the street, the two operator's houses have round-arch door openings with replacement metal half-doors (the lower half of the door opening has concrete in-fill). The lift machinery is located in the area around the trunnions, below the street level. Mounted on the exteriors of the northeast and southwest operator's houses are the original 1929 bronze dedication plaques and, on the balustrades near the houses, brass 1999 River Walk District plaques. The metal railing on the bascule leaves is original.

The original bridge deck and sidewalk on each leaf consisted of wood sub-planking overlaid with grooved rubber paving blocks. In 1974 the original decks, including the 6" x 12" x 1 ¼"-thick rubber block surfaces, were replaced with the present open steel mesh deck. The original sidewalks, including the 6" x 12" x 5/8"-thick rubber block surfaces, were replaced with the present metal diamond-tread plates. The counterweights were adjusted for the change in weight and balance of the leaves.

In 1978 the separate east and west bridge controls were modified to allow both leaves to be controlled from a single control in the southeast operator's house. Original AC motors and open gear drives were replaced by DC motors and enclosed reduction gear drives. As part of the same project, but a year later, the original 12, one-over-one, double-hung, metal-sash windows in the southeast operator's house were replaced with the present anodized metal windows. The contractor was instructed to save four of the original windows, which were to remain the property of the city. The other operator's house and the two pylons retain their original windows, which match those removed from the southeast house. The original metal street-level doors on the four houses were replaced with the present flat, hollow, metal doors, each with a single, square, fixed window. A similar door replacement occurred at the pier level, where the doors retain their original round-arch tops.

The only architectural modifications of the West Kilbourn Avenue Bridge have been the tuckpointing of the houses between 1989 and 1992 and removal in 1999 of a section of stone balustrade, just west of the southwest pylon, to allow pedestrian access down a stairway to the new River Walk. Additional routine maintenance work has not changed the appearance of the bridge.

The bridge is currently in need of rehabilitation to repair deteriorated structural, mechanical, and electrical components.[4]

The Historic Highway Bridges in Wisconsin Bascule Bridge Intensive Survey Form for the Kilbourn Avenue Bascule Bridge supplies additional information:

Although the bridge's architectural treatment was unusually ornate, its engineering was quite traditional, featuring the basic simple trunnion, fixed-counterweight, bottom-mounted-rack design introduced by the 1904 Muskego Avenue Bridge. [RAZED] Like the 1926 Holton Street Bascule, the Kilbourn Avenue Bridge has two pairs of bascule girders per leaf. On the Holton Street structure, the rear of each bascule girder terminates in a series of bolted cast-iron blocks, which jointly serve as a counterweight for the leaf. On the Kilbourn Avenue Bridge, however, the bascule girders are not individually

[4] Mead & Hunt, Draft Historic Structures Report, Milwaukee Bridge P-40-881, West Kilbourn Avenue Bridge Over the Milwaukee River, Milwaukee, Wisconsin (February, 2005), pp. 3-4.

counterweighted. Instead, each pair of bascule girders shares a common counterweight in the form of a concrete-filled, built-up, plate box connecting the tail ends of the girders. Used in Chicago bascules as early as 1904, the counterweight box also appears on the bascule span of the Sixteenth Street Viaduct, which was designed and constructed simultaneously with the Kilbourn Avenue Bridge. On the Kilbourn Avenue Bascule, each counterweight box is positioned over a concrete pit excavated in the floor of the abutment. Together, the two counterweight boxes maintain the leaf in equilibrium, with the center of gravity approximately at the trunnions. Each trunnion is supported, on the outside of the bascule girder, by a longitudinal built-up girder bordering the pit and tied into the abutment masonry. The inside end of the trunnion is carried by a built-up steel column anchored to the floor of the pit.[5]

Originally, the northwest and southeast pylons contained the controls for operating the lift machinery of their respective leaves. In the late 1970s, however, the bridge was converted to one-man operation from the southeast pylon. At that time, the original, AC-motor-driven, open-spur-gear lift machinery on the abutment floors was remodeled with a DC-motor-driven system largely utilizing enclosed reduction gears. The last reduction drives a pinion that engages a cast-steel, segmental rack bolted to the bottom of each bascule girder slightly beneath the trunnion. The activating pinion is positioned below the front, or river, end of the rack, slightly forward of the trunnion. Since the leaf is counterbalanced, the power train is designed primarily to overcome the friction and inertia of the system. When the power train is set in motion, the leaf pivots on the trunnion so that the front end rises and the counterweight boxes descend into the pits. When the motor is reversed, the leaves close and the counterweight boxes rise. The lift machinery is still in use during the navigational season.[6](Historic Highway Bridges)

The break in the leaf occurs on the river side of the trunnion so that only the rear ends of the bascule girders experience uplift from the weight of traffic. The live load is transferred to the bridge foundations by means of a slightly protruding heel plate at the end of the bascule girders. In closed position, the heel plate nestles against a transverse beam attached to steel columns anchored in the abutment masonry. There is no mechanical heel lock. To ensure rigidity of the bascule span under traffic, the front ends of the bascule girders are equipped with motor-driven ram-and-socket center locks that tie the leaves together below deck.

The primary character defining features of the Kilbourn Avenue Bridge remain in good condition and include the four, pyramidal-roofed pylons/bridge tenders houses, the stone balustrades, the prominent metal railings, and all the structural members including the plate-girder double leaf span with slight arch, the thick plates of the girders with their prominent rivets and the piers which house the mechanicals. The stone balustrades show the effects of over zealous sandblasting and a number of the individual balusters have lost their original profiles. Alterations to the bridge have been minimal and have been listed above. Access doors to the operators' houses and pylons are replacements as are the doors at the pier level below the street. The original bridge deck and sidewalk on each leaf consisted of wood sub planking overlaid

[5] Jeffrey A. Hess, Historic Highway Bridges in Wisconsin, Movable Bridges Intensive Survey Forms, Appendix Bascule Bridges Intensive Survey Forms, Vol. 3, Part 2: Appendix (Wisconsin Department of Transportation, 1996), Kilbourn Avenue Bascule Bridge (pages not numbered).
[6] Ibid.

with grooved rubber paving blocks. The plank roadway was replaced with the open steel mesh deck in 1974. The sidewalks were replaced with the current metal diamond-tread plates at the same time. The AC driven system was converted to DC in 1978.

VII. SIGNIFICANCE

The Kilbourn Avenue Bascule Bridge is significant as one of just a handful of pre-1950 bascule bridges in Milwaukee. These include the State Street Bridge (originally 1924 but now under reconstruction), the Holton Street Bridge (1926), the 16th Street Bridge (1929), and the Cherry Street Bridge (1940).

The Kilbourn Avenue Bascule Bridge is considered eligible for National Register listing under Criterion C, the area of architecture as a result of a statewide survey of movable bridges conducted by the Wisconsin Department of Transportation in 1986 and the Historic Plan for Bascule Bridges in 1996. As a result of the study and plan, only six National Register-eligible bascule bridges survived in the state by the mid-1990s although some of these may have already been replaced with new structures. Although the Kilbourn Avenue Bascule Bridge utilizes engineering developed for the Muskego Avenue/Emmber Lane Bridge and does not represent a new milestone in engineering, it followed the precedent setting State Street Bridge in the use of aesthetic design and surpassed all prior efforts in producing a monumental link

The Kilbourn Avenue Bascule Bridge is significant as Milwaukee's most architecturally prominent bridge. In Milwaukee's past, economy and utility had been paramount in bridge design until the administration of Mayor David Rose, the first official known to make a plea for bridge aesthetics. His request in 1901 that the new Grand Avenue/Wisconsin Avenue Bridge be designed "sufficiently ornamental to conform to the location and surroundings" was in keeping with his goal of making Milwaukee a mecca for tourists and conventioneers.[7] Mayor Rose was out of office by the time the first aesthetically designed bridge, the State Street Bridge, was authorized in 1912 and built in 1924. By this time more attention was being directed at the waterways as important features of the city and not just the dreary backwater alleys they had become in the nineteenth century. As commercial shipping began to decline and the City Beautiful movement took hold, city planners such as Alfred Clas capitalized on European models and conceived of grandiose riverwalks lining the Milwaukee River with equally monumental bridges spanning the waterways[8].

