National Register of Historic Places Registration Form

This form is for use in nominating or requesting determinations of eligibility for individual properties or districts. See instructions in *Guidelines* for Completing National Register Forms (National Register Bulletin 16). Complete each item by marking "x" in the appropriate box or by entering the requested information. If an item does not apply to the property being documented, enter "N/A" for "not applicable." For functions, styles, materials, and areas of significance, enter only the categories and subcategories listed in the instructions. For additional space use continuation sheets (Form 10-900a). Type all entries.

(Form 10-900a). Type all entries.			
1. Name of Property			
historic name JOHN MACK BRID	GE		
other names/site number SOUTH LA	WRENCE STREET BRIDGE 173	-5880-1383	
2. Location		and appendix house the	chicker of the resolution
street & number NE/SEE1/4, SE	1/4, SE 1/4, NE 1/4, S. 5	, T. 28S, R. 1E	not for publication
city, town WICHITA			vicinity
state KANSAS code	KS county SEDGWIC	K code 17:	3 zip code 67202
3. Classification			
Ownership of Property	Category of Property	Number of Besour	ces within Property
	building(s)	Contributing	Noncontributing
		Contributing	buildings
			buildings
		1	structures
		and the local sector of the	Structures
		100 100 100 100 100 100 100 100 100 100	ODjects
In the standard multiple and the list			
"Reinhous Anab (Manab Anab	ng:) Pridros of Konsos"	Number of contribu	iting resources previously
Rainbow Arch (Marsh Arch) Bridges of Kansas	listed in the Nation	al Register
4. State/Federal Agency Certific	ation		
Signature of certifying official KANSAS STATE H	TE HISTORIC PRESERVATION ISTORICAL SOCIETY	OFFICER	DECEMBER 4, 1991 Date
State or Federal agency and bureau			
In my opinion, the property i mee	ets L does not meet the National Re	egister criteria. 🛄 See co	ntinuation sheet.
Signature of commenting or other officia	al		Date
State or Federal agency and bureau			
. National Park Service Certific	ation		
hereby, certify that this property is:	1	Intered 1	n the
Ventered in the National Desister		2 National 1	Register 7
entered in the National Register.	Nelose A	Thes	1/22/97
determined eligible for the Matiens	crusp	1	/ // .
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EC 20 1991

NATIONAL

Current Functions (enter categories from instructions) TRANSPORTATION: ROAD RELATED (VEHICULAR); bridge
Materials (enter categories from instructions)
oundationwalls
coof
other <u>CONCRETE</u>
1

Describe present and historic physical appearance.

The John Mack Bridge (c. 1930-1931) spans the Big Arkansas River along lower South Broadway in Wichita, Sedgwick County, Kansas (pop. 279,835). The structure is an example of a reinforced concrete, tied arch, Rainbow Arch (Marsh Arch) bridge.

The John Mack Bridge is the largest extant bridge of its kind in the nation and is the largest Marsh Arch bridge constructed in Kansas, making it an extremely rare and important example of Marsh Arch bridge construction. The structure maintains an extremely high degree of architectural and structural integrity.

The eight span bridge has a north to south orientation, measuring 800 feet in length. The road deck measures 30 feet wide, a 5 foot wide sidewalk runs the length of the bridge on both the east and west sides.

The superstructure of the bridge is supported by massive concrete piers. The piers sit in the shallow river, there is very little debris around them.

Eight tied arches sit on the piers, connected with cast steel rocker shoes. The arches are supported by vertical hangers with each arch. Each arch is connected to its parallel member with a concrete "tie." All concrete members are incised and panelled.

Visible deterioration on the bridge includes some spalling around drain mouths underneath the deck, some craking on the hangers, and some spalling on the sidewalks.

A four-lane street meets the north and south approaches to the bridge. The four lanes merge into two lanes and are accepted by the 30 foot wide roadway. The John Mack Bridge has served the Wichita community as a two-lane bridge for sixty years.

A. G. Lichtenstein and Associates Consulting Engineers was hired by the City of Wichita to study the rehabilitation potential of the bridge in September, 1991. The firm's engineering report is expected to be completed in December, 1991.

8. Statement of Significance	Sector Sector	and an a set of the
Certifying official has considered the significance of this property anationally as a statement of the significance of this property and the significance of this property and the significance of the signifi	in relation to other properties:	
Applicable National Register Criteria XX A B XX C]D	
Criteria Considerations (Exceptions)	D E F G	
Areas of Significance (enter categories from instructions) ENGINEERING	Period of Significance 1930-1931	Significant Dates 1930-1931
SOCIAL HISTORY	1929–1931	
	Cultural Affiliation	
Significant Person	Architect/Builder MARSH, JAMES B.	ana Geo
	TOMLINSON, EDWARD	

State significance of property, and justify criteria, criteria considerations, and areas and periods of significance noted above.

The John Mack Bridge (c. 1930-1931) is being nominated to the National Register under criteria A and C for its historical association with the growth and development of Wichita and for its architectural significance as a reinforced concrete, tied arch, Rainbow Arch (Marsh Arch) bridge, and is to be included in the "Rainbow Arch (Marsh Arch) Bridges of Kansas" National Register thematic resources nomination. The John Mack Bridge is the largest extant bridge of its kind in the nation and is the largest Marsh Arch bridge constructed in Kansas, making it an extremely rare and important example of Marsh Arch bridge construction.

The bridge spans the Big Arkansas River along lower South Broadway in Wichita, Sedgwick County, Kansas (pop. 279,835). The eight span bridge has a north to south orientation, measuring 800 feet in length. The road deck measures 30 feet wide, a 5 foot wide sidewalk runs the length of the bridge on both the east and west sides.

