Sutliff's Ferry Bridge
Spanning the Cedar River in Cedar (TWD)
~~Cedar Township~~ Solon Vicinity
Johnson County
Iowa

HAER No. IA-6

HAER
IOWA,
52-SOLON.V,
1-

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

Historic American Engineering Record
National Park Service
Department of the Interior
Washington, D.C. 20240

HAER
IOWA,
52-SOLON.V,
1-

HISTORIC AMERICAN ENGINEERING RECORD
SUTLIFF'S FERRY BRIDGE
(SUTLIFF BRIDGE)
~~CEDAR RAPIDS~~ Solon Vicinity, JOHNSON COUNTY, IOWA
HAER-IA-6

Location: Spanning the Cedar River in the Southwest Quarter of Northeast Quarter of Section 11, Township 81 North, Range 5 West of the 5th Parallel Meridian.

UTM: East end: 15/633525 4632980
West end: 15/633300 4633070

Quad: Solon, Iowa 1:24,000

Date of Construction: Begun in Spring 1897, completed in May 1898

Owner: Johnson County, Iowa

Use: Vehicular bridge

Statement of Significance: Based on current findings from the Iowa Department of Transportation's truss bridge inventory, Sutliff's Ferry Bridge is believed to be the longest (approximately 825 feet) and oldest, Parker truss span presently known on the state's secondary road system. It was built to facilitate farm-to-market travel, at the site of a ferry that had operated from the early 1840's until the late 19th century. Sutliff's Ferry Bridge was designed by Johnson County Engineer George W. Wynn. Steel, supplied by Jones & Laughlin Steel Corp. of Pittsburgh, Pennsylvania, was fabricated by Fair-Williams Bridge and Manufacturing Co. of Ottumwa, Iowa. Contractor for erection was J. R. Sheely & Co., of Des Moines, Iowa.

Project Information: Sutliff's Ferry Bridge was recorded by Dennett, Muessig & Associates, Ltd., Iowa City, Iowa, under a contract with the Board of Supervisors, Johnson County, Iowa, in 1982. The project team consisted of Robert A. Ryan and J Ceronie, Photographers; Martha H. Bowers, Historian; Hans Muessig, Technical Preparation; and Bruce A. Harms, Drafting Assistant.

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DESCRIPTION

The Sutliff's Ferry Bridge, commonly known as Sutliff Bridge, spans the Cedar River on county road F14, in the far northeast corner of Johnson County, Iowa. On the east side is the unincorporated crossroads community of Sutliff, at the T-intersection of Swine and Madison Avenues. Its structures include several late 19th century frame farmhouses, a number of newer river cabins, and a late 19th century frame commercial building with false front and bracketted cornice, which houses part of a neighborhood tavern-restaurant.

The bridge is a through-truss structure, with three pin-connected steel Parker truss spans set on limestone piers. It was built in 1897-1898 from designs by George W. Wynn, then the Johnson County Engineer. The steel, rolled by the Jones and Laughlin Steel Co., of Pittsburgh, was fabricated in Ottumwa, Iowa at the shops of the Fair-Williams Bridge & Manufacturing Co. Contractor for the project was J. R. Sheely & Co. of Des Moines.[1]

The substructure of the Sutliff's Ferry Bridge consists of three river piers plus one shore pier at the east end.[2] All four are constructed of coursed rockfaced limestone ashlar with rubble cores, the material very likely obtained from quarries in nearby Cedar, Linn or Jones county. The river piers, with triangular nosings on the upstream ends, are built on 16' (4.88M.) piles with pine grillage consisting of 10" x 12" x 10' (.25M. x 30M. x 3.05M.) caps covered with 6" (.15M.) planking. Above a two-foot base, the battered shaft of each pier rises 17' (5.18M.) to a one-foot-high coping. Atop the coping of each pier are two large rockfaced stone blocks, 3' x 5' x 16' (.9M.

x 1.52M. x 4.88M.) in dimension, which act as pedestals for the end shoes of the trusses.[3] The shore pier is of similar construction except that it sits on a rock ledge foundation and lacks the triangular nosing found on each river pier.[4]

The three Parker through truss spans of Sutliff Bridge are basically identical.[5] Each measures 214'6" (65.38M.) long, center to center, with a clear width of 16' (4.88M.) between trusses. The height of each truss ranges from 21' (6.40M.) center to center (at the outer hips) to a maximum of 32' (9.75M.) at midpoint. The trusses, symmetrical about the center, are divided into 11 panels, each 19'6" (5.94M.) long.

The polygonal top chord of each truss is formed from paired channels joined with bar lacing and a cover plate, while the bottom chord consists of paired eyebars which decrease in section from the center to the end of the truss. Vertical compression members are bar-laced channels, with flanges oriented parallel to the main axis of the span. The end verticals consist of paired eyebars which act as tension members. Paired eyebars are also used for main diagonal tension members in panels 2, 3, 4 and 5, and are crossed with single rods with turnbuckles in panels 4 and 5. Diagonals in each center panel consist of two pairs of crossed eyebars. The end panels have no diagonal bracing.

Top laterals and substruts are fashioned as two pairs of bar-laced ells, the top laterals riveted to the flanges of the top chord. Rods with turnbuckles provide additional stability as top lateral and sway bracing. The portal struts and substruts are paired ells, and the portal bracing consists of a

wide lattice of single ells.

The bridge deck is carried on I-beam floor beams which are riveted to cover plates on the vertical compression members just above the lower chord connections. At the first connections, however, where the verticals are paired eyebars, hangers consisting of a pair of laced channels with plates at the upper and lower ends, feature two pin connections: one for the vertical eyebars and one for the bottom chord connection. The floor beams at these points are riveted to plates on the interior faces of the hangers between the two connections. Floor beams at each end of the bridge are riveted to the inclined end posts, forming shoe struts. Roller shoes for expansion are located at the east end of each truss, while the west end shoes are fixed.

