BLUE WATER BRIDGE
Spanning the Saint Clair River at U.S.
Interstates 69 and 94 and Canadian
Route 402
Port Huron
Saint Clair County
Michigan

HAER No. MI-16-A

HAER
MICH
74-PORHU,
1A-

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

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

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Location:	Spanning the Saint Clair River at U.S. Interstates 69 and 94 and Canadian Route 402, Port Huron, Saint Clair County, Michigan.
USGS Quad:	Port Huron, Michigan - Ontario
UTM Coordinates:	17:383020:4761520 (U.S.A.) / 17:384940:4760800 (Canada)
Dates of Construction:	1936-1938
Engineer:	Modjeski and Masters, Harrisburg, Pennsylvania
Consulting Architect:	Paul Philippe Cret, Philadelphia, Pennsylvania
Contractor for Main Span:	American Bridge Company, Pittsburgh, Pennsylvania
Present Owner:	State of Michigan Department of Transportation, Lansing, Michigan 48909
Present Use:	Vehicular and pedestrian highway bridge
Significance:	When it opened in October 1938, the Blue Water Bridge symbolized the peaceful relationship between the United States and Canada, a sharp contrast to the hostilities in Europe which were about to erupt into World War II. Forming an efficient link between the Midwest and the East Coast, the bridge has become one of the most heavily-travelled border crossings between the two nations. Modjeski and Masters, an internationally renowned engineering firm based in Harrisburg, Pennsylvania, designed and supervised construction of the bridge. Although the arched cantilever through truss did not present any unusual engineering challenges, use of the lower chord as part of the deck system was a creative response to aesthetic and budgetary concerns.
Project Information:	The Michigan Department of Transportation commissioned this study as mitigation for planned construction in 1995 of a new span adjacent to the bridge. The study was prepared between November 1994 and March 1995 by Charlene K. Roise, a principal historian of the historical consulting firm Hess, Roise and Company, Minneapolis, Minnesota. Senior research historian John F. Lauber provided substantial research assistance. Clay Fraser of Fraserdesign, Loveland, Colorado, completed the photography.

DESCRIPTION

The Blue Water Bridge extends east from Port Huron, Michigan, in the United States, to Point Edward, Ontario, Canada. The bridge spans the northern end of the Saint Clair River, which forms a critical link in the Great Lakes chain. The river is fed by Lake Huron from the north. About 35 miles to the south, it empties into Lake Saint Clair which, in turn, drains into Lake Erie. The topography in the vicinity is flat.

Port Huron, situated on the western bank of the Saint Clair, is the governmental seat of Saint Clair County and the eastern gateway to the "Thumb" region of Michigan. Interstate 94 ties Port Huron to Detroit, about 60 miles to the southwest. Interstate 69 connects Port Huron with the industrial center of Flint, some 70 miles to the west, and to the state's capitol, Lansing, another 50 miles beyond Flint. This route, which bypasses the traffic congestion of Detroit, provides a short-cut between Chicago and northern cities on the East Coast. Interstates 94 and 69 are directly accessible from the western end of the Blue Water Bridge.

Across the river in Canada is the small community of Point Edward and, immediately to the south, the city of Sarnia. Both are located in Lambton County. Route 402, a four-lane limited-access highway, leads east from the bridge to London, Ontario, where it intersects with Route 401, connecting Toronto and Detroit.

The main structure of the Blue Water Bridge is a cantilevered Warren through truss, designed in the form of an arch. Rivets connect the steel members of the truss, which is oriented on an east-southeasterly to west-northwesterly axis. The approaches at each end curve slightly to the south. Including the plazas and the approach spans, the bridge measures 8,020 feet in length. From abutment to abutment, it is 6,535 feet long. The main structure, which extends for 1,576 feet, consists of three sections: an 871-foot center span and two 326-foot anchor arms. The center span, which stretches between piers on the opposing riverbanks, clears the Saint Clair waterway vertically by 150 feet. Two-hundred-eighteen-foot cantilever arms arch from the piers to support a 435-foot suspended section. The top chord of this central section forms a low parabolic arch. The truss is 68-feet deep at mid-span; at the portals over the main piers, the truss depth increases to 113 feet, then tapers to 48 feet at the outer ends of the anchor arms. Heavier primary truss members consist of plates and perforated plates riveted together; laced angles form lighter primary members and most secondary supports.[1]

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[1] Specific details about the design of the bridge were obtained from a field visit by the author on 6 and 7 January 1995; from a series of original plans dating from 1937-1938 prepared for the Michigan Bridge Commission by Modjeski, Masters and Case and Monsarrat and Pratley; and from plans drafted by the Michigan State Highway Department and the Ontario Highway Department. Copies of the plans were obtained from the Ontario Ministry of Transportation in Downsview. Other useful accounts relating to the bridge's design include Varnum Steinbaugh, "The Blue Water Bridge," *Proceedings of the Twenty-fifth Annual Highway Conference* (Ann Arbor, MI: University of Michigan, 1939), 10-11; Varnum B. Steinbaugh, "The Blue Water Bridge," *The Michigan Engineer* 57 (October 1938): 19-22; "Economy and Good Appearance Rule Cantilever Design," *Engineering News-Record* 121 (25 August 1938): 234; "Blue Water International Bridge," Exhibit No. 17 in Modjeski and Masters, "Brochure Presenting Experience and Qualifications for

The main span is supported by 53-foot-tall reinforced-concrete piers situated on opposite banks of the Saint Clair River. The piers consist of two vertical shafts braced by a cross member near the top. Beveled corners add visual interest to the square-section, slightly tapered shafts. Horizontal lines, incised at five-foot intervals, suggest masonry courses. The piers rest on reinforced-concrete caissons extending about 100 feet to bedrock. The cylindrical caissons are 24 feet in diameter to a depth of 77 feet, broadening to 26 feet below. The outer end of each anchor arm is held by a steel tower rising 120 feet above the ground. The 40-foot-wide towers, essentially the same width as the truss, form the first 26-foot span of the approach. The four legs of each tower are made from a series of 43-foot-long units formed from perforated and solid plates. The units, which measure two feet by two feet in section, weigh thirteen tons apiece. Heavy diagonal members, built up from web plates, angles and lacing, brace the legs.

The 2,301-foot American approach, which consists of 32 spans, rises on a 4.316 percent grade. There are two Warren deck trusses, measuring 260 feet and 204 feet, immediately west of the anchor tower. These trusses maintain the same depth as the anchor arm trusses, providing a smooth visual transition between the two sections. The remaining deck-girder spans range from 44 to 80 feet in length. The western end of each girder is fixed to a floor beam. The eastern ends share a floor beam with the next span. The top flanges of the corresponding girders from adjacent spans are tied together with a strap, creating a continuous floor system. Bronze sliding bearings beneath one girder end permit deflection. The girders are primarily rolled sections. The shortest, 44-foot spans rest on square towers made from rolled I-beam verticals braced with laced angles. The towers are typically separated by three deck-girder spans measuring from 61 to 78 feet in length; the intermediate ends rest on simple bents similar in composition to the towers. The towers and bents are supported by spread footings.[2]

The Canadian approach is inclined on a 4.25 percent grade over its 2,657-foot length. It is made up of 40 spans. As on the American side, two trusses of 260 and 204 feet extend from the anchor tower. The tower and bent spans are also similar, with one exception: Bent C-15 broadens to 52 feet to accommodate Alexandra Avenue, which passes beneath it. Most bents are supported by spread footings, although swampy conditions in the area required some use of timber piles. The main difference between the American and Canadian approaches is that the latter employs built-up sections for floor beams and larger bent members. Unlike their American counterparts, Canadian steel mills could not roll beams of sufficient size at the time of the bridge's construction.

Heavy Construction Projects of Modjeski and Masters, Consulting Engineers," [1943], typed manuscript in possession of Modjeski and Masters, Mechanicsburg, PA (hereafter referred to as "MM"); P.L. Pratley, "Sarnia-Port Huron Bridge," *The Canadian Engineer* 73 (24 August 1937): 11; and "Fabrication and Erection," *The Canadian Engineer* 75 (11 October 1938): 12.

[2] "Economy and Good Appearance Rule Cantilever Design," 235.

The 32-foot-wide roadway, which is divided into three traffic lanes, is edged by a 4.2-foot-wide sidewalk to the south and a 20.5-inch walkway to the north. Railing panels consist of two horizontal channels to which vertical metal pickets are welded at five-inch intervals. The upper channel is topped by a 4.5-inch pipe. The original pipe lamp standards tapered from six inches at the base to four inches above. When new light fixtures were installed in the mid-1950s, the light poles were extended.

Elevated plazas at each end of the bridge contain toll and customs booths, customs processing and warehouse facilities, and administrative offices. The concrete slab of the U.S. plaza, originally 685 feet in length and about 150,000 square feet in total area, held a two-story, reinforced-concrete office building and a small permit building. Parking, maintenance shops, storage, and livestock inspection facilities occupied the ground level. The plaza was widened in 1953, and a third story was added to the office building in 1960. The plaza was completely rebuilt in 1994. Prior to the reconstruction, it was documented as HAER No. MI-16. A more detailed description of the plaza is included in that report.[3]

The 900-foot-long Canadian plaza rose above the flood plain on about 4.5 acres of fill topped with concrete. Four lanes carried traffic to the United States past toll booths; twice as many lanes brought vehicles from the west to the Canadian customs booths. Customs and immigration operations were housed in two flat-roofed, 39- by 58-foot, single-story buildings on an island in the middle of the plaza. South of the roadway, a 73- by 60-foot building had facilities for inspecting bus passengers and truck cargo. A partial basement held the heating plant, electrical equipment, and storage area for the complex. The steel-framed, tile-walled buildings were faced with Queenston limestone. The toll/customs booths and the connecting canopies were trimmed with polished aluminum bands, reflecting the influence of the Streamline Moderne style popular in the 1930s. The Canadian plaza is undergoing extensive remodeling at the time of this writing. It is being documented for the Canadian government.[4]

In conjunction with the plaza alterations, adjacent approach spans were somewhat modified. The westernmost U.S. approach spans were widened to provide a transition between the bridge roadway and the plaza. This extension, which is supported by solid concrete columns, has modern concrete and pipe railings. For the most part, however, the approaches and main span of the Blue Water Bridge are essentially unaltered and retain excellent physical integrity.

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[3] Paul W. McAllister, "Blue Water Bridge Plaza," HAER No. MI-16, 1984-1986, prepared for the Michigan Department of Transportation, Lansing.

[4] Norman B. Forbes, "Canadian Plaza Buildings," *The Canadian Engineer* 75 (11 October 1938): 9.

HISTORICAL SIGNIFICANCE

In the late seventeenth century, the French government briefly maintained Fort Saint Joseph in the vicinity of what is now Port Huron to defend this strategic juncture against the British. The U.S. Army followed suit in the early nineteenth century, building Fort Gratiot to guard the straits. The western approach of the Blue Water Bridge is near the site of that fort, which was named in honor of American General Charles Gratiot.[5]

By the early 1800s, the area was attracting substantial Euro-American settlement. In 1805, Michigan was organized as a territory; in 1837, it became the nation's twenty-sixth state. As the region's population grew, and as the frontier lured westward-bound migrants by the thousands, the swift waters of the Saint Clair River became an increasingly bothersome obstacle. Entrepreneurs founded ferry lines to transfer passengers, vehicles, and freight between Canada and the United States. The Port Huron-Sarnia Ferry Company, established in 1881, survived the longest, remaining in service until the late 1930s. Ferries, however, could not efficiently handle the large volume of traffic generated by the railroads. In 1889, the Grand Trunk Railroad began excavating beneath the river, opening a two-mile-long train tunnel two years later.[6]

The tunnel was an immediate success, and served well in a period when long-distance travel was dominated by railroads. The continent's transportation system, however, was to experience a radical change in the twentieth century, creating new problems -- and opportunities -- at river crossings.

The Planning Begins

The first major push to bridge the upper Saint Clair River came in the late 1920s. Efforts were catalyzed by a desire to remain competitive with nearby Detroit, where plans for the Ambassador Bridge to Windsor, Ontario, were progressing. The need for a bridge was also engendered by the phenomenal growth in car ownership, and by Michigan's leading role in the automobile industry. Nascent state highway departments struggled to keep up with the demand for intra- and interstate roads. Often, motivated by enlightened self interest, the private sector took the lead. Such was the case at Port Huron, where investors concluded that an international bridge would not only improve the region's transportation network, but would be financially lucrative as well.[7]

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[5] William Bodley, "The First Fort at Le Detroit," *Michigan History* 72 (November/December 1988): 32-35; Eric Poersch, *The Unabridged Blue Water Bridge History* (London, Ontario: Published by author, 1988), 45-46.

[6] Poersch, 83; Port Huron Bicentennial Committee, "Bridging the Years," prepared for the Michigan American Revolution Bicentennial Commission, [1976], 96.

[7] Ralph F. Swan, "Across Blue Waters," *Motor News*, August 1938, 9.