The design for the Rainbow Arch or Marsh Arch bridge was patented by James Barney Marsh (1856-1936) in 1911 (U.S. Patent No. 1,035,026). Marsh writes in the patent application that, "broadly speaking the object of the present invention is, to construct an arch bridge of reinforced concrete in such manner as to permit of a limited amount of expansion and contraction both of the arches and of the floor which are, of course, the longest members of the bridge."

The original patent described the fixed arch; the tied arch is a later design but uses the same technology described in the 1911 patent. In the tied arch, the arches are connected to the top of the piers with the use of cast steel rocker shoes. One of these shoes was engineered to allow for expansion and contraction of the structure and roadway. This design lacked the massive abutment to

9.	Major	Bibliographical	References
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SEE CONTINUATION SHEET.

	XX See continuation sheet
Previous documentation on file (NPS):	Considerant Devery
preliminary determination of individual listing (36 CFR 67)	Primary location of additional data:
has been requested	XX State historic preservation office
previously listed in the National Register	Other State agency
previously determined eligible by the National Register	Federal agency
designated a National Historic Landmark	Local government
recorded by Historic American Buildings	University
Survey #	Other
recorded by Historic American Engineering	Specify repository:
Record #	KANSAS STATE HISTORICAL SOCIETY
10. Geographical Data	The second s
Acreage of propertyLESS THAN ONE ACRE	
LITM Deferences	
$\mathbf{A} \mid 1, 4 \mid 6 \mid 4, 6 \mid 8, 6, 0 \mid 4, 1 \mid 6, 7 \mid 4, 9, 0 \mid 4$	B
Zone Easting Northing	Zone Easting Northing
clulli, luulli, luul	
	See continuation sheet
Verbal Boundary Description	
THE NOMINATED PROPERTY IS LOCATED ON THE NE/SE R. 1E IN WICHITA, SEDGWICK COUNTY, KANSAS ON A AND 40 FEET FROM EAST TO WEST WHOSE NORTHEAST OF THE BRIDGE. BEGINNING AT THE NORTHEAST COR FEET SOUTH, 40 FEET WEST, 800 FEET NORTH, AND	1/4, SE 1/4, SE 1/4, NE 1/4, S. 5, T. 28S, TRACT MEASURING 800 FEET FROM NORTH TO SOUTH CORNER IS REPRESENTED BY THE NORTHEAST CORNER NER OF THE BRIDGE THE BOUNDARY PROCEEDS 800 40 FEET EAST TO THE POINT OF BEGINNING. See continuation sheet
Boundary Justification THE BOUNDARY INCLUDES ONLY THAT AREA THAT IS H PROPERTY.	ISTORICALLY ASSOCIATED WITH THE NOMINATED

See continuation sheet

11. Form Prep	ared By	A start survey was open		
name/titleMAR	RTHA HAGEDORN-KRASS,	ARCHITECTURAL	HISTORIAN	
organization KAN	NSAS STATE HISTORICAL	L SOCIETY	date DECEMBER	4, 1991
street & number	120 W. 10th	mar and the	telephone 913-	296-5264
city or town	TOPEKA	WARD J.	state KANSAS	zip code _66612

Form 10-900-a

United States Department of the Interior National Park Service

National Register of Historic Places Continuation Sheet

Section number <u>8</u> Page <u>1</u>

absorb or resist horizontal thrust so a bottom chord or tie was added to the arch to fill this function.

The earliest know Marsh arch in Kansas was built in 1917, the latest in 1934. Construction of the reinforced concrete arches in Kansas reached a peak in the late 1920s and declined after 1930. "Kansas did not make extensive use of reinforced concrete spans until the introduction by James Barney Marsh of the rainbow arch, often referred to as the Marsh arch." (Jochims, <u>Kansas</u> <u>Preservation</u>, p. 2, September-October 1980)

Marsh received his Bachelor's of Mechanical Engineering from Iowa State College of Agriculture and Mechanical Arts (Ames, Iowa) in 1882. Between 1883 and 1896 he worked for the King Bridge Company in Cleveland, Ohio in sales, design, and construction. In 1889 he became the director of the King Bridge Company's general western office in Des Moines, Iowa. In 1896 Marsh formed the Marsh Bridge Company, which was reorganized as the Marsh Engineering Company in 1909.

Called the South Lawrence Street Bridge in plan specifications, the John Mack Bridge was designed by the Marsh Engineering Company of Des Moines, Iowa in August, 1929. It was outside the city limits at the time of its construction. While this part of Wichita was not annexed into the city until the early 1950s, South Lawrence Street, which later became South Broadway, was the southern outlet to Wichita and served as U. S. Highway 81 until it was rerouted. A traffic survey taken by the Kansas state highway department in 1930 showed that 4,965 motor vehicles crossed the metal truss South Lawrence Street Bridge (c. 1883) between 8 a.m. and 6 p.m. daily.

"Agitation for a new structure started after many Sedgwick county residents had pointed out that the present structure, which has been in existence for years, is inadequate for traffic in addition to being dangerous...The new bridge will follow a course almost due north and south as contrasted to the present structure which follows a diagonal route across the river. As soon as the bridge itself is completed the state highway department will construct paving from the southern extremity to a point meeting with the turn in the South Lawrence pavement due east of the Shadowland dance pavilion. This connection will serve to eliminate a dangerous curve." (Wichita Morning Eagle, 4 February 1930, p.3)

National Register of Historic Places Continuation Sheet

Section number ____8 Page ___2

The new South Lawrence Street Bridge was named after John C. Mack (1867-1930), a newspaper publisher, senator, and member of the Kansas state highway commission from Newton. His activity as chairman of the roads committee of the Kansas House of Representatives gave him the recognition as "father" of the Kansas good roads system. He was appointed to the state highway commission as the fifth district representative by Governor Ben S. Paulen (1869-1961) in October, 1928. As the fifth district representative Mack represented Wichita on the state highway commission and is credited with the successful negotiations which resulted in the contract for the new bridge.