By the time that the Kilbourn Avenue Bascule Bridge was constructed in 1929, the Civic Center plan had been adopted and a grand boulevard, connecting the two seats of government, Milwaukee City Hall and the Milwaukee County Courthouse, was envisioned to be the heart of the downtown. Grand civic and quasi public buildings like museums and libraries, designed in Classical Revival style, would line the thoroughfare. The Kilbourn Avenue Bascule Bridge was seen as something special beyond the mere crossing of a river. It was to serve as a visual link in the Civic Center, bridging the way between the Old World character of City Hall and the new Classical Revival Courthouse. Its design, although executed by city architect Charles Malig, seems based upon a number of images prepared by architect Alfred Clas during the years he was involved in city planning. Large masonry bridges with wide floor plates, prominent stone balustrades with classical balusters and pylon shaped light standards were illustrated again and again in his renderings of downtown riverwalks and viaducts,

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[7] Hess and Frame, pp. 35-36.

[8] William George Bruce, ed., History of Milwaukee City and County (Milwaukee: S.J. Clarke Publishing Company, 1922), Vol. 1, pp. 506, 514, 522.

especially the span crossing over the Chicago and North Western tracks at Mason Street. This viaduct provided access to the new Lincoln Memorial Drive. Some of these illustrations were published as early as 1917 by the Milwaukee Press Club in their magazine Once A Year while others were incorporated in Bruce's History of Milwaukee City and County, published in 1922, as part of a lengthy chapter on city planning and zoning.[9] A particulary noteworthy image is the watercolor, crayon and graphite illustration of the Milwaukee River Improvements dated 1922 and executed by Charles Morgan. It is owned by the city and is hung up in the Long Range Planning's Library.

VIII. HISTORY

INTRODUCTION

The Kilbourn Avenue Bascule Bridge is being nominated for local designation as a result of the Programmatic Agreement Among the Federal Highway Administration, The Wisconsin State Historic Preservation Office, and The Advisory Council on Historic Preservation Regarding Implementation of the Historic Preservation Plan For Bascule Bridges In Wisconsin. The Historic Preservation Plan for Bascule Bridges was prepared in April, 1996 and identified the following Wisconsin bascule bridges eligible for inclusion in the National Register of Historic Places:

Sturgeon Bay Bridge, City of Sturgeon Bay
Emmber Lane Bridge, City of Milwaukee
Kilbourn Avenue Bridge, City of Milwaukee
State Street Bridge, City of Milwaukee
Lawe Street Bridge, City of Kaukauna
Cherry Street Bridge, City of Milwaukee

Of these only the State Street, Kilbourn Avenue, and Cherry Street Bridges in Milwaukee were considered candidates for rehabilitation while the remainder were not. As part of the stipulations in the Programmatic Agreement, the three Milwaukee bridges cited above are to be nominated for local designation and there is to be a Historic Structures Report completed for each that includes the history, significance and identification of the character defining features, as well as guidance for future rehabilitation efforts and recommendations for maintenance geared to long-term preservation. Representatives from the Advisory Council on Historic Preservation, the Federal Highway Administration, the Wisconsin State Preservation Officer, the Wisconsin Department of Transportation and the City of Milwaukee (Mariano Schifalacqua, City Engineer at that time) all signed the agreement in late 1996 and early 1997. The application for local designation is being submitted at this time because the Milwaukee Department of Public Works is scheduling rehabilitation of the bridge in late 2006-early 2007. Consultants Mead & Hunt, Inc. submitted the nomination application for DPW.

MILWAUKEE BRIDGES OVERVIEW

The Milwaukee and Menomonee Rivers divide Milwaukee's land mass into three distinct areas that were originally settled as three distinct communities: Kilbourntown, Juneautown and Walker's Point. Transportation among the communities across the rivers was first provided by ferries, which conveyed passengers over the Milwaukee River between East and West Wisconsin Avenue and between North Water Street and South First Street. The

[9] Bruce, Vol. 1, pp. 481-555; Milwaukee Press Club, Once A Year, October 15, 1917, p. 71.

responsibility for bridge building, however, was very controversial and touched off heated exchanges between east and west sides. Bridge construction was fraught with local jealousies over development and navigation rights and disagreements flared over the financial burdens of construction and maintenance. This dissention culminated in what is known today as the Bridge War of 1845.[10]

Funding for the construction of bridges in these early years relied on private sponsorship such as joint-stock companies or a local government. The 1848 Wisconsin State Constitution prohibited state funding for transportation projects and the Wisconsin State Legislature in 1849 laid out the responsibilities and authority of local governments for bridge maintenance and construction.[11] Prior to this, by 1840, Byron Kilbourn had erected the community's first bridge across the Menomonee River as a private venture, joining what is now Plankinton Avenue to South Second Street. Although planned in the mid-1830s, the construction of Kilbourn's bridge had been delayed due to various mishaps. His purpose was to join his West Side settlement with the Chicago Road that terminated in Walker's Point and divert settlers to his plat rather than ferrying them across to his arch-rival's Juneautown settlement on the East Side. East Siders naturally resented this action although the need for better accessibility from the south was becoming a necessity. Earlier official attempts to construct a bridge had met with failure. In 1836, the Territorial Legislature authorized Milwaukee County to construct a bridge across the Milwaukee River at Wells Street. Local dissention kept the project from being realized. In 1838, the Legislature once again stepped in and authorized construction of a bridge across the Milwaukee River, this time at Juneau Avenue, with the costs to be born equally by east and west siders. When disagreement between the two factions threatened the project, the County Commissioners invoked their authority and had the bridge built in 1840. Another bridge was subsequently constructed in 1842 at Wisconsin Avenue, but it was paid for by private conscription. This was followed by a third bridge at Wells Street in 1844, which was built chiefly at the expense of East Side residents, who resented the West Side's reluctance to share the financial burden. Damage to the Wisconsin Avenue bridge by a schooner on May 3, 1845 fanned the enmity between the communities as West Siders charged deliberate sabotage, while East Siders blamed the negligence of the bridge tender. When the Village Board of Trustees met to discuss the matter, the West Siders, surprisingly, objected to the placement of most of the existing bridges and, citing its disrepair, voted to demolish their half of the Juneau Avenue bridge. On May 8, 1845 a group of West Siders removed their portion of the Juneau Avenue bridge causing the entire structure to collapse. They also damaged the west end of the Wells Street bridge, causing the East Siders to assemble in a mob and threaten cannon fire. Violence was averted but in late May, a mob of still angry East Siders assembled again and destroyed the Wisconsin Avenue bridge and threatened to demolish the new dam upstream as well. The Village Board managed to diffuse the explosive situation, but no real progress was made in rectifying the lack of an adequate means of crossing the Milwaukee River until a bill was introduced into the Legislature authorizing the construction of three bridges: one at the foot of Water Street, one at Wisconsin Avenue, and one at Cherry Street. The Village Board approved the matter on February 12, 1846 and thereafter bridge building was undertaken as needed.

Because the original town promoters never intended to consolidate their separate settlements, west side streets were not platted in alignment with those of the east side, necessitating the construction of bridges angled to join the staggered streets on either side of the Milwaukee River. Despite such awkwardness, by the 1870s, bridges spanned most east-west streets in the Central Business District including Broadway, Buffalo, Clybourn,

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[10] Les Vollmert, Carlen Hatala, Robin Wenger, Central Business District Historic Resources Survey (Milwaukee: City of Milwaukee, Department of City Development, 1986), pp. 41-52. Most of this section, unless otherwise noted, is taken from the chapter on Transportation.

