

HAER
IOWA
90-OTT, 1-

HAER No. IA-86

JEFFERSON STREET VIADUCT
Iowa Bridges Recording Project II
Spanning over Des Moines River
on U.S. Highway 63 and 34 (Jefferson St.)
Ottumwa
Wapello County
Iowa

BLACK & WHITE PHOTOGRAPHS
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HISTORIC AMERICAN ENGINEERING RECORD
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Photographs by Bruce A. Harms, LBA; Summer 1996

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Photographs by Bruce A. Harms, LBA; Summer 1996

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HISTORIC AMERICAN ENGINEERING RECORD

JEFFERSON STREET VIADUCT

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HAER No. IA-86

Location: Spanning the Des Moines River and railroads on Jefferson Street carrying U.S. 63 and 34 in Ottumwa, Wapello County, Iowa
UTM: 15.5554450.4540750
USGS: Section 24, Township 72 North, Range 14 West

Date of Construction: 1935-36

Designers: Pittsburgh-Des Moines Steel Co., Des Moines, Iowa

Builders: Wisconsin Bridge and Iron Company, Milwaukee, Wisconsin

Fabricators: Wisconsin Bridge and Iron Company, Milwaukee, Wisconsin

Present Owner: City of Ottumwa

Present Use: City street bridge

Significance: As one of Iowa's most handsomely proportioned highway trusses, the Jefferson Viaduct--a continuous Warren deck truss--is technologically noteworthy as an uncommon application of deck truss technology in Iowa. It is an important example of Iowa urban bridge construction from the 1930s with its structural integrity largely intact.

Historians: Richard Vidutis, Jim Hippen

Project information: This document was prepared as part of the Iowa Historic Bridges Recording Project performed during the summer of 1996 by the Historic American Engineering Record (HAER). The project was sponsored by the Iowa Department of Transportation (IDOT). Preliminary research on this bridge was performed by Clayton B. Fraser of Fraserdesign, Loveland, Colorado.

EVENTS SCHEDULE

1902 - viaduct promotion committee formed.

1921 to 1929 - First viaduct movement formed during the Charles Chilton administration: conferences with railroad officials held and blue prints prepared by City Engineer John T. Brady.

November 20, 1929 - Mayor Edwin Manning resurrects viaduct process and heads delegation to ISHC to state the City of Ottumwa's case.

January 1930 - ISHC Engineer Don Teal placed in charge of preliminary engineering work regarding the Ottumwa viaduct.

Early 1930 - Ottumwa City Engineer Henry Cook meets with railroad officials regarding sharing the expense of building the viaduct.

March 25, 1930 - Ottumwa delegation in Ames examines preliminary designs and show plans prepared by ISHC as basis for preparing cost estimates.

September 1930 - ISHC traveled to Ottumwa to meet with city council railroad officials, and local citizens. The Jefferson Street location is chosen for the bridge and viaduct construction site.

September 30, 1930 - Ottumwa delegation in Ames discusses possible sources of funds for the viaduct. ISHC states it cannot participate in the construction but would pay one-half the cost of paving.

September 3, 1931 - Ottumwa delegation at ISHC explains that the railroads are willing to pay \$100,000 towards the approximate \$500,000 cost of the viaduct leaving \$400,000 to be split between Ottumwa and ISHC.

September 16, 1931 - ISHC meeting discusses three possible designs (steel and/or concrete) for the viaduct prepared by Engineer W.E. Jones. Estimates range from \$217,022 to \$336,851.

June 1, 1933 - City of Ottumwa registers its frustration over ISHC delays in the form of a letter which reiterates previously stated reasons why the City needs a new bridge and viaduct.

June 6, 1933 - Ottumwa delegation arrives in Ames to force its point and discusses possible Federal Government sources of funds for the viaduct.

July 19, 1933 - a delegation from Ottumwa is told by the ISHC that it is prepared to recommend to federal authorities the expenditure of \$200,000 from National Recovery Act Funds.

August 23, 1933 - ISHC submits to the City of Ottumwa its estimate for work on a 1,904' long bridge. Ottumwa formally filed for federal aid with Lieut. Gov. N.G. Kraschel.

January 1934 - ISH Chief Engineer Fred R. White is directed by the ISHC to arrange preparation of alternate design plans. White invites the Pittsburgh-Des Moines Steel Company of Des Moines to prepare plans for a steel viaduct and the Marsh Engineering Company of Des Moines to prepare plans for a reinforced concrete bridge.

February 13, 1934 - the Pittsburgh-Des Moines Steel Company submits a design bid for \$10,400, and the Marsh Engineering Company of Des Moines submits a bid for \$10,500.

April 24, 1934 - H.H. Stipp, Attorney for the City of Ottumwa, requests the commission to address a certificate to the Federal Emergency Administration of Public Works relative to the \$200,000 appropriated by the IHC.

November 7, 1934 - advertisements for bids were started with estimates placed at \$375,000 for the concrete viaduct and \$315,000 for the steel viaduct.

November 20, 1934 - agreements reached between the City of Ottumwa and ISHC delineates construction and financial responsibilities of each party for the construction of the viaduct and bridge.

November 21, 1934 - the Ottumwa City Council passes a resolution accepting the proposal of the ISHC for construction of the Jefferson Street Viaduct.

December 4, 1934 - the ISHC approves the viaduct for letting on December 18, 1934.

December 18, 1934 - an Ottumwa delegation is present at ISHC at the opening of bids for the viaduct. Snyder & Johnson, Inc., Humboldt, Iowa and Weldon Brothers of Iowa Falls submit a low bid of \$361,120.31 for the concrete design; Wisconsin Bridge & Iron

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Company, Milwaukee submits a low bid of \$303,004.96 for the steel structure.

December 18, 1934 - S.L. McGavic and George W. Morrill of Ottumwa start injunction proceedings against the City of Ottumwa and ISHC regarding the levying of taxes and issuance of bonds to finance viaduct construction.

December 19, 1934 - H.H. Stipp, Attorney for the City of Ottumwa, presents the commission with a copy of the City of Ottumwa resolution requesting the ISHC to award a contract for the viaduct. ISHC complies and awards the contract to Snyder & Johnson, Inc., Humboldt, Iowa and Weldon Brothers of Iowa Falls.

January 16, 1935 - C.E. Walters, Special Assistant, Attorney General and Counsel to ISHC, explains the legal irregularities in the contracts and agreements reached between the City of Ottumwa and ISHC over the construction and financing of the Ottumwa viaduct and bridge. ISHC informs the low bidders that the date for final acceptance or rejection of bids for construction of the viaduct will be delayed until February 15, 1935.

February 13, 1935 - ISHC declares the contract with Snyder & Johnson, Inc., Humboldt, Iowa and Weldon Brothers of Iowa Falls null and void. ISHC passes a resolution to pay for the whole structure, including the approaches, and to give the contract to the low bidder, Wisconsin Bridge & Iron Company, Milwaukee, to build the steel structure it designed.

February 1935 - about two weeks after the awarding of the contract, the first manual labor appears on the site.

April 22, 1935 - the Ottumwa Courier reports that piers and arches were being poured with concrete for the viaduct and bridge.

September 18, 1935 - work on the viaduct is stopped for the Corps of Engineers to review the plans and for the War Department to approve them.

October 1935 - the City of Ottumwa issues \$110,000 in bridge bonds to pay for property damage and to contract J.C. Blunk Construction Co. to pave the south approach of the viaduct.

April 1, 1936 - extension granted for work on the viaduct which was supposed to end before Christmas of 1935.

May 28, 1936 - the Jefferson Street Viaduct is dedicated.

INTRODUCTION

The City of Ottumwa constructed the Jefferson Street Viaduct in 1935-36, after fifteen years of discussion and planning. The first serious attempt to discuss the possibility of constructing of a viaduct (to span the numerous railroad tracks that ran along the banks of the Des Moines) and a connecting bridge (to span the river) occurred during the mayoral term of Charles Chilton (1921 to 1929). Conferences were held with railroad officials (CD&Q, the CRI&P, and the CM&StP) about the possibility of constructing a viaduct, and blue prints were prepared, but nothing materialized. The movement had to wait until Mayor Edwin Manning resurrected the process in 1929 and pursued the goal for 7 years until the viaduct and bridge were finished.