Contrary to original plans, wooden floor joists do not appear to have been included in actual construction. Instead, I-beam stringers support the worn plank deck. The planks were originally nailed to pieces of dimensioned lumber fitted between the inner flanges of each stringer. Later, metal bolts driven through the flanges of the stringers were used, somewhat unsuccessfully, to secure the planking. The original deck planking has been at least partly replaced, with similar materials. Portions, however, retain strips of mesh laid down to provide better traction in snow or rain.

The Sutliff Bridge features two trestle spproaches, the longer (155' or 47.24M.) located at the west end. (The east approach is approximately 27' (8.23M.) long; the total bridge length is approximately 825' or 251.46M.) The slightly inclined west approach consists of pile bents set approximately 20' apsrt. Original plans called for single three-pile bents with diagonal

bracing.[6] These appear to have been for the most part replaced with pairs of three-pile bents, each pair connected by lateral timbers atop each pair of piles below a timber floor beam, presumably to permit greater loads. The east approach is similar, but with only two bents, one of which consists of truncated "piles" set on the top of the stone shore pier, between the pedestals for the roller shoes. Both approaches have plank decks on wooden floor joists and rudimentary wood railings. The bridge itself may have once featured wood railings (according to the original plans) but now has very flimsy railings of steel.

FOOTNOTES

[1] George W. Wynn was born in Ohio on 24 December 1840 and died in Cedar Rapids, Iowa, on 9 March 1911. His brief obituary in the Cedar Rapids Gazette (9 March 1911, p. 2) described Wynn as "a pioneer of this city" and former Linn County Surveyor. Listed in Cedar Rapids city directories as a civil engineer with offices at 111 First Avenue, Wynn worked for Johnson County apparently on a part-time basis during the period of the design and construction of Sutliff Bridge.

Jones & Laughlin, Ltd., was a partnership established in Pittsburgh in 1850. It was incorporated as Jones & Laughlin Steel Company in 1902, and as Jones & Laughlin Steel Corporation in 1922. The firm had plants in Pittsburgh and Woodlawn, Pennsylvania.

The Fair-Williams Bridge & Manufacturing Co. was incorporated in Ottumwa, Iowa in 1894. It was founded by J. H. Williams, who came from Pennsylvania to Iowa in 1866. The following year, Williams went to Keosauqua, Iowa, as a carpenter and joiner. By 1880, he was "identified" with the "bridge and manufacturing business" in that Van Buren County town. In 1887, Williams moved to Ottumwa and with E. D. Fair (a former carpenter and railroad construction contractor) established a partnership in a building formerly occupied by the Ottumwa Plow Company. By 1900, the firm had built a "large fireproof structure", with a "foundry complete in all its appointments." Products included roof trusses, engines, boilers, coal mining and milling machinery, as well as steel truss members for bridges. These found markets in Nebraska, Kansas, Missouri and the Dakotas as well as Iowa (see Evans, S. B. (ed.), History of Wapello County, Iowa. Chicago: Biographical Publishing Co., 1901, pp. 201-2).

Little is known concerning the contractor for Sutliff Bridge. An 1896 Des Moines city directory lists Josephus R. and Charles G. Sheely as bridge contractors (J. R. Sheely & Co.), and the following year as bridge "builders" as well. Charles G. Sheely lived not in Des Moines, but in Lincoln, Nebraska. Sometime before 1923 he relocated to Denver, Colorado, and bridges constructed by his firm have been recorded in that state and Montana.

[2] In the original plans, Wynn's profile of the west approach shows the bridge supported on steel lally columns. However, the same set of plans includes sheets of drawings (one each) for stone river piers as well as a stone shore pier. From J. R. Sheely & Co.'s proposal to the Board of Supervisors, it appears that prospective bidders were asked to supply estimates for both steel and stone piers. In Sheely's proposal, a bridge with steel columns was estimated at $12,821, while the same structure on stone piers came in at $12,000 - the latter being the figure accepted by the Board. (See Photos IA-6-31-34, and Appendix A).

[3] See Photo IA-6-34, Plan of River Piers.

[4] See Photo IA-6-33, Plan of Stone Pier for East End.

[5] See Photo IA-6-35 for dimensional and loading data.

[6] See Photos IA-6-31,32.

HISTORICAL BACKGROUND AND CONSTRUCTION

Cedar Township, like most of Johnson County, was settled in the late 1830's, following the opening of the territory through the Black Hawk Treaty of 1833. Many of the earliest township residents came from Ohio, Pennsylvania and New York, with 27 households listed in the federal census of 1850, four years after Cedar Township was formally organized. The township's population gradually increased over subsequent decades, as emigrants from eastern states were joined by sizeable numbers from various German states and principalities. Although Cedar Township eventually contained two churches and several schools, it developed no population centers, and it remains a predominantly rural agricultural area.

