NPS Form 10-900
(3-82)

United States Department of the Interior
National Park Service

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

National Register of Historic Places Inventory—Nomination Form

For NPS use only

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date entered

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

1. Name

historic Highway Bridges Owned by the Commonwealth of Pennsylvania, Department of Transportation

and or common Pennsylvania Department of Transportation Owned Highway Bridges

2. Location

street & number multiple--see individual survey forms N/A not for publication

city, town N/A vicinity of

state code county code

3. Classification

Category
___ district
___ building(s)
___ structure
___ site
___ object
X Thematic

Ownership
X public
___ private
___ both

Public Acquisition
N/A in process
___ being considered

Status
X occupied
___ unoccupied
___ work in progress

Accessible
___ yes: restricted
X yes: unrestricted
___ no

Present Use
___ agriculture
___ commercial
___ educational
___ entertainment
___ government
___ industrial
___ military
___ museum
___ park
___ private residence
___ religious
___ scientific
X transportation
___ other:

4. Owner of Property

name see individual survey forms

street & number

city, town N/A vicinity of state

5. Location of Legal Description

courthouse, registry of deeds, etc. multiple--see individual survey forms

street & number

city, town state

6. Representation in Existing Surveys

title Pennsylvania Historic Resource Survey has this property been determined eligible? ___ yes X no

date 1982 ___ federal X state ___ county ___ local

depository for survey records Bureau for Historic Preservation

city, town Harrisburg state Pennsylvania

7. Description

Condition		Check one	Check one	
___ excellent	___ deteriorated	___ unaltered	_X_ original site	
_X_ good	___ ruins	_X_ altered	_X_ moved	date Waterville Bridge (T-27), 1985
___ fair	___ unexposed			Yeakle's Mill Bridge (T-24), 1947
				Washingtonville Bridge (T-35),

Describe the present and original (if known) physical appearance

DESCRIPTION SUMMARY

This thematic nomination comprises 135 highway bridges owned by the Pennsylvania Department of Transportation. These bridges represent five broad categorical types which are classified by material and structural type. Fifty-eight bridges are stone arch bridges built between 1697 and 1932. Thirty-two bridges are concrete; thirty-one of these are concrete arch bridges with construction dates ranging from 1904 to 1934; one is a prestressed concrete girder bridge completed in 1950. Thirty-nine are metal truss bridges built between 1871 and 1930. Five bridges are metal arch bridges; the earliest arch bridge was built in 1869 and the most recently built was constructed in 1935. One is a suspension bridge, built in 1890.

Within each of the five broad categories there are variations in form and materials, and differences in the number of spans. Both single span and multiple span bridges are represented in the thematic group. Within two of these broad bridge categories are several sub-categories which are determined by structural form. The metal truss bridges are identified by their proprietary types. The concrete arch bridges are characterized as open spandrel, solid spandrel, and solid filled barrel arches.

The overall condition of these bridges is good. In general, few alterations have been made which compromise the integrity of individual structures or their sites. The Waterville Bridge (T-27), Yeakle's Mill Bridge (T-24) and the Washingtonville Bridge (T-35) were moved to their present locations; however, each of these bridges retain their structural integrity.

For a complete listing of the bridges included in this nomination see Continuation Sheets Nos. 1-10.

There are seven bridges included in this nomination which are listed on the National Register as part of historic districts; this information is noted on the relevant bridges, pp. 1-10. These bridges are individually significant and they are eligible for individual listing as part of this thematic group.

Thirty seven Pennsylvania DOT bridges that were determined significant as a result of the Pennsylvania Bridge Survey have already been listed on the National Register. Twenty-six of these are covered bridges which were previously thematically nominated and listed. Eleven bridges were individually listed previously.

Bridges included in Pennsylvania Historic Highway Bridges Thematic Group

Stone Arch Bridges

S-1	Pondtown Mill Bridge L.R. 01009, Adams County	Unknown
S-2	Bridge in Jefferson Borough L.R. 02085, Allegheny County	1901
S-3	Bridge in Shaler Township L.R. 02349, Allegheny County	1915
S-4	"S" Bridge L.R. 06024, Berks County	1919
S-5	Bridge in Albany Township L.R. 06172, Berks County	1841
S-6	Bridge in Yardley Borough L.R. 09023, Bucks County	1889
S-7	Newtown Creek Bridge L.R. 09042, Bucks County Listed on the National Register as part of the Newtown Historic District (Boundary Increase: Sycamore Street Extension) on February 25, 1986	1796
S-8	Bridge in Buckingham Township L.R. 09049, Bucks County	1905
S-9	Bridge in Solebury Township L.R. 09066, Bucks County Listed on the National Register as part of the Carversville Historic District on December 13, 1978.	1854
S-10	Lilly Bridge L.R. 276, Cambria County	1832
S-11	Bridge in Cassandra Borough L.R. 276, Cambria County	1832
S-12	Lenape Bridge L.R. 134, Chester County	1911-1912
S-13	County Bridge #101 L.R. 173, Chester County	1918
S-15	Bridge in Tredyffrin Township L.R. 544, Chester County	Unknown

S-16	Marshall's Bridge L.R. 612, Chester County	1903
S-17	County Bridge #148 L.R. 626, Chester County	1911
S-19	Bridge in the East Fallowfield Township L.R. 15072, Chester County	Unknown
S-20	County Bridge #124 L.R. 15126, Chester County	1916
S-21	Brower's Bridge L.R. 15195, Chester County	1904
S-22	Bridge #171 L.R. 15215, Chester County	1907
S-23	Bridge in Reed Township L.R. 1, Dauphin County	1860
S-24	Bridge in Lykens Township near Erdman L.R. 22001, Dauphin County	Unknown
S-25	Bridge in Lykens Township L.R. 22033, Dauphin County	1872
S-26	Bridge in Ridley Park Borough L.R. 180, Delaware County	Unknown
S-27	Bridge in Radnor Township #1 L.R. 23034, Delaware County	1905
S-28	Bridge in Radnor Township #2 L.R. 23035, Delaware County	1905
S-30	McClay's Twin Bridge (east) L.R. 28010, Franklin County	1827
S-31	McClay's Twin Bridge (west) L.R. 28010, Franklin County	1827
S-32	Bridge between Guilford and Hamilton Townships L.R. 28033, Franklin County	Pre-1860
S-33	Horse Valley Bridge L.R. 28093, Franklin County	Pre-1860

S-34	Bridge in West Wheatfield Township L.R. 32008, Indiana County	1911
S-35	Centennial Bridge L.R. 39009, Lehigh County	Unknown
S-36	Frantz's Bridge L.R. 39060, Lehigh County	1887
S-37	Bridge in Heidelberg Township L.R. 39110, Lehigh County	1887
S-38	Bridge in City of Wilkes-Barre L.R. 5, Luzerne County	Unknown
S-39	Bridge in Plunkett's Creek Township L.R. 41053, Lycoming County	1932
S-40	Bridge between Bryn Athyn Borough and Lower Moreland Township L.R. 26, Montgomery County	1828
S-41	Perkiomen Bridge (Collegeville) L.R. 146, Montgomery County	1799
S-43	Bridge in Upper Merion Township L.R. 225, Montgomery County	1789
S-44	Bridge between Horsham and Montgomery Townships L.R. 373, Montgomery County	1838
S-45	County Bridge #64 L.R. 565, Montgomery County	1841
S-46	Bridge in Upper Fredrick Township L.R. 46007, Montgomery County	1854
S-47	Swamp Creek Road Bridge in Marlborough Township L.R. 46033, Montgomery County	1892
S-48	Sutch Road Bridge in Marlborough Township L.R. 46033, Montgomery County	1910
S-49	Bridge in Franconia Township L.R. 46043, Montgomery County	1837
S-50	Bridge in Hatfield Township L.R. 46046, Montgomery County	1874