Under Paulen's term as governor (1925-1929) the state highway commission successfully designated a new state highway system, and in doing so regained frozen federal aid for road and bridge construction in Kansas. The Federal Aid System (FAS), which was created in 1916, mandated that all states designate state highway systems that would be maintained in part by federal funds. This mandate resulted in the establishment of the Kansas state highway commission in 1917. Since its establishment, the state highway commission struggled against the desire for local control of the road systems by the counties, jeopardizing federal aid to Kansas. The South Lawrence Street Bridge was a federal aid project that benefited from the tenacity of state highway system proponents such as Mack and Paulen.

On November 20, 1929 the state highway commission approved the Tomlinson Bridge and Supply Company's bid of \$153,526 for the construction of a concrete arch span bridge at South Lawrence Street in Wichita. The action was described as "a virtual cleanup of the 1929 road construction program." (Wichita Morning Eagle, 21 November 1929, p.2) The Tomlinson Bridge and Supply Company of Garfield, Pawnee County bid out two other Kansas firms and two Iowa firms for the project. The company had recently completed a bridge between Hutchinson and Wichita and was currently building a bridge over the Big Arkansas at Larned.

Work on the bridge began on January 30, 1930 with the excavation of the footings; all work was supervised by the state highway department's resident engineer on the project, B. J. Berson. Eighteen months were allowed for the bridge's construction.

After the bridge's metal frame was erected, the footings, abutments and/or piers were concreted. The hangers, the arch ribs, and the

National Register of Historic Places Continuation Sheet

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beams were concreted next. "Expansion plates were placed on the beams in preparation for receiving the floor. Finally, the intermediate ties, floor slab, wall copings and rail were poured. Once the floor centering was struck the intermediate hangers were concreted. Because the hangers had to be under full dead load when they were concreted, the floor centering was struck no less than ten days or more than twenty-one days after the rest of the concrete was placed. The handrail was the last portion of the bridge to be concreted." (Small, "Rainbow Arch (Marsh Arch) Bridges of Kansas" National Register thematic resources nomination, 1983)

Dramatically, only a month into the construction of the new South Lawrence Street Bridge, one of the middle spans of the old South Lawrence bridge collapsed. The collapsed truss bridge originally was part of a span across the Arkansas River at Douglass Avenue. Subsequently, five of these spans were moved to become the old South Lawrence Street Bridge. "The collapsed span was 100 feet in length and the state men almost set a record in driving seven lines and piles and laying a floor in three days." (Wichita Morning Eagle, 5 March 1930, p.1)

In response to the clear need for the new bridge, Edward Tomlinson attempted to finish the bridge ahead of schedule. Tomlinson was arrested in September, 1930 for working his employees more than eight hours a day. "In one of the most unusual complaints ever filed in the court, Tomlinson, who holds a contract with the state, is charged with having worked his employees more than eight hours a day. The statute applies only to contractors or sub-contractors who are working for the state." (Wichita <u>Morning Eagle</u>, 17 September 1930, p.5) A nominal fine of \$50 was levied against Tomlinson. The construction of the bridge provided employment for a crew of twenty-two men, Tomlinson's unintentional oversight clearly was overshadowed by the economic importance of those jobs.

The Globe Construction Company of Wichita submitted the low bid of \$24,306 for paving the approach to the new South Lawrence Street Bridge and for the grading and culverts on State Highway 81 to the state highway commission in October, 1930. The bridge and the paved approaches were completed in mid-July, 1931, a crew of thirty-five men accomplished this labor. Two thousand, seven hundred feet of concrete paving connected the bridge to the pavement. The total cost of the bridge, paved approach, and rightof-way acquisition was \$191,000, with the cost of the bridge proper

National Register of Historic Places Continuation Sheet

Section number ____8 Page ____4

right on target with the original bid.

"....the handsome new bridge across the Big Arkansas river on South Lawrence....is a thing of architectural beauty with its rows of arches in gleaming white concrete, replac(ing) an antiquated span across which motorists for the past year have been crawling in fear and trembling." (Wichita <u>Morning Eagle</u>, 26 May 1931)

The Wichita Chamber of Commerce and the South Side Improvement Association sponsored a gala celebration to mark the completion of the bridge on the evening of July 22, 1931. Five thousand people attended the ceremony and dance which followed. It was at this ceremony that the new South Lawrence Street Bridge was officially named the John Mack Bridge, in memory of the state highway commissioner that made the bridge possible. The celebrants danced on the bridge's concrete deck until midnight to the Bob and Laura Collins Orchestra. The Bob and Laura Collins Orchestra was playing at the Shadowland dance pavilion that week; the Shadowland, located near the southwest bank of the Big Arkansas River, was closed for the event. When the dance was over the bridge and the new section of the highway were opened.

The John Mack Bridge has served the Wichita community for sixty years. The structure maintains an extremely high degree of architectural and structural integrity and is eligible for the National Register. Strong community support for its preservation and continued active use has been demonstrated by the Save the John Mack Bridge Committee petition which gathered over six thousand signatures in May and June, 1991. Since that time the City of Wichita has hired A. G. Lichtenstein and Associates Consulting Engineers to study the bridge for its rehabilitation potential. The firm's engineering report is expected to be completed in December, 1991. The John Mack Bridge continues to serve the Wichita community as a two-lane bridge. Form 10-800-a

United States Department of the Interior National Park Service

National Register of Historic Places Continuation Sheet

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Des Moines Tribune; 26 June 1936.