The rectilinear township-and-range system of land survey imposed upon the Iowa landscape seldom took natural features into account. As a result, the Cedar River, one of the state's major internal waterways, isolated two full sections of Cedar Township, and goodly portions of four more, from the rest of the township and the county lying south and west. Although bridges were built in Johnson County as early as the 1840's, they were located primarily on the Iowa River in Iowa City (first state capital as well as county seat), some 20 miles west and south of Cedar Township. For many decades, county-wide transportation priorities lay in establishment of roads: "There was no money, no means to build bridges, and had there been, no one could determine which point needed the bridging most."[1]

Without bridges, county inhabitants crossed local rivers most easily in

winter, when ice provided a hard if often slippery, footing. In other seasons, they simply waded across at shallow points, which during spring floods were few and far between. A popular alternative was the ferry, often one of the first businesses to operate in a newly-settled area. In Cedar Township, Allen C. Sutliff, a aettler from Trumbell County, Ohio, established a ferry across the Cedar River in 1841, which was later taken over by James McClelland.[2] Despite fees as high as $5, Sutliff's ferry was a crucial feature of the township's tranaportation system. It lay on the road north to Lisbon, a town located on the Chicago and North Western Railroad's main line and thus an important shipping point for local agricultural products. In the other direction, the road went to Solon, where it intersected a main road to Iowa City, the region's principal market center. Thus, when in the late 19th century a sandbar developed at the Sutliff crossing, effectively ending ferry service at that point, township residents were justifiably concerned, as they were forced to travel well out of their way, over poor roads, to find another crossing.[3]

As was the custom, Cedar Township inhabitants sought county help, through petitions to the Board of Supervisors. The Cedar being a large river, any bridge built across it would of necessity be long, and therefore expensive. While Johnson County was not averse to building a bridge across the Cedar, the potential cost was of no little concern. One proposal was for Linn and Johnson counties to fund a Cedar River bridge jointly. This idea however, failed in disagreement over how much each county should pay.[4]

Eventually, the Johnson County Board of Supervisors bowed to Cedar Township pressure and at a special session in December, 1896, authorized construction

of a bridge "at a point known as the McClelland or Sutliff Ferry." They instructed the County Engineer, George W. Wynn of Cedar Rapids, to "prepare plans and specifications for said bridge...to be on file in the auditor's office...on and after December 28th, 1896."[5]

Prospective bidders had until January 8, 1897, to submit proposals and budgets for construction of the Sutliff's Ferry Bridge. On letting day, representatives of bridge firms "from all over the west," and "even the bridge builders from Ohio" were in attendance at the county courthouse.[6] The contract was awarded to the low bidder, J. R. Sheely and Co. of Des Moines, whose bid was $12,000, $6,000 below the highest bidder.[7] The document, dated January 8, 1897, specified a completion date of September 1, 1897, with payment to be made in three installments. The first, for $3,500, would be due upon completion of the substructure. The second, for $5000, would be made within 30 days following completion of the bridge and its acceptance by the County. This left $3,500, which the County would not pay until April 1, 1898, fully seven months after the bridge was to be completed, and then without any interest - a situation hardly designed to encourage a speedy construction effort.[8]

As it was, work on the Sutliff Bridge was delayed until May, due to high water in the Cedar River. Once begun, things apparently did not go smoothly, first due to problems in obtaining stone for the piers (which eventually resulted in a $1,000 cost overrun), and then to difficulties with the workmen. In June, members of the Board of Supervisors visited the bridge site, because "one of the sub-contracting parties or an employee [had] been letting things go at loose ends." Whatever the problem, it appears to have been quietly solved,

with the contractor, Griffith of Sheely and Co., pronounced "blameless in the trouble."[9]

Nonetheless, despite the efforts of County Engineer George Wynn (who had been appointed "Engineer to Superintend" construction at a rate of $5 per day),[10] the three-span Sutliff Bridge remained behind schedule. During its November, 1897, session, the Board of Supervisors had a meeting with representatives from Sheely & Co. "relative to urging the completion of said bridge."[11] In January, 1898, the bridge was still "in Process of Erection" owing to "a Number of Circumstances" left unspecified by the Board. However, Joe Smith, chairman of the County Bridge Committee, urged that the Board be "lenient," as "the work [was] being well done and at a very low figure, and there seem[ed] to be no negligence on the part of any one."[12] In February, 1898, the Board of Supervisors authorized the first payment to Sheely and Co.: the originally specified $3,500 less $943 in claims of "sundry persons" against the contractor, who were named neither in Board minutes nor in local newspaper accounts.[13]

About this time, controversy arose over the merits of George Wynn's plans and specifications for Sutliff Bridge. On March 2, 1898, the Iowa City Weekly Republican noted that rumors were circulating to the effect that the newly completed bridge was not "what the people pay[ed] for." These rumors were fueled by publication in the same issue of a letter from A. V. Sims, a Professor of Engineering at the University of Iowa. Acting upon the suggestion of "an Iowa Civil Engineer," Sims said he had examined the figures on Wynn's stress sheets, and found them "so far in error" that he thought they might have been copied from sheets for another bridge "by mistake." Sims

claimed that "the stresses in every web member save one" were too small and said he had made his own, "correct" calculations for an intended load of 1000 lbs. per linear foot. Although Sims noted that Sutliff Bridge would probably never have to meet that goal, "the people of the county imagine they are paying for a bridge which will carry it."[14]

Picking up on Sims' charges, the Republican called upon the Johnson County Board of Supervisors to make "a careful investigation" of the bridge matter. The paper's complaint lay not with the contract nor with Sheely & Co., but with the specifications developed by County Engineer Wynn. "The Board arranged for a bridge capable of sustaining a certain weight. The people are paying for such a bridge. As built, under the specifications, the bridge will be weak in vital particulars..."[15]

Despite the Republican's urging, the Board of Supervisors appears to have taken no immediate formal action. However, by remarkable coincidence, J. A. L. Waddell, then one of America's foremost bridge engineers,[16] "happened" to pass through Iowa City in early March, on his way to Chicago from Council Bluffs.[17] Seizing the opportunity, Board members Wescott and Ohl met with Waddell, and asked him to review Wynn's designs for Sutliff Bridge based on a portion of the shop drawings and a photograph taken just after the trusses were swung into place.[18]