S-51	Bridge in Williams Township L.R. 48007, Northampton County	1857
S-52	Bridge in Newport Borough L.R. 31, Perry County	1929
S-53	Frankford Avenue Bridge L.R. 67020, Philadelphia County	1697
S-54	Ridge Avenue Bridge in Philadelphia L.R. 67029, Philadelphia County	1888
S-55	Adams Avenue Bridge in Philadelphia L.R. 67049, Philadelphia County	1901
S-56	33rd Street Bridge in Philadelphia L.R. 67333, Philadelphia County	1901
S-57	Belmont Avenue Bridge in Philadelphia L.R. 67365, Philadelphia County Listed on the National Register on February 2, 1972 as part of the Fairmont Park Historic District.	1896
S-58	Bridge in Jenner Township L.R. 55125, Somerset County	1908
S-59	Bridge in Gibson Borough L.R. 57045, Susquehanna County	Unknown
S-60	Pithole Stone Arch L.R. 60046, Venango County	1897
S-61	Bridge in Dreher Township L.R. 171, Wayne County	1873
S-62	Kise Mill Bridge L.R. 66003, York County Listed on the National Register as part of the Kise Mill Bridge Historic District on October 15, 1980.	1915

Concrete Arch Bridges

C-2	Colwell Cut Viaduct L.R. 66, Armstrong County	1922
C-3	Bridge between Madison and Mahoning Townships L.R. 03178, Armstrong County	1895
C-4	Bridge in Snake Spring Township L.R. 39, Bedford County	1934
C-5	Lindbergh Viaduct L.R. 146, Berks County	1927
C-6	Barto Bridge L.R. 284, Berks County	1908
C-7	Ironstone Bridge L.R. 284, Berks County	1907
C-8	Dauberville, Bridge L.R. 06036, Berks County	1908
C-9	Campbell's Bridge L.R. 09017, Bucks County	1906
C-10	Black Rock Bridge L.R. 270, Chester County and Montgomery County	1927
C-11	Bridge in Westover Borough L.R. 17003, Clearfield County	1917
C-12	Bridge in Fishing Creek Township L.R. 19078, Columbia County	1915
C-13	Market Street Bridge L.R. 34, Dauphin County and Cumberland County	1928
C-14	Soldiers and Sailors Memorial Bridge L.R. 140, Dauphin County	1930
C-15	Second Street Bridge L.R. 542, Delaware County	1919
C-16	Bridge in Metal Township L.R. 45, Franklin County	1907
C-17	Bridge in Franklin Township L.R. 268, Greene County	1919

C-18	Harrison Avenue Bridge L.R. 5, Lackawanna County	1922
C-19	Old Columbia-Wrightsville Bridge L.R. 128, Lancaster County and York County	1930
C-20	Hammer Creek Bridge L.R. 36011, Lancaster County	1908
C-21	Bridge in West Earl Township L.R. 36032, Lancaster County	1917
C-22	Alburtis L. Meyers Bridge L.R. 158, Lehigh County	1913
C-23	Cold Spring Bridge L.R. 175, Lehigh County	1930
C-24	Market Street Bridge L.R. 11, Luzerne County Listed on the National Register on September 10, 1985 as part of the River Street Historic District.	1926-29
C-25	County Bridge #36 L.R. 517, Northampton County	1907
C-26	Bridge in Bangor Borough L.R. 48089, Northampton County	1915
C-27	Watsontown River Bridge L.R. 240, Northumberland County and Union County	1927
C-28	City Line Avenue Bridge L.R. 67009, Philadelphia County	1913
C-29	Frankford Avenue Bridge L.R. 67020, Philadelphia County and Bucks County	1904
C-30	Holme Avenue Bridge L.R. 67296, Philadelphia County	1921
C-31	Wissahickon Memorial Bridge L.R. 67343, Philadelphia County Listed on the National Register on February 2, 1972 as part of the Fairmont Park Historic District.	1931
C-32	Walnut Lane Bridge L.R. 67345, Philadelphia County	1947-50

C-33	Bridge between Monroe and Penn Townships L.R. 54013, Snyder County	1919

Metal Truss Bridges

T-1	Bridge in Cumberland Township L.R. 01002, Adams County	1894
T-3	Liberty Bridge L.R. 02270, Allegheny County	1928
T-4	Bridge in South Beaver Township L.R. 04097, Beaver County	1878
T-5	Bridge in Athens Township L.R. 08081, Bradford County	1916
T-6	Bridge in Tinicum Township L.R. 920, Bucks County Listed on the National Register on October 29, 1974 as part of the Delaware Division of the Pennsylvania Canal	1877
T-7	Bridge in Johnstown City L.R. 525, Cambria County Listed on the National Register on June 18, 1973 as part of the Johnstown Inclined Railway	1890
T-8	Bridge in New Garden Township L.R. 15017, Chester County	1871
T-9	Bridge in West Fallowfield Township L.R. 15170, Chester County	1885
T-10	Hogback Bridge L.R. 869, Clearfield County	1893
T-11	Bridge in Greenwood Township L.R. 17026, Clearfield County	1892

T-14	Bridge in Cambridge Springs Borough L.R. 84-Spur B, Crawford County	1896
T-15	Bridge in East Fallowship Township L.R. 20012, Crawford County	1894
T-16	Bridge in West Mead Township L.R. 20027, Crawford County	1888
T-17	Bridge in Rockdale Township L.R. 20076, Crawford County	1887
T-18	Bridge in Oil Creek Township L.R. 20132, Crawford County	1896
T-21	Brownsville Bridge L.R. 268, Fayette County and Washington County	1914
T-22	Layton Bridge L.R. 26191, Fayette County	1899
T-23	West Hickory Bridge L.R. 598, Forest County	1896
T-24	Yeakle's Mill Bridge L.R. 28042, Franklin County	1887
T-25	Marion Bridge L.R. 451, Green County and Fayette County	1930
T-27	Waterville Bridge Swatara State Park, Lebanon County This bridge was moved to its present location in 1985. Determined eligible by the National Register on September 3, 1980.	1890

T-28	Bridge in Porter Township L.R. 41017, Lycoming County	1889
T-29	Bridge in Brown Township L.R. 41022, Lycoming County	1890
T-30	Bridge in Lewis Township L.R. 41051, Lycoming County	1890
T-32	Bridge in French Creek Township L.R. 43-74, Mercer County	1898
T-33	Quaker Bridge L.R. 43135, Mercer County	1898
T-34	Bridge in Upper Frederick Township L.R. 46021, Montgomery County	1888
T-35	Washingtonville Bridge L.R. 47036, Montour County This bridge was moved to its present location in	1887
T-36	Allenwood River Bridge L.R. 460, Northumberland County and Union County	1895
T-37	Pond Eddy Bridge L.R. 51013, Pike County, Pa. and Sullivan County, N.Y. Jointly owned by N.Y. and Pa.	1904
T-40	Witherup Bridge L.R. 60007, Venango County	1906
T-41	Bridge in Clinton Township L.R. 60010, Venango County	1887
T-42	Bridge in Cherrytree Township L.R. 60052, Venango County	1882
T-43	Webster-Donora Bridge L.R. 143, Washington County and Westmoreland County	1908