[11] Historic Highway Bridges in Wisconsin, Truss Bridges, Vol 2, Part 1 (Wisconsin Department of Transportation, 1998), p. 86.

Juneau, State, Wells and Wisconsin Avenue and also such important north-south routes as Plankinton Avenue and Water Street. Michigan Street was relatively late in receiving a bridge and was not spanned until 1891. Bridge engineering in Milwaukee illustrated the various technological innovations of the times. Wood bridges were replaced by iron ones which in turn were replaced by steel construction. Mechanical power for draw bridges was replaced by electricity in the late 1880s and early 1890s. In the Central Business District all bridges had to be moveable ones, either draw, swing, bascule or vertical lift types, to permit commercial shipping on the Milwaukee and Menomonee Rivers. Owning to the high volume of traffic and the general wear and tear on moveable bridges, no nineteenth century examples remain. Some crossings have had as many as five successive bridges constructed at their sites and today, most of the downtown bridges date from the 1970s through the 1990s.

EARLY BRIDGE TYPES

Wooden bridges were the earliest constructed across Milwaukee's rivers and consisted of various draw, floating box draw, bascule and Howe Truss spans. The last wooden bridge downtown was built over the Milwaukee River at Wells Street in 1869 and remained in use until 1883.

Metal truss bridges were the natural progression in bridge construction providing greater strength and durability than wood bridges, especially in heavily traveled urban areas. Although iron technology existed at the beginning of the nineteenth century it was generally not applied to bridge construction until the 1840s. Debates among engineers raged over the use of wrought versus cast iron well into the 1870s. When steel technology evolved to the point that it was more economical to produce and the resulting product was more consistent in composition, debates then centered around its use in bridge building versus wrought and cast iron.[12] The first iron bridge in Milwaukee was built over the Milwaukee River at Clybourn Street in 1868. Described as a tubular wrought iron swing type, the Clybourn Street bridge had a 180 foot draw and was built at a cost of $21,703. It remained in use until 1896. It proved so successful that city officials recommended that "future bridges be constructed of stone and iron exclusively."[13] The second iron bridge was at State Street, also a swing type, completed in 1871 at a cost of $27,890. It remained in use until 1924.

BASCULE BRIDGES

Steel bascule bridges began to replace the older wood and iron truss structures by the late 1890s due to a convergence of factors. In the early 1890s Congress gave the War Department the nationwide authority to approve all bridges over navigable waterways and the power to encourage the replacement of those bridges that interfered with the free flow of commerce. The swing bridge, which pivoted from a center pier in the middle of the river, took up important navigable space. The required turning radius also used up valuable docking space next to the bridge. The War Department's denial for a new swing bridge in Chicago and the recommendation in 1892 to remove an existing one also in Chicago sent engineers scrambling to research and develop alternative moving bridge types.[14]

Milwaukee both participated in and benefited from the engineering experiments in bridge design and, along with Chicago, formed the center of bridge technology in the late nineteenth and early twentieth centuries. In Chicago one serious alternative to the swing bridge was the vertical lift bridge where the vertical lift span rises and descends in the same vertical plane. Another alternative was the bascule bridge. Bascule bridges have one or

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[12] Historic Highway Bridges in Wisconsin, Truss Bridges, Volume 2, Part 1, pp. 17-31.
[13] Hess and Frame, p. 9.
[14] Ibid., pp. 10-11.

two lift portions called a leaf "which rotates in a vertical plane around a horizontal axis - much like a seesaw, which is one meaning of the word in French."[15] Bascules have their source in the medieval castle drawbridge, which provided not only a crossing over a waterway but also an effective barricade when raised. There were experiments in Europe over the centuries but the first centers of modern bascule construction were Milwaukee and Chicago as cited above, "with Chicago taking precedence by a few years."[16] Although vertical lift bridges enjoyed some popularity during these years of experimentation, the bascule bridge became the preferred alternative. The bascule provided a single wider channel for larger vessels than the swing type bridge, vessel height was not an issue and the raised leaf prevented vehicles from accidentally crossing over the riverbanks. In Wisconsin especially, the bascule bridge was exceedingly popular and between 1900 and 1935 some two-thirds of the 72 movable highway bridges constructed were of the bascule type.[17]

Some of the more notable persons connected with the development of the bascule bridge included William Harman, William Scherzer, Max Schinke and John Ericson. Harman worked in Chicago and developed and patented the "jackknife " bascule that was used in the Weed Street (1891) and Canal Street (1893) crossings in Chicago.[18] William Scherzer patented the rolling lift bascule with iron counterweight that was compatible with both truss and plate girder construction and could be built in both a single or double leaf design. His bascule moved both vertically up from the water as well as moved back toward the shore in a rocking chair motion. Scherzer's brother established the Scherzer Rolling Lift Bridge Company that went on to produce some 175 examples before World War II.[19] Max Schinke was Milwaukee's Assistant City Engineer from 1890 to 1899. He created the counterbalanced leaf supported by a pivoted swinging arm attached to rollers set in a curved stationary track at the rear of the assembly. "Because of the track's shape, the leaf's center of gravity retreated and advanced in a horizontal line, thereby maintaining a counterbalanced system."[20] Schinke's design was utilized in the 16th Street Viaduct in 1895 and the Huron/Clybourn Street Bridge of 1897. Chicago City Engineer John Ericson developed the simple trunnion type bascule, which came to be the most popular form of the bascule. It was based on the recently completed Tower Bridge in London, England, which was an "updated version of a simple trunnion bascule, the oldest of all drawbridge types. In a seesaw manner, each leaf vertically rotated on a horizontal steel pivot, or trunnion. Powered by a steam engine, the lift machinery operated the draw by means of a pinion engaging a curved rack mounted on the upper side of the rear end of the leaf." Chicago's version, built at Courtland/Clybourn Street in 1902, incorporated all the essential features of the Tower Bridge and was noted for its simplicity. The structure maintained a constant center of gravity, there was less stress on the bridge abutments, the number of moving parts was kept to a minimum and the design was never patented, making it easy to adapt and modify. This simple trunnion type became synonymous with the Chicago Type Bascule in all the technical literature.[21]

Milwaukee likewise developed a form of trunnion bascule that became nationally recognized but without the acknowledgement of Milwaukee as its source. The first example in Milwaukee, the Grand Avenue/Wisconsin Avenue Bridge (opened March 10, 1902) was actually completed three months before the Courtland/Clybourn street Bridge in Chicago. It was designed and built by the Wisconsin Bridge Company and consisted of a double leaf simple trunnion design. It differed from the Chicago example by using an

[15] Ibid., p. 17.
[16] Ibid.
[17] Ibid., pp. 10-17.
[18] Ibid., p. 19
[19] Ibid., pp. 21-24
[20] Ibid., pp. 26-28
[21] Ibid., pp. 29-34.

arched plate-girder design rather than a truss configuration, by utilizing a new rack and pinion operating mechanism and shifting the break in the roadway from the river side of the trunnion to the shoreward side of the trunnion. Locks and center locks were required to keep the bridge closed under live loads. The Grand Avenue/Wisconsin Avenue Bridge was hailed as "The first bridge of this type to be completed in this country, although some bridges of similar type are now being built across the Chicago River."[22]

Milwaukee's second simple trunnion bascule was built at Broadway in 1903. It retained most of the features of its predecessor but placed the break in the roadway on the river side of the trunnion. Local consulting engineer John Geist is known to have designed the Broadway Bridge and possibly originated the form with the Grand /Wisconsin Avenue Bridge.[23]