Jochims, Larry. "Rainbow Arch Bridges Add Variety to Kansas Highways," <u>Kansas Preservation</u>, V. 2, N. 6, September-October, 1980.

Approval No. 1024-0018

- Rowland, Mary. "Kansas and the Highways, 1917-1930," <u>Kansas</u> <u>History: A Journal of the Central Plains</u>, V. 5, N. 1, Spring, 1982.
- Schirmer, Sherry Lamb and Dr. Theodore A. Wilson. <u>Milestones: A</u> <u>History of the Kansas Highway Commission and the Department</u> <u>of Transportation.</u> (Topeka, 1986).
- Small, Nora Pat. "Rainbow Arch (Marsh Arch) Bridges of Kansas," (National Register thematic resources nomination, 1983).
- United States Patent Office. United States Patent No. 1,035,026. James B. Marsh, of Des Moines, Iowa. Reinforced Arch-Bridge.
- Wichita Morning-Eagle; 8 November 1929, 21 November 1929, 30
 January 1930, 4 February 1930, 31 August 1930, 17 September
 1930, 18 September 1930, 28 September 1930, 25 October 1930,
 23 January 1931, 24 May 1931, 26 May 1931, 18 July 1931, 19
 July 1931, 22 July 1931, 23 July 1931, 22 December 1934.

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Section number _____ Page _____

Rainbow Arch (Marsh Arch) Bridges of Kansas MPS

11. Mack, John, Bridge

120000 1 50 miles 1/22/92

UNITED STATES DEPARTMENT OF THE INTERIOR NATIONAL PARK SERVICE

NATIONAL REGISTER OF HISTORIC PLACES

EVALUATION/RETURN SHEET
REQUESTED ACTION: NOMINATION
UNCTION
NAME: Subject States St
MULTIPLE Rainbow Arch (Marsh Arch) Bridges of Kansas MPS NAME:
STATE & COUNTY: KANSAS, Sedgwick
DATE RECEIVED:12/20/91DATE OF PENDING LIST:12/31/91DATE OF 16TH DAY:1/16/92DATE OF 45TH DAY:2/03/92DATE OF WEEKLY LIST:
REFERENCE NUMBER: 91002018
NOMINATOR: STATE DestroyAviebling cests officer
REASONS FOR REVIEW:
APPEAL:NDATA PROBLEM:NLANDSCAPE:NLESS THAN 50 YEARS:NOTHER:NPDIL:NPERIOD:NPROGRAM UNAPPROVED:NREQUEST:NSAMPLE:NSLR DRAFT:NNATIONAL:N
COMMENT WAIVER: N
1/2/92 Intered in the
ACCEPTRETORNREJECT _/DATE National Register
ABSTRACT/SUMMARY COMMENTS:
. WANGARDIAN
SOULABUICAL DATA
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ACCOMPANYING DOCUMENTATION/PRESENTATION
Insk-sch mapsUSGS 1493Photographspresentation
A CALENDARY CONTRACTOR OF
RECOM./CRITERIA REVIEWER
DISCIPLINE
DATE

DOCUMENTATION see attached comments Y/N see attached SLR Y/N

D STATES DEPARTMENT OF THE INTERIOR	
CLASSIFICATION	
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STATE/FEDERAL AGENCY CERTIFICATION	NOTTIN ASTRALOS
FUNCTION	
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DESCRIPTION 29M 268 MeX 10 September 1014 deteM 103	MULTIPLE Rainbow NAME:
architectural classification materials descriptive text	STATE & COUNTY: K
12/20/91 DATE OF PENDING LIST: 12/31/91 12/20/91 DATE OF ASTH DAVE 2/97/92	DATE RECEIVED: DATE OF 15TH DAY:
SIGNIFICANCE	DATE OF WEEKLY LIST
Period Areas of SignificanceCheck and justify be	REFERENCE NUMPERWOL
Specific dates Builder/Architect	
Statement of Significance (in one paragraph)	
<pre>summary paragraph completeness clarity applicable criteria justification of areas checked relating significance to the resource</pre>	APPEAL: N DATA PI OTHER: N PDIL: REQUEST: N SAMPLE: COMMENT WAIVER: N
justification of exception other	ABSTRACT/SUMMARY C
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BIBLIOGRAPHY	
GEOGRAPHICAL DATA	
acreageverbal boundary description UTMsboundary justification	
ACCOMPANYING DOCUMENTATION/PRESENTATION	
sketch mapsUSGS mapsphotographspreser	ntation
OTHER COMMENTS	A LODIEL COL
Questions concerning this nomination may be directed to	
Phone	DATE
Signed Date	DOCUMENTATION STO



South Lawrence Avenue Bridge of Marsh Arch Design Now Under Construction on Highway 81.

Tomlinson Bridge & Supply Co.

Ed Tomlinson, Proprietor

Garfield,

Kansas



South Lawrence Avenue Bridge of Marsh Arch Design-Spanning the Arkansas River-Now Under Construction on Highway 81.



will be made within two

spines'













Revised 1961 in cooperation with the City of Wichita

Polyconic projection. 1927 North American datum 10,000-foot grid based on Kansas coordinate system, south zone 1000-meter Universal Transverse Mercator grid ticks, zone 14, snown in blue

Red tint indicates areas in which only landmark buildings are shown

1°02' 133 MILS

UTM GRID AND 1982 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

To place on the predicted North American Datum 1983 move the projection lines 27 meters east as shown by dashed corner ticks

There may be private inholdings within the boundaries of the National or State reservations shown on this map THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS FOR SALE BY U. S. GEOLOGICAL SURVEY, DENVER, COLORADO 80225, OR RESTON, VIRGINIA 22092 AND STATE GEOLOGICAL SURVEY, LAWRENCE, KANSAS 66044 A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

CONTOUR INTERVAL 10 FEET

DOTTED LINES REPRESENT 5-FOOT CONTOURS

NATIONAL GEODETIC VERTICAL DATUM OF 1929

KANSAS QUADRANGLE LOCATION Revisions shown in purple compiled from aerial photographs taken 1980 and other sources This information not field checked. Map edited 1982 Purple tint indicates extension of urban area

WICHITA EAST, KANS.