Mayor Manning's initial contacts with the Iowa State Highway Commission sought help in designing the bridge/viaduct and sought financial support. Eventually, in January 1934 the ISHC agreed to share the cost of the viaduct/bridge with the city and invited the Pittsburgh-Des Moines Steel Company of Des Moines to prepare design plans for a steel viaduct and the Marsh Engineering Company, also of Des Moines, to prepare plans for a reinforced concrete bridge to be placed at the Jefferson Street location. In December 1934, bids were submitted and Snyder & Johnson of Humboldt, Iowa won the bid for the concrete design, and Wisconsin Bridge & Iron won the bid for the steel structure. May Manning and the City Council of Ottumwa were partial to the aesthetics of concrete and desired the more expensive concrete design promising to have the city pay the difference. But in 1935, the contracts between the City of Ottumwa and ISHC proved to be illegal and thus the contract with Snyder & Johnson was deemed null and void. At this point the ISHC took over full control of the construction and of the financing of the project and selected the cheaper steel structure--five-span, riveted continuous Warren deck truss on massive concrete piers--to build over the Des Moines River. The bridge and viaduct took about 15 months to build and was finally put into service in May 1936.

I. REGIONAL HISTORY

Ottumwa is the county seat of Wapello County and was founded in 1843 at the Appanoose Rapids by a company of promoters who saw the area as a good place to invest in the future.¹ Situated in a

¹S.B. Evans, editor, History of Wapello County, Iowa and Representative Citizens, (Chicago: Biographical Publishing Co., 1901), p. 71.

valley through which the Des Moines River flows, two natural features aided in the promotion and growth of Ottumwa. One was the water power resource of the Des Moines River and the other was the large reserve of coal in the county. The Des Moines River has always attracted those who saw potential in the power of the river, and through the years has convinced many companies that the water power could be secured for manufacturing and other purposes such as providing the city with water from a municipally owned water plant.² Apart from the superior soils throughout Iowa, the state's greatest natural resource is coal which underlies 21 counties in the south central section. Wapello County, with Ottumwa at its geographical center, is one of five counties in southern Iowa which produced coal. To advertise its prominent resource, Ottumwa collected \$20,000 in 1890 from local subscription and built the era's most famous landmark in Ottumwa, the Great Coal Palace. The two-story, 230' x 130' structure had a 200' tower and was covered in bituminous coal to make it look as if it had actually been built out of coal.³ The manager of the promotion, Calvin Manning, who may have been a relative of Mayor Edwin Manning who championed Ottumwa's next great structure in the 1930s, the Jefferson Street Viaduct.

These sources of power, and the manufacturing which developed to make use of the resources, started to attract settlers to Ottumwa already in the 1850s which was growing as the largest settlement in the county.⁴ Because of the power generated in the form of water and cheap coal, Ottumwa was fast becoming an industrial town by 1900. The variety of products produced by the growing city was large and included steam hoisting machines for mines, steam engines, boilers and all kinds of iron and steel work, material for bridges, agricultural implements, box car loaders, linseed oil, flouring and starch mills, sash, door and bind factory, wagon carriages, breweries, soap factory, staves and barrels, and a meat packing plant. These companies employed many hundreds of men and sent their products across America with large quantities going to Europe.⁵ To manufacture these products, raw materials had to be transported into Ottumwa, and to market the

²Ibid., pp. 88-92.

³Ibid., pp. 95-96.

⁴Clare C. Cooper, "The Role of the Railroads in the Settlement of Iowa," M.A. thesis, University of Nebraska, Lincoln, 1958. Maps on population growth from 1850 to 1900.

⁵Ibid., History of Wapello County, p. 95.

finished product, roadways had to be built and refined to access markets in Iowa and even the rest of the country.

Starting in 1859 railroads began laying lines to Ottumwa to service the growing number of manufacturing companies--"Without railroads, production and marketing would have been non-existent."⁶ The growth of Ottumwa and the growth of railroads, and later auto roads, in Iowa are intertwined histories showing the life-and-death character of relationships between roads and cities, especially industrial centers.

The Des Moines Improvement, was an early scheme that ultimately failed to open up the valley of Des Moines and improve the opportunities of economic outreach of central and southern Iowa. Its collapse forced people to turn towards other methods of reaching national centers of trade. At first a plank road was suggested in 1850. It was designed to lay a road from Burlington to the Mississippi via Ottumwa and thereby divert trade through the City. But with the introduction of railroads in 1851, and the better means of transporting goods they afforded, the plank road plan was dropped.⁷ Instead, the City of Ottumwa eventually became a railroad center through the following railroad developments in the 1850s: the Burlington and Missouri River Railroad (eventually leased by the Chicago, Burlington and Quincy corporation) became permanently located in Ottumwa, thus linking the area with Chicago a few hours away and placing it on a direct line to the Pacific Coast; the Keokuk, Ft. Des Moines and Minnesota road (under the management of the Chicago, Rock Island and Pacific Corporation) gave access to north-south routes as well as to east-west ones while the Chicago, Rhode Island & Pacific diverted its lines from unfinished central Iowa lines to Ottumwa thus giving it access to St. Paul and the vast granary of the North.⁸ "Thus the county has St. Louis linked to St. Paul and the Northern Pacific, while the Atlantic and the Pacific Coasts are terminal points of competing roads through Wapello."⁹

With the slow but persistent industrialization of Ottumwa, the near completion of the railway network in Iowa, and the advent

⁶William H. Thompson, Transportation in Iowa: A Historical Summary (Ames: Iowa Department of Transportation, 1989), p. 44.

⁷Ibid., The History of Wapello County, p. 506.

⁸Ibid., pp. 506-507.

⁹Ibid.

and increased use of cars and trucks, Ottumwa found itself with old bridges which better served its agricultural past during which goods were transported by wagon. The two bridges erected over the Des Moines River had become old and almost beyond repair. The pressures of these problems regarding its bridge crossings, along with the changing technologies of transportation, were already felt in the early 1920s.¹⁰ Fortunately for Ottumwa it received direct benefits from its industrialization in the form of improved transportation. While rural areas pressured the state of Iowa to improve roads leading to markets,¹¹ factory towns such as Ottumwa also pressured the state for improved roads on which to transfer their finished goods.

II. HISTORY OF THE JEFFERSON STREET VIADUCT

History of the crossing and its part in the infrastructure

The current crossing on Jefferson Street carries both city streets and county and interstate roads (U.S. Highways 63 and 34). The need for the crossing was initially determined by the geographic location of the city which developed on both sides of the Des Moines River. As the city developed, railroads needed to cross the river to link their north-south lines. And with the development of roads in Iowa, an intra- and interstate road system had to be maintained by a highway bridge capable of carrying traffic which had increased in volume and in weight. The Jefferson Street Bridge and Viaduct, as well as all other earlier crossings between the north and south portions of Ottumwa, had great impact on its citizens regarding economics as well as communication.

The Ottumwa Viaduct and Bridge Movement

With the growth of Ottumwa in the second half of the 1800s, along with other towns in the area, the need developed for roads and crossing of all types. In February 1850 a Plank road committee netted \$8,700 from Ottumwa to represent the county at a convention to promote a road from Ottumwa to intersect the Burlington and Mt. Pleasant plank road. Eddyville, to the

¹⁰Letter from the City of Ottumwa to the Iowa State Highway Commission (ISHC) describing the deteriorated condition of the bridge crossings. Dated June 1, 1933. ISH Commission Minutes, June 6, 1933. Located at the Iowa Department of Transportation (IDOT), Ames.

