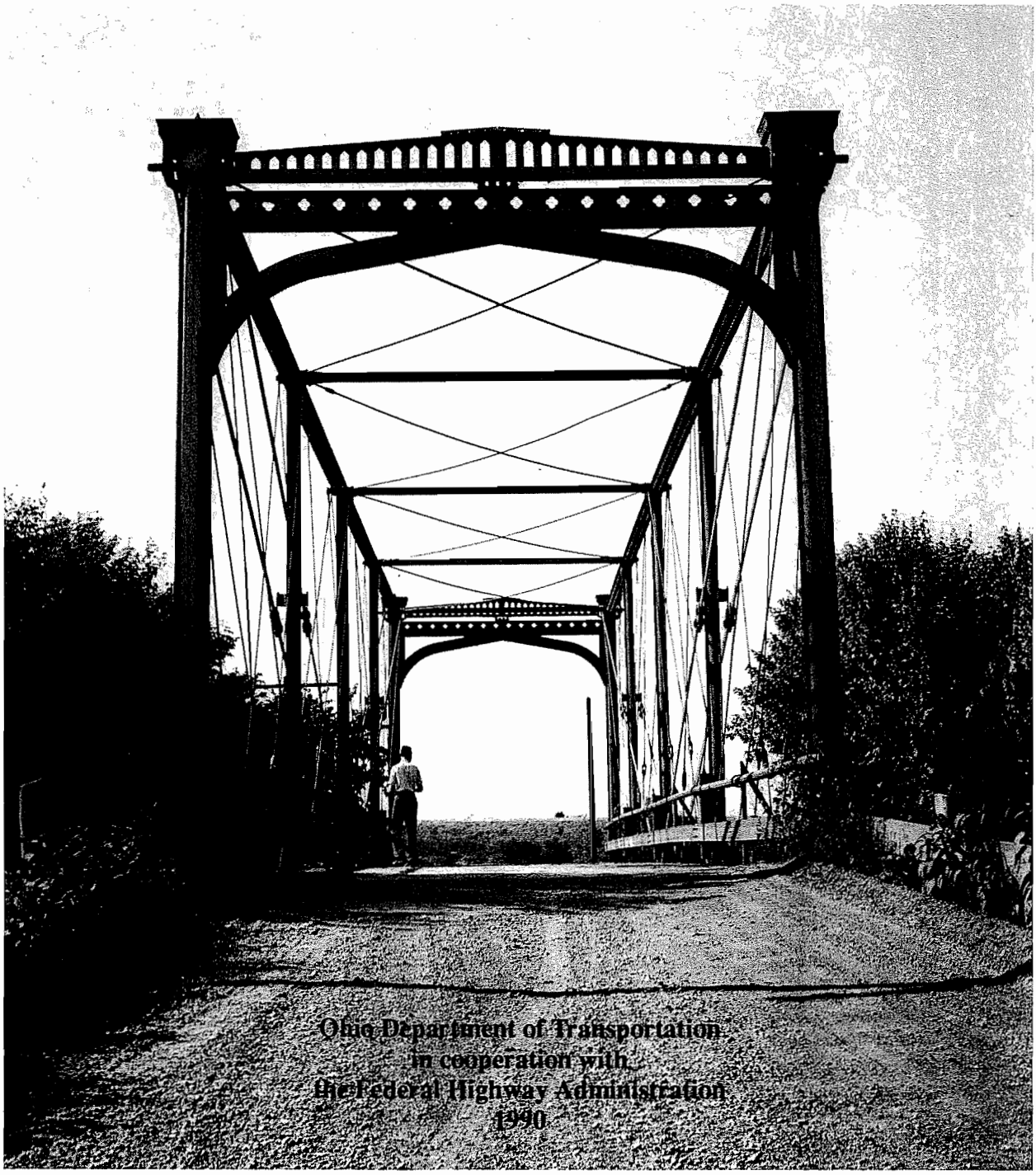
THE SECOND OHIO HISTORIC BRIDGE INVENTORY, EVALUATION AND PRESERVATION PLAN



Ohio Department of Transportation
in cooperation with
the Federal Highway Administration
1990

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review process to properties eligible for the National Register of Historic Places. The other extended the administrative protection of the law to privately owned as well as federally owned properties. An amendment strengthening the Preservation Act of 1966 was passed in 1976. This amendment established the National Historic Preservation Fund which provided additional money to fulfill the law's requirement for comprehensive state inventories and plans for historic sites and structures.

The U.S. Department of Transportation faced two conflicting mandates: providing a safe and efficient transportation system and preserving historically significant structures. State departments of transportation faced the same dichotomy.

As a result in 1980, the Ohio Department of Transportation (ODOT) recognized the need for a thorough and detailed historic inventory of all the remaining bridges in Ohio to determine significance and eligibility for the National Register. A multi-disciplinary Advisory Committee comprised of engineers and historians from county, state and federal levels, was formed to comment upon and assist in the development of an evaluation program. With the co-operation of the Federal Highway Administration (FHWA) and the Ohio State Historic Preservation Office (SHPO), approximately 4,000 stone arch, concrete arch and metal truss bridges built prior to 1941 were evaluated during a two year program. Those considered significant and potentially eligible for the National Register were included in the first Historic Bridge Inventory, Evaluation and Preservation Plan, published in 1983. ODOT and the Ohio SHPO agreed that the inventory would be updated every ten years to include bridges that might have become eligible during that time. (Generally, a bridge must be at least 50 years old to be eligible for the National Register.) Since its publication, more bridges have become eligible for selection to the National Register; others have been selected .

In 1987, Congress passed the Surface Transportation and Uniform Relocation Assistance Act, declaring it to be in the national interest to encourage the rehabilitation , reuse and preservation of bridges significant to American history, architecture, engineering and cultural heritage. The legislation included four sections: coordination between the Secretary of Commerce and the states to implement the programs for historic bridges; state inventories of all bridges on and off the Federal Aid System; eligibility of historic bridges for reimbursable project costs and preservation to maintain the bridges and their historically significant features.

This second book is the first update of the original inventory. It includes sections on covered bridges, continuous construction , rehabilitation, reuse as well as information about the bridges built between 1941 and 1950.

Part I outlines both the evaluation criteria and preservation plan to which the SHPO and the Ohio Department of Transportation have agreed. These two chapters, one and two respectively, should be viewed as working documents to which engineers, especially, and others, may refer on an on-going basis. Historians especially will be interested in chapter three which describes the history of bridge building.

Part II describes the bridges identified as eligible for selection to the National Register since publication of the first inventory book and features photographs of the bridges along with a brief discussion of each one.

Part III outlines Ohio's covered bridges and their rehabilitation. Chapters eight , nine, and ten highlight the bridges with photographs and text.

Part IV features rehabilitated bridges and new uses for old bridges. Photographs and descriptions are included in this section.

Readers from varied backgrounds are encouraged not only to become familiar with the new information, but to use it as a working document on a regular basis.

Again, an Advisory Committee with engineers and historians from state and federal levels assisted in the development of the program. Acknowledgment of their efforts, as well as those of all individuals and agencies involved, should be noted. Members of the Advisory Committee and other contributors are listed below.

ADVISORY COMMITTEE

Susan Scherff received her B.S. in Historic Preservation from Middle Tennessee State University in 1982 and her M.A. in Historic Archaeology from the College of William and Mary in 1987. She has been involved in archaeology excavations in Tennessee, Virginia, Maryland, Pennsylvania and overseas. She served as the Assistant Conservator for the Archaeological Conservation Center in Williamsburg, working with Monticello, Colonial Williamsburg and Harper's Ferry National Parks. Prior to moving to Ohio in 1988, she was the Cultural Resource Manager for U.S. Army Training and Doctrine Command, responsible for the preservation programs of 24 installations in ten states. From 1988-1990 she was a review and compliance archaeologist in the Ohio State Historic Preservation Office. Ms. Scherff is a member of Phi Alpha Theta, the Society for Historic Archaeology and the National Trust for Historic Preservation.

David Simmons received his A.B. and M.A. in American History from Miami University in 1973 and 1975. He also did coursework at Defiance College in 1973. During the summers of 1973 and 1974, he was a crew leader for the archaeological excavation of Fort Meigs, Perrysburg, Ohio. He also was an associate in the Cincinnati Environmental Preservation Office and Executive Director of the Preble County Historical Society during these years. In 1976, he became a historian with the Ohio Historic Preservation Office eventually functioning as Head of the Department of Inventory and Registration. Since 1986 he has been Associate Editor of Timeline, the Ohio Historical Society's award winning popular history magazine. He is the author of numerous articles published in a wide variety of journals and is a frequent speaker at scholarly conferences. He is a member of the Society for Industrial Archaeology, the Ohio Academy of History and is currently an officer with the Southern Ohio Covered Bridge Association.

Lou Triandifilou received his B.S. degree in Civil Engineering and B.A. degree in Business Administration from Rutgers University in 1974. He attended graduate school in Structural Engineering at Northeastern University from 1982 to 1984 and has taken various courses related to structural, geotechnical and hydraulic design and bridge inspection during the past ten years. From 1978 to 1984 he was Assistant Division Bridge Engineer in Massachusetts. He has been Federal Highway Administration Division Bridge Engineer in Ohio since 1984. He is a licensed professional engineer and a member of the American Society of Professional Engineers, affiliated with both the national and local chapters.

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Miriam Wood received her B.S. in Education with a major in History from Capital University. Since 1953 she has photographed, measured and recorded all the available information on Ohio's covered bridges. In 1960 she became a charter member of the Southern Ohio Covered Bridge Association (SOCBA) and has served as historian for the organization since that time. She also has served as President and is currently serving as Secretary and Editor for publications. She also has served as Secretary for over 20 years for the Ohio Covered Bridge Committee, has been a frequent speaker for local groups and has published numerous articles on covered bridges. In the 1970s she worked with the Ohio Historical Society and prepared National Register nomination forms for more than 50 covered bridges. She is frequently called upon to advise and/or assist local organizations and government agencies in the preservation of covered bridges. In 1989, in recognition of her contributions to the preservation of covered bridges, she was awarded the Public Education and Awareness Award by the Ohio State Historic Preservation Office.

Karen MacGillivray Young graduated from Capital University in 1962 with a B.A. in Political Science and History and was winner of the Lila Black Award as outstanding political science graduate of the year. She was an interpretive guide at the Ohio Historical Society. For the past 12 years she has been historian in the Bureau of Environmental Services at the Ohio Department of Transportation and served as Project Manager for both the first and second editions of the Historic Bridge Inventory, Evaluation and Preservation Plan.

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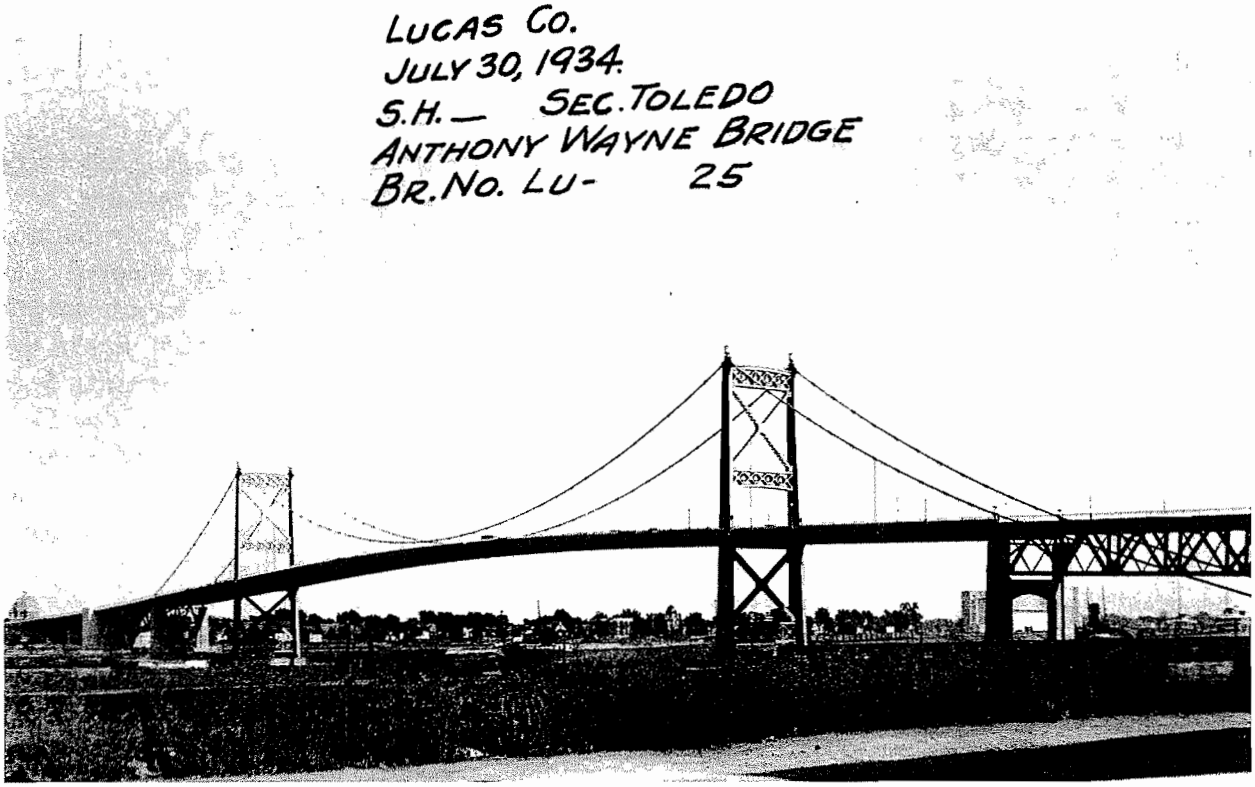
INTRODUCTION



In 1983, the Ohio Department of Transportation published the results of the first Historic Bridge Inventory, Evaluation, and Preservation Plan (hereafter called historic bridge inventory.) The present report is an update of that inventory. Both publications record the systematic evaluation and assessment of all the bridges in specific categories to determine which are eligible for the National Register of Historic Places as significant representatives of bridge technology in Ohio. These evaluations also are intended to aid planners who must consider both historical merit and highway use of bridges.

Phase I - List of Bridges to be Evaluated

ODOT maintains a computerized, continually updated listing of all bridges on federal, state and local systems within the state. This listing includes data necessary for developing, planning and programming bridge maintenance and construction. Information from this listing relevant to bridge type and date of construction was used by the ODOT staff in selecting bridges to be evaluated. The cutoff date for the initial historic bridge

inventory, published in 1983, was 1941, making the study valid through 1990. This second historic bridge inventory includes evaluations of bridges built between 1941 and 1950. This study will be valid through 2000 when another update will be necessary. Bridge types included were metal trusses, concrete and metal arches. Selected bridges from this time period were chosen from a list of approximately 200 that were evaluated for age and type.

This second inventory features Ohio's covered bridges: some are already on the National Register of Historic Places and others soon will be nominated. In addition, it includes new information about continuous steel bridges built in the 1930s.

Phase II - Field Inspection of the Bridges

The form used in the initial survey also was used for the present inventory. It was developed by the BES staff and David Simmons, based on the form used by the state of Virginia for its historic survey and the Ohio SHPO's bridge form. ODOT staff conducted the field survey in the summer of 1989, photographing and documenting some 200 bridges. Miriam Wood conducted the field survey of the covered bridges.

Phase III - Development of the Numerical Rating System

Using ODOT's initial evaluation system as a basis, BES staff members and the Advisory Committee developed a numerical system which rated the bridge's historic and technological features in the context of the 1940s. The evaluators determined that the rating system developed for the first inventory still had merit for certain bridges built before 1941, but that a new rating system was needed to evaluate accurately bridges built in the 1940s. The system developed for the first inventory was used in evaluating covered bridges.

Phase IV - Evaluation Process

The final evaluation process was initiated in 1990 and completed by BES staff members and David Simmons. Each bridge was evaluated independently. The bridges are identified in two material categories - metal and concrete. No stone bridges were identified for this time period. For purposes of the evaluation, the metal category was subdivided by configuration into high-through, low-through (pony) and deck trusses.

Phase V - Report

This second historic bridge inventory documents the entire project and has been written by BES members with contributions by Miriam Wood, David Hanhilammi and John Smolen. A draft report was circulated to FHWA, Ohio SHPO, and the members of the Advisory Committee. Their comments were requested on the draft and then incorporated into the final report. The recommendations in this report have been accepted by the Ohio SHPO and will become the basis for future decisions on selecting bridges which merit preservation.

Phase VI - Preservation Plan

The process of evaluation and preservation is a continuing and constantly changing one. Attitudes toward reuse, rehabilitation and preservation are not static but contingent upon public perceptions, technological advances and availability of funds. Structures selected for preservation may be destroyed through unforeseeable events such as natural disasters or accidents. The historic bridge inventory and methods of evaluation change as bridges built with modern technology and materials become eligible for the National Register of Historic Places.

Recognizing these contingencies, ODOT has developed a Preservation Plan with the cooperation of the Ohio SHPO. This plan establishes the priorities and procedures which ODOT and the Ohio SHPO will follow

on future bridge projects. It details both the individual and joint responsibilities of the agencies and will ensure close coordination of future preservation efforts. This Preservation Plan is presented in Chapter 2.

PART 1

CHAPTER 1

EVALUATION CRITERIA

An important feature of this update was the evaluation of the approximately 200 bridges built between 1941-1950 that are still extant. Bridges determined eligible for inclusion in the National Register of Historic Places represent the development of the bridge industry and the history of bridge technology in Ohio between 1941-1950.

Working closely with the Advisory Committee, the staff developed the evaluation criteria based on the National Register's criteria for historic structures. For this update the criteria was a 48 point system and was divided into two major sections: technological significance (24 points) and general significance (24 points). A detailed outline of the accepted rating system is provided on the following pages.

BRIDGE RATING SYSTEM FOR OHIO'S BRIDGES BUILT 1941-1945/1946-1950

A. Technological Significance (Maximum Points 24) **Points Assigned**

1. Length of individual span
   a. Pony truss - 3 points for each span greater than 80 feet.....12 (max.)
   b. Pony truss - 1 point for each span 50 - 80 feet..... 4 (max.)
   c. Through truss - 3 points for each span over 150 feet.....12 (max.)
   d. Through truss - 1 point for each span 100 - 150 feet..... 4 (max.)
   e. Concrete - 1 point for each span over 100 feet..... 6 (max.)
2. Special Features
   a. Decorative elements or railing (non-structural)..... 2
   b. Artistic treatment of structural elements..... 2
   c. The builder's distinctive structural elements..... 2
   d. Patented features (technology)..... 2
   e. Welded structural members - partial
      (1) Bridges built 1941 - 1945..... 3
      (2) Bridges built 1946 - 1950..... 2
   f. Welded structural members - complete
      (1) Bridges built 1941 - 1945..... 4
      (2) Bridges built 1946 - 1950..... 3

B. General Significance (Maximum Points 24)

1. History
   a. Association with WPA..... 4
   b. Recipient of award for excellence in design or technology or use of material..... 4
   c. Built during 1941-1950 by Champion Bridge Co. master bridge builder..... 4
   d. Documentation of methods of construction or technology (journals, articles, plans)..... 4
   e. Older structure reused in 1941-1950 4
   f. Unknown..... 0
2. Integrity
   a. Excellent..... 4
   b. Good..... 3
   c. Fair..... 2
3. Aesthetics
   a. Excellent..... 4
   b. Good..... 3
   c. Fair..... 2
   d. Poor..... 0

Technological Significance (24 points)

Since bridges are practical structures intended to carry traffic over impediments to travel, it is appropriate that the evaluation recognizes bridges as engineering accomplishments and examples of developments in industrial history.

Length of Individual Spans

a. Pony truss - 3 points for each span greater than 80 feet.....12 (max.)
b. Pony truss - 1 point for each span 50 - 80 feet.....4 (max.)
c. Through truss - 3 points for each span over 150 feet.....12 (max.)
d. Through truss - 1 point for each span 100-150 feet..... 4 (max.)
e. Concrete - 1 point for each span over 100 feet.....6 (max.)

Recognition was given for length of span based on the difficulty of the engineering achievement. Length is a simple indicator of engineering significance.

Special Features

a. Decorative elements or railings (non-structural)..... 2
b. Artistic treatment of structural elements..... 2
c. The builder's distinctive structural elements 2
d. Patented features (technology).....2
e. Welded structural members - partial
   (1) Bridges built 1941-1945.....3
   (2) Bridges built 1946 -1950.....2
f. Welded structural members - complete
   (1) Bridges built 1941 - 1945.....4
   (2) Bridges built 1946 - 1950.....3

In order to promote the preservation of specific, unusual elements which might be found on otherwise unexceptional bridges, points were awarded for the category of Special Features.

Non-structural decorative elements such as finials, bas reliefs, pierced nameplates, bracing, elaborate railings and lattice guardrails qualified bridges for decorative elements points. Similarly, structural elements might be created artistically. Aesthetic points were allotted to bridges which were constructed to be visually pleasing.

Points were awarded to bridges exhibiting a builder's distinctive structural elements, techniques or engineering design. These characteristic proprietary techniques and designs represent a firm's impact on the landscape and on the bridge industry. Bridges likewise earned points by displaying examples of patented features. The bolts, columns and bracings that fit in this category are, therefore, significant features even when they do not appear intrinsically important today.

Bridges with welded structural members were awarded points. During the 1940s Ohio was a leader in the use of welding to replace riveting in bridge construction. Welding was used most extensively in strengthening and repairing existing bridges rather than building new ones. This was the reverse of tthe situation in Europe and Australia where welded bridge construction found earlier acceptance. In the United States there were bridge failures attributed to the poor weldability of the steel. Consequently, some bridges were only partially welded and although a few completely welded trusses were built these were considered the exceptions rather than the rule. The welded plate grider was used by several state highway departments, including Ohio, to reduce fabricating costs using more modern methods and to make inspection methods more reliable. Specifications for the use of high-strength steel specifically designed for welding were not published in the U.S. until 1954. It was the availability of high-strength steel that allowed for more versatile and economical welded bridge designs. Ohio's willingness to experiment with partial and

complete welding prior to the 1950s represents a significant contribution to engineering theory and technology.

General Significance (24 Points)

General significance deals with the bridge's historic and aesthetic value. In this section, the bridges are treated much like any other antique object and are evaluated for their involvement in historic events, their integrity and their aesthetic qualities.

History

a. Association with WPA.....4
b. Recipient of award for excellence in design or technology or use of material.....4
c. Built during 1941-1950 by Champion Bridge Co., master bridge builder.....4
d. Documentation of methods of construction or technology (journals, articles, plans).....4
e. Older structure reused in 1941-1950.....4
f. Unknown.....0

In addition to being part of the overall evaluation of historic bridges, each bridge was evaluated for its own historic significance.

Between 1939 and 1941 Works Progress Administration (WPA) workers were used in a variety of building programs funded by the Ohio Department of Highways. At the height of this program, 20 percent of the WPA workers in Ohio were employed by the Department of Highways.

Awards for excellence were presented by professional or commercial organizations such as the American Steel Institute and Lincoln Electric Company in fields related to bridge construction. Points were awarded to bridges built by the Champion Bridge Company in recognition of the company's innovative building methods and continued influence on bridge building during this period. (Figure 1).

Points were awarded for documentary evidence indicating recognition of the application of new methods and theories and for showing the bridge's importance at the time it was built.

Various sources of information were studied in an effort to learn if any patented or innovative bridge designs originated in Ohio between 1941 and 1950. Based on available documentation, it appears that during World War II and the years immediately following, only the most essential bridge work was done. When a new bridge was needed, existing designs of proven worth were used. The most popular bridge design during this period appears to have been the Warren polygonal chord pony truss. Sources consulted include Journals of Civil Engineering, Transactions of the American Society of Civil Engineers, "Public Roads," "Highway Research Board," "Welded Highway Bridge Design," "Welding Handbook, 1942," of the American Welding Society.

Points awarded for relocation of truss bridges recognized the reuse of a bridge due to the scarcity of labor and materials during both the war and post-war years.

Integrity

a. Excellent.....4
b. Good.....3
c. Fair.....2
d. Poor.....0

Ordinarily for a structure to qualify for the National Register of Historic Places, it must

retain most of its original integrity, not having been moved, reworked or repaired in such a way as to diminish its historic qualities.

Aesthetics

a. Excellent.....4
b. Good.....3
c. Fair.....2
d. Poor.....0

In 1983 guidelines were developed for judging bridges. For the purpose of the evaluation, aesthetics was defined as the visual effect of a bridge on a viewer. That effect was to be purely intuitive. However, at the same time, the aesthetics evaluation had to be codified for use by a variety of evaluators, standardized for consistent application to the entire set of bridges and qualified for inclusion in the overall evaluation score. The overall aesthetics rating was divided into four categories:

1. Scale :

- Do the overall dimensions of the bridge relate well to the surrounding environment ?
- Does the bridge fit coherently with the valley width and depth and the approach landscape?
- Does the bridge fit coherently with the stream width?

2. Proportion :

- Do the various elements of the bridge relate well to each other in size, spacing, height and width?
- Are the decorative elements appropriate in size, distribution and character for the structure?

3. Balance :

- Does the overall shape of the bridge function as a cohesive visual entity?
- Is its symmetry/asymmetry suited to the shape?

4. Detail :

- Does the texture and massing of the bridge relate well to the details of its natural setting?
- Does the style of the bridge relate well to the architectural style in adjacent areas?

Scoring

Scoring for these categories awarded one - five points for each item, with one being Poor, three being Average, and five being Excellent. The total score was then translated into the eight point aesthetics scale as follows:
17-20 points= 4 points
13-16 points= 3 points
9-12 points= 2 points
4 - 8 points= 0 points
Two categories, proportion and balance, dealt with the intrinsic aesthetic qualities of the bridge; and two, scale and detail, dealt with the relationship of the bridge to its surroundings. For each category, guidelines were provided for the evaluator to follow in examining the bridge. Each category also included a range of points to allow a gradation of response rather than a simple "yes" or "no" answer to the aesthetic qualities which a single-point system would produce. This aesthetics system adopted in the first historic bridge inventory was utilized in this update because it fulfilled the requirement of being as objective and consistent as possible.

Bridges Built Between 1941 and 1950 By Company

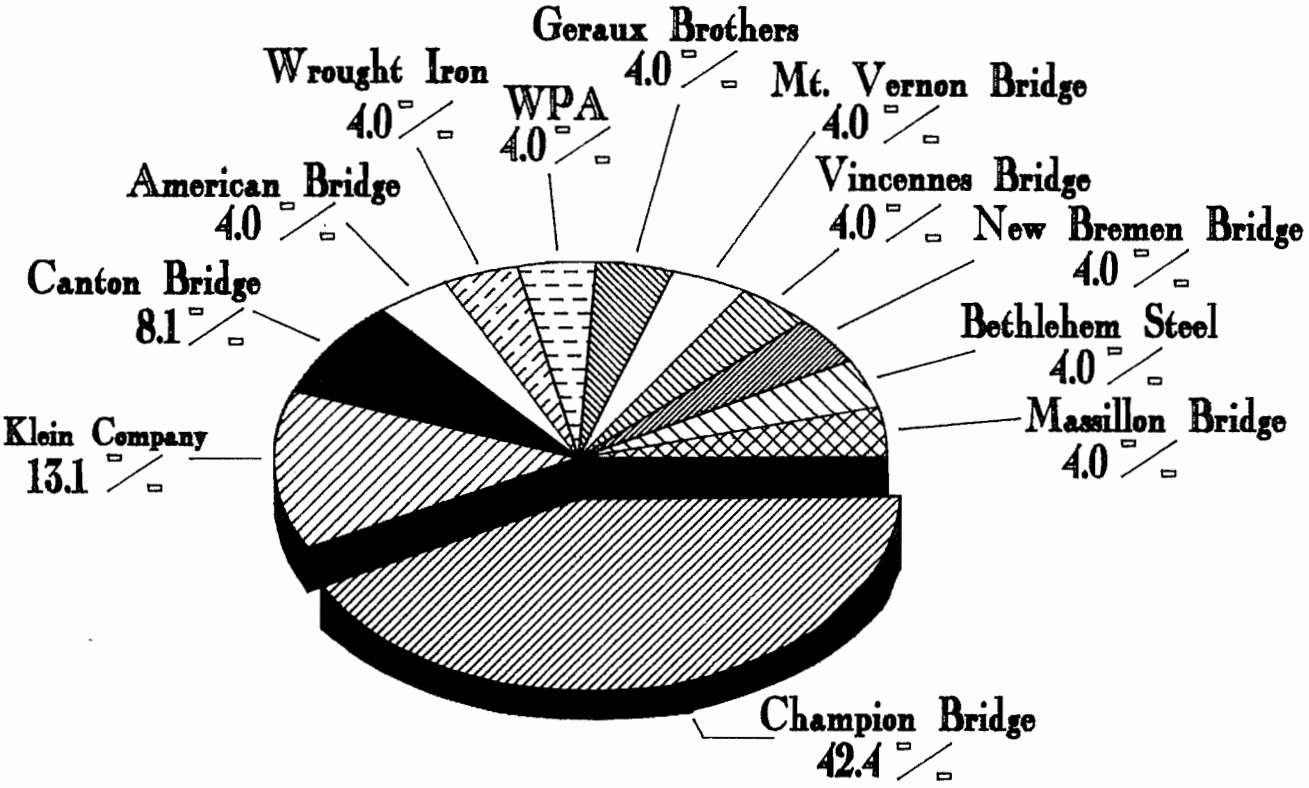


Figure 1

CHAPTER 2

PRESERVATION PLAN

At the conclusion of the historic bridge inventory in 1983, ODOT and the Ohio SHPO agreed to a comprehensive Preservation Plan for Ohio's historic bridges. This publication, in compliance with the Preservation Plan, represents the results of the first update and includes information on bridges built between 1941-1950, an update on the status of bridges built prior to 1941 and an update of the original Preservation Plan.

For purposes of this Preservation Plan bridges will be identified in four discrete categories. Bridges listed on the National Register are identified as Category I bridges. Bridges identified as Selected as eligible for the National Register are identified as Category II bridges. Bridges previously identified as Reserve Pool bridges are recognized as potentially eligible for the National Register and are identified as Category III bridges. All other bridges which have been included in the two historic surveys and not identified for preservation will be identified as Category IV bridges. It is understood that conditions over time may change and in order to maintain an adequate preservation pool all bridge types in Category IV may be reclassified as

Category III bridges to compensate for any losses in Categories I or II.

The goal of the historic bridge inventory and update has been to identify and preserve bridges on or eligible for the National Register. To formalize this goal ODOT and the Ohio SHPO have entered into a Preservation Plan which encompasses the following activities:

Maintenance of Historic Bridge Inventory
Rehabilitation of Historic Bridges
Relocation of Historic Bridges
Salvage of Historic Bridges
Documentation of Historic Bridges
Replacement of Historic Bridges

BRIDGE PRESERVATION PLAN

1. ODOT will notify owners of all the bridges Selected as eligible for the National Register (Category II). Each owner will be provided with a copy of this update and requested to preserve the structure(s).

2. Sufficient copies of this publication will be provided to the Ohio SHPO to form a permanent record in the State and Regional Preservation Offices. Copies of the inventory forms including contact prints and numerical scorings of each structure will be presented to the Ohio SHPO for a permanent record to be housed at the Ohio Historical Center. Copies of other charts and graphs that were developed but not included in the final evaluation will be provided to the Ohio SHPO.

3. The Ohio SHPO will publish in its newsletter that the evaluation is available and the location where it may be reviewed along with the name of a contact in the Ohio SHPO office to assist those wishing to conduct further research.

4. A copy of ODOT's internal operating guidelines for the implementation of the Preservation Plan will be provided to the Ohio SHPO.

5. ODOT and the Ohio SHPO will meet on an annual basis to review the status of the Category I, II, III and IV bridges, the Preservation Plan and new technology in bridge preservation.

(a) To assist in this review ODOT will provide the SHPO with a computer listing summarizing the current status of the Category I, II and III structures. The summary will include the latest condition rating of the bridges and any plans for rehabilitation and/or replacement.

(b) ODOT and the Ohio SHPO will review the Preservation Plan and determine if any of the elements need to be re-evaluated because of changing conditions.

(c) ODOT and the Ohio SHPO will monitor current technologies and practices related to the maintenance and rehabilitation of historic structures. This information will be provided to village, city and county bridge engineers who are responsible for the maintenance and rehabilitation of historic structures.

6. ODOT and the Ohio SHPO agree to re-analyze the inventory of concrete arch bridges built prior to 1941 from the standpoint of technology with the goal of developing an evaluation criteria for concrete arches. The results of this analysis will be published in 1991.

7. ODOT and the Ohio SHPO will present an annual award to the city, town, village or county engineer who has initiated and completed the most outstanding project involving the preservation, rehabilitation or reuse of a historic bridge. The recipient of the award will be chosen by representatives of ODOT and the Ohio SHPO.

8. When an owner of a bridge listed on or eligible for the National Register (Category I or II bridges) proposes to replace a historic bridge using federal aid highway funds, ODOT will comply with Section 106 of the National Historic Preservation Act (NHPA). This includes:

(a) Requiring the owner to consider rehabilitation. If it is possible , taking into account structural, economic and safety concerns, the bridge will be rehabilitated. If the bridge cannot be rehabilitated:

(b) Evaluating the bypass potential to enable the reuse of the bridge for nonvehicular traffic. If the bridge cannot be bypassed:

(c) Evaluating the potential of relocating the bridge to another site for reuse. This will include offering the bridge to a responsible governmental agency, private organization or individual for reuse.

In order to assist in this, ODOT and the Ohio SHPO will request state agencies and organizations to identify potential sites for bridge reutilization. The Ohio SHPO and ODOT will maintain an updated file of parks, cities, agencies and museums interested in obtaining a historic bridge for non-vehicular or limited use. If it is economically and structurally feasible to move the bridge to a new location, the Ohio SHPO and ODOT will assist by identifying potential funding sources to aid in the relocation.

(d) Requesting the Ohio SHPO to assist in developing a plan to mitigate the loss of the historic structure if reuse and/or relocation are not feasible alternatives.

9. When the owner of a bridge listed on or eligible for the National Register (Category I and II bridges) notifies ODOT of its intent to replace a historic bridge using local funds and no other federal permits are required, ODOT will encourage the owner to follow the basic tenets of Section 106. This would include consideration of rehabilitation, reuse, relocation and documentation if the bridge is removed.

10. When the owner of a bridge listed on or eligible for the National Register (Category I and II bridges) proposes rehabilitation of the historic bridge ODOT and the Ohio SHPO, upon request, will meet with the owner and provide expertise on rehabilitation which would retain the historic integrity of the structure.

11. ODOT will notify the Ohio SHPO when a Category I or II bridge is lost through demolition by a local governmental agency, a natural disaster or an accident. The Ohio SHPO and ODOT will review the evaluation material related to bridges in Category III and agree on a replacement bridge of the same type as eligible for the National Register.

12. If a Category III bridge is programmed for replacement and there are more than 20 extant examples of this bridge type in the state ODOT will notify the Ohio SHPO by letter and request a determination of eligibility. If the bridge is determined eligible ODOT will comply with Section 106 requirements of the NHPA. If the bridge is determined not eligible ODOT will evaluate the condition and recommend the disposition of the bridge.

13. If a Category III bridge is proposed for replacement and there are 20 or fewer of this bridge type in the state, ODOT will notify the Ohio SHPO by letter and request a determination of eligibility. If the bridge is determined eligible ODOT will comply with Section 106 requirements of the NHPA. If the bridge is determined not eligible ODOT will recommend the owner consider an evaluation of rehabilitation. If rehabilitation is not feasible or prudent ODOT will recommend relocation of the bridge for reuse.

(a) If rehabilitation and/or relocation are not feasible alternatives, ODOT and the Ohio SHPO will encourage the owner to salvage portions of the structure and store them for future use. ODOT and the Ohio SHPO will maintain a list of those interested in salvaged parts and a list of the salvaged parts. This list will be circulated periodically by the Ohio SHPO and ODOT to county engineers and others who would be interested. If the owner agency is unable to store the parts, the Ohio

SHPO and ODOT will assist the owner by finding suitable storage for the salvaged parts. If none is available, the parts will be retained for a six month period and then discarded.

(b) If the structure is to be demolished, the owner will be advised by ODOT and the Ohio SHPO if further documentation of the structure will be necessary. ODOT will assist the owner in determining the proper documentation.

14. When significant new information is found for a Category IV bridge, it will be re-evaluated for National Register eligibility.

15. The Ohio SHPO, upon request, will be provided with additional information when evaluations of structures in Category III are needed.

16. As projects for replacement of Category IV bridges are programmed , the Ohio SHPO will be advised via correspondence of the potential loss of the structure so that any ongoing research can account for the loss.

17. County engineers will be encouraged to salvage usable elements of Category IV structures. These elements will be stored for a nominal period of time and the Ohio SHPO and ODOT advised of the type of bridge that was removed and where the salvaged parts are located. The Ohio SHPO and ODOT will notify interested individuals, by means of newsletters, of the location of the salvaged bridge elements for use in the rehabilitation of other bridges.

18. The Ohio SHPO will utilize the bridge evaluation report in making recommendations to the Ohio Historic Site Preservation Advisory Board, county engineers and interested individuals who may be considering National Register nominations for Category IV bridges.

19. The Ohio SHPO will notify ODOT of all nominations of (historic district, thematic, individual and railroad) Category IV bridges.

20. When any of the 12 remaining rainbow arch bridges is programmed for replacement, ODOT will encourage rehabilitation.

(a) If rehabilitation is not possible, ODOT will recommend bypassing the bridge and reusing it for pedestrian and/or bicycle traffic.

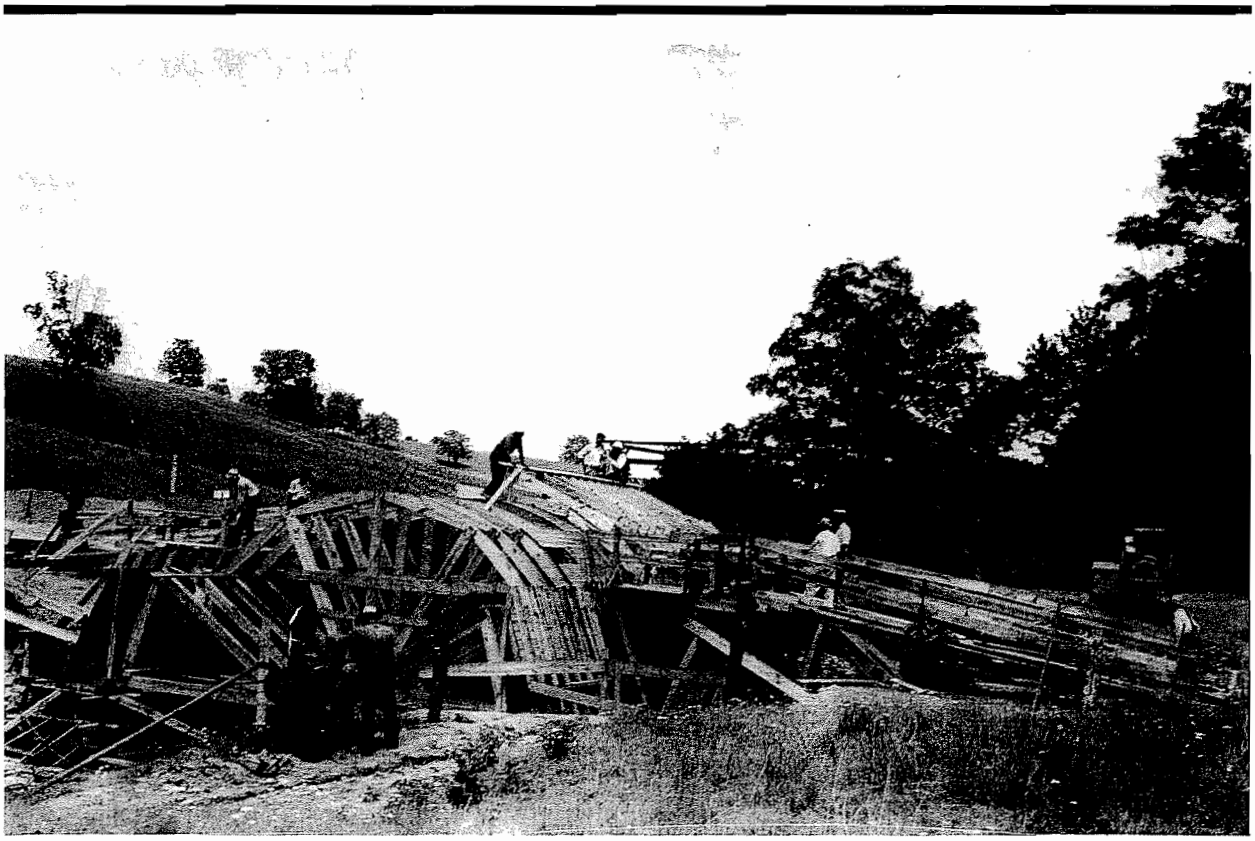
(b) If it is not prudent and/or feasible to either rehabilitate or bypass the bridge, ODOT will recommend a new rainbow arch. The new rainbow arch will not be an exact replica, but will be built using the highway department standard plans for rainbow arches, revised to meet current design standards. Revision of the standard plan for this bridge form will begin immediately. This option would be considered only if there were no other alternatives.

(c) No more than three bridges will be replaced in this manner, with one in northern Ohio, one in central Ohio and one in southern Ohio.

21. The next Historic Bridge Inventory update will be published in the year 2000.

CHAPTER 3

HISTORY of BRIDGE BUILDING in OHIO



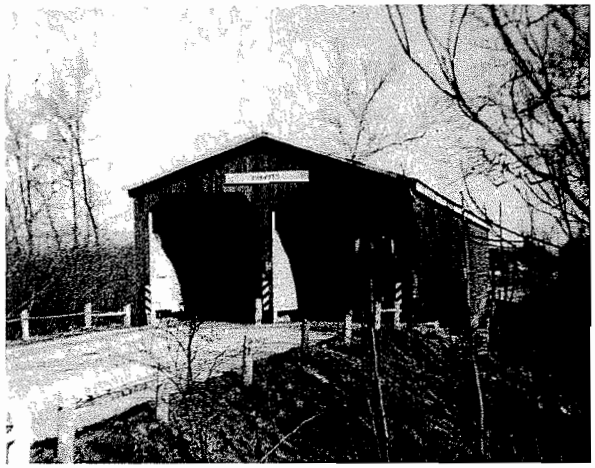
From bridges built by early settlers to the latest in engineering innovations, fine examples of bridge design and innovative use of materials can be found in Ohio. There are stone bridges on the old National Road; over 135 covered wooden bridges of many different truss designs including those still being built in Ashtabula County; examples of a variety of patent designs for wrought iron and steel trusses; and concrete beam and concrete arch structures.

The signing of the Greeneville treaty in 1795 ended the Indian wars in Ohio and resulted in a rapid influx of settlers from eastern states into the Ohio territory. The settlers found a sparsely populated wilderness without adequate roads, bridges or canals. The Ohio River and other navigable streams were the most common means of transportation. Overland travel in the territory developed from well - used Indian trails but the need for a road system to meet the needs of the burgeoning population soon became apparent.

The first major road-building effort in the Ohio territory was the trail which Congress

authorized Ebenezer Zane to build in 1796. Zane's Trace , as the road was known, was the first federally subsidized local construction. The road originally ran from Wheeling , in what is now West Virginia, to Zanesville, Ohio. It eventually passed through Lancaster, Kingston, Chillicothe and extended as far as Maysville, Kentucky.

In 1802, an Act of Congress authorized the people of Ohio to form a state constitution. In 1809, Congress set aside $12,000 for construction of the National Road which reached Ohio in 1825 and was completed to Columbus by 1833. It reached the Indiana border in 1837. The National Road was the only east-west thoroughfare across Ohio connecting the eastern seaboard with the western frontier. Both covered wooden truss bridges and stone, including the unique "S" bridges carried travelers on the National Road across Ohio's many rivers.



In addition to the National Road, Ohio was served by a system of roads and bridges built by turnpike companies subsidized by the federal government. The first of these, the Boardman Turnpike Company, was incorporated in 1809. These companies built most of the roads and bridges in Ohio until 1843. After that date, the Ohio General Assembly authorized county commissioners to provide free turnpikes constructed with funds raised by a tax on land within two miles of the road. These were known as "Two Mile Turnpikes." Because timber was cheap and readily available, the covered wooden truss was the bridge of choice on these roads. These were built by the thousands from the early 1800s to 1920, the greatest number being built between the 1820s and 1880s.

During the late 18th and early 19th centuries bridge designers and builders took the first tentative steps toward the construction of metal bridges. The first rational analysis of the stresses in the members of truss spans came in a book published by Squire Whipple in 1847. The first long span truss of the Whipple type was built across the Ohio River at Steubenville in 1864. The end posts and all other compression members of this bridge were of cast iron while all tension members were of wrought iron.

Modern bridge building can be said to have begun in 1855 with the development of the Bessemer process of steel making, followed a few years later by the open hearth, or Siemens-Martin, process. As steel replaced wrought iron, the most common type of short span bridge used the riveted built-up plate girder. In response to the growing demand for highway and railroad bridges large numbers of bridge companies sprang

up, many of them in Ohio, making the state a major builder of metal bridges. Many of the metal truss bridges still found in the state were built by these companies. Some of these firms also built bridges far beyond the state's borders.

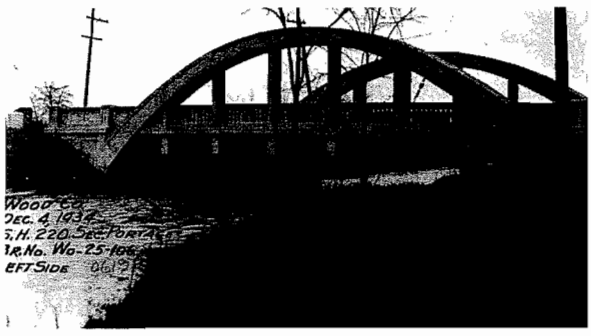
Three Ohio bridge companies of this time are notable for their designs and technological contributions to bridge engineering and for the number of bridges they built: The King Iron Bridge Company, Cleveland; the Wrought Iron Bridge Company, Canton; and the Champion Bridge Company, Wilmington. A partial list of other Ohio bridge companies includes Bellefontaine Bridge and Iron Company, Bellefontaine; Brackett Bridge Company, Cincinnati; Buckeye Bridge and Boiler Works, Cleveland; Canton Bridge Company, Canton; Columbus Bridge Company, Columbus; Columbia Bridge Works, Dayton; Hocking Valley Bridge Works, Lancaster; Massillon Bridge Company, Massillon; Mt. Vernon Bridge Company , Mt. Vernon ; Smith Bridge Company, Toledo; and the Youngstown Bridge Company, Youngstown.

The years following the Civil War saw a great increase in activity on the part of Ohio bridge builders who were patenting new designs such as the bowstring arch. These builders also experimented with designs of cast and wrought iron. The tragic collapse of a railroad bridge in Ashtabula County in 1876 with its great loss of life marked the end of this era of large-scale experimentation in bridge design in Ohio.

The latter decades of the 19th century saw the development of the "Good Roads Movement" led by various cyclist groups that focused public attention on the need for better roads and bridges. In response to public demand, hundreds of short span pony truss bridges were built during this period over streams which formerly simply had been forded. In addition to wood and metal bridges, reinforced concrete bridges have been built in Ohio since the late 19th century when the first reinforced concrete arch in America was built in Cincinnati in 1895.

The first decade of the 20th century was a time of standardization and consolidation in the bridge industry. Many small bridge companies were absorbed into larger firms such as the American Bridge Company. Incorporated in 1902, this firm merged 35 smaller companies including several located in Ohio. State highway departments also were being established during these years. Ohio's Department of Highways was created in 1904 and its Bureau of Bridges in 1911. This bureau was responsible for writing specifications for a wide range of standard bridge types to ensure uniformity of design and quality.

Steel almost totally replaced iron during the early years of this century and pin connections were disappearing in favor of riveted fastenings which were able to meet the demands of increased loads. The use of reinforced concrete for highway structures increased steadily. It was especially popular for short spans of about 20 feet because it was strong and durable. It also was replacing wood for the flooring in longer span steel structures.



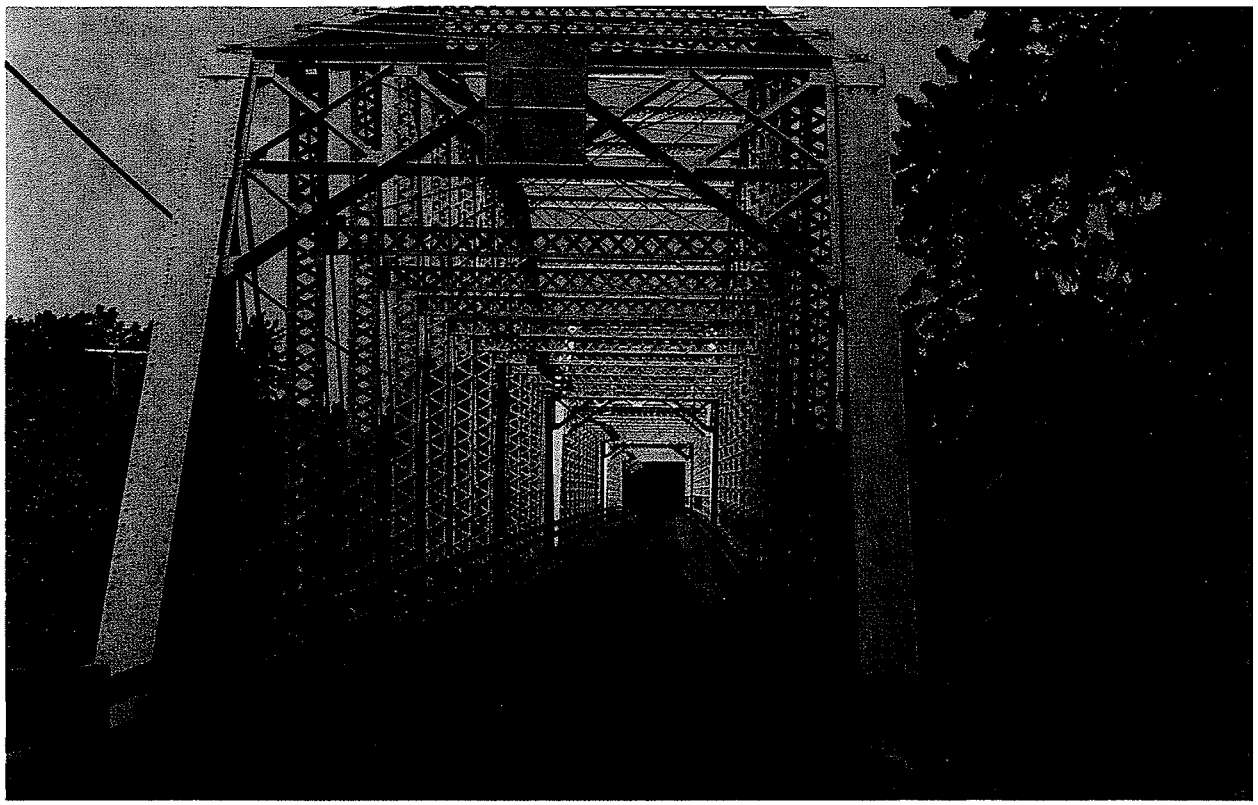
A significant trend in the 1920s was the increased acceptance and use of reinforced concrete for bridge building. A concrete filled arch could be used in much the same

situation as a stone structure with analogous engineering effects. The solid concrete face allowed for decorative treatment such as recessed panels, elaborate railings and decorative moldings. This decade saw the development and construction of the concrete arch bridge known as the "Rainbow Arch." Twelve of these visually appealing structures are still standing in Ohio.

Despite economic effects of the Depression , the decade of the 1930s saw a great concern with the aesthetics of bridges. Engineers realized that the malleable characteristics of concrete allowed almost limitless possibilities for decorative treatment and some of the most ornamental bridges in the history of Ohio bridge building were conceived and constructed during this decade. On a more practical level , engineers began to design continuous beam bridges to eliminate deck joints and the first standard drawing for this bridge type was issued in 1939. Ohio led the way in continuous beam technology. The decade of the 1930s also saw some use of welding in bridge construction although this technology developed more rapidly during the 1940s.

PART II

SELECTED BRIDGES



CHAPTER 4

SELECTED BRIDGES BUILT PRIOR to 1941

As part of the 1983 Preservation Plan, ODOT and the SHPO agreed that when a Selected bridge was lost through a natural disaster, an accident or demolition, the Reserve Pool of bridges in the affected category would be reviewed and the agencies would agree to a replacement bridge. This replacement bridge would be identified as Selected and become eligible for the National Register of Historic Places. ODOT and the Ohio SHPO also agreed that when a bridge, not previously identified for preservation, was included in a newly defined historic district, it would be added to the Selected category. In addition, both offices agreed that when significant new information was found for a non-Selected bridge, the bridge would be re-evaluated for National Register eligibility. This chapter identifies and describes bridges built prior to 1941 which were added to the Selected category since the first publication.

S of Mt. Gilead, Morrow County
Township Route 127
Crosses Whetstone Creek
UTM Coordinates-17/344080/4489300

Bowstring arch truss
Builder: Wrought Iron Bridge Co.
Constructed: 1879
Structure File No. 5930197

The "bowstring girder" form was extremely popular in Ohio. From the earliest Ohio designs in the 1850s, the bowstring girders were the prevailing bridge patents for 20 years and account for 40% of the actual Ohio patents in the last half of the 19th century (Simmons 1985: 112). The subject bridge is 103 feet long and is set on stone abutments. The bridge arch resembles William Laird's 1874 patent for an octagonal, tubular design. This bowstring arch was upgraded to the Selected category because of the loss of the Highland County bridge built in 1905 by an unknown builder (Structure File No. 3633497).

S of Lexington, Richland County
Township Route 340
Crosses Clear Fork Mohican River
UTM Coordinates-17/368720/4499920

Pratt pony truss
Builder: Massillon Bridge Co.
Constructed: 1884
Structure File No. 7034962

The Pratt pony truss was commonly used to span small streams in the late 19th and early 20th centuries. More than 1300 examples were identified in Ohio's first historic bridge inventory in 1980 and fewer than 50 of these were over 100 feet in length. The subject bridge, which is 69 feet long and 14 feet wide, is typical of the Pratt pony trusses built in the late 19th century. It features pin-connections, eyebars, latticework posts, a wood deck and sandstone block abutments. The Massillon Bridge Company, established in 1869 by Joseph Davenport, remained in business as a prolific builder of truss bridges until the Depression in the 1930s. This Pratt pony truss was upgraded to the Selected category because of the loss of the Clinton County bridge built before 1900 by the Champion Bridge Company (Structure File No. 1437968).

NE of Wrightsville, Adams County
County Route 1
Crosses Ohio Brush Creek
UTM Coordinates-17/285350/4290470

Pennsylvania through truss
Builder: Unknown
Constructed: 1888
Structure File No. 0132012

The Pennsylvania through truss, also referred to as a Petit, is a Pratt through truss with a polygonal top chord and sub-struts and/or sub-ties. There are fewer than 20 Pennsylvania through trusses remaining in Ohio. This pin-connected, one span through truss extends 204 feet. It is set on stone abutments and has lattice posts and lateral struts. This Pennsylvania through truss was upgraded to the Selected category because of the loss of the Lake County bridge built in 1896 by the King Bridge Company (Structure File No.4345673).

N of Marshallville, Wayne County
Township Route 261
Crosses East Branch Red Run
UTM Coordinates-17/439010/4530700

Truss leg bedstead
Builder: Canton Bridge Co.
Constructed: 1890
Structure File No. 8535922

The truss leg bedstead bridge was built to span small streams. In the first historic bridge inventory, fewer than 60 were identified and most of these were in rural areas in western counties in Ohio. All of the identified truss leg bedstead bridges are under 100 feet in length. The Wayne County bridge is 31 feet long and 13 feet 6 inches wide. It has pin connections and sits on concrete abutments. There were three Canton Bridge Companies in Stark County incorporated in 1878, 1891, and 1926. During their existence they built numerous bridges nationwide. This truss leg bedstead was upgraded to the Selected category because of the loss of the Mercer County bridge built in 1904 by an unknown builder (Structure File No. 5436338).

SW of Russells Point, Logan County
Township Route 79
Crosses Brandywine Creek
UTM Coordinates-17/251680/4477240

Pratt pony truss
Builder: Bellefontaine Bridge and Iron Company
Constructed: 1896-1897
Structure File No. 4637364

The Buchanan Bridge Company changed its name to the Bellefontaine Bridge Company in 1894. Bridges manufactured by the company were shipped as far away as Oklahoma and Nevada. Headquartered in Logan County, the company also built numerous bridges locally and throughout the state. This bridge extends 50 feet and has pin-connections, latticework on the verticals and steel plates on timber abutments. This Pratt pony truss was upgraded to the Selected category because of the loss of the Preble County bridge built in 1897 by D. H. Morrison (Structure File No.6833101).

SE of Middleburg, Logan County
Township Route 157
Crosses Little Darby Creek
UTM Coordinates-17/281500/4460920

Truss leg bedstead
Builder: Bellefontaine Bridge and Iron Company
Constructed: 1896
Structure File No. 4644832

The truss leg bedstead is a Pratt pony truss with long vertical end posts which are incorporated into the base of the abutments. This 46 foot, pin-connected bridge is typical of the truss leg structures identified in Ohio. The top chords and end posts consist of two channels with a cover plate and lacing; the bottom chords consist of two angles with stay plates on top and the posts consist of two channels with lacing. The bridge is set on concrete abutments. This truss leg bedstead was upgraded to the Selected category because of the loss of the Fairfield County bridge built in 1920 by the Hocking Valley Bridge Works (Structure File No. 2335220).

SE of Mt. Hope, Holmes County
Township Route 655
Crosses Middle Fork Sugar Creek
UTM Coordinates-17/435810/4495760

Lattice bridge
Builder: Unknown
Constructed: 1900
Structure File No. 3841278

Lattice bridges combine a system of thin cross hatched diagonal bars with heavy diagonal bars that help support the single floor beam. These short span bridges were often riveted in the factory and shipped to the installation site. This single span riveted lattice bridge extends to an overall length of 32 feet and is set on stone abutments. The top chords and end posts consist of two angles with cover plates. The posts are angle buttresses. This lattice bridge was upgraded to the Selected category because of the loss of the Morrow County bridge built in 1915 by the Wrought Iron Bridge Company (Structure File No. 5931193).

NW of Defiance, Defiance County
County Route 140
Crosses Prairie Creek
UTM Coordinates-16/710740/4587830

Warren pony truss
Builder: Unknown
Constructed: 1903
Structure File No. 2041227

The Warren truss has a triangular web system. The diagonals carry both compressive and tensile forces. This single span, riveted pony truss has an overall length of 47 feet and is 13.7 feet in width. It is set on concrete abutments. The top chords and end posts consist of two channels with a top plate and bottom spacer plates; the bottom chords consist of two angles with spacer plates; the posts consist of four angles with spacer plates and the diagonals consist of two angles with lacing. This Warren pony truss was upgraded to the Selected category because of the loss of the Pickaway County bridge built in 1910 by the Champion Bridge Company (Structure File No. 6530354).

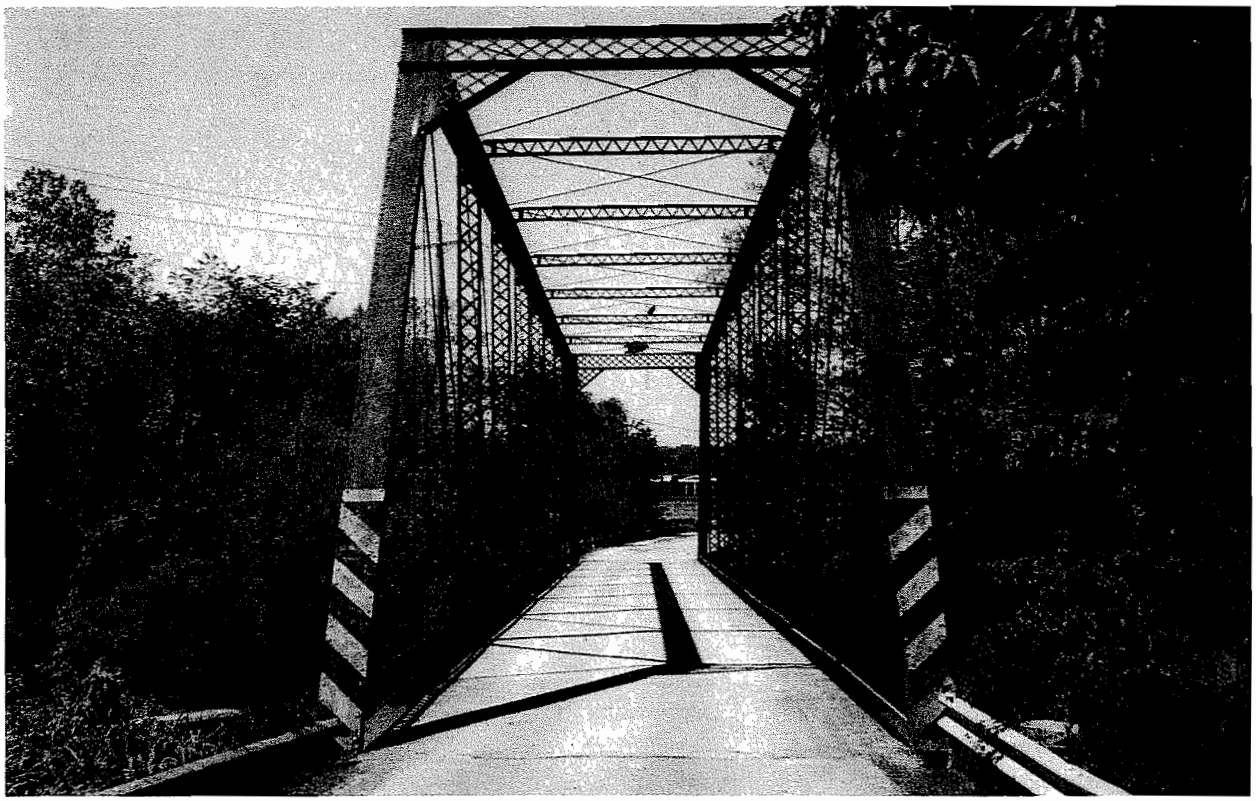
Preble County
Township Route 453
Crosses Twin Creek
UTM Coordinates-16/711430/4408550

Camelback through truss
Builder: Indiana Bridge Co.
Constructed: 1904
Structure File No. 6833861

The Camelback truss uses a Pratt configuration of compression and tension members with a polygonal top chord of exactly five slopes. In this bridge, the top chords and end posts, which are laced and riveted, consist of two channels with cover plates and bottom stay plates. The bottom chords and diagonals consist of two eyebars. This one span bridge, which is 180 feet in length, is set on stone abutments. Interesting decorative features of the bridge include the lattice railing and the builder's nameplates on the portals. This Camelback through truss was upgraded to the Selected category because of the loss of the Hamilton County bridge built in 1894 by the King Bridge Company (Structure File No. 3133443).

NW of Defiance, Defiance County
County Route 42
Crosses Tiffin River
UTM Coordinates-16/718900/4564070

Pratt through truss
Builder: Toledo Massillon Bridge Company
Constructed: 1906
Structure File No. 2033739



The Pratt through truss has diagonals in tension and its verticals in compression, except for the hip verticals adjacent to the inclined end posts. It was the most popular through truss built on highways in the late 19th and early 20th centuries. This one span bridge extends 170 feet and is 16 feet wide. It is set on concrete abutments. The top chords and end posts are composed of two channels, a top plate and lacing while the posts have two channels with lacing. Like many of the bridges built during this time, it has pin-connections. This Pratt through truss was upgraded to the Selected category because of the loss of the Pickaway County bridge built in 1887 by the Motherwell Iron and Steel Bridge Company (Structure File No. 6531342).

City of Cleveland, Cuyahoga County
Stone's Levee
Crosses the B & O Railroad
UTM Coordinates-17/442440/4593440

Baltimore through truss
Builder: The Interstate Engineering Company
Constructed: 1908
Structure File No. 1866389

This riveted one span Baltimore through truss is 112 feet long. The Baltimore through truss is a variation of the Pratt through truss with sub-struts and/or sub-ties which provide greater rigidity and permit construction of longer spans than the basic Pratt. It was often used in the 19th and early 20th centuries for railroad bridges. This example is set on concrete abutments. The top chords and end posts consist of two channels with lattice bracing and stay plates on the top and bottom. The posts and the diagonals consist of four angles with lattice bracing and stay plates. The bottom chord is a built-up box section. The bridge was rehabilitated in 1964 and at that time a new concrete deck and sidewalk were added. This Baltimore through truss was upgraded to the Selected category because of the loss of the Wayne County bridge built in 1892 by the Toledo Bridge Company (Structure File No. 8333661).

Between Lockland and Reading, Hamilton County
Crosses West Fork of Mill Creek
UTM Coordinates-16/719729/4336870

Lockland-Reading Bridge
Concrete rainbow arch
Builder: Hamilton County Engineers
Constructed: 1909
Structure File No. 3137600

This bridge is believed to be the first concrete rainbow arch built in Ohio and is among the earliest of this type constructed in the nation. The concrete bowstring originated in Europe in the early years of the 20th century. This structure essentially duplicated in reinforced concrete the lines of a 19th century bowstring metal truss with its main arches, diagonal braces and verticals comprising the "bow" and the horizontal lower chord in tension as "the string." In Hamilton County, concrete technology in all its facets found an early acceptance. In fact one of the earliest reinforced concrete arch bridges in the county was built in Eden Park, Cincinnati, in 1895. It was the policy of the Hamilton County Commissioners to use concrete in the early 20th century when replacing old bridges. Just as a discussion of the merits of concrete bowstring bridges was occurring in the engineering literature in 1909, a decision was made to replace the metal truss Lockland and Reading Bridge.

In the years that followed, the rainbow arch gradually gained popularity among state highway bridge builders. Significant numbers of rainbow arches were erected throughout Ohio in the 1920s and the design drew the attention of other state highway departments around the country. Today the Lockland-Reading Bridge stands as an important landmark and trend-setter in the history of a major and distinctive concrete bridge design in Ohio (Simmons 1985: 21). This was added to the Selected category because additional research revealed that the bridge was built in 1909 and not in the 1920s.

City of Columbus, Franklin County
Indianola Avenue
Crosses Iuka Avenue
UTM Coordinates-17/329020/4429920

Stone faced concrete arch
Builder: Unknown
Constructed: 1912
Structure File No. 2561433

The structure is a stone faced, non-reinforced concrete, single span, earth filled, spandrel arch. The arch span is 58 feet. The overall structure length including wing walls is about 170 feet. The roadway is 25 feet curb face to curb face with two 10 foot sidewalks. The railings are concrete balustrade with concrete balusters. The abutment, wingwall and spandrel wall stone facing is cut in a rusticated pattern with highly detailed classical moldings (Richland Engineering 1988:1). In 1986, the bridge was listed on the National Register of Historic Places as part of the Iuka Ravine Historic District. A subsequent inspection showed that the bridge was in poor condition and that rehabilitation or removal would be necessary. The City of Columbus, in cooperation with the Ohio SHPO, developed a plan to rehabilitate the bridge.

This includes a new concrete arch and replacement of the existing deteriorated stone facing on the wingwalls. The rehabilitated bridge will retain a look similar to its original construction and meet current safety standards.

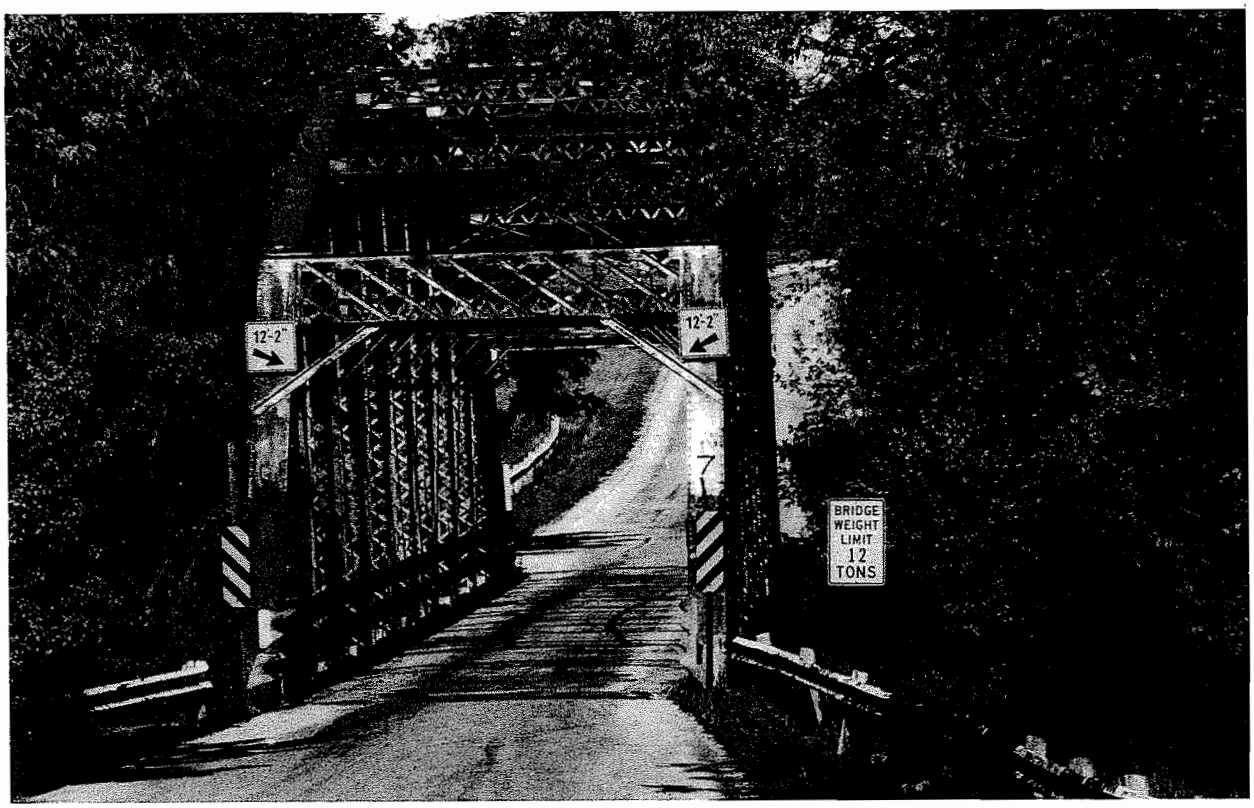
N of Gratis, Preble County
Township Route 347
Crosses Aukerman Creek
UTM Coordinates-16/712730/4392750

Pratt pony truss
Builder: Central States Bridge Company
Constructed: 1913
Structure File No. 6838235

The Central States Bridge Co., located in Indianapolis, Indiana, was a prolific builder of Ohio bridges in the early 20th century. This Pratt pony truss has one span which extends for 86 feet and is 15.5 feet wide. It has concrete abutments. It features a lattice railing, a nameplate on the southeast end post, laced and riveted top chords and end posts. This Pratt pony truss was upgraded to the Selected category because of the loss of the Darke County bridge built in 1884 by the Massillon Bridge Company (Structure File No. 1944010).

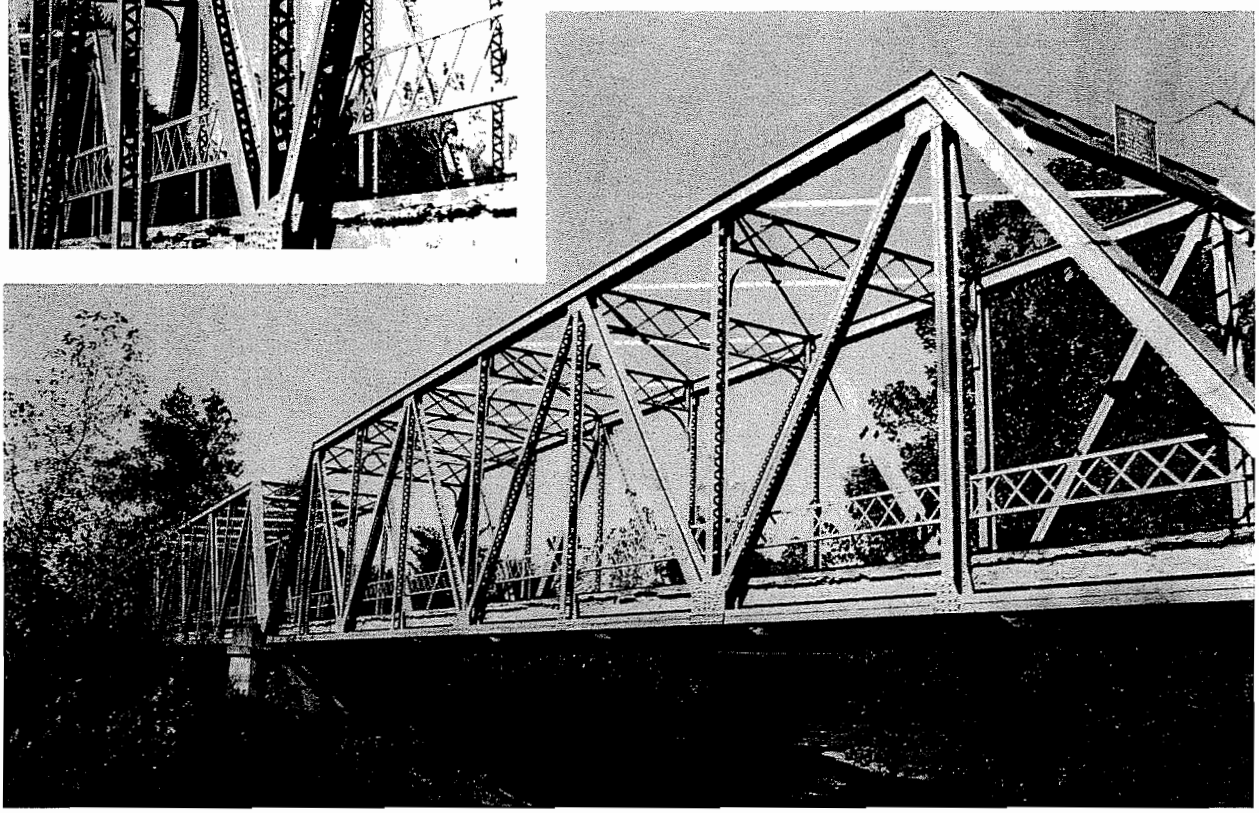
Troy Township, Delaware County
County Route 213
Crosses Olentangy River
UTM Coordinates-17/324360/4468860

Main Road Bridge
Parker through truss
Builder: Bellefontaine Bridge and Steel Company
Constructed: 1915
Structure File No. 2132850



The Main Road Bridge was built in 1915 by the Bellefontaine Bridge and Steel Company to replace a structure damaged by the 1913 flood. It is located three miles north of Delaware and spans the Olentangy River. The lower chord is a combination of pinned eyebars and riveted and laced T-bars. The top chord is pinned; cross struts and portal struts are riveted. Vertical compression members are laced channels. The abutments are stone. This Parker through truss was upgraded to the Selected category because of the loss of the Hamilton County bridge built in 1914 by Capitol Construction (Structure File No. 3130142).

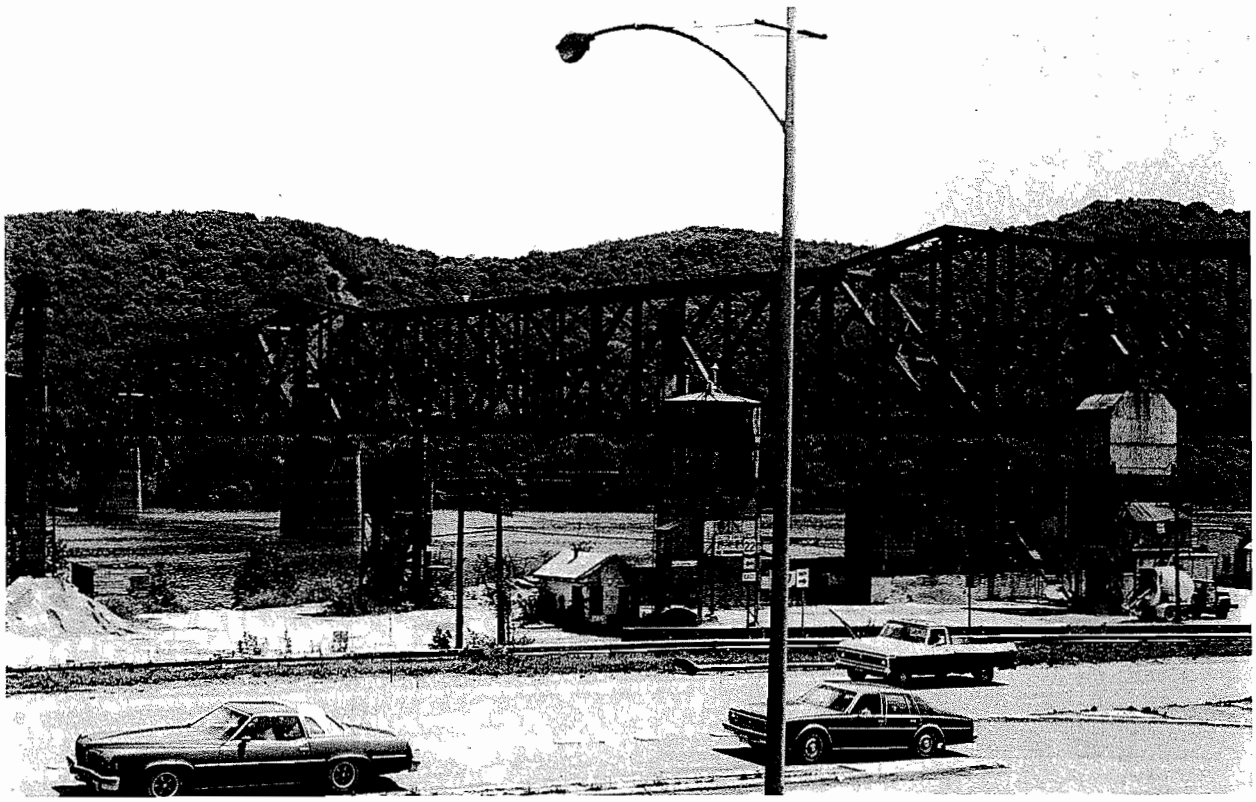
E of Lewisburg, Preble County
CR 15, Crosses Twin Creek
UTM Coord-16/711110/4413140
Warren through truss
Builder: Brookville Bridge Co.
Constructed: 1915
Structure File No. 6837166



The Brookville Bridge Company, located in Montgomery County, built numerous truss bridges in southwestern Ohio in the early 20th century. This two span bridge has two 125 foot Warren through spans and extends to an overall length of 262 feet. It is 18 feet wide. It is set on concrete abutments and a concrete pier. The top chords and posts consist of two channels laced and riveted with a cover plate and bottom stay plates; the bottom chords consist of two pairs of 5 inch angles with stay plates, and the diagonals and posts consist of two pairs of 5 inch angles laced and riveted. This Warren through truss was upgraded to the Selected category because of the loss of the Madison County bridge built in 1904 by the Brackett Bridge Company (Structure File No. 4930649) .

City of Steubenville, Jefferson County
Penn Central Railroad
Crosses State Route 7 and Ohio River
UTM Coordinates-17/533010/4469120

Baltimore through truss
Builder: Unknown
Constructed: 1927
Structure File No. 4100999

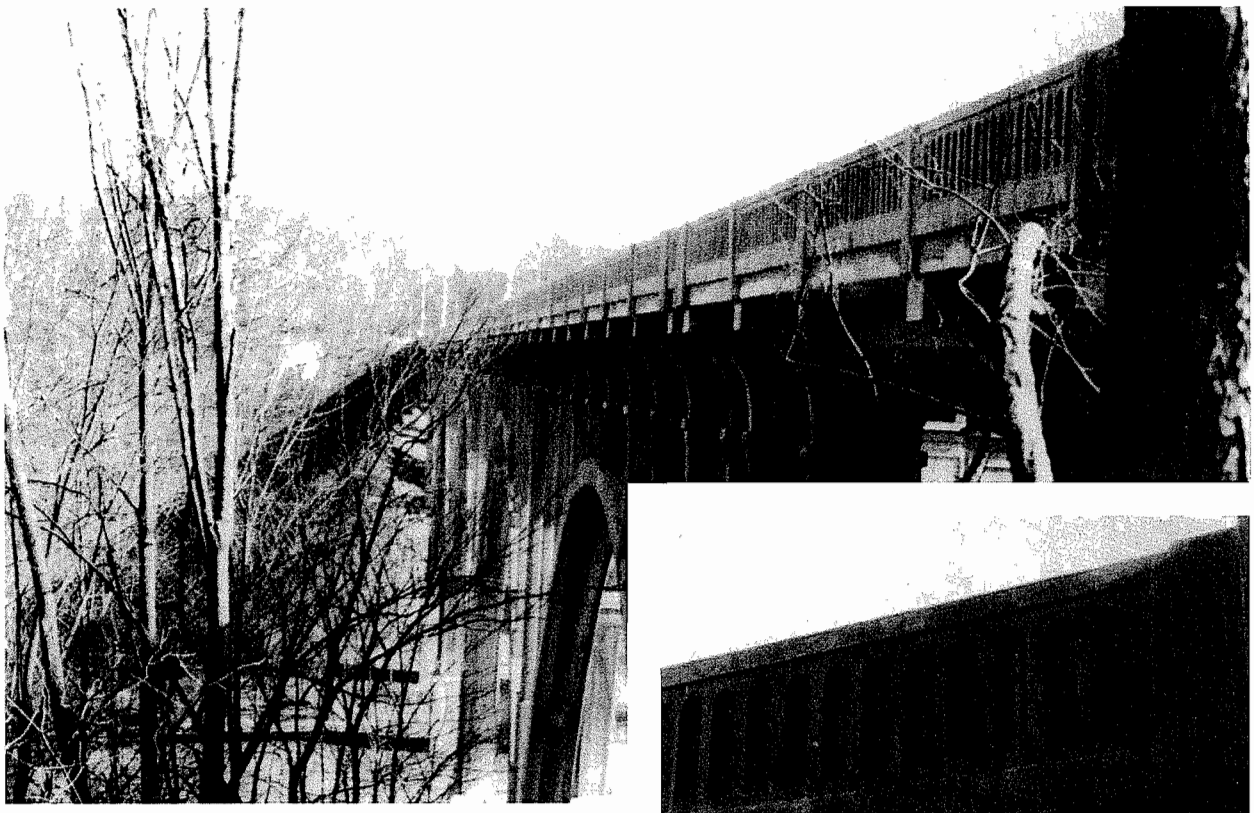


Three of the four spans of this massive railroad bridge are Baltimore through trusses. Two of the through truss spans measure 450 feet each and the other main channel through truss extends over 1000 feet. The approach span is an 80 foot Warren deck truss with verticals. The top chords and end posts of the Baltimore through trusses consist of four angles with four flat plates on the edge and a flat plate cover on the top and bottom. The bottom chords, diagonals and counters consist of four angles with four flat plates on the edge and top and bottom laced stay plates. This Baltimore through truss, a type often selected for railroad bridges, is jointly owned by West Virginia and Ohio. It was added to the Selected category because it was determined eligible for the National Register by the West Virginia Historic Preservation Office.

E of Brecksville, Cuyahoga/Summit County
State Route 82
Crosses Cuyahoga River, Ohio & Erie Canal, and B & O Railroad
UTM Coordinates-17/450840/4574380
Structure File No. 7706871

Brecksville-Northfield High Level Bridge
Concrete open spandral arch
Builder: Highway Construction Company
Designer: A.M. Felgate
Constructed: 1930-1931

This 1133 foot bridge is located in the scenic Cuyahoga River Valley. It is a high level structure, consisting of five arches having a span of 181.25 feet, one arch having a span of 135 feet 4.5 inches and one having a span of 90 feet 7.5 inches. Each span has two 7 foot arch ribs spaced at intervals of 19.25 feet which carry the deck and sidewalk. When originally built the bridge had a granite chip handrail and elaborate metal lamps (Blosser 1932: 71). Both were replaced at an unknown date. By 1986 the bridge was determined



eligible for the National Register but had deteriorated to a point where major rehabilitation was necessary. To retain the original architectural appearance, the superstructure was removed down to the top of the column caps and the existing columns and abutments were utilized. Precast arch panels were used to create the appearance of the original arch. In order to retain the appearance of the cast concrete balustrade and meet current safety standards, the new parapets were solid concrete with recessed arch insets on the exterior face.

N of Tarlton, Fairfield County
Township Route 128
Crosses Salt Creek
UTM Coordinates-17/346360/4383300

Borneman truss
Builder: Hocking Valley Bridge Works
Constructed: Unknown
Structure File No. 2336243

This is a special truss patented by August Borneman owner of the Hocking Valley Bridge Works. Borneman dominated the bridge building trade in Fairfield County for about 20 years until his death in 1889. Although many of the Borneman trusses had stone end posts topped with a nameplate and metal ornament, this bridge has steel end posts with outside lacing. A nameplate topped by a metal ornament on the northwest post was removed in 1989. The single span of this bridge is 60 feet and it is 13.7 feet wide. The vertical posts, like the other Borneman trusses, are formed by steel bars with a cross bar and a rectilinear bar to form the "A" shape on the outside. This Borneman truss was upgraded to the Selected category because of the loss of the Fairfield County bridge built at an unknown date by the Hocking Valley Bridge Works (Structure File No. 2338084).

A. BORNEMAN.
Truss-Bridge.

No. 219,846. Patented Sept. 23, 1879.

Fig. 1.

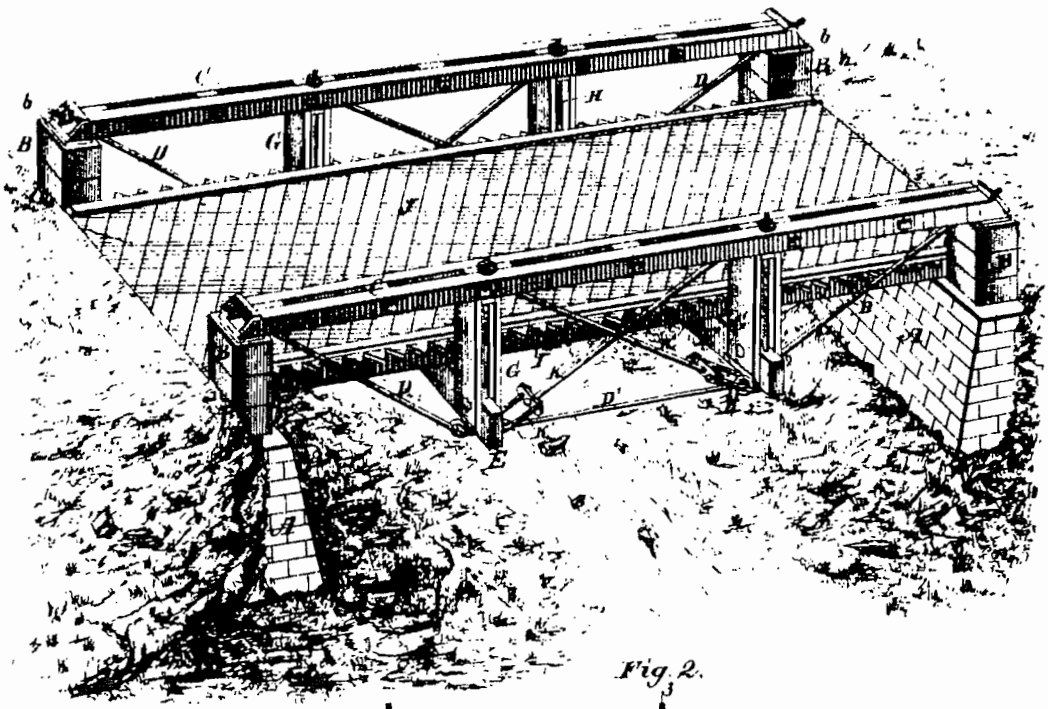


Fig. 2.

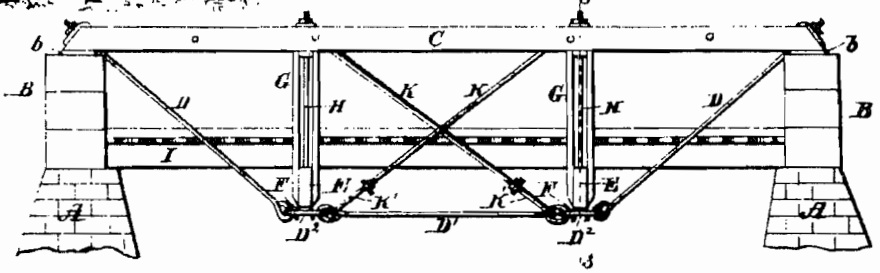


Fig. 3.

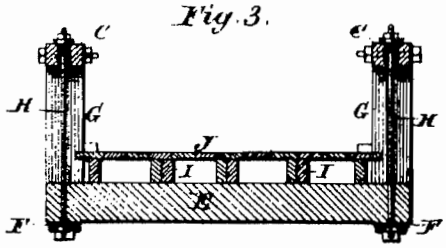
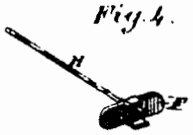


Fig. 4.



Attest

Henry Kassel
Walter Allen

Inventor

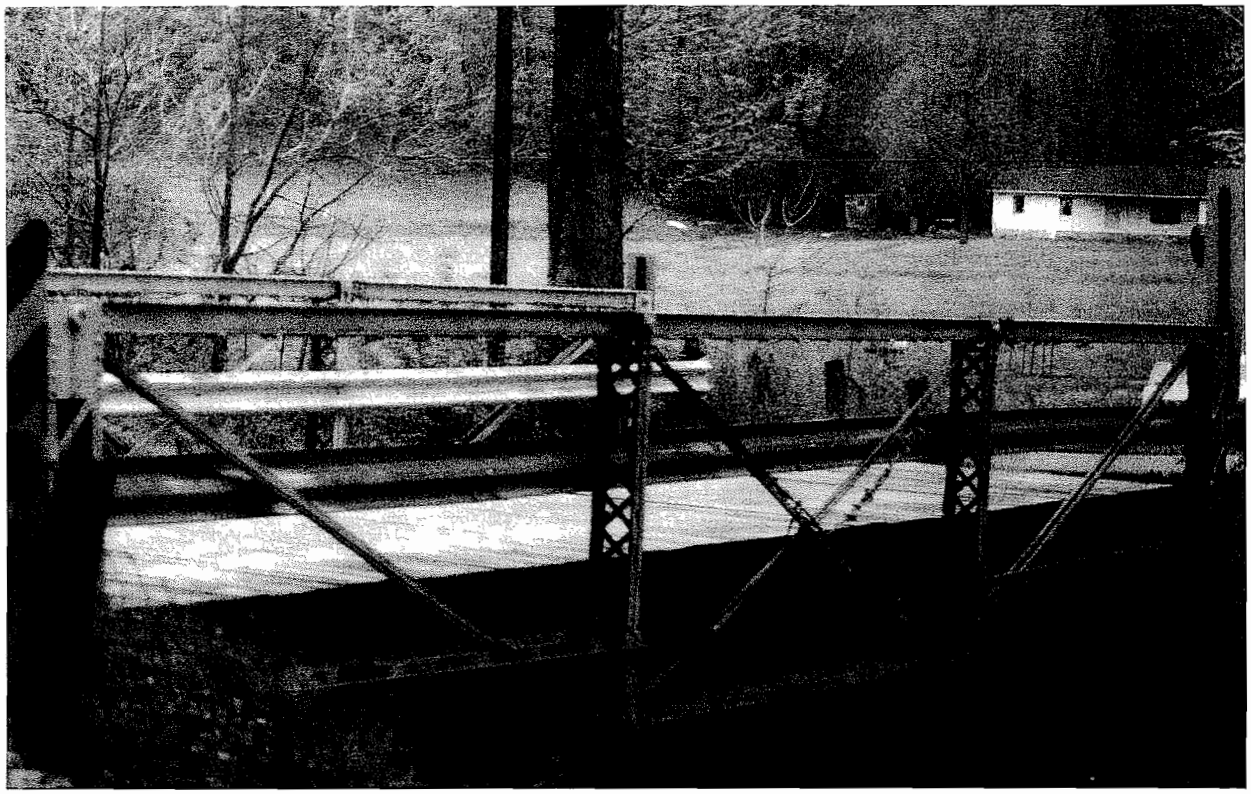
August Borneman

By Knight Bros
Attys.

Figure 2

SW of Otway, Scioto County
County Route 40
Crosses Rocky Fork
UTM Coordinates-17/306000/4300260

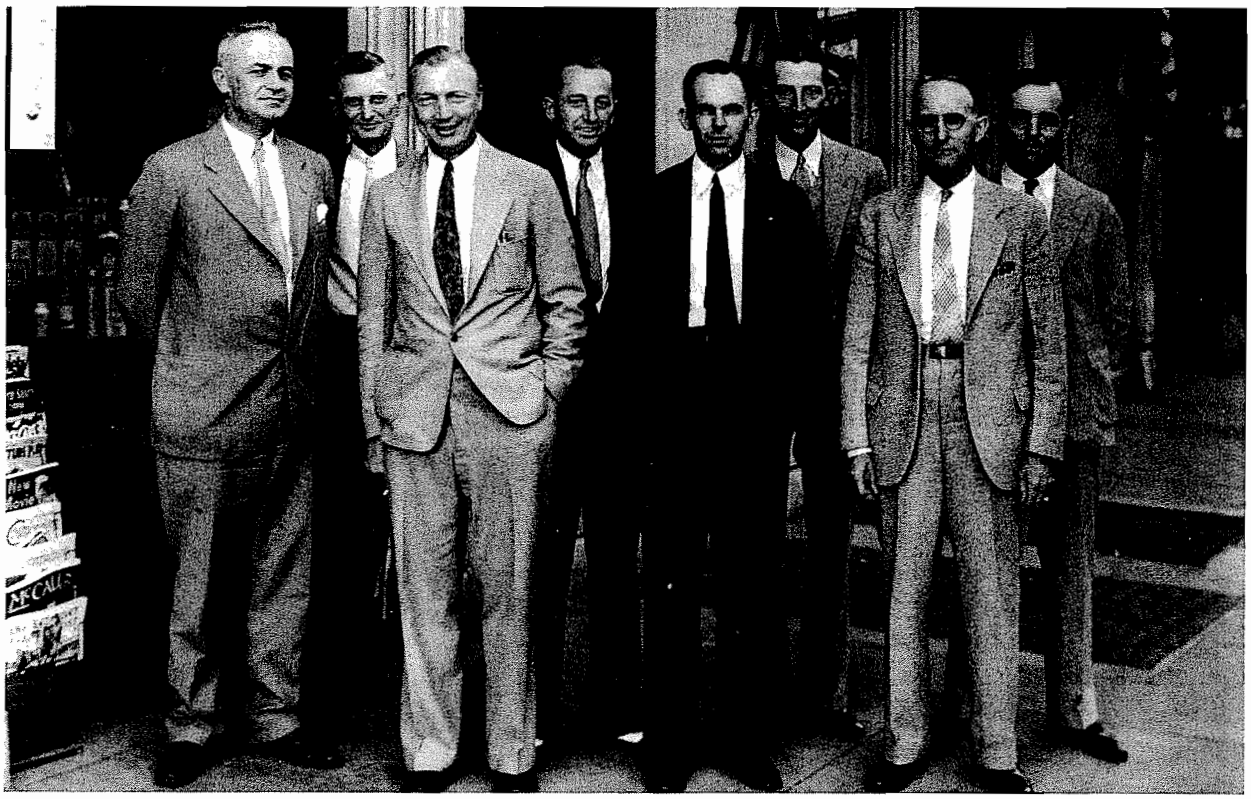
Truss leg bedstead
Builder: Unknown
Constructed: Unknown
Structure File No. 7331134



This one span bridge extends to an overall length of 49 feet and is 14.5 feet wide. The west abutment is concrete and the east abutment is stone. In this pin-connected bridge, the top chords are built of two upright channels with a cover plate and lacing; the end posts are built of two channels with double lacing and the bottom chords consist of two eyebars. The truss leg, a variation of the Pratt pony truss, was popular for crossing small streams in rural areas. This truss leg bedstead was upgraded to the Selected category because of the loss of the Mercer County bridge built in 1887 by the Bellefontaine Iron Works (Structure File No. 5451930) .

CHAPTER 5

1930s, STEEL BRIDGE INNOVATIONS



Since the first historic bridge inventory was published, staff of the Ohio Department of Transportation discovered additional information pertaining to bridge design innovations. ODOT is presenting this significant information about a new category of bridges in compliance with the Preservation Plan.

During the 1930s, the Ohio Department of Highways became a leader in bridge design largely due to the creativity of its bridge engineers. Represented by such men as Kiser Dumbauld, Harry Hawley, Henry Overman, Martin Ward, Henry Miller, Forest Christian, Whitey Merrell, Erv Nofer, J.R. Burkey and Bill Rabe, the bridge engineers brought Ohio to a new phase in steel bridge design . (Photographed from left to right : Miller, Christian, Merrell, Nofer, Dumbauld, Overman, Burkey and Rabe.)

Maintenance problems, a desire for aesthetic bridges, as well as the need to use resources efficiently spurred the engineers to pour their creativity and intellect into new bridge technology, design and construction. Some of the most important innovations were the routine use of continuous construction and welded splices. When put into practice these

Departmental bridge engineers designed continuous bridges at about the same time that the instrumental theory of continuous construction was published by Mr. Hardy Cross. The concepts in his 1930 paper, "Analysis of Continuous Frames by Distributing Fixed End Moments," in the *Proceedings of the American Society of Civil Engineers* and their practical application revolutionized bridge design and construction. Although many highway departments began improving their bridge design practices following publication of this paper, Ohio's bridge engineers had paved the way.

The desire to eliminate deck joints was the force behind the initial interest in continuous construction. Ohio began a new era in steel bridge construction when the first continuous girder was built in 1931 and only a year later the last non-continuous steel beam bridge was built. The detailed designs were created by the departmental bridge engineers and the concept readily became accepted . The first standard drawings were issued in 1939 (Figure 8). In order to maintain continuity, the standard drawing incorporated the riveted splice concept, a design which improved the members' strength, stress, and rigidity.

Aesthetic concerns were also important during this decade. Concrete and steel arches along with long column piers made bridges more visually pleasing. The engineers believed it was important to maintain a balance between utilitarian and aesthetic issues.

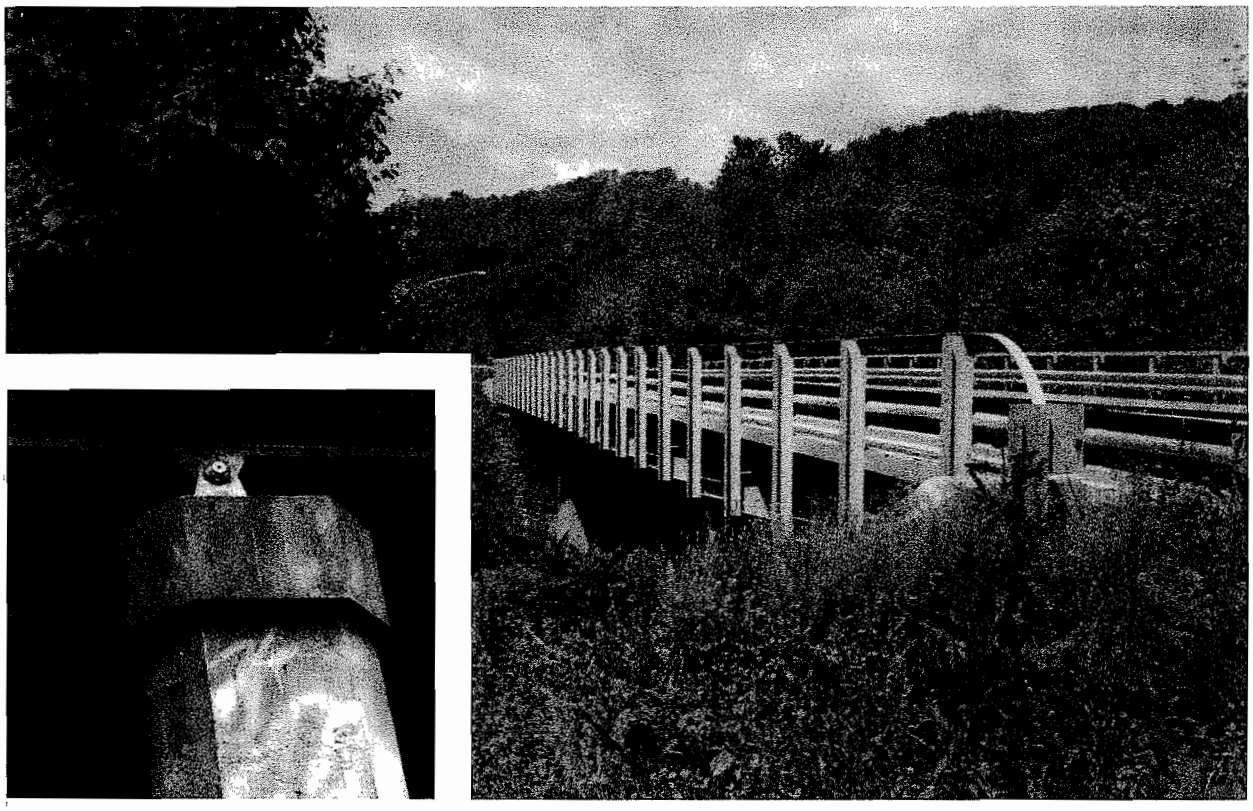
In general, this was a very creative decade for Ohio's bridge engineers. Not only did they innovate, but they examined the problems firsthand. The department did not hire consultants in the 1930s, so it was the job of the staff engineers to investigate the maintenance problems of bridges in person. These activities allowed them to evaluate and prescribe appropriate measures to correct deficiencies and address problems in future structures.

In recognition of these men and their innovations in bridge design in the 1930s, seven continuous bridges have been identified as Selected bridges. Staff members in the Bureau of Environmental Services evaluated the continuous beam and girder bridges built before the issuance of the standard plan of 1939. The selected bridges were evaluated based on history, technology, integrity and current condition. The bridges did not receive points for builder, date or aesthetics.

The following chapter identifies the bridges designed and built through the tireless efforts of these bridge engineers. Because of their efforts, bridge design in Ohio progressed into a new era. (See Appendix C for information on Innovations of the 1950s and 1960s in the Ohio Department of Transportation Bridge Bureau).

Adams County
U. S. Route 52
Crosses Isaacs Creek
UTM Coordinates-17/272000/4284880

Continuous steel deck girder
Builder: Brewer, Brewer & Sons
Constructed: 1931
Structure File No. 0101834
Selected as Eligible



Designed by Harry Hawley and Erv Nofer, both bridge engineers with the Ohio Department of Highways Bridge Bureau, this continuous steel deck girder bridge was the first continuous structure built in Ohio (Federal Aid Project). It crosses Isaacs Creek on U. S. Route 52 in Adams County. With three spans, two of 48 feet and 11 inches and one of 61 feet, this bridge is 161 feet long. Riveted beam splice plates were used to connect the girder members across the full length of the structure. These plates connected to the web of two beams which are butted together. Designed to resist bending and shearing stress at the connected point, splices helped to facilitate the building of a continuous structure. Brewer, Brewer & Sons, Inc. of Chillicothe was the original builder. In 1938, the bridge was repaired and in 1960 the forward approach span was widened 2 feet on each side with 16 inch thick reinforced concrete slab. The fabricator for the repair was the American Bridge Company of Ambridge, Pennsylvania.

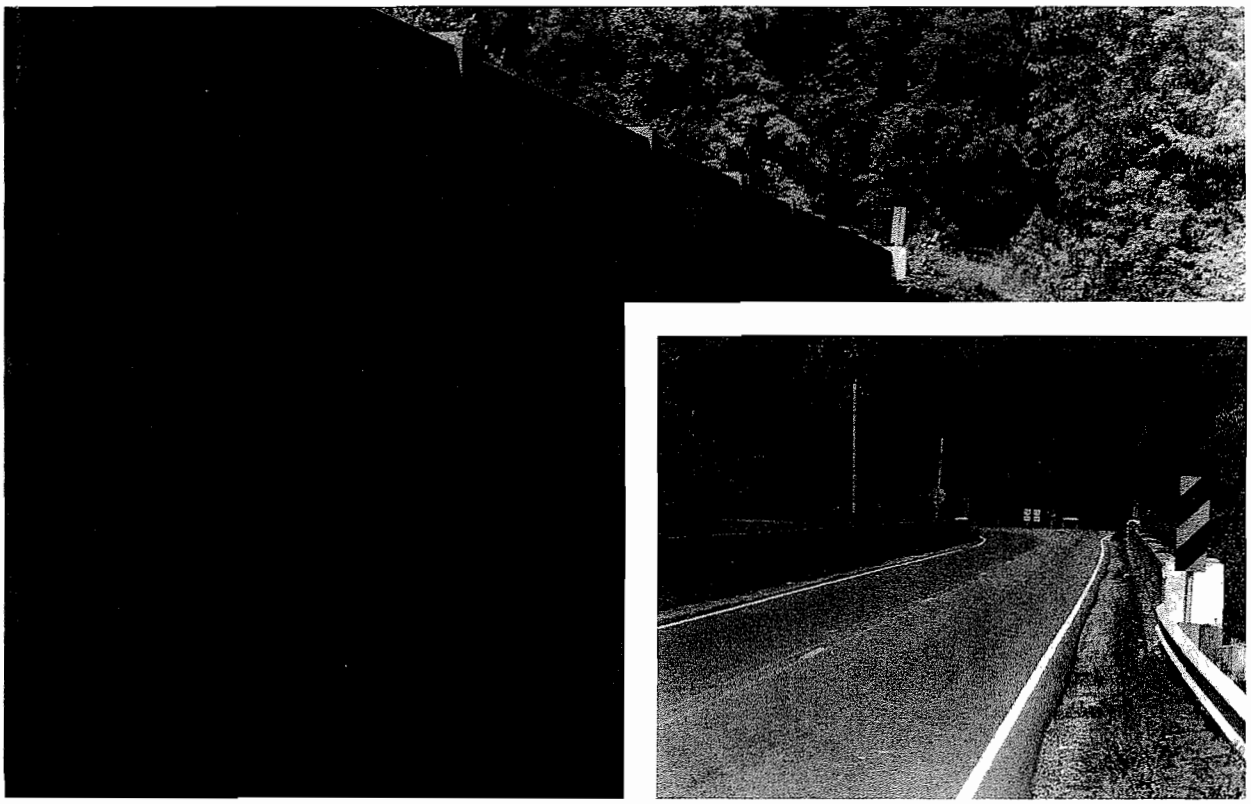
Adams County
State Route 125
Crosses Ohio Brush Creek
UTM Coordinates-17/286960/4294900

Continuous steel deck girder
Builder: George W. Timmons Co.
Constructed: 1932-1933
Structure File No. 0103098
Selected As Eligible

Constructed in 1935 by George W. Timmons Co. of Columbus, this continuous steel deck girder bridge crosses Ohio Brush Creek on State Route 125 in Adams County. It was designed by Kiser E. Dumbauld, Howard M. Scott and Stan R. Rudin. Plans were drawn by Mr. Dumbauld and Mr. Scott. Two of the spans are 77 feet, 3 inches and one is 96 feet, 6 inches. The width between the curbs is 24 feet.

Athens County
State Route 78
Crosses Sunday Creek
UTM Coordinates-17/407610/4373650

Continuous steel beam
Builder: Simon Straley, Celina
Constructed: 1933
Structure File No. 0502944
Selected As Eligible



Spanning Sunday Creek in Athens County, this continuous steel beam bridge was designed by Amedeus J. Friemoth, Costas S. Demos, who drew the plans, and Stan R. Rudin, engineers in the Bridge Bureau. Simon Straley of Celina was the builder. The bridge's wing walls are cantilevered from the abutment pedestals. Total length of the three span structure is 171 feet and it has riveted floor beams. (Federal Aid Project)
(Miriam Wood, Photographer)

Gallia County
State Route 160
Crosses Raccoon Creek
UTM Coordinates-17/382920/4319080

Continuous steel deck girder
Builder: W.C. Moore and E. Elford and Son
Constructed: 1934
Structure File No. 2702371
Selected As Eligible

This bridge spans Raccoon Creek on State Route 160 in Gallia County and is another example of the 1930s continuous construction. Plans were drawn by C. Erv Nofer of the Bridge Bureau. Both Mr. Nofer and Virgil Eberle designed this steel deck girder which has two spans of 55 feet, 11 3/8 inches and one span of 68 feet, 10 inches. This bridge is 191 feet long and has riveted floor beams. It was built in 1934 by W.C. Moore and E. Elford and Son of Marysville, Ohio. (Miriam Wood, Photographer)

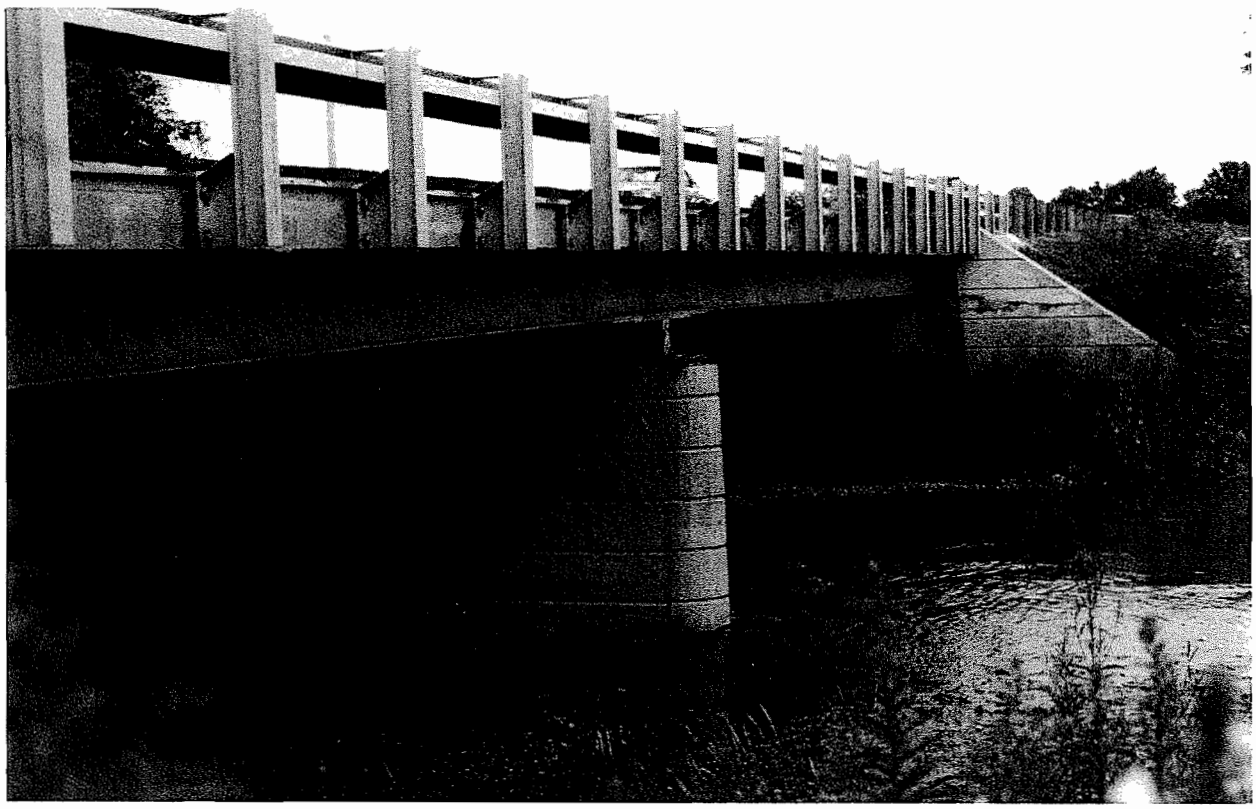
Ross County
U. S. Route 35
Crosses North Fork of Paint Creek
UTM Coordinates-17/308920/4369460

Continuous steel deck girder
Builder: C.A. Baker and Midland Construction Co.
Constructed: 1935
Structure File No. 7101503
Selected As Eligible

With an overall length of 208 feet, this continuous steel deck girder bridge has three spans; two spans are 64 feet and one is 80 feet. It was built in 1935 by the C.A. Baker and Midland Construction Co. of Columbus to cross the North Fork of Paint Creek in Ross County (Federal Aid Project). It has riveted floor beams and cross frames that are welded at the abutments. Though several experiments were conducted, this is one of the first implementations of the welding process at the end cross frames at the abutments. A new, reinforced, concrete deck, railing and concrete backwalls were added to the structure in 1963.

Ross County
U. S. Route 35
Crosses Walnut Creek
UTM Coordinates-17/339560/4343910

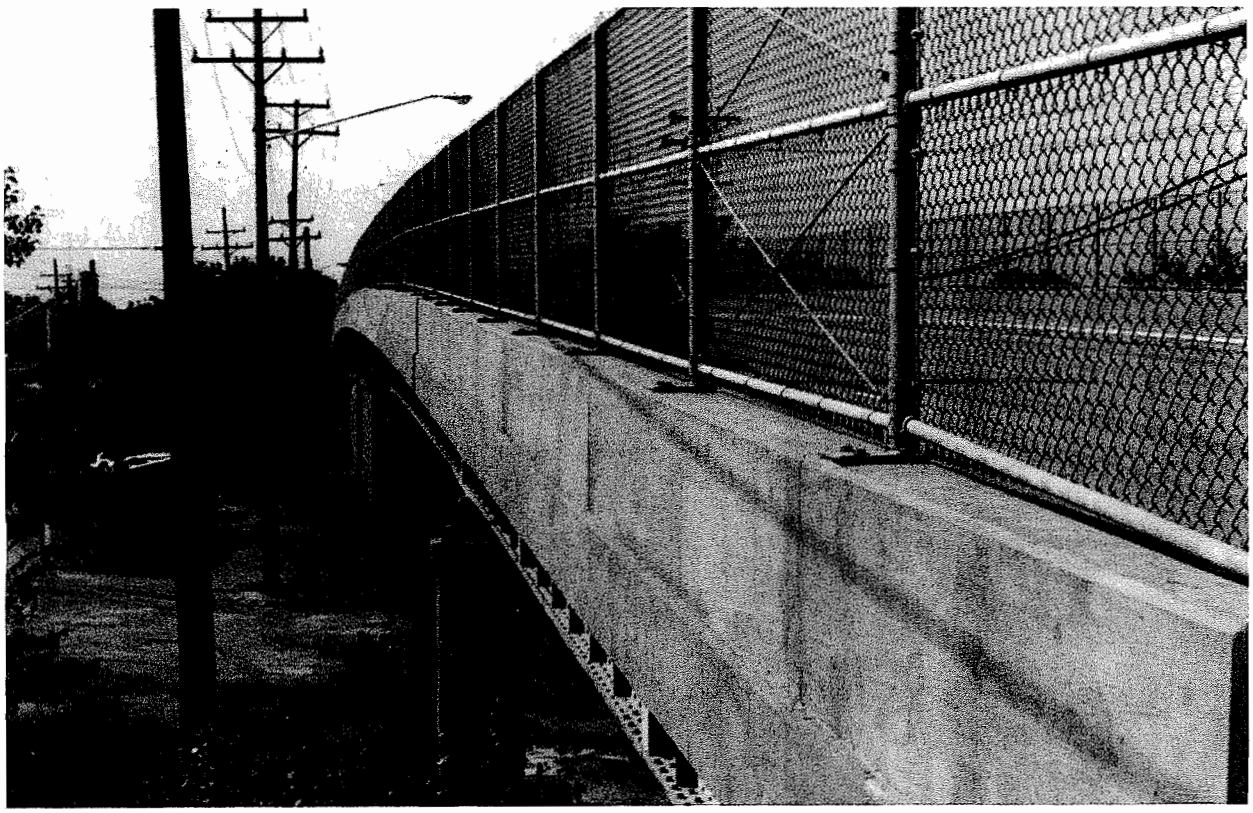
Continuous steel beam
Builder: Midland Construction Co.
Constructed: 1935-1936
Structure File No. 7102496
Selected As Eligible



Built in 1936 by the Midland Construction Co., this continuous steel beam bridge crosses Walnut Creek on U. S. Route 35 in Ross County. Drawn and designed by Stan R. Rudin, Ohio Department of Highways bridge engineer, the overall length of the bridge is 111 feet with two spans which are 52 feet and 9 inches (Federal Aid Project). The concrete abutments are cantilevered. In 1962, the pier was widened. (Miriam Wood, Photographer)

Cuyahoga County
State Route 8
Crosses Pennsylvania Railroad
UTM Coordinates-17/455930/4579740

Continuous steel deck girder
Builder: William E. McHugh Co.
Constructed: 1936
Structure File No. 1801201
Selected As Eligible



Built in 1936 by the William E. McHugh Co., Cleveland, this six span, continuous steel, deck, girder bridge carries State Route 8 over the Pennsylvania Railroad at a skewed angle. It was designed by Amedeus J. Friemoth, who also drew the plans. The overall length of the bridge is 605 feet and 3 inches. The two longest spans are each 98 feet, 6 inches; two spans are 98 feet each and two spans are 91 feet, 10 inches. The cross girder is supported on a ball-in-socket bolster, which is a horizontal member,47 resting on pier columns at piers two and three and on a ball-in-socket bolster on a roller nest at pier four. The plate girder and floor beams are riveted. (Federal Aid Project)

CHAPTER 6

SELECTED BRIDGES 1941-1945

The progress made by Ohio's innovative bridge builders during the 1930s came to a dramatic and abrupt halt with the beginning of World War II. The effects of the war on road and bridge building were much more serious than the effects of the Depression. Prior to December of 1941 labor was plentiful; materials were relatively cheap and equipment and services could be obtained readily. With the coming of the war the Department of Highways faced severe shortages of most materials including steel, rubber, copper, bituminous materials and even timber, which were channeled into the war effort. In addition, the department faced an acute shortage of personnel.

Robert S. Beightler, Department of Highways director as of January of 1939, was a member of the Ohio National Guard and was inducted into the Army on October 15, 1940. A member of the 37th Division, he saw active service in the Pacific theater.

By the end of 1943 there were 1,239 names of department employees on the Military Service Honor Roll. The total number of state employees in the department in 1942 was 7,924 so this number represented a 16 percent

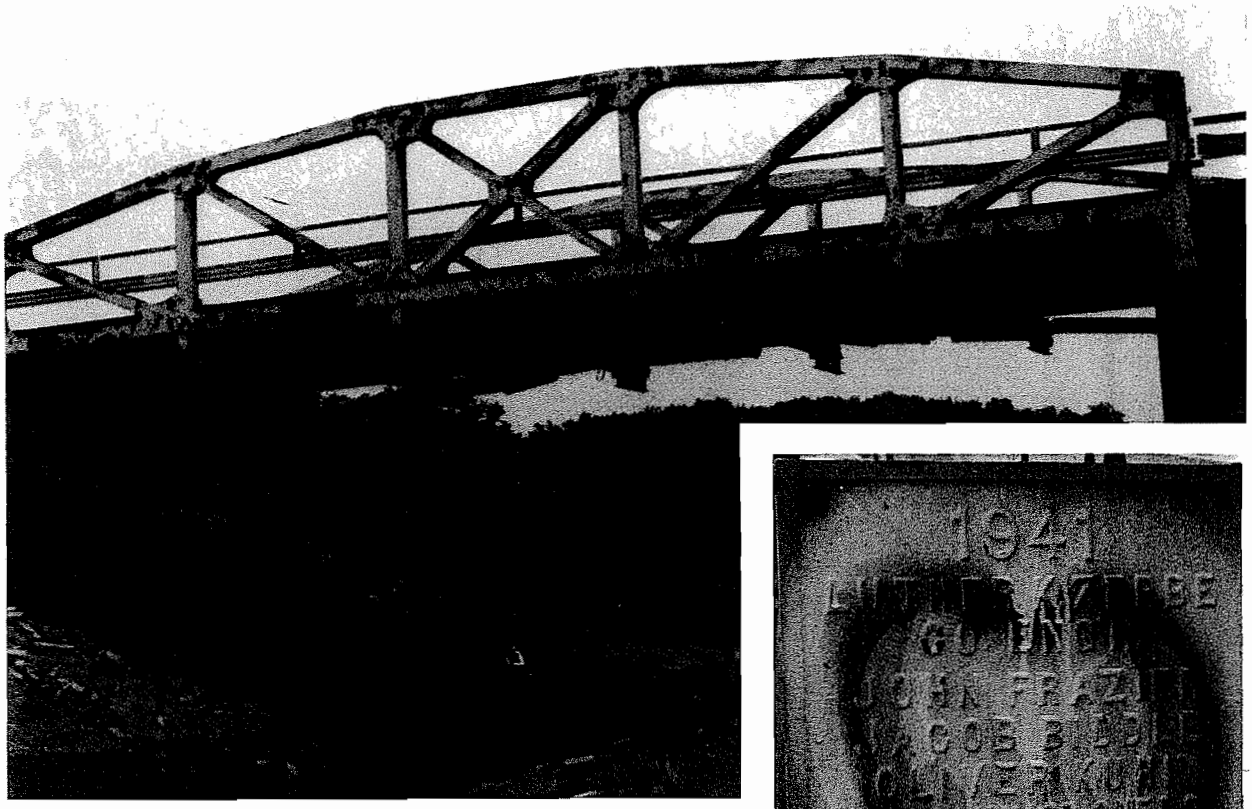
decrease in employees. These men and women went directly into the military from their positions in the department. Thus, Ohio faced, as did the rest of the nation , not only severe restrictions on the availability and use of construction equipment and materials but also serious shortages of engineers, many of whom entered the service as engineering officers. So, the department lacked people who were experienced in drawing plans for construction needs; workers who could put the plans into practice and contractors and producers of materials and equipment (Figure 3).

Because of these wartime complications many completed plans were scrapped and designs involving the use of a minimum of critical materials were used. Pavement and drainage structures were redesigned to allow for use of less materials. Wooden bridges were built on secondary highways and several bridges which were obsolete at their original locations were dismantled and used to replace weak or damaged bridges on less traveled highways.

As the war in Europe neared its end, Congress passed the Federal Aid Highway Act of 1944. With this far reaching legislation Congress authorized 500 million dollars for each of the first three post war years for road and bridge construction . Congress also authorized for the first time the use of federal aid highway funds in urban areas, provided authority for the construction of a secondary road system and directed the design of a national system of interstate highways (Figure 4) .

Stark County
County Road 3
Crosses Deer Creek
UTM Coordinates -17/487810/4536430

Pratt pony truss
Builder: WPA
Constructed: 1941
Structure File No. 7632053



Early in 1939 a State Highway Department sponsored Works Progress Administration program was established on a state-wide basis. This program continued through 1941 when increased employment brought about by the war effort allowed the program to be phased out. Nearly all types of highway work were performed by workers in this program including berm widening, ditch eliminating, grading, guard rail constructing, painting and bridge constructing, brick relaying, new brick laying, concrete and bituminous pavement constructing. Among the 33 bridges built by WPA workers was this Pratt pony truss across Deer Creek in Stark County. Constructed in 1941, the bridge is a single span of 72 feet. Piers, abutment and wings are concrete and the seats are steel. Steel I-beams form the top chords, end posts, posts and diagonals. The bottom chords are formed of web box steel.

Clinton County
County Road 30
Crosses East Fork of Todds Fork
UTM Coordinates -17/257870/4358300

Warren polygonal chord pony truss
Builder: Champion Bridge Co.
Constructed: 1942
Structure File No. 1433326

A prolific builder of smaller highway bridges, the Champion Bridge Co. constructed this Warren polygonal chord pony truss over the East Fork of Todds Fork in Clinton County. The single span has a length of 65 feet. Abutments, wings and seats are concrete and the bottom chords are I-beams.

Preble County
County Route 30
Crosses Big Cave Run
UTM Coordinates -16/700400/4382940

Concrete filled arch
Builder: Unknown
Constructed: 1942
Structure File No. 6835678

The original structure of this 22 foot span in Preble County probably was a brick arch. Concrete was added at the north and south sides in 1942, presumably to widen the bridge at a time when the road was widened. The brick still is visible within the soffit between the concrete additions. This is an example of modernization of an older structure made necessary by wartime constraints. The incised parapet adds a decorative touch to this small bridge that carries County Route 30 across Big Cave Run.

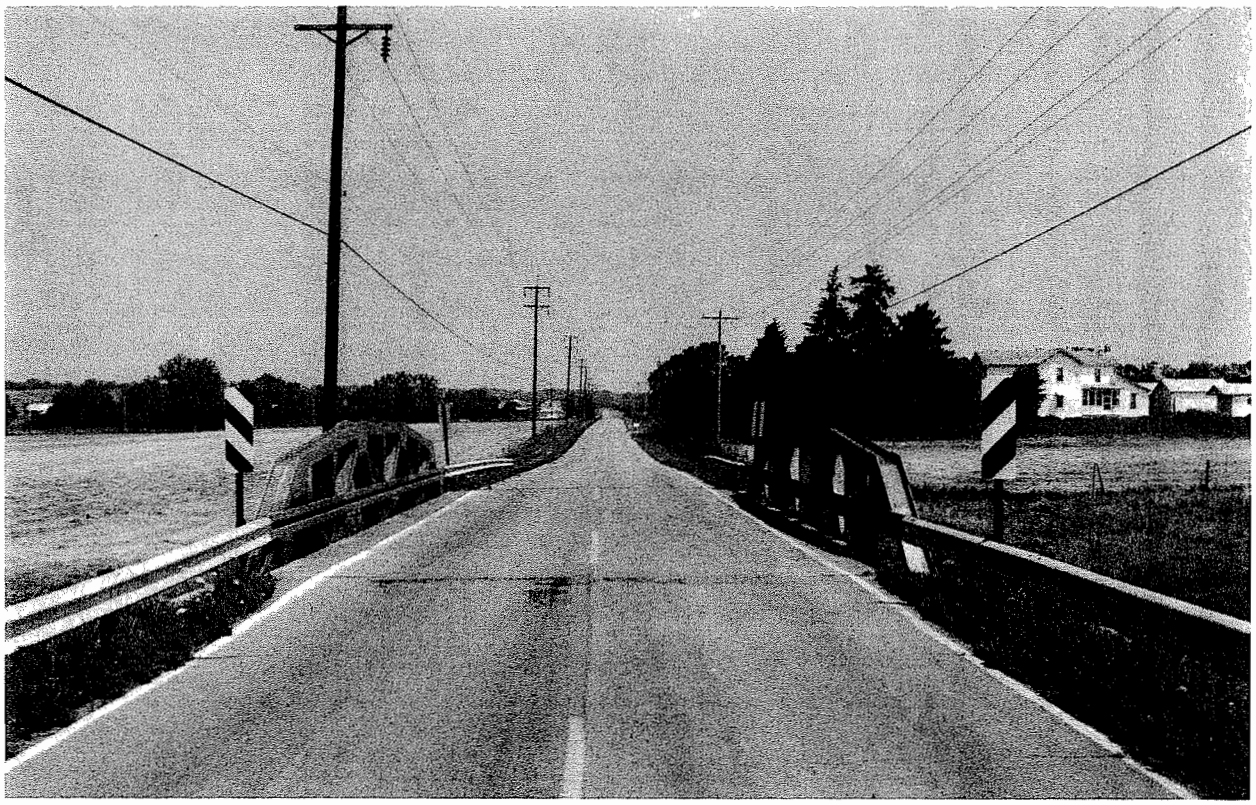
Scioto County
County Road 48
Crosses Scioto Brush Creek
UTM Coordinates -17/317140/4301840

Pratt through truss
Builder: Unknown
Re-Constructed: 1944
Structure File No. 7332521

This steel Pratt through truss has carried traffic over Scioto Brush Creek since 1944. Its pin-connected construction shows it was built prior to the war years and moved here from another location, a common practice at a time when materials for bridge and road building were in short supply. The abutments, seats and the wings are concrete.

Butler County
County Road 71
Crosses Nine Mile Creek
UTM Coordinates -17/707760/4376680

Warren polygonal chord pony truss
Builder: Unknown
Constructed: 1945
Structure File No. 0934151



Built in 1945, this Warren polygonal chord pony truss crosses Nine Mile Creek in Butler County. Length of the single span is 54 feet. The abutments and wings are concrete; the bottom chords are I-beams and the connections are gusset plates indicating the use of welding. The transition from pin-connected to riveted joints in bridges occurred in the early years of the 20th century. The mid-1940s marked another transition from riveted to welded connections.

Findlay, Hancock County
County Road 204
Crosses Eagle Creek
UTM Coordinates -17/277980/4542760

Warren polygonal chord pony truss
Builder: Unknown
Constructed: 1945
Structure File No. 3233863

Crossing Eagle Creek in Findlay, this Warren polygonal chord pony truss was built in 1945. The single span is 101 feet in length with concrete wings and abutments. The seats are two welded angles that form a box bearing plate for the truss. Top chords, end posts, posts and diagonals are I-beams and the bottom chords are channels. Connections are welded and bolted gussets. The experience gained during World War II in the use of welding in ship construction accelerated the use of this form of fastening in structures such as bridges.

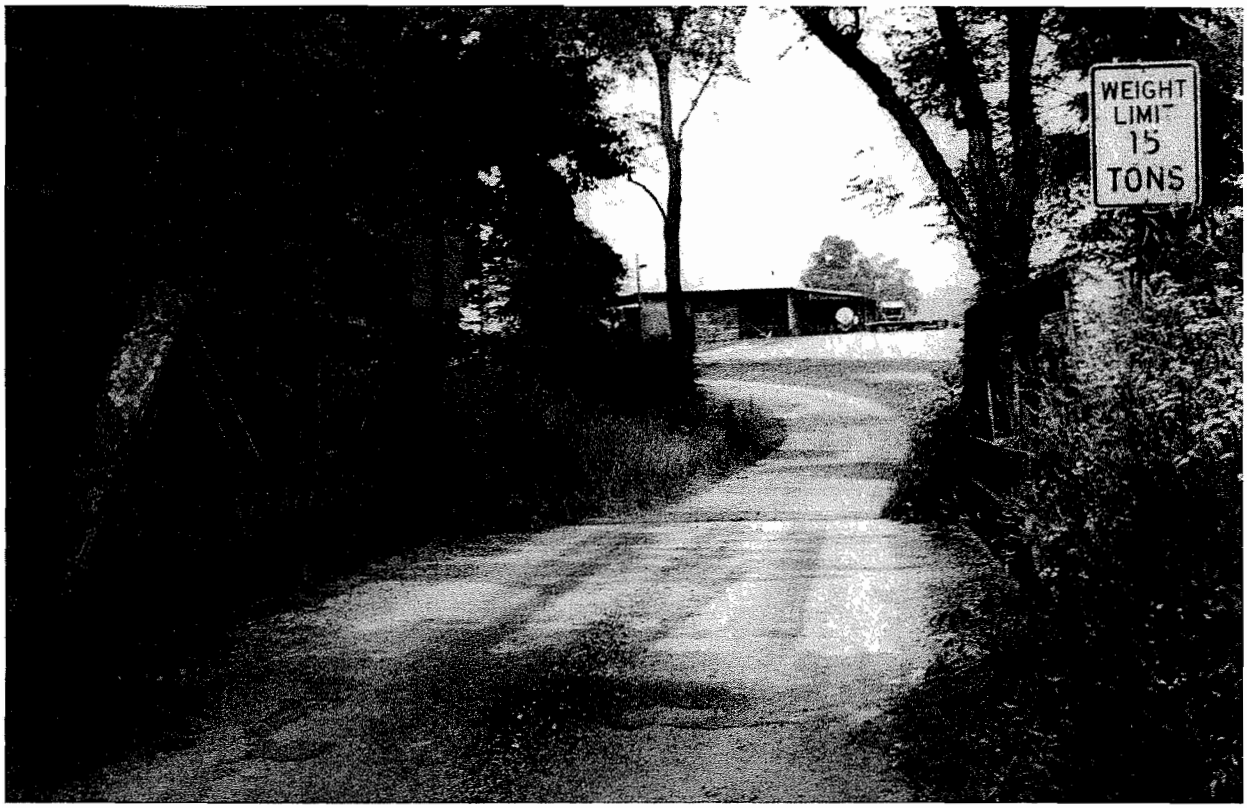
Pike County
Township Road 338
Crosses Sunfish Creek
UTM Coordinates -17/316180/4325170

Warren polygonal chord pony truss
Builder: Unknown
Constructed: 1945
Structure File No. 6633242

This single span Warren polygonal chord pony truss carries Township Road 338 across Sunfish Creek in Pike County. The bridge was built in 1945. It is 104 feet in length with concrete abutments. The superstructure is steel with gusset plates indicating welded connections. Welding offered an economical alternative to riveting in bridge construction and was gaining acceptance by engineers, many of whom had gained the technological experience during the war.

Scioto County
Township Road 213
Crosses McConnel Creek
UTM Coordinates -17/337120/4308530

Pratt pony truss
Builder: Champion Bridge Co.
Re-Constructed: 1945
Structure File No. 7334117



This Pratt pony truss was built by the Champion Bridge Company at an unknown site years ago. In 1945 it was moved to span McConnel Creek in Scioto County.

The Champion Bridge Company was founded in 1874 by Zimri Wall who built both timber and wrought iron bridges. In the early 1880s it was one of the first companies to use and promote the use of steel on smaller highway bridges. Champion continued building bridges through the war years. The company survives as a result of diversifying into general steel erections and structural work. This one span bridge with an overall length of 34 feet has stone wings and abutments. The top chords consist of double channel steel; the bottom chords are rectangular steel bars and the diagonals are rectangular steel eyebars.

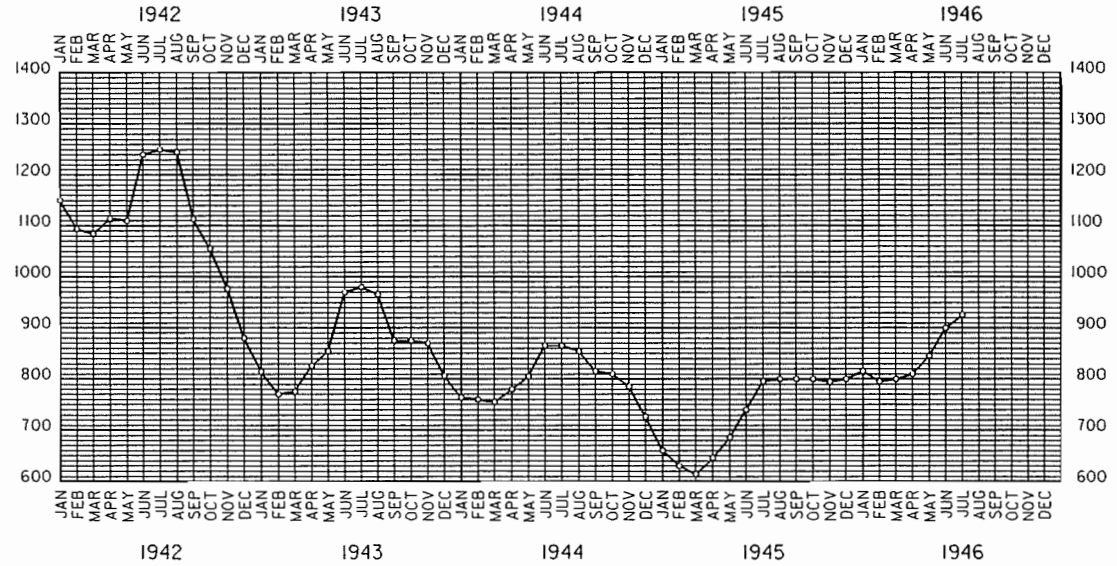


Figure 3

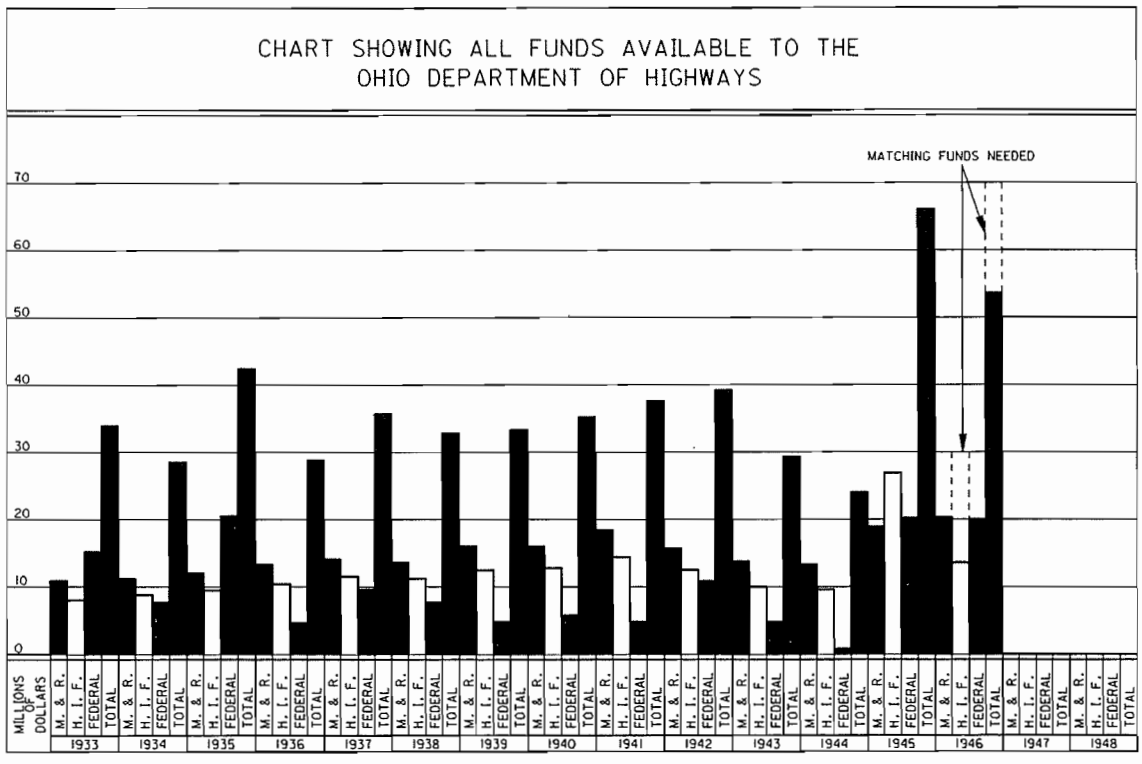
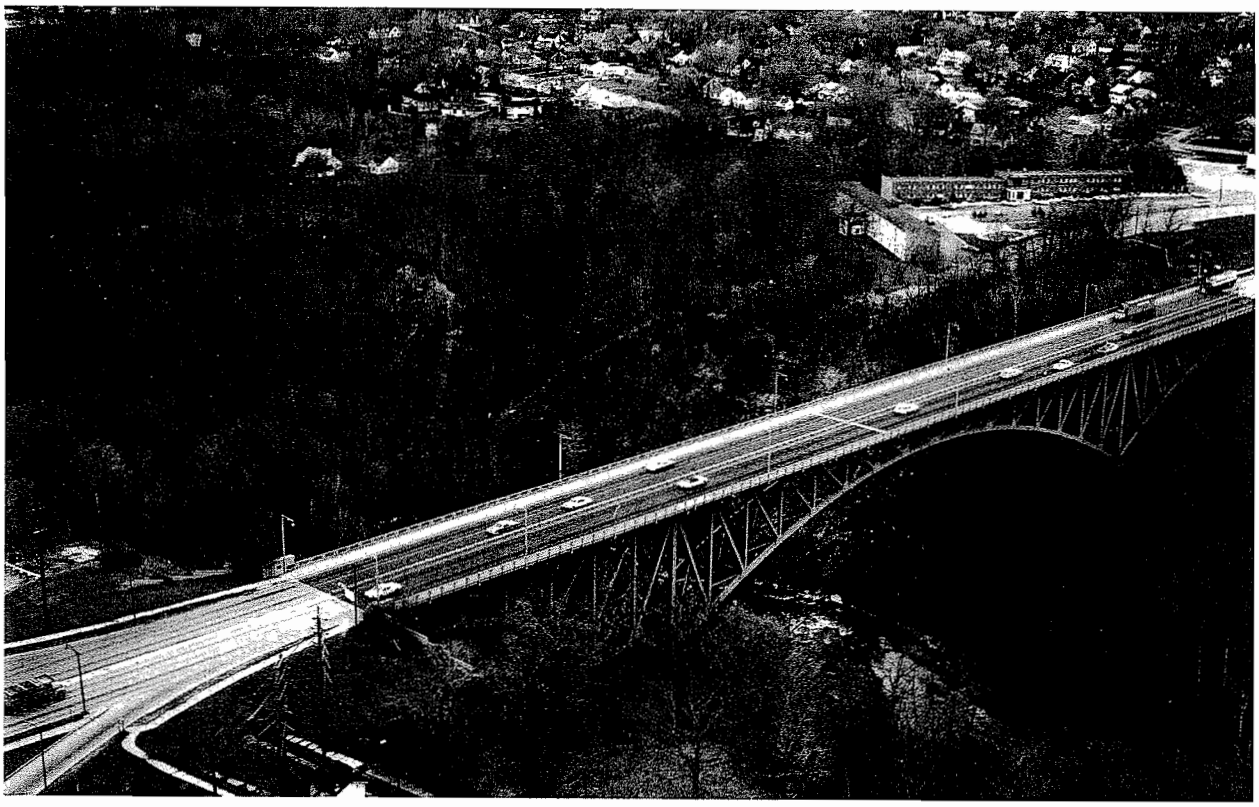


Figure 4

CHAPTER 7

SELECTED BRIDGES 1946-1950



By the mid- 1940s the need for new roads and bridges was imperative. The Depression and World War II severely limited road and bridge construction and maintenance. Bridge building lagged far behind the need to replace old structures which were rapidly wearing out from increased automobile traffic and damage by the elements, and many bridges were not designed to carry the maximum legal weight vehicles of the day.

Passage of the Federal Aid Highway Act of 1944 marked a new era in highway and bridge construction, but changes did not come immediately. Steel remained in critically short supply for some years following the end of the war. Work was hampered further by the lack of skilled engineers and workers who were being demobilized slowly and re-entering the civilian work force. In 1946, contracts in Ohio were awarded for more than $25,000,000 worth of highway construction: $14,861,000 in contracts for 54 federal aid projects involving 109 miles and $10,524,000 in contracts for 242 non federal aid projects involving 2,484 miles of which 2,000 miles were surface treatment.

In addition to changes in highway and bridge construction brought about in the next years

by new legislation, wartime engineering experience brought new uses of materials and new construction methods. Continuous beam construction and the use of high-strength steel changed the look of bridges as the 1940s gave way to the 1950s and the era of the interstate highway systems dawned.

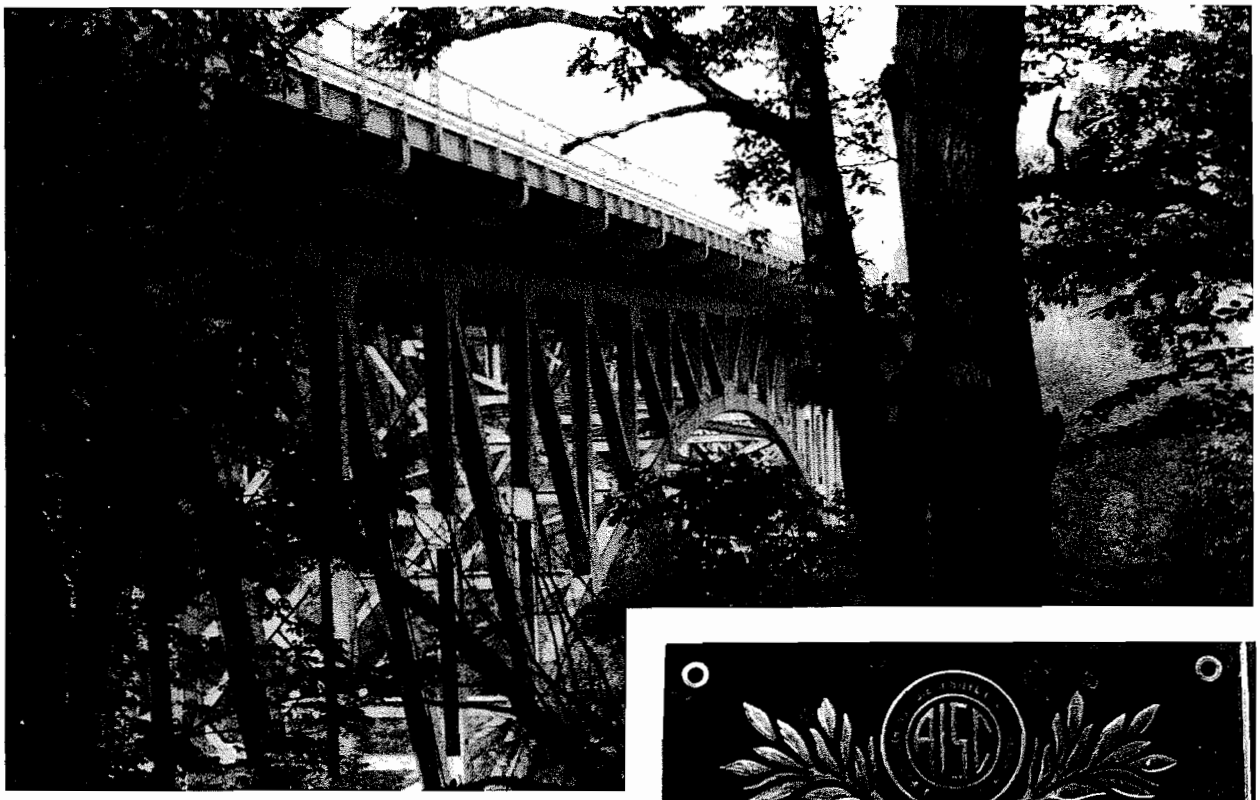
Clinton County
County Road 58
Crosses Anderson Fork
UTM Coordinates -17/256180/4381940

Warren polygonal chord pony truss
Builder: Champion Bridge Co.
Constructed: 1947
Structure File No. 1435191

Champion Bridge Co. was the builder of this 94 foot single span bridge across Anderson Fork in Clinton County. Its abutments are stone and concrete. The bottom chords are I-beams and the connections are gusset plates. Post-war high prices and shortages of equipment and materials caused construction of highways and bridges to lag behind need throughout 1946. Work gained momentum during 1947 when this bridge was built. This rather unpretentious style of bridge reflects a philosophy of functionalism in the design of structures that pervaded the post-war years. Through the 1930s pleasing appearance was a consideration in bridge design. Beginning in the 1940s, the trend moved to simple, basic design with little regard for aesthetics.

City of Akron, Summit County
Old State Route 8
Crosses Cuyahoga River
UTM Coordinates -17/457240/4552830

High Level Bridge
Cantilevered deck
Builder: Mt. Vernon Bridge Co.
Constructed: 1947-1948
Structure File No. 7730306

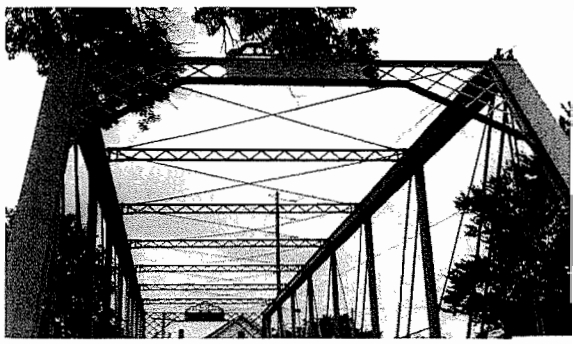


The Mt. Vernon Bridge Company built this high level bridge in 1947-1948, at a cost of more than two million dollars. The placing of this and similar projects under contract marked an important step toward construction of much-needed improvements designated to eliminate traffic congestion in Ohio's cities. It was designed by Wilbur Watson and Associates and awarded the American Institute of Steel Construction Award in 1949. The bridge consists of two 180 foot cantilever spans and one 120 foot center span supported by compression struts from the cantilevered ends. It carries old State Route 8 across the Cuyahoga River in Summit County. Piers, abutments, wings and seats are concrete and the top chords, end posts, bottom chords, posts and diagonals are all steel box beams. The bridge will be rehabilitated in 1991 under the county's bridge program.

Stark County
County Road 13
Crosses Mahoning River
UTM Coordinates -17/491010/4531100

Pratt through truss
Builder: Wrought Iron Bridge Co.
Re-Constructed: 1948
Structure File No. 7632681

The decorative nameplate, portal cut-outs, bracing and lacing on this single span structure indicate that it is an older bridge moved to the site in 1948. The truss members are pin-connected. Abutments, wings and seats are stone. The overall length is 119 feet. The bridge was rehabilitated in 1986.



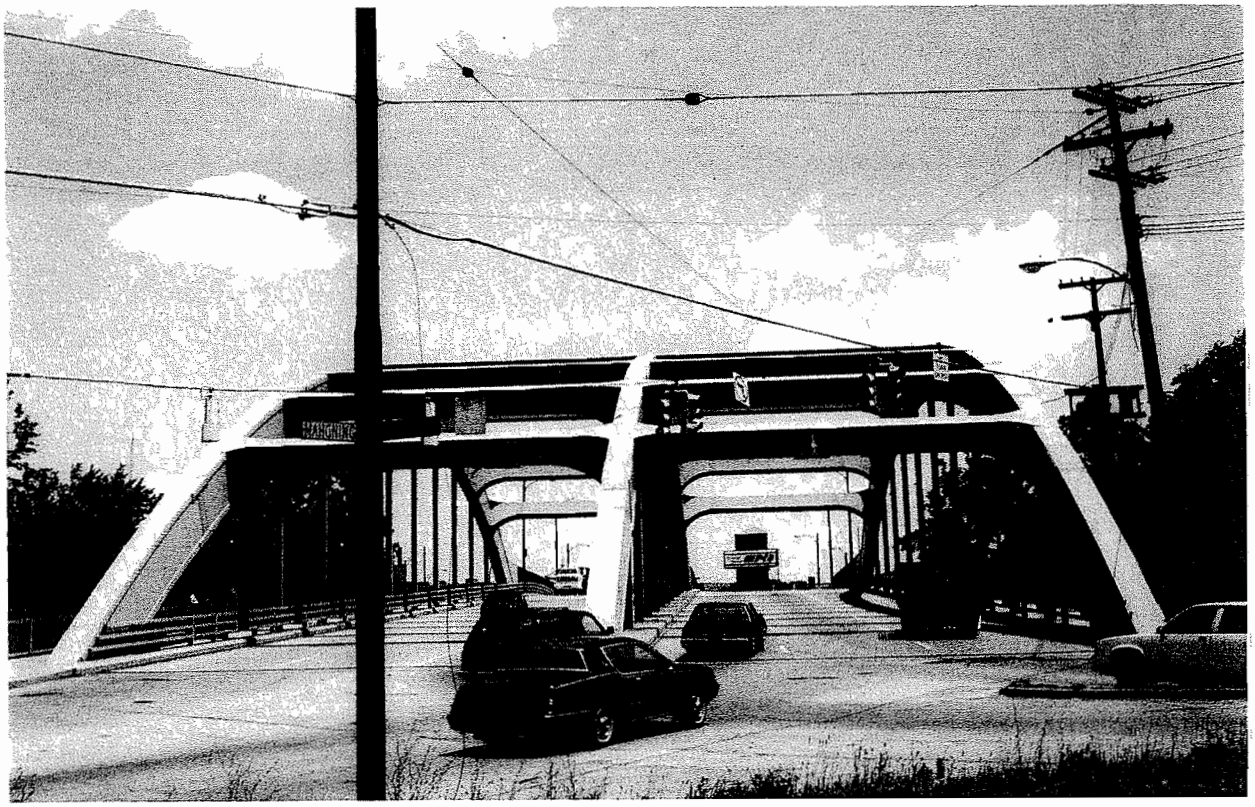
Trumbull County
County Road 68C
Crosses Mahoning River
UTM Coordinates -17/519820/4558600

Warren polygonal chord pony truss
Builder: Unknown
Constructed: 1948
Structure File No. 7837283

The pace and volume of highway and bridge construction increased in 1948 the same year this two span Warren polygonal chord pony truss was built over the Mahoning river in Trumbull County. The use of steel plate welds and bolts reflect increased confidence in the use of welding technology for connections. The top chords and diagonals are I- beams and the bottom chords are steel beams. The two spans share a concrete pier. The abutments, wings and seats are concrete. Each span is 88 feet in length.

City of Youngstown, Mahoning County
County Route 18
Crosses Mahoning River
UTM Coordinates -17/528850/4549940

Spring Common Bridge
Steel arch
Builder: Mt. Vernon Bridge Co.
Constructed: 1949
Structure File No. 5058082



Spring Common Bridge crosses the Mahoning River, Erie-Lackawana, Baltimore and Ohio Railroads and West Front Street in Youngstown. The present bridge was built in the same location as the older structure , but on a new alignment. The overall length of the bridge is 432 feet and the steel arch is 274 feet. The west end of the arch span rests on a full-height type concrete abutment. The arch is supported on the other end by a concrete wall-type pier. It was repainted and given a new deck by the Mahoning County Engineer's Department in 1986.

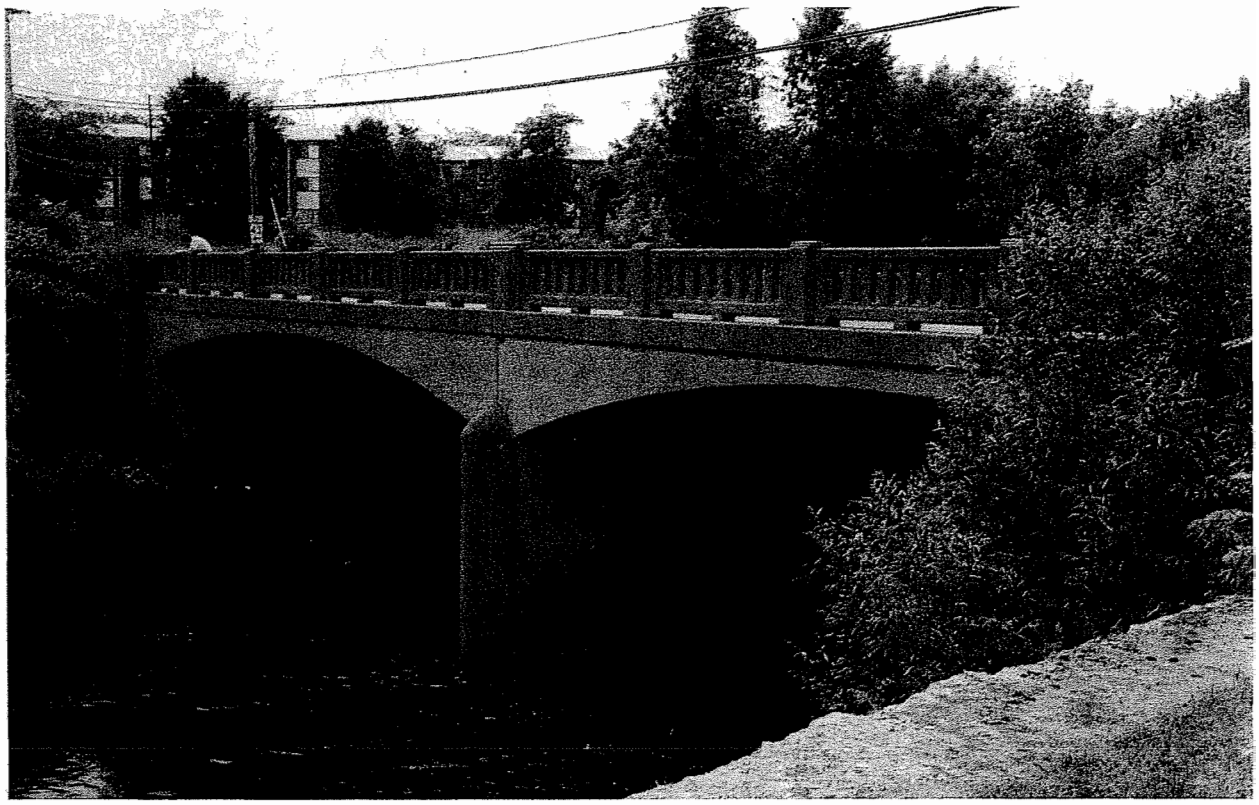
Tuscawaras County
U. S. Route 36
Crosses Tuscarawas River
UTM Coordinates -17/463600/4468400

Camelback through truss
Builder: American Bridge Co.
Constructed: 1949
Structure File No. 7900333

Indicative of the increased abundance of materials as the country recovered from the war, steel was used liberally in this double continuous truss four span bridge built in 1949 by the American Bridge Company to span the Tuscarawas River. The top chords are 28 inch lattice beams, end posts are 28 inch steel beams, bottom chords are 18 inch double girders, posts and diagonals are 12 inch steel beams and the counters are 8 inch angle steel. Seats are concrete and steel and the piers, abutments and wings are concrete. Steel beams carry the two secondary spans. The connections are rivets and bolts on gusset plates. The bridge is scheduled for rehabilitation under ODOT's bridge program.

Canton, Stark County
Cherry Ave.
Crosses East Branch of Nimishillin Creek
UTM Coordinates -17/468600/4514680

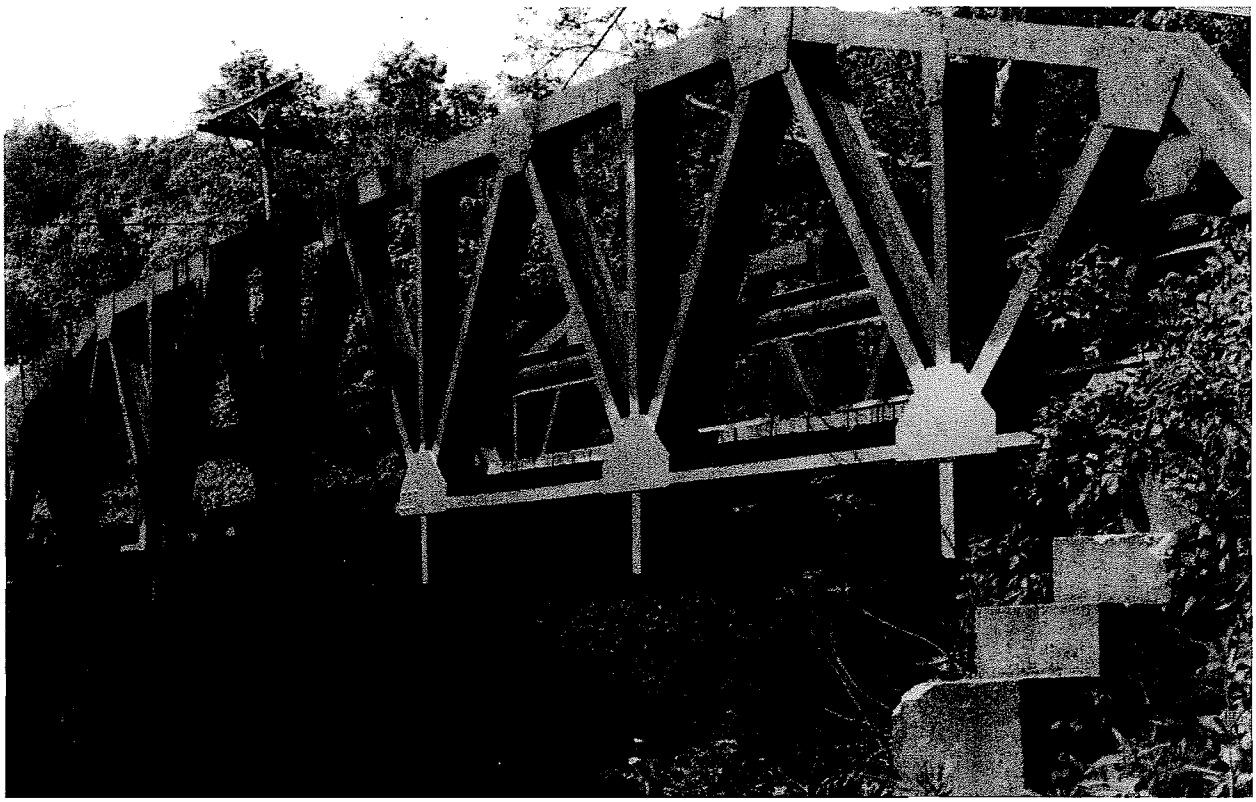
Concrete filled arch
Builder: Geraux Brothers Co.
Constructed: 1949
Structure File No. 7631375



Concrete was used for the piers, abutments, wings, seats and superstructure by the builders of this two span bridge in Stark County. The two segment arches, totalling 105 feet, carry Cherry Avenue across the East Branch of Nimishillen Creek in Canton. Ornamental touches on the balustrade are evidence of the imaginative use of the material by the builders.

Athens County
County Road 28C
Crosses Monday Creek
UTM Coordinates -17/405260/4364840

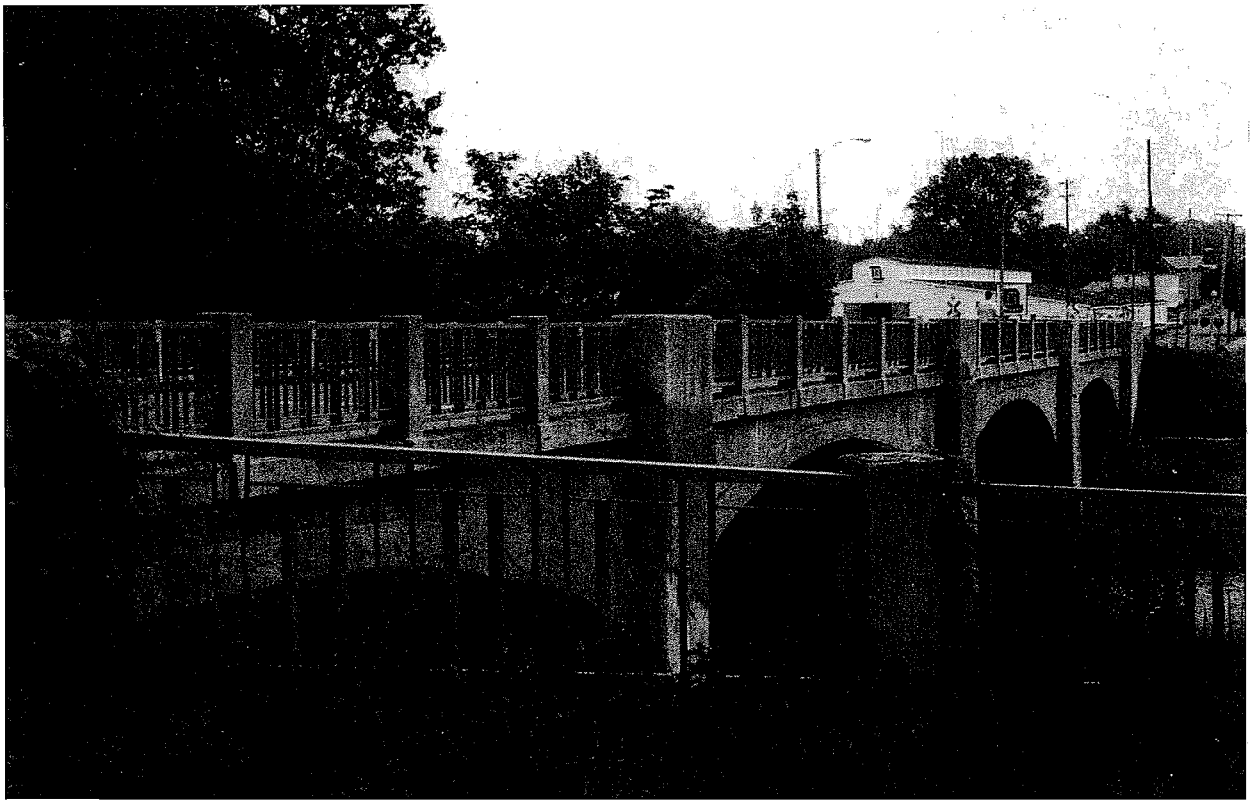
Warren polygonal chord pony truss
Builder: Unknown
Constructed: 1950
Structure File No. 0544272



The Warren truss is named for a British engineer, James Warren. It is a favorite railroad bridge truss and one of the most economical to build. Even though in the late 19th and early 20th century the Pratt truss commonly was used in Ohio to span small streams, during the 1940s the Warren truss surpassed the Pratt design in popularity. This bridge is rustoleum red in color, has stone abutments with concrete caps, a wood deck and welded connections.

Springfield, Clark County
County Route 203
Crosses Buck Creek
UTM Coordinates -17/261200/4423600

Concrete filled arch
Builder: Unknown
Constructed: 1950
Structure File No. 1260693



The four segmental arches of this concrete bridge total 267 feet. It carries County Route 203 across Buck Creek in Springfield. Constructed in 1950, the piers, abutments, wings, seats and railing posts all are concrete demonstrating the continued popularity of this material with bridge designers. Concrete bridges were built where formerly stone bridges were used and have similar engineering characteristics. Concrete, a carbonate-based substance, is subject to the same deteriorating effects of environmental acids as are such carbonate building stones as limestone and dolomite.

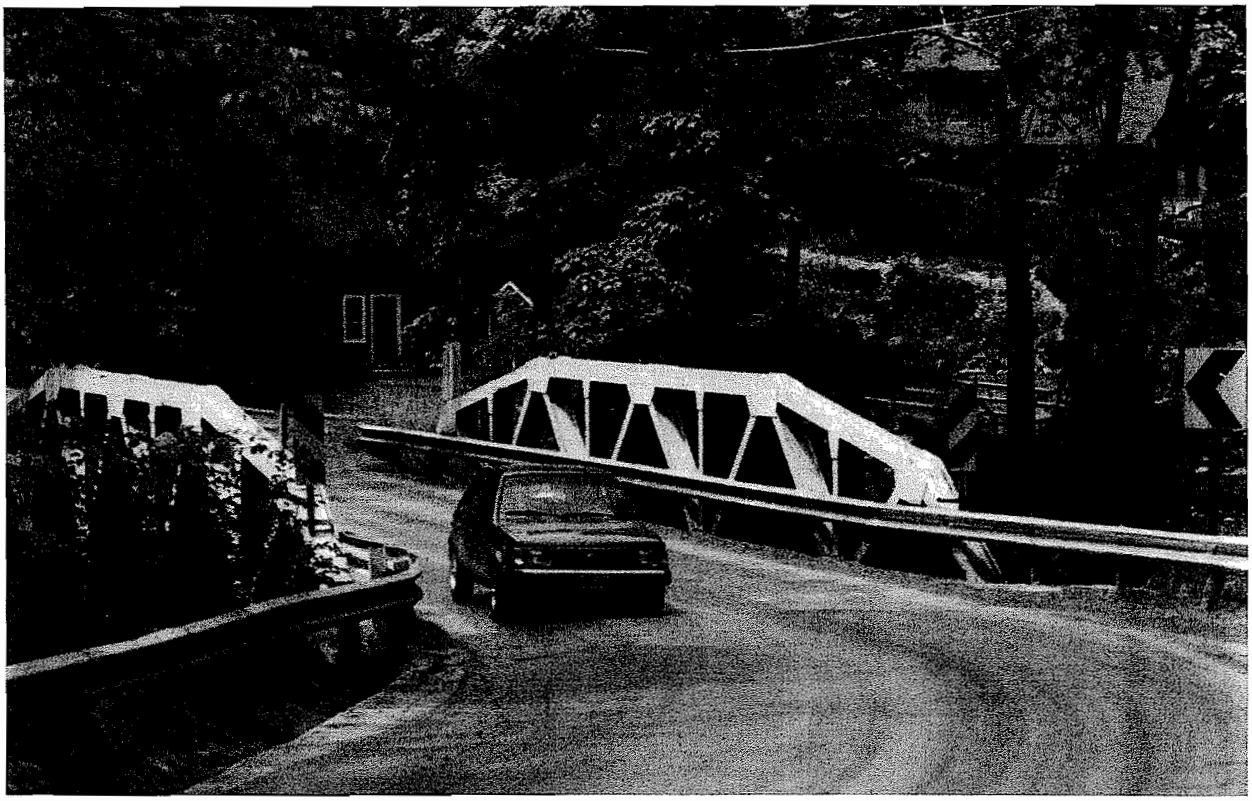
Columbiana County
Township Road 914
Crosses West Fork of Little Beaver Creek
UTM Coordinates -17/528090/4506320

Warren polygonal chord pony truss
Builder: Unknown
Constructed: 1950
Structure File No. 153764

Small and medium-size structures represent the majority of bridges built and engineers were particularly concerned with keeping construction costs down as the dollar was declining in value. One great saving was simplification of detail in the bridge design. Maximum duplication in bridge building reduced the amount of labor, materials and complications for the contractors. The Warren polygonal chord pony truss bridge was a popular design at this time. It was simple, functional and durable as the survival of so many of these bridges shows. This bridge, 102 feet in length, has steel beam top chords, end posts, bottom chords, posts and diagonals. Wings and abutments are stone; seats are concrete and the deck is wood.

Willoughby Hills, Lake County
Maple Grove Road
Crosses Unnamed Stream
UTM Coordinates -17/463780/4605900

Warren polygonal chord pony truss
Builder: Unknown
Constructed: 1950
Structure File No. 4352068



As workers and materials became increasingly available after the war, more bridges were built each year. Bridge designers, mindful of the population increase (post war baby boom trend toward two-car families) and increased truck traffic, saw the need to design bridges that were adequate not only for current requirements but for future demands. Bridges narrower than the roadway no longer were considered adequate and building bridges as wide as the adjacent roadway was considered to be worth the extra cost. This Warren polygonal chord pony truss in Lake County has an overall length of 101 feet and a width of 22 feet. The bottom chords are steel I-beams and connections are welded. It was rehabilitated in 1968.

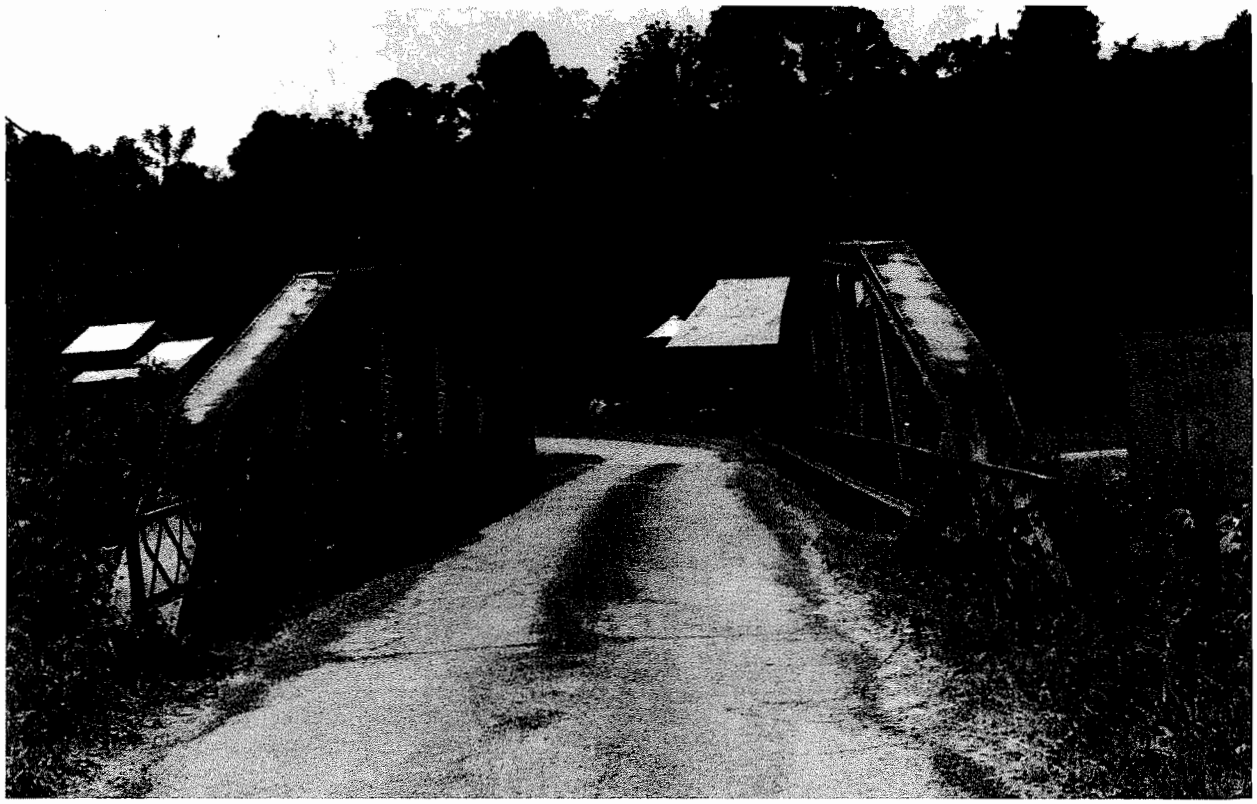
Mercer County
Celina-Mendon Road
Crosses Twelve Mile Creek
UTM Coordinates -16/709720/4502800

Warren polygonal chord pony truss
Builder: Unknown
Constructed: 1950
Structure File No. 5457173

By 1950 welding was used to fasten longer span pony trusses as shown in this 100 foot span that crosses Twelve Mile Creek in Mercer County. Connections are welded with one gusset plate on each side in the middle of the bridge. The bottom chords, posts and diagonals are I-beams; the abutments are stone and concrete and the wings are concrete.

Morgan County
County Road 79
Crosses West Branch of Wolf Creek
UTM Coordinates 17/424600/4375040

Warren polygonal chord pony truss
Builder: Unknown
Constructed:1950
Structure File No. 5834686



Length of span, indicating increased confidence in modern techniques and materials, distinguishes this Warren polygonal chord pony truss built in 1950. The bridge crosses the West Branch of Wolf Creek in Morgan County with a single span of 90 feet. Only a few years before it probably would have been two spans of 45 feet each. The use of riveted connections in the bridge's construction shows that welding did not totally replace this well-established method of fastening.

Scioto County
County Road 277
Crosses Ginat Stream
UTM Coordinates -17/340420/4276190

Pratt pony truss
Builder: Champion Bridge Co.
Re-Constructed: 1950
Structure File No. 7332270

Invented by Caleb and Thomas Pratt, a father-and-son engineering team, the Pratt truss was originally a wood-and-iron combination. It is the reverse of the Howe in that the iron is used for the diagonals rather than in tension. The Pratt design is not as economical as the Howe because the vertical members are shorter than the diagonals. At the time of the Pratt invention, iron was more expensive than wood. This Pratt pony has stone block abutments and wings. It has a metal deck with asphalt overlay, steel, double channel top chords and end posts, and riveted connections. Although its original location is unknown, it is obvious that this is an older bridge that has been moved here.

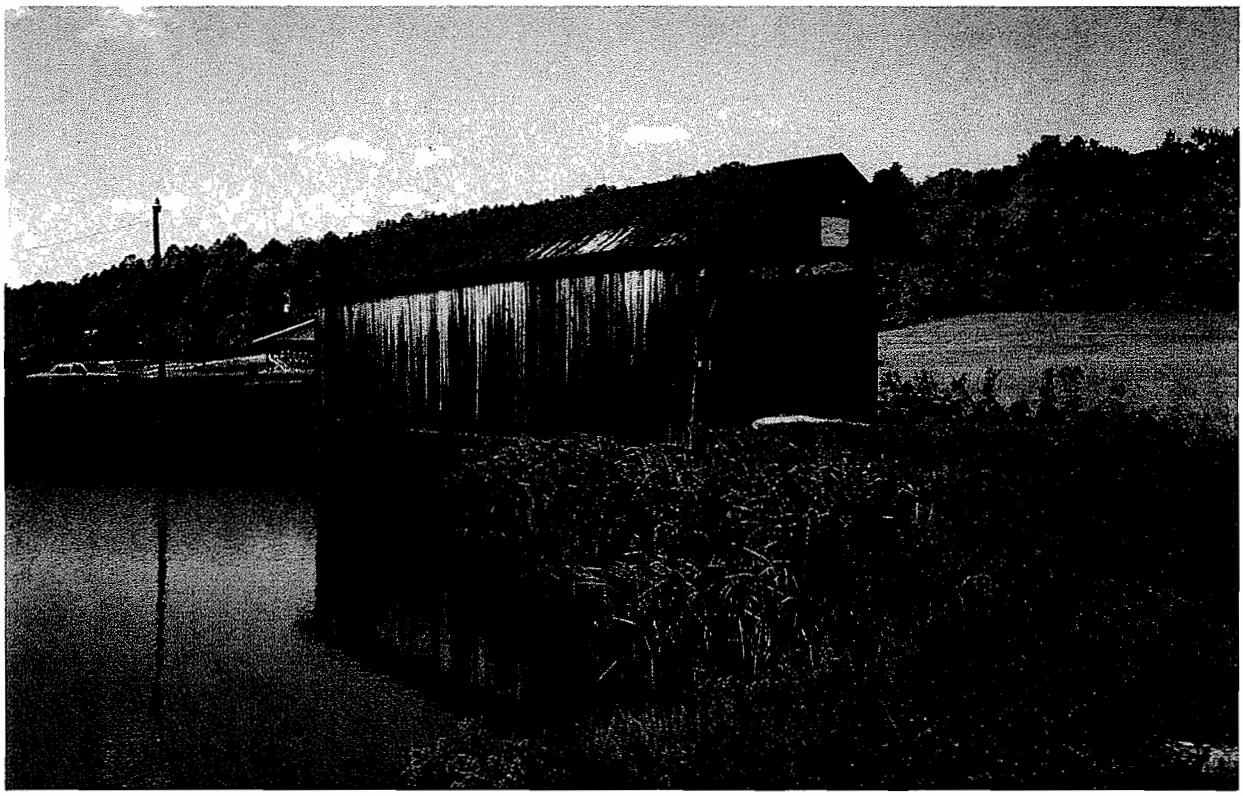
Seneca County
Township Road 75
Crosses Indian Creek
UTM Coordinates -17/323100/4568480

Concrete filled arch
Builder: Unknown
Constructed:1950
Structure File No. 7443943

Concrete was used for the abutment wings and parapets of this single span arch built in 1950. Incising on the parapet shows the decorative possibilities of concrete as a building material. The arch is 22 feet from spring line to spring line and the overall length is 32 feet. The bridge carries Township Road 75 across Indian Creek in Seneca County.

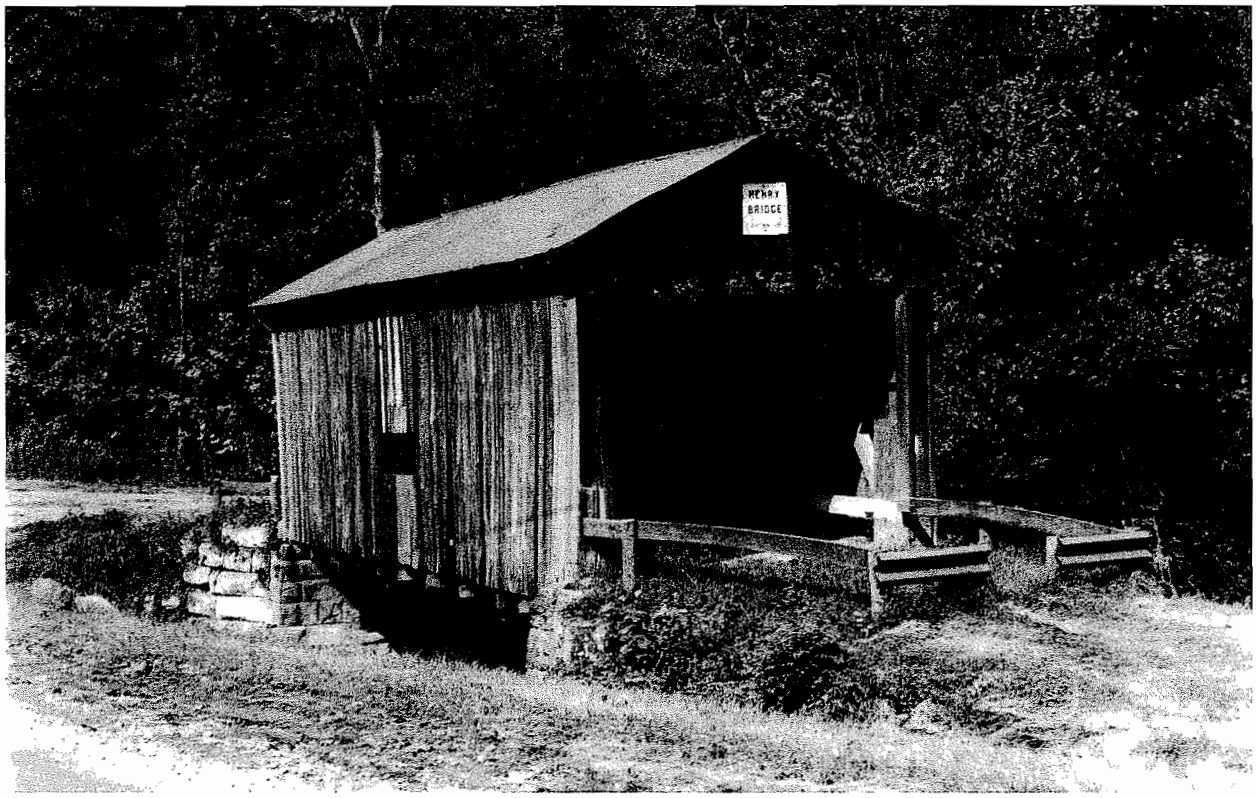
PART III

COVERED BRIDGES



CHAPTER 8

WOODEN TRUSS DESIGNERS and BUILDERS



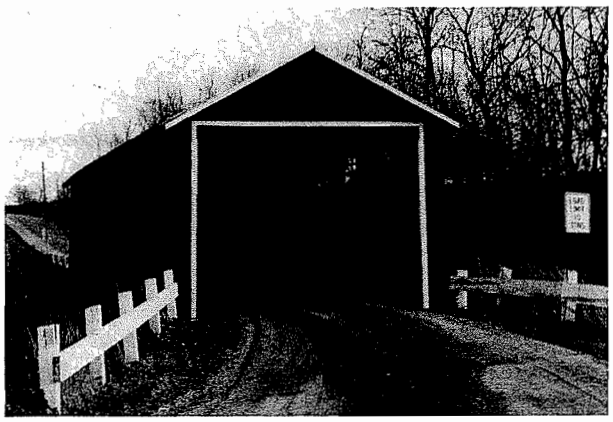
Many of the early wooden bridges built in the Ohio wilderness were beam-stringer types with no trusses, no roofs and often no guardrails. Later, some bridges were built with simple trusses like the kingpost, queenpost and when longer spans were needed, the multiple kingpost. The multiple kingpost wooden truss bridge became the most popular type used in Ohio and these structures frequently included a roof and siding. The validity of the design and the competence of the workmanship is evident in the more than 50 multiple kingpost bridges that still stand in Ohio.

In Ohio, the multiple kingpost truss was named Buckingham truss for Catharinus Buckingham, West Point graduate and adjutant general of Ohio. His father, Ebenezer Buckingham, was one of the owners of the Y-Bridge Company in Zanesville and in 1832, when the old covered Y-Bridge was in need of repair, young catharinus was asked to draw up plans for a new bridge and to supervise its construction. His plans were for a double multiple kingpost truss. This bridge and its builder were so admired in Ohio that from the 1830s on, county commissioners would request the Buckingham truss when they

wanted a simple, sturdy multiple kingpost bridge. Although the Y-Bridge was a double multiple kingpost bridge, most multiple kingpost bridges used single truss members. Another reason this simple truss was so popular was that it was not patented and no royalties were necessary for its use. From 1809 to 1919, hundreds of models of this simple truss were built at prices ranging from $4.50 to $12 per linear foot. Many Ohio bridge contractors built their reputations using the Buckingham truss.

In 1806, New Englander Theodore Burr was granted a patent for a simple wooden bridge truss using arches fastened to the trusses and anchored into the abutments. Many were built in the eastern United States. Those built in

Ohio resembled the multiple kingpost with arches. Only two true Burr trusses remain today in Ohio, one in Coshocton County and one in Preble County. Many Ohio multiple kingpost trusses were strengthened by the addition of arches and these arches were usually, but not always, built with their ends resting on the lower chords instead of the foundations.

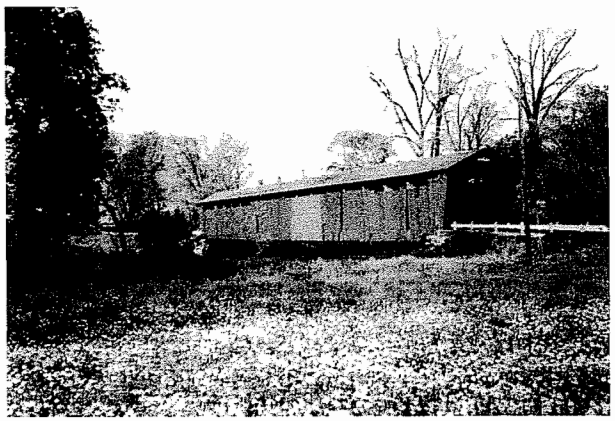


Martinsville Road Bridge

In 1830 a new all-wooden bridge truss was patented by Colonel Stephen H. Long of the United States Army Topographical Engineers. The 1830 Long truss used in Ohio was simplified to a basic multiple kingpost with wooden counterbraces. The majority of the Long trusses in Ohio were built in Washington, Highland and Clinton Counties. Highland County Commissioners specified the use of "Long's Improved Truss Patent" when advertising a bridge project.

Hune Bridge

In 1840, there were changes in wooden bridge construction with the Howe truss patent , a design which used iron rods as the vertical members. Bridges with such trusses could be assembled rapidly and the tension adjusted easily by tightening the bolts on the ends of the iron tension rods. This drew the diagonals firmly against the iron angle blocks which were set against the chords. This new design quickly became popular among the rapidly expanding Ohio railroads and with the builders of Ohio's expanding road system. Seventeen are still in use on Ohio's highways. One of the finest is the Hill's Bridge which crosses the Little Muskingum River in Washington County. This bridge, built in 1878 by the Hocking Valley Bridge Works, was recently bypassed and will be maintained on its original site as an historic structure (p.114).

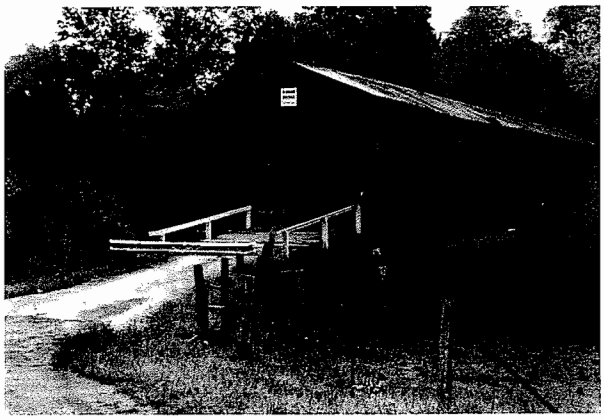


Parker Bridge

Horace Childs of Henniker, Vermont, was a relative of Colonel Long and served as one of his agents. In 1846, Childs patented a wooden bridge truss similar to the Long patent, but it used iron rods as the counterbraces. As far as is known, this truss was used first in 1883 when Everett S. Sherman, used it in the Chambers Road Bridge in Delaware County. In the late 1880s, Sherman moved to Preble County where he built 15 more Childs truss bridges. Seven still stand in excellent condition .

In the third quarter of the nineteenth century the wooden through truss bridge was still the primary type built in Ohio. In 1867 and 1869, the patents issued to Robert W. Smith of Tipp City for his all-wood truss were an important development. Smith designed a bridge with braces set at 45 degrees and counterbraces set at 60 degrees; it was light , yet strong. As far as is known now, the 1867 patent was never used. Smith moved his business to Toledo to take advantage of better transportation facilities and there in his bridge yards, he prefabricated trusses to order, then shipped them by rail or canal to their destination. Agents worked all over the state to promote the Smith truss bridge. Smith continued to improve on his truss design but he never patented these later improvements. The Smith Bridge Company did not limit its offerings to its own truss patent --- it built what the customer wanted: Smith, Howe, Warren, their own wood and iron combination trusses, full-height and pony trusses. Fine examples of the Smith truss still stand in Ohio, Indiana, Pennsylvania and California. An excellent example of the Smith truss is the Buckeye Furnace Bridge in Jackson County (p.103).

The Warren truss built by Smith and other builders, is a simple, lightweight design patented in 1838 by two Englishmen, James Warren and T. W. Morzani. The timbers are placed in a W arrangement with no rods or panel posts. The Warren truss was used most in iron and steel bridges, but also was used in timber bridges to a limited extent. Ohio had at least 20 Warren trusses and of the three remaining, the prime example is the 80 foot Warren truss bridge belonging to the Southern Ohio Covered Bridge Association in Muskingum County (p.109). It was built in 1876 by Thomas Fisher for $8 per linear foot.



Rinard Bridge

In 1872 , Reuben L. Partridge of Marysville, Union County, Ohio patented his all-wood bridge truss similar to the Smith truss. The main difference is a special metal bifurcated shoe which is a footpiece added to fasten the ends of the braces at the chords. Partridge was a prolific builder of both his own and other truss designs but only in central Ohio. Six

fine examples of his little-known truss design are still standing including the Bergstresser Bridge in Franklin County built in 1887 by the Columbus Bridge Company (p.124). None of the six remaining examples of the Partridge truss follows the patent closely.

Bridge builders built some unusual trusses in Ohio. Outstanding examples of bridges with innovative designs are found in two wood and iron suspension bridges---John Bright #2 Bridge in Fairfield County and the Germantown Bridge in Montgomery County. The John Bright Bridge was built in 1881 by August Borneman, an immigrant from Prussia who dominated the bridge building trade in Fairfield County for more than a decade (p.169). Borneman owned and operated the Hocking Valley Bridge Works in Lancaster. The Germantown Bridge was built in 1865 by D. H. Morrison who pioneered building combination wood and iron and all-metal bridges (p.101). The John Bright and Germantown Bridges are similar; both have wooden end posts held in position by a wooden upper chord and inverted arches formed of metal eyebars. Metal stirrups are fastened at the joint of the wooden verticals and the metal eyebars. The floor beams are suspended from these stirrups. There are no lower chords. There is a wooden arch in the John Bright Bridge that is butted into the foundation. This arch is probably a later addition. The Germantown Bridge always had a roof but no siding, while the John Bright Bridge was always fully-covered. August Borneman was once in partnership with William Black and it was during this period that references were made to them building a "patented inverted arch". In 1875, William Black was issued a patent for an all-metal bridge which featured an inverted arch. This design was used successfully by the firm of Black and Borneman and later by Borneman alone for both canal and highway bridges in wood and iron combinations and in all-metal.

Almost every bridge builder in Ohio had his favored form of the combination truss by the 1880s and these usually featured wooden end posts, top chords and intermediate verticals with iron tension rods. The combination truss was a popular choice for use on Ohio's railroads, too.

(See Appendix B for list of covered bridge builders.)

(Martinsville Road Bridge picture by David Miars, all other photographs by Miriam Wood)

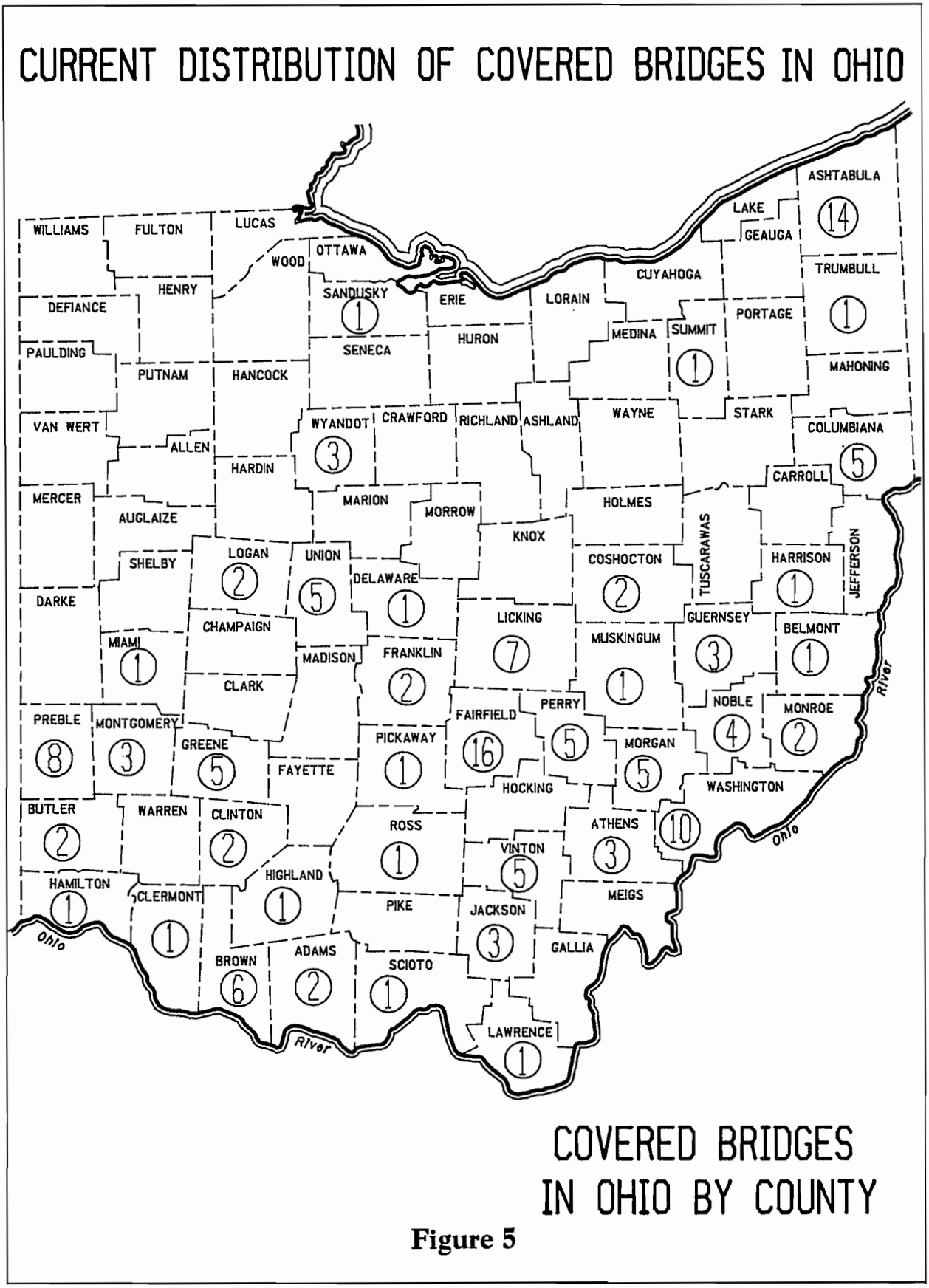

CURRENT DISTRIBUTION OF COVERED BRIDGES IN OHIO
WILLIAMS
FULTON
LUCAS
WOOD
OTTAWA
SANDUSKY
1
ERIE
LORAIN
CUYAHOGA
LAKE
GEAUGA
ASHTABULA
14
TRUMBULL
1
PORTAGE
HENRY
DEFIANCE
SENECA
HURON
MEDINA
SUMMIT
1
MAHONING
PAULDING
PUTNAM
HANCOCK
VAN WERT
ALLEN
WYANDOT
3
CRAWFORD
RICHLAND
ASHLAND
WAYNE
STARK
COLUMBIANA
5
HARDIN
MERCER
AUGLAIZE
MARION
MORROW
KNOX
HOLMES
CARROLL
SHELBY
LOGAN
2
UNION
5
DELAWARE
1
COSHOCTON
2
TUSCARAWAS
HARRISON
1
JEFFERSON
DARKE
CHAMPAIGN
LICKING
7
GUERNSEY
3
BELMONT
1
MIAMI
1
MADISON
FRANKLIN
2
MUSKINGUM
1
CLARK
PERRY
NOBLE
4
MONROE
2
PREBLE
8
MONTGOMERY
3
GREENE
5
FAYETTE
PICKAWAY
1
FAIRFIELD
16
5
MORGAN
5
HOCKING
WASHINGTON
BUTLER
2
WARREN
CLINTON
2
ROSS
1
VINTON
5
ATHENS
3
10
HAMILTON
1
CLERMONT
1
HIGHLAND
1
PIKE
JACKSON
3
MEIGS
GALLIA
BROWN
6
ADAMS
2
SCIOTO
1
LAWRENCE
1
Ohio River
Ohio River
COVERED BRIDGES
IN OHIO BY COUNTY

Figure 5

CHAPTER 9

COVERED BRIDGES

Covered bridges are a significant part of transportation history. Recently, transportation experts, business groups and public minded citizens have recognized the importance of preserving these reminders of the past. Like the covered wagons and horse drawn carriages of both memory and movie images, covered bridges figure in literature and pictorial history. Ohio has made great strides toward the preservation of its covered bridges and, to the extent possible, documentation of their individual histories.

In 1809, the first documented wooden through truss bridge was built over Little Beaver Creek in Columbiana County. The daily log of a riverboat captain noted the bridge under construction. The first large, well-known, wooden through truss bridge was built in 1817 over the Scioto River near Chillicothe. Although iron was used in some early bridges, it was not common due to the difficulty and expense involved in transporting it from the East. At that time, the cheapest long span bridges usually were covered with a roof and siding to protect the trusses from weather.

Research has shown that more than 3,000 wooden truss and combination truss bridges,

covered and uncovered, were built in Ohio to serve highways, railroads and canals. In 1937 there were approximately 747 covered bridges. The first Ohio covered bridge listing, published in 1953 by the Ohio Historical Society's Ohio Covered Bridge Committee, showed a total of 353-1/2 covered bridges--the 1/2 shared by Preble County, Ohio, and Union County, Indiana. This 1953 list showed a loss of 393 bridges in 16 years. Each succeeding updated covered bridge listing showed a steady decline in the number of these historic spans. Many of the bridges were lost to vandalism, especially arson. Others were removed or bypassed by transportation experts because the narrow old covered bridge no longer was a viable option for carrying modern traffic except on little used back roads.

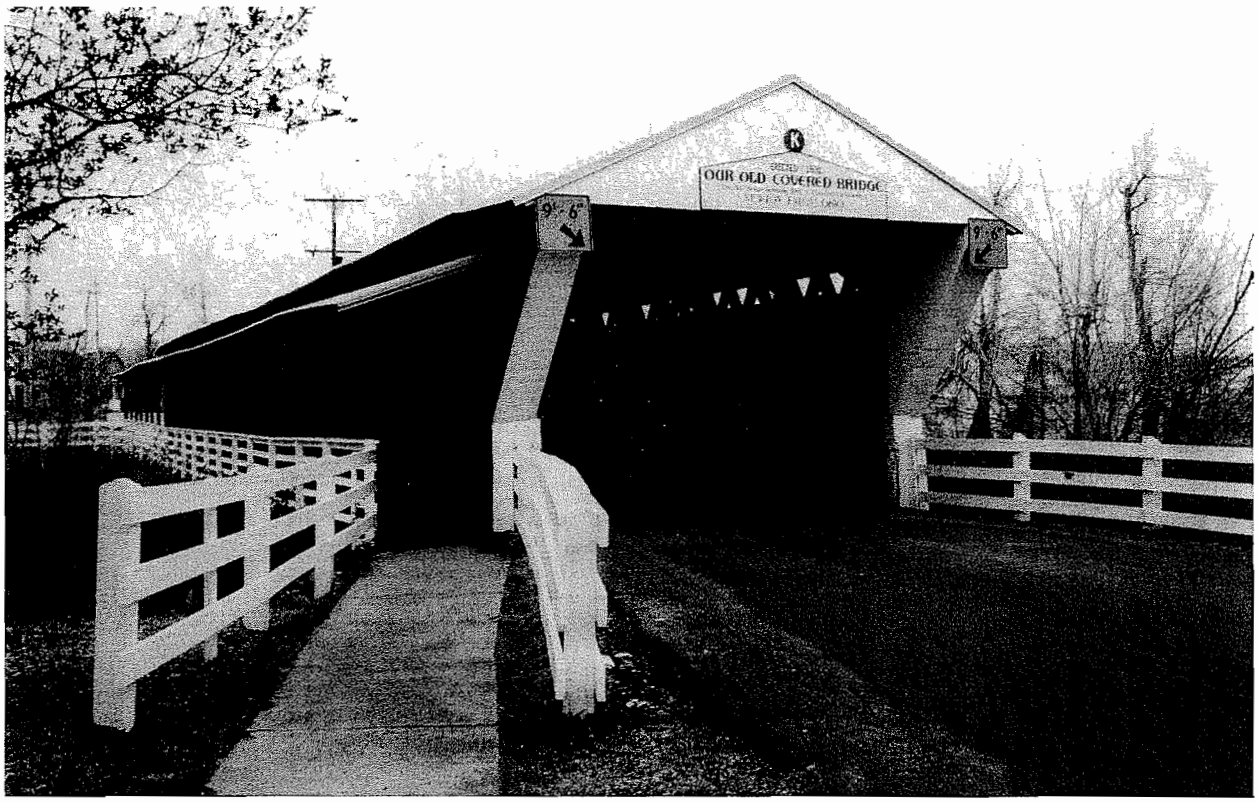
The 1961 Ohio Covered Bridge Map showed a total of 226 covered bridges but from that point on fewer bridges were removed. This was due largely to the efforts of the Ohio Covered Bridge Committee (OCBC) and the Southern Ohio Covered Bridge Association (SOCBA) which were active in the promotion of covered bridge preservation and made every effort to reach county officials and the public to educate them on the value of these historic spans. Also striving for the preservation of Ohio's remaining covered bridges were concerned county officials and the Northern Ohio Covered Bridge Association.

As of this printing there are 139 covered bridges in Ohio (Figure 5). It should be noted that this list includes the Roberts Bridge built in 1829 which was badly damaged by fire in 1986. Seventy of Ohio's covered bridges still carry traffic. Twenty-four have been moved to college campuses, fairgrounds or parks and 11 are now on private property. The rest are still on the original sites and some of these have been abandoned and receive no maintenance.

In this chapter we will present a selected group of Ohio's covered bridges. Selections are based on National Register status or eligibility for the National Register, truss type, builder and historic integrity. In the information given on each bridge there is an OCBC number given for the bridge. The numbering system used for Ohio's covered bridges and now in use world-wide was developed in the 1940s by John A. Diehl, chairman of the Ohio Covered Bridge Committee. The first number (35) stands for Ohio, the next number (for example 01) is for county and the final number is that assigned to the specific bridge. This numbering system is effective in keeping track of these historic structures. Many covered bridges have names, often taken from early landowners. Sometimes more than one covered bridge will be known as Smith Bridge (for example). No two bridges ever have the same number.

Newton Falls, Trumbull County
Arlington Avenue
Crosses East Branch Mahoning River
OCBC No. 35-78-01
UTM Coordinates-17/502400/4559410

Newton Falls Bridge
Town lattice truss
Builder: Unknown
Constructed: 1831
Structure File No. 7830165
National Register



This venerable structure is the second oldest wooden truss bridge in Ohio. It is a wood pin-connected lattice truss from a patent issued in the 1820s to Ithiel Town of Connecticut. The bridge has served this community well for nearly 160 years. Renovations include installation of steel piers in the 1960s. The sidewalk was added in 1923 so school children could safely use the bridge. The Newton Falls Bridge is Ohio's only remaining covered bridge in the center of a town.

NW of Okeana, Butler County
Private park road
Crosses gully
Morgan Township
OCBC No. 35-09-02
UTM Coordinates-16/689100/4361110

Bebb Park Bridge
Wernwag truss
Builder: Unknown
Constructed: c. 1850

This truss style was patented in 1829 by Lewis Wernwag, an engineer who immigrated to this country from Germany. The Bebb Park Bridge is the only known Wernwag truss left in Ohio. It is a one span 125 foot bridge moved from Indian Creek, west of Oxford to Bebb Park in 1966. In the Wernwag truss the vertical members are slightly flared outward from the center vertical. The arches are fastened to the trusses and are firmly seated into the abutments. (Miriam Wood, Photographer)

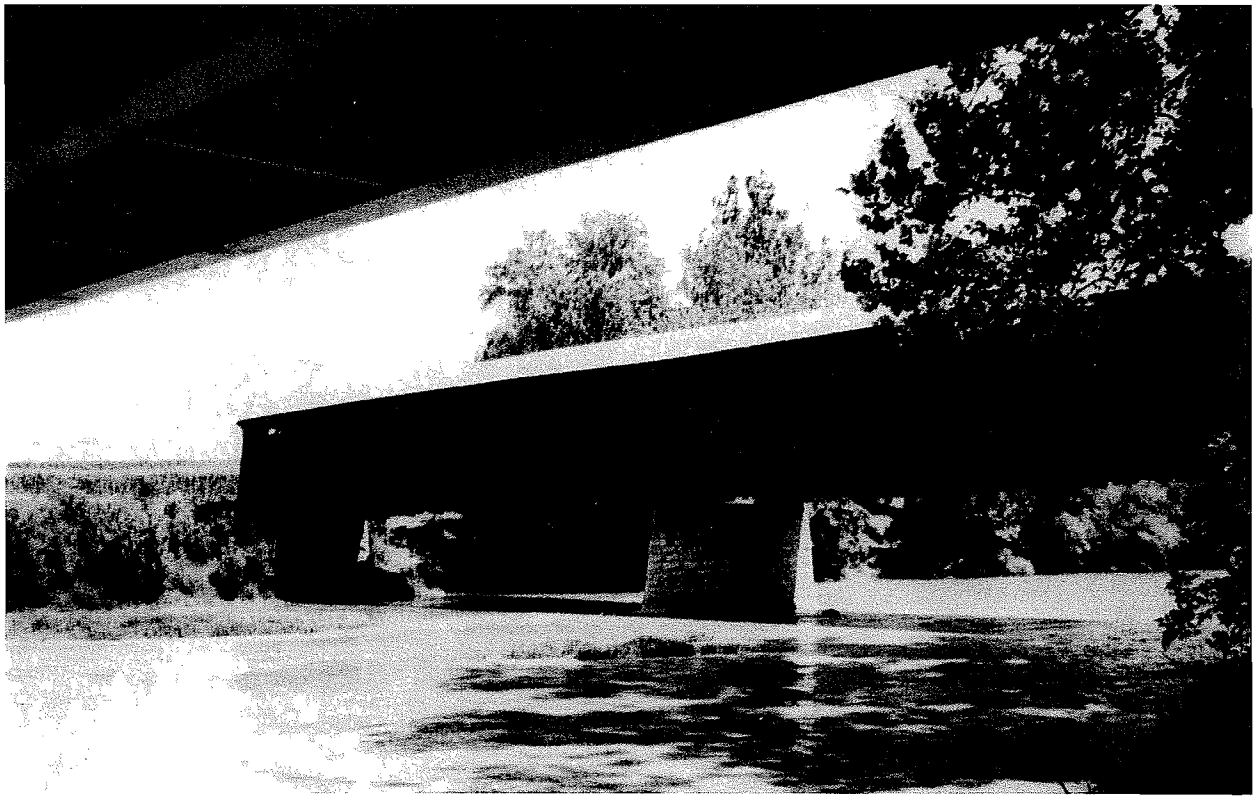
Harshaville, Adams County
County Route 1 (Wheat Ridge Road)
Crosses Cherry Fork
Oliver Township
OCBC No. 35-01-02
UTM Coordinates-17/279420/4309220

Harshaville Bridge
Multiple kingpost truss
Builder: Unknown
Constructed: 1855
Structure File No. 0130192
National Register

The use of the multiple kingpost truss was common in Ohio, because of the simplicity of design and the fact that no patent royalty fees had to be paid. The Harshaville Bridge is a 116 foot one span bridge built with double truss timbers and an extra brace on the center panel. It is considered an outstanding example of this truss design. Built in 1855, this bridge remains in service on a county road. The corrugated metal siding and roof, the laminated arches and the concrete piers were part of a c. 1940 renovation. The steel floor and joists were added about 1960. (Miriam Wood, Photographer)

N of Troy, Miami County
Eldean Road (old section)
Crosses Great Miami River
Concord Township
OCBC No. 35-55-01
UTM Coordinates-17/735320/4439940

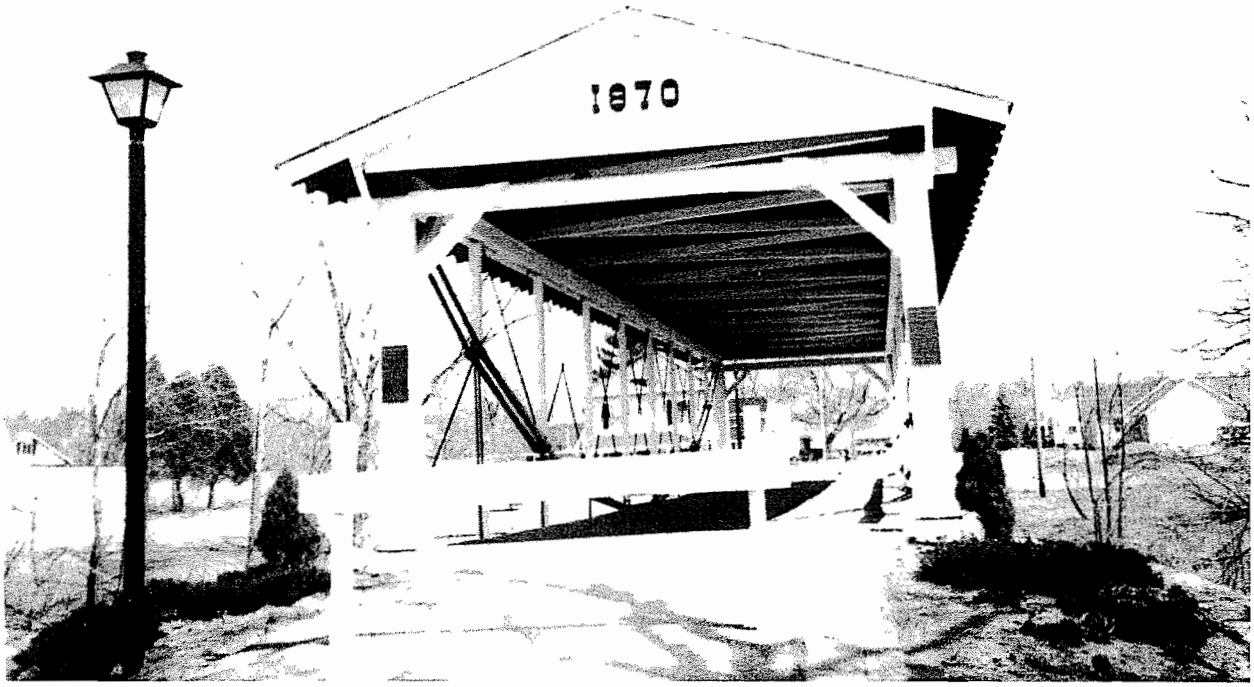
Eldean Bridge
Long truss
Builder: James and
William Hamilton
Constructed: 1860
National Register



The 223 foot two span Eldean Bridge is the second longest covered bridge in Ohio. It is built on the Long truss patented in the 1830s by Colonel Stephen H. Long of the United States Army Topographic Engineers. The well-maintained Eldean Bridge is typical of the Long trusses built in Ohio. It features an all-timber truss with wooden posts, braces and counter braces and the connections are metal. The portals are straight and the roof is metal. The bridge has been in almost continuous use except for a brief period in the 1960s when it was bypassed. To prevent continued vandalism the bridge was reopened to limited traffic. To date this has proven to be an effective deterrent. (Miriam Wood, Photographer)

Germantown, Montgomery County
Center Street (Closed)
Crosses Little Twin Creek
German Township
OCBC 35-57-01
UTM Coordinates-16/726160/4390610

Germantown Bridge
Suspension truss
Builder: D. H. Morrison
Constructed: 1865
Structure File No. 5767172
National Register



Innovative bridge builder D. H. Morrison designed this 110 foot suspension truss to span Little Twin Creek. The bridge collapsed under a threshing rig in 1911 and was moved to Center Street in Germantown. It has undergone two major rehabilitations, the last one the result of an accident. A dedicated local committee completed the renovation and the bridge is now maintained as an historic site. Unlike the usual covered bridge, the Germantown Bridge has never been sided. (Recent research indicate the bridge was built in 1865). (Miriam Wood, Photographer)

N of Oxford, Butler County
Abandoned section of SR 732
Crosses Four Mile Creek
OCBC No. 35-09-03
UTM Coordinates- 16/689100/4361110

Black/Pugh's Mill Bridge
Long truss
Builder: Unknown
Constructed: c. 1870
National Register

The Black Bridge is a heavily-built two span, 206 foot Long truss built about 1870. The truss design was patented in the 1830s by Colonel Stephen H. Long. The Long truss is a multiple kingpost with wooden counter braces. Iron tension rods have been used on the center panels of the Black Bridge in place of the wooden counter braces. The Long truss was once popular in southwestern Ohio and the Black Bridge is one of the few covered bridges using this truss design still standing today. (Miriam Wood Collection)

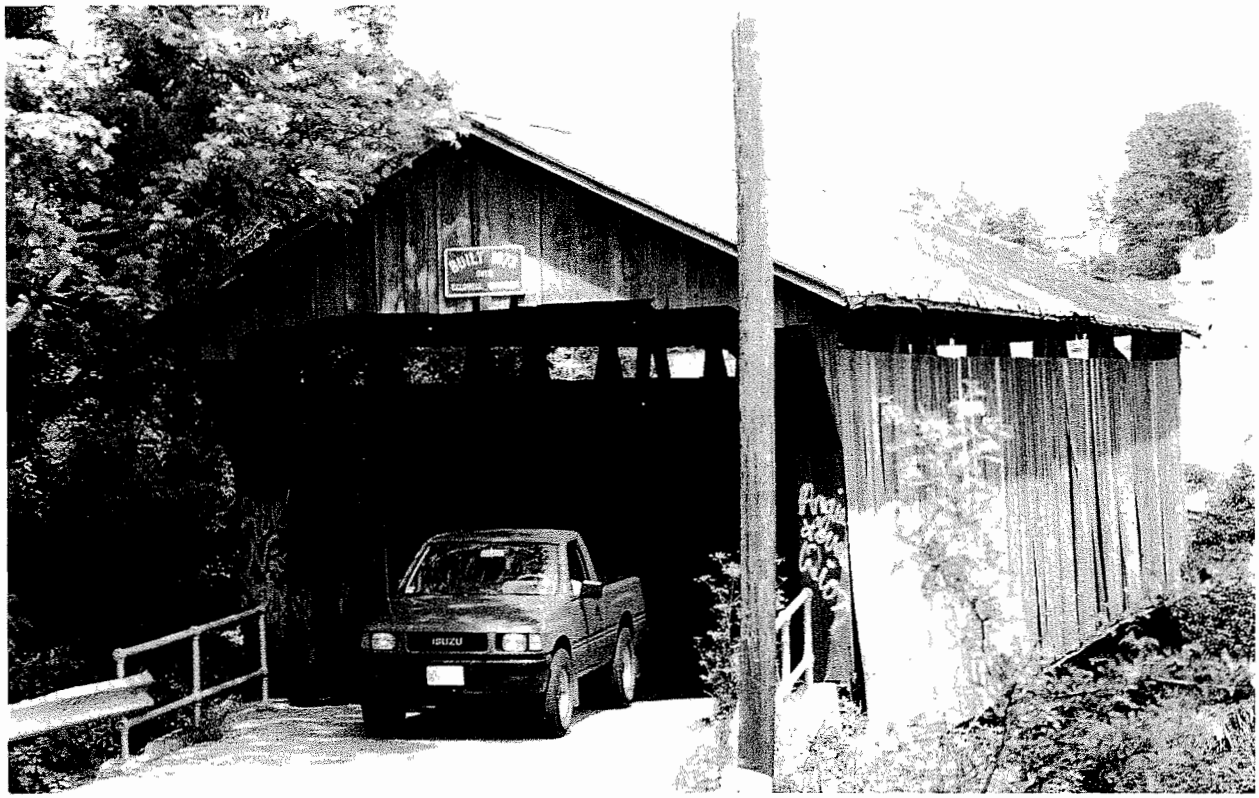
Buckeye Furnace, Jackson County
Township Route 165
Crosses Little Raccoon Creek
Milton Township
OCBC No. 35-40-11
UTM Coordinates-17/373700/4323600

Buckeye Furnace Bridge
Smith truss
Builder: Smith Bridge Co.
Constructed: 1872
Structure File No. 4032292
National Register

The Buckeye Furnace Bridge is an excellent example of the Smith truss built by the Smith Bridge Company of Toledo, Ohio. It is a type three variation of the 1869 Smith patent. In this variation two diagonals were added to the center panel. This all-timber truss features braces set at 45 degrees and counters set at 60 degrees. The bridge is in good condition and carries daily traffic. It is a valuable historical asset to the restored Buckeye Furnace Village nearby. (Miriam Wood Collection)

W of South Salem, Ross County
County Route 54
Crosses Buckskin Creek
OCBC No. 35-71-02
UTM Coordinates-17/300510/4356200

South Salem/Buckskin Bridge
Smith truss
Builder: Smith Bridge Co.
Constructed: 1873
Structure File No. 7132603
National Register



For nearly 120 years, this bridge has served the village of South Salem. The one span bridge is a well-maintained and attractive 99 foot Smith truss. It is a product of the well-known Smith Bridge Company, a firm that built hundreds of bridges in Ohio and the eastern United States. Many of these bridges used the truss system patented in 1867 and 1869 by company founder Robert W. Smith. Mr. Smith devised variations on his 1869 patent and while these improvements were never patented, they were used widely . The South Salem Bridge is a fine example of the original 1869 Smith patent.

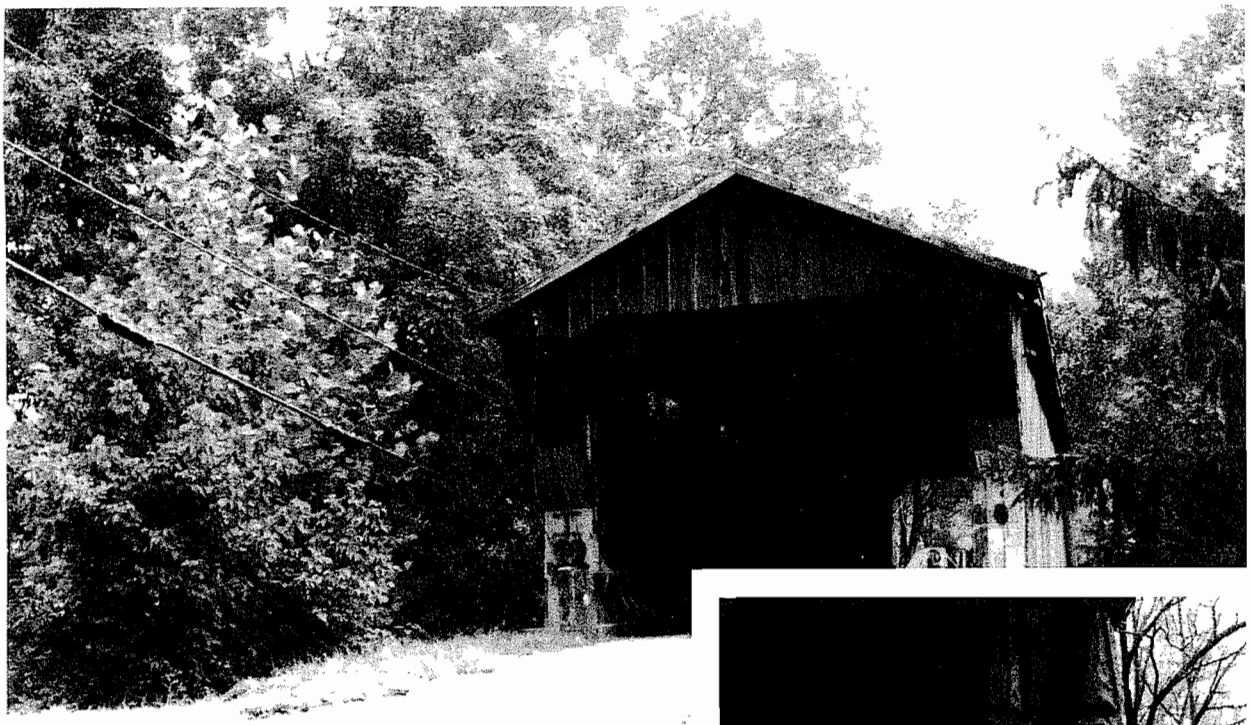
SW of Wilkesville, Vinton County
Township Route 4
Crosses Raccoon Creek
Wilkesville Township
OCBC No. 35-82-06
UTM Coordinates-17/380810/4322760

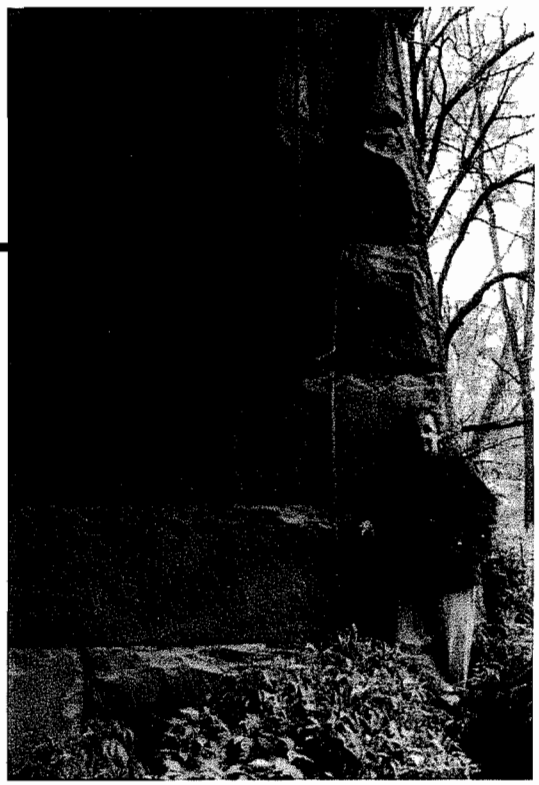
Humpback/Geers Mill/Ponn Bridge
Multiple kingpost with arches
Builder: McGrath and Wells
Constructed: 1874
Structure File No. 8235988
National Register

The Humpback Bridge, one of Ohio's most scenic bridges crosses Racoon Creek in a remote setting in southeast Vinton County. The old structure was built to replace an earlier covered bridge destroyed by arson in May 1874. The Humpback Bridge is a three span, multiple kingpost with double truss timbers and a segmented plank arch on the center span. Its name comes from its curved upper and lower chords. The stone foundations have been reinforced with concrete. (Miriam Wood, Photographer)

W of Otway, Scioto County
Bypassed section of State Route 348
Crosses Scioto Brush Creek
Brush Creek Township
OCBC No. 35-73-15
UTM Coordinates-17/309980/4303520

Otway Bridge
Smith truss with arches
Builder: Smith Bridge Co.
Constructed: 1874
National Register

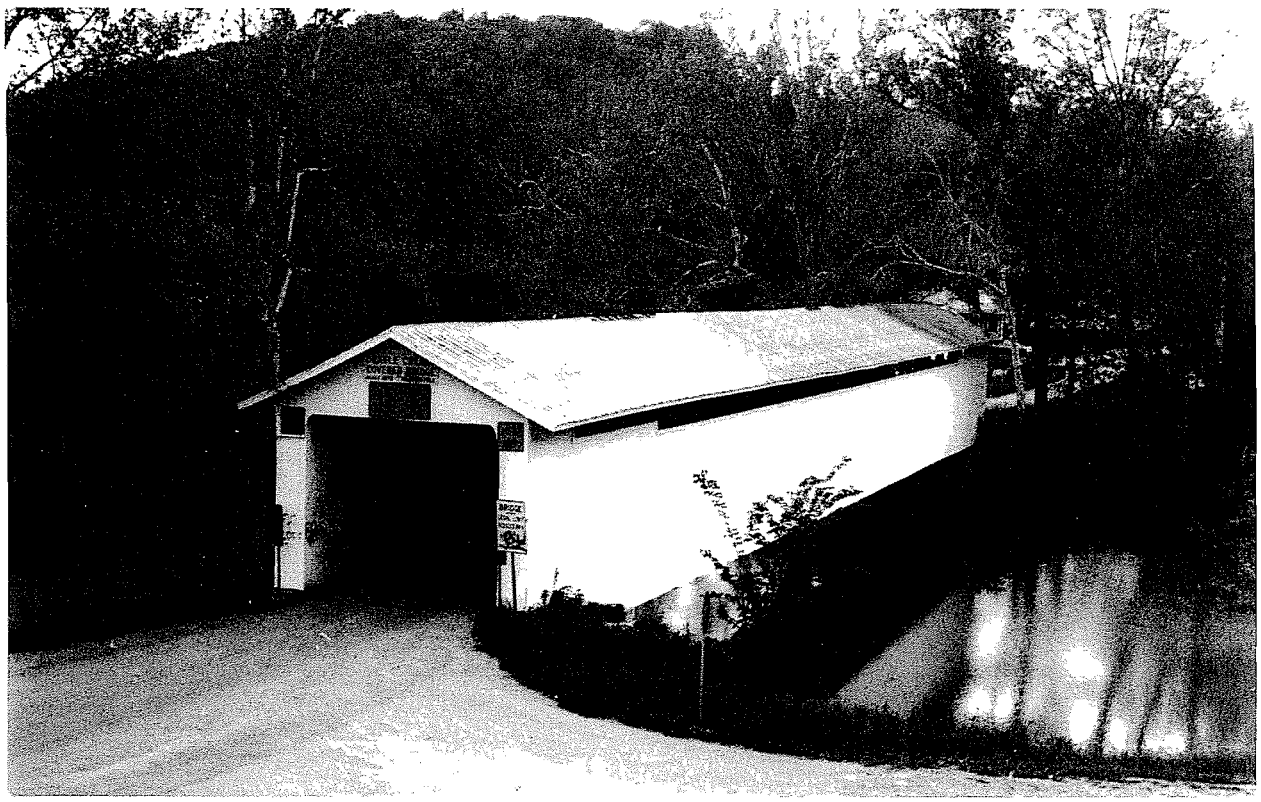




The Otway Bridge is typical of the Smith trusses built by The Smith Bridge Company of Toledo, Ohio. The abutment stones were quarried nearby. It was renovated in 1896 with wooden arches and steel rods. The steel truss on the east end was added in 1923. The bridge was bypassed in the early 1960s and is maintained locally by the Otway Community Institute. It is one span and has an overall length of 126 feet. (Miriam Wood, Top Photograph)

S of Decator, Brown County
State Route 763
Crosses Eagle Creek
Huntington Township
OCBC No. 35-08-18
UTM Coordinates-17/264110/4293800

Eagle Creek/Bowman Bridge
Smith truss
Builder: Smith Bridge Co.
Constructed: 1875
Structure File No. 0804088
National Register



The Eagle Creek or Bowman Bridge, at 164 feet clear span is the second longest single span covered bridge in Ohio. This structure was built in 1875 on the Smith truss design, using both single and double truss timbers.This is a refinement of the 1867 and 1869 Smith patents which featured single truss members. There were 99 covered bridges on the state highway system in 1940. This figure dropped to 44 in 1951 and to 13 in 1955. In 1973, with the closing of the Kirker Bridge in Adams County, Eagle Creek became the only wooden bridge on the state highway system. Rebuilt in 1952, the bridge is 14 feet 10 inches wide, and has a 10.5 foot clearance. It is built on dry-laid limestone abutments which have been capped with concrete. (William Helsel, Photographer)

NE of Allensville, Vinton County
Township Route 8 (Mt. Olive Road)
Crosses Middle Fork of Salt Creek
Jackson Township
OCBC No. 35-82-04
UTM Coordinates-17/392960/4349510

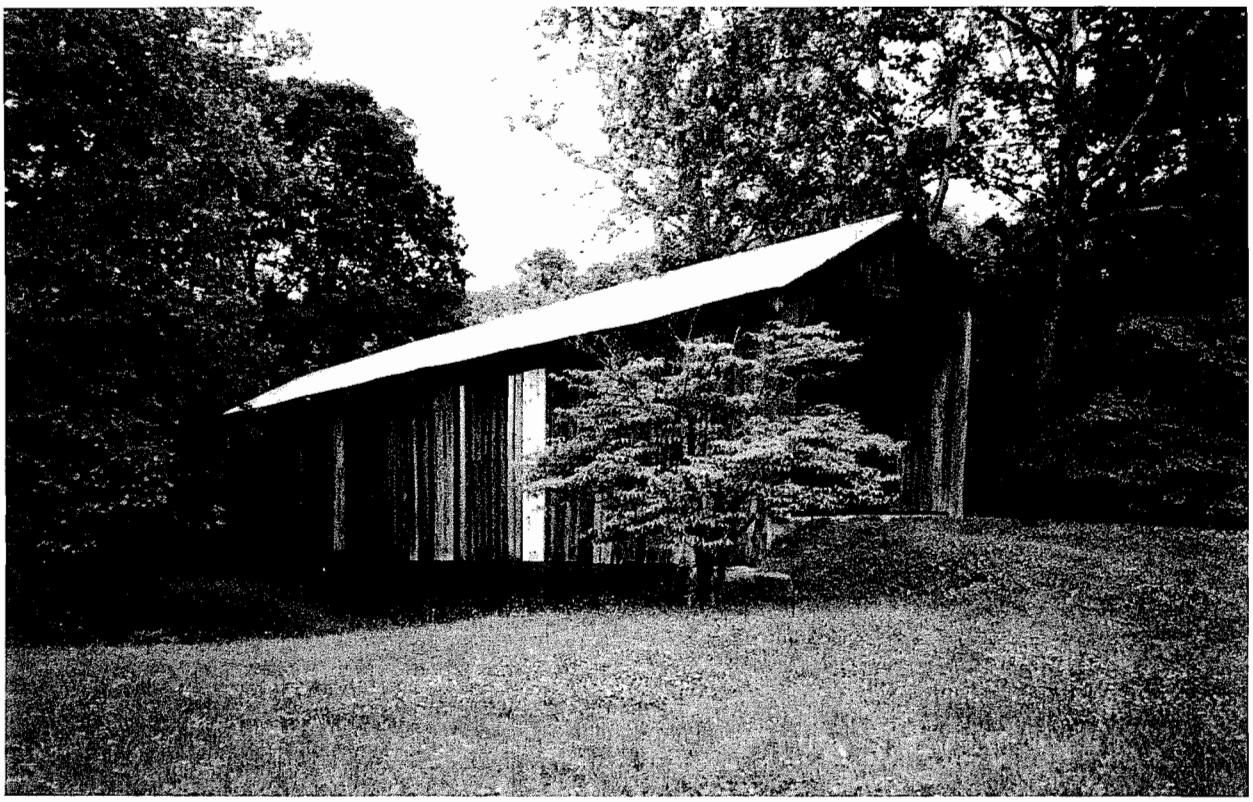
Mt. Olive Road Bridge
Queenpost truss
Builder: George Washington Pilcher
Constructed: 1875
Structure File No. 8234922
National Register

Originally contracted as the stone mason, G. W. Pilcher took over construction of this simple 48 foot queenpost when the builder defaulted on his bond. Pilcher was a well-known mason and bridge builder in Vinton County, specializing in the queenpost design.

There have been renovations made to this bridge over the years, including replacement of some truss timbers and rebuilding of the cut-stone abutments in concrete. (Miriam Wood, Photographer)

WNW of Norwich, Muskingum County
Bypassed section of County Route 82
Crosses Salt Creek
Perry Township
OCBC No. 35-60-31
UTM Coordinates-17/428270/4427780

Salt Creek/Johnson Mill Bridge
Warren truss
Builder: Thomas Fisher
Constructed: 1876
National Register



Thomas Fisher contracted with Muskingum County to build this bridge at Johnson's Mill for $8.00 per linear foot on his "Plan #3". This plan, seldom used in a wooden bridge, turned out to be a Warren truss, a simple triangular design with no truss verticals. The bridge was bypassed in 1953 and in 1960 it was sold to the Southern Ohio Covered Bridge Association (SOCBA), an organization founded for the purpose of maintaining this bridge. The SOCBA has continued to work to educate the public about the historic value of Ohio's covered bridges. (Miriam Wood, Photographer)

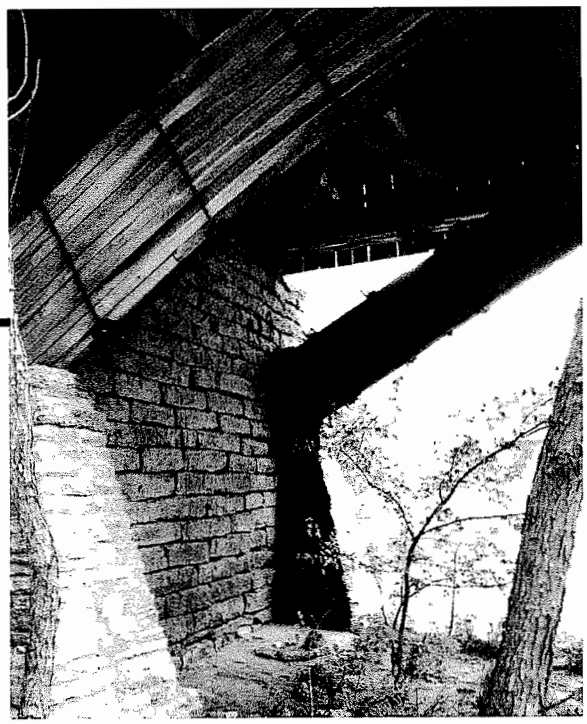
E of Scottown, Lawrence County
County Route 67 (Pleasant Ridge Road)
Crosses Indian Guyan Creek
Windsor Township
OCBC No. 35-44-05
UTM Coordinates-17/379320/4267290

Scottown Bridge
Multiple kingpost truss
Builder: William Thompson
Constructed: 1877
Structure File No. 4441923
National Register

The Scottown Bridge is an unusually heavily built multiple kingpost truss with cross braces on the two center panels and a segmental arch on each side. The bridge is heavily reinforced with steel rods, cables and channels that were added in 1934. These probably were added because of damage which occurred to the bridge during a flash flood in 1931. The metal roof was added in 1973. The Lawrence County Engineer is planning to rehabilitate the bridge and keep it in service. (Miriam Wood, Photographer)

SW of New Hope, Brown County
Bypassed section of Bethel -New Hope Road
Crosses Whiteoak Creek
Scott Township
OCBC No. 35-08-05
UTM Coordinates-17/249360/4316110

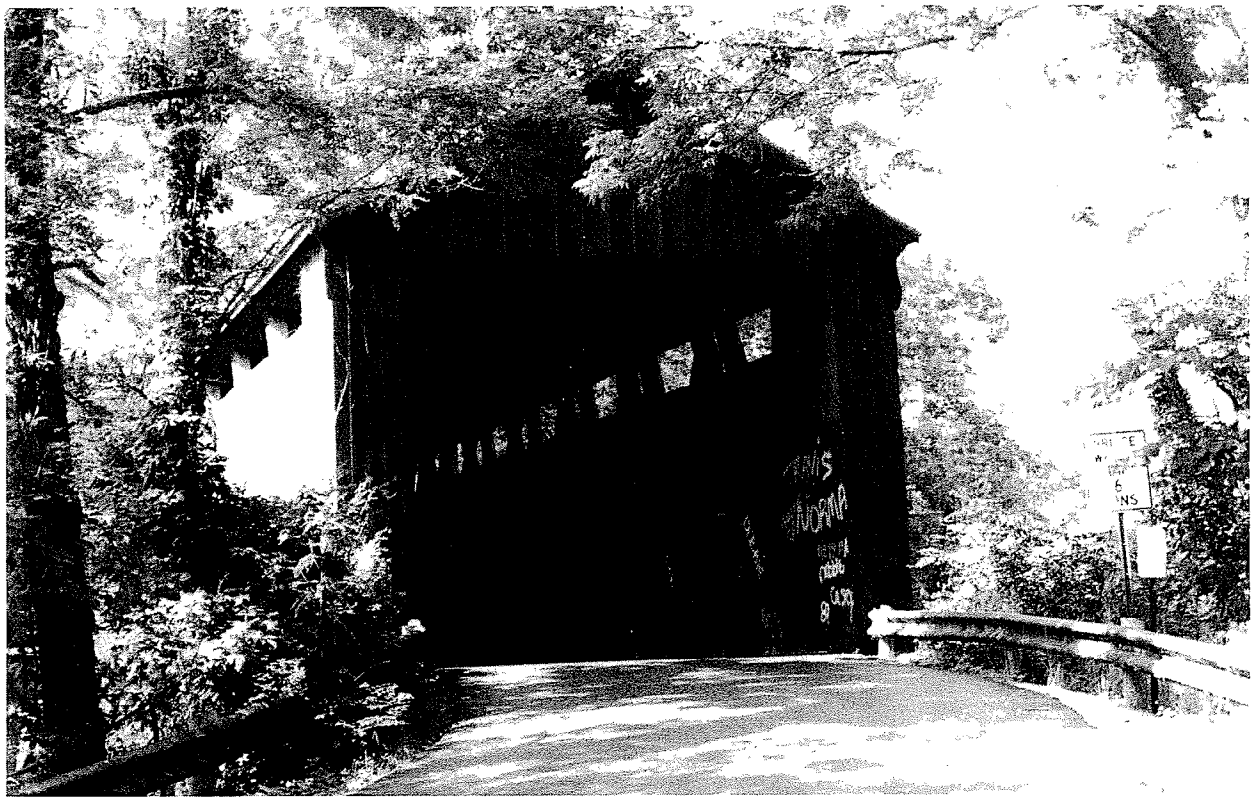
Bethel-New Hope Bridge
Howe truss
Builder: Josiah Bryant
Constructed: 1878



At 177 feet clear span, the Bethel-New Hope Road covered bridge is Ohio's longest single span covered bridge. The bridge is a 20 panel Howe truss.The laminated arches were added in 1902. The Bower Bridge Company of Flemingsburg, Kentucky rebuilt this bridge in 1932 and again in 1977. The structure was bypassed a few years ago and is now closed to traffic. (Preston S. Fettrow, Sr., Photographer)

E of Perintown, Clermont County
County Route 116
Crosses Stonelick Creek
Located 1.25 miles N of US 50
Stonelick Township
OCBC No. 35-13-02
UTM Coordinates-16/743160/4349910

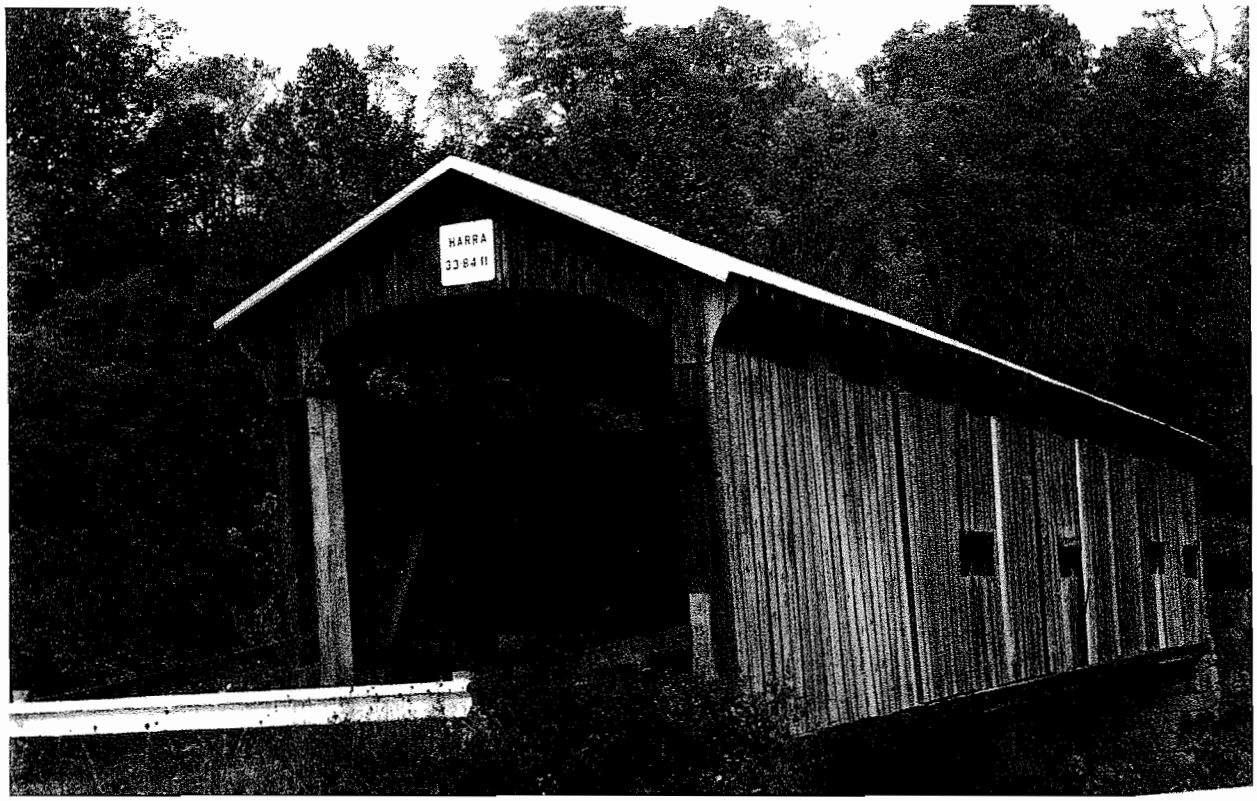
Stonelick/Perintown Bridge
Howe truss
Builder: Unknown
Constructed: 1878
Structure File No. 1359975
National Register



The Stonelick or Perintown Bridge is the last covered bridge in Clermont County and has been in continuous service since it was built in 1878. The Howe truss design, which features adjustable iron tension rods as the verticals, was used in this 140 foot single span structure. (Miriam Wood, Photographer)

NW of Watertown, Washington County
Bypassed off Township Route 172
Crosses South Branch of Wolf Creek
OCBC No. 35-84-11
UTM Coordinates-17/444290/4370880

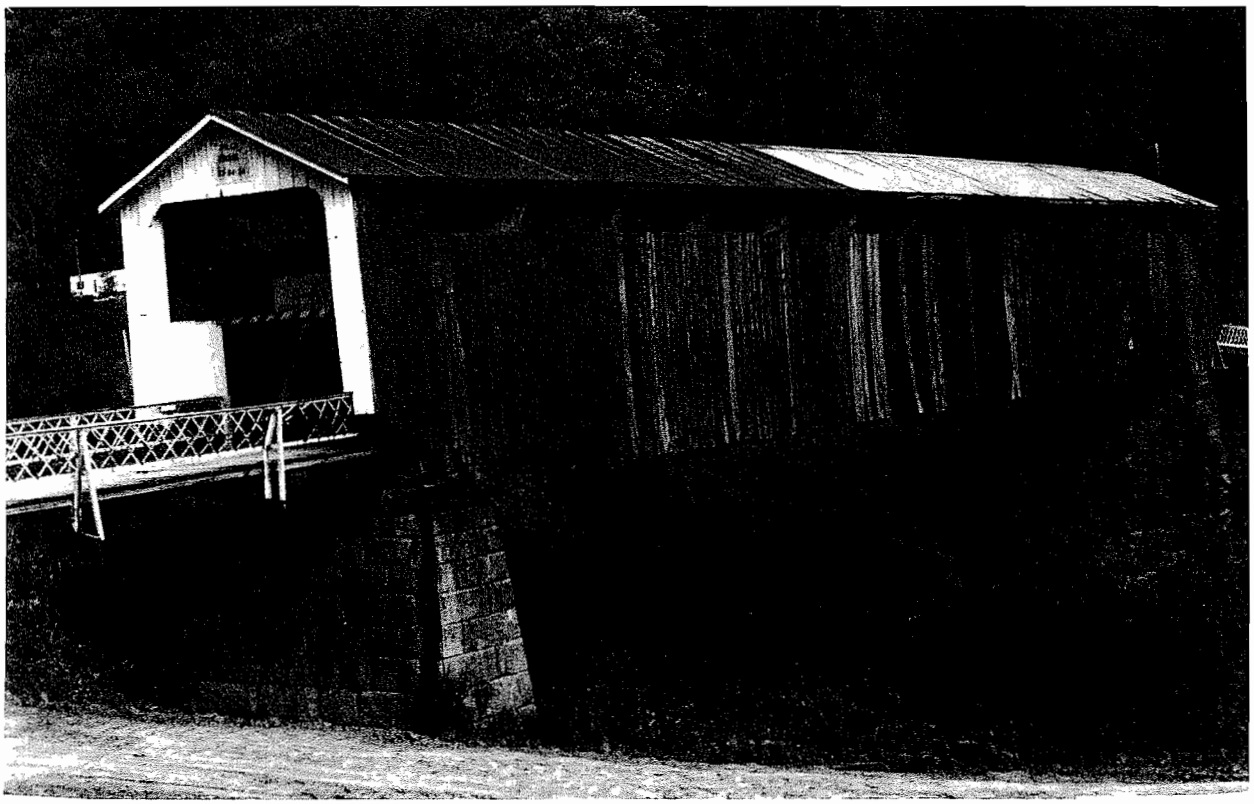
Harra Bridge
Long truss
Builder: Rolla Merydith
Constructed: 1878
Structure File No. 8436215
National Register



Rolla Merydith, a well-known Washington County bridge builder, built the Harra Bridge of yellow poplar for $7.17 per linear foot. The bridge, a ten panel Long truss, uses the design patented in the 1830s by Colonel Stephen H. Long. The Harra Bridge now is bypassed but still owned and maintained by Washington County. (Miriam Wood, Photographer)

E of Marietta, Washington County
County Route 333 (bypassed)
Crosses Little Muskingum River
OCBC No. 35-84-24
UTM Coordinates-17/468860/4364040

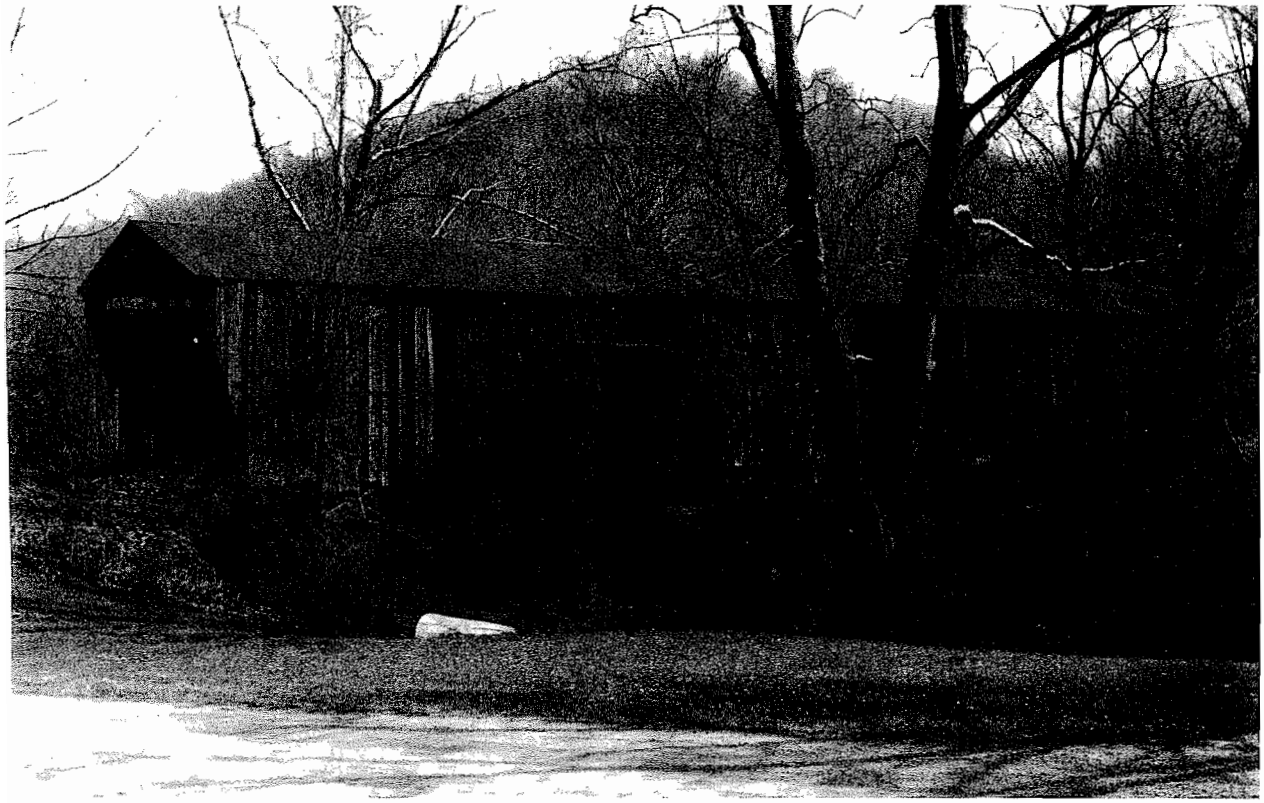
Hills Bridge
Howe truss
Builder: Hocking Valley Bridge Works
Constructed: 1878
Structure File No. 8430799
National Register



This three span bridge is perched high on magnificent cut-stone abutments and piers. Typical of the bridges built to span the Little Muskingham River in Washington County, the main wooden truss of this bridge is reached by short wooden beam spans. The center span is a well-built 12 panel Howe truss constructed by the Hocking Valley Bridge Works. The masonary work was done by Ebenezer B. Henderson. The Hills Bridge now is being bypassed and will be maintained as a historic site. (Miriam Wood, Photographer)

SE of Conesville, Coshocton County
Abandoned Section of
Township Route 274
Crosses Wills Creek
Franklin Township
OCBC No. 35-16-07
UTM Coordinates-17/428140/4446040

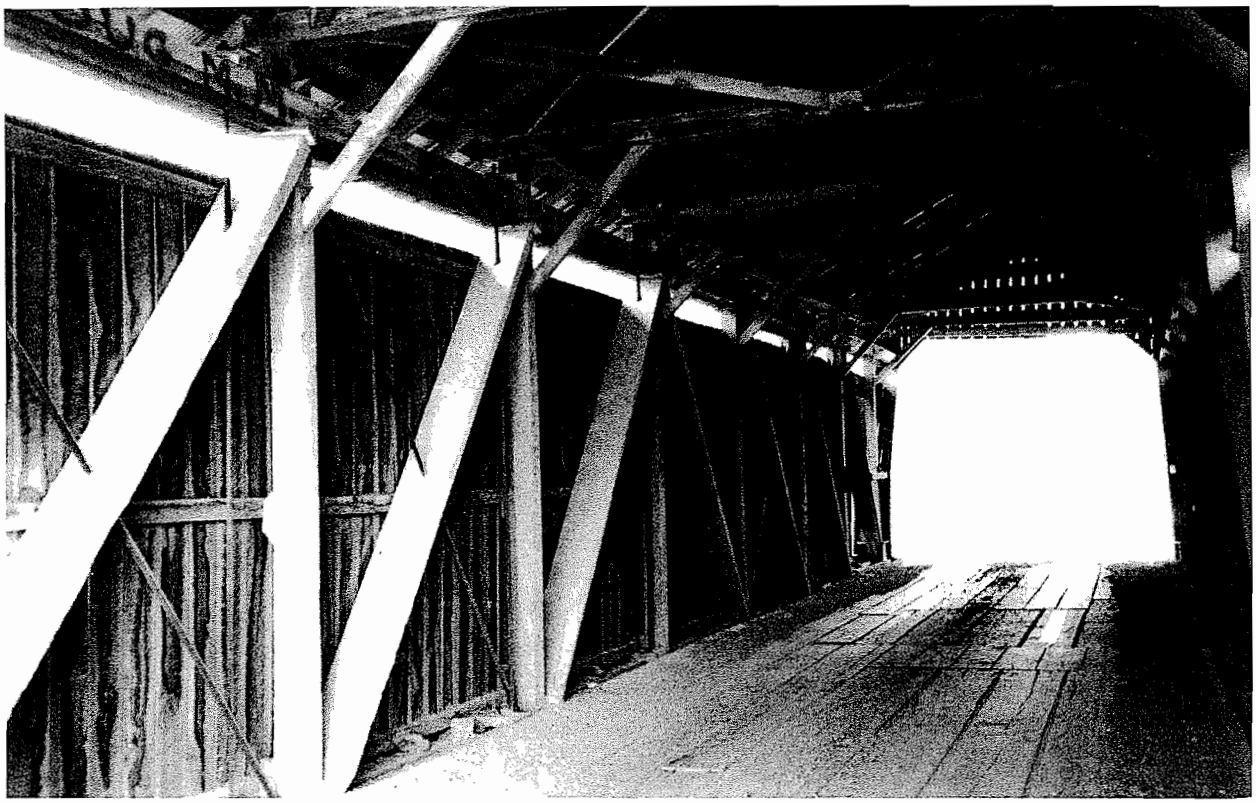
Hamilton Farm Bridge
Burr truss
Builder: F. Mayer
Constructed: 1879



Coshocton County's Hamilton Farm Covered Bridge is one of the two remaining true Burr truss covered bridges in Ohio. In the Hamilton Farm Bridge there are arches on each side of the truss and these arches are firmly embedded into the stone foundations. Most of the Ohio covered bridges with arches are multiple kingposts with arches added and most of the time these arches rest on the lower chords. The Hamilton Bridge is one span, 141 feet 6 inches long. It spans Wills Creek on an abandoned township road. The road and covered bridge were closed in the 1950s. (Miriam Wood, Photographer)

NE of Olive Green, Delaware County
Township Route 63 (Chambers Road)
Crosses Big Walnut Creek
Porter Township
OCBC No. 35-21-04
UTM Coordinates-17/345560/4466670

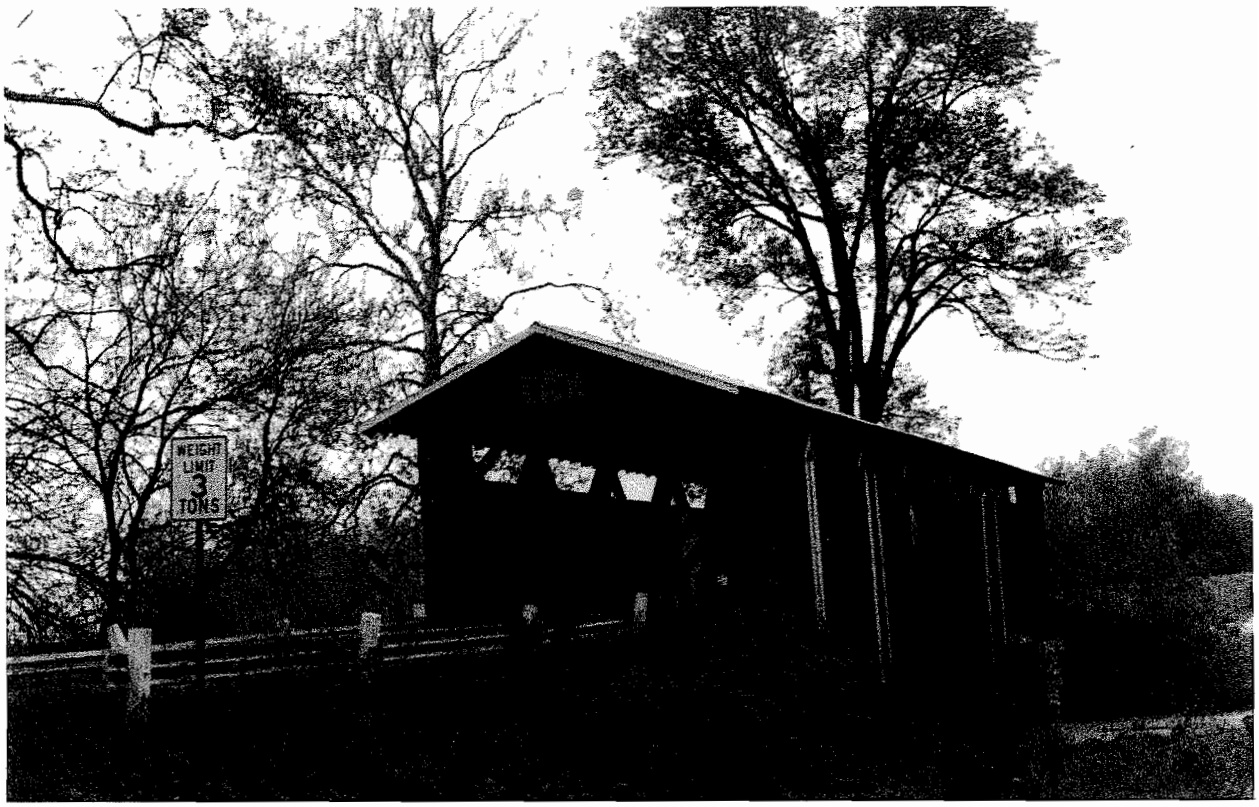
Chambers Rd. Covered Bridge
Childs truss
Builder: Everett S. Sherman
Constructed: 1883
Structure File No. 2131706
National Register



The Chambers Road Covered Bridge is an 86 foot, two span Childs truss. The Childs truss was patented in the 1840s and the only examples ever known to have been built were in Ohio. In this truss design iron tension rods are used as the counter braces. This bridge was extensively renovated in 1983 and heavily reinforced with steel. The pier was added at that time and both abutments were rebuilt of concrete. The Chambers Road Bridge has been in continuous service for more than 100 years. It is believed to be the first Childs truss built by Mr. Sherman.

E of Xenia, Greene County
Township Route 6 (Ballard Road)
Crosses North Fork Caesar's Creek
New Jasper Township
OCBC No. 35-29-18
UTM Coordinates-17/258540/4395600

Ballard Road Bridge
Howe truss
Builder: J. C. Brown
Constructed: 1883
Structure File No. 2934744
National Register



This one span Howe truss bridge is 80 feet long. The foundations were built by H. E. Hebble and the superstructure was built by J. C. Brown. The intermediate verticals are metal tension rods and all the truss members are wood. The abutment wings are limestone and the abutments are stone reinforced with concrete. Painted dark green, an unusual color for a covered bridge in Ohio, it is a scenic example of a typical Howe truss, once so common in Ohio.

SE of Chalfont, Perry County
County Route 33
Crosses Painter's Fork of Jonathon Creek
Hopewell Township
OCBC No. 35-64-02
UTM Coordinates-17/390540/4411960

Parks/South Bridge
Multiple kingpost truss
Builder: William Dean
Constructed: 1883
Structure File No. 6431232
National Register

The Parks/South Bridge is an outstanding example of the well-built multiple kingpost truss which features sculptured timbers and the use of both wooden pins (trunnels) and metal bolts as fasteners. Another feature of the Parks/South Bridge is its noticeable camber. The gingerbread trim at the portals was removed when the bridge was painted red, white and blue for the nation's Bicentennial. Some of the floor beams and stringers still have bark on them.

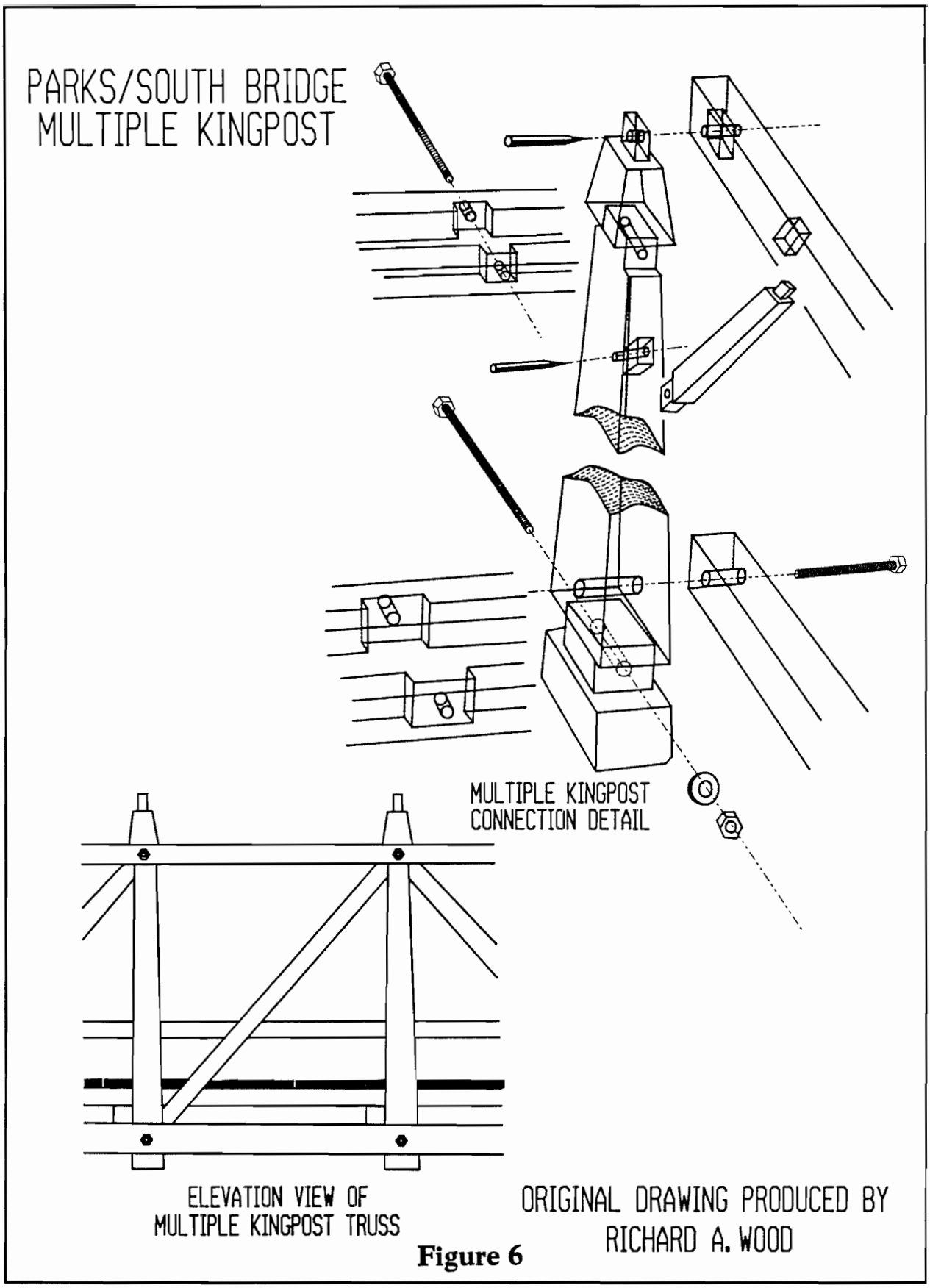