The potential for profit from a new bridge appeared so certain that a bitter battle evolved between the backers of competing plans. One group was led by John Lyle Harrington, a leading bridge engineer based in Kansas City and New York. Born in Lawrence, Kansas, in 1868, Harrington received engineering degrees from the University of Kansas and McGill University in Montreal. Between 1907 and 1914, he achieved prominence for developing vertical-lift and other bridges with his partner, engineer and scholar J.A.L. Waddell. When the two men parted company, Harrington formed the firm Harrington, Howard and Ash.[8]

Another proposal was promoted by local businessman Maynard D. Smith, who had made a fortune as the construction contractor for the Hudson Department Store, the Henry Clay Hotel, and other major projects in the Detroit area. Smith retained Port Huron attorney Henry R. Baird and renowned Chicago bridge designer Joseph Strauss for his team. Before Strauss established his own practice in 1904, he gained experience at a number of engineering firms, serving as principal assistant for Ralph Modjeski between 1899 and 1902. Strauss was most famous for innovations in bascule bridge construction, with over 250 bridges of this design to his credit by the mid-1920s. He was also chief engineer of San Francisco's Golden Gate Bridge, and was involved with the cantilevered Montreal-South Shore Bridge over the Saint Lawrence River, although Canadian engineers Monsarrat and Pratley are given credit for this 1929 span.[9]

Strauss and Harrington made the first of many joumeys to Port Huron and Sarnia in July 1927 to meet with local officials regarding their competing bridge proposals. The next month, the cities gave Harrington exclusive rights for ninety days to produce a feasibility study for their consideration. He reported in September that the bridge would cost about $3.5 million and take two years to build, and returned a month later with initial plans. Port Huron and Sarnia adopted Harrington's proposal in November.[10]

Politics and Designs

Ignoring Harrington's apparent victory, Maynard Smith continued to pursue his plans. Meanwhile, the Port Huron-Sarnia Ferry Company, led by vice president Fred Newton, entered the fray with a third proposal. A Toledo, Ohio, investment company, Stranahan, Harris and Oatis, joined forces with Sarnia solicitors Cowan, Cowan and Gray, to promote yet another plan.[11]

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[8] "John Lyle Harrington" in Jobn W. Leonard, ed., *Who's Who in Engineering 1925* (New York: Who's Who Publications, 1925), 898-899.

[9] Biographical information on Josepb Baermann Strauss is in Leonard, *Who's Who in Engineering 1925*, 2018. Biographical information on Maynard Smith is in Poersch, 80-81.

[10] A blow-by-blow account of the battles during this period is in Paul W. McAllister's HAER documentation of the Blue Water Bridge Plaza (HAER No. MI-16).

[11] McAllister, 4-5.

Each of the teams worked, with varying degrees of success, to arrange financing and obtain necessary permits from the U.S. Congress and War Department, and from the Canadian Parliament. The need to comply with government restrictions significantly influenced the proposed designs for the bridge. The U.S. Army Corp of Engineers, which had jurisdiction over the country's navigable waters, required bridges to provide vertical clearance of at least 150 feet to allow passage of the largest commercial and military ships. The Corps also prohibited use of floating construction platforms during erection of any structure over the Saint Clair, and stipulated that the channel could not be obstructed by falsework during construction. Political and economic considerations also shaped the designs. Sarnia officials wanted the bridge to terminate in their community rather than in Point Edward, a short distance to the north. Port Huron boosters feared that the bridge would bypass their downtown. A direct link between the commercial districts of Sarnia and Port Huron, however, would require a significantly longer bridge than would be needed just upstream, where the river was narrower. Also, subsoil conditions were better to the north.[12]

Local pressure, however, was apparently stronger than logic. Promoters of every plan ended the western approach in the Port Huron business district, resulting in designs that were visually and functionally flawed. Harrington proposed a bridge "of the suspension type, like those at Niagara Falls," according to an article in a contemporary magazine. An accompanying sketch showed the 1,100-foot span stretched between a tower north of downtown Port Huron and one on Bay Point, a peninsula between Point Edward and Sarnia. The bridge's eastern approach was a series of deck-arch spans over swampy Sarnia Bay. To placate local interests, the Michigan approach curved to the south immediately west of the suspension tower, descended to downtown Port Huron, and terminated with a semicircular ramp.[13]

The Strauss design also called for multiple stringer spans rising from the Port Huron business district. The approach met the main span, a rather traditional cantilever through truss, at an impractical 90-degree angle. The Canadian side employed a more standard approach which followed the orientation of the main span.[14]

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[12] "Port Edward Realizes Its Fondest Dream," *Sarnia Canadian Observer*, 10 August 1938, 1.

[13] E.J. Schoolcraft, "Port Huron-Sarnia Bridge," *The Michigan Property Owner*, February 1928, 13.

[14] The design for the cantilever truss is very much like that of the Strauss-designed Longview Bridge over the Columbia River in the State of Washington, which opened in 1930; it is pictured on page 313 in Donald Jackson's *Great American Bridges and Dams* (Washington, D.C.: Preservation Press, 1988). A faded photocopy of a sketch of the Strauss Engineering Corporation's "Proposed Port Huron-Sarnia Bridge over the St. Clair River" is in the collections of the Lambton County Public Library in Wyoming, Ontario (hereafter "LCPL").

Frank Masters, a principal in the Pennsylvania-based firm Modjeski and Masters, was the third engineer to wrestle with the design.[15] His office was retained by Smith early in 1928, after Smith formed an alliance with Stranahan, Harris, and Oatis, and attorneys Cowan, Cowan and Gray. At the same time, Strauss was dropped from the team. Masters first designed a suspension bridge, apparently in response to Harrington's plans, then looked more seriously at a cantilever span. Preliminary drawings from November 1928 show a traditional cantilever through-truss bridge. Trusses rise high over the main piers, then dip down as the cantilever arms approach the suspended span. Two months later, the design was modified by slightly arching the top chord of the suspended section, presaging the ultimate form of the Blue Water Bridge. This version is also strikingly similar to the Huey P. Long Bridge over the Mississippi River at New Orleans, which the firm designed during the same period.[16]

Perhaps Modjeski borrowed ideas for the suspension span from his work on the Ambassador Bridge between Detroit and Windsor, which was being developed by the McClintic-Marshall Company during the same period. Modjeski and Masters served as consultants for the design along with a host of other engineers, including the Canadian firm Monsarrat and Pratley. Monsarrat and Pratley became the Canadian associates of Modjeski and Masters for the Port Huron-Sarnia project, although it is unclear when this affiliation occurred.[17]

In any case, not long after Modjeski and Masters joined the Port Huron melee, the tables began to turn in favor of the Smith proposal. In the United States, political pressure apparently advanced the cause of local favorite Smith and his Port Huron backers. U.S. Congressman Louis Cramton, who represented Michigan's Seventh District, aggressively pushed for the new

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[15] The firm has operated under several names since its founding in 1893. Born in Poland in 1861, Ralph Modjeski studied engineering at the Ecole des Ponts et Chaussis in Paris. He moved to the United States in 1885 to work for renowned bridge engineer George Morison. He formed the firm Modjeski and Nickerson in Chicago in 1893, but the partnership soon dissolved and Modjeski continued his practice alone. In 1924, Modjeski teamed up with Frank Masters, who had earlier worked for the firm and had since established his own reputation as a consulting engineer. Clement E. Chase was elevated to partnership in 1926, and the company became Modjeski, Masters and Chase. Chase died in 1933 and was replaced by Montgomery B. Case. When Case retired in about 1937, the firm returned to the name Modjeski and Masters, which it retains today. For the sake of simplicity, this report will refer to the firm as "Modjeski and Masters" regardless of the period. Background on the firm is provided by a typed manuscript prepared by the firm, "Brochure Presenting Experience and Qualifications on and for Heavy Construction Projects of Modjeski and Masters, Consulting Engineers," [1943], and by "Memoirs of Frank M. Masters and Historical Sketch of Modjeski and Masters" [1962] edited by Margaret W. Masters; both typed manuscripts are in the possession of Modjeski and Masters, Mechanicsburg, PA. A biographical sketch on Ralph Modjeski is in "Memoir of Ralph Modjeski," *American Society of Civil Engineers Journal* 106 (1941): 1624-1628.

[16] McAllister, 6-7; Poersch, 49; Modjeski and Masters, "General Plan, Port Huron-Sarnia, 13 November 1928, and Modjeski and Masters, "Port Huron, Mich. St. Clair River Bridge Clearance Diagram," January 1929, both on microfilm reel 128 at MM.

[17] David Plowden, *Bridges: The Spans of North America* (New York and London: W.W. Norton and Company, 1974), 242; Detroit International Bridge Company, *Detroit International Bridge: The Ambassador Bridge* (Detroit: Issued by the Company, [ca. 1930]), 5.

bridge on behalf of his electorate. In February 1928, he introduced a bill empowering Smith's group to build and own a bridge at Port Huron over the Saint Clair River. The bill stipulated that eighty percent of the tolls be dedicated to construction debt repayment. When the bonds were paid off, which was anticipated to occur in about sixteen years, tolls would be reduced to a level sufficient to fund necessary maintenance and operating costs. The Smith proposal also gained ground in the Canada Parliament, where it was championed by W.T. Goodison, who represented the district encompassing Sarnia and Point Edward, and by Ross Gray, the man who would succeed Goodison in 1929. Gray was a principal of Cowan, Cowan and Gray, the law firm associated with the Smith team. Outmaneuvered, Harrington withdrew his proposal in March 1928. By April, the 70th Congress had passed Public Act No. 312, authorizing Smith's group to erect a bridge over the Saint Clair at Port Huron. A similar bill was approved by the Canadian Parliament in June, creating the Saint Clair Transit Company for the purpose of bridging the river. Smith's team obtained other necessary permits from the U.S. and Canadian governments soon thereafter.[18]

Stranahan, Harris and Oatis bankrolled the costs of getting the government permits and drafting preliminary plans, devoting over $150,000 to the effort. The group also acquired the stock of the Saint Clair Transit Company. Once the necessary permits were granted, however, the firm had difficulty finding financing for the venture. Inflated property values in downtown Port Huron forced up estimates of the project's cost. Owners of the ferry service between Port Huron and Sarnia used political pressure to stall progress. Ultimately, private funding efforts were doomed by the economic depression that engulfed the country by late 1929.[19]

Perseverance Pays Off

Local bridge promoters were not deterred. With the help of Representative Cramton and Jesse Wolcott, who replaced him in Washington in 1931, they were granted several extensions to the federal permit, which had initially required construction to begin within a year. Since it was virtually impossible to raise funds in the early 1930s, backers began to pursue government support. Federal assistance for highway construction had been introduced by the Federal Aid

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[18] "The Bridge Bill," *Michigan Roads and Pavements* (21 June 1928): 8; "Parliamentary Officials Who Guided Bridge Project," *The Sarnia Herald*, 8 October 1938; "Bill Would Provide," *Michigan Roads and Pavement* (23 February 1928): 44; "Port Huron-Sarnia Bridge Bill Passed," *Michigan Roads and Pavement* (26 April 1928): 9; "Canadian House," *Michigan Roads and Pavement* (31 May 1928) 5; "Sarnia-Port Huron Bridge Bill," Michigan Roads and Pavements, (7 June 1928): 22.

[19] Most local newspaper articles used as references for this report were photocopied in files at the St. Clair County Library in Port Huron (hereafter "SCCL") and the Lambton County Public Library. The source of the photocopies was rarely given, but it is assumed that articles in the SCCL files were from the *Port Huron Times Herald* and articles in the LCPL were from the *Sarnia Canadian Observer*, unless otherwise indicated. Dates handwritten on the photocopies are taken to be correct. Information on the problems of financing the bridge is in "Statement of James W. Williams," *Port Huron Times Herald*, 21 April 1939; "Larger Structure Considered," *Michigan Roads and Pavements* 25 (5 July 1928): 17; and Swan, "Across Blue Waters," 9.

Road Act in 1916, but the legislation prohibited the use of these funds in municipalities. Congressman Wolcott, a member of the House Road Committee, attached an amendment to the 1934 Hayden-Cartwright Act that removed this restriction. To fend off legal challenges to future allocations for the Port Huron bridge, Wolcott authored another bill that specifically permitted use of federal-aid funds for the structure, upon the request of the Michigan Highway Department. The bill also gave a state-authorized bridge commission the power to build and operate the bridge, and purchase the Port Huron-Sarnia Ferry Company. The promoters felt that it was essential to control the ferry, because competition from ferries had hurt toll bridge income in other locations. Arthur Vandenberg, a Michigan senator, successfully championed the legislation in that chamber.[20]

By June 1935, a group led by the persistent Port Huron attorney Henry Baird convinced the Michigan legislature to pass a law creating a state bridge commission. Baird was appointed head of the three-member commission. He was joined by Varnum Steinbaugh, an engineer with the Michigan Highway Department, and Dale Moffett. The commissioners, who served without compensation, could issue bonds to finance the design and erection of the main bridge structure. The bonds would be repaid by revenue from bridge tolls. The plan assumed that Ontario and Michigan would build their respective approaches to the bridge, along with any necessary toll and customs facilities.[21]

On 29 January 1936, the commission officially resolved to build the bridge on the northern site, connecting the north end of Port Huron with Point Edward. Henry Baird explained that "this location was selected over other possible locations, because, at this point, the river is narrowest and there would be a great savings in the cost of construction." In addition, "there would be no turns in the approaches to the bridge and it would better fit in with the line of the proposed Montreal-Chicago international highway." On 31 January, Baird formally asked Murray D. Van Wagoner, State Highway Commissioner, to make a commitment to build the western approach. Presumably, the request was made simultaneously to Van Wagoner's counterpart at the Ontario Highway Department, T.B. McQuesten.[22]

The overture fell on receptive ears. Varnum Steinbaugh later recalled that early in 1936, Van Wagoner and McQuesten began a concerted effort to push the project through the appropriate channels within their respective governments and make the bridge a reality. At the same time, the bridge commission consolidated development interests by purchasing the Saint Clair Transit

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[20] "Wolcott had Important [Role]," *Port Huron Times Herald*, 4 August 1938.