¹¹Ibid., Thompson, p. 69.

northwest constructed a toll-bridge across the Des Moines River, and Ottumwa had a chain ferry was running across the river. In 1870 the Ottumwa Bridge Company obtained a charter to erect a bridge at Green Street (one street parallel to and to the north of Jefferson Street, this bridge may have stood close to the spot of the current Jefferson Street Viaduct) with the sole right of bridging the river for two miles up and down the stream. The Green Street Bridge was 1,200' in length, had seven-100' spans, and five-100' spans of trestle work on the west side. King and Co., of Cleveland contracted for the iron work while the wood work was done locally.¹²

It is common knowledge that a viaduct promotion committee had formed by 1902 in Ottumwa.¹³ More definite records show the first viaduct movement in Ottumwa during the administration of Charles Chilton who was mayor in Ottumwa from 1921 to 1925. During that period conferences were held with railroad officials whose railways paralleled the river. Blue prints were then prepared by City Engineer, John T. Brady. This early movement came to a sudden end when Seneca Cornell succeeded Chilton as mayor.¹⁴ Interest in the viaduct was resurrected in 1929 by Mayor Edwin Manning who pursued the issue through seven years of planning, financial difficulties, and legal red tape. The seven year process was marked by a series of bureaucratic delays of almost continuous conferences, blue print preparations and alterations, money allotments sought locally and federally, and legal challenges which started with the early agreements between the City of Ottumwa and ISHC.

In the early years several sites were considered for the north approach of the viaduct: the Market Street location (parallel to and two streets north of Jefferson already had a bridge crossing) but it was dismissed because of the large amount of property damage which would take place during construction; College Street (one street over south from Jefferson and ending at the Wabash R.R. iron truss bridge) had its drawbacks which included a steep hill and it did not extend entirely to the river; and Vine Street

¹²The History of Wapello County (Chicago: Western Historical Co., 1878), p. 475.

¹³"Success came only after a long struggle," *Ottumwa Courier*, 1936. Vertical File in the Ottumwa Public Library.

¹⁴Ibid.

which also crossed the river over an old bridge.¹⁵ Eventually, Jefferson Street was chosen because it was considered to have all the requirements desired.¹⁶

The exact number of delegations (from the Iowa State Highway Commission [ISHC] and the City of Ottumwa) traveling between Ames the City of Ottumwa to discuss the various aspects of acquiring the viaduct and bridge on Jefferson Street may never be known. But one of the first meetings took place on November 20, 1929, when a delegation headed by Mayor Edwin Manning¹⁷ appeared before the ISHC to present its case for the construction of a bridge, on College Street, to cross the Des Moines River, along with a viaduct to cross the tracks of the Chicago, Burlington & Quincy, the Rock Island, the Wabash, and the Milwaukee Railroads. The viaduct and bridge would carry the traffic on Primary Roads U.S. 63 and 34, require their extension, and would pass through the city of Ottumwa with the viaduct beginning at the southwest end of Jefferson Street. The intent of the delegation was to advise the ISHC that in order to authorize the necessary bonds, preliminary plans and estimates had to be prepared for the structure in order to deal with the various railroad companies and the State Railroad Commission. The delegation also explained that the City of Ottumwa engineering department was not capable of preparing the necessary preliminary plans and estimates, nor was it capable of bearing the financial burden of constructing the bridge and viaduct. Therefore, the delegation requested: that the ISH Commission lend its cooperation and support to the proposed project; take over the engineering work of preparing preliminary plans, cost estimates, detailed construction plans, and the supervision of the construction work; and, if possible, that the commission grant financial aid to the City of Ottumwa from the Primary Road Fund to meet a portion of the cost of the construction of the road improvement. After deliberation, the commission agreed to lend its support and assume the engineering work as requested by Ottumwa, but it was unable, at that time, to

¹⁵"Viaduct request drawn by Cook," *Ottumwa Courier* (1933).

¹⁶Ibid.

¹⁷Other members of the delegation included Henry J. Krapka, Commissioner, J.F. Parker, Commissioner, W.C. Wyman, City Engineer, O.H. Michael, member of the State Board of Control, and Mr. Keefe, a reporter for the *Ottumwa Courier*. ISH Commission Minutes, November 20, 1929. Located at IDOT, Ames, Iowa.

pass on the question of giving aid from the Primary Road Fund towards the cost of construction.

By January of 1930 Don Teal of ISHC was placed in charge of the preliminary engineering work. The City Council of Ottumwa and City Engineer Henry Cook met regularly with railroad executives. A controversy arose when the railroads, who initially offered to share the expense of building the bridge, wanted the city, in return, to close both the Market and Vine street bridges in order to dispense with watchmen at the crossings. The city balked and negotiations remained at a standstill.¹⁸ On March 25, 1930, officials of the ISHC met with the city council in Ottumwa to continue discussions of the proposed viaduct and bridge.

Preliminary designs and show plans were prepared at the offices of the ISHC at Ames and presented to the council as a matter of cooperation with municipal officials and for discussion of possible alterations. A design was decided on, and was used to compute probable costs of construction giving the council, and other interested parties such as the railroads, a basis for agreements as to the proportion each would have to pay. The plan in 1930 called for the structure to extend from south of the intersection of Jefferson and Main street to a point approximately at the intersection of Church and Myrtle Streets. It was assumed the structure would be concrete.¹⁹

In early September 1930 ISH Commission members traveled to Ottumwa to continue discussions of a viaduct over the railroad tracks on South Jefferson Street. The meeting was attended by officials from the affected railroads and local citizens. This meeting appears to have chosen the Jefferson Street location as the best place for the new bridge. It was the best spot because it could be built there with greater economy and would connect with the well improved cross-city highway.²⁰

¹⁸Ibid., "Success came...", *Ottumwa Courier*.

¹⁹"viaduct meeting to be March 25," *Ottumwa Courier* (March 19, 1930).

²⁰"viaduct hearing here next week," *Ottumwa Courier* (September 12, 1930).

On September 30, 1930, a delegation from Ottumwa, headed by Mayor Manning,²¹ returned to the ISH Commission in Ames this time to request aid from the Primary Road Fund for the Jefferson Street Viaduct. The commission replied that under its understanding of the law, it had no authority to participate in the construction of the viaduct, but could contribute one-half of the cost of the paving (estimated at a total cost of \$30,000) of the viaduct and its approaches. Mayor Manning agreed to send in exact measurements of the viaduct and approaches for the estimate.

One year later, on September 3, 1931, another delegation arrived under the leadership of Mayor Manning.²² Once again the delegation requested the commission's cooperation in the construction of the viaduct. At this meeting Mayor Manning explained that as a result of conferences with the city the railroads were now ready to cooperate and would contribute about \$100,000 to the project which had an estimated cost of \$500,000. This would leave \$400,000 to be divided equally between the City of Ottumwa and the highway commission. Mayor Manning explained in detail the city's financial situation: it had about \$900,000 of outstanding bonds with a debt limit of about \$1,300,000. Ottumwa planned to finance its portion of the cost of construction of the viaduct through the issuance of bonds to be retired from the proceeds of the earnings of the city water plant and profits from a hydro-electric plant owned by the city with earnings of about \$85,000 per year. The commission took the proposition into consideration.

September 16, 1931, the ISH Commission met to discuss a memorandum by Engineer W.E. Jones, which laid out preliminary estimates of the cost for what was still referred to at this meeting as the College Street Viaduct. The three estimates, submitted with blue prints, for ISHC Crossing Project Number 956 were: 1) for a structure consisting of concrete arches over the river with steel deck plate girder and concrete deck girder approaches, all with a 30' clear vehicular roadway, a 5' sidewalk on each side, lighting, and a ramp approach on Mill Street for a total cost of \$336,851; 2) for a structure same as for estimate

²¹Other members of the delegation included O.H. Michael, member of the State Board of Control, and John Houston of the Ottumwa Courier. ISH Commission Minutes, September 30, 1930.

²²Other members of this delegation included William Desbro and John Davies, City Councilmen, Henry Cook, City Engineer, and Horace Brown, Engineer. ISH Commission Minutes, September 3, 1931.