The Board of Supervisors received Waddell's response on March 23. It proved to be a rather critical document, as Waddell found no fewer than fifteen points on which his own views on proper bridge design differed from those of George Wynn as set forth in the latter's plans for Sutliff's Ferry Bridge. In

genetal, Waddell took issue with sizes specified by Wynn for various truss membets, citing in particular the second, third and fourth main diagonals; bottom chord pins; channels for posts nearest mid-span; roller plates; webs of the vertical posts; and the connecting plates for the lower lateral rods. Waddell also found fault with sevetal connections, particularly those for the upper and lower lateral rods, and with the design of the portals, which he termed "most unscientific." His overall conclusion was that "the bridge the county is getting is by no means a good one," being too lightly designed for proper loading or to withstand potential pressure from storms or high winds.[19]

Somewhat taken aback, the Johnson County Board of Supetvisors delayed dissemination of the teport until they had "duly considered the matter and had the technical parts explained to them by some competent engineer" who turned out to be Professor Sims of the Univetsity of Iowa.[20] Apparently not completely satisfied, the Board sent Waddell the complete plans and specifications along with several basic questions: "Is the County getting the bridge it is supposed to be paying for? If not, is the bridge safe as it is for loads likely to come on it, including a drove of cattle, as it now stands, without any alterations or changes? If not, please specify just what changes must be made in order that the btidge may be made safe. What would, in your estimation, be the probable cost of such changes as will make the bridge safe - if not safe?"[21]

Waddell's second reply was brief. He had looked over the additional items sent by the Board, but "found nothing in them [he] did not know before."

> First - The county is not getting a properly designed bridge, and as the specifications are very loosely drawn, it is hard to say whether the county is getting what it is supposed to be paying for; but my opinion is that it is not.
> Second – If the bridge be changed as I have suggested, it will be safe enough for vertical loads, although not for horizontal ones. Of course there are a great many faulty details throughout the whole work, but these cannot be corrected.
> Third - In my report I have stated what changes considered ought to be made.
> Fourth – It would give me more trouble to make you a detailed estimate of the cost of the changes than the fee would warrant...
> Fifth - I do advise that the changes be made at once.
> I return to you today under separate cover the so-called plans, and the other papers you sent me.[22]

With Waddell's scathing comments in hand, the Board of Supervisors turned to Wynn and the fabricator, Fair-Williams Bridge & Manufacturing Co., for replies. J. D. Dittman, Fair-Williams' shop engineer, confined his responses largely to mathematical calculations proving that the sizes of the lower chord pins were fully adequate, and to expressions of confidence in the strength of the inclined end posts. He closed with the remark that "...the burden of [Waddell's] report seems to come where he says 'I strongly recommend that the strengthening and remodeling of this bridge be entrusted to a competent engineer (J. A. L. Waddell) etc.'"

> And one thing yet. Of all of the bridges in the state of Iowa, that are not any better than this bridge, were to be taken down the state would not have a single bridge left, with the possible exception of a few heavy city bridges, and they are not any better in their place than this bridge is in the place where it goes.[23]

County Engineer George Wynn responded to Waddell's criticisms at some length. He maintained that Sutliff's Ferry Bridge was designed to carry all the load that might ever be reasonably required, and that most of the details at issue

were in conformance with standard engineering practices of the day. Wynn agreed with Waddell that "the greatest danger to which the bridge is exposed is from the 'wind'...for possibly I may hear some time that it has been struck by a tornado and blown away, but I never expect to hear that it has failed under any load that will come upon it."

> In conclusion I will say that this bridge might have been designed differently, and might have been detailed in one of a number of different ways, and any one of them would as justly be a subject of criticism as this. I have followed what I considered good practice, and have used designs and details that have been tried and stood the test. It is a good bridge, and in it, your county is getting all it is paying for.[24]

Solicitation, preparation and digestion of these various opinions on the merits of Sutliff Bridge took several weeks. The Iowa City Weekly Republican, which had in effect promoted the controversy, filled this time with criticism of the Board of Supervisors. Complaining about a "lack of prompt action," the Republican remarked: "Politics will not strengthen a weak spot in a bridge, although, it is sometimes used to cover weak spots in the records of certain officials."[25] And, when it appeared that the Board of Supervisors might accept Sutliff Bridge as built, despite J. A. L. Waddell's fifteen objections to its design and construction, the paper declared, "The manner in which a majority of the Board has treated the criticisms...by competent engineers is not such as to give the public undying faith in the frankness of that body."[26]

To those standing to benefit most from the Sutliff Bridge, the "battle of the experts" appeared largely meaningless and rather a waste of time. Even in the county seat, J. A. L. Waddell's well-earned reputation as a bridge engineer was treated with skepticism. In an introduction to the full text of Waddell's

report, the Iowa State Press (the Republican's major rival) described Waddell as

> ...an expert engineer, who builds bridges, draws plans, furnishes criticisms, etc. from an office in Kansas City...It is very probable that the gentleman does not see the construction of one bridge out of a hundred for which he prepares the plans: in other words, he is an expert theoretical bridge engineer, compared with Mr. Wynn who is a practical one.[27]

The Press view was eminently shared by the Economy, a fledgling paper published from Solon that reflected the concerns of its largely rural readers - not least among them citizens of Cedar Township. The Economy, unlike the Press, chose not to publish Waddell's, Dittman's and Wynn's various arguments over the merits of the long-awaited Sutliff Bridge. Instead, the paper provided a summary that, if short on specifics, left no question as to how local interests viewed the entire issue.