[21] Swan, "Across Blue Waters," 9; Steinbaugh, "The Blue Water Bridge," *Michigan Engineer*, 19; "Steinbaugh Resigns, *Michigan Contractor and Builder* 32 (29 October 1938): C.

[22] Henry R. Baird, State Bridge Commission, Port Huron, to Murray D. Van Wagoner, State Highway Commission, Lansing, 31 January 1936, typed letter, Michigan Department of Transportation Collection, Michigan State Archives, Lansing (hereafter "MDOT/MSA").

Company, which had received authorization to build the bridge from the Canadian government in the late 1920s.[23]

Modjeski and Masters apparently remained involved in the interim. A trade joumal article in 1937 reported that the firm had "been working on the scheme for several years studying sites, preparing designs and estimates, assisting the promoters, financiers, and the various governmental authorities concerned." Modjeski and Masters did not draft a contract, however, until 22 August 1936. It was accepted by the State Bridge Commission on 4 September. The agreement included "all preliminary services" as well as "services heretofore rendered" for "the securing of necessary permits, the preparation of preliminary plans, estimates of cost and attendance of conferences with the commission, the Attorneys, Canadian authorities and bankers relative to the financing of the project." For their work on the project, the firm earned a lump sum of $132,000, payable in monthly installments of $5,500. The contract outlined the firm's responsibilities for design and construction supervision, and also identified areas excluded from the scope of work, such as planning the administration and other buildings on the plazas.[24]

From their fee, the firm paid the Montreal-based engineering firm Monsarrat and Pratley, the Canadian representative on the design team. The association may not have been completely welcome from the American firm's perspective. In fact, Masters called a provision of Canadian customs regulations a "scheme of the Canadian engineers":

> American engineers cannot send blue prints into Canada for any construction work without paying a duty of a certain percent of the cost of the work contemplated, which is more than the fee we receive, thus making it necessary for us to engage Canadian engineers to sign the plans and check the details of the work which we prepare. It is on account of this fact that we arranged with Monsarrat and Pratley to act as our associates in Canada, for which we paid them a large fee.[25]

Indeed, Monsarrat and Pratley appear to have had little involvement with developing the design. Long before their contract was signed, Modjeski and Masters were refining their plans.

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[23] Poersch, 12.

[24] Frank Masters, Modjeski, Masters and Case, Harrisburg, PA, to V.B. Steinbaugh, State Bridge Commission, Port Huron, 22 August 1936, typed letter outlining "Agreement for Engineering Services, St. Clair River Bridge, Port Huron, Michigan," MDOT/MSA; Pratley, "Sarnia-Port Huron International Highway Bridge," 11.

[25] [Frank Masters], Harrisburg, to W.C. Stinson, Port Huron, 23 August 1939, unsigned letter on microfilm reel 125, MM.

The Bridge Takes Form

The engineers ruled out a simple span early in the design process, because the necessary piers would have blocked the busy channel and been threatened by heavy ice flows. The river's flat banks could not buttress an arch. For a suspension span of sufficient height to adequately clear the river, "the roadway level would appear to be propped way up in the air by . . . two spindly towers and would appear to end into massive anchorages nearby," according John Giese, an engineer with Modjeski and Masters; as a result, "all beauty of proportion is lost." A cantilever bridge seemed the most logical choice.[26]

As late as February 1936, however, the firm may have been exploring the possibility of a suspension span. Two small (1"=250') blueprints in the Michigan State Archives show elevation and plan views comparing suspension and cantilever designs. The cantilever study is dated 11 February 1936; the suspension version, which appears to be of the same vintage, is not dated. The 850-foot suspension span, given the constraints of aesthetics and the site, cleared the river by about 133 feet, far short of the 150 required by the federal government. An arched, cantilevered truss of equal length rose 153 feet above the river.[27]

These plans were perhaps prepared for submission to the War Department. Authorization of the project by the U.S. Congress was subject to approval of the bridge plans by the department. The commission formally applied for permission to proceed on 11 February 1936. A public hearing was originally scheduled in Detroit for later that month, but was postponed until 19 March. Bridge proponents feared a confrontation at the hearing, based on an anonymous, antagonistic letter that had been mailed from Port Huron to the War Department. When the time for the hearing arrived, a small group assembled in the office of War Department engineer Lieutenant Colonel R.C. Crawford. Commissioners Baird and Steinbaugh opened with a presentation on the need for the bridge. L.C. Sabin, vice president of the Lake Carriers Association, reported that his group had no objection to the bridge, as long as plans provided sufficient clearance for commercial vessels. The meeting chairman then asked if anyone opposed the construction. According to a newspaper account, "a tense moment followed with the bridge proponents holding their breaths and hoping the hearing might end with nothing to upset their plans." Their wish was granted, and on 18 May the War Department approved the bridge plans. The specifications called for main span piers to be 851 feet apart. As site plans were developed in more detail, it became clear that at least one pier would have to be in the

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[26] Speech by John Giese given in Port Huron on 3 March 1938; text reprinted in Poersch, 20-21.

[27] Modjeski, Masters and Case, to J.B. Steinbaugh, 4 January 1936, Western Union Day Letter on microfilm reel 125, MM; Michigan State Bridge Commission, "Proposed International H'w'y Bridge, Port Huron and Point Edward," blueprint for cantilever span dated 11 February 1936, blueprint for suspension span undated, in MDOT/MSA.

river with that length of span. In August, the War Department amended the permit to allow 871 feet between the piers, so that construction could proceed on dry land.[28]

It was during this period, long before construction began, that the bridge claimed its first victim: Henry Baird, who collapsed and died on 6 May. Varnum Steinbaugh replaced him as chairman the following week, and Marshall E. Campbell, a Port Huron resident, was added to the commission. Steinbaugh proved an excellent choice. He had received a degree in civil engineering from the University of Michigan in 1921. After gaining experience in the private sector as a contractor, he joined the Michigan Highway Department in 1933 as a road engineer. Within a year, he was elevated to deputy engineer and, in 1937, to chief engineer of the department. Because of his position, Steinbaugh was well situated to keep the bridge project on track.[29]

Dealing for Dollars

On 13 May, just as Steinbaugh took control of the bridge commission, Michigan's Administrative Board voted to allocate $510,000 of federal-aid funds for the Port Huron approach. This expenditure was subsequently approved by the Chicago office of the U.S. Bureau of Public Roads. Two weeks later, the bureau agreed to pay half of the cost of upgrading the state highway leading west from the bridge plaza to the Black River. The bureau's cost was initially estimated at $336,200; the total later rose to $336,500. This was the only direct federal funding that supported the project. Even before Michigan and the bureau made these commitments, Ontario pledged over $600,000 to build the eastern approach.[30]

These amounts, however, were dwarfed by the cost of the main span, which the commission planned to fund by issuing $1.9 million revenue bonds. A friendly lawsuit tested the legality of the bond issue, since obligating the state's taxpayers by such an indebtedness would have constituted taxation without representation. In July, the state supreme court ruled that the state had no liability for the bonds; in the event of a default, bondholders could only seek redress from bridge revenue. With this legal hurdle cleared, the bridge commission proceeded to finalize arrangements for sale of the bonds with the firm long associated with the project, renamed Stranahan, Harris Company since its involvement in the 1920s.[31]

The majority of the bond proceeds were to pay for construction of the main span. The commission earmarked $500,000, however, to purchase the Port Huron-Sarnia Ferry Company,

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[28] Photocopy of newspaper article at SCCL; no facts of publication given.

[29] Swan, "Across Blue Waters," 9; "Steinbaugh Resigns," *Michigan Contractor and Builder*, C; Poersch, 76.

[30] *Port Huron Times Herald*, 7 and 13 May 1936; "Blue Water Bridge," n.d., typed report, MDOT/MSA.

[31] "State High Court Explains Ruling on Bridge Bonds," *Port Huron Times Herald*, [October 1936]; "Statement of James W. Williams."

a long-standing obstacle to bridge plans. Estimated annual net revenue of $125,000 from ferry operations would help pay bond interest in the transitional period before the bridge opened. Control of the ferries would also maintain a direct link for pedestrians between the two downtowns until another alternative, such as a bus line, was established. It would eliminate competition for vehicular traffic, as well.[32]

The highway departments and the bridge commission started preconstruction activity, including right-of-way acquisition, before financing for the main span was in hand. Negotiations dragged on through the fall. In November, Masters complained to Monsarrat that "I have never been connected with any job where there have been so many hurdles to cross before you could spend some money." A crisis brought the matter to a head at the end of 1936, when Governor Fitzpatrick's term was to expire. If arrangements for the financing were not completed by midnight on 31 December, lengthy delays with the new administration were certain. Key players sequestered themselves at the Fort Shelby Hotel in Detroit for a marathon negotiating session. After three tense days, they emerged with an agreement. The *Sarnia Canadian Observer* reported that in "the 'eleventh hour'. . . bonds issued by the State of Michigan, through the Michigan Bridge Commission, . . . were signed by Governor Frank D. Fitzgerald, approved by New York bonding interests, sold and the ferry company bought in rapid succession." A subsequent issue of $400,000 completed the financing.[33]

Stranahan, Harris Company, which handled both transactions, later claimed that "participation in this epochal project renders the participant very unusual and gratifying satisfactions." Presumably, they also earned healthy fees, most of which probably came from the spread between the $2.3 million bond proceeds and the $2.07 million deposited in the Bridge Commission's construction fund. An additional $4,570, a relatively small disbursement from the construction fund, went to the company for "expense in issuance of bonds and construction expense advanced in 1936 to keep franchise alive."[34]

Designing for Beauty and Economy: Evolution of the Cantilever Form

Frank Masters, another veteran of the decade-long struggle for the bridge, was delighted to receive word that the financing was finally arranged. On 2 January, he wrote to Steinbaugh: "The good news in your message seems too good to be true. I still believe I will wake up some morning and find I was only dreaming." In the next paragraph, however, he proved that he was well prepared for the event, which forced final decisions regarding the bridge's design:

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[32] Steinbaugh, "The Blue Water Bridge," *Proceedings of the Twenty-fifth Annual Highway Conference*, 9.

[33] [F.M. Masters] to C.N. Monsarrat, 16 November 1936, unsigned typed letter on microfilm reel 124, MM; "Features of the Bridge Project," *Sarnia Canadian Observer*, 2 January 1937, 1.

[34] Advertisement for Stranahan, Harris Company in *The Sarnia Herald*, 8 October 1938; list of receipts and disbursements from the State Bridge Commission construction fund, typed carbon copy, MDOT/MSA.

> We have the work fairly well advanced on the stress calculations for the main bridge. . . . The only thing we do not have straightened up . . . is a final . . . agreement on the re-arrangement of the approach spans, for which we recently sent you an architect's study of the plan recommended, which it is believed will greatly improve the appearance of the structure. . . . We would appreciate very much your advising us . . . whether . . . it will be satisfactory to substitute this span arrangement for the one originally submitted, using the longer deck trusses in place of the little short ones, this plan having been developed at your suggestion and the suggestion of your highway department.[35]

The "architect" was presumably the office of Paul Philippe Cret. Born in France in 1876, Cret studied at the Ecole des Beaux-Arts from 1897 to 1903. After graduation, he moved to the United States to accept a teaching position at the University of Pennsylvania, where he remained until 1937. After arriving in Philadelphia, he established an architectural practice which gained international renown. Among his most famous commissions are the Pan American Union Building (with Albert Kelsey, 1907) and the Folger Shakespeare Library (1929) in Washington, D.C.; the Detroit Institute of Arts (1919); the University of Texas campus at Austin (1930s); and a number of war memorials and monuments in the United States and Europe.[36]

In addition to designing buildings, Cret worked with engineers on bridges, dams, and other structures. He first joined forces with Ralph Modjeski in about 1920 to design the award-winning Delaware River (later Benjamin Franklin) Bridge in Philadelphia, the world's biggest suspension span at the time. It was the beginning of a long, friendly, and productive relationship. Decades later, Cret reminisced: "I have done a good many bridges in collaboration with Modjeski & Masters during the past twenty years, and we work together very harmoniously."[37]

In the mid-1930s, before the Blue Water project jelled, Cret was working with Modjeski and Masters on the Calvert Street Bridge in Washington, D.C. and the Davenport, Iowa, suspension bridge over the Mississippi. While Cret played a principal role on the Calvert Street project, the engineering firm more typically took the lead on bridges. Since each large bridge project was unique, Cret's level of involvement varied. His general responsibility was to provide guidance on the aesthetic character of the design of these essentially utilitarian structures. A scope of services prepared by Modjeski for a project in 1924 explained that the architect "shall . . . pass[ ] upon the plans of the designing engineer from the standpoint of beauty and shall

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[35] Frank Masters to Varnum Steinbaugh, 2 January 1937, typed letter, microfilm reel 125, MM.