T-44	Charleroi-Monessen Bridge L.R. 247, Washington County and Westmoreland County	1906
T-45	Millanville-Skinners Fall Bridge L.R. 63027, Wayne County, Pa. and Sullivan County, N.Y. Jointly owned by Pa. and N.Y.	1901
T-47	Bridge in Nicholson Township L.R. 65021, Wyoming County	1876
T-48	Bridge between East Manchester and Newberry Townships L.R. 250, York County	1889
T-49	Bridge in Washington Township L.R. 66150, York County	1884

Metal Arch Bridges

MA-2	McKees Rocks Bridge L.R. 76-Spur 2, Allegheny County	1929-31
MA-3	Jerome Street Bridge L.R. 392, Allegheny County	1935
MA-4	Washington Crossing Bridge L.R. 02260, Allegheny County	1924
MA-5	Mifflin Road Bridge L.R. 02376, Allegheny County	pre-1900
MA-8	Bridge in Lynn Township L.R. 39112, Lehigh County	1890

Suspension Bridges

SU-2	Kellams Bridge L.R. 966, Wayne County,Pa. and Sullivan County, N.Y. Jointly owned by Pa. and N.Y.	1890

GENERAL DESCRIPTION

A diversity of types is represented in the 135 bridges included in this thematic group. Characterized by construction materials and structural form, the group includes stone arch bridges, concrete arch bridges, metal truss bridges, metal arch bridges, a suspension bridge and one prestressed concrete girder bridge. Characterized by function, the majority of these varied highway bridges was constructed for vehicular use in crossing rivers. However, several bridges serve as vehicular overpasses crossing railroad lines, and a few which now serve as highway bridges were built originally as canal aqueducts.

Design and construction techniques used to build these bridges varied also. The stone arch bridges continued an empirical tradition of engineering which was centuries old, while evolving scientific analysis was the basis for designing suspension bridges, metal arches, metal trusses and reinforced concrete arches. Skilled craftsmen were required for the construction of the masonry bridges, including all stone arch bridges and many early concrete arch bridges. Less labor intensive and demanding was the erection of the metal bridges. Bridge companies of national and statewide reputation fabricated and erected metal bridges throughout Pennsylvania. Many bridges in the thematic group, both metal and masonry, were built by known bridge builders; some of these builders are bridge companies while some are individual engineers and craftsmen.

Stone Arch Bridges

The Pennsylvania bridge survey results indicate a long-established tradition of constructing stone arch bridges for Pennsylvania roadways. Although historians of technology note that very little data exist nationally for seventeenth and eighteenth century stone arch bridges in the United States, five Pennsylvania DOT-owned bridges from this era continue to carry traffic on Pennsylvania highways. As extant representatives, these bridges provide inportant information on seventeenth and eighteenth century stone bridges. Fifty-eight stone arch bridges are included in this thematic group. Forty-nine of these bridges have documented dates of construction. They are located primarily in the southeastern and central portions of the state; a few are located in the western counties. The oldest known stone arch bridge in the United States which still carries traffic is the Frankford Avenue Bridge (S-53), a three-span arch bridge constructed in 1697 to cross Pennypack Creek in Philadelphia. Three late eighteenth century stone arch bridges (S-7, S-41, S-43) are located near Philadelphia, in Montgomery and Bucks County. Twenty-five nineteenth century bridges and nineteen twentieth century stone arch bridges illustrate the continuity of stone arch building styles. Many of the later bridges imitate the eighteenth and earlier nineteenth century stone bridges.

Form and ornamentation are varied in the stone arch bridges constructed in Pennsylvania. Some are single span bridges; some have multiple arches. Some are camelback-shaped when viewed in elevation. Some have ornamental parapet walls and some have highly articulated piers. Single span and multiple span stone arch bridges were built of both rubble and ashlar construction. Most of the earliest stone arches associated with highways were constructed of rubble masonry. Two early examples of ashlar construction in Pennsylvania, the Lilly Bridge (S-10) and the Cassandra Township Bridge (S-11), were built in 1832 by the Allegheny Portage Railroad, and were originally associated with the Pennsylvania Main Line Canal; today they carry vehicular traffic on state highways.

Concrete Bridges

There are thirty-two reinforced concrete bridges included in this thematic bridge nomination. Thirty-one bridges are concrete arch bridges, built prior to 1935 and one bridge, the Walnut Lane Bridge (C-32), built between 1947 and 1950, is the first prestressed concrete girder bridge built in the United States.

The concrete arch bridges included in the thematic bridge nomination are of three types, the solid filled barrel arch, the open spandrel arch, and the through arch. Open spandrel arches have pierced spandrel walls and solid spandrel arches have solid spandrel walls. The through arch extends above the bridge deck, is laterally braced and carries the deck by means of vertical hangers.

Early structural forms for concrete arches took their cues from stone arch construction. The earliest concrete arches were shaped as traditional masonry barrels, and frequently treated on the exterior surface to imitate stone. The earliest concrete arch bridges built in Pennsylvania are of the solid barrel type; several of these early twentieth century bridges have had their surfaces embellished to imitate stone. Solid, filled barrel arch bridges were also constructed later in the twentieth century as monumental, often heavily ornamented, metropolitan bridges, like the Market Street Bridge (C-13) and The Soldiers and Sailors Bridge (C-14) in Harrisburg.

As theoretical understanding of reinforced concrete grew, the shape of the concrete arch evolved to a lighter, open spandrel form. Ornamentation used for concrete bridges evolved also, from surface treatment to more complex architectural and sculptural detailing, taking full advantage of the plastic nature of concrete.
There are sixteen open spandrel arch bridges in this thematic group. These lighter, ribbed open spandrel arches were built from 1906 to 1935. The earliest open spandrel arch, built in 1906 in Buck's County (C-9) is a very good example of transition in form from solid filled barrel arched to ribbed open spandrel arches.

Continued experimentation with ribbed arches resulted in the development of through arches. The Second Street Bridge in Delaware County (C-15), built in 1919, is an early example of this type in Pennsylvania. It is the only one this type included in the thematic group.

Metal Truss Bridges

There are thirty-nine metal truss bridges included in this thematic group. Their distribution is concentrated in three areas of the state, the northwestern, north-central and southwestern counties. The metal truss types represented are: Pratt, Pratt Double Intersection, Parker, Pennsylvania (Petit), Baltimore, Warren, Warren Quadrangular, and Lenticular. The majority of the metal truss bridges are Pratt trusses (20/39), with construction dates ranging from 1871 to 1928. Both through and pony Pratt trusses are included in this number. Results of the Pennsylvania survey indicate the earliest truss type built in Pennsylvania was the pin-connected Pratt pony truss. Six pin-connected Pratt pony trusses are included in this group; they were built between 1871 and 1894.

Most of the other metal truss bridge types represented in the thematic group are Pratt truss variations. The only example of the Parker truss included in this nomination is the Webster-Donora Bridge (T-43); it is composed of Parker and Pennsylvania (Petit) trusses. There are eight Pennsylvania (Petit) trusses, constructed between 1893 and 1916). The Pennsylvania (Petit) truss modified the Parker truss by the introduction of sub-struts or sub-ties. The Baltimore truss is like the Pennsylvania truss in the addition of auxiliary sub-struts and sub-ties, but it has a horizontal upper cord. There are three Baltimore trusses included in the metal truss bridge group. Another Pratt truss variation represented is the Double Intersection Pratt Truss, also termed Whipple, Whipple-Murphy or Linville truss. The Double Intersection Pratt truss modified the basic Pratt truss profile with additional diagonals which extended across two panels. Two double intersection Pratt truss bridges, constructed between 1883 and 1887, are included in the thematic group.

