

The Davison Freeway from
M-10 to Oakland Avenue,
Woodward Avenue Bridge Spanning Davison Freeway
Highland Park
Wayne County
Michigan

HAER No. MI-103-E

HAER
MICH
82-HIPA,
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PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

Historic American Engineering Record
National Park Service
Great Lakes Systems Office
Department of the Interior
1709 Jackson Street
Omaha, Nebraska 68102-2571

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Location: Woodward Avenue Spanning the Davison Freeway,
Highland Park, Wayne County, Michigan

Quad: Highland Park, Michigan 1:24,000
UTM: 17.327520.4696500

Date of Construction: 1942

Engineers: Julian C. Meade, Engineer of Structural Design; and Harry A. Shuptrine, Engineer of Bridges and Structures, Wayne County Road Commission.

Builder: William J. Storen Company

Present Owner: Michigan Department of Transportation,
425 West Ottawa Street
Lansing, Michigan 48909

Present Use: Vehicular and pedestrian bridge, to be replaced by a new bridge.

Significance: This is one of three similar bridges designed to carry a major north-south arterial street over the Davison Limited Highway. The hinged, reinforced concrete, rigid-framed bridge design permitted maximum underclearance without raising the grade of the crossing street. Because this bridge also carried a double-track streetcar line, along with automobile traffic, a two-span design was used, resulting in a stronger bridge than those at the other crossings over the Davison. This bridge has a series of retaining walls built to allow for the construction of bus stops on the expressway and four sets of stairs to the depressed roadway below.

Historian: Charles K. Hyde, Wayne State University,
Detroit, Michigan 48202, May 1996.

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DESIGN AND CONSTRUCTION

This two-span hinged, reinforced concrete, rigid-framed bridge design was used because it permitted maximum underclearance without raising the grade of the streets crossing above. Each of the Woodward Avenue bridge slabs are only 1 foot 6 inches thick at the crown, 3 feet 6.50 inches thick at the center pier, and 3 feet 3.75 inches at the abutments, and provides a minimum underclearance of 13 feet 2 inches next to the center pier. While the bridge was under construction, braces made up of railroad rails were built into the bottom segment of the abutments to prevent the abutments from overturning before the deck slab was poured. Once the deck slab was sufficiently solid, the braces were burned away.

In mid-March 1942, the Road Commission awarded a contract for three similar two-span bridges (at Hamilton, Woodward, and Oakland avenues) to the William J. Storen Company, in the amount of \$329,957.20. The William J. Storen Company first appeared in the Detroit city directories as an independent contractor in 1939. Previously, Storen was listed as a vice president of the Cooke Contracting Company. For the Hamilton and Woodward bridges, Storen completely shut down vehicular traffic to speed construction, although the Detroit Street Railway lines remained in operation during construction. The Woodward bridge was opened in early October, the last bridge to be completed over the new expressway.¹

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DESCRIPTION

This is in effect three parallel two span bridges, two for vehicular traffic and one for a double-tracked streetcar line. The western (vehicular) section of the bridge is 60 feet 4 inches wide, the central (streetcar) section is 17 feet wide, and the eastern (vehicular) section is 60 feet 4 inches wide, producing an overall width of 137 feet 8 inches and an overall length of 93 feet 6 inches. The slab carrying the streetcar line is 3 inches thicker than the rest of the bridge.

The reinforced concrete deck slabs, which carry vehicular traffic and support a 3.50 inch wearing surface, vary in thickness from 1 foot 6 inches at the crown, to 3 feet 6.50 inches at the center pier, and 3 feet 0.75 inches at the abutments. They rest on an open-type center pier, 129 feet 9.75 inches long and 3 feet thick, and a pair of reinforced concrete abutments with triangular cross-sections, one at each end, and these in turn rest on reinforced concrete footings. The abutments are 14 feet 2 inches high, 3 feet 3 inches wide at the top, 1 foot 6 inches wide at the base, and extend the full width of the deck slab. The footings are 9 feet wide and range from 5 feet to 3 feet in height. The center pier also rests on a abutment 12 feet wide under the roadway sections and 14 feet wide under the streetcar section.

The Woodward Avenue bridge has two clear spans of 42 feet 6 inches. A median 6 feet wide is created by the center pier, which is 3 feet wide and two 6-inch raised curbs, each 1 foot 6 inches wide. Two 4-inch raised curbs near the abutments, each 8 feet wide, reduces the clear width of the depressed roadway to a total of 66 feet, divided into two pavements of 33 feet.

The corners of the bridge are defined by a large truncated pyramid or pylon of reinforced concrete extending from below the surface level of the depressed central roadway to approximately 5 feet above the road surface on the bridge proper. Because of the retaining walls and stairwells at each of the four corners of this bridge, there are no curved wing walls.