[36] For general biographical information on Cret, see Theo B. White, ed., *Paul Philippe Cret, Architect and Teacher* (Philadelphia: Art Alliance Press/Associated University Presses, 1973), and Elizabeth Greenwell Grossman, "Paul Philippe Cret: Rationalism and Imagery in American Architecture," Ph.D. thesis, Brown University, June 1980.

[37] Paul P. Cret to Will Alban Cannon, Niagara Falls, 10 November 1938, carbon copy of typed letter, Paul Philippe Cret Papers, University of Pennsylvania Archives, Philadelphia.

make such suggestions and give such advice as may, in his opinion, add to the beauty of the plans."[38]

With the Blue Water Bridge, Cret's role is difficult to discern. He is listed as "consulting architect" in an August 1938 article on the bridge in *Engineering News-Record*. Two preliminary sketches for the bridge give Cret prominent billing as architect. The two views were apparently used for publicity by Modjeski and Masters. It was Frank Masters who, after viewing a draft version, suggested that Cret's name be placed in the right-hand corner below the sketches to balance credits for the engineers to the left.[39]

In one of the views, stone or concrete piers support both the main span and anchor arms. Each pier consists of two tapered, slightly flattened cylinders resting on a single foundation, and joined on top by a masonry cross beam. The inward side of the cylinders is chamfered. The top chord of the deck truss approach span continues the line of the top chord of the anchor arm. Because the approach truss is shallower, however, its lower chord seems suspended in air above the pier. The problem with this design, according to an engineer with Modjeski and Masters, was that "the main span looked good but the large anchor piers appeared bulky, the eye insisting on returning to this focal spot rather than contemplating the entire effect." The other sketch shows the single pier and steel anchor tower on one bank essentially as they were ultimately built. The steel tower eases the visual transition between the 40.6-foot-wide anchor arm trusses, which flank the roadway, and the approaches, where the deck is cantilevered beyond the 29-foot-wide supports below.[40]

The alternatives were apparently drafted by the Philadelphia branch of Modjeski and Masters, which was managed by partner Montgomery B. Case. The firm's office was in the same building where Cret maintained his practice. The letter from Masters to Steinbaugh on 2 January suggests that Cret's office had already been consulted. In a letter to Case on 22 January, however, Masters wrote: "I have just received your letter of January 19th, which was sent just prior to our discussion yesterday relative to the desirability of having Bill Hough pass upon the type, size, and architectural treatment of the main piers on the Port Huron-Sarnia bridge." A 1911 graduate of the University of Pennsylvania, Hough was one of four former Cret students who became affiliated with their teacher's practice after World War I. Masters continued: "Personally I think this very desirable . . . and I think he should also be given an opportunity to criticize the arrangement of the structural steel members and the use of lacing or

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[38] Ralph Modjeski, Philadelphia, to Paul P. Cret, Philadelphia, 8 August 1924, typed letter, Paul Philippe Cret Papers, University of Pennsylvania Archives, Philadelphia.

[39] "Economy and Good Appearance Rule Cantilever Design," 236; F.M. Masters, Harrisburg, to Carl H. Martin, Barton and Martin, Philadelphia, 2 April 1938 [1937?], typed letter, microfilm reel 125, MM.

[40] [J.R. Giese], typed manuscript of speech given in March 1938, microfilm reel 125, MM; F.M. Masters, Harrisburg, to Carl H. Martin, Barton and Martin, Philadelphia, 2 April 1938 [1937?], typed letter, microfilm reel 125, MM.

batten plates in various members, as these things affect the appearance of the bridge. I am sure a little money spent on him will not be wasted." Later, Masters wanted Hough's reaction to the preliminary sketches showing the two pier alternatives. Other correspondence from Masters revealed that he was concerned about appearing to copy the design of the Sagamore Bridge over the Cape Cod Canal in Massachusetts, a well-publicized arched cantilever through truss which had recently opened.[41]

No documentation ties Cret himself to the project. Cret's involvement may have been impeded by health problems. Suffering from laryngeal cancer, Cret resigned from the university faculty in March 1937 at the recommendation of his physician. Although he lived until 1945, surgery in 1937 cost him his voice.

In addition, there may have been little he could have contributed to the design, given the tight budget and fast-track schedule. Cret's bridge work is characteristically most visible on arch spans, piers, and approaches, where he created dramatic sculptural forms of stone or concrete. There was little opportunity for this type of elaboration on the Port Huron-Sarnia structure.

Although an engineer eredited Modjeski as "a leader in the design of bridges of beauty as well as service," Case and Masters were probably far more influential in designing Blue Water. "In ill health and advanced years, [Modjeski] had retired to California in 1936," according to Masters, who asserted in 1938 that Modjeski "has taken no active part in any of our work" for several years. During the following year Case, too, retired. Since Masters claimed that "from 1936 to 1950, I conducted the firm's business individually," he apparently had the chief responsibility for overseeing the completion of the Blue Water's design.[42]

In any event, designing an attractive cantilever bridge was considered something of a challenge. "The engineers and architects [for the Blue Water Bridge] exerted every effort to produce a cantilever design that would dispute the reputation for ugliness that is usually attached to this type," according to an article in the *Engineering News-Record*. On earlier cantilever spans, such as the Firth of Forth Bridge in Scotland, the cantilever section had looked disproportionately light in comparison with the rest of the structure, resulting in a visual imbalance. By the first decades of the twentieth century, engineers attempted to integrate the suspended span more harmoniously with the cantilever and anchor arms. One popular solution was to arch the chords of the suspended and cantilever sections, and hang the deck below the bottom chord. This arrangement, however, required more material than a traditional cantilever span, adding cost and

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[41] Frank Masters to W.C. Stinson, State Bridge Commission, 10 January 1937, and to M.B. Case, 22 January 1937, and to Modjeski, Masters and Case, Philadelphia, 25 January 1937, F.M. Masters, Harrisburg, to Carl H. Martin, Barton and Martin, Philadelphia, 2 April 1938 [1937?], typed letters, microfilm reel 125, MM; Goodman, 9.

[42] Poersch, 19-20; Margaret W. Masters, ed., "Memoirs of Frank M. Masters and Historical Sketch of Modjeski and Masters," 1962, page 29, typed manuscript, MM; Frank Masters to Grant Moloney, editor, *The Canadian Engineer*, 1 October 1938, typed letter, microfilm reel 125, MM.

weight. In addition, the high arches needed substantial bracing to counteract significant wind stresses. In contrast, the Blue Water's top chord formed a very low-profile arch, while the bottom chord also served as part of the deck structure. As a result, the Blue Water's design was a success both aesthetically and economically.[43]

It is not clear who deserves credit for this innovative design. At least one phase of the evolution, though, can be attributed to T. Kuo, an engineer in the Philadelphia office of Modjeski and Masters. Kuo began pondering the arched cantilever design after Masters had asked his opinion on a visit to Philadelphia. On 21 January 1936, when the design was still in a formative stage, Kuo wrote to the Harrisburg office: "It is my studied thought that there are several features which could be changed to provide a more efficient and more economical structure." With the top chord arched above the roadway, he found that "the middle span is top-heavy." He suggested that "large portions of the thru truss could be brought down with much beneficial result. By merging the floor area and lower chord of the suspended span into one level and thus lessening the amount of exposed area, wind stresses would be less in the lateral systems." In addition, "all hangers would therefore be eliminated, thus effecting a considerable saving in cost." Kuo, however, advocated a modified rhomboid form; the sponsor of the attenuated arch is unknown. One of the firm's engineers maintained, in any case, that by melding the cantilever and arch forms for the Port Huron structure, "we may congratulate ourselves that we have created a happy marriage out of necessity and discover that this bond is a happy, long lasting union."[44]

The aesthetic aspect apparently posed a greater challenge than the technical design. A letter presumably written by Frank Masters in November 1936 observed that "there is no question about [the bridge's] feasibility from an engineering standpoint; there are no great engineering questions involved other than the design of the large cantilever span and we have designed and built much greater ones. We do not consider this any particularly difficult problem."[45]

Ceremonies and Squabbles

The long-awaited official ground breaking ceremonies were held on 23 June 1937 in Port Huron. Thousands of onlookers were serenaded by a band playing the Canadian and U.S. national anthems as William A. Guthrie, Provincial Member of Parliament for the Sarnia area, plunged a large power shovel into the dirt. Commissioners, politicians and local dignitaries gathered

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[43] "Economy and Good Appearance Rule Cantilever Design," 234.

[44] T. Kuo, Modjeski and Masters, Philadelphia, to Modjeski, Masters and Case, Harrisburg, PA, 21 January 1936, typed letter, microfilm reel 125, MM; speech by John Giese given 3 March 1938; text reprinted in Poersch, 20-21.

[45] [Frank Masters] to J.S. Harris, Stranahan, Harris and Company, 21 November 1936, unsigned typed letter, microfilm reel 124, Modjeski and Masters, Harrisburg.

again in mid-July to celebrate the initiation of work on the Canadian approach. A local newspaper headline declared the festivities an "International 'Love Feast.'"[46]

Behind the scenes, though, the relationship between the two sides was not always cordial. Around the time of the Port Huron ground breaking, American officials told the editor of the *Port Huron Times Herald* that the bridge would be christened "Blue Water." The name had not, however, been officially blessed by the Canadian side due to ambivalence on the part of McQuesten, who had fallen ill. The lack of consensus was not discovered until 29 June, after the newspaper had printed up a supplement for the next day's centennial edition touting the new name. While the issue was apparently resolved that day, it displayed the tension underlying the international project.[47]

A more serious flap had threatened the project earlier in the spring. McQuesten apparently felt that progress on plans and specifications was proceeding too slowly, and began to question the qualifications of the designers. While Steinbaugh attempted to calm flustered bureaucrats at the Ontario Highway Department, Frank Masters reminded Ross Gray that the process required care: "We could not design large cantilever structures and build them successfully and economically without giving the matter a lot of thought and study." He reassured Gray that the foundation plans were finished and the superstructure plans were well underway, right on schedule.[48]

All things considered, it is somewhat surprising that the international venture proceeded as smoothly as it did. Each side was clearly motivated by the economic benefit that would be derived by the final product and, as the parties committed themselves to the project, it gained a self-sustaining momentum that would have been embarrassing to derail. Nevertheless, the cooperation relied, to a remarkable degree, on trust and on hope. Steinbaugh later wrote that "throughout the extensive negotiations before and during the construction of this bridge there has been nothing in writing to bind either country to go through with its part of the bargain to build the bridge. . . . All understandings between the United States and the Dominion Government and between Ontario and Michigan were strictly gentlemen's agreements."[49]

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[46] "When Sarnia Broke Ground for the International Bridge," *Sarnia Canadian Observer*, [June 1937]; "Progress in Construction of Blue Water Bridge," *Michigan Contractor and Builder* 32 (27 August 1938): 4; "Sarnia Span Work Begun; International 'Love Feast' Marks Ceremony," *Port Huron Times Herald*, 15 July 1937.

[47] George Hunter, *Port Huron Times Herald*, to Ross Gray, Cowan, Gray and Millman, 29 June 1937, typed letter in Blue Water Bridge File, LCPL.

[48] Frank Masters, Harrisburg, to Ross Gray, Sarnia, 2 April 1937, typed letter in Blue Water Bridge File, LCPL.

[49] Steinbaugh, "The Blue Water Bridge," *Proceedings of the Twenty-fifth Annual Highway Conference*, 12.

Construction Begins

By the time of the ground breaking, John R. Giese had settled in at Port Huron as resident engineer for Modjeski and Masters. Giese, who made his home in Louisville, Kentucky, had begun working for the firm after graduating from Harvard University in 1926. A newspaper profile observed that "on Mr. Giese's shoulders rests the responsibility of making sure the contractors fulfill in every way the plans and specifications." His counterpart at the Michigan Highway Department was L. Bruce Henderson, who had five years of experience as a project manager before he was appointed to supervise construction of the American approach, plaza and access roads at Port Huron. A.A. Smith, chief engineer for the Ontario Department of Highways, oversaw work on the Canadian side.[50]

The first major construction phase focussed on the piers for the main span. The contract for this work, which was to be completed by 18 December, was awarded to a joint venture of the Missouri Valley Bridge and Iron Company of Leavenworth, Kansas, and the Kansas City Bridge Company for $217,070. Both firms had been active in bridge construction since the 1870s. The superintendent of construction, Herbert H. Brandt, and his assistant, Charles F. Greever, were from Missouri Valley Bridge. The 39-year-old Brandt claimed nineteen years of bridge-building experience, having worked on a number of substantial structures in the southern United States and Mexico. Greever, who came out of the University of Kansas with an engineering degree just as the Depression hit, returned to Missouri Valley Bridge, where he had worked during the summer since he was sixteen. The pair had previously managed pier construction for the San Francisco-Oakland Bay Bridge, which required 235-foot caissons. Although less challenging technically, the Blue Water project presented unusual problems. Greever commented that "the peculiar part of this job . . . is working under the laws, regulations, and customs of two governments at the same time." Brandt added that "we have had quite a few snarls to untangle," including passport problems for superintendents and other project managers who crossed the border repeatedly.[51]

Actual construction got underway in July, when contractors began working on the foundation for the piers. Each pier rested on two cylindrical concrete caissons, measuring 24 to 26 feet in diameter, which were formed on steel cutting edges. As each caisson sank 100 feet to bedrock, additional concrete sections were added on top. Cranes scooped dirt and debris from the caisson's hollow core, which was eight feet in diameter, to facilitate the lowering. Friction between the caisson and earth was reduced by shooting jets of water through pipes embedded

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[50] "Would be Toll Free after Bonds Paid," *Sarnia Canadian Observer*, 26 February 1937; "Key Men of Bridge Work," *Port Huron Times Herald*, [1938?]; Pratley, 11.