No. 1, except that the roadway is reduced to 24' and sidewalks, ramp and lighting features are all omitted for a total cost of \$235,112; and 3) for an all steel structure with a 24' roadway without walks, without ramp, without provision for lighting, and consisting of steel deck trusses and I-beam spans for a total cost of \$217,022. The report was placed on file and action was deferred by the ISHC.²³

Starting June 1933, an intense series of meetings took place between ISHC and the City of Ottumwa which culminated in agreements of responsibility on the viaduct and bridge. On June 1, 1933, in order to impress upon the ISH Commission the seriousness of the situation, the City of Ottumwa sent a letter to the ISHC stating its frustration that in spite of years of hearings, meetings, preparation of plans and estimates for a viaduct, the dangerous conditions afflicting the old bridges crossing the Des Moines River and the railroad tracks in Ottumwa still remained. The letter records Ottumwa's sense of self as an important transcontinental crossroads--that the viaduct and bridge is a "paramount issue to the state as a whole"²⁴--and seems to have been spurred also by the fact that a national Public Works bill was to be enacted soon which would provide state highway commissions with funds for certain crossing improvements. Specifically, the letter mentioned traffic and crossing conditions within the city which required immediate correction: the city of thirty thousand, divided into two parts by the Des Moines River, was connected by two bridges built before the automobile era and unsuitable for the traffic of 1933. They were too narrow, antiquated and badly in need of repair, repairs which the city could no longer afford. The two Federal Highways, No. 34 (Harding Highway, a transcontinental east-west artery) and No. 63 (White Pole Road, another transcontinental north-south artery) carried both local traffic and traffic from outside Ottumwa, including heavy trucks. Complicating the traffic situation were railroad tracks at both ends of the bridges which slowed down traffic with their main line trains and switching operations.²⁵

²³ISH Commission Minutes, September 16, 1931.

²⁴Ibid., Quote from City Engineer Henry Cook in "Viaduct request...", *Ottumwa Courier*.

²⁵ISH Commission Minutes, June 6, 1933.

Following the introductory letter of June 1, a delegation²⁶ from the city arrived on June 6, 1933, in Ames to personally impress upon the commission the serious condition of the bridges across the Des Moines River, the chaotic railroad situation, and to urge the building of bridge and viaduct to be constructed with Federal Government funds. The commission's response was to state that consideration would be given in forming a program of expenditure of proposed Federal Aid funds.

On July 19, 1933, another delegation²⁷ arrived to urge the commission to take action on the viaduct and was told that the commission was prepared to recommend to the Federal authorities the expenditure of \$200,000 for a viaduct from highway funds allotted to Iowa under the National Recovery Act. The funds would be available provided the City of Ottumwa produced the remainder of the funds necessary.

On August 23, 1933, the ISHC submitted to the City of Ottumwa, through Senator Roy E. Stevens, their estimate of the cost of the proposed viaduct across the railroad tracks from Jefferson Street near East Main Street to Bashaw Street. Ottumwa formally filed its application for federal aid with Lieut. Gov. N.G. Kraschel. The plans filed called for a concrete structure 1,904' long, carried on concrete arches and with concrete approaches with a 30' roadway which would be 55' above ordinary low water on the Des Moines River and about 30' above the high water mark of the 1903 flood.²⁸ The ISHC estimated that the cost of the structure would be \$299,718 which did not include the cost of property damage on either side of the river (for a total of about \$400,000), nor for the 800' of roadway which would have to be constructed from the end of the bridge to the intersection of Church and Myrtle Streets. It was thought that the roadway would have to be either filled in and paved or would have to be built

²⁶Ibid.; members of the delegation included Mayor Edwin Manning, W.L. Disbrow and John Davies, Councilmen, and Henry Cook, City Engineer.

²⁷Members of the delegation included Senator Roy Stevens, Mayor Edwin Manning, Representative Ernest Fabritz, Horace Brown, Engineer, and Will Disbrow, City Commissioner. ISH Commission Minutes, July 19, 1933.

²⁸"viaduct cost estimate is received; city will ask for federal aid," *Ottumwa Courier*, (August 23, 1933).

on a runway.²⁹ With the request for federal aid, whatever objections the railroads had were pushed aside because they were now not expected to pay any of the expense of federally and municipally funded construction.³⁰

With the commission's decision to support the Ottumwa viaduct, the planning and financial phases which started five years earlier finally came to an end. The next phase was the preparation of alternate viaduct plans. ISH Chief Engineer Fred R. White was directed in January 1934 by the commission to take steps for the preparation of alternate design plans.³¹ Engineer White proceeded to invite the Pittsburgh-Des Moines Steel Company to prepare plans for a steel viaduct and the Marsh Engineering Company of Des Moines to prepare plans for a reinforced concrete bridge, both designs showing a crossing over the Des Moines River and over the railroad tracks on Jefferson Street.³² The letters of invitation to submit plans also stipulated which design data and specifications were to be included and stressed that the design should conform fully with the Iowa State Highway specifications for highway bridges; any variations required written approval. Location of centerline, length of grade, width of roadway, total length of structure, depth of footings, cross section of stream and foundation soundings were furnished the designers by ISHC. The designers were also advised to avoid the use of patented materials, methods, processes, types or devices which could limit free competition in bidding on the construction of the viaduct--patents unique to the companies preparing the plans and included in the designs had to be listed with comment on how it may hinder competitive bidding. The letters also stress that the project was a National Recovery Project and, therefore, subject to checks and approval by engineers of the U.S. Bureau of Public Roads. The plans had to be made up on size, form and manner specified by the Bureau and become the property of the ISHC "as fully and completely as though wholly prepared by the commission's engineers."³³

²⁹Ibid.

³⁰Ibid.

³¹ISH Commission Minutes, January 30, 1934.

³²ISH Commission Minutes, February 13, 1934.

³³Ibid.; correspondence between ISHC Chief Engineer Fred R. White and the Pittsburgh-Des Moines Steel Company (February 8, 12, 16, 1934) and the Marsh Engineering Company (February 8, 12,

In responding to the letters of invitation, Gordon R. Lunt of the Pittsburgh-Des Moines Steel Company accepted the proposal in February 1934 to prepare designs for a steel bridge and viaduct for \$10,400,³⁴ and James Barney Marsh, President of Marsh Engineering Company, accepting on the same date, agreed to prepare designs for a concrete bridge and viaduct for \$10,500.³⁵ Although in his letter he says that because of several problems (unmentioned) involved in the design of the structure, it may develop that the use of steel in the superstructures may produce more pleasant grades and prove more economical. Both companies stated in their letters that it would take between four and five months to prepare the designs.

The viaduct-bridge process now moved into a financial phase. During its meeting of April 24, 1934, the commission reviewed a communication from April 18 and accepted the request by Attorney H.H. Stipp of Des Moines that the commission address to E.H. Foley, Jr., Assistant General Counsel, Federal Emergency Administration of Public Works, Washington, D.C., a certificate stating that \$200,000 was appropriated and approved by the IHC for the construction of the bridge and viaduct in Ottumwa.³⁶

On November 7, 1934, Chief Engineer White stated to the commission that the plans for the bridge and viaduct were substantially completed and that advertisements for bids on the structure would be started after all financial arrangements had been finally determined. The preliminary estimated cost of the concrete arch viaduct was placed at \$375,000 and of the steel viaduct at \$315,000. The commission considered various financing methods: either as a Primary Road Project or an emergency Federal Works Project. But no final action was taken and the matter was deferred until its November 20 meeting.³⁷ By then the commission hoped that the Federal Government would have announced an emergency Federal Works Program for the winter which would

16, 1934).

³⁴Ibid.; letter from Gordon R. Lunt to Fred White, February 12, 1934.

³⁵Ibid.; letter from J.B. Marsh to Fred White, February 12, 1934.

³⁶ISH Commission Minutes, April 24, 1934.

³⁷ISH Commission Minutes, November 7, 1934.

involve large bridges, viaducts, railroad-highway grade separations and highway-highway separations.³⁸

To discuss the issue of financing the viaduct project in Ottumwa, a delegation³⁹ arrived at the ISH Commission meeting on November 20, 1934. Irrespective of which design would eventually be chosen, Mayor Manning stated that preliminary estimated costs for right of way acquisitions, property damage during construction, grading and paving of approaches and viaduct was approximately \$150,000. He said the city was ready to issue and sell bonds in an amount not less than \$75,000 to aid in the construction of the viaduct. After full discussion of the whole matter, a resolution was passed which obligated both parties to the following courses of action: Ottumwa would provide the necessary right of way without cost to the commission, would be responsible for all damage to property during construction, would pay for and construct the approaches to the viaduct, and would provide \$75,000 towards the cost of construction of the viaduct; whereas the Iowa State Highway Commission would furnish all bridge and viaduct plans and specifications, would let the contract, would supervise and inspect all construction work, and would pay from state funds at its disposal, the cost of the bridge and viaduct.⁴⁰ On November 21, 1934, the City Council of Ottumwa passed a resolution accepting the proposal of the ISHC for the construction of the viaduct on Jefferson Street.⁴¹ Finally, during its meeting of December 4, 1934, the commission approved the Ottumwa viaduct for letting on December 18, 1934.⁴² A

³⁸Ibid.; letter from Chief Engineer Fred White to P.F. Hopkins, State Engineer, Public Works Administration, Des Moines, Iowa, November 9, 1934.