N3737.5-W9715/7.5

1961

PHOTOREVISED 1982

KANSAS STATE HISTORICAL SOCIETY

NATIONAL

REGISTER

HISTORIC PRESERVATION DEPARTMENT Center for Historical Research 120 West Tenth * Topeka, Kansas 66612-1291 913-296-7080 * FAX 913-296-1005

December 4, 1991

Ms. Carol Shull Interagency Resources Division National Park Service National Register Branch 1100 L St., N. W. Room 6111 (Code 413) Washington, D. C. 20240

Dear Ms. Shull:

We are pleased to submit the following property for listing on the National Register.

John Mack Bridge (Wichita, Sedgwick County, Kansas)

Sincerely yours, onen ch Ramon Powers

State Historic Preservation Officer

enc.

National Register of Historic Places Inventory—Nomination Form

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

1. Name

historic Masonry Arch Bridges of Kansas N/A and/or common ocation See individual nomination forms N/A street & number not for publication N/A N/A city, town vicinity of N/A N/A N/A N/A code state county code 3. Classification **Ownership** Status **Present Use** Category X_ occupied _ district _ public _ agriculture _ museum building(s) private X_ unoccupied commercial park structure x_both work in progress educational private residence site **Public Acquisition** Accessible entertainment religious _ object in process _x_ yes: restricted government scientific industrial being considered x yes: unrestricted <u>_x</u> transportation x thematic no no military other: $d \to d d$ **Owner of Property** Multiple ownership -- see individual nomination forms. name N/A street & number N/A N/A N/A city, town vicinity of state Location of Legal Description 5. See individual nomination forms. courthouse, registry of deeds, etc. 1111 N/A street & number N/A N/A city, town state **Representation in Existing Surveys** 6.

	Inventory of Histo	ric Bridges				
title	Kansas Department	of Transportation	has this property been	determined elig	ible? yes	<u> </u>
date	1980-1983		fed	eral <u>×</u> state	county	local
depos	sitory for survey records	Kansas State His	torical Society			1

7. Description

See	individu	al nomination	forms.			x	
Conditi	ion		Check one	Check one			
exc	ellent	deteriorated	unaltered	original s	ite		
goo	bd	ruins	altered	moved	date .		
fair		unexposed					

Describe the present and original (if known) physical appearance

The Kansas Department of Transportation (KDOT) carried out a statewide inventory of historic bridges between 1980 and 1983. The bridges to be included were identified through computer printouts developed by KDOT, from information supplied by the counties (since almost all of the historic bridges were located on secondary rather than the primary road system), and by direct observation by field personnel. All bridges were inspected by KDOT personnel, and all of the bridges included in this thematic nomination were inspected by staff of the Kansas State Historical Society (KSHS).

All of the bridges included in the four subclasses which together make up the Masonry Arch Bridges of Kansas thematic nomination were jointly evaluated by representatives of KDOT, KSHS, and the State Historic Preservation Officer.

Most of the bridges in each subclass are alike or quite similar in their methodology and techniques of construction. Little historical information is available on many of these small bridges. For example, the designer, builder, and date of construction are not known on a large number of the inventoried bridges in these classes. Often bridge plaques which may have contained that information have been removed, or the county's records are not complete or have been destroyed. Many times there is little to choose from in differentiating among individual bridges of these subclasses other than condition and the likelihood of preservation. Technology and individual historical significance are usually not factors.

The purpose of the KDOT survey and the subsequent evaluation was to identify a representative selection of bridges of each class or subclass and nominate to the National Register those candidates which meet the criteria of eligibility. Through this approach KDOT and KSHS hope to preserve for posterity some examples of each type of bridge.

* * * * * * * * * * * * *

The bridges included in this nomination are representatives of the arch bridge class. This class is made up of stone arches, reinforced concrete arches, filled spandrel concrete arches and open spandrel concrete arches. These categories represent 17.5% of the identified historic bridges in Kansas.

National Register of Historic Places Inventory—Nomination Form

POT RES	5 U 60 (Ga	iy .	
receive	D		
date er	nerea		

Continuation sheet	1	Item number	7	Page 1	

7. DESCRIPTION Continued

Listed below, by subclass, are the thirty-two bridges which make up this thematic nomination:

Stone Arch

Polecat Creek Bridge, 5 miles west and 2 miles south of Douglass, Butler County

Esch's Spur Bridge, 3 miles south and 3 miles west of Dexter, Cowley County

Middle Creek Tributary Bridge, $l^{1_{2}}_{2}$ miles south and ${}^{1_{2}}_{4}$ mile east of Homewood, Franklin County

North Branch Otter Creek Bridge, 2 miles south and $8\frac{1}{2}$ miles west of Climax, Greenwood County

Bullfoot Creek Bridge, 4 miles south and 1 mile east of Vesper, Lincoln County

Spring Creek Tributary Bridge, 8 miles south and 5 miles east of Lincoln, Lincoln County

Lander's Creek Bridge, south edge of Goodrich, Linn County

Morton County WPA Bridge (Bear Creek Masonry Bridge), 3 miles north and 6 miles west of Richfield, Morton County

Pawnee River Tributary Bridge, 8 miles south of Bazine, Ness County

Vermillion River Tributary Bridge, 5 miles south and 1 mile east of Onaga, Pottawatomie County