[51] "Principal Bridge Contractors," *The Sarnia Herald*, 8 October 1938; "56 Footings are Finished," *Port Huron Times Herald*, 30 June 1937; Pratley, 11; Victor C. Darnell, *Directory of American Bridge-Building Companies, 1840-1900*, Occasional Publication No. 4 (Washington, D.C.: Society for Industrial Archeology, 1984), 17-18, 30; "Blue Water Span Superintendents are Old Hands at Bridge Building Business," *Port Huron Times Herald*, [1937].

in the concrete. Contractors could also force air through the pipes to slow settlement if one side was sinking too fast, tilting the caisson out of plumb.[52]

Work went smoothly on the Canadian side. By late September, a diver from the Sinmac Company, Sarnia, removed the last fragments of dirt from between the caissons and the bedrock to ensure a solid connection. The Port Huron caissons, however, were snagged by ancient logs buried 45 to 90 feet beneath the surface. Local geologists speculated that the logs had been deposited by glaciers 20,000 years earlier. Divers worked with pneumatic chisels inside the caisson well to cut away the obstruction. The American side also presented the challenge of a 25-foot-deep layer of heavy clay, compared to about four feet on the Canadian bedrock. Early in September, when a section of concrete was being added to the top of the southern caisson, "clay near the bottom of the pier gripped the concrete cylinder" and "attempts to free the pier by water, forced through jets in the steel cutting edges at the base of the pier, were unsuccessful." Divers were also unable to break the clay's hold. The caisson was buoyed by water in and around it, which reduced the effective weight of the concrete mass by about one-third. Still frustrated, the contractors attempted to pump water out of the caisson in November to make a dry work space for an excavation crew. The pumping proved unsuccessful, so the divers continued their laborious efforts. The last caisson finally rested on bedrock by 26 December.[53]

After each caisson had settled, concrete was poured into the core through a 100-foot-long tube ten inches in diameter. Displaced water flowed out of the top of the caisson. When concrete filled the lower 25 feet of the caisson, water was pumped out of the remaining core and the entire length packed solid with concrete. The caissons supported 50-foot-tall, cast-in-place concrete piers. Because of the delays in sinking the caissons, the American main pier was not completed until mid-January, about a month behind schedule.[54]

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[52] "Progress in Construction of Blue Water Bridge," 4;"Bridge Pier Sinking Completed," *Port Huron Times Herald*, [November? 1937]; Steinbaugh, "The Blue Water Bridge," *Michigan Engineer*, 21-22.

[53] "Bridge Builders Steadily Overcome Handicaps on Canadian Approach Site," *Port Huron Times Herald*, 25 September 1937; "Logs 20,000 Years Old found in Excavations for Main Span Piers," *Port Huron Times Herald*, 17 October 1937; Steinbaugh, "The Blue Water Bridge, *Michigan Engineer*, 21-22; "Clay Bed Hinders Bridge Operations on American Side," *Port Huron Times Herald*, [December 1937]: "Main Bridge Pier Refuses to Settle, Water is Blamed," *Port Huron Times Herald*, 8 September 1937; "New Attempt Made to Sink Pier of Bridge," *Port Huron Times Herald*, 23 November 1937; "Span Workers Ignore Storm," *Port Huron Times Herald*, [December 1937]; [Frank Masters], "The Blue Water Bridge between Port Huron, Michigan and Sarnia, Ontario," [1938], typed manuscript apparently prepared for *The Canadian Engineer*, microfilm reel 125, MM.

[54] "Bridge Builders Steadily Overcome Handicaps"; "56 Footings are Finished"; Poersch, 17; [Frank Masters], "The Blue Water Bridge between Port Huron, Michigan and Sarnia, Ontario," [1938], typed manuscript apparently prepared for *The Canadian Engineer*, microfilm reel 125, MM.

Approaching the Bridge

Preparing the foundation for the approach spans was a large undertaking, but not as dramatic as the caisson work. Grace Builders' Supplies of Sarnia advertised that it "moved 80,000 cubic yards of earth and fashioned the ground for the Canadian approach and buildings." Footings for the approach spans were supported by eight-foot-tall concrete pedestals, five feet of which were buried in the ground. Measuring six feet by six feet at their base, the pedestals tapered to five feet square on top. Steel plates embedded in the pedestals securely moored the steel bents above. E.C. Noland and Son of Detroit, contractor for the substructure of the American approach, began working on the footings on 24 June. The firm completed the last of the 63 pedestals on 30 August, two weeks ahead of schedule, earning $15,050 for their effort. Work went more slowly on the 73 pedestals required for the Canadian approach, which crossed a swampy area with patches of quicksand. Water rose above the oak pilings which had been driven to give additional support for some of the footings. Pumps dried the area before the footings were poured, then again before the pedestals were added. The Russell Construction Company, Toronto, finished the $69,000 project in mid-October.[55]

The Sarnia Bridge Company was hired to erect the 2,750 tons of steel required for the Canadian approach. Founded in about 1905 by the owners of a Port Huron ship-building company, the firm's name was changed from the Jenks-Dresser Company when A.A. Dresser retired in 1910. The Sarnia Bridge Company was active in bridge construction in Ontario and Michigan, and supplied fabricated steel to bridge and building contractors across Canada.[56]

Modjeski and Masters had originally specified rolled beams for most of the structural members in the approach spans. Canadian mills, however, were incapable of producing larger rolled members, so Monsarrat and Pratley redesigned the eastern approach to use built-up sections. Dominion Foundries and Steel Ltd. of Hamilton, Ontario, provided all the steel plate, and Algoma Steel Corporation Ltd., Sault Ste. Marie, Ontario, supplied angles and other components. The Hamilton (Ontario) Bridge Company fabricated the girders, floor beams, and larger truss members; the remainder, including the bents, was formed by Sarnia Bridge. This economic chauvinism was justified as a means of alleviating massive Depression-era unemployment: the Blue Water order, for example, meant 60,000 man-hours of work for laborers at the Dominion Foundries. Although the bridge was not seen primarily as a relief project, the employment opportunities generated by the construction were jealously guarded by each country.[57]

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[55] Advertisement for Grace Builders' Supplies and article on "Principal Bridge Contractors" in *The Sarnia Herald*, 8 October 1938; "56 Footings are Finished"; "Piers for American Approach to Bridge are Completed Today," *Port Huron Times Herald*, 2 September 1937; "Bridge Builders Steadily Overcome Handicaps."

[56] "Started on Small Scale Fifteen Years Ago," 24 April 1920, n.p., photocopy of newspaper article in Sarnia Bridge Company file, LCPL.

[57] "Fabrication and Erection," 11-12.

The Sarnia Bridge Company started work on the approach in the midst of a December storm. Hundreds of spectators were undeterred by the cold and snow. The first span consisted of four 60-foot steel girders, each tipping the scale at eight tons. These girders extended from the abutment at the toll plaza to the most easterly approach bent. Rail cars delivered the girders and floor beams to a siding along the approach, where a 100-foot derrick raised the material into position on the piers. When the structure reached sufficient length, the derrick was replaced by a traveling crane situated on top of the approach. To erect the longer truss spans, the contractor used two portable, adjustable bents. Each bent was made from two braced steel columns with sliding caps and bases. The bents were positioned at the first two panel points and the truss members were erected to the furthest bent. The first bent was then removed and relocated to support the third panel point. The bents thus alternated as the truss, self-supporting except at its western end, was extended. Truss members were secured with pins and bolts, which were replaced by rivets when all members of the truss were in position. By May 1938, steel had been erected up to the tower for the final 260-foot truss, which would connect to the anchor arm, and the Russell Construction Company of Toronto was pouring the 7.5-inch concrete floor for the approach.[58]

On the other side of the river, the Michigan State Highway Department had accepted the Wisconsin Bridge and Iron Company's $386,575.90 bid to build the U.S. approach in mid-August. The firm's main office and fabricating plant were in Milwaukee, where the company had been established half a century earlier. In 1908, Wisconsin Bridge opened a branch office in Detroit under the management of engineer W.T. Curtis, who had studied at the University of Michigan. The company built a number of structures in Michigan, including three lift bridges over the River Rouge and the graceful Belle Isle Bridge in Detroit; the Mortimer Cooley Bridge between Manistee and Cadillac; and the Seventh Street Lift Bridge in Port Huron.[59]

By December 1937, Wisconsin Bridge had started erecting the Michigan approach, which required about 2,500 tons of steel. A caterpillar crane "with its 135-ft. lifting arm or 'boom' . . . picked up the heavy girders, columns, etc., raised them high in [the] air and lodged them in precise positions." The company was finished with five of the thirty spans by mid-February. With good weather, the company hoped that crews working at full speed could complete three spans every two days. While this prediction proved overly ambitious, the company made steady progress. By 12 March, they had reached the half-way point, with fifteen spans to go. On 31

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[58] "Important Contract Awarded to the Sarnia Bridge Co.," *The Sarnia Herald*, 8 October 1938; "Span Workers Ignore Storm," *Port Huron Times Herald* [December 1937]; "Span Sections to be Linked Next Week," *Port Huron Times Herald*, [May 1938]; "Fabrication and Erection," 11-12.

[59] "Principal Bridge Contractors," *The Sarnia Herald*, 8 October 1938; "Wisconsin Company Pioneers in Steel Construction," *Michigan Contractor and Builder* 32 (27 August 1938): 6; "Wisconsin Bridge and Iron Company Built Approach," *Michigan Roads and Construction* 35 (13 October 1938): 6, 14.

May, work began on the truss span immediately west of the anchor tower, the last part of the approach to be erected. Workers drove the last rivet early in July.[60]

In addition to placing stringers and girders for the spans, Wisconsin Bridge installed the railings, light poles, and brackets for the sidewalks. The firm subcontracted the concrete work to E.C. Nolan and Company, which had completed foundation work for the approach. Nolan crews began to lay the concrete roadway on 15 April, and anticipated completion by the end of June. Cement used for the concrete on the American side was manufactured at the Peerless Cement Company's Port Huron plant, located just south of the bridge approach. Originally known as the Egyptian Cement Company, the firm had been founded by Maynard Smith, one of the early bridge promoters.[61]

Crossing the Saint Clair

By far the biggest and highest-profile contract was for fabricating and erecting the main structure. Bids were due at the bridge commission's office in Port Huron on 3 August 1937. Proposals were based on a per-unit price for eight items: 9,500,000 pounds of metalwork for the main bridge superstructure; 508 cubic yards of reinforced concrete roadway slab over the anchor towers and arms; 29,043 square feet of lightweight roadway floor between the main piers; 153 cubic yards of sidewalk and curb; 160,000 pounds of reinforcing steel for the sidewalks, curbs and roadway; navigation lights, wiring, and installation; 700 linear feet of precast white traffic markers; and 880 cast-in-place white traffic markers. The call for bids noted that the substructure was scheduled to be finished by 11 December, and "it is intended that the work on the superstructure will be started as soon as the main piers 'M' and 'C' are ready to receive steel." Within 270 days after erection began, the bridge was to be "ready to receive traffic."[62]

Rail freight costs put Canadian contractors at a disadvantage. The rate to ship steel to Port Huron from the mills in Pittsburgh, for example, was 29 cents per 100 pounds; to Sarnia, it cost 34 cents. John Cowan and Ross Gray lobbied the Canadian National Railroad to give the Sarnia

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[60] "Wisconsin Bridge and Iron Company Built Approach," 6; "Harvey, Forbes to Prepare Plans for Bridge Building," *Port Huron Times Herald*, 17 August 1937; "Progress in Construction of Blue Water Bridge," 4; "Approach Steelwork to be Completed by March 15, Prediction," *Port Huron Times Herald*, 21 February 1938; "Progress on International Bridge," *Michigan Contractor and Builder* 36 (12 March 1938): 8; "Concrete Pouring on Plaza will be Started Next Week," *Port Huron Times Herald*, 19 April 1938; "Last Approach Span is Begun," *Port Huron Times Herald*, 31 May 1938; "Steelwork on Main Span is 75 Per Cent Completed," *Port Huron Times Herald*, 4 May 1938; Poersch, 25.