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The pylons are 21 feet 4 inches high, with a face measuring 8 feet long on the arc, and are 2 feet 1 inch wide. The inside facing of the southeast pylon has a standard stone name plate (22 X 14 inches), with the names of the Wayne County Road Commissioners. The pylons have decorative fluting (grooves) on their inside and outside facings. The grooves are 3 inches wide at the surface, 1.50 inches deep, and tapered to 2.50 inches wide at depth. Each pylon has three grooves, all 3 feet 6 inches long.

The bridge deck is divided symmetrically into distinct segments. The railings are anchored in a 9-inch raised curb which is 3 feet 4 inches wide and extends the length of the bridge along the east and west edges of the deck. Turning lanes 15 feet wide adjoin the railing curb on both side of the deck. The edges of the turning lanes are defined by a pair of raised islands 8 inches high and 10 feet wide. These safety islands keep traffic in the turning lanes separated from traffic on Woodward Avenue and serve as sidewalks for pedestrians crossing the bridge. Since the relocation of the Davison north service drive in 1994, the turning lanes have been blocked by large concrete barriers. The middle of the bridge is a 81-foot wide roadway, divided into five traffic lanes, including a turning lane for traffic making a left-hand turn to use the service drives.

The two bridge railings are identical and consist of symmetrical panels of welded square steel posts, rails, and spindles. Each railing is comprised of 9 panels, each 9 feet 8.25 inches long, for a total length of 87 feet 2.25 inches. The posts for each panel are 3 feet 2 inches tall and 7 inches square, with a 5 inch square cap. Each post has three parallel vertical ornamental fillets on the side facing the crossing street. Each fillet is 0.75 inch wide and 0.375 inch deep; the one in the center is 30 inches long, flanked by two shorter fillets, each 26 inches long. The end posts, which abut the concrete pylons, are 7 inches wide at the base, 12.50 inches wide at the top, and 9 inches thick.

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The top and bottom rails each consist of two welded rectangular bars, one 2.25 inches wide and 1 inch high, which meets the 1 inch square horizontal posts in each panel and an outer bar 3 inches wide and 2.25 inches high. The bottom rail is 5.50 inches above the curb, while the top rail is 2 inches below the top of the post. Each panel includes 10 clusters of 3 spindles, each 1 inch square and 2 feet 0.50 inches long, with 2 inch spacing within each cluster, but 3.50 inch spacing between clusters. The pattern is continued without interruption through the length of the panel.

The Woodward Avenue bridge is easily the most elaborate of all the crossings over the Davison Freeway because of the two bus stops provided on the depressed roadway. The bus stops included an extra lane 100 feet long for busses to pull off the central artery at the northeast corner of the bridge (for westbound busses) and at the southwest corner of the bridge (for eastbound busses). A set of stairs at each corner of the bridge allowed pedestrians to descend from Woodward Avenue to the bus stops. An 8 foot-wide sidewalk passing under the bridge allowed bus passengers to reach either side of Woodward from the depressed roadway below. Given the right-of-way of only 205 feet, the gently sloped embankments used along most of the highway could not be used here. Instead, a total of eight distinct retaining walls were built, ranging in length from 43 feet to over 252 feet.

There are two stairway configurations used at the Woodward Avenue bridge, one at both the northeast and southwest corners, and the other at the northwest and southeast corners. Even where the stairway designs are virtually identical, the dimensions differ slightly. The arrangement of retaining walls, as well as their dimensions, also varies considerably, reflecting different soil conditions.

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The stairways at the northeast and southwest corners, where the bus stops were located, are straight with two flights and a single landing at roughly the halfway point. Starting on the Woodward Avenue level, the first flight extends 13 feet 8.50 inches horizontally (NE stairs) or 12 feet 7.50 inches (SW stairs) and 7 feet 11.375 inches vertically (NE stairs) or 7 feet 3.50 inches (SW stairs). Both stairways have landings 6 feet 11 inches long. The second flight extends 11 feet 4 inches horizontally (NE stairs) or 11 feet 5 inches (SW stairs) and 6 feet 9.625 inches vertically (NE stairs) or 6 feet 10.50 inches (SW stairs). All stairs have 12-inch treads, 7.17-inch risers, and are 6 feet 11 inches wide. Both sets of stairs adjoin a retaining wall, which has a tube handrail measuring 2.50 inches by 1.50 inches, bolted to the wall with brackets.

Each stair railing has a total of six posts, one at each end of the railing, one at each end of the landing, and one at the mid-point of each flight. The end posts are 2.50 inches X 4 inches and are 2 feet 11.75 inches tall. The intermediate posts are 3.375 inches X 5 inches and 2 feet 8.75 inches tall. The top and bottom rails are both 2 inches high and 3 inches wide. The bottom rail is 5.50 inches above the stair string, which is 12 inches wide, and the top of the upper rail is 2 inches below the top of the posts. Spindles measuring 0.625 inch square and 1 foot 8 inches long extend between the top and bottom rails in clusters of three, with 4 inch spacing between the individual spindles and from 4.35 inches to 4.90 inches between the spindle clusters.

