Form No. 10-300 REV. (9/77)

UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

NATIONAL REGISTER OF HISTORIC PLACES INVENTORY -- NOMINATION FORM

FOR NPS USE ONLY
RECEIVED JUL 16 1981
DATE ENTERED AUG 13 1981

SEE INSTRUCTIONS IN *HOW TO COMPLETE NATIONAL REGISTER FORMS*
TYPE ALL ENTRIES -- COMPLETE APPLICABLE SECTIONS

1 NAME

HISTORIC
1931 Tempe Bridge

AND/OR COMMON
Mill Avenue Bridge

LOCATION

STREET & NUMBER
Mill Avenue — NOT FOR PUBLICATION

CITY, TOWN
Tempe — VICINITY OF

CONGRESSIONAL DISTRICT
1

STATE	CODE	COUNTY	CODE
Arizona	04	Maricopa	13

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
		__NO	__MILITARY	__OTHER:

OWNER OF PROPERTY

NAME
Arizona Department of Transportation

STREET & NUMBER
206 S. 17th Avenue

CITY, TOWN
Phoenix — VICINITY OF

STATE
Arizona

LOCATION OF LEGAL DESCRIPTION

COURTHOUSE, REGISTRY OF DEEDS, ETC.
Arizona Department of Transportation

STREET & NUMBER
206 S. 17th Avenue

CITY, TOWN
Phoenix

STATE
Arizona

6 REPRESENTATION IN EXISTING SURVEYS

TITLE
N/A

DATE

__FEDERAL __STATE __COUNTY __LOCAL

DEPOSITORY FOR SURVEY RECORDS

CITY, TOWN

STATE

7 DESCRIPTION

CONDITION		CHECK ONE	CHECK ONE
X EXCELLENT	__DETERIORATED	__UNALTERED	X ORIGINAL SITE
__GOOD	__RUINS	X ALTERED	__MOVED DATE_____
__FAIR	__UNEXPOSED		

DESCRIBE THE PRESENT AND ORIGINAL (IF KNOWN) PHYSICAL APPEARANCE

The Tempe Bridge was built across the Salt River in 1931 between Phoenix and Tempe, Arizona. The structure lies in an area that includes a variety of cultural resources. To the east, classic Hohokam ruins dating to c. 700 A.D. have been located, mapped and partially excavated. Near the bridge is the site of Hayden Ferry, built by Charles Hayden in 1874. This ferry served as a horse, wagon and "jitney" link across the Salt River in times of flooding. At the south approach to the bridge is La Casa Vieja, the birthplace, in 1877, of Charles' son, Carl, a distinguished Arizona Senator. The gracious "Old House" is now a restaurant. Standing to the east is the Hayden Flour Mill which was built in 1878 by the elder Hayden. It was rebuilt in the 1890's and again in 1917 and is still operated by the Hayden family. To the north of the mill are the remains of the 1898 Santa Fe Railroad bridge which replaced Hayden's Ferry. This structure was subsequently replaced in 1913 by an automobile bridge still extant but in a state of disrepair 300 feet to the west of the 1931 Tempe Bridge.

Also to the west is the trussed span Southern Pacific Railway Bridge which was built in 1912 and is still in service. This structure was a link in the Southern Pacific's mainline route between El Paso and Los Angeles for more than three decades.

The 1931 Tempe Bridge is a graceful poured concrete structure consisting of ten arched spans, each measuring 140 feet in length. The total length of the bridge, including the approach roadways, is 1,577 feet. The spans are multiple ribbed with open spandrels. The concrete roadway is supported on beamed and webbed columns above the ribs. Each rib measures two feet nine inches by nine feet at the crown and seven feet thick in the vertical plane at the piers. Reinforcement consists of one and one quarter inch square steel bars at 12 inches on center throughout the length of each rib. At each end the steel is doubled for a distance of 30 feet out from the piers. The ribs are designed as hingeless arches fixed at the piers. Two types of piers are used in the design and the spans are divided into groups of three, four and three, separated by abutment piers. These measure 15 feet in girth while the intermediate piers measure seven feet six inches. The former were built as two separate shafts each with its own footing. These were tied together with an arched tie strut built integral with the pier caps at their junction with the arch rings. Above the arches, the intermediate piers are of a typical column construction. The abutment piers were surmounted by sand boxes extending the length of the piers for additional weight. The piers extend up over the roadway in the form of hexagonal towers complete with canopies; these form pedestrian rest stations. This effect is maintained with hexagonal pylons terminating the railings at each end of the bridge.