[61] "Span Sections to be Linked Next Week"; "Work on Canadian Plaza of Bridge to Start Next Week," *Port Huron Times Herald*, 22 April 1938; "Work on Bridge Roadways to Start in April," *Michigan Contractor and Builder* 36 (26 March 1938): 8; "Co-operation of Many Varied Entities Makes Bridge Actuality," *Michigan Roads and Construction* 35 (13 October 1938): 5; Poersch, 81.

[62] State Bridge Commission of Michigan, *International Highway Bridge over the St. Clair River . . . Main Bridge Superstructure, Contract No.* 2, July 1937. In Ontario Ministry of Transportation Archives, Downsview.

Bridge Company a competitive rate. Cowan argued that the contract "will mean possibly $800,000.00 more business for Sarnia and labour running into between $300,000.00 and $400,000.00, and it would also mean a large amount of freight for the C.N.R. which might easily go around by the American side and not come through Canada at all. In other words, the C.N.R. might be circumvented."[63]

Despite these efforts, the American Bridge Company of Pittsburgh, a subsidiary of the U.S. Steel Corporation, won the award in mid-August 1937 with the low bid of $767,279.39. Company officials C.W. Doerr and H.B. Van Hook reviewed construction plans with the bridge commissioners and resident engineer Giese in October. By that time, steel fabrication was already underway at the Gary, Indiana, plant of U.S. Steel, with the first rail shipment expected to arrive in Port Huron early in 1938. W.J. Ward, who claimed thirty years of bridge-building experience, supervised the erection for American Bridge. He was assisted by W.F. Beeman, another long-term veteran of the business, who had graduated from Michigan State College in East Lansing in 1926. The team had served the company in the same capacity in California on the construction of the San Francisco-Oakland Bay Bridge.[64]

For the Saint Clair River crossing, the first step was to construct the 115-foot anchor towers between the anchor arms and the approach spans. A crane with a 135-foot boom positioned the components of each tower, then lifted a derrick to the top to raise materials for the superstructure. Work began first on the Canadian side, with the derrick in place by the end of February. Tower construction was delayed in Port Huron until a railroad spur line was laid along the riverbank to carry steel to the base of the main pier.[65]

Construction proceeded through the winter. The area's climate posed a constant challenge. "The bridge site," a business journal reported, "is one of the coldest places in Michigan winter or summer. Veteran steel workers, who will piece the main span superstructure together, working as high as 250 feet in the air, face a frigid task."[66]

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[63] John [Cowan], Sarnia, to Ross Gray, Montreal, 4 June 1937, typed letter in Blue Water Bridge File, LCPL.

[64] "Impressive River-Crossing," *Michigan Roads and Constructian* 35 (20 October 1938): back cover; "Harvey, Forbes to Prepare Plans;" "Co-operation of Many Varied Entities Make Bridge a Reality," 5.

[65] "Harvey, Forbes to Prepare Plans"; "Work on Bridge Superstructure to Start in January," *Part Huran Times Herald*, 8 October 1937; "First Steel on American End of Span Superstructure to be Placed This Week," *Port Huron Times Herald*, [1938]; "First Steel on U.S. Side," *Port Huran Times Herald*, [5 February 1938?]; "Work on Bridge Superstructure is Resumed Today," *Port Huran Times Herald*, 23 February 1938; "W.J. Ward," *The Sarnia Herald*, 8 October 1938.

[66] "'Blue Water' Bridge Work to be Continued," *Michigan Manufacturer and Financial Record* 61 (1 January 1938): 3.

By mid-April 1938, the American Bridge Company had linked the Canadian anchor tower and pier, and began erecting the first panels of the center span over the Saint Clair River. Work lagged slightly on the American side, where the arm from the anchor tower rested on falsework 125 feet from the main pier. Soon, however, the main span began to emerge from both piers. Dolly cars on a standard railway track brought steel from the anchor tower to a travelling derrick, which positioned the panel members. As panels were finished, the derricks crept along the newly placed top chords, suspended without falsework over the rushing water below.[67]

Excitement grew as the derricks inched toward each other, slowly narrowing the gap between the U.S. and Canadian sides. On the afternoon of 25 May, a 75-foot-long beam connected the southern lower chord and, a local newspaper reported, "a cheer went up from several hundred spectators on both sides of the river." Because it was Victoria Day, a national holiday in Canada, an American bridge worker had to be hoisted to the eastern side of the span to bolt the beam on that end. Resident engineer Giese proudly reported that "the steelwork [met] at the center of the span on schedule and with extreme accuracy." A more formal celebration was organized on 28 May when connecting sections were riveted together. Varnum Steinbaugh and Ross Gray extended goodwill greetings from their respective nations. The National Broadcasting Company and the Canadian Broadcasting Company beamed the ceremony across North America.[68]

After the final members of the truss were secured, the travelling crane laid steel flooring in place. Workers welded the "I-Beam-Lok" flooring, produced by the Carnegie-Illinois Steel Corporation, to the stringers. American Bridge subcontractors Couse and Sanders of Detroit then finished the deck with concrete. Workers poured the four-inch floor slab on the western half first, then moved the concrete plant to the Canadian shore to finish the other side. According to Steinbaugh, concrete for both the main span approaches "was mixed on the ground and hoisted by cranes to the deck level where it was buggied into place."[69]

Ports of Entry: The Plazas

Modjeski and Masters were responsible for laying out the plazas, which proved almost more difficult than designing the main structure. Although there had been customs facilities in Port Huron and Sarnia for many years, officials on both sides seemed perplexed about the impact of

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[67] "Bridge Construction," *Michigan Contractor and Builder* 31 (9 April 1938): 3; J.R. Giese, Port Huron, to Grant Maloney, editor, *Canadian Engineer*, Toronto, 3 October 1938, typed letter, microfilm reel 125, MM.

[68] "Newest Link between U.S. and Canada Forged," *Port Huron Times Herald*, 25 May 1938; "Blue Water Bridge Spans Linked," *Michigan Contractor and Builder* 32 (4 June 1938): 4; John R. Giese, "Comments on Construction," *The Canadian Engineer* 75 (11 October 1938): 8.

[69] "Impressive River-Crossing," back cover; *Sarnia Canadian Observer*, 25 July 1938; "Center Span S[oon] to be Comple[ted]," *Port Huron Times Herald*, [August? 1938]; Steinbaugh, "The Blue Water Bridge," *Michigan Engineer*, 21-22.

the new bridge on their operations. In January 1937, C.W. Hanson, assistant engineer with Modjeski and Masters, had a frustrating visit to the customs facilities in Port Huron:

> The customs have no detailed information regarding the length of time required for the various operations on the plaza, and they all seem to agree that the results of a survey of this nature would not be applicable to all the seasons of the year and figures from one location would not apply to another, due to variations in the relative volumes of local and thru traffic.

En route back to Harrisburg, Hanson observed customs operations in Detroit and at the Peace Bridge in Buffalo, New York. He determined that Detroit's Ambassador Bridge was the best model for Port Huron, with appropriate adjustment for the higher traffic volume in Detroit. Hanson sent Steinbaugh a preliminary layout of the Michigan plaza in February.[70]

Plans for the plaza underwent numerous changes. In April, Masters sent Steinbaugh "a revised study of the United States Plaza, prepared along the lines of your request at the conference in Washington." Although he gives no other details of the meeting, it presumably involved federal customs officials. In the revised plans, the elevation of the plaza was lowered to create better grades for the ramps connecting to surface streets. A few days later, Steinbaugh responded that he was "well pleased with the general arrangement," but felt that "many details in connection with customs and immigration inspection and toll collection remain to be worked out." Alternatives bounced back and forth between Michigan and Pennsylvania for months.[71]

The design of the Canadian plaza presented equally difficult challenges. In August, the State Bridge Commission sent plans for the Canadian plaza to R.M. Smith, Deputy Minister of Highways. At the request of Steinbaugh, W.C. Stinson, secretary of the commission, asked Ross Gray to meet with Smith "within the next few days and endeavor to secure approval of this plan." The design remained in flux throughout the fall, however. The swampy nature of the terrain on the Canadian side prompted the engineers to further elevate the Ontario plaza. Masters wrote that "this plaza should be raised as much as possible consistent with good grades, not only to reduce the grade on the plaza, but also to be sure that the plaza when finished will be above future high waters which may occur due to works that will be constructed to maintain the lake levels."[72]

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[70] C.W. Hanson, Modjeski, Masters and Case, Harrisburg, PA, to V.B. Steinbaugh, State Bridge Commission, Port Huron, 2 February 1937, typed letter, MDOT/MSA.

[71] Frank Masters, Harrisburg, PA, to Varnum Steinbaugh, Lansing, MI, 26 April 1937, typed letter; Steinbaugh to Masters, 29 April 1937, carbon copy of typed letter; both letters at MDOT/MSA.

[72] W.C. Stinson, Port Huron, to Ross W. Gray, Sarnia, 5 August 1937, typed letter in Blue Water Bridge File, LCPL; F.M. Masters, Harrisburg, to Norman B. Forbes, Sarnia, 6 November 1937, carbon copy of typed letter, Blue Water Bridge File, LCPL.

Finally, at their meeting on 12 January 1938, the State Bridge Commissioners approved plans for the Michigan plaza by Modjeski and Masters, for the Canadian plaza by Monsarrat and Pratley, and for the buildings at each end by architects George Harvey and Norman Forbes. Political and legal considerations had forced the bridge commission to let separate contracts for designing the Canadian and U.S. plaza buildings. Norman B. Forbes of Sarnia and George L. Harvey, Port Huron, were hired in August 1937 to design and supervise the construction in their respective countries. As mayor of Port Huron, Harvey had been deeply involved with promoting the bridge. Forbes, a 1915 graduate of McGill University, had worked with Harvey from 1920 to 1932, when he established his own office in Sarnia.[73]

Proposals for constructing the plazas were opened simultaneously but separately by the Ontario and Michigan highway departments on 1 March. With a bid of $236,362.70, the H.G. Christman-Lansing Company was selected to build the U.S. plaza, which included customs and immigration facilities and the office of the State Bridge Commission. The company's construction superintendent was Homer Bair, a 23-year veteran of the firm. Bair, who had previously worked on the Fisher Office Building in Detroit and the Ford Motor Company's River Rouge Plant, had just finished managing the construction of the J.W. Knapp Department Store in Lansing. He estimated that the plaza roadway would require 2,000 cubic yards of concrete weighing over 3,500 tons. By April, the contractor had started to place the 125 footings for the plaza. Seventy-five workers built forms for casting the concrete above the footings; the first batch was poured in mid-May. Progress was slowed when the contractor had problems obtaining a sufficient quantity of reinforcing steel. The Pine Grove Avenue entrance ramp and Elmwood Street exit were paved by a local contractor, J.H. Baker and Sons.[74]

These exits emptied all traffic from the bridge onto the streets of Port Huron. The Michigan Highway Department promised a bypass for through traffic from the bridge to alleviate downtown congestion. A key link in the so-called "24th Street bypass" was an overpass just west of the bridge plaza to raise U.S. Highway 25 above Pine Grove Avenue and the Pere Marquette Railroad tracks. Funding for this structure was the first sign that the bypass, which had been in the planning stage for years, would be completed. The highway department earmarked $136,000 for the overpass from a $1.6 million federal grade separation program approved in 1938. The project was delayed, however, until the early 1950s.[75]

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[73] State Bridge Commission Minutes, 12 January 1938, photocopy MDOT/MSA; "Harvey, Forbes to Prepare Plans"; "Norman B. Forbes to Open Office," *Sarnia Observer*, 10 December 1932.

[74] "Principal Bridge Contractors"; "Approach Steelwork to be Completed"; "He's in Charge of Construction of Bridge Plaza," *Port Huron Times Herald*, 28 March 1938; "Bridge Construction," 3; "Span Sections to be Linked next Week"; "Last Approach Span is Begun"; "Work on Roadway of Bridge Plaza about Half Done," *Port Huron Times Herald*, 10 June 1938.

[75] "Piers for American Approach to Bridge are Completed Today"; "To Link Bridge with 24th St. Traffic Bypass," *Port Huron Times Herald*, [1938].