³⁹Members of the delegation included Mayor Edwin Manning, W.L. Disbrow and John Davies, City Council Members, Henry Cook, City Engineer Senator Roy Stevens, and H.H. Stipp, Attorney. ISH Commission Minutes, November 20, 1934.

⁴⁰Ibid.

⁴¹Letter, plus copy of resolution, by Alvah C. Orvis, City Clerk, City of Ottumwa to Fred White, Chief Engineer, ISHC, regarding the resolution for building the Jefferson Street viaduct, passed by the City Council of Ottumwa, November 21, 1934. ISH Commission Minutes, December 4, 1934.

⁴²Ibid.; Weekly Letting Report 22:50 (12 December 1934).

delegation⁴³ from the City of Ottumwa was present at the December 18th meeting and examined the bids which were opened that day. The low bid on the concrete design was \$361,120.31 and was submitted by Snyder & Johnson, Inc. of Humboldt, Iowa, and Weldon Brothers of Iowa Falls, Iowa, while the low bid on the steel design was submitted by the Wisconsin Bridge & Iron Company, Milwaukee, Wisconsin in the sum of \$303,004.96. Mayor Manning expressed his opinion that Ottumwa would pay an additional \$45,000 over the \$75,000 in order to build the concrete crossing. Attention was called to the fact that the plans for the concrete structure required that the steel girders over the railroad tracks be encased in a cement covering known as Gunitite at a cost of \$12,745. It was also mentioned that this cost could be eliminated by substituting in lieu of the Gunitite a paint coating for the girders and blast plates to protect them from engine gases.⁴⁴

With the development of the financial phase and subsequent contractual agreements between ISHC and the City of Ottumwa, court challenges were thrown up almost immediately to question the legality of the contracts and methods of financing of the viaduct and bridge. The history of legal questions surrounding the contracts between ISHC and the City of Ottumwa eventually led to the cancellation of the contract with Snyder & Johnson. The arrangements regarding financing of the viaduct made between the City of Ottumwa and the Iowa State Highway Commission were challenged in court when S.L. McGavic and George W. Morrill of Ottumwa, and eventually others, started injunction proceedings⁴⁵ on December 18, 1934, against the City of Ottumwa and the Iowa State Highway Commission. The injunction stated that the city had no legal basis to levy taxes or issue bonds for the specific purpose of providing funds prior to building the bridge and viaduct. Section 5876 of the city code, which authorizes the levy of the city bridge tax, provides that "after the completion of the work" the tax may be levied, and Section 1179-b2 provides

⁴³Delegation members present were Mayor Edwin Manning, Henry Cook, City Engineer, H.H. Stipp, Attorney, Members of the City Council, Disbrow and Davis, and others. ISH Commission Minutes, December 18, 1934.

⁴⁴Ibid.

⁴⁵Ibid; copy of injunction by S.L. McGavic and George W. Morrill, Plaintiffs, against the City Ottumwa and the Iowa State Highway Commission. Served December 18, 1934.

that the tax must be levied before the bonds may be issued.⁴⁶ The injunction, while pending, did not prevent a contract between ISHC and Ottumwa from going forward. Under the advise of H.H. Stipp of Des Moines, Attorney for the City of Ottumwa, who appeared before the commission of December 19, 1934, a copy of the resolution passed by the city was filed requesting the commission to award a contract for the concrete design of the bridge and viaduct, minus the Gunite on the steel girders over the railroad tracks, and pledging that the City of Ottumwa, through the issuance and sale of bridge bonds, to provide \$45,369.50 in addition to the \$75,000 (for a total of \$120,369.50) previously pledged to aid in payment of the cost of the bridge and viaduct. In spite of the injunction, Attorney Stipp said that in his opinion, the City of Ottumwa could legally issue and sell bridge bonds. The commission then passed a resolution reaffirming the one passed on November 20, 1934, which laid out the obligations of both parties in the construction of the viaduct. The same resolution also stated that the design for the concrete bridge (now referred to as the Jefferson Street Bridge) was chosen and awarded to Snyder & Johnson, Inc. of Humboldt, Iowa, and Welden Brothers of Iowa Falls, Iowa for the sum of \$361,120.32.⁴⁷

But events would take a decisive turn against the intended contracts being prepared by ISHC. During the commission's meeting, January 16, 1935, a committee headed by Mayor Manning discussed with C.E. Walters, Special Assistant, Attorney General and Counsel to ISHC, the matter of the proposed contract for the bridge and viaduct. In a response to a December 26, 1934 letter from Chief Engineer White, Attorney Walters expresses his opinion in a letter dated January 15, 1935, that if the ISHC had previously secured Ottumwa's approval of the plan for the crossing improvement, ISHC would have authority to construct the bridge, viaduct, including the approaches and pay for it from Primary Road Funds. But without such previous approvals, the Primary Road Fund cannot be used to improve city or town streets. Thus, the entire proceedings relative to the construction of the bridge and viaduct, and the contract with the City of Ottumwa, were deemed null and void. Further reasons for his opinion centered on the question of authority: ISHC relinquished part of its authority--public officers and bodies are restricted by law

⁴⁶Ibid; letter from Harley Stipp, Attorney representing ISHC, to Fred White, Chief Engineer, ISHC, explaining the legal basis of the injunction.

⁴⁷ISH Commission Minutes, December 19, 1934.

not to surrender the exercise of judgment--by agreeing to let the City of Ottumwa build and pay for the approaches to the bridge and viaduct, and also allowed Ottumwa to select the type of structure to be built by ISHC; although cities have the right to build their own bridges, they do not have the authority to aid in the construction of bridges other than within their borders with the exception of agreements over county roads; since the Jefferson Street Viaduct is not a county bridge, the city had no legal authority to levy taxes or to aid in the construction of the contemplated bridge; the approaches contemplated for the bridge and viaduct were in sections where houses were less than 200' apart, a condition prohibiting the erection of approaches leaving the ISHC with no authority to deal with attendant questions of right of way and payment of claims of damages as defined in the Statutory Authority of Commission under Section 4755-d1⁴⁸; and finally, in the event the City of Ottumwa may become incapable for financial or legal reasons to finish its part of the construction contract, the bridge and viaduct project would remain unfinished.⁴⁹ Because of these legal discussions, on January 16, 1935, the commission gave itself some maneuvering room and extended the date by which the ISHC would accept or reject the bids submitted by the construction companies to February 15, 1935. At the same time the commission also passed a resolution reaffirming the intention of previously arranged contractual agreements with the City of Ottumwa but also resolved that the Attorney Walters continue examining the legal questions related to the contracts.⁵⁰

Attorney Walter's legal opinions were definitive and decided all legal questions. On February 13, 1935, the ISHC voted unanimously to declare the contract with Snyder & Johnson and the Welden Brothers null and void. With Attorneys Stipp and Walters present, a course of action was decided on: first, that the ISHC would have legal authority to let the necessary contract and construct the viaduct out of Primary Road Funds; and second, that the City of Ottumwa would establish an assessment district in order to purchase or condemn the necessary right of way for the construction of the viaduct and approaches. Further discussion at the meeting led to the resolution to build a viaduct (Project B-840) and to give the contract to the Wisconsin Bridge and Iron Company of Milwaukee whose bid of \$303,004.97 was almost \$60,000

⁴⁸ISH Commission Minutes, January 30, 1935.

⁴⁹ISH Commission Minutes, January 16, 1935.