The northeast corner of the Woodward bridge has two retaining walls. The first (Wall "E") is perpendicular to the northeast pylon and supports the upper-level entrance to the stairway. It is 43 feet long, 17 feet high 11 inches above the sidewalk level on the depressed roadway, and tapers from a width of 3 feet at the base to 1 foot 6 inches at the top. It rests on a footing 12 feet 6 inches wide and 3 feet high. This wall ends at the stairway, which is open. The second retaining wall (Wall "F") is located north of (behind) the stairway, begins at the stairway landing, and measures 252 feet 3.75 inches long. It is 10 feet high at the west end, but then tapers to a height of 8 feet 6 inches at the east end. It also has footings 3 feet high and 12 feet 6 inches wide.

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The southwest corner of the Woodward bridge has three retaining walls. The first, Wall "G," which begins at the bridge and extends westward, supports the upper-level entrance to the stairs and is virtually identical to Wall "E" on the northeast corner of the bridge. A second retaining wall (Wall "J") is south of (behind) the stairway, extends 180 feet to the west, rests on footings 3 feet thick and 11 feet 6 inches wide, and has an elevation of 22 feet 6 inches above the sidewalk, making it the highest retaining wall at Woodward. A third wall (Wall "H") then continues another 127 feet 6 inches to the west in a straight line and has an elevation of 16 feet 10.625 inches. After a short jog to the north the wall then continues westward for another 44 feet 6 inches. After the jog, the wall has an elevation of only 9 feet 1.75 inches above the roadway and then slowly drops to only 5 feet 1.50 inches at its western end.

The configuration of stairways at the southeast and northwest corners of the Woodward Avenue bridge are nearly identical, with minor variations in dimensions. Each has two flights of stairs, with a dog-leg configuration and a landing at the dog-leg. Starting on the Woodward Avenue level, the first flight extends 11 feet 11.50 inches horizontally (NW stairs) or 12 feet 11 inches (SE stairs) and 7 feet 4 inches vertically (NW stairs) or 7 feet 10 inches (SE stairs). The second flight extends 11 feet 6 inches horizontally (NW stairs) or 12 feet 5.50 inches (SE stairs) and 6 feet 10.50 inches vertically (NW stairs) or 7 feet 7 inches (SE stairs).

The landings at both stairways are 14 feet 8 inches wide facing the flights of stairs and are 9 feet 7 inches deep. The landings are not entirely rectangular in shape. The 12-inch thick concrete railings enclosing the two sides of the landings facing the depressed highway are curved a full 90 degrees at the south corner at the NW stairs and at the north corner at the SE stairs.

All stairs have 11.50-inch treads, 7-inch risers, and are 7 feet wide on the upper flights and 6 feet 8 inches wide on the lower flights. Both sets of stairs adjoin a retaining wall, which has a tube handrail measuring 2.50 inches by 1.50 inches, bolted to the wall with brackets.

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The stair railings on each flight have three posts, one at each end of the railing and one at the mid-point of each flight. The upper end posts are 2.50 inches X 4 inches and are 2 feet 11.75 inches tall and the remaining posts are 3.375 inches X 5 inches and 2 feet 8.75 inches tall. The top and bottom rails are both 2 inches high and 3 inches wide. The bottom rail is 5.50 inches above the stair string, which is 12 inches wide, and the top of the upper rail is 2 inches below the top of the posts. Spindles measuring 0.625 inch square and 1 foot 8 inches long extend between the top and bottom rails in clusters of three, with 4 inch spacing between the individual spindles and from 4.35 inches to 4.90 inches between the spindle clusters.

The stairs at the northwest and southeast corners have retaining walls (Walls "D" and "K") extending from the bridge abutments to the upper entrance of the stairways which are essentially the same as the retaining walls "E" and "G" at the other corners. Walls "E" and "G" are only 17 feet high above the sidewalk level on the depressed highway. A short retaining wall (Wall "L") adjoins the south edge of the southeast stairway and helps support the service drive. A longer retaining wall (Wall "M") extends eastward from the stairway and supports the embankment above the expressway. Wall "M" is 113 feet long, has an elevation above the pavement of 10 feet 10.25 inches at the western end and then falls gradually to an elevation of 4 feet 6 inches at the eastern end.

The original pipe railings are still standing on top of retaining walls F, H, and M. They consist of cast grey iron posts 3 feet 6 inches high, 5 inches wide at the base and tapering to 3 inches wide at the top. The posts, placed between 8 feet 1 inches and 9 feet 6 inches apart, have three round holes to hold the 1.50-inch diameter pipe which makes up the rails. The bottom rail is 1 foot above the top of the wall, the top rail is at the apex of the post, with 1 foot between the middle rail and the others.