On the Canadian side, Carter-Halls-Aldinger Company received a quarter-million-dollar contract to build the plaza, roadway, and three buildings for Canadian customs and immigration services. The company, in turn, subcontracted the heating system to J. Morley Calcott, the plumbing to C. Keith White, and wiring to the Chambers Electric Company, all of Sarnia. Construction began in April 1938. The contractor erected the steel-frame buildings first, then poured concrete for the plaza deck and access roads. The buildings were faced with Queenston limestone, provided by the National Cut Stone Company of Toronto. The Canada Building Material Company, Toronto, supplied concrete for the project.[76]

The lighting was the last major contract for the project. After consulting with the Michigan and Ontario highway departments, the bridge commission specified sodium-vapor lamps. A relatively new technology, the bulbs used gas, rather than traditional filaments, to generate an amber light. The lamps, which were rated at 10,000 lumens, produced about as much light as four standard 200-watt incandescent bulbs, but required only one-quarter of the power. The lamps bathed the roadway in an even light, while cars and other objects appeared as distinct, dark shapes. The commissioners felt that this "silhouette" lighting would be superior in the foggy conditions that often engulfed the area, and would serve as an attractive beacon to distant ships. The light standards were spaced about 170 feet apart, and staggered on opposite sides of the roadway. The lighting contractor was required to supply and install the fixtures on the bridge and plazas, and also navigation lights at the piers. Proposals to complete the lighting were due on 22 June 1938. Hall Construction Company of Muskegon, Michigan, won the bid on the American side; David Moore of Windsor, Ontario, did the work for Canada. Plans for the lighting system were complicated by differences between Canada, which had 25-cycle current, and the 60-cycle current adopted by the U.S. As a result, two systems of wiring were required, and power was purchased from two sources: the Ontario Hydro-Electric System and the Detroit Edison Company.[77]

With work initiated on the lighting, the end of construction was clearly in sight. Despite occasional delays, resident engineer John Giese remarked that "we have been fortunate to have had no construction difficulties." He observed that "probably the most interesting feature of [the] construction is the surprisingly short time in which the entire structure was completed." Only fourteen months had passed between ground breaking in June 1937 and completion of the concrete deck in August 1938, "compared to the two to five years formerly required to build bridges of an equal magnitude." He attributed this "noteworthy achievement" to the team effort

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[76] "Work on Canadian Bridge Plaza Starts," *Michigan Contractor and Builder* 31 (16 April 1938): 4; "Work on Canadian Plaza of Bridge is Started Today," *Port Huron Times Herald*, 4 May 1938; "Span Sections to be Linked Next Week"; "Work on Canadian Plaza of Bridge to Start Next Week"; Poersch, 22.

[77] "Blue Water International Bridge Dedication," *Michigan Contractor and Builder* 32 (27 August 1938): 7; "Bridge Lighting System," *Michigan Contractor and Builder* 32 (11 June 1938): 14; "Sodium Vapor Lamps to Light Blue Water International Bridge," *Port Huron Times Herald*, [1938]; "To Install Sodium Vapor System," *Sarnia Canadian Observer*, 16 July 1938; [J.R. Giese], "Bridge Lighting," 19 July 1938, typed manuscript, microfilm reel 125, MM.

by the State Bridge Commission, the Ontario Department of Highways, and the Michigan State Highway Department.[78]

A Time to Celebrate

Every phase of the project had been closely followed by the press and photographers. The Michigan Highway Department even commissioned a film to document and publicize the construction. When photographers William Odum and Albert E. Murphy shot footage of the structure in May 1938, a reporter covering the visit noted that "the final chapter . . . will be made in September, when the bridge is dedicated." As it turned out, the "final chapter" came a month later than that, and only after a good deal of backstage politicking almost moved the date forward to August.[79]

Plans for the bridge dedication had begun long before construction was completed. In fall 1937, Port Huron mayor George Harvey invited President Roosevelt to attend the ceremonies. The response, written by Roosevelt's son James, promised that "while no plans have yet been made, your invitation will, of course, be given careful consideration." Early in 1938, the president made a commitment to dedicate the Thousand Islands Bridge between Ivy Lea, Ontario, and Collins Landing, New York. This event was set for mid-August, and Blue Water planners hoped he could proceed directly from New York to Port Huron. Roosevelt resisted this tight scheduling, however, and remained uncommitted regarding a later date. Hopes for his participation persisted through the end of August when, finally, word came that he would not attend. His decision was apparently motivated by political considerations. Because Michigan Governor Murphy's reelection bid was faring poorly, Roosevelt found it prudent to remain at a distance. Roosevelt's announcement reversed Canadian Prime Minister Mackenzie King's plans to join the festivities. By default, Governor Murphy and Ontario Premier Hepburn were asked to officiate. "The opening is now somewhat of an anticlimax to the one we had proposed," sighed Ross Gray, "but we cannot do anything about it."[80]

In part because of Roosevelt's equivocation, the date of the opening was uncertain until September. Earlier in the summer, bridge contractors had worried about rushing to meet a mid-August completion date. The long period of ambiguity was also a nightmare for planners, who needed as much time as possible to prepare for the proposed celebration. In July 1938, a

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[78] J.R. Giese, Port Huron, to Grant Maloney, editor, *The Canadian Engineer*, Toronto, 3 October 1938, typed letter, microfilm reel 125, MM.

[79] "Blue Water Span poses for Motion and Sound Picture," *Port Huron Times Herald*, 4 May 1938.

[80] "President Replies to Invitation to Visit Port Huron," *Port Huron Times Herald*, 16 October 1937; V.B. Steinbaugh, Michigan State Highway Department, Lansing, to Ross Gray, Cowan Cowan and Gray, Sarnia, 10 June 1938, typed letter, Blue Water Bridge File, LCPL; [Ross Gray, Sarnia] to Prime Minister W.L. Mackenzie King, Ottawa, 1 September 1938, and Ross Gray to David Mackenzie, Ottawa, 15 September 1938, carbon copies of typed letters, Blue Water Bridge File, LCPL.

"Celebration Committee" of leading citizens from Sarnia, Point Edward, and Port Huron had retained New York promoter A.E. MacKinnon to direct a gala to mark the bridge's opening. The group hoped to draw international attention to the area's attractions to stimulate the lucrative tourism industry. MacKinnon had managed similar celebrations for a number of major structures, including the Mount Hope Bay Bridge in Rhode Island, the Bear Mountain Bridge over the Hudson River in New York, the Philadelphia-Camden Bridge, the Pontchartrain Viaduct Bridge near New Orleans, and the tunnel connecting Detroit and Windsor. He had a number of ties to Michigan, having once owned a newspaper in Battle Creek and having served, for a time, as president of the Michigan Press Association.[81]

With Roosevelt out of the picture, the dedication of the $3.9 million structure was set for Saturday, 8 October. MacKinnon and the Celebration Committee pulled together a three-day extravaganza that incorporated "Blue Water Days," an annual local event. Friday night featured a coronation ball for "Miss Blue Water" and her court. On Saturday morning, four-man relay teams from the University of Detroit and the University of Western Ontario ran international greetings across the bridge. The structure was blessed by an ecumenical prayer service. In the afternoon, there was a sailboat race and boat parade on the river. The highlight of the day began around noon when Governor Murphy and other American dignitaries drove over the bridge to Canada and picked up Ontario Premier Hepburn and other prominent Canadians. The international procession then returned across the bridge, stopping midway to cut a ribbon at the international border. They continued on to the U.S. plaza, where Murphy and Hepburn addressed the crowd and, by radio, both nations from coast to coast.

Premier Hepburn's message articulated the new dread that overshadowed North Americans still struggling to recover confidence after the hard years of the Depression:

> What a strange contrast it is that we should be building on our international boundary connecting links while in European countries, with even older civilizations, there are being built on their frontiers grim fortresses facing each other in anticipation of another horrible conflict which will be so ghastly that we, in peaceful North America, can not by the wildest stretch of imagination, visualize its consequences. We might say the citizens of [the] United States and Canada write "welcome" on the mat, while the bristling armaments of Europe are ready to bark forth "they shall not pass."[82]

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[81] "Director . . . Bridge . . . Chosen Today," *Port Huron Times Herald*, 5 July 1938; "Director of Publicity on Span Arrives," *Port Huron Times Herald*, 15 July 1938; "Banner Season is Underway," *Port Huron Times Herald*, 4 August 1938.

[82] "Governor Murphy and Premier Hepburn Dedicate Bridge," *Michigan Roads and Construction* 35 (13 October 1938): 4.

Governor Murphy added: "Today we dedicate an invaluable aid to commerce and travel; we dedicate another bond of respect and fraternity between the land of the Maple Leaf and the home of the Stars and Stripes; we dedicate above all, an enduring monument to peace among us."[83]

When the speeches were finished, Murphy and Hepburn flipped switches that opened flag-festooned gates at both ends of the bridge. That afternoon, over 30,000 pedestrians took advantage of the opportunity to cross the bridge at no charge. The next day, cars were free, and the pedestrian toll of ten cents was introduced.[84]

After the ceremony, John Cowan of the Sarnia law firm Cowan, Cowan and Gray, long involved with bridge planning, hosted a luncheon for local and visiting dignitaries. Frank Masters was among those invited to attend. In a letter responding to Cowan, Masters wrote:

> Opening bridges, for the Engineer, as a rule are more or less of a headache. In fact these opening celebrations are generally very political in their character and sometimes they almost forget to invite the Engineer, so it gives me extreme pleasure to accept on behalf of Mrs. Masters and myself. . . . We will try to get there early and stay as long as possible.

Masters added that "I wanted to share a party with you and Ross [Gray]. I feel we are sort of three musketeers in this matter."[85]

Open for Business

The bridge was officially opened to traffic at 6 a.m. on Monday, 10 October. In the first 24 hours, it carried 2,000 cars and 6,775 persons. Slightly more than half of that total (1,069 cars and 3,747 people) were going from Canada to the United States; the remainder were travelling east. After a week of operation, the bridge had logged 11,238 vehicles, "a 160 per cent increase over the traffic carried by the ferry boats during the corresponding week of last year." After the bridge opened, the ferries stopped carrying automobiles. Passenger service continued for over a year, until the bridge commission began offering regularly scheduled buses between Port Huron and Sarnia and ferry operations were terminated.[86]

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[83] "Governor Murphy and Premier Hepburn Dedicate Bridge," 4.

[84] "Blue Water International Bridge Celebration Schedule," *Michigan Contractor and Builder* 32 (8 October 1938): 3; "Governor Murphy and Premier Hepburn Dedicate Bridge," 4.

[85] Frank Masters, Harrisburg, to John Cowan, Cowan Gray and Millman, Sarnia, 3 October 1938, typed letter, Blue Water Bridge File, LCPL.

[86] Poersch, 36-37; "Bridge Crossers Pay $1,600 during First Business Day," *Port Huron Times Herald*, 11 October 1938; "Heavy Traffic Marks First Week for Blue Water Bridge," *Michigan Roads and Construction* 35 (20 October 1938): 40; Poersch, 35.

The bridge quickly proved itself worthy of the decade-long struggle for its creation. Bridge commission chairman Varnum Steinbaugh observed that "a great tourist loop through Michigan and Ontario is being forged . . . with the Blue Water Bridge as its first link." Steinbaugh also noted that "the importance of this bridge as an example for future construction of a similar type in Michigan can hardly be overestimated." Specifically, he referred to a bridge at the Mackinac Straits. Modjeski and Masters were engaged in 1938 to analyze the financial and structural feasibility of bridging the straits. After two years of study, their answer was affirmative. Although the bridge was not built until the 1950s, the success of the Blue Water Bridge and the role of the bridge commission served as useful precedents.[87]

While the benefits of Blue Water were immediately apparent, however, the project was less sanguine for Steinbaugh. He partook of the opening ceremonies, then resigned from the bridge commission and the highway department effective the end of October, citing ill health. Highway Commissioner Van Wagoner accepted his resignation with regret, and made Steinbaugh a consultant to the department on a $2,000 a year retainer.[88]

The excitement of the opening festivities quickly faded. The bridge remained in the spotlight for a few years, however, because of accusations against former state treasurer Frank D. McKay. McKay had received a $92,300 fee from Stranahan, Harris Company related to the construction bonds they sold for the bridge. There was an appearance of impropriety because no other investment houses were invited to bid on the bonds. McKay maintained that he had worked with the bond house on a contingency fee basis after his term as treasurer ended. He received the fee when he succeeded, after five years of effort, to revive plans for the bridge, and the company closed on the bond sale. After conducting an investigation, State Attorney General Thomas Read concluded that there was no evidence of misconduct. Subsequently, the state legislature appointed a House committee to look into the highway department's funding of the Port Huron approach span. Apparently, nothing came of the probe.[89]

The bridge suffered a financial setback during the World War II when traffic decreased from over 310,000 vehicles in 1939 to a low of 170,000 in 1943. Due to the resulting drop in revenue, the bridge commission could pay only interest, not principal, on the bonds. Significantly lower interest rates in 1945 justified retiring the original 4.25 percent bonds with proceeds from a $2.2 million reissue at 2.3 percent. Toll income rebounded within a few years, with traffic jumping to a record 534,000 vehicles in 1947. Revenue exceeded expectations to

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[87] Steinbaugh, "The Blue Water Bridge," *Proceedings of the Twenty-fifth Annual Highway Conference*, 12; "Mackinac Straits Project," Exhibit No. 23, Modjeski and Masters, "Brochure Presenting Experience and Qualifications on and for Heavy Construction Projects of Modjeski and Masters, Consulting Engineers," [1943], typed manuscript at MM.

[88] Steinbaugh, "The Blue Water Bridge," *Michigan Engineer*, 20; "Steinbaugh Resigns State Highway Post," C.