> Engineer Waddell at the distance of several hundred miles, with a few drawings and specifications in his hands undertakes to pass judgement upon the structure of a bridge he never saw and he does it in technical language that is practically Latin to most people... Engineer Dittman makes a mathematical report that would puzzle anyone but an expert...but ends up by taking some wind out of brother Waddell's report. Engineer G. W. Wynn gets back at Mr. Waddell in a column and a half that knocks the wind out of Waddle's [sic] fifteen windy criticisms. So ends the fight of the experts, and no one is much the wiser.[28]

In the end, Sutliff's Ferry Bridge was to stand as built. The Johnson County Board of Supervisors duly considered all three reports, and finally voted unanimously to accept the bridge, completed in late April or early May, 1898.[29] J.R. Sheely & Co. was paid the balance of the contract, and plans were begun for a "monster celebration" on June 4.[30] According to the Economy, nearly a thousand people attended the late spring gathering at the

new bridge, among them members of the Board of Supervisors and the now-vindicated County Engineer, George Wynn. A podium was erected in a grove of trees near the west end of the bridge, from which "issued words of oratory and good fellowship." The speeches were "largely reminiscent and congratulatory, calling up the early struggles of the pioneers of the '40's and '50's...," including, no doubt, the struggles of Cedar Township inhabitants to obtain a proper crossing over the Cedar River.[31] Persons puzzled over the design controversy had been given "explanation" in the pages of the Iowa State Press, which blamed it all on a "combination of bridge engineers and bridge contractors...which, reduced to the common parlance of the times, means a trust."[32] The Economy agreed with this analysis, and beneath a fine drawing of Sutliff Bridge commended Engineer Wynn for having "the courage to stand by his work and bid the trust defiance. We want a few more such constructors [sic] in Iowa, and a little less combining to fleece the people."[33]

Sutliff's Ferry Bridge was the longest span erected in Johnson County at the time. Currently, it is one of only eleven Parker high truss bridges confirmed as existing on Iowa's secondary road system, and has the longest spans presently recorded for Parker trusses on that system. Construction of Sutliff Bridge clearly improved farm-to-market travel for residents of northeast Johnson County. It may have drawn more business to Iowa City from adjacent portions of Linn and Cedar counties, as well as providing improved access for people west of the river to shipping points along the Chicago and North Western main line. The controversy over the design of Sutliff's Ferry Bridge had little impact upon actual construction, but provides an interesting look at the issue of "style" in bridge engineering and the attitudes of the general

public toward arguments among "the experts." This attitude was perhaps best expressed by the Solon Economy when it declared "...the people will use the bridge till it blows down, breaks down or wears out" - which is exactly what "the people" did.[34]

FOOTNOTES

1 Aurner, Charles Ray, Leading Events in Johnson County History, 2 vols. (Cedar Rapids: Western Historical Press, 1912), 1: 196.

2 History of Johnson County, Iowa (Iowa City, 1883), pp. 702-3.

3 Aurner, p. 203.

4 Johnson County Board of Supervisors, Minute Book 6, pp. 356-66.

5 Ibid., p. 368.

6 Iowa State Press, 8 June 1898, p. 1.

7 Johnson County Board of Supervisors, Minute Book 6, pp. 390-91; Iowa State Press, 8 June 1898, p. 1.

8 Contract between Johnson County Board of Supervisors and J. R. Sheely & Co., 8 January 1897, Johnson County Auditor's Office, Iowa City, Iowa.

9 Solon Economy, 13 May 1897, p. 1; 24 June 1897, p. 1.

10 Johnson County Board of Supervisors, Minute Book 6, p. 391.

11 Ibid., p. 444.

12 Ibid., p. 459.

13 Ibid., p. 473; Iowa City Weekly Republican, 2 March 1898, p. 5; Solon Economy, 17 March 1898, p. 6.

14 Iowa City Weekly Republican, 2 March 1898, p. 4.

15 Iowa City Weekly Republican, 9 March 1898, p. 4.

16 Dennett, Muessig & Associates, Ltd., "The Pacific Short Line Bridge," (Iowa City, 1980).

17 Iowa City Weekly Republican, 9 March 1898, p. 2; 16 March 1898, p. 4.

18 Ibid., 16 March 1898, p. 1; 23 March 1898, p. 5; Iowa State Press, 11 May 1898, p. 4.

19 Iowa State Press, 11 May 1898, p. 1.

20 Iowa City Weekly Republican, 23 March 1898, p. 5; 6 April 1898, p. 6.

21 Iowa State Press, 11 May 1898, p. 4.

[22] Ibid., p. 4.

[23] Ibid., p. 5.

[24] Ibid., p. 5.

[25] Iowa City Weekly Republican, 27 April 1898, p. 2.

[26] Ibid., 11 May 1898, p. 4.

[27] Iowa State Press, 11 May 1898, p. 1.

[28] Solon Economy, 19 May 1898, p. 2.

[29] Johnson County Board of Supervisors, Minute Book 6, p. 480.

[30] Cedar Rapids Gazette, 3 June 1898, p. 4.

[31] Solon Economy, 9 June 1898, p. 2; Iowa State Press, 8 June 1898, p. 1.

[32] Iowa State Press, 11 May 1898, p. 1

[33] Solon Economy, 9 June 1898, p. 7.

[34] Solon Economy, 19 May 1898, p. 2.

APPENDIX A

BID AND CONTRACT DOCUMENTS

J. R. Sheely & Company.

Bridge Contractors and Builders.....

Wrought Iron or Steel Combination or Wooden Bridges and Foundations.....All kinds of County Work and Pile Driving.... Hardwood Lumber and Piling.....

Rooms 67 and 69
Clapp Block.