The width of the roadway is 36 feet between the curbs and a five foot sidewalk on each side increases the total width, between concrete handrails, to 46 feet. The roadway is reinforced as a continuous slab between expansion joints. Bent steel provides for negative movement over the supporting beams. Four expansion joints are included in each span at the third points of the span at each pier. A feature of the design is the elimination of the sliding joints by supporting all ends on separate columns. Engineer Hoffman stated, "The sections or the members throughout the bridge were designed to a minimum required for the stress and practically no concrete was added for mass effect or architectural treatment except on the work above the deck, handrails and towers."

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Heritage Conservation and Recreation Service

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There have been no structural changes to the bridge in over 50 years although the original lighting system was replaced in 1962. The 22 original lights and concrete poles were removed and the new system employed twelve 400 watt mercury vapor luminaires on 30 foot steel poles. To provide illumination on the road system beneath the bridge, 16 quartz lights were installed on the underside of the bridge. In 1968, these were replaced with eleven 400 watt mercury vapor fixtures mounted on wood poles which were installed along the roadway. In 1978, extensive flooding damaged these poles. They were subsequently removed and replaced with five 400 watt high pressure sodium fixtures mounted on the bridge and aimed down at the roadway. In 1979, the twelve 400 watt mercury vapor luminaires on the bridge were converted to twelve 250 watt high pressure sodium lights as part of a statewide conversion program.

At that time, the roadbed received a preservative coating. At the present time, the bridge receives routine maintenance by the Highway Department and is in extremely sound condition.

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	X 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 August 1931

BUILDER/ARCHITECT Arizona Highway Department

STATEMENT OF SIGNIFICANCE

The Tempe Bridge, completed in 1931, is significant because for the past fifty years it has served as a major transportation link in two transcontinental highways: U.S. Route 60 and the "Ocean to Ocean" U.S. Route 80. Also, until the advent of the freeway system in the early 1950's, it was a key element in U.S. Route 89, Arizona's only north/south border to border route. The bridge has provided access between Phoenix and Tempe since 1931. At that time the population of Phoenix was 48,118 and Tempe's numbered about 300. Today, the number of people in the Phoenix Metropolitan area is approaching two million. The historic structure remains in service and in excellent condition. It is also significant as the outstanding example, of two in the state, of a poured concrete open spandrel arch bridge.

The pressing need for construction of a new bridge to cross the Salt River at Tempe came to official attention on May 9, 1928, when a delegation of Tempe businessmen appeared before the State Highway Commission. They pleaded that the old bridge, built in 1913, was only 18 feet wide and that two right angle turns were required on the Tempe side for access and egress. The old bridge averaged 8,000 vehicles within a twenty-four hour peak season period and considerable congestion ensued. As vehicles were being designed heavier and wider, the need for a more substantial bridge was clearly demonstrated. The State Engineer concurred and recommended implementation of survey, plans and construction in the 1928-1929 program.

According to the minutes of the State Highway Commission,

> "Bids were opened on January 20, 1930 and the State Engineer recommended the contract be awarded to the lowest bidders, Lynch-Cannon Engineering Company, stating that they were responsible contractors and well financed. It was regularly moved by Commissioner Mansfield, seconded by Commissioner Trengove and carried that recommendation of State Engineer be approved and contract on the Phoenix-Tempe Highway, Tempe Bridge, Federal Aid Project B, be awarded to the lowest bidders, Lynch-Cannon Engineering Company, 1027 Chapman Bldg., Los Angeles, California, in the amount of $397,608.10 which does not include for engineering and contingencies provided said contractors furnish good and sufficient bond and meet all requirements. State Engineer was authorized to sign said contract."

Ralph Hoffman, Bridge Engineer for the State of Arizona, signed the contract. The Arizona Highway Department then designed the bridge and construction began on March 30, 1930.

The original survey projected the bridge straight across the river at right angles to the banks, but borings showed soft caliche for half the length of the proposed structure. The Southern Pacific Railroad Bridge, 300 feet upstream, provided hard-won experience that caliche would scour away footings sunk at depths of less than forty to fifty feet. Consequently, a new survey was ordered with the hope that the granite dyke extending

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9 MAJOR BIBLIOGRAPHICAL REFERENCES

Breusch, W.R., Bridge Engineer, Structures Section, Arizona Department of Transportation to Marion D'Luzansky. Oral Interview, 1980.