[89] "Bridge Probe seen Complete by Dickinson," *Port Huron Times Herald*, 24 April 1939; "Statement of Frank D. McKay," *Port Huron Times Herald*, 21 April 1939; "Legislators Close Bridge Inquiry Here," *Port Huron Times Herald*, 7 June 1937.

such a degree that in 1951, the ten-cent charge for passengers was dropped. The fee for a car and driver was lowered from 60 to 50 cents in 1954. Five years later, the toll was slashed to 25 cents, and regular users could purchase a ten-coupon book for two dollars. Higher traffic levels continued to generate sufficient revenue to cover maintenance, interest costs, and the required amount of bond principal reduction.[90]

The bridge commission used the increased income for maintenance that had been deferred during the war, and for improvement projects that were demanded by the greater volume of traffic. In an analysis completed in 1952, Modjeski and Masters concluded that "the facilities for handling vehicles through the Customs and Immigration lanes have reached the practical saturation point." Even before the report was submitted, plans to upgrade the plazas were underway. On the American side, a 56-foot-wide extension was built to support two additional traffic lanes and another toll booth on the plaza level, while expanding cattle-processing operations below. This was done in conjunction with the highway department's construction of the long-awaited bridge over Pine Grove Avenue just to the west. A new public restroom was also added to the plaza. In the following year, maintenance facilities beneath the American plaza were improved. During the same period, the Canadian plaza was widened, more toll booths were installed, a new maintenance building was constructed, and other buildings were expanded.[91]

While the bridge structure required only routine maintenance, its once state-of-the-art lighting system did not age well. An inspection report by Modjeski and Masters in 1952 concluded that "the present roadway lighting equipment on the Blue Water Bridge has become obsolete in recent years. Repair parts are difficult to obtain because replacements are no longer carried in stock by the manufacturers." The firm recommended that the highway department investigate "a modern lighting system that would be more efficient in operation and more easily maintained." In 1956, the commission called for bids based on plans prepared by Modjeski and Masters and, for the Canadian side, Monsarrat and Pratley. Vogel Electric of Port Huron and Johnson-Turner Electric of Sarnia got the contracts with bids of $114,447 and $103,500, respectively.[92]

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[90] Correspondence and other information about the 1945 bond refunding is in Boxes 2 and 3 of Record Group 86-40, MDOT/MSA. Other references for this paragraph are: "534,027 Vehicles Cross Bridge in '47 for Record," *Port Huron Times Herald*, 11 January 1948; Bernard P. Lyons, "Postwar Traffic Pickup Changed Bridge Picture," *Port Huron Times Herald*, 20 February 1962.

[91] "Blue Water Bridge Fares to be Cut 10 Cents Jan. 1," *Port Huron Times Herald*, 17 December 1953; Lyons, "Postwar Traffic Pickup"; Modjeski and Masters, "Report: Improvements, The Blue Water Bridge," prepared for the State Bridge Commission, June 1953, page 5, typed manuscript at MM.

[92] R.J. Stickel, Modjeski and Masters, "Inspection Report for Blue Water Bridge," 10 June 1952, page 7, typed manuscript, MDOT/MSA; State Bridge Commission Minutes, 28 September 1956, typescript, MDOT/MSA.

The Battle of the Tolls

While the success of the bridge during the 1950s vindicated those who had struggled to see it built, "it became increasingly clear to members of the Bridge Commission that the expansion of facilities and the increase of traffic were generating trouble for the future," according to a local newspaper. As long as the commission received income from tolls, they could comfortably sustain the operation of the bridge. The course was less clear, however, once the bonds were retired. At that time, the bridge was supposed to become a free crossing, but the commission had no other source of funds to meet the substantial maintenance costs required to keep the structure in safe condition. In addition, attempts to charge rent and utility costs to the U.S. Customs Service and the Department of Agriculture for the space they occupied at the American plaza led to a lawsuit, which the commission lost at the U.S. Court of Appeals.[93]

With the bond indebtedness amortizing rapidly, the Michigan legislature moved in 1955 to amend the act that had created the bridge commission. The change permitted the commission to assess tolls to cover necessary maintenance. Based on this amendment, the commission continued to collect tolls when the bonds were paid off in June 1961. Congressional approval for the project, however, had stipulated that the bridge be free after construction debt was retired. Because of this provision, the U.S. Bureau of Public Roads threatened to cut all federal highway aid to the state. After protracted analysis of the issue, Governor John Swainson ordered the commission to stop collecting tolls as of 1 March 1962.[94]

Reserve funds were drawn down to cover maintenance costs. These funds were nearly depleted a year later, when the Michigan legislature passed a law permitting expenditure of highway department funds for the bridge. This was not a successful solution, however, since "supporting the costs of maintenance and operations from gas and weight tax funds proved a financial burden."[95]

The action was also not sufficient to mollify the Canadians, who had grown increasingly concerned about the bridge's upkeep. Going on the offensive, the Canada government began charging a 25-cent toll in August 1964 for traffic travelling in either direction. This sparked a virtual border war. American politicians protested that by supporting the bridge with both tolls and taxes, their citizens were paying twice as much for maintenance as were the Canadians. They also claimed the moral high ground in desiring a toll-free bridge. Senator Patrick McNamara, who represented Michigan and chaired the Senate Public Works Committee,

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[93] Lyons, "Postwar Traffic Pickup."

[94] Lyons, "Postwar Traffic Pickup"; "New Michigan Constitution Prompts Move," *Port Huron Times Herald*, 1 December 1965.

[95] J.P. Woodford, Michigan Department of State Highways and Transportation, Lansing, to Congressman David B. Bonior, Washington, D.C., 11 December 1978, typed letter, MDOT/MSA.

remarked: "The fact that Canada has re-imposed tolls does not make it ethically right for us to follow suit."[96]

A reorganization of the state bureaucracy was the first step in bringing resolution to the conflict. Michigan's new state constitution, adopted in 1965, consolidated 120 separate governmental units into eighteen departments. The bridge commission was among the agencies abolished. Its responsibilities were taken over by the newly named Department of State Highways, and its once independent staff became civil servants. The bridge was put under the care of the department's Bridge Maintenance Division. The simmering border dispute was not settled, however, until 1970, when the U.S. Congress passed a law permitting the state to collect tolls on the bridge. First, though, the state had to repay the $348,000 federal grant given in 1937 to fund the road to the approach. That sum was returned to the U.S. Treasury in the following year and, by September 1971, the Michigan toll collectors were back in business.[97]

The Fiftieth Anniversary: A Time of Transition

In 1988, the bridge celebrated a half century of service. The decade of the 1980s also brought controversy and change. In 1986, for example, the highway department decided to clean off the many layers of paint applied over the years to protect the structure's metal surfaces. The sandblasting covered houses and cars near the approach with a thick coat of dust. Local residents worried that the fallout contained hazardous materials, particularly lead paint, and complained about the noise generated by the equipment. Some sued the department and the contractor. Their lawyer charged that the sandblasting made the houses unmarketable: "If you were looking for a house to buy and you heard about the toxic materials that fell in this area, would you buy one?"[98]

The long-term implications of another event, however, were even more significant: in 1984, Interstate 69 connected Lansing and Port Huron. It was complemented by Canada's Route 402, a new four-lane expressway extending east from Sarnia. Together, these highways created a short-cut between Chicago and Toronto that avoided Detroit. In addition, Blue Water accepted trucks carrying hazardous wastes, which weren't permitted at any of the Detroit crossings. The popularity of the new route catapulted the Blue Water Bridge into the fourth-busiest crossing between the United States and Canada. Traffic increased by 65 percent between 1984 and 1989. In the latter year, the bridge carried about 4.6 million vehicles. The U.S.-Canada Free Trade

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[96] "New Michigan Constitution Prompts Move."

[97] "New Michigan Constitution Prompts Move"; J.P. Woodford, Michigan Department of State Highways and Transportation, Lansing, to Congressman David B. Bonior, Washington, D.C., 11 December 1978, typed letter, MDOT/MSA; Michigan State Highway Commission press release regarding toll collections, 1 October 1971, MDOT/MSA.

[98] Steve Sibula, "Residents Blast Cleanup," *Port Huron Times Herald*, 10 July 1986; Steve Spalding and Steve Sibula, "Bridge Area Families File Lawsuits," *Port Huron Times Herald*, 10 October 1986.

Agreement, signed in 1988 and effective the following January, promised to further stimulate border crossings. According to an 18-year veteran of the Michigan Highway Department, "the traffic has become unbelievable."[99]

Inspection of truck freight caused massive delays at the Port Huron plaza. The inadequacy of the customs area had been noted as early as 1973, when a U.S. customs official informed the Michigan Highway Department that "it is imperative that expansion of the truck facilities . . . begin as soon as possible in order to be able to take care of current imports properly and also take care of future increases in the trucking import business." The official noted that truck traffic over the bridge had jumped by 700 percent since 1966.[100]

The growing number and duration of traffic jams at the bridge infuriated long-time users. A Canadian customs officials observed that "people who are used to quickly crossing the bridge are now facing a culture shock when they see all the traffic backed up on the bridge." A $30 million project to triple the size of the elevated U.S. plaza was scheduled to begin in 1988, but funding cut-backs postponed the work for two years. In the early 1990s, the "city in the sky" was essentially rebuilt with new facilities for customs and bridge administration, new customs and toll booths, new roads, sidewalks and access ramps, and a greatly expanded area for truck cargo inspection. Ultimately, the budget grew to over $40 million.[101]

The plaza renovation eased the congestion, but a larger problem remained: the Blue Water Bridge was reaching maximum capacity. By 1993, the Michigan Department of Transportation was committed to building a companion span immediately to the south of the original bridge. It turned again to Modjeski and Masters to lead the planning, with Buckland and Taylor Ltd. of Vancouver, British Columbia, serving as their Canadian counterpart. The *Port Huron Times Herald* invited area residents to vote on alternatives for the design. The overwhelming majority, some 75 percent, wanted a duplicate of the 1938 span. The Department of Transportation, however, preferred a continuous tied-arch design, which would be significantly less expensive to build and maintain. The Michigan Bureau of History concurred with the department, believing that a duplicate span would create a false sense of history. Ultimately, the tied-arch design was selected. The arch of the new structure will echo the profile of the original bridge.

In October 1994, the federal government committed $34.8 million to the project, representing about 45 percent of the estimated $70 to $75 million cost. The state of Michigan promised to

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[99] Sevil Omer, "Blue Water Bridge ranks as 4th Busiest Crossing on Border," *Port Huron Times Herald*, 12 September 1990.

[100] Joseph Grubach, Acting District Director of Customs, Detroit, to Warren Shaw, Michigan State Highway Department, Port Huron, 10 August 1973, typed letter, MDOT/MSA.

[101] Omer, "Blue Water Bridge ranks"; Steve Sibula, "Bridge Plaza Delayed," *Port Huron Times Herald*, 27 August 1987; "Revamping the Plaza," *Port Huron Times Herald*, 26 August 1989; Mary Lou Creamer, "Plaza: City in the Sky," *Port Huron Times Herald*, 10 May 1993.

cover five percent of the total amount, and the Canadian government agreed to shoulder the remaining fifty percent. Construction is scheduled to begin in spring 1995, and be completed by summer 1997. Because the bridge has been declared eligible for the National Register of Historic Places, it was necessary to mitigate the impact of the new construction. This Historic American Engineering Record study has been completed as part of the mitigation.[102]

[102] Mary Lou Creamer, "Blue Water Bridge Plans Rush Forward," *Port Huron Times Herald*, 29 August 1993; Mark Andrejevic, "Readers: Duplicate Existing Bridge," *Port Huron Times Herald*, 21 October 1993; Tracy Wilson, "Washington Finds $34.8M for 2nd Span," *Port Huron Times Herald*, 28 October 1994.

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Engineering Drawings

Michigan Department of Transportation Collections. Michigan State Archives, Lansing.
This collection has a few plans, but most cover later remodeling work.

Modjeski and Masters, Mechanicsburg, Pennsylvania.
The firm has given most of its original plans to the Smithsonian Institution, and retains only microfilm copies.

Ontario Highway Department Papers. Ontario Ministry of Transportation Archives, Downsview.
The best set of drawings for the bridge, including detailed shop drawings, are at this location.

Historic Views

Lambton Room. Lambton County Public Library, Wyoming, Ontario.
A number of photographs showing the bridge are included in this local history collection.

Michigan Department of Transportation Collections. Michigan State Archives, Lansing.
This is the best collection of construction photographs reviewed for this report.

Michigan Room. St. Clair County Library, Port Huron, Michigan.
A number of photographs showing the bridge are included in this local history collection.

Modjeski and Masters, Mechanicsburg, Pennsylvania.
The firm has given most of its original photographs to the Smithsonian Institution, and retains only microfilm copies.

Interviews

Paul Cret Harbeson, interviewed by John Lauber on 7 December 1994 in Philadelphia.
Harbeson is a principal in the architectural firm H2L2, the successor to Paul Cret's practice. Paul's father, John Harbeson, was one of Cret's original partners.

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Archival material from the engineering firm Modjeski and Masters at the Smithsonian Institution in Washington, D.C., could provide additional information about the bridge.

ACKNOWLEDGEMENTS

The following individuals provided invaluable assistance with the preparation of this report:

Margaret Barondess, Michigan Department of Transportation, Lansing.

LeRoy Barnett and John Curry, Michigan State Archives, Lansing.

Therese El-Khoury, Ontario Ministry of Transportation, Downsview.

Elizabeth Greenwell Grossman, Rhode Island School of Design, Providence, Rhode Island.

Paul Harbeson, H2L2, Philadelphia, Pennsylvania.

Dick Little, Modjeski and Masters, Mechanicsburg, Pennsylvania.

John Moroz, Moroz Associates, London, Ontario.