Rush-Russell County Line Bridge, 11 miles north of Otis, Rush County

Brush Creek Bridge, ½ mile south of Coyville, Wilson County

Filled Spandrel

Cottonwood River Bridge, north edge of Cottonwood Falls, Chase County Hudgeon Bridge, 10 miles south and 3¹/₄ miles west of Girard, Crawford County

Parsons Labette Creek Tributary Bridge, 1 mile east and $l\frac{1}{4}$ miles south of Parsons, Labette County

For NPS use only

received

date entered

United States Department of the Interior National Park Service

National Register of Historic Places Inventory—Nomination Form

Continuation sheet	2	Item number	7	Page ²	6 6

7. DESCRIPTION Continued

Harris Bridge, 3 miles north and 4 miles west of Americus, Lyon County Maxwell's Slough Bridge, 1 mile south of St. Paul, Neosho County Cut-Off Bridge, 6¹/₄ miles south and 1 3/4 miles east of St. Paul, Neosho County Township Line Bridge, 3 miles west of Rozel, Pawnee County McCauley Bridge, ¹/₂ mile south of Auburn, Shawnee County

Open Spandrel

Verdigris River Bridge, ½ mile north of Madison, Greenwood County Hackberry Creek Bridge, 12 miles west and 11 miles north of Jetmore, Hodgeman County

Reinforced Concrete Arch

Muddy Creek Bridge, 3 miles east and 1 mile north of Douglass, Butler County Eight Mile Creek Bridge, 1½ miles north and 2 miles west of Rock, Cowley County Walnut Creek Bridge, 1½ miles south of Wellsville, Franklin County Belvidere Medicine River Bridge, north edge of Belvidere, Kiowa County Labette Creek Tributary Bridge, west edge of Parsons, Labette County Pumpkin Creek Tributary Bridge, 2 miles west of Mound Valley, Labette County Jake's Branch Bridge, 6 miles south and 1 mile west of Louisburg, Miami County Pennsylvania Avenue Rock Creek Bridge, south edge of Independence, Montgomery County State Street Bridge, east edge of Erie, Neosho County Old Maid's Fork Bridge, 2 miles west and ½ mile north of Nekoma, Rush County

3

National Register of Historic Places Inventory—Nomination Form

For HPS use only received date entered

Continuation sheet

Item number 7

7. DESCRIPTION Continued

The stone arch bridges included in this nomination consist of limestone arch rings which spring from and are disposed between abutments or piers. Limestone spandrel walls rest on these arch rings and are used to retain the earthen fill which loads the arch. This earth loading allows for even distribution of the live loads and helps to strengthen the arch. The structural design of the filled spandrel concrete arch bridge is similar. Instead of limestone arch rings, spandrel walls, piers, and abutments, reinforced concrete is substituted. The earthen fill remains the same. In some instances, reinforcement was increased and concrete was utilized as the fill. We refer to these bridge simply as reinforced concrete arches. In the case of an open spandrel arch, the reinforced concrete arch ring or rings spring from and are disposed between the abutments or piers. The roadway deck is supported by reinforced concrete cross-spandrel walls or columns that rest on the arch ring or rings. No spandrel walls are used.

The nominated bridges include examples of variations and combinations of the above types. The North Branch Otter Creek bridge features limestone ring stones and spandrel walls with a concrete arch ring. The Landers Creek bridge consists of a limestone arch ring with concrete spandrel walls. The Brush Creek and Jake's Branch bridges combine the use of corrugated metal and concrete to form the arch ring, while limestone is used to form the spandrel walls and ringstones.

8. Significance

invention

Specific dates See individual forms Builder/Architect See individual forms

Statement of Significance (in one paragraph)

The individual components of the thematic nomination "Masonry Arch Bridges of Kansas" possess integrity of location, design, setting, workmanship, feeling, and association and meet criterion C of the National Register eligibility requirement: "that embody the distinctive characteristics of a type, period, or method of construction,"

Stone arch bridges were popular in Kansas for many reasons, a major one being that the stone was often available locally. Thus a larger amount of the money expended for the construction could be retained within the area than would be true with the purchase of a metal structure. It was also often possible to use local workers on the project. This approach sometimes had its drawbacks as the quality of local stone and workers would vary widely. Generally speaking, stone bridges were more expensive initially to construct than metal bridges. Walter Sharp, a major stone arch contractor in Kansas, estimated the cost differential at 10% in 1904, although this too was somewhat misleading. Those contractors proposing steel bridges would often lower their bids \$100-\$500 when they found themselves as competitors to stone contractors. An additional selling point for stone bridges was their strength. There was ample evidence that they were far better able to withstand the periodic floods than were their metal counterparts.

The relatively low cost and widespread fabrication of iron and steel bridges in the 19th century and their overrated permanence put them slightly ahead in sales. By the first decade of the twentieth century, however, the combination of steel and masonry and the economic production of cement in Kansas promoted a rapid return to masonry construction.

Many claims were made for concrete and the positive aspects of its use in bridge building. It was said to be a permanent material, far more durable than stone, and one which actually increased in strength with age. A concrete bridge was said to be frostproof, fireproof and floodproof. The concrete, it was thought, would permanently protect the steel. In the arch bridge the support for the roadway is below, and it was felt that the roadway could be widened without destruction of the original investment, with the possible exception of the railing.

Although concrete, in itself, is far from an aesthetically pleasing compound, it can be moulded into intricate designs. Decorative ornamental features, which would have been prohibitive costwise for a community planning a bridge in any other medium, now became possible.

9. Major Bibliographical References

See continuation sheet.