"Bridge to be Put Into Service Without Ceremonies at 8:00 a.m.". Arizona Republic, July 25, 1731.

(continued)

10 GEOGRAPHICAL DATA

ACREAGE NOT VERIFIED

UTM NOT VERIFIED

ACREAGE OF NOMINATED PROPERTY 3.62

QUADRANGLE NAME Tempe QUADRANGLE SCALE 1:24000

UTM REFERENCES

	ZONE	EASTING	NORTHING
A	12	416600	3699200
B	12	412400	3699810
C			
D			
E			
F			
G			
H			

VERBAL BOUNDARY DESCRIPTION

The boundaries of this nomination are a line, and all area 50' on either side of this line, between Points A and B. This will create a rectangle 100' wide and 1,577' long. The structure is within this rectangle.

LIST ALL STATES AND COUNTIES FOR PROPERTIES OVERLAPPING STATE OR COUNTY BOUNDARIES

STATE	CODE	COUNTY	CODE
N/A			
STATE	CODE	COUNTY	CODE

11 FORM PREPARED BY

NAME / TITLE: William J. Perreault
Marion L. D'Luzansky/Registrar, State Historic Preservation Office

ORGANIZATION: Tempe Historical Society

DATE: May, 1981

STREET & NUMBER: Box 27394

TELEPHONE: (602) 966-7902

CITY OR TOWN: Tempe

STATE: Arizona 85282

12 STATE HISTORIC PRESERVATION OFFICER CERTIFICATION

THE EVALUATED SIGNIFICANCE OF THIS PROPERTY WITHIN THE STATE IS:

NATIONAL ___ STATE X 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 Ann S. Pritzlaff

TITLE Arizona State Historic Preservation Officer DATE 8 July 1981

FOR NPS USE ONLY

I HEREBY CERTIFY THAT THIS PROPERTY IS INCLUDED IN THE NATIONAL REGISTER

Entered in the National Register

Acting KEEPER OF THE NATIONAL REGISTER Carol Byers DATE 9/13/81

ATTEST: DATE

CHIEF OF REGISTRATION

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from the Tempe Butte near the south end of the bridge site could be located. As a result of extensive drillings, the ridge was located and it was determined that angling the bridge one degree at each end would allow all of the footings to be based in bedrock. The new alignment was plotted and a new centerline laid out. A fairly shallow footing foundation was made possible by spanning a small underground channel in the rock near the north bank. The savings resulting from basing the bridge foundations in shallow bedrock, as opposed to 50 feet deep in caliche, was estimated at nearly $100,000.00. The greater strength of the bedrock basing also made possible the adoption of the concrete arch design which was preferred to the truss-span because of architectural and esthetic considerations.

The first task of the construction crews was to excavate for the piers and abutments. Cofferdams of steel sheet pilings were driven into the rock, and the sand and gravel removed. Concrete footings were poured at least three feet into solid rock after the rock was blasted out to the footing line. A central mixing plant was constructed adjacent to a commercial gravel plant in the Salt River bed and furnished the sand and gravel for the job. Conveyor belts sent the material from the plant to large storage bins above the mixer. As required, the sand and gravel were weighed, placed in a batcher and sent into the mixer with the required amounts of concrete. From the mixer, the concrete was transported on an industrial railroad to wherever it was required on the job. The batch boxes were lifted from the cars and contents poured into the forms. For the footings and piers a gasoline powered crawler was used, but in concreting the arch rings and deck it was necessary to build a machine which could service the entire height and width of the structure. A travelling gantry was devised and a boom derrick was positioned in a short time. Each rib was poured in five sections and four keys (projecting portions used to prevent movement, at a construction joint, into the adjacent section) were added after each section of concrete had cured. The purpose of the keys was to eliminate initial stress in the arch rings.

When the construction workers reached pier nine, it was discovered that the footing was unsound. The original tests had show rock at the same elevation on both sides of the pier site. It was later learned that the drill had encountered a massive boulder and the crew, confident that it was bedrock, moved on without further investigation. Steel rails were driven into the perimeter of the pier and a profile of bedrock was plotted to determine true location and slope. There was a thirty foot differential between high and low sides and the construction called for very special treatment and preparation. To correct this, work was carried on in three eight hour shifts per day and more than 3,000 cubic yards of material were excavated, twenty-five percent of which was solid rock. The last concrete was poured on June 3, 1931, just fifteen months after the initial survey. The total cost of the bridge was $518,788.00 of which the federal government paid $351,433.00.