The final modification that led to the creation of the Milwaukee Bascule Type appeared with the Muskego Avenue/Emmber Lane Bridge of 1904. The modification consisted of moving the side mounted segmental rack to a bottom mounted position below the trunnion but otherwise retained the plate-girder construction. F.W. Moore is credited with originating the bottom mounted rack for this bridge and went on to design the city's next six bascule bridges, all constructed before 1910. This form became the standard in Milwaukee and all thirteen spans built by the city before World War II were of this simple trunnion form. Like the Chicago designs, the Milwaukee bascule was not patented but was soon adopted around the country. As early as 1905 the Muskego Avenue/Emmber Lane form could be found in plans by the Federal Government for the Anacostia River Bridge over the Potomac River. The rear rack, truss configured Chicago type proved not as popular. Milwaukee's came to be the most common form of movable bascule highway bridge because it was the easiest to design, build and maintain. The Milwaukee Type Bascule also appeared in the US Department of Transportation's Bridge Inspector's Manual for Movable Bridges (1977) as a typical trunnion bascule with plate girder span and bottom mounted segmental rack, although it does not credit Milwaukee as the place of origin.[24]

As indicated above, the simple trunnion bascule became the bridge of choice for the City of Milwaukee. When the city created its own Bureau of Bridges and Public Buildings within the Department of Public Works in 1910, all architectural plans and engineering were completed in-house by its own staff. Conservative City engineers continued to use the form established by the 1904 Muskego Avenue/Emmber Lane Bridge through at least 1940, even retaining cast iron counterweights when technology had shifted toward the use of concrete counterweights. [25]

Following World War II shipping continued to decline, especially in the Milwaukee River, making bascules less necessary than they had been. During the course of the last 20 to 30 years, most of Milwaukee's historic bridges and viaducts have been either substantially renovated or replaced. Lift bridges, which had their antecedents in the late nineteenth century, can now be found at the Milwaukee River due to the end of commercial shipping in the 1960s. This type of bridge, as its name implies, has a center portion which raises vertically to allow for the passage of boats. It is less complex mechanically than the bascule and costs less to operate. With a clearance of only 25 feet, the vertical lift bridge is well suited to the small pleasure craft that now ply the downtown waterways.

KILBOURN AVENUE BASCULE BRIDGE

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[22] Ibid., pp. 34-39.
[23] Ibid., p. 41
[24] Ibid., pp. 43-49.
[25] Ibid., p. 50.

The Kilbourn Avenue Bascule Bridge is the city's most majestic span. It was the culmination of many years of planning to handle both transportation needs and the creation of a dramatic Civic Center, based on tenets of the City Beautiful movement.

Kilbourn Avenue was the last major downtown thoroughfare to receive a bridge. The bridge's history began on May 21, 1900 when newspaper publisher George Brumder and a group of Milwaukee citizens petitioned the Common Council for the construction of a bridge at the site. It was one of the few locations that did not have a span crossing the river and it was envisioned as important for commerce. After some debate, the petition was placed on file. Two years later, however, the Common Council adopted a resolution ordering the City Engineer to prepare an estimate for a bascule bridge to connect what was then known as Cedar (west of the river) and Biddle Streets (east of the river). The misalignment of the streets from east to west, the legacy of the early pioneer rivalry, was quite prominent at this location and the engineer's report indicated that certain parcels of land needed to be condemned to straighten the approaches to the bridge. The span was estimated to be 290 feet and cost $165,000. At the same time, the Common Council was considering the Civic Center plan that entailed constructing a new courthouse at Ninth Street and widening Kilbourn Avenue (Cedar and Biddle Streets) into an arterial highway. Uncertainty over the width of the avenue and, therefore, the bridge, led the Council to postpone action on the bridge indefinitely. Multiple properties would have to be condemned for the project.[26]

The Civic Center Plan was one of four plans that proposed major improvements for the city in the early years of the 20th century. Such planning efforts began with the creation of the Milwaukee Park Commission in 1889. The interest in parks, parkways and boulevards soon expanded into preparing plans to alleviate traffic congestion, improve the river and lakefront areas, open new subdivisions, and determining the proper location for public buildings. The Commission was renamed the Milwaukee Park and Planning Board in 1905 and then a separate Metropolitan Park Commission was created in 1907.

In 1909 two renowned city planning consultants, Frederick Law Olmsted and John Nolen, were retained by the Metropolitan Park Commission to advise on the feasibility and practicality of the Commission's Civic Center Plan, which had been drafted by noted local architect Alfred C. Clas. Clas proposed to link the existing city hall, east of the Milwaukee River, and a proposed new county courthouse on the hill at Ninth Street and Kilbourn Avenue by the construction of a wide mall lined with public and quasi-public buildings. Olmsted and Nolen's report, issued July 27, 1909, generally praised the project. The Civic Center Plan remained the chief preoccupation of city planners, first in the City Planning Commission (which followed the Metropolitan Park Commission) and the later Board of Public Land Commissioners, created in 1915. Although several variations to the original Civic Center Plan were studied, a revised version of Clas' original plan was found to be best. The matter was put before Milwaukee residents in a referendum vote on April 20, 1920, and the concept of the civic center was approved by a three to one margin. A special commission of architects was subsequently appointed to study the planning problems of the civic center and drew up plans in 1922. Delays in immediately implementing the project were caused by problems with land acquisition and other planning issues.[27]

The matter of the Kilbourn Avenue Bridge was considered as a parallel project yet integral part of the civic center concept. In 1916 and 1920 bond issues were sold after public referenda but action was delayed despite the urging of area businessmen and civic organizations. The total funds available for building the bridge from the bond issues came to $850,000 and the money was set aside. In 1923 and again in 1925 business groups urged the construction of a bridge at this site and even proposed that the old State Street

[26] Vollmert, Transportation Chapter p. 47.
[27] Ibid., Planning and Landscape Architecture Chapter, pp. 3-9.

Bridge (being replaced by a new structure in 1924) be temporarily placed at Kilbourn Avenue to alleviate traffic congestion.

The Common Council finally passed a resolution to construct the Kilbourn Avenue Bridge on May 24, 1926. Once the decision had been made to widen Kilbourn Avenue to 130 feet from Sixth Street to Broadway, plans for the bridge moved rapidly. Costs for the road paving was to be financed jointly by County, State and Federal funds since the street was to be an arterial highway. The bridge was to be financed by the bond issues mentioned above. On August 2, 1926, plans were approved for a bridge 250 feet long, with a 60 foot roadway and 12 foot side walks. Later modifications included the widening of the opening between the fenders from 110 feet to 130 feet to comply with the United States Engineers requirement of a clear channel of 100 feet. Bids for the construction of the span were opened in August, 1927. City engineers designed the superstructure. The Milwaukee Bridge Company was chosen to build the superstructure. The Concrete Engineering Company designed the substructure while the Edward E. Gillen Company was selected to build the substructure. The new $757,433 bridge was dedicated and opened to traffic on June 15, 1929, some 29 years after the citizens first petitioned for its construction. The thoroughfare was renamed Kilbourn Avenue in honor of all the improvements.[28]

The Kilbourn Avenue double leaf bascule bridge is unique to the Central Business District. It was originally conceived of as a span similar to that of the State Street Bridge, constructed in 1924, with two copper clad operators' houses. A more embellished design was chosen, apparently promoted by the Commissioner of Public Works. The 1928 annual report for the Department of Public Works indicated that "[c]onsiderable attention was paid to the architectural features of the the Cedar-Biddle streets bascule bridge which crosses the Milwaukee River in the heart of downtown section and is the connecting link in what will ultimately be Milwaukee's most important thoroughfare." [29]As built, the Kilbourn Avenue Bascule Bridge has monumental Bedford limestone approaches and balustrades, ornamental metal railings on the bascule leaves and four prominent Classical Revival bridge houses. The bridge houses are in the form of pylons, tapered toward the top. They are poured reinforced concrete structures clad in smooth blocks of Bedford limestone, a material authorized by the Department of Public Works, against the wishes of the aldermen who supported allegedly less expensive all-concrete structures. The Commissioner of Public Works argued that stone was more durable and that Milwaukee needed to follow the best examples of bridge work in other cities. The pylons at the southeast and northwest housed the mechanicals for the bridge operators while those at the northeast and southwest were built strictly for symmetry.[30]