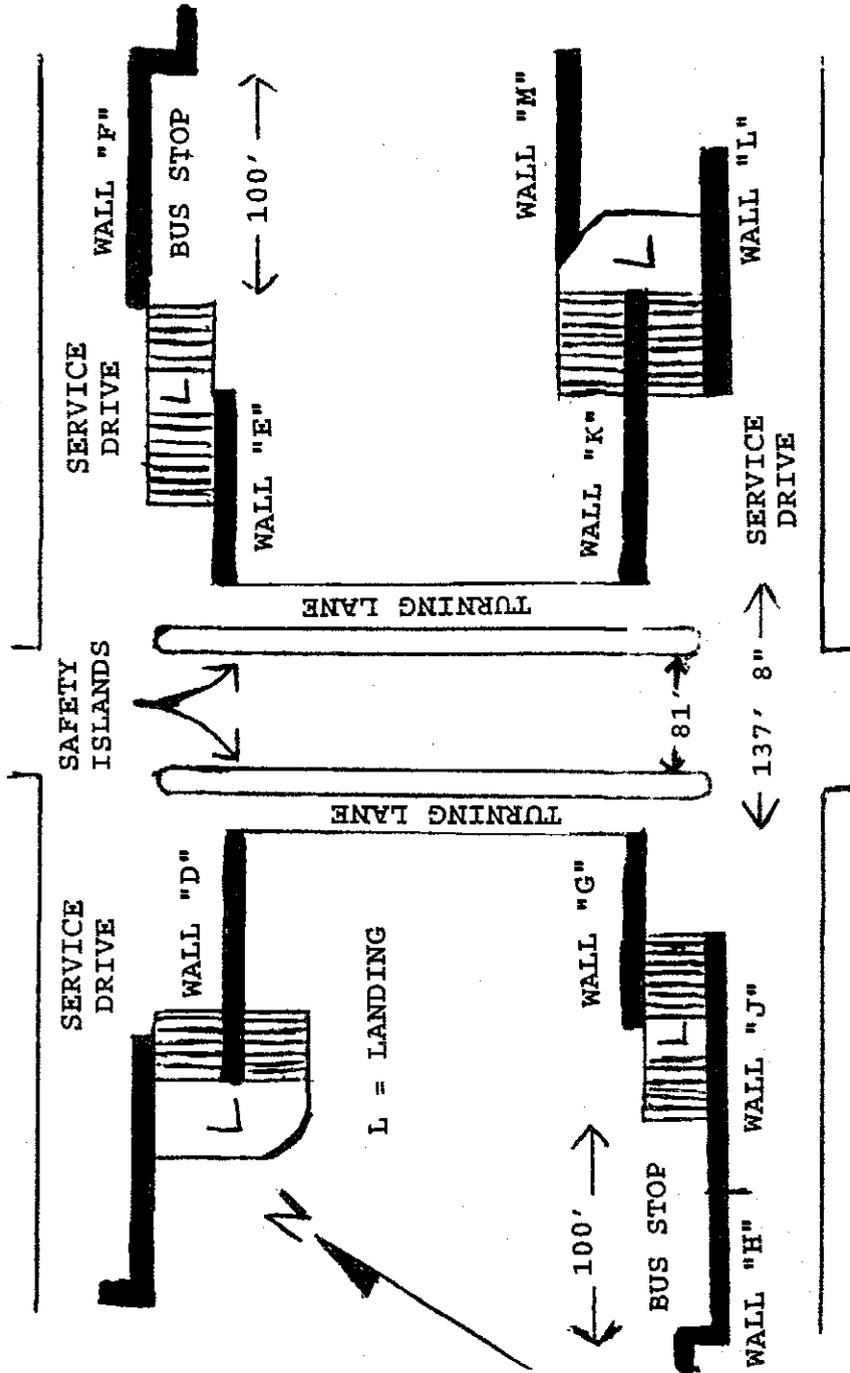
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NOTES

¹Polk's Detroit City Directory (Detroit: R.L. Polk & Company, 1928-1942); "New Plans Speed Work on Highway, County Proposal Wins Approval of Council," The Highland Parker, 8 January 1942; "Four Davison Highway Bridges 50 Per Cent Completed," Michigan Roads and Construction 39 (19 February 1942): 2; and "Open Brush, Third Bridges On Davison, Second Avenue Will Be Opened This Weekend," The Highland Parker, 9 April 1942. Contract details are found in the vertical files in the engineering offices of the Wayne County Department of Public Services.

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SITE PLAN



ADDENDUM TO:
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WOODWARD AVENUE BRIDGE SPANNING DAVISON FREEWAY
Highland Park
Wayne County
Michigan

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FIELD RECORDS

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