⁵⁰Ibid., ISH Commission Minutes, January 30, 1935.

less than the bid for a concrete bridge.⁵¹ Under this new agreement, the entire cost of construction was assumed by the State of Iowa.⁵² The City of Ottumwa assumed responsibility for expenses for side-walks, culverts, and driveways.⁵³ With the construction contract finally awarded, agreements were reached with the railroads involved: the C.B. & Q. Railroad; the C.M. St. P. & P. Railroad; and the C.R.I. & P. Railroad.⁵⁴ On April 22, 1935, the Ottumwa Courier reported that work was progressing on the bridge and was at the stage of pouring concrete. Two arches were poured with concrete on the north side up to the construction joint and the forms removed. At other sections of the bridge, digging was proceeded for piers, forms took shape, and reinforcing rods were fitted into some pier forms. About 80 men were employed at the time to work on the bridge.⁵⁵ In October 1935 the city issued \$110,000 in bridge bonds to pay for property damage on Jefferson and Myrtle Street and the contract to pave the south approach went to J.C. Blunk Construction Co. of Ottumwa. A final impediment to construction came from the Federal Government which required that all work on the viaduct be stopped until the plans for the viaduct had been reviewed by the Corps of Engineers⁵⁶ and approved by the War Department. This requirement applied to all bridges spanning waterways not wholly within one state, such as the Des Moines River, as stipulated by the Federal Rivers and Harbors Act of March 3, 1899, Section 9.⁵⁷ After approval by the War Department, the first manual labor was put into action in February 1935.⁵⁸ The goal was that work on the viaduct would have been completed by Christmas of 1935 but an extension was requested and given until April 1, 1936. Further

⁵¹ISH Commission Minute, February 13, 1935.

⁵²ISH Commission Minutes, March 13, 1935.

⁵³ISH Commission Minutes, February 27, 1935.

⁵⁴Ibid.

⁵⁵"Viaduct piers taking shape," *Ottumwa Courier* (April 22, 1935).

⁵⁶ISH Commission Minutes, September 3, 1935.

⁵⁷ISH Commission Minutes, September 18, 1935.

⁵⁸"Success came only after a long struggle," *Ottumwa Courier* (1936).

delays developed because of adverse weather conditions and labor disputes.⁵⁹ The Jefferson Street Viaduct was dedicated on May 28, 1936.⁶⁰

III. DESIGN AND TECHNOLOGY OF THE JEFFERSON STREET VIADUCT

Besides being an important center for the county road network, and thus an important crossing of the Des Moines River, Ottumwa is also a significant point in the state and regional transportation infrastructure. Established by the railroads, this position was ratified and strengthened by the advent of the automobile. In the decade 1910-1920 the number of motor vehicle registrations in Iowa skyrocketed from 10,422 to 437,378.⁶¹ With remarkable speed the automobile became a means for much more than just trips to the nearest railroad depot or to the county seat. One indicator of this was the establishment of designated routes for auto travel across the state and beyond. Most well known is the Lincoln Highway, which was announced as a route by a private association in 1913.⁶² It did not, however, go anywhere near Ottumwa, but other important routes did. In 1912 Melchior Huebinger, a Des Moines cartographer and civil engineer, produced a cascade of "automobile publications": guides to ten Iowa routes and a highway atlas of the whole state.⁶³ Three north-south and one east-west routes passed through downtown Ottumwa. All crossed the Des Moines River. In 1919 a state system of numbered roads was established, so the east-west "Blue Grass Road" became State Highway No. 8. Names still were used to boost travel. In 1924 the Harding Highway, to honor the recently deceased president, was established over essentially the same route.⁶⁴ By 1927 the

⁵⁹Ibid., "Success came...", Ottumwa Courier.

⁶⁰ISH Commission Minutes, May 12, 1936.

⁶¹Ibid., Thompson, p. 141.

⁶²Drake Hokanson, *The Lincoln Highway: Main Street across America* (Iowa City: University of Iowa Press, 1988), p. 15.

⁶³Huebinger's Automobile and Good Road Atlas of Iowa (Des Moines: Iowa Publishing Co., 1912). The ten guides were published as separate volumes. They are listed in Guide for Iowa Official Trans-Continental Route, 65.

⁶⁴George S. May, "The Good Roads Movement in Iowa," *The Palimpsest* 46 (February 1965):93; Iowa Department of Transportation, *Iowa Registered Highway Routes, 1914-1925* [map]

federal numbering system was established, and this same east-west route through Ottumwa became U.S. 34.⁶⁵ The north-south highways through the city followed a similar evolution in designation. When the issue of a new bridge was discussed in the 1930s, Ottumwa had two key highways of state and regional importance: U.S. 34 (E-W) and U.S. 63 (N-S), both on the national system. This constantly increased road traffic, which continues to the present, combined with the civic desire for an improved appearance and the need to avoid level crossings of the numerous tracks of three railroads to produce plans for a combined river bridge and viaduct. Two alternate schemes were prepared for a structure that would be nearly half a mile long. Both plans represent elements of what was then advanced bridge technology.

The Depression, which in some ways made such large public works projects easier to realize, did not make it easier for the highway commission. Cuts in staff meant that such a design job would be beyond the capabilities of office personnel. Consequently, in January 1934 the commission directed Fred White, the chief engineer, to arrange for the preparation of alternate plans. Pittsburgh-Des Moines Steel Co. (for \$10,400) prepared 49 sheets of plans for a steel truss viaduct. Marsh Engineering Co., also of Des Moines, (for \$10,500) drew 65 sheets of plans for an open-spandrel concrete arch viaduct. Both designs were completed by September 1934.⁶⁶ Marsh Engineering was the company of James B. Marsh, an engineer with much experience both in designing concrete bridges and in dealing with the highway commission. Marsh was well known for his "rainbow arches," a popularized form of a concrete arch he built two decades earlier. His relations

(Ames: Iowa D.O.T., 1986); Chicago Tribune Auto Trails Map: Iowa, 1925 (Chicago: Rand McNally, 1925); "A Shorter Route East and West: The Harding Highway" (Burlington, Iowa Chamber of Commerce, 1931).

⁶⁵Milwaukee Journal Tour Club, Motor Atlas (Milwaukee: Clason Map Co., 1928); "Map of U.S. 34" (Burlington, Iowa: U.S. Highway 34 Association, ca. 1935).

⁶⁶The City of Ottumwa received a federal PWA grant of \$50,000 ("3,600 man-months") to go toward construction of the viaduct, Engineering News 111 (October 26, 1933), p. 516; information on the diminution in the staff of the highway commission supplied by Hank Zalatel, librarian, Iowa Department of Transportation, July 1996; Minutes of the Highway Commission, 1934, Iowa Department of Transportation; Bridge Designs 134 [concrete arch] and 134a [steel truss], Iowa Department of Transportation.

with the highway commission involved preparation of many bridge designs, such as the open-spandrel concrete arch at Mederville in Clayton County.⁶⁷ He also acted with the commission in breaking the Luten patents, a long drawn out action (brought by Luten against Marsh) ending in 1918.⁶⁸ Marsh's designs evolved over the years away from the illogicality of the rainbow arch, and he had commissions in many states. In 1932, for instance, he prepared designs for a 200' span concrete arch at Fort Scott, Kansas, and saw completion of a very large six-span open-spandrel concrete arch viaduct in Knoxville, Tennessee, built to his design.⁶⁹ Marsh also knew how to adjust to the esthetic tastes of city governments. In 1918 he built the Court Avenue bridge for the City of Des Moines. Although an open-spandrel ribbed structure, it is faced with ornamental spandrel walls and embellished with Beaux Arts details.⁷⁰ The proposed concrete bridge, as designed by Marsh, would have had a south approach of one 50' concrete girder and a series of four rising arches with spans of 90'-9", 111'-3", 121'-6", and 131'-9". The river crossing required four arches of 142' each. The arch spans were all two-ribbed open-spandrel deck structures. Each rib was 8' wide, with a space of 17' between. The arch ribs were connected only at the floor beams and the piers, with columns of rectangular cross sections rising from rib to deck. The arches were concrete with bar reinforcement.⁷¹

At the north bank of the Des Moines River there was an abrupt change in the bridge. The problem was caused by the necessity of crossing a total of some sixteen tracks of three different railroads.⁷² These tracks were on an embankment at about the level of high water in the river, which, added to the clearance

⁶⁷HAER No. IA-79, 1996.