Des Moines, Iowa. Jan 8 189 7

Hon Board of Supervisors
Jones City Iowa
Gentlemen :

We hereby propose to furnish all materials and labor and build for you Complete and ready for Travel a Bridge Near Colon and Lisbon according to Plans and specifications on file and as per your advertisement for the following prices viz :

~~#1~~ Entire work Complete with Steel Piers & Tons Piers and 400 yards Rip Rap for $ 12821 00

#2 Entire work Complete with 1 Shore Pier and 3 Stone River Piers & 400 yards Rip Rap for $ 12000 00

#3 - Same as #1 except Stone Piers & Rip Rap for $ 11924 00

#4 - East Shore Pier & 400 yards Rip Rap for $ 997 00

#5 - Superstructure and approach Complete for $ 9070 00

#6 = 1 Shore Pier & 3 River Piers & Tons & 400 Yds Rip Rap for $ 3800 00

Masonry for $ 7 00 per Cubic yard Increase or Decrease

Rip Rap " $ 6 00 " " " "

We furnish Bond in double sum of Contract if awarded us Respectfully Submitted J R Sheely & Co
per [illegible]

This agreement made and entered into by and between the Board of Supervisors of Johnson County Iowa of the first part and J.R. Skeely & Co of Polk County Iowa of the second part Witnesseth

That the said second party hereby agrees to furnish all the material and labor required, and build and erect and Complete, ready for travel the sub-structure and superstructure and approaches for a highway Bridge over the Cedar River at a point known as Sutliffs Ferry in said County in accordance with the plans and specifications hereto attached and made a part of this Contract.

The work to Consist of three stone Piers built in accordance with plan marked "A" and one Stone Pier built in accordance with plan marked "B" and three Spans of superstructure each 214 feet long built in accordance with plan marked "C" and Two Hundred feet of approach built in accordance with plan marked D and profile marked E. all hereto attached, and 400 Cubic Yards of Rip Rap to be placed around the piers.

All to be Constructed in a Substantial and workmanlike manner and to the Satisfaction and acceptance of the Engineer in Charge, and the Board of Supervisors of the Davis Johnson County

The entire work to be Completed on or before the first day of September 1897

And the said First-Party, for and in Consideration of the above described work done and Completed, hereby agrees to pay to the said Second-party the sum of Twelve Thousand Dollars ($12000.00) in payments as follows.

Thirty five Hundred Dollars ($3500.00) when the Substructure is Completed,

Five Thousand Dollars ($5000.00) thirty days after the work is Completed and accepted, and the balance of Thirty-five Hundred Dollars ($3500.00) on the first Monday in April 1898. without interest

Witness our hands this 8th day of January 1897

Lewis H Miller
Chairman of Board of
Supervisors of Johnson County Iowa

J.R. Skeely & Co.
By J.F. Griffith

APPENDIX B

SPECIFICATIONS

Specifications for the Sub-structure of a Highway Bridge over the Cedar River, in Johnson County, Iowa.

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~~The location of the work is about seven miles from Solon, a station on the C. R. & W. Railroad.~~

The work will consist of ~~three~~ (3) Stone Piers like Plan A, and one Stone shore pier, like Plan B hereto attached.

The foundation of the shore pier is rock. The ledge is covered with earth and loose rock which must be excavated to e depth sufficient to reach the solid ledge as shall be determined by the Engineer in charge, and all cost of excavation must be included in the cost per yard or the lump sum bid for the work.

The right is reserved to increase or diminish the height of the pier to meet the varying elevation of the foundations and bids for a lump sum must state the price per yard for increase or decrease in amount.

FOUNDATIONS.

The bottom of the River where river piers are located, is sand and the foundation will be of Piling and Grillage/.

The Piles may be of any sound, live timber that is sufficiently hard and firm to bear driving. There will be forty three (43) Piles under each pier.

The piles will be sixteen (16) feet long and shall be eight (8) inches in diameter at the small end, and shall be driven to a firm bearing, with a hammer weighing not less than 1500 lbs., with a final fall of not less than twenty (20) feet.

The piles shall be cut off at a uniform height, leaving the heads with a level surface, and capped with sound pine timber 10 X 12 inches. The caps shall be secured to each pile by a drift bolt sixteen (16) inches long of five-eighths (5/8) inch round iron.

A solid floor will be laid on the caps, of sound pine timber six (6) inches thick, well spiked to the caps. The piles shall be

(1)

SPECIFICATIONS FOR A HIGHWAY BRIDGE OVER THE CEDAR RIVER AT SUTLIFFS FERRY JOHNSON COUNTY, IOWA.

The bridge site is about 7 miles from Solon, a station on the R.C.R. & N. Railway and about 7 miles from Lisbon a station on the C.& N.W.Railway.

The work will be done under Contract with the Board of Supervisors of Johnson County, Iowa.

The work will consist of Substructure and Superstructure and approaches complete, as shown by the plans herewith, and the specifications thereon, and these specifications.

cut off at such a height that all the timber work shall be eighteen (18) inches below extreme low water, the said height to be determined by the Engineer in charge of said work.

Before the floor above mentioned is laid, all the space between the piles shall be excavated to such depth as shall be determined by the Engineer on charge, and the space excavated shall be filled with broken stone, well rammed between the piles and to the top of the caps, and the said stone shall be measured and estimated as rip rap.

The said piles and caps and floor shall be placed in form and dimensions as shown by the detailed drawings herewith.

MASONRY MATERIAL.

The stone may be from any quarry where a suitable quality can be obtained and must be equal to the average of the stone used in piers in the Cedar River and must be acceptable to the engineer in charge.

The mortar shall be made of Hydraulic Cement one part, and clean sharp sand two and one-half parts by measure. The cement must be equal to the best brands of Milwaukee or Louisville cement, and will be subject to inspection and test, and acceptance by the engineer in charge.

CONSTRUCTION.

The Masonry will be regular coursed Ashlar, the courses decreasing in thickness from the bottom to the top, and no course shall be less than twelve (12) inches in thickness.