The remaining truss types are Warren, Warren Quadrangular, and Lenticular. There are one Warren truss, one Warren Quadrangular, and three Lenticular trusses. Two lenticular trusses (T-27, T-28) and the Warren Quadrangular truss (T-29) were fabricated by the Berlin Iron Bridge Company in 1890, 1889, and 1890 respectively. The other lenticular truss was fabricated in 1876 by the Corrugated Metal Company builders, predecessor

company to the Berlin Iron Bridge Company. The Berlin Iron Bridge Company was a nationally significant fabricator of truses, particularly known for the fabrication of lenticular trusses.

Suspension Bridges

Although the suspension bridge was developed in Pennsylvania, there are no remaining early highway suspension bridges owned by Pennsylvania DOT. American pioneers in suspension bridge building, James Finley, Charles Ellet and John A. Roebling built significant suspension spans in Pennsylvania, the first being James Finley's 1801 span in Fayette County. The one suspension bridge included in this thematic group was built in 1890 (Kellams Bridge, SU-2).

The structural system of suspension bridges is visible and straightforward. A system of flexible cables is carried by towers and anchored generally at the abutments. To the main cables, suspenders are attached which support the bridge deck and auxiliary stiffening structures. The suspenders between the main cables and the stiffening structure are usually equally spaced and vertical. Suspenders may be eyebars, rods, or steel ropes. Most suspension bridges consist of main cables carried over two towers and, thus, are divided into a main span and two side, or anchor, spans. Site conditions determine whether the cables extend over the side spans, which are then suspended from the cables, or whether the cables drop directly from the towers to their anchorage. In the latter case, the side spans are independently carried by guides or trusses.

Historically, suspension bridges have been built with cables of two types: wire rope and bar chains. The Kellams Bridge (SU-2) is an example of a small span, wire-rope cable suspension bridge. Spanning 384 feet, this one-lane bridge spans the Delaware River from Stalker, Pennsylvania to Kellams, New York. The cables drop directly into their anchorage. Abutments are concrete.

Metal Arch Bridges

There are five metal arch bridges in this thematic group. These include long-span through arches, shorter span deck arches and one bowstring arch.

The McKees Rocks Bridge (MA-2), in Alleghany County and the Jerome Street Bridge (MA-3) are long-span through arches. Both the 750 feet long main span of the McKees Rocks Bridge and the 762 feet long Jerome Street Bridge are two-hinged through arches. The two ribs of each arch are braced by trusses and the roadway is supported from vertical hangers. The McKees Rocks Bridge also has numerous approach spans consisting of two-hinged deck arches, deck trusses and steel girders.

Washington Crossing Bridge (MA-4) and Mifflin Road Bridge (MA-5) are deck arch bridges. The three 350 feet long steel arches of the Washington Crossing Bridge are supported on massive concrete piers and flanked by twelve approach spans. The comparatively smaller, single span 51 feet long deck arch of the Mifflin Road Bridge is supported by stone masonry abutments.

The bridge in Lynn Township (MA-8) is an unusually configured, pin-connected bowstring arch bridge. The upper chord of this bowstring is made of cast sections. The arch is divided into sections, or panels, which consist of diagonal tensile members. The horizontal bottom chord is supplemented by a curved member which is pinned at the ends and the center panel. This curved member is adjustable by turnbuckles. Constructed in 1890, this 89 feet long bowstring is supported on stone masonry abutments.

SURVEY METHODOLOGY

The inventory and survey process used to identify the potentially significant highway bridges in Pennsylvania was a joint effort involving the Pennsylvania Department of Transportation (Penn DOT) and the Pennsylvania Historical and Museum Commission (PHMC). Penn DOT's network of approximately 45,000 highway miles included about 25,000 bridges. A list of bridges which warranted examination was chosen from these bridges by applying three criteria. First, bridges built after 1941 were eliminated, with the exception of the extraordinarily technologically significant Walnut Lane prestressed girder bridge. The year 1941 was chosen as a cut-off for several reasons. Many bridges constructed during the WPA era were not completed until the late 1930s. Then, the war effort during World War II

shifted the focus of the nation's economy, with construction priorities centered on military needs. And, post-World War II technological developments make this time a convenient break in the evolution of bridge technology. The second criterion applied was bridge category. Bridges had to be of a type considered technologically significant prior to 1941. Categories selected include stone arch, concrete arch, metal arch, metal truss, suspension and covered bridges. Steel girder and reinforced concrete girder bridges were not included since they were determined principally significant for post-World War II technology. The final criterion was size. Because of the large number of small concrete arch culverts built on highways, no concrete arch bridge under 20 feet long was considered.

The application of these three criteria resulted in a list of 1,635 bridges which required further examination. To facilitate the standardization of data obtained from a field survey of these bridges, a survey card was developed by PHMC staff. During 1982 personnel from each of Penn DOT's eleven engineering districts were trained and dispatched to photograph and gather basic structural data for each of the 1,635 bridges.

Upon completion of the field survey, all survey cards and bridge photographs were reviewed by PHMC staff. Three hundred and ninety-nine bridges were identified as worthy of additional consideration, based upon significance in bridge technology and transportation development. The 1,236 bridges that appeared to be ineligible for the National Register were eliminated from consideration.

A panel of national experts was assembled to evaluate the 399 bridges and make recommendations regarding eligibility for the National Register of Historic Places. These experts were chosen for their expertise in bridge technology, civil engineering history, and the history of technology. During a two day meeting in July 1983, the panel of experts evaluated the 399 bridges. The criteria used by the panel to evaluate these bridges included the following:

1. Basic structural data (length, width, number of spans) and age were used to establish the technological significance of individual bridges. Architectural quality, special decorative elements and artistic treatment of structural elements were also considered;

2. Structures associated with an important bridge engineer or a particularly important bridge company;

3. Bridges that exemplify a specific type, design or method of construction and retain a high degree of integrity; and

4. Bridges that significantly contributed to the development of transportation on a local, state or national level.

After their evaluation, the panel identified 172 bridges which were considered to possess the technological significance, historic importance and integrity necessary to be eligible for the National Register. This list included examples of each type of historic bridge initially considered. Of these 172 historic highway bridges owned by Penn DOT, 37 were already listed on the National Register of Historic Places, 26 in the thematic covered bridge nomination and 11 individually. Thus, the list was reduced to the 135 bridges included in this thematic nomination. Seven of the 135 bridges included in this nomination are listed on the National Register as part of historic districts; these are individually significant and eligible for individual listing on the National Register as part of this thematic group.

NPS Counting Purposes: this thematic nomination includes 135 structures, all of which are contributing. Seven of the nominated bridges were previously listed on the National Register as part of historic districts.

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	
_x_ 1600–1699	___ architecture	___ education	___ military	___ social/ humanitarian	
_x_ 1700–1799	___ art	_x_ engineering	___ music	___ theater	
_x_ 1800–1899	___ commerce	___ exploration/settlement	___ philosophy	_x_ transportation	
___ 1900–	___ communications	___ industry	___ politics/government	___ other (specify)	
		___ invention			

Specific dates 1697-1950 **Builder/Architect** Various

Statement of Significance (in one paragraph)

Pennsylvania's rich historic transportation heritage claims civil engineering landmarks which span the centuries, from recorded early experimental structures to significant extant structures. Among the many significant bridges still standing in Pennsylvania are the first known stone arch bridge built in the United States (S-53), and several extant 18th century stone bridges (S-7, S-41, S-43); several long-span 20th century arches (MA-2, MA-3); one of the world's longest multiple-span concrete arch bridges (C-19), as well as the first major prestressed concrete girder bridge built in the United States (C-32).