⁶⁸Records of the case in Attorney General's papers, State Historical Society of Iowa, Des Moines.

⁶⁹"New Henley Bridge at Knoxville, Tennessee," Engineering News 109 (August 4, 1932), p. 143; "Effect of Labor Rates on Bridge Bid," Engineering News 109 (October 27, 1932), p. 516.

⁷⁰HAER No. IA-70.

⁷¹Design 134, sheet 3 and sheets 4-29, Iowa Department of Transportation.

⁷²Chicago, Milwaukee, St. Paul & Pacific; Chicago, Burlington & Quincy; Chicago, Rock Island & Pacific.

necessary over the tracks, required a north approach viaduct which occupied a minimum of vertical space. Marsh chose the best possible structural solution, a series of continuous steel deck plate girder spans. Avoided by American engineers in earlier decades because of difficulties real and exaggerated, the use of continuous bridge spans was becoming common in the United States by the 1930s.⁷³ But Marsh refused to let the transition between concrete arch and riveted plate girder remain obvious. He proposed that all the girders be covered with "Gunitite," a proprietary sprayed-on concrete coating.⁷⁴ Part of the reason for the Gunitite coating would have been to provide protection against corrosion, especially over railroad tracks. (This protection would be provided by other means, as noted in the discussion of the steel truss design.) But much of the motivation must have been esthetic. The outer surfaces of the girders were to be specially treated to form panels, using the web stiffening angles as a foundation. Thus the girders would be false concrete beams, and supposedly harmonizes more effectively with the concrete arches.

The competing design, by Pittsburgh-Des Moines Steel, consisted of steel spans, with two exceptions. The extreme southern approach span was a reinforced concrete girder of 32'-10" span. The extreme northern end was a combination of reinforced concrete girders and retaining walls, 142'-10 ½" long. In between, the viaduct was designed in three sections of steel trusses and girders, resting on concrete piers. Starting from the south, the spans were organized into groups of continuous trusses or girders, as follows. All bearings are expansion (rocker or roller) except as noted.⁷⁵

⁷³Carl W. Condit, American Building Art, The Twentieth Century (New York: Oxford University Press, 1961), pp. 92-98, 99-100; George A. Hool & W.S. Kinne, Movable and Long-Span Steel Bridges, 2nd ed. (New York: McGraw-Hill, 1943), pp. 199-202, 255-255g.

⁷⁴Design 134, sheet 32, Iowa Department of Transportation.

⁷⁵Design 134a, sheet 1, etc., Iowa Department of Transportation.

SOUTH CONTINUOUS TRUSS GROUP (Deck Warren)

Span 1 105'-0"
Span 2 105'-0"
Span 3 105'-0"
 Fixed support
Span 4 106'-2"

RIVER CONTINUOUS TRUSS GROUP (Deck Warren)

Span 1 111'-2"
Span 2 150'-0"
Span 3 150'-0"
 Fixed support
Span 4 150'-0"
Span 5 111'-2"

NORTH CONTINUOUS GIRDER GROUP No. 1

Span 1 94'-5"
 Fixed support
Span 2 60'-6"

NORTH CONTINUOUS GIRDER GROUP No. 2

Span 1 65'-0"
 Fixed support
Span 2 60'-6"

NORTH CONTINUOUS GIRDER GROUP No. 3

Span 1 104'-0"
 Fixed support
Span 2 82'-0"

NORTH CONTINUOUS GIRDER GROUP No. 4

Span 1 50'-0"
Span 2 63'-0"
 Fixed support
Span 3 50'-0"

1722'-11"

The continuous truss and girder construction had several advantages. For one thing, the piers rested on rock, which removed any concern about settlement, a possible source of trouble with continuous designs. Another plus was the decrease in cost over a simply supported truss and girder bridge, due to savings of metal and easier erection procedures. Finally, since the river spans needed to be stronger over the supports, the truss could be shaped with greater depth at those points. This saved on the cost of the piers, which could be shorter. And it provided an arch-like appearance, something the city government fancied. The economic advantage of the steel design was apparent when bids on both designs were opened. Low bids were \$361,170 on the concrete arch and \$303,004 on the steel truss. Naturally the latter was chosen, the low bidder and builder being Wisconsin Bridge and Iron Company of Milwaukee. The bridge was constructed during 1935-36, with a dedication ceremony May 28, 1936.⁷⁶

The continuous viaduct represented the best of contemporary bridge technology. It has remained in use and is in good condition, having been rehabilitated in 1983.⁷⁷ Nearly all the railroad tracks, except for the main line of the Burlington Northern, are gone. Mute evidence of the past are the blast plates on the bottom of the girders, centered over the old track locations. These wrought-iron sheets shielded the structural steel from the corrosive and abrasive effects of steam locomotive exhaust. They were the alternative to a Gunitite protective coating.

⁷⁶Minutes, Iowa Highway Commission, 1934, Iowa Department of Transportation.

⁷⁷Fraserdesign, Iowa Historic Bridge Inventory, HAER card for Jefferson Street Viaduct and bridge sheet WAPE37 (1993).

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APPENDIX A Bridge Designs for the Jefferson Street Viaduct

Microfilm files located at the Iowa Department of Transportation, Ames, Iowa. Filed under: File 10259, Design 134, and Design 134a:

1. *Proposed Bridge and Viaduct Over Des Moines River and Railway Tracks.* City of Ottumwa, Iowa. Primary Project No. 840, Wapello County. Iowa State Highway Commission. March-August 1934. Design No. 134, Wapello County. [65 sheets]
2. *Proposed Bridge and Viaduct Over Des Moines River and Railway Tracks.* City of Ottumwa, Iowa. Wapello County. Primary Project 840. Iowa State Highway Commission. 1934. Design No. 134a. [49 sheets]
3. *State of Iowa State Highway Commission Design for Des Moines River Bridge and Viaduct Over Railway Tracks in the City of Ottumwa.* Primary Project No. 840. Wapello County. November 1934. March-August 1934. [35 sheets]

APPENDIX B

List of Illustrations

- Fig. 1 Profile Sketch of the Jefferson Street Viaduct. James Hippen, 1996.
- Fig. 2 Photograph showing construction of the concrete piers, October 31, 1935. Located at the Iowa Department of Transportation, Ames.
- Fig. 3 Photograph showing construction of the concrete piers, October 31, 1935. Located at the Iowa Department of Transportation, Ames.
- Fig. 4 Photograph showing construction of the viaduct deck over concrete piers, October 31, 1935. Located at the Iowa Department of Transportation, Ames.
- Fig. 5 Photograph of panoramic scene of the whole structure, October 31, 1935. Located at the Iowa Department of Transportation, Ames.
- Fig. 6 Photograph of approach and deck, October 31, 1935. Located at the Iowa Department of Transportation, Ames.
- Fig. 7 USGS Map.