All stone must be so dressed that their bearing beds will be parallel to their natural beds and must be properly dressed before going on the wall, as dressing or tooling upon the wall will not be allowed.

The stone must be laid on their natural beds in a full bed of

HEADERS AND STRETCHERS.

Stretchers for courses sixteen (16) inches and upwards in thickness, must have a width of bed at least equal to their depth ; and for courses under sixteen (16) inches in thickness, a bed equal to at least one and one half (1-1/2) times their depth ; and no stretcher shall be less than three (3) feet in length.

Headers must have a width at least equal to their depth, and hold back into the heart of the wall the size they show on the face. Headers shall occupy at least one-fifth (1/5) of the whole face of the wall and be as near as practicable, equally distributed over it, and be so placed that the headers in each course shall generally, divide equally the spaces between the headers in the next course below.

Headers must reach two-thirds (2/3) of the distance across the wall when the width of the stretcher on the opposite side will admit it, and in no case shall the length of the header be less than one-half (1/2) the width of the wall, and care must be taken so to place the stone as to secure a good bond across the hearth of the wall.

Projecting or shelving edges in either headers or stretchers will not be allowed.

The nose of the piers shall be laid with double headers, with a bed not less than one and one-fourth times their depth, for courses sixteen (16) inches and upwards in thickness, and not less than one and one half)1-1/2) times their depth for courses less than sixteen (16a) inches in thickness, and each stone forming the apex of the nose must break at least twelve (12) inches around the shoulder of the pier.

BACKING AND FILLING.

Backing stone shall be the full depth of the course, and shall be as large as the space will contain, and all remaining voids shall be filled with spawls thoroughly bedded in mortar.

Care must be taken not to disturb the stone in their beds

after being set,and if a stone should be moved,it must be taken up and all the old mortar removed,and the stone re-set.

JOINTS AND FINISH.

Joints shall not be more than three-quarters (3/4) inch,nor less than one half (1/2) inch,and all vertical joints shall square at least ten (10) inches back from the face,and joints shall break not less than ten (10) inches on the face of the wall.

The joints on the face of the wall must be cleaned of loose mortar and neatly pointed.

The stone shall be finished with pitched or rock face. The joints shall be pitched full and true to line,and there shall be no projection more than four (4) inches beyond the line of the joints.

The nose shall be carefully dressed to a uniform surface within one half (1/2) inch of the line of the joints.

A chisel draft shall be cut on each angle of the pier and carried up from the footing to the under side of the coping.

No hollow faced stone will be allowed in the work.

COPING.

The coping shall be twelve (12) inches thick and finished with vertical face. Each stone shall extend across the wall,but shall not project beyond the face of the wall.

PEDESTALS.

The pedestals shall be made each of one (1) stone. The stone shall be sound and free from seams or caps,with all sides dressed vertical,and the top dressed to a true surface to receive the bridge shoes.

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The piers shall be constructed in accordance with the plans and detail drawings herewith.

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About 100 cubic yards of rip rap will be required around each pier to be placed as directed by the Engineer in charge.

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The Contractor shall furnish all material and labor required, and erect and complete the above specified sub-structure, ready for the super-structure, in a substantial and workmanlike manner, and to the satisfaction and acceptance of the Engineer in charge and the Board of Supervisors of Johnson County.

All material of whatsoever kind entering into the work, and all workmanship shall be subject to inspection and acceptance or rejection by the Engineer in charge of the work, or the authorized representatives of Johnson County.

(5)

SUPERSTRUCTURE.

The superstructure will be three spans 214 1/2 feet long each, to be constructed in accordance with the diagram of strains and dimensions and the specifications thereon hereto attached and made a part of these specifications.

The metal in all members except top and bottom laterals and vertical bracing shall be of medium steel with an ultimate tensile strength of not less than 60000 lbs. per square inch of section, and an elastic limit of not less than one half its ultimate strength.

The metal in the top and bottom laterals and vertical bracing may be iron or mild steel of an ultimate tensile strength of not less than 50000 lbs. and an elastic limit of not less than 26000 lbs.

If required all steel and iron shall be tested at the mills at the expense of the Contractor, and the Certificate of the Manufacturer that the metal is in compliance with these specifications must be attached to each invoice or Bill of Lading.

All work shall be subject to inspection at the shop before it is painted, and the engineer shall receive due notice of the time the work is ready for inspection.

The lumber used shall be sound, free from shakes, rotten knots or wany edges.

In erection all connections must be rivited wherever possible.

All exposed surfaces of the metal work must be painted on coat at the shop and one coat after erection.

The quality of all material and all details of Construction, not specifically mentioned, shall be in accordance with the standard specifications of Cooper or Thacher.

The Contractor will be required to furnish a copy of the detailed working drawings for inspection and acceptance before the shop work is begun, and all details must be made to the satisfaction of the engineer representing the Board of Supervisors, within the limits of the above mentioned specifications.

(6)

APPROACHES.

There will be an approach at each end of the bridge, as shown by the profile and elevation hereto attached.

The approaches will be constructed in form and dimensions as shown by the drawings herewith and these specifications.

PILING.

The piles will be Red Cedar, and shall be good sound timber free from snakes and rotten knots, and must be stripped of bark before driving.

All piles 14 feet, or under, in length, shall be not less than 10 inches in diameter at small end, and all 16 feet and upwards in length shall not be less than 8 inches in diameter at small end.

The piles shall be driven to a firm bearing and in sufficiently true line that the cap shall have a full bearing upon each pile head, and the tops shall be cut off to a true level surface to receive the cap.

CAPS.

The caps shall be 8 x 10 oak, and 18 feet long.