Along with these remarkable extant structures, historic records describe and illustrate noteworthy spans and early experimental bridges which were built in Pennsylvania but no longer stand. Early timber bridge builders like Timothy Palmer, Lewis Wernag and Theodore Burr tested their skill in crossing the Susquehanna, Schuylkill and Delaware Rivers. Skilled stone masons established a three hundred year tradition of building stone arch bridges in Pennsylvania. Early suspension bridge builders, James Finley, Charles Ellet and John Roebling, developed the suspension bridge in Pennsylvania. These bridge builders were followed by the designers of steel and concrete bridges, as the state's system of roads expanded from east to west, and south to north.

The earliest bridges built were elemental structures of timber or stone, and likely consisted of simple beams resting on supports. For long-span timber bridges, a series of beams was carried on piles. In the case of stone, the beam was actually a slab, but the structural principle was the same. Although timber lent itself to use as a beam, which bends and is subject to tensile stresses, stone would not be used efficiently as a beam. Thus, primitive application gave way to designs which allowed for longer spans and more efficient use of the materials. The simple timber beam was expanded to a truss by joining vertical and diagonal members. Stone was used to build arches which act in compression and use the natural strength of stone as a building material.

The oldest extant highway bridges in Pennsylvania are stone arch bridges. Many examples survive throughout Pennsylvania, illustrating not only variations typical in masonry arch bridge construction, but also evolutionary types. An example of the most primitive stone bridge type, the clapper or slab bridge discussed above, carries vehicular traffic today in Susquehanna County (S-59). This bridge also may be classified as a

primitive corbelled, or false arch as the supports for the huge slab are corbelled. The oldest true arch still carrying traffic today is the Frankford Avenue Bridge (S-53) in Philadelphia, built in 1697. Not only is this bridge the oldest one in Pennsylvania, but it is the oldest known stone arch bridge built in the United States. This bridge is an extremely rare example of a 17th century stone masonry structure in the United States.

Although both 19th and 20th century bridge historians have concurred that early stone masonry structures are poorly represented in America, there is a large number of early stone arch bridges in Pennsylvania. The tradition for building stone arch bridges may not have been widespread in other states, but Pennsylvania's reputation for stone construction was recorded in 1808 by Secretary of the Treasury, Albert Gallatin in his report on transportation in America:

> "In the lower counties of Pennsylvania, stone bridges are generally found across all the small streams. Both in that state and at some distance eastwardly, bridges with superstructure are common over the wide rivers."

This early, recognized tradition continued in Pennsylvania into the 20th century with the construction of many fine stone arch bridges. Today, there are extant stone arch bridges which were built for King's highways, turnpikes, canals, railroads, and modern highways. Many of them still carry traffic. Of the 135 historic bridges included in this group, 58 are stone arch bridges.

As Gallatin noted in his 1808 report, streams in Pennsylvania were crossed by both stone and timber bridges. Thus, through the earliest years of Pennsylvania's growing transportation network, stone arch bridges and timber bridges were built simultaneously. Of course, the inherent durability of stone, when properly used, contrasts with the relatively short life of timber structures. Thus, there are no extant timber bridges which were built in the 17th or 18th centuries.

There are, however, still many extant examples of 19th century timber bridges all across Pennsylvania. These are the well known covered bridges of Pennsylvania. These timber bridges are examples of wooden trusses, sheathed and roofed to protect and prolong the life of the wooden framing and deck. Covered bridges in Pennsylvania have been listed on the National Register in several thematic groups.

Historical records abound in descriptions of timber bridges built in Pennsylvania by America's most famous wooden bridge builders, Timothy Palmer, Theodore Burr and Lewis Wernag. The earliest recorded long-span

timber bridge built in Pennsylvania was Timothy Palmer's three-span "Permanent Bridge" constructed across the Schuylkill River at Philadelphia in 1805. Its 195-foot main span was flanked by 150-foot side spans. Theodore Burr built many of his arch trusses in Pennsylvania; among these were multiple span bridges crossing the Susquehanna and Delaware Rivers. Lewis Wernag's most famous Pennsylvania bridge was named "The Colossus" and spanned the Schuylkill at Fairmont Pennsylvania. It was a single span arched truss of 340 feet.

While stone and timber bridges continued to be built, the 19th century saw the introduction of metal bridges in the United States. Several types of metal bridges were built first in Pennsylvania. The first suspension bridge in the United States was built in 1801 over Jacob's Creek in Fayette County. Designed by James Finley of Fayette County, it was one of many chain suspension bridges built by him. He received a patent title in June 1808, and through numerous historical descriptions, his work is known. None of these early suspension bridges still stand. The first metal arch in the United States, on the other hand, was completed in 1839 and still spans Dunlap's Creek in Fayette County. It was built by the Army Corps of Engineers for the National Road and replaced a Finley suspension bridge. This 80 feet long bridge has been individually listed in the National Register of Historic Places.

The tradition for early and significant suspension bridges continued in Pennsylvania, with noteworthy designs by both Charles Ellet and John Roebling. Charles Ellet's first major bridge was a suspension bridge built in 1842 to replace Lewis Wernag's "Colossus". Ellet's wire cable suspension bridge spanned 358 feet in a single span over the Schuylkill River in Philadelphia. It carried traffic until 1874.

John A. Roebling's reputation for substantial suspension bridges was also established in Pennsylvania, though his most recognized bridge is New York's Brooklyn Bridge. One of Roebling's early bridges, the 1848 Delaware Aqueduct of the Delaware and Hudson Canal, stands today as the earliest extant suspension bridge built which still has its original structure. This wire cable suspension bridge carried the canal in a wooden aqueduct across the Delaware River. Today, the seven-span structure is located in a national park and has been listed on the National Register of Historic Places. John Roebling built several other suspension bridges in Pennsylvania for both canal and highway traffic.

Suspension bridges of both chain cable and wire cable systems were built for Pennsylvania highways through the 19th century and into the 20th century. On the other hand, metal arch bridges were not widely built after the remarkably early Dunlap's Creek Bridge until the late 19th and early 20th centuries, when several noteworthy iron or steel arch bridges were built in Pittsburgh.

The overwhelming majority of metal bridges built during this period (19th and early 20th century) were metal truss bridges. As a structural form, the truss was first built in timber. In the 1840's, two truss types (Howe and Pratt) were patented as combination wood and iron structures. The truss members which acted in compression were made of wood, while the tension members were iron. The combination wood and iron truss continued to be built throughout most of the 19th century, alongside the more progressive forms in iron.

Bridge historian, Henry Tyrell, wrote in 1911 in his History of Bridge Engineering that the majority of bridges built prior to 1860 in the United States were made of timber. Timber was readily available and was adequate for the loading needs of early railroads and highways. The transition to iron members began in the 1840s with tension rods and progressed by 1861 to eyebars and posts made of rolled section. Structural iron shapes began to be mass produced in the 1860s and were thus available at lower prices. The post Civil War years saw many attempts to improve truss types and the organization of many large bridge building companies to manufacture them. By 1895, wrought iron shapes were no longer available and the predominant structural metal used was steel.

The Pratt truss, built first with iron members, and later with steel, became the predominant metal truss bridge built in the United States after 1860. At the same time, scores of truss bridge patents were granted. Among the variations included in the bridges of this thematic group are Petit, Baltimore, Warren, Parker and Lenticular trusses. The most novel configuration is the Lenticular truss, in which the upper and lower chords are curved. Gustav Lindenthal's multiple span lenticular truss built in 1883 in Pittsburgh, has been designated a Civil Engineering Landmark and is listed on the National Register of Historical Places. Included in this nomination are several smaller, single span lenticular trusses which are good examples of this unusual type (T-27, T-28, T-47).

The metal truss bridge was a structural form which could respond to the tremendously rapid geographical and technological growth of 19th century railroads. Overcoming geographical obstacles was a taxing design problem. Added to this was the incredibly rapid development of increasingly heavy locomotives which could travel at increasingly faster speeds. The metal truss had numerous advantages for the railroad companies. It was possible to analyze their structural behavior, members could be standardized, and it became possible to test materials and members for their capacity and behavior under applied loads. The components of the truss were easily manufactured and shipped, and the entire bridge could be erected quickly on the substructure with a minimum of skilled labor. Each railroad had its own preferred type of truss, but as a categorical structure, the metal truss bridge was identified with the 19th and early 20th century American railroad network.

It seems natural that the ease of its erection and its suitability for various site conditions made the metal truss bridge an equally favored choice for many highway bridges. Of the 135 bridges included in this thematic nomination, 39 are metal truss bridges. Most of these are Pratt trusses.

As discussed, the transition in bridge building materials evolved from 17th and 18th century use of stone and timber to early 19th century use of iron, and by the end of the 19th century to the predominance of steel.

The development of concrete as a primary construction material was roughly simultaneous with that of steel. By 1900, zealous proponents of both materials were developing patents and selling their bridge types throughout the states. Concrete became the predominant form for highway bridges and short railroad spans early in the 20th century, but the competition between concrete and steel is a tradition which continues today.

Concrete lent itself to the arch shape and had the advantage over stone masonry of much greater span capability. The first concrete bridge built in the United States was unreinforced, or plain, concrete and was built in 1871 in Prospect Park, New York. The first reinforced concrete bridge was built in 1889 in Golden Gate Park, San Francisco. Designed by concrete pioneer, Ernest L. Ransome, this bridge was a solid barrel arch which was treated on the surface to imitate stone. Concrete was seen as an extension of stone masonry and it took years for it to be accepted in an unembellished natural state. The earliest concrete arch bridge included in this group was constructed in 1904 and was embellished to imitate stone.

As theoretical understanding of reinforced concrete progressed, changes in the shape of each arch bridge occurred. The arch itself became flatter, the monolithic nature of the barrel changed by division into arch ribs, the ribs were pierced into open spandrels and the structure became progressively lighter and more efficient. This transition, from massive plain arches in 1871 to the lighter, divided arch ribs had occurred by 1905. An excellent example of an early open spandrel bridge is the 1906 Campbell's Bridge in Buck's County (C-9). Of course, the massive barrel arches continued to be built by more conservative designers. The longest open spandrel arch bridge of its time was built to carry Walnut Lane across the Wissahickon Creek in Philadelphia. Its span was 233 feet. The Wissahickon Creek Bridge span was exceeded in 1912 by the Larimer Avenue Bridge, which has a clear span of 312 feet, and parabolically shaped ribs.

Noteworthy concrete spans, arched and otherwise, continued to be built on Pennsylvania highways well into the 20th century. In 1930, the longest mulitple span arch bridge (one mile long) of its time was ingeniously built between Columbia and Wrightsville, Pennsylvania (C-19). It was designated a

National Historic Civil Engineering Landmark in 1984. In 1950, the first major prestressed concrete beam bridge designed and built in the United States was completed. This three-span bridge carries Walnut Lane over Lincoln Drive and Monoshone Creek. The Walnut Lane Bridge (C-32) is the most recently built bridge included in this nomination. It is illustrative of the continuously evolving technological innovations developed for bridging America's highways.

Though these most recently constructed bridges have been designed by trained engineers applying systematic structural analysis, the history of Pennsylvania's bridges reflects a history of an evolving tradition of bridge builders. These bridge builders were people with skills ranging from experienced craftsmen and artisans to trained engineers.

Pennsylvania's Bridge Builders

The early stone arch builders were highly skilled craftsmen who continued an ancient established tradition of building. Some of their names are carved in bridge stones or noted in legislative records. Among these were Silas Harry and D. S. Stoner, who built many turnpike bridges early in the 19th century in Maryland and Pennsylvania, along the National Road. Two of Silas Harry's bridges are located in Franklin County (S-30, S-31), as is one of D.S. Stoner's (S-29). Other handsome stone bridges were built by skilled men across Pennsylvania and many of them continue to carry traffic.

The builders of the early 19th century long-span timber bridges, like Palmer, Burr and Wernag, were highly skilled craftsmen in heavy timber construction, but they were also innovative designers. Though none had formal training in engineering, and though they relied on traditions of timber building, they devised their own designs and patented them. Their works remain only through illustrations and descriptions in historical records. The tradition of building long and short span timber bridges continued in the 19th century, with local craftsmen erecting their own handiwork at various locations. Many 19th century covered timber truss bridges remain standing in Pennsylvania today.

The introduction of bridges built of manufactured metal components in the early 19th century transformed the empirical design traditions of those early American bridge builders. The first metal bridge built in the United States was an 1801 suspension bridge by James Finley. Descriptions exist which describe Finley's graphical method of calculating member lengths for his suspension bridge, with a horizontal roadway. Though he apparently had no formal engineering training, Finley's invention was lauded even by French engineers. The other early American metal bridge was the cast iron arch built over Dunlap's Creek on the National Road in 1839. It was designed by Richard Delafield of the Army Corps of Engineers. As late as the 1830's,

there were only a few colleges in the United States like West Point and Rennselser Polytechnic Institute which offered civil engineering training, and the few engineers in charge of public works lamented the scarcity of engineers in the United States.

The canals provided training ground for a few young engineers in America. But it was the rapid growth of the American railroads, with their need for longer and stronger bridges, and the increasing availability of manufactured structural iron, which demanded systematic rules of analysis and controlled, standardized materials for bridge building. Early attempts at standarded texts were circulated among professionals in 1847 and 1851. Developed approximately simultaneously by engineers with railroad experience, Squire Whipple's book, A Work on Bridge Building, was produced in 1847 and Herman Haupt's book, General Theory of Bridge Construction, was published in 1851. Haupt had extensive experience on Pennsylvania railroads and even taught engineering at Pennsylvania College in Gettysburg.

The availability of trained engineers for teaching and the resultant increase in programs which produced more engineers led to an established engineering profession in the United States by the 1860's. Long-standing professional organizations were organized and an increasing supply of engineers guaranteed.

The post Civil War years were years of rapid growth for American railroads. The bridge type which the railroad adopted was the metal truss bridge and many new truss types and improvements on existing forms developed. These years also saw the establishment of large, specialized bridge building companies, with manufacturing, erecting and material testing capabilities. Some of these companies were formed by patentees to construct their particular truss types.

In 1889, Theodore Cooper, a well known railroad engineer, numbered American bridge building companies at about 40, and said of them in a paper published in the American Society of Civil Engineers:

> "Up to about 1874, the designing and the construction of bridges were, almost exclusively, in the hands of the several bridge companies. Each of these companies had its own peculiar style of bridge...each company also had its own special geographical field, or lines of railroad, giving it the preference. Even at points where they did meet as competitors, it was rather as advocates for their special trusses or forms of parts..."

By the late 19th century, all the major bridge companies had their own shops and handled their bridge parts from the rolling mills to final shipment. Each company had the shop capacity to handle bridge manufacturing from receiving the iron to straightening, punching, fitting, riveting, finishing, painting and shipping.

Many of these bridge building companies were located in Pennsylvania. Among these were the Keystone Bridge Company in Pittsburgh and the Phoenix Bridge Company in Phoenixville, not far from Philadelphia. The Keystone Bridge Company was organized in 1865 with J. H. Linville as president and Andrew Carnegie as vice president. Between 1891 and 1894, Keystone was Keystone Bridge Works of the Carnegie Steel Company. Many steel bridges including the very early (1874) Eads Bridge over the Mississippi River were fabricated by this company throughout the United States. The Phoenix Bridge Company, with its roots in iron manufacturing since the late 18th century, also built iron and steel bridges throughout the United States. Several of the bridges in this thematic group incorporated the company's easily recognized Phoenix column in their structure. Other nationally significant bridge companies represented in the bridges of this nomination are The Berlin Iron Bridge Company, Caton Bridge Company, Champion Bridge Company, Concrete Steel Bridge Company, Groton Bridge and Manufacturing Company, King Bridge Company, and Wrought Iron Bridge Company.

Although the bridge manufacturing companies grew primarily out of railroad needs, they quickly saw the adaptability of their product to the highway bridge market. It is interesting to note that the establishment of these large bridge building companies was made possible by the growing competance of the engineering profession, but that the need for competitive design and quick solutions produced a "cookbook" bridge, the catalog variety metal truss bridge.

The procedure by which a locality would contract to have a truss bridge erected was detailed in the 1873 catalog of the Phoenixville Bridge Works and Clarke, Reeves and Company. There are 14 plates in the back of the catalog which illustrate various styles of bridges available. Prospective bridge buyers treated the catalog much like today's mail order catalog customer does. The bridge company instructed its customers to "follow directions" and provide information concerning the site conditions.

When this data was furnished, the company promised to "quote prices, by return mail" and "construct the bridges in as short a time as any other bridge builders can do".

Their cash rates were uniform to all, but prices were lower if a number of trusses were ordered. Although their system encouraged the customer to choose one of their standard styles, they claimed to be able to "make special plans and estimates to suit any required case" for a higher cost.

This procedure continued to be used for local highway bridges as vehicular traffic increased and more highway bridges were needed. The metal truss bridge continued to be a popular bridge form well into the 20th century because of its relative ease of construction and the tendency of the manufactures to encourage standardization.

Concrete arch bridges for highway spans also shared this tendency toward standardization. Bridge companies which specialized in reinforced concrete structures flourished in the early 20th century. Among these, the Luten Bridge Company with offices in York, Pennsylvania was one of the most prolific companies. Established by Daniel Luten, the company produced catalogs of various arch styles, from monumental city bridges to ornamental park bridges. The catalogs also advertised the advantages of concrete bridges over steel bridges. Luten built hundreds of his concrete arches throughout the east and midwest.

Although the majority of bridges constructed during this late 19th and early 20th century flurry of standardized bridge building were of the catalog type, long-span or complex structures still required the design skills of the trained engineers. Then, as the states began to see the need for central control of highway and bridge design, highway departments were established, and today's method of bridge design was born. From the 1920's and 1930's, highway bridges were either designed by the State Highway Department, municipal departments of public works, or by consulting firms. The construction of both substructure and superstructure was accomplished by contractors. The more recent examples of Pennsylvania historic bridges represent designs by consultants and municipal and state engineers.

The Development of a Transportation System in Pennsylvania

Pennsylvania's modern highway system is a product of 300 years of evolution, beginning with early post roads and turnpikes, heavily influenced by canal and railroad agency advances, expanded by local automobile roads in the twentieth century and culminating with the interstate highway program. Physical remnants of each major period, bridges remain as reflections of Pennsylvania's growth and development.

Early Highways

Pennsylvania's earliest travelers depended on rivers and Indian paths for movement across the state. Roads, as defined by the twentieth century traveler, were nonexistant. Early roads, even primitive ones by today's standards, were rare in the Commonwealth. It was the English settlers in the Philadelphia region who began to build them. Pennsylvania's network of

roadways had its earliest beginnings in the "King's highways" which radiated out from Philadelphia. By a 1699 act of the General Assembly, all "King's highways or public roads" were to be laid out upon orders from the Governor and Provincial Council. These roads were cleared of brush and trees and could be as wide as fifty feet. Slowly, a system of King's highways grew in southeastern Pennsylvania. By the later seventeenth century, a road carried traffic from Philadelphia to Morrisville and Bristol. Among other early roads were a Queen's road to Chester in 1706, the Old York Road from Jenkintown to New Hope in 1711, and a road from Philadelphia to Doylestown and Easton in 1722. In 1733, the King's Highway connecting Philadelphia with Lancaster was begun.

Until the mid-eighteenth century, the focus of road building activity was in southeastern Pennsylvania. Although a network of roads had grown to facilitate trade in the east, travel to the west was difficult. The impetus for better roads to the west was provided by the French and Indian War. In 1752 a wagon road was opened from what is now Cumberland, Maryland to the Youghiogheny River. In 1755 it was improved and extended to the Monongehela River by General Edward Braddock's troops. This road became known as Braddock's Road. It carried traffic from Cumberland, Maryland through present Somerset, Fayette, and Westmoreland Counties and ended at Braddock, south of Fort Duquesne. It roughly followed the course of the present US-40. Another well-traveled route was the Forbes Road, constructed by order of General John Forbes in 1758 to allow British and Colonial troops to attack the French at Fort Duquesne, now Pittsburgh. Forbes' Road began at Raystown (Bedford) and went west to a point about ten miles west of Ligonier; much of the present US-30 between Bedford and Pittsburgh follows this route.

Braddock's and Forbes' Roads remained the principal routes west until well after the Revolution. From 1811 to 1818, parts of Braddock's Road were used for the National, or Cumberland Road built by the United States government to provide a connection between the Atlantic Seaboard and the Ohio River.

After the Revolution, on September 21, 1785, the first highway legislation passed by the Pennsylvania General Assembly provided for the laying out of a state highway from western Cumberland County to Pittsburgh. Legislation continued to be enacted which created more roads in Pennsylvania, establishing the precursors of many current highways.

Although public roads continued to be built after the Revolution, the lack of adequate funds for the continued construction and maintenance of its growing transportation network led to the beginning of Pennsylvania's turnpike or toll road era. These early toll roads and the military roads relied on ferries and fords for crossing rivers.

On April 9, 1792, the Pennsylvania legislature chartered the Philadelphia and Lancaster Turnpike Road Company, a venture which combined a partial public subsidy with private capital. The Lancaster Pike, a hard-surfaced road of macadam was completed in 1794 at a cost of approximately $450,000.00. An Act of 1806 authorized establishment of a turnpike road along what became known as the "Pittsburgh Pike" between Harrisburg and Pittsburgh; much of this followed the old Forbes Road which became US-30. This road was to be an important thoroughfare leading westward and its success spurred the formation of a large number of turnpike companies in the early 1800's. By 1831, Pennsylvania led the country in turnpike road mileage, having a total of about 3,000 miles divided among some 220 local companies.

These numerous privately owned, state chartered turnpikes carried so much traffic that ferries, which had originally crossed all major rivers, were incapable of handling the volume. Often, the turnpike companies built their own bridges. At major river crossings like the Delaware, Susquehanna, Juniata and Allegheny Rivers, separate, private companies formed to construct toll bridges. Because of the size of the bridges that needed to be built at these crossings, master bridge builders tested new construction techniques, exceeded previous span lengths successfully and became prominent. By the end of 1821, documents indicate that authority had been granted for the construction of forty-nine privately owned toll bridges across the state.

Canals

The principal period of turnpike construction ended around 1830 with the successful completion of a statewide canal system. Travelers returned again to the water and the emphasis in bridge building changed from highway bridges to canal aqueducts. Between 1791 and 1819 fifteen private companies were chartered in Pennsylvania to build canals. The network of turnpikes built in Pennsylvania was largely funded with private capital until the Commonwealth began to suffer a loss of trade as a result of the completion of New York's Erie Canal in 1825. In 1826 Pennsylvania legislation was passed which established the State Works, a state transportation system whose principal component was a statewide canal system. By 1834 travel by the canal was possible across the state from Philadelphia to Pittsburgh on the Main Line of the Pennsylvania Canal. The Allegheny Mountains were crossed by means of the Allegheny Portage Railroad, a unique system of inclines and planes. The thirty-seven mile long Allegheny Portage Railroad included several stone arch bridges which remain in service today as vehicular bridges. Numerous other private and Commonwealth sponsored canals were built throughout the state during the first half of the nineteenth century.

Construction of the system of canals required solutions for crossing obstacles just as other modes of transportation did. Bridges were built to accommodate intersecting roads, and aqueducts were built to carry the canals and towpaths across streams, large rivers or ravines. Among the aqueducts built for Pennsylvania canals were several designed and built by John A. Roebling, of Brooklyn Bridge fame. Roebling's first aqueduct was a replacement bridge built in 1845 on the Pennsylvania Canal in Pittsburgh. Between 1847 and 1850 he built four aqueducts on the Delaware and Hudson Canal in northeastern Pennsylvania. One of these, the aqueduct at Lackawaxen, is still standing. Innovations in bridge technology and engineering advances developed for canals eventually led to more sophisticated applications in railroad and highway bridge design. It was with the building of America's early canals that a group of field-trained engineers emerged in the United States.

Railroads

No sooner had the canals become fully operational than major railroad lines began to be built, further expanding the demand for advances in engineering technology. A systematic approach to bridge design developed which would influence highway bridge design. By 1860, with 2,600 miles of trackage, railroads had superseded the highways and canals as the preferred means of transportation. Pennsylvania pioneered in railroad development, with the largest, the Pennsylvania Railroad, traversing the state. Other railroads included the Reading, Delaware and Hudson, and the Pittsburgh and Lake Erie. The rapid growth of the railroad industry influenced the art of bridge building and resulted in the development of new bridge types, new construction techniques, and the shift to new building materials. Because of the relative economy and superiority of railroads, most canal and turnpike systems were abandoned during this period and fell into disrepair. While a few canals and several turnpikes continued to be used for local traffic, the railroads became the primary means of long-distance transportation.

Many canal beds were used for railroad rights-of-way because they were flat, long and linear. Parts of the Pennsylvania Main Line were taken over for railroad use. In 1857 the Commonwealth sold the Main Line Canal, and two railroads which linked the canal system, the Allegheny Portage Railroad and the Philadelphia and Columbia Railroad, to the Pennsylvania Railroad Company for $7,500,000. Other canals were sold to subsidiaries of the Pennsylvania Railroad and to other railroads.

Rise of the Automobile

In the late nineteenth century, the development of the automobile and the popular use of the bicycle spurred a national movement for the re-

establishment of good roads. Many of the old turnpike roads were in use again, even though they had been maintained poorly for years. In 1895 Pennsylvania enacted legislation which furnished procedures for any county to take over local roads and improve them.

During the early 1900's, the increasing volume of automobile traffic gradually re-established the highway as the principal facility by which people and goods were moved. As traffic increased, communities and counties were unable to cope with the maintenance, construction and improvements of roads. The need for state intervention became clear.

With the backing of Governor Pennypacker, an act was passed on April 15, 1903 organizing the State Highway Department (later the Pennsylvania Department of Highways), one of the first such departments in the country. The Department provided a means to handle state assistance to townships and counties for road improvements. On May 31, 1911 the Sproul Act, signed by Governor Tenor, provided for a state highway system. The Sproul Act made provisions for the Commonwealth to take over a system of 8,835 miles of roads on 296 different routes, linking county seats and other important places. These roads included county, township and private turnpike company roads.

The focus of highway work in the 1920's was to complete the paving of a network of primary highways. Some of these, like the Lincoln Highway, were intended for national travel and were the beginning of a transcontinental system of U.S.-numbered highways. In the 1930's the focus shifted to the paving of the farm-to-market roads. The greatest growth in the state highway system occurred in 1931 when 20,156 miles of rural roads were taken over by the Commonwealth. This growth in the state highway system included the state assuming responsibility for all the bridges on these roadways, which had been built by county and local authorities through the nineteenth century. In this manner, many old highway bridges became the property and responsibility of the state.

The late 1930's saw the construction of Pennsylvania highway and bridge projects under the work-relief program of the Works Progress Administration (WPA) and the creation of the Pennsylvania Turnpike Commission. On October 1, 1940, 160 miles of the Pennsylvania turnpike were opened from Middlesex to Irwin. The road was heralded as America's first long-distance super highway and featured four lanes, no at-grade intersections, and very low roadway grades. This progress was dampened by World War II, when wartime controls were imposed on travel and funding was channeled to military needs. After the war, a growing population and increased mobility created new needs. Urban bypasses were built to alleviate urban traffic congestion. At the same time, turnpike extensions were completed which joined the Pennsylvania Turnpike with the Ohio and New Jersey turnpikes, forming a part

of a four-lane road connecting New York with Chicago. In 1956 the Federal Highway Act established a new 41,000 mile Interstate Highway System, stretching across the country. By the late 1970's, 1,576 miles of Federal-aid Interstate Highways were built in Pennsylvania.

In 1970, the Department of Highways became the nucleus of the Pennsylvania Department of Transportation, created by Act 120. The intent of the legislation passed in May 1970 was to consolidate transportation-related functions formerly performed in the Departments of Commerce, Revenue, Community Affairs, Forests and Waters, Military Affairs and other state agencies.

The bridges included in this nomination are owned by the Pennsylvania Department of Transportation. Most of them were built as highway bridges, some by localities and some by PennDOT's predecessor organizations. A few were built for other uses and taken over as highway bridges by PennDOT or its predecessors. Many other historic bridges exist in Pennsylvania which are not owned by PennDOT; they were not included in the survery and thematic group.

9. Major Bibliographical References

See Continuation Sheets item 9, pages 1-2.

10. Geographical Data

Acreage of nominated property various-- see individual survey forms

Quadrangle name various-- see individual survey forms **Quadrangle scale** 1:24,000

UTM References See individual survey forms

	Zone	Easting	Northing
A			
B			
C			
D			
E			
F			
G			
H			

Verbal boundary description and justification

See individual survey forms

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

state	Pennsylvania	**code** 042	**county** see individual survey forms	**code**	
state	New York	**code**	**county** see individual survey forms	**code**	

11. Form Prepared By

name/title Paula A. C. Spero

organization Historic Structures Consultant **date** 8/25/86

street & number P.O. Box 10207 **telephone** (301) 668-2688

city or town Baltimore **state** Maryland

12. State Historic Preservation Officer Certification

The evaluated significance of this property within the state is:

X **national** ___ **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

title Dr. Brent Glass, Pennsylvania State Historic Preservation Officer **date**

For NPS use only

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

date

Keeper of the National Register

Attest: **date**

Chief of Registration

GPO 911-399

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