JEFFERSON STREET VIADUCT

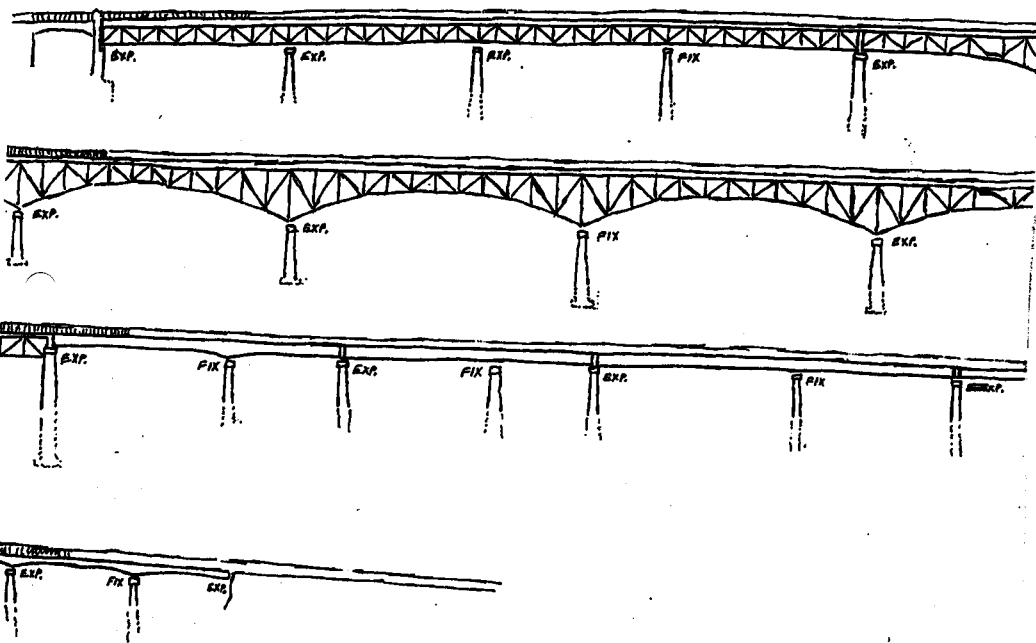


Fig. 1 Profile Sketch of the Jefferson Street Viaduct. James Hippen, 1996,



Fig. 2 Construction view of concrete piers, October 31, 1935.



Fig. 3 Construction view of concrete piers, October 31, 1935.

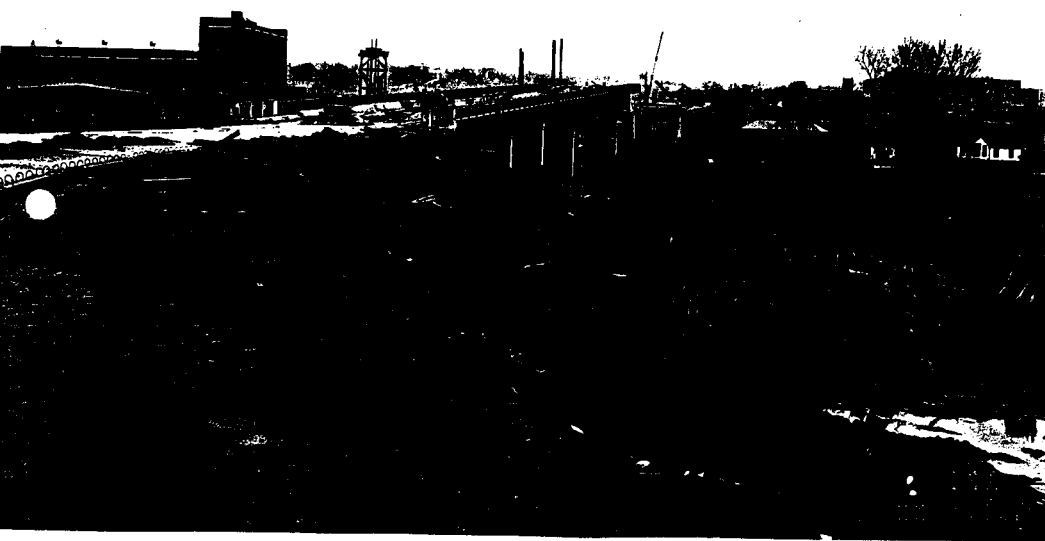


Fig. 4 Construction view of viaduct deck over concrete piers,
October 31, 1935.



Fig. 5 Panoramic view of viaduct and bridge, October 31, 1935.



Fig. 6 View of approach and deck, October 31, 1935.

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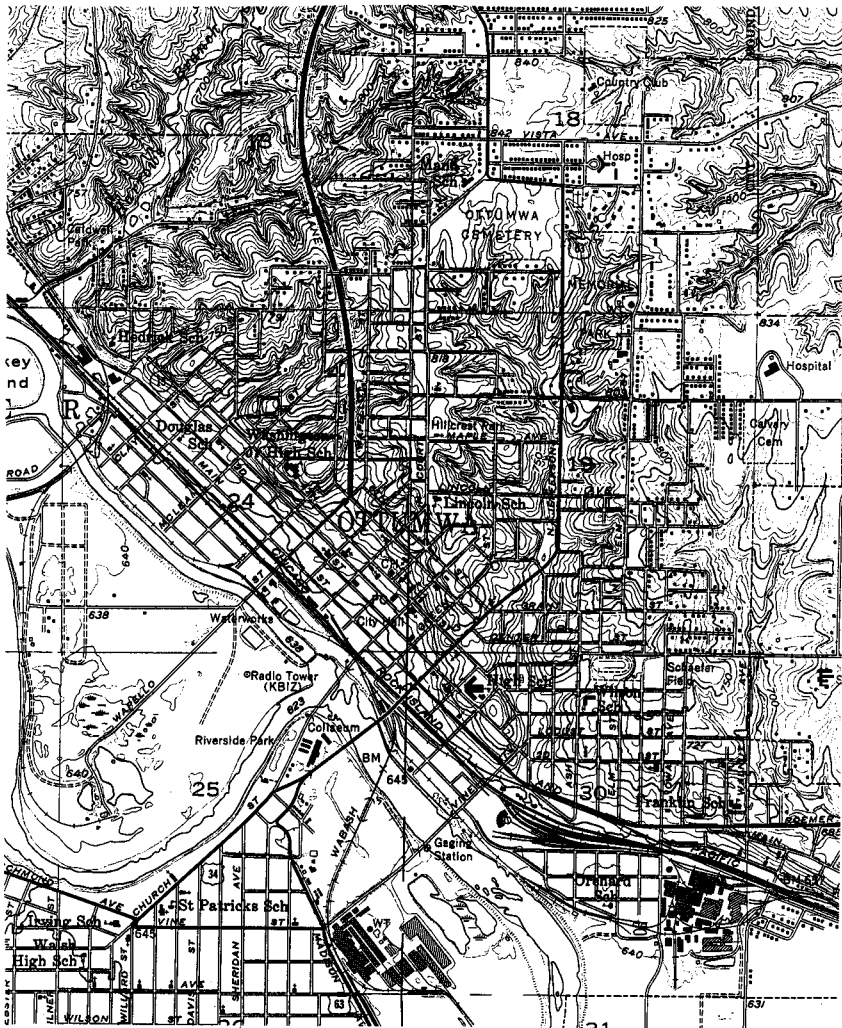


Fig. 7 USGS Map.

APPENDIX C Research Statement

Future Directions for Researching the Jefferson Street Bridge and Viaduct

Historical records of the Iowa State Highway Commission, starting in 1913, are readily available on film, as well as in physical form (e.g., Weekly Letting Report) at the Iowa Department of Transportation in Ames. These files contain the historical events surrounding the Jefferson Street Viaduct as recorded by ISHC. To get the perspective of the City of Ottumwa, possible document sources should be investigated of minutes of meetings, files of contracts and agreements, and blue prints produced by the City of Ottumwa during the 1920s and 1930s. Newspaper articles about the viaduct in the *Ottumwa Courier* from the 1930s occasionally refer to such meetings. Finally, files which may still exist from the Wisconsin Bridge and Iron Company should be searched for in Wisconsin as well as records at the still active Inland Steel Company in East Chicago, Indiana.

ADDENDUM TO
JEFFERSON STREET VIADUCT
Iowa Historic Bridges Recording Project II
Spanning Des Moines River at U.S. Highway 63/64 (Jefferson Street)
Ottumwa
Wapello County
Iowa

HAER No. IA-86

HAER
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WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
1849 C Street, NW
Washington, DC 20240

ADDENDUM TO
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HISTORIC AMERICAN ENGINEERING RECORD

JEFFERSON STREET VIADUCT

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This appendix is an addendum to a 40-page report previously transmitted to the Library of Congress.

APPENDIX: ADDITIONAL REFERENCES

Interested readers may consult the Historical Overview of Iowa Bridges, HAER No. IA-88: "This historical overview of bridges in Iowa was prepared as part of Iowa Historic Bridges Recording Project - I and II, conducted during the summers of 1995 and 1996 by the Historic American Engineering Record (HAER). The purpose of the overview was to provide a unified historical context for the bridges involved in the recording projects."