NPS Form 10-900
(7-81)

EXP. 12/31/84

United States Department of the Interior
National Park Service

National Register of Historic Places Inventory—Nomination Form

For NPS use only
received JAN 24 1983
date entered

See instructions in *How to Complete National Register Forms*
Type all entries—complete applicable sections

1. Name

historic Soden's Grove Bridge (Rainbow Arch

and/or common Soden's Grove Bridge

2. Location

street & number ~~1.5 Miles South of U.S. 50 on K57/99~~ K57/99 N/A not for publication

city, town Emporia vicinity xx vicinity of ~~congressional district~~

state Kansas **code** 20 **county** Lyon **code** 111

3. Classification

Category	Ownership	Status	Present Use	
___ district	_x_ public	_x_ occupied	___ agriculture	___ museum
___ building(s)	___ private	___ unoccupied	___ commercial	___ park
_x_ structure	___ both	___ work in progress	___ educational	___ private residence
___ site	**Public Acquisition**	**Accessible**	___ entertainment	___ religious
___ object	___ in process	___ yes: restricted	___ government	___ scientific
	___ being considered	_x_ yes: unrestricted	___ industrial	_x_ transportation
	N/A	___ no	___ military	___ other:

4. Owner of Property

name State of Kansas, Department of Transportation

street & number State Office Building

city, town Topeka N/A vicinity of **state** Kansas

5. Location of Legal Description

courthouse, registry of deeds, etc. Register of Deeds

street & number Lyon County Courthouse

city, town Emporia **state** Kansas

6. Representation in Existing Surveys

title Inventory of Marsh Arch Bridges--Kansas Department of Transportation **has this property been determined eligible?** ___ yes _x_ no

date 1980 ___ federal _x_ state ___ county ___ local

depository for survey records Kansas State Historical Society

city, town Topeka **state** Kansas

7. Description

Condition		Check one	Check one
___ excellent	___ deteriorated	___ unaltered	x original site
x good	___ ruins	x altered	___ moved date _____
___ fair	___ unexposed		

Describe the present and original (if known) physical appearance

The Soden's Grove Bridge spans the Cottonwood river on K57/99, 1.5 miles south of U.S. 50 in Emporia, Kansas. It consists of one 126 foot reinforced concrete "rainbow arch" (also known as a "Marsh arch") and a 32 foot, 3 inch approach deck on the east end making the total length 158 feet, 3 inches. Soden's mill, which was situated to the immediate north of the bridge's east abutment, no longer remains. The east approach bridge spanned the mill race. The 20 foot wide roadway has been resurfaced periodically but this has not significantly compromised the bridge's integrity. Marsh's plans allowed for whatever filling material, between the bridge deck curbs, that locality might desire.

The limestone pier and abutments remain from an earlier bridge, a metal post truss built in the late 19th century, and rest on a bed of soapstone 31 feet below grade. The low water level is 26 feet below grade and the height of the arch from the roadway is approximately 25 feet.

The best description is contained in James Marsh's 1911 patent application. The bridge consists of ". . . two abutments (which could be piers), a pair of arches disposed between and springing from the abutments, the floor carried by and between the arches and reaching from one abutment to the other where it alines with the parapets or rails along opposite sides of the floor line." The original patents called for slideable wear plates to be moulded into the concrete where the bridge floor came into contact with the beams and abutments. This is of importance as one of the main benefits of this design was to allow for the expansion and contraction of the reinforced concrete bridge under varying conditions of temperature and moisture.

There were two basic rainbow arch designs, fixed and tied. The original patent application describes the fixed type in which case the arch flowed below the bridge deck and was "fixed" directly into the abutment. This massive abutment (or pier) resisted both the horizontal and the vertical thrust of the arch. In a tied design such as that of the Soden's Grove bridge, the arch did not flow below the deck line and was not fixed directly into the abutment. It was secured atop the abutment or pier by the use of steel rocker or expansion rocker bearings. Vertical thrust was resisted by the pier and bearing, while horizontal thrust was resisted by the addition of a lower chord.