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8. SIGNIFICANCE Continued

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Local labor gangs were often employed by contractors so again much of the construction expense remained within the community. The use of local aggregates could also significantly reduce the cost of a structure as did the availability of Kansas produced cement. Some contractors, such as Walter Sharp, even purchased rock crushers and used local fence stone. It is not surprising that the quality of the final product bore a direct relationship to the quality of the cement and aggregate used in the construction.

The vast majority of the early reinforced concrete structures were built from patented designs. These patents actually related more to the placement and type of reinforcement than to the outside appearance of the bridge.

The person with the largest number of such patents was Daniel B. Luten of Indianapolis, Indiana. His company, the National Bridge Company, and its Kansas agent, Topeka Bridge and Iron Company, were responsible for the greatest number of filled spandrel and reinforced concrete bridges in the state.

Luten was granted many patents dealing with various aspects of reinforced concrete arch bridge construction. He was granted so many patents in fact that he was able to tell the Kansas Engineering Society in 1914 that "A safe and durable concrete bridge can undoubtedly be erected without infringing any patent. But it is a serious question whether a reinforced concrete arch can be erected without infringement." Although the royalty figures varied, the Luten Engineering Company usually claimed 10% of the contract if any of their patents were used.

Because it was virtually impossible to build a reinforced concrete arch bridge without using one of his patents, the royalty costs for bridge companies, states, counties and municipalities became burdensome. The company was continuously involved in litigation throughout the midwest. A number of lawsuits charging patent infringement were filed in Kansas by Luten's attorneys against local units of government. The issue was not settled until 1918 when the state attorney general successfully argued that Luten's patents were invalid, and the cases were dismissed.

No attempt will be made to discuss all of the intricacies of Luten's patents and construction details as modifications were made over the years. One of his first was patent #649,643, granted May 15, 1900. It consisted of uniting the abutments of an arch bridge by means of a tie or ties placed beneath the water line of the structure. This relieved the abutments of some horizontal strain and provided a foundation for the bridge. At the same time the ties were concealed from view, offered no obstruction to flow, and prevented stream bed scouring. Luten initially recommended the use of timber as he felt this was practically permanent if placed under water. In later refinements the ties were steel and covered with concrete. This "floodproofing pavement" allowed the bridge to be constructed without pilings or even soil foundations. This enabled a saving in initial construction as one could decrease the amount of material in the abutments.

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8. SIGNIFICANCE Continued

It also gave a solid support for centering and the aprons along the edge of the pavement extending several feet into the stream bed rendered the bridge virtually "floodproof."

A patent filed May 17, 1902 [818,386] gives the basic reinforcement theory of Luten Arches. It was an arch having "embedded therein a plurality of tension members passing alternately across the rib, said members being low at the crown and high at the haunches, and each of said members passing alternately across the rib at different longitudinal points from the others." The theory was that the tension would occur at alternately opposite edges of the arch in limited regions only. The steel was located in those regions and extended continuously from one end to the other for convenience of placement.

Topeka Bridge and Iron was responsible for the construction of a great number of the filled spandrel and reinforced concrete bridges in Kansas. The company used both the Luten designs as well as a patent obtained by Lloyd B. Smith of Topeka. Without the destruction of a bridge it would be impossible to determine whose reinforcement design was employed.

Smith had worked for four years as assistant engineer with Missouri Valley Bridge and Iron Works in Leavenworth before coming to Topeka in 1904 as chief engineer of Topeka Bridge and Iron. That company initially manufactured steel bridges at its shops in Topeka, but that fabrication was discontinued in 1914 due to unsatisfactory freight rates and the increased demand for concrete bridges. Adapting to the changes, the company continued as a construction company chiefly involved in concrete bridges and deep foundations. In addition to his bridge patent, Smith received four others for river bank protection.

The final type of construction being presented is the open spandrel type. It is difficult at this time to determine why this particular style might have been selected over the filled arch design. Several considerations often went into its selection. The solid earth fill was generally used for small spans and flat arches. If, however, the arch was large and especially semicircular, the open construction was found to be less expensive. In other instances it was selected, even when it was more expensive, to reduce the load on the foundations. It is also possible by selecting either the solid or open spandrel type to adjust the imposed loads on the arch to the type desired. The loads on the arch rings with open cross spandrel chambers or arcades are concentrated loads. The distribution of loads in earth filled arches was uncertain in most cases. In addition to preventing this uncertainty the open spandrel construction also prevented water from collecting and soaking into the arch masonry. The style could also be used as an aesthetic feature. By building open chambers crosswise and having the openings appear on the spandrel faces, the design presented a lighter appearance and at the same time showed plainly the plan of construction. When a heavier and more massive appearance was desired sidewalls were used and all the spandrel openings closed. These curtain walls could be thinner and hence less expensive than the retaining walls of the earthen filled structures. Because both the colonnade and arcade styles left major portions of the bridge's substructure exposed more finishing and architectural treatment was often deemed necessary.

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8. SIGNIFICANCE Continued

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Although an arch is merely a means of transforming generally vertical, or nearly vertical, loads into diagonal thrusts, the masonry-concrete arch bridge is more than a strictly utilitarian structure. The remaining examples exhibit construction techniques no longer utilized. They are the physical remains of experiments in the evolution of concrete reinforcement and patented theories, as well as the legal battles involved in protecting those patents. They were constructed using local funds and when possible local labor and natural resources. They are also major remnants of the "good roads" movement within the state. By the turn of the century the ever expanding needs for readily available markets impressed upon Kansans the necessity of all-weather roads as well as safe and secure river crossings.

Henry Tyrrell, the author of <u>Artistic Bridge Design</u>, concluded that "the bridges and structures erected by a people or nation reveal their degree of aesthetic taste and are a measure of their culture and civilization. Bridges should be strong enough to last and beautiful enough to be worth preserving." The nominated bridges are worth preserving.