The caps shall be fastened to the piles by a drift bolt of 5-8 round iron 16 inches long, driven through the cap, and into the pile, and a dog of 7-8 inch round iron, with 3 inch tines set at right angles and 20 inches in the clear between the tines, shall be driven in 3-4 inch holes bored in the joist and pile.

Each bent shall be braced with two 3 x 10 braces running from the projecting end of the cap to the bottom end of the opposite pile, and be bolted to the caps and piles with 5-3 inch bolts.

The end bents shall be planked with pine plank from the floor of the bridge to the ground, to retain the earth approaches.

JOISTS.

There will be eight lines of 3 x 12 pine, and two lines of 3 x 12 pine joists.

The joists shall be spaced at equal distances apart and spiked to the caps.

(7)

The joists shall be bridged in the center of the spans with pieces of plank 12 inches wide, and of a length to fit closely between the joist and nailed through the joist into the ends of the bridging with 50d spikes, three in each end. The bridging will not be set in continuous line, but each alternate piece will be set out of line a distance equal to its thickness, so that each piece may be nailed at both ends.

FLOOR.

The flooring shall be 3 inch pine not less than 10 inches wide and 16 feet long.

The floor will be nailed to the joist with 50d spikes. There shall be two spikes in each end of the floor plank into the outside joist and one spike in each of the other joist alternating from edge to edge of the plank.

RAILING.

The railing will consist of 4 x 6 pine posts, one 2 x 10 pine hub plank, and 2 x 6 and one 2 x 4 pine hand rail.

There will be a post at each end of the panel and one in the center. The bottom of the post will be notched one inch and bolted on the outside of the joist with 2 one-half inch bolts.

The hub plank will be nailed to the inside of the post about 20 inches above the bridge floor. The 2 x 4 will be nailed to the inside of the post at the top, and the 2 x 6 will be nailed on top of the posts and the 2 x 4, all as shown by the drawings.

The railing shall be of dressed lumber and painted two coats.

All bolts shall have washers under the head and nut.

The lumber used shall be sound, free from shakes, rotten knots or wanes.

RIP RAP.

400 cubic yards of rip rap will be required, to be placed around the river piers as shall be directed.

(3)

The Contractor shall furnish all material and labor required and erect and complete the bridge, or such parts as may be included in the contract, ready for travel in a substantial and workmanlike manner, and to the satisfaction and acceptance of the Board of Supervisors of Johnson County, or their authorized representative.

All material entering into the structure shall be subject to inspection and acceptance by the Board of Supervisors, or their authorized representatives.

The plans and specifications herein referred to are intended for a complete structure and the right is reserved to correct any errors or omissions and in case of omissions, the engineer in charge shall have t the right to determine what is required to make the work complete.

Bids will be received as follows:

1st. For the entire work complete as above specified.

2nd. For the Superstructure and 5 foot Tubular Pier No.4 and the approaches.

The stone in pier No.1 is estimated at 99.0 cubic yards. Bids for the entire work will be upon that basis, and bids will state how much per cubic yard for increase or decrease in the amount.

The Board of Supervisors reserves the right to reject any or all bids or to award the Contract to such persons as may seem to be for the best interests of the said County whether the bid is the lowest ot not.

Aug. Lenz, Jr.

Chairman of Board of Supervisors.

Geo. A. Wynn,

Engineer.

T. L. Crowley,

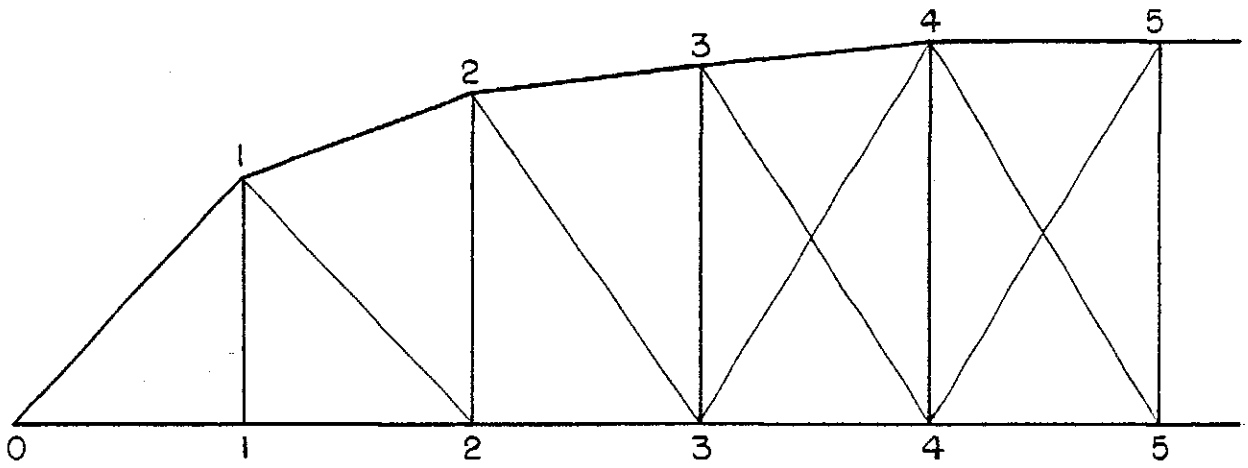
Auditor.

December 28th, 1896.

APPENDIX C

TABLE OF PIN DIAMETERS

TABLE OF PIN DIAMETERS



Panel Point	Upper Chord	Lower Chord
0	n.a.	3-1/2"
1	inaccessable	Hanger pin: 2-1/4" Lower chord pin: 3"
2	3-3/4"	2-7/8"
3	3"	3-3/8"
4	3-1/2"	3-3/8"
5	3"	3-3/8"

APPENDIX D

INDEX TO PHOTOGRAPHS

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