The first flood to which the new bridge was subjected occurred before completion, in May 1931, just three days after the last concrete had been poured into troublesome pier #9. Water from the Verde River, in a flash flood, came roaring down the normally dry Salt River bed but no damage was done to the new construction.

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In February and March 1932, the Salt and Verde combined to wet the feet of the new bridge for more than two months. This occurred again during the same months of 1937. During the last part of 1940 and into 1941, unusually heavy snowfall in the mountains of the watershed combined with warm rains to cause heavy damage at the Bartlett Dam Site on the Verde River. Upstream reservoirs failed, creating widespread flooding in the normally dry downstream beds. The Tempe Bridge held firm against an estimated 100,000 cubic feet per second (cfs). Similar conditions prevailed in January, 1948 and caused widespread flooding.

In the Southwest, water is much too precious a commodity to be left lying about in stream beds, especially if it can be stored against future needs. During years of normal precipitation, stream beds are dry because upstream impoundments meet community and agricultural needs, and the release of surplus water is not necessary. A series of dry years and increased traffic convinced the Highway Department, in 1961, of the efficacy of laying a road in the riverbed next to the Tempe Bridge to carry northbound vehicles. Southbound traffic used the bridge. Traffic moved smoothly except when water was released and two-way traffic moved back onto the bridge. Minor water releases were made until 1965, when January and March conditions caused major flooding and the Tempe Bridge held against 120,000 cfs. The failure of Phoenix's Central Avenue Bridge, the McKillips crossing in Mesa and the destruction of both the Hayden and Scottsdale Road bridges left the Tempe Bridge the only link between Phoenix and Mesa/Tempe/Scottsdale. The snarled traffic on the bridge approaches clearly demonstrated the need for more and better bridges across the Salt. Waiting time to cross the Tempe Bridge ran as high as three hours and traffic backed up several miles in all approach directions. In 1973 major flooding and traffic confusion was as great as in 1965. The Central Avenue Bridge held but the amount of traffic had increased as the Phoenix Metropolitan area had grown to 580,000 people with inadequate public transportation.

In 1977 the major highway routes U.S. 70 and U.S. 80 were assigned to segments of the Interstate system. Finally, in 1978, 1979 and 1980, the Salt River Valley was subjected to three epic "one-hundred-year" floods. The Interstate Bridge across the Salt River was closed for safety reasons and Interstate traffic was rerouted across the Tempe Bridge. Also, all of the other, newer bridges in Phoenix had either totally failed or suffered some structural damage. The Tempe Bridge withstood 200,000 cfs and handled over 92,000 vehicles in a 24-hour period during February 1980. This was far beyond its design capability, but it held. Structural conditions were constantly monitored by the Arizona Department of Transportation and maintenance chores were carried out between midnight and 3:30 a.m. so as to not interfere with traffic. This consisted primarily of renewing the material between the joints of the structure that had worn from stress and vibration. Valley newspapers paid tribute to the structure, calling it "Old Faithful."

The 1931 Tempe Bridge is also significant as being one of only two poured concrete open spandrel arch bridges constructed in the State of Arizona. The second is its predecessor situated immediately to the west. This structure is abandoned and in a deteriorating condition. Of the two, the 1931 bridge is clearly the outstanding example.

After 50 years of hard service, the Tempe Bridge remains in exceptionally fine structural condition. The excellence of its design has permitted it to withstand traffic and flood stresses far beyond the intent of the original engineers.

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"Los Angeles Company Submits Lowest Bid on Tempe Bridge." Arizona Republican. January 21, 1930.

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"Poems of Praise for Tempe Bridge." Arizona Republican. July 24, 1931.

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"Tempe Bridge." Arizona Republican. July 28, 1930.

"Tempe Bridge Construction. Pier 9 to Require Special Equipment as the Condition of Bedrock and Waterflow Different From Other Piers." Arizona Republican. September 29, 1930.

"Tempe Bridge Dedication Plans for 4th of July." Arizona Republic. June 2, 1931.

"Tempe Bridge and Highway Budget." Arizona Republican. October 27, 1927.

"Tempe Bridge Rated Best in Southwest." Arizona Republic. August 28, 1931.

"Tempe Bridge Site Survey Ordered." Arizona Republican. August 12, 1926.

"Tempe City Fathers Request Bridge Funds Be Placed in New State Highway Budget Due to Deterioration of Bridge." Arizona Republican. August 27, 1927.

"Work on Tempe Bridge to Begin on 1 March." Arizona Republican. February 20, 1930.