THIS STATEMENT REFLECTS CURRENT KNOWLEDGE AND IS SUBJECT TO AMENDMENT

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OMB No. 1024-0018 Expires 10-31-87

Continuation sheet Page Item number Multiple Resource Area dnr-11 Thematic Group Name Masonary Arch Bridges of Kansas Thematic Resources State Butler County & others, KANSAS 7/2 Nomination/Type of Review Date/Signature eeper Entered in the 1. Belvidere Medicine River National Register Bridge Attest Substantive Review Keeper 2. Morton County Bear Creek WPA Bridge Attest Entered in the Keeper 3. Brush Creek Bridge Mational Register Attest Substantive Review Keeper Kith Groveni 4. Rush County Line Bridge Attest Entered In bha Keeper 5. Bucher Bridge National Register Attest Substantive Review 6. Bullfoot Creek Bridge Keeper Attest Keeper Entered in the 7. Cottonwood River Bridge National Register Attest Substattive Nevley Keeper 8. Cut-Off Bridge Attest Keeper in the 9. Esch's Spur Bridge National Register Attest Keeper (growen. 10. Hackberry Creek Bridge Substantive Verfam Attest

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Multiple Resource Area Thematic Group

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13. Jake's Branch of Middle Creek Bridge	Entered in the Keeper	LelourByen 7/2/85
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14. Labette Creek Tributary	Substantive Review Keeper	Bett Growing 7/2/85
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16. Maxwell's Slough Bridge	Substantive Review Keeper	Beth Grosvena 7/2/25
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National Register of Historic Places Inventory—Nomination Form

Continuation sheet Page Item number Multiple Resource Area Thematic Group 1 Masonary Arch Bridges of Kansas Thematic Resources Name KANSAS State Nomination/Type of Review Date/Signature Entered in the Old Maids Fork Bridge 21. Keeper National Register Attest Parsons Filled Arch 22. Substantive Review Keeper Bridge Attest Pennsylvania Avenue Rock 23. eeper In th Creek Bridge National Register Attest Substantive Review Keeper Polecat Creek Bridge 24. 7 ADorna Attest Entered In the Pumpkin Creek Tributary National Register 25. Keeper Bridge Attest Substantive Heview Spring Creek Tributary 26. Keeper Bridge Attest Entered In The .. 27. State Street Bridge Reeper National Register Attest Schetastive Maview Township Line Bridge 28. Keeper Growen Attest Entered in the Verdigris River Bridge 29. Keeper National Register Attest Vermillion Creek Tributary 30. Keeper sound Substantive Har Stone Arch Bridge Attest

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UNITED STATES DEPARTMENT OF THE INTERIOR NATIONAL PARK SERVICE

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NATIONAL REGISTER OF HISTORIC PLACES EVALUATION/RETURN SHEET

Mason r y Arch Bridg Butler County - oth KANSAS	es of Kansas TR _{substan}	tive Review	Working No. MAY 3 D 1985
			Fed. Reg. Date: 2/4/86
			Date Due: 6/27/25 - 7/1/155
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Post Initial Nomination Entries

See individual property file within **Masonry Arch Bridges of Kansas TR** for any entries completed after the original nomination.

Resource Name	County, State	Reference Number
Beaver Creek Native Stone Bridge	Barton, KS	08000296
Hitschmann Cattle Underpass Bridge	Barton, KS	08000298
Hitschmann Double Arch Bridge	Barton, KS	08000299
Fox Creek Stone Arch Bridge	Chase, KS	06001164
Fort Fletcher Stone Arch Bridge	Ellis, KS	01000385
East Stone Arch Bridge-Lake	Wabaunsee, KS	09001170
Wabaunsee		
Southeast Stone Arch Bridge-Lake	Wabaunsee, KS	09001171
Wabaunsee		

KANSAS STATE HISTORICAL SOCIETY

CENTER FOR HISTORICAL RESEARCH 120 West Tenth • Topeka, Kansas 66612 • 913/296-3251 KANSAS MUSEUM OF HISTORY 6425 South West Sixth • Topeka, Kansas 66615 • 913/272-8681

May 9, 1985

Ms. Carol Shull National Park Service National Register of Historic Places U.S. Department of the Interior 440 G. St., N.W. Washington, D.C. 20240

Dear Ms. Shull:

Enclosed is a thematic nomination for the "Masonry Arch Bridges of Kansas." It includes 32 structures for the subclasses of bridges covered by the nomination.

After extensive research and evaluation these structures were selected from the Kansas Department of Transportation's statewide inventory of historic bridges. This represents the second thematic nomination of bridges for Kansas--two years ago we submitted a thematic nomination of Marsh Arch bridges. We expect to continue to deal with our historic bridges in that manner; in fact, a researcher is now at work on a thematic nomination for high (through) truss bridges. Should additional information be received which identifies other masonry bridges as meeting the National Regsiter criteria, this thematic nomination could be expanded.

Sincerely,

W. Smill

Joseph W. Snell State Historic Preservation Officer

caf

Reca 5-30-85

JOSEPH W. SNELL, Executive Director ROBERT W. RICHMOND, Assistant Executive Director PORTIA ALLBERT, Library Director EUGENE D. DECKER, State Archivist MARK A. HUNT, Museum Director THOMAS A. WITTY, State Archeologist PATRICIA A. MICHAELIS, Curator of Manuscripts MAXINE BENSON, Director of Publications RICHARD D. PANKRATZ, Director, Historic Preservation Dept. THOMAS P. BARR, Historic Properties Supervisor LARRY JOCHIMS, Research Historian MARILYN FOSTER, Director of Development NYLE H. MILLER, Executive Director Emeritus EDGAR LANGSDORF, Executive Director Emeritus

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