The four bridge structures are nearly identical. Each features a pyramidal roof of stepped stone courses while the two that house the operators feature a small chimney or vent at the apex of the roof. These chimneys were added in 1941. A prominent cornice wraps each structure, with palmette cresting at the top and a dentil frieze at the bottom. Below the cornice are three rectangular, one-over-one metal sash on each elevation. A thin vertical recessed panel is located below each window while the remainder of the wall surfaces are flat and unornamented. The bridge operators houses both feature bronze bells, located on the bridge side of the structures above the doorways. A shaped gable on the river side of these houses might have been the intended original placement for the bell as they are absent from the other two pylons. Each operator's house also features a pole for a

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[28] Vollmert, Transportation Chapter, pp. 47-48; Works Progress Administration, History of Milwaukee Bridges. Compiled for the City of Milwaukee, Bureau of Bridges and Public Buildings. 1939-1940, Kilbourn Avenue Bridge, pp. 3-5; Historic Site Designation Application, Robert M. Frame III and Katy Holmer, p. 5; Mead & Hunt, Draft Historic Structure Report, p. 2.

[29] Frederick N. MacMillin, compiler, Municipal Government Activities of the City of Milwaukee for 1928. Report of the Common Council of the Activities of the City Departments, Boards and Commissions, p. 24.

[30] Mead & Hunt, Draft Historic Structure Report, p. 2.

navigational signal ball that raises up when the bridge is closed to vessels and moves down when the bridge is open to vessels. The bridge houses, along with the stone approaches and piers have been little altered over the decades and retain their architectural integrity.

Although city architect Charles Malig executed the drawings for the bridge, he undoubtedly looked to prior designs by local architect and city planner Alfred Clas for his inspiration. Clas consistently showed classically inspired bridges in drawings he prepared for the Mason Street viaduct at the lakefront, for a proposed riverwalk sytem downtown and even a grand "Bridge and River Dock area in the Center of the City" as illustrated in Bruce's History of Milwaukee in 1922. These bridges were broad masonry thoroughfares with bold balustrades and pylon styled light standards, very unlike the delicate yet more industrial looking iron and steel bridges that had been built up to this time in Milwaukee. Clas also judged the competition for the design of the new courthouse, ensuring that a classically inspired building would top the hill at Ninth Street.

Malig, probably under the direction of DPW Commissioner Roland Stoelting, conceived of the Kilbourn Avenue Bridge as a monumental structure. This is not to slight the talents of Charles Malig. In the hands of a lesser designer the bridge could easily have ended up as a heavy, clumsy affair rather than the graceful, elegant structure that was built. This was a period of extensive growth and renewal for the city and in 1928 it was reported that the amount of bridge and public building construction was unprecedented with projects amounting to close to six million dollars.[31] Malig's design was befitting a city that had reached its maturity and was looking for architectural symbolism to show that it belonged among those enlightened municipalities whose good government held out the promise of a better life for its citizens. The Kilbourn Avenue Bascule Bridge, with it classical palmette cornice cresting, the heavy balusters in the approach balustrades, and the horizontal emphasis of the masonry below the bridge houses pays homage to the Classical Revival style County Court House that was completed in 1931 and formed the western terminus of the Civic Center.

THE ARCHITECT

The design of the Operator's Houses and Pylons of the Kilbourn Avenue Bascule Bridge can be attributed to Charles E. Malig, who worked for 38 years as a staff architect for the city's Department of Bridges and Buildings. His initials appear on the architectural drawings of the bridge but not on the drawings of the structural elements as the floor beams, or the railing system, or girders. An article about Malig's retirement in 1949 indicates that he "became an architect the hard way." Malig took special engineering and design courses and then apprenticed to various local architects. For ten years he was a director and instructor in architecture at the Rheude & Heine college, a local architectural and engineering school. He is also known for having apprenticed in the office of local architect John Menge Jr. and worked for George C. Ehlers before joining the city in 1911. During his tenure he is credited with the design of South View Hospital (begun in 1911) at 2320 W. Mitchell Street / 1640 S. 24th Street, the Matthew Keenan Health Center (1932) at 3200 n. 36th Street, the Johnson Emergency Hospital (1930) at 1230 W. Grant Street; the Cherry Street Bridge and all or most of the firehouses and police stations built during his 38 years at the city. This article also indicates that he designed the Kilbourn Avenue Bascule Bridge. He is also said to have designed the 10th and 24th Ward schoolhouses while in private practice. [32]

[31] MacMillin, p. 24.
[32] "Many Recognize Structures This Retiring Man Designed", unidentified article about Charles E. Malig dated Sunday, February 13, 1949.

The consistency in design in buildings erected by the Department of Bridges and Buildings throughout the 1920s and 1930s attests to the continuity of its staff, especially Charles Malig. While period revival designs dominated the public restroom facilities and ward yard buildings in the 1920s and 1930s, and bungalow firehouses prevailed in the 1920s, Malig turned to the burgeoning Art Deco style for the Matthew Keenan Health Center and Third District Police Station among other buildings in the late 1920s and early 1930s. Malig's later work reflects the growing interest in Modernism, and buildings became starker in appearance with fewer historical references. Malig can be credited, along with his staff, for helping create the "golden age" of municipal buildings in Milwaukee.

Malig and his wife Kate lived for many years in the Washington Heights neighborhood at 2251 North 51st Street. After his retirement at the age of 70 in 1949, the Maligs moved to a new house at 7222 W. Burleigh where they lived until Charles Malig's death in 1960 at the age of 81.[33]

The Kilbourn Avenue Bascule Bridge is the most outstanding bridge structure in Milwaukee and a tribute to Malig's talents. Incorporated into the Civic Center planning, the Kilbourn Avenue Bascule bridge still serves as an important focal point along Kilbourn Avenue, the boulevard thoroughfare that links the two symbols of Milwaukee government, City Hall and the Milwaukee County Courthouse.

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IX. STAFF RECOMMENDATION

Staff recommends that the Kilbourn Avenue Bascule Bridge be given historic designation as a City of Milwaukee Historic Structure as a result of its fulfillment of criteria e-5, e-6 and e-9 of the Historic Preservation Ordinance, Section 308-81(2)(e) of the Milwaukee Code of Ordinances.

e-5. Its embodiment of the distinguishing characteristics of an architectural type or specimen.

RATIONALE:

The Kilbourn Avenue Bascule Bridge is significant as Milwaukee's most architecturally important span. It was designed in the Classical Revival style in emulation of important European bridges and as part of Milwaukee's most important City Beautiful project, the Civic Center. The Kilbourn Avenue Bascule bridge provides the visual link between two seats of government in Milwaukee, Milwaukee City Hall and the Milwaukee County Courthouse which crowns the west vista along Kilbourn Avenue. The bridge's grandiose character symbolized that Milwaukee had entered the ranks of enlightened and progressive municipalities who were holding out the promise of a better, and more ordered life for its citizens.

e-6 Its identification as the work of an artist, architect, craftsperson or master builder whose individual works have influenced the development of the City of Milwaukee, State of Wisconsin, or of the United States.

RATIONALE:

Architect Charles Malig served the community for 38 years as staff architect for the city's department of Bridges and Buildings. Under his tenure, the public buildings and bridges designed, especially from the 1920s through the 1940s, have a quality and character very distinctive to this day. He is in many ways the person responsible for the golden age of municipal design in Milwaukee.

e-9. Its unique location as a singular physical characteristic which represents an established and familiar visual feature of a neighborhood, community or the city of Milwaukee.

RATIONALE:
The Kilbourn Avenue Bascule Bridge is a visual landmark in the heart of downtown Milwaukee. Its gently arched double leaf bascule form, beautiful stone piers and approaches and four large Bedford stone bridge houses/pylons draw attention to this span of the Milwaukee River and complement the host of adjacent historic buildings in the nearby Plankinton, Wells, Water Streets National Register Historic District and the Old World Third Street National Register and local Historic District.

X. PRESERVATION GUIDELINES

The following preservation guidelines represent the principal concerns of the Historic Preservation Commission regarding this historic designation. However, the Commission reserves the right to make final decisions based upon particular design submissions. Nothing in these guidelines shall be construed to prevent ordinary maintenance or the restoration and/or replacement of documented original elements. The primary goal of these guidelines is to ensure the retention of the character defining features that make the Kilbourn Avenue Bascule Bridge eligible for National Register listing. They are meant as a supplement to the Guidelines for Bridge Maintenance and Rehabilitation in Sections 4 and 5 of the Draft Historic Structures Report, prepared by Mead & Hunt in compliance with the 1996 Programmatic Agreement.

Kilbourn Avenue Bascule Bridge Houses

A. Roofs

Retain the roof shape of the four bridge houses/pylons. Skylights or dormers are not allowed as all sides of the structure are visible from the public way. The distinctive shape of the roofs are a character defining feature of the structure and should not be altered in height, roofline, pitch or cladding. If replacement is necessary, duplicate the appearance of the original stone roofing as closely as possible. The chimneys on the roofs of the southeast and northwest houses will be retained as will the poles and signal balls.

B. Materials

1. Wood/Metal/Stone

a. Retain original material, whenever possible. Avoid removing and damaging architectural features that are essential to maintaining the building's character and appearance. The Bedford limestone cladding of the bridge houses is essential to the reading of this structure as a product of pre-World War II design and especially, the City Beautiful Movement. Sandblasting of the stone is not allowed. Prior sandblasting of the balustrades has resulted in the erosion of the fine detail on the balusters. Any scaffolding erected to assist with repairs must be anchored in mortar joints not the face of the stone.

b. Retain or replace deteriorated material with new material that duplicates the appearance of the old as closely as possible. Avoid covering architectural features with new materials that do not duplicate the appearance of the original materials. Covering stone or wood trim with aluminum or vinyl is not permitted. Consultation with Historic Preservation staff is required before undertaking any repointing of the structures.

C. Windows and Doors

1. Retain existing window and door openings. Retain the existing configuration of panes, sash, surrounds and sills, except as necessary to restore to the original condition. Avoid making additional openings or changes in existing fenestration by enlarging or reducing window or door openings to fit new stock window sash or new stock door sizes. Avoid

changing the size or configuration of windowpanes or sash. Use storm windows or protective glazing that have glazing configurations similar to the prime windows and that obscure the prime windows as little as possible.

2. Respect the building's stylistic period. If the replacement of doors or window sash is necessary, the replacement should duplicate the appearance and design and material of the original window sash or door. Avoid using inappropriate sash and door replacements. The filling-in or covering of openings with inappropriate materials such as glass block or concrete block is not allowed. Avoid using modern style window units, such as horizontal sliding sash or casements, in place of double-hung sash or the substitution of units with glazing configurations not appropriate to the style of the building. Vinyl or metal clad prime window units are not permitted. Original windows consisted of one-over-one, double hung, metal sash windows. All are original except for those in the southeast bridge operator's house. Rehabilitation is recommended if possible. Any replacement windows should match the originals. The current doors are replacements. New doors should be fabricated to match the original designs, both at the operators' houses/pylons (rectangular) and below, at the pier level (round headed).

3. Steel bar security doors and window guards are not allowed.

D. Trim and Ornamentation

There should be no changes to the existing trim or ornamentation except as necessary to restore the building to its original condition. Replacement features shall match the original member in scale, design, color and appearance.

E. Additions

No additions will be permitted to the operators' houses/pylons.

F. Bronze Bells

Bronze bells were mounted above the street-level entry doorways of the two operators' houses but not the matching pylons. These bells should be restored if necessary and made operational.

Kilbourn Avenue Bascule Bridge Bascule Leafs, Roadbed, Pedestrian Walks and Railings

The gently arched bascule leaves will be retained with their current shape, along with riveted steel plates, dedicatory plaques, and understructure including bottom mounted racks and counterweights. Deteriorated structural members and architectural features shall be retained and repaired rather than replaced. Sandblasting or other less abrasive methods may be used on steel members to remove paint and corrosion after consultation with Historic Preservation staff. Changes to the existing form of the open steel mesh roadway and the diamond-tread plates on the pedestrian walkways will be reviewed with Historic Preservation staff. The ornamental railings with their distinctive detail are to be retained. The prominent brackets supporting the pedestrian sidewalks are built up from plates

and angles riveted together. They are to be retained.

Abutments and Piers

The Bedford stone clad bridge abutments and piers should be retained in their current form. Any modification will be reviewed Historic Preservation staff.

Mechanicals

Historic Preservation staff will review any alterations to the mechanicals.

Signs/Exterior Lighting

The installation of any permanent exterior sign or light fixture shall require the approval of the Commission. Approval will be based on the compatibility of the proposed sign or light with the historic and architectural character of the building. Plastic internally illuminated box signs are not permitted. Existing historic plaques on the bridge will be retained.

Site Features

New plant materials, paving, fencing, or accessory structures shall be compatible with the historic architectural character of the bridge if visible from the public right of way.

Guidelines for New Construction

The Historic Preservation Commission will review any new construction proposed for the Kilbourn Avenue Bascule Bridge.

I. Guidelines for Demolition

Although demolition is not encouraged and is generally not permissible, there may be instances when demolition or removal of a portion of the structure may be acceptable if approved by the Historic Preservation Commission. The following guidelines, along with those found in subsection 9(h) of the ordinance, shall be taken into consideration by the Commission when reviewing demolition requests.

1. Condition

   Demolition requests may be granted when it can be clearly demonstrated that the condition of a structure or a portion thereof is such that it constitutes an immediate threat to health and safety and is beyond hope of repair.

2. Importance

   Consideration will be given to whether or not the structure is of historical or architectural significance or displays a quality of material and craftsmanship that does not exist in other structures in the area.

3. Location

   Consideration will be given to whether or not the structure contributes to the neighborhood and the general street appearance and has a positive effect on other buildings and structures in the area.

4. Potential for Restoration

Consideration will be given to whether or not the structure is beyond economically feasible repair.

5. Additions

Consideration will be given to whether or not the proposed demolition is a later addition that is not in keeping with the original design of the structure or does not contribute to its character.

THE FOLLOWING PAGES CONTAIN THE RECOMMENDATIONS FOR THE KILBOURN AVENUE BASCULE BRIDGE MADE BY THE CONSULTANTS MEAD & HUNT

4. Identification of Character-Defining Features

The focus of maintenance and rehabilitation work for the West Kilbourn Avenue Bridge should be on preserving the historic integrity and character-defining features of the bridge. Historic integrity is defined as the authenticity of a property's historic identity, evidenced by the survival and/or restoration of physical characteristics that existed during the property's historic period. There are seven aspects or qualities that define integrity: location, design, setting, materials, workmanship, feeling, and association. The rehabilitation of the West Kilbourn Avenue Bridge should adhere to these seven qualities and preserve the character-defining features of the bridge.

The character-defining features of the West Kilbourn Avenue Bridge that should be preserved or restored include:

- *Simple-trunnion, double-leaf bascule* – The simple-trunnion, double-leaf bascule, with undermounted segmental rack and counterweight, is the defining characteristic of the Milwaukee Type bascule bridge, as first used in the Emmber Lane Bascule Bridge. As such, it is one of the key defining characteristics of the West Kilbourn Avenue Bridge (See Plan D-3). Each bascule leaf is comprised of four bascule girders mounted on simple trunnions.

The leaf is raised and lowered by moving the large segmental racks mounted beneath the girders.

Concealed from view within the approach structures, and below the roadway, are the counterweights, mounted on the shore ends of the leaves. When properly counterweighted and balanced, the leaves are moved with a modest application of power, transmitted through reduction gears.

- *Bascule girders* – The character-defining elements of the bascule leaves are their curved bascule girders, especially the two outside girders on each leaf (See Plan D-3). The massive girders are built up from plates and angles, riveted together. They are highly visible from any point on either side of the bridge, and give it its characteristic Milwaukee Type bascule profile.

- *Operator's houses and pylons* – The two operator's houses and two pylons, located at the four corners of the bascule leaves, comprise the character-defining feature that makes the West Kilbourn Avenue Bridge unique among the city's Milwaukee Type bascule bridges. The pylons were included only to balance the placement of the operator's houses and to complete the architectural symmetry essential to the bridge's Neoclassical design. The pylons never contained bridge operating equipment. The four structures are square, tapered from base (sidewalk level) to roofline, and built of reinforced concrete with a Bedford limestone veneer (See Plan D-4).

Among the only alterations to the structures are the replacement of the original metal doors and the replacement of original windows in the southeast operator's house. Exterior doors should be replaced with doors replicating the original design (See Plans D-5 and D-6). Window replacements should replicate the original metal sash.

- *Bedford limestone veneer* – A Bedford limestone veneer is applied to exterior vertical surfaces of the operator's houses, pylons, and abutments. The pyramidal roofs of the houses and pylons are also clad in limestone. The bridge's Neoclassical architectural style is expressed in the design and details of the stonework, complementing the form and massing of the houses and pylons. As such, the Bedford limestone is a defining characteristic of the West Kilbourn Avenue Bridge.

  In the houses and pylons, Neoclassical elements are found in the recessed vertical panels centered beneath each window, the ornamental stone cresting and dentils carried around each roof edge, the smooth coursed stonework of the facades, the inset corners of each structure, and the stepped pyramidal stone roofs. In the abutments, Neoclassical elements include the raised horizontal bands of stylized coursed stonework and panels defined by raised stone borders.

The stone veneer should be maintained in its original design.

- *Balustrades* – The east and west approaches are lined with limestone balustrades above the abutments. The balustrades are character-defining elements in the Neoclassical architectural treatment of the bridge. The southwest balustrade has been partially removed to provide access to a stairway down to the recently installed River Walk. Extant limestone balustrades should be maintained in their original architectural design.

- *Bascule railing* – Metal railings designed for the bridge are mounted along the outside edge of the cantilevered sidewalks on both bascule leaves. The simple composition of railing elements helps blend the modern steel bascule leaves with the Neoclassical treatment of the stonework and is a character-defining element. The railings are composed of top and bottom horizontal square pipe railings, center panels comprised of square vertical bars connected at the top and bottom with flat horizontal bars, and recessed square newel posts with cast fittings. The flat verticals in the panels are attached to horizontals with single bolts, creating a flexible pantograph element that allows the interior panels to be adjusted to the horizontal slope of the bascule leaves while remaining vertically plumb. Each panel has a cast center support at the mid-panel point. Each post is mounted above a sidewalk bracket. Existing railings reflect the design in the c. 1928 Milwaukee Bridge Company shop drawing (See Plans D-7 and D-8).

- *Signaling devices* – Each operator's house (but not the pylons) was designed and constructed with a custom-made bronze bell with bracket mounted above the street-level entry doorway (See Plan D-9).

Each operator's house also had navigation signal pole with movable signal ball device mounted on the roof, behind a special cornice section on the river side of the roof (See Plans D-10 and D-11). The signaling devices are character-defining features of the operator's houses and the bridge.

- *Deck* – The deck or roadway portion of each leaf consists of an open steel grid, which replaced the original rubber paving blocks on wood sub-planking. The original rubber paving-block surface was a character-defining feature of the bridge (See Plan D-12).

- *Sidewalks and brackets* – Mounted on the exterior of the outside bascule girders are prominent brackets supporting the sidewalks. The sidewalk brackets are built up from plates and angles, riveted together. The brackets and sidewalks are character-defining features of the bridge. The sidewalk surface originally consisted of rubber paving blocks, similar to, but thinner than, the blocks used on the original deck surface. They were mounted on a wood-plank subsurface and were replaced with the present diamond-tread metal plates. The original sidewalks, surfaced with rubber paving blocks, were a character-defining feature of the bridge (See Plan D-13).

5. Guidance for Rehabilitation Efforts

The PA calls for the design of the project to be compatible with the historic and architectural qualities of the bridge and to be consistent with the recommended approaches to rehabilitation set forth in the *Secretary of the Interior's Standards for Rehabilitation* (Standards) and *Guidelines for Bridge Maintenance and Rehabilitation Based on the Secretary of the Interior's Standards* (Guidelines). The Standards recommend repairing, rather than replacing, deteriorated features when possible. The Guidelines from the Virginia Transportation Research Council represent adaptations of the Standards to address the special requirements of historic bridges and identifies specific applications of the Standards to historic bridges. The Standards and Guidelines are included in Appendices C and D.

A detailed description of rehabilitation needs should be developed from inspections conducted prior to the development of bridge rehabilitation plans. General guidance is provided below.

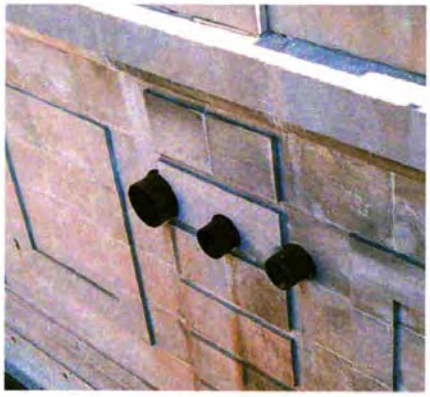
- *Bascule elements* – Deteriorated steel members should be replaced with new members of similar geometry and cross section to provide the same appearance as the existing elements. Elements not exhibiting extensive deterioration and where the surface appearance is not significantly compromised can be cleaned and painted (this would generally be expected in areas in which the section loss is less than 10 percent) rather than replaced. Members that have been previously repaired with inappropriate welds and plates should be replaced with built-up members having the appearance of the original members. To maintain the original appearance of the bridge, button-head bolts that are consistent with the look of the original rivets should be used in locations where the connections are clearly visible to pedestrians, motorists or boaters.

- *Substructure* – Concrete areas of the abutments at the waterline should be repaired where the removal of the protective horizontal timber planks has left exposed bolts in place. The exposed bolts and deteriorated concrete should be removed down to sound concrete on the complete exposed face. The concrete should be repaired with pre-placed aggregate concrete or similar methods to produce a uniform surface appearance across the entire exposed face. Discontinuous repairs that cause a dissimilar surface appearance should be avoided. In areas that are not to be repaired but exhibit rust staining, rust staining should be removed from the concrete surface with methods that will not compromise the surface appearance or color of the concrete and will produce a uniform clean appearance that matches the surrounding concrete surfaces.

  Areas that are being undermined due to scour should be repaired in a manner that does not alter the original appearance of the substructure down to the low water mark on the structure. Below this elevation repair should be accomplished in the most economical manner possible that corrects the deficiencies.

  The projecting metal pipes in the southeast abutment wall should be removed. The drainage system for which these pipes provided outlet should be replaced to route the storm water into existing storm sewer systems that are sized to accommodate the storm water runoff. The holes created for the pipes in the reinforced concrete wall should be filled with non-shrink grout. A new limestone veneer having a surface color and finish that matches the surrounding limestone should be placed over the

grouted holes. The new limestone veneer should be replaced as a complete block unit that matches the existing limestone block pattern.



- *Operator's houses and pylons* – The operator's houses should be inspected to determine the extent of rehabilitation work necessary. Exterior metal doors and frames at both sidewalk and pier level should be replaced with metal doors matching those shown on original plans (See Plans D-5 and D-6) or as shown in historic photographs (if available). The round-arch door openings at pier level should be restored to their original size and configuration by removing the concrete in-fill.

All four houses should have windows of identical appearance, which may be either restored original windows or replacement windows that replicate the original windows. Existing original metal windows should be restored to their original painted appearance or replaced with energy efficient windows that replicate the original design. Windows should be caulked to prevent leaking. The newer replacement windows on the southeast operator's house should be replaced with energy efficient windows that replicate the original, painted, metal windows.

Extant original historical material on the interior of the operator's houses and pylons, including brass pipe railings and concrete stairways, should be retained and repaired.

- *Bedford limestone veneer and balustrades* – Prior to bridge rehabilitation, a professional consultant in historic stone masonry work should be commissioned to conduct a detailed analysis of the limestone veneer and recommend appropriate treatments for rehabilitation, restoration, cleaning, and maintenance, including any necessary testing of proposed procedures.

  For any restoration and cleaning that is recommended, an experienced (5/10 years), masonry restoration and cleaning firm should be engaged to perform the work. Firms should have completed work similar in material, design, and extent to that indicated for this project, with a record of successful in-service performance. Work may be divided between two specialist firms, one for cleaning and one for repair.

- *Bascule railings* – The metal sidewalk railings along the bascule spans should be inspected for pedestrian loading and be repaired where necessary. The railing and newel posts may be restored in place or, if necessary, removed for sandblasting, repairs, and painting before being reinstalled in their original locations.

  Crash-tested railings should be utilized adjacent to vehicular traffic. The crash-tested railings should be designed to be compatible with the historic bridge. A railing with tubular horizontal top and bottom rails and vertical posts in line with the sidewalk brackets would be in keeping with the design of the bridge.

- *Signaling Devices* – The bells on the operator's houses should be inspected and restored or replicated where necessary. The roof-mounted navigation signal poles should be restored to original condition with operating signal balls (See Plan D-9).

- *Deck, deck surfaces, and sidewalk surfaces* – Repair and/or restoration of the bascule and approach decks and the surfaces of the bascule deck and sidewalks involve considerations of appearance, materials, and techniques. The concrete decks in the approach spans are experiencing problems and the existing steel decks in the bascule leaves are rated to be in poor condition as stated in the Routine Bridge Inspection Report. The existing surfaces of the bascule decks and the sidewalks are not original.

  - *Historical considerations*
    The original bascule decks were solid, with surfaces comprised of individual, reinforced, rubber paving blocks that presented a particular appearance of color, texture, and design. The original sidewalks had a rubber-block surface that was identical to the bascule surface except for a minor variation in thickness of the block. In both cases, the blocks were bolted to wooden sub-surfaces. The rubber-block system is shown in detail in various plans, but photographs of the surfaces and materials have not been located. The rubber block surfaces were removed in 1974 and replaced with the existing open-grid bascule decks and diamond-tread, metal-plate sidewalks. No original rubber blocks have been located.

    According to the Secretary of the Interior's Standards for Rehabilitation, the missing original surfaces, if a "distinctive feature," should be replaced by elements matching the original in "design, color, texture, and other visual qualities and, where possible, materials." If the visual qualities of the original surfaces cannot be replicated, modern alternatives must be considered. The Secretary's Standards state that any new work shall be differentiated from the old and shall be compatible with the massing, size, scale, and architectural features of the property in order to preserve its historic integrity

  - *Engineering considerations*
    There are five bascule deck alternatives for consideration, listed in order of decreasing consistency with the Secretary's Standards. [NOTE: Supplemental information on costs, materials, and techniques for each option has been provided separately in a memo by the engineer.]

    1. Install a timber deck with an eslatomeric deck surface to replicate the original deck and the original rubber paving-block surface. This alternative is the most consistent with the Secretary's Standards because it replicates the original bascule deck appearance in design, color, texture, and materials.

    2. Install a fiber-reinforced plastic (FRP) panel system as new construction that is compatible with the historic bridge in massing, size, and scale. It would not replicate the appearance of the rubber paving-block surface. It differs from alternatives 3 and 4 in non-historical considerations of cost and engineering.

3. Install an exodermic (or "composite, unfilled steel grid") deck panel system as new construction that is compatible with the historic bridge in massing, size, and scale. It would not replicate the rubber paving-block surface. It differs from alternatives 2 and 4 in non-historical considerations of cost and engineering.

4. Install an aluminum frame and panel deck system as new construction that is compatible with the historic bridge in massing, size, and scale. It would not replicate the rubber paving-block surface. It differs from alternatives 2 and 3 in non-historical considerations of cost and engineering.

5. Install a new galvanized, steel-grating deck system. A steel open-grid deck, similar to the existing deck, would be consistent with the Secretary Standards for new construction by being clearly differentiated from old materials, but it is inconsistent with the Secretary's Standards because its open appearance represents inconsistent massing and is not an architectural feature that protects the overall historic integrity of the bridge.

There are four sidewalk alternatives for consideration, listed in order of decreasing consistency with the Secretary's Standards. [NOTE: Supplemental information on costs, materials, and techniques for each option has been provided separately in a memo by the engineer.]

1. Install a rubber-block surface to replicate the original rubber block sidewalk appearance. This alternative is consistent with the Secretary's Standards because it replicates the original sidewalk surface appearance in design, color, texture, and materials.

2. Install an elastomeric rubber-block surface to replicate the original rubber block sidewalk appearance. This alternative is consistent with the Secretary's Standards because it replicates the original sidewalk surface appearance in design, color, and texture. It differs from alternative 1 only in the use of a different material to achieve the original appearance.

3. Install a wood-plank sidewalk system similar to the sidewalks on the two neighboring historic bascule bridges that have been restored. This alternative needs further study to assess its consistency with the Secretary's Standards. A wood-plank sidewalk was never original to the Kilbourn bridge, but it was original to another Milwaukee Type bascule (State Street) from a similar era. Wood plank may not be appropriate to the Neoclassical architectural style of the Kilbourn bridge.

4. Install an entirely new sidewalk surface of an appearance and material to be determined, but one that is consistent with the Secretary's Standards in massing, size, scale, and architectural detail.

- *Sidewalk brackets* – Brackets not exhibiting extensive deterioration and where the surface appearance is not significantly compromised can be cleaned and painted rather than replaced. Rivets should be replaced with button-headed bolts in areas where the connections are clearly visible to pedestrians or boaters on the shore, sidewalk or river.

- *Lighting* – Currently, the lighting on the bridge consists of post-1970 standard-plan overhead lights. The original plans do not show any lighting for the bridge. New lighting should be chosen that is compatible with the period of significance for the bridge and the Neoclassical architectural style.

- *Electrical* – Electrical switches, wiring, and controls should be replaced with up-to-date systems to improve the efficiency of operation and utilize the latest digital-logic controls. Electrical conduit should be replaced with painted conduit that blends in with adjacent stone, concrete, and steel surfaces. Electrical systems for the gates, horns, traffic signals, bridge lighting, and alarms should be completely replaced to ensure reliable operation of these safety systems.

- *Mechanical* – Worn and misaligned gears and bearings should be replaced and realigned. The gearing system installed in the 1970s should be evaluated to determine if replacement is necessary. Motors, breaks, shafts, and linkages that are worn or misaligned should be replaced.

KILBOURN AVENUE BRIDGE
KILBOURN AVENUE
OVER THE MILWAUKEE RIVER
Section 28 Town 7 North Range 22E
WisDOT P-40-881