8. Significance

Period	Areas of Significance—Check and justify below				
___ prehistoric	___ archeology-prehistoric	___ community planning	___ landscape architecture	___ religion	
___ 1400–1499	___ archeology-historic	___ conservation	___ law	___ science	
___ 1500–1599	___ agriculture	___ economics	___ literature	___ sculpture	
___ 1600–1699	___ architecture	___ education	___ military	___ social/ humanitarian	
___ 1700–1799	___ art	x engineering	___ music	___ theater	
___ 1800–1899	___ commerce	___ exploration/settlement	___ philosophy	x transportation	
x 1900–	___ communications	___ industry	___ politics/government	___ other (specify)	
		___ invention			

Specific dates 1923 **Builder/Architect** James B. Marsh, Engineer

Statement of Significance (in one paragraph)

The Soden's Grove "rainbow arch" (or "Marsh arch") bridge in Emporia retains its integrity of location, design, setting, materials, feeling, and association. It is associated with the life of James B. Marsh, pioneer in steel and concrete bridge construction. It embodies the distinctive characteristics of a type and method of construction that is no longer used, and, as such, may yield information important to the history of engineering. Although more than 70 rainbow arches remain in Kansas the ever-changing needs of modern transportation have made them an endangered species. This particular bridge has a good chance for survival as a proposed highway re-alignment will leave it undisturbed. There is also a good deal of local public sentiment in favor of the structure's preservation.

James Barney Marsh was born in 1856 at North Lake, Wisconsin. He went to Iowa at the age of 18 to enter preparatory school at Fredericksburg. Marsh graduated in 1882 from Iowa State College of Agriculture and Mechanical Arts in Ames, with a B.M.E. degree. In March of 1883 he began his professional career in the Des Moines office of the King Bridge Company of Cleveland, Ohio. With King, Marsh was involved in the design, sales and actual erection of metal bridges. While he continued to work with the King company, he also became head of the Northern Agency for the Kansas City Bridge and Iron Company. In this capacity, he both designed and superintended the actual construction work done by the company. By March of 1889, Marsh had become general western agent and contracting engineer for the King Bridge Company and was placed in charge of the general western office in Des Moines. In the spring of 1896, he formed his own company, the Marsh Bridge Company, and was its sole proprietor. In private practice as a contracting engineer, Marsh was able to more fully develop his own designs. He also constructed the designs he developed, usually using steel as a medium. At the turn of the century, Marsh initiated the use of both concrete and steel in his bridge design. In April of 1904, the Marsh Bridge Company was incorporated with Marsh as president and chief engineer. In 1909, the company was reorganized as the Marsh Engineering Company.

It was not until the introduction of the "rainbow arch" by Marsh, that Kansas made widespread use of reinforced concrete spans for major stream crossings. Marsh canvassed the midwest, selling his arches in direct competition with the steel trusses at that time.

Contracts for the construction of approximately three miles of hardsurfaced road south of Emporia, a rainbow arch bridge across the Cottonwood river at Soden's mill, and a Dry creek tee-girder bridge were let by the Lyon county commissioners on the morning of February 16, 1923.

The contract for the construction of the concrete rainbow arch was let to the Western Bridge Company of Harrisonville, Missouri, for a total of $18,217.62. Other bids were submitted by the F. E. Marsh Construction Company of Jefferson, Iowa ($22,505.32), the Sharp & Hillis Construction Company of Emporia ($23,295.54) and the Yancy Construction Company of Abilene ($23,465.63).

See Continuation Sheet

9. Major Bibliographical References

See Continuation Sheet, Item 9.

10. Geographical Data

Acreage of nominated property .5

Quadrangle name Emporia **Quadrangle scale** 1:24,000

UMT References

	Zone	Easting	Northing		Zone	Easting	Northing
A	14	746180	4252200	B			
C				D			
E				F			
G				H			

Verbal boundary description and justification

The structure being nominated is 158 feet, 3 inches long and 20 feet wide. That property on and over which the bridge is built, south of Emporia, Kansas, S22, T19S, R11E. Includes bridge superstructure plus supporting piers and abutments.

List all states and counties for properties overlapping state or county boundaries

state	N/A	**code**	**county**		**code**
state		**code**	**county**		**code**

11. Form Prepared By

name/title Larry Jochims, Research Historian and Michael C. Snell

organization Kansas State Historical Society **date** 7/22/82

street & number 10th and Jackson Streets **telephone** (913) 296-2973

city or town Topeka **state** Kansas

12. State Historic Preservation Officer Certification

The evaluated significance of this property within the state is:

___ national X state ___ local

As the designated State Historic Preservation Officer for the National Historic Preservation Act of 1966 (Public Law 89-665), I hereby nominate this property for inclusion in the National Register and certify that it has been evaluated according to the criteria and procedures set forth by the National Park Service.

State Historic Preservation Officer signature Joseph C. Snell

title Executive Director, Ks. State Historical Society **date** January 4, 1983

For NPS use only

I hereby certify that this property is included in the National Register

Linda McClelland **date** 3/10/83

for **Keeper of the National Register**

Attest: **date**

Chief of Registration

UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

NATIONAL REGISTER OF HISTORIC PLACES INVENTORY -- NOMINATION FORM

FOR NPS USE ONLY
RECEIVED
DATE ENTERED

8. Significance continued

On March 20, 1923, the Emporia Gazette reported that the old Soden's bridge would be closed for construction and by May 15 of the same year nearly all of the structural steel work for the rainbow arch was completed.

The new bridge was to rest upon the piers that had supported the old bridge since the early 1890's. The old bridge was built in 1869 and in the early eighties it was jacked up on the west end so that a new Ruggles limestone pier could be put in. About 10 years later the east pier was replaced by one of Pritchard limestone. Both piers were capped by concrete slabs on which the new rainbow arch was placed. The materials from the old Soden's bridge were used for the superstructure of the county bridge across the Neosho at the waterworks.

According to the Emporia Gazette on August 6, 1923 the new Soden's bridge was nearing completion. J. T. Williams, construction foreman, said that in one respect there was probably no other bridge like it in the state. The Soden's Grove bridge is a "tied" arch meaning that the floor is on the same level as the bases of the arches as opposed to being a "fixed" arch where the arch bases extend down below the floor of the bridge. This allowed the Soden mill to have a bigger water passageway than would have been possible with a fixed arch.

The Gazette announced on August 28, 1923 that the floor of the new concrete bridge was completed and it would be open in three weeks. While the concrete floor was curing workmen built handrails and polished the structure. The bridge was at this time open to foot travel.

The Soden's Grove bridge was opened in mid-September, 1923. Approximately four hundred tons of concrete and 38 tons of structural steel were used in the main span for a total cost of $19,849.36

UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

NATIONAL REGISTER OF HISTORIC PLACES INVENTORY -- NOMINATION FORM

FOR NPS USE ONLY
RECEIVED
DATE ENTERED

9. Bibliography

"Notice to Bridge Contractors," Emporia Gazette, February 5, 1923, p. 7, c. 7.

"Let Road Contract," Emporia Gazette, February 16, 1923, p. 1, c. 7.

"Soden's Bridge No Longer Open," Emporia Gazette, March 20, 1923, p. 1, c. 3.

"Road Workers Busy," Emporia Gazette, May 15, 1923, p. 2, c. 5.

"Raze Soden Bridge," Emporia Gazette, May 28, 1923, p. 1, c. 6.

"New Soden Bridge Nearing Completion," Emporia Gazette, August 6, 1923, p. 8, c. 3.

"To Open West Road," Emporia Gazette, August 20, 1923, p. 1, c. 4.

"Work at Night to Lay Floor of New Bridge," Emporia Gazette, August 28, 1923, p. 5, c. 1.

"Localities," Emporia Gazette, September 7, 1923, p. 2, c. 4.

"The New Soden Bridge. . . ," Emporia Gazette, September 8, 1923, p. 2, c. 4.

"Begin Work on Neosho Bridge," Emporia Gazette, September 27, 1923, p. 6, c. 7.

Nichols, C. S., Comp. Directory of Graduates of Division of Engineering, Iowa State College of Agriculture and Mechanical Arts, Ames, Iowa.

The Alumnus of Iowa State. Alumni Association of State College, Ames. Volume XXXIII, #1, July 1936.

Marsh, James B., Specification of Letters Patent, Number 1,035,026, patented August 6, 1912, United States Patent Office, Washington, D.C.

Plans and files. Design Department, Kansas Department of Transportation, Topeka, Kansas Microfilm Roll #110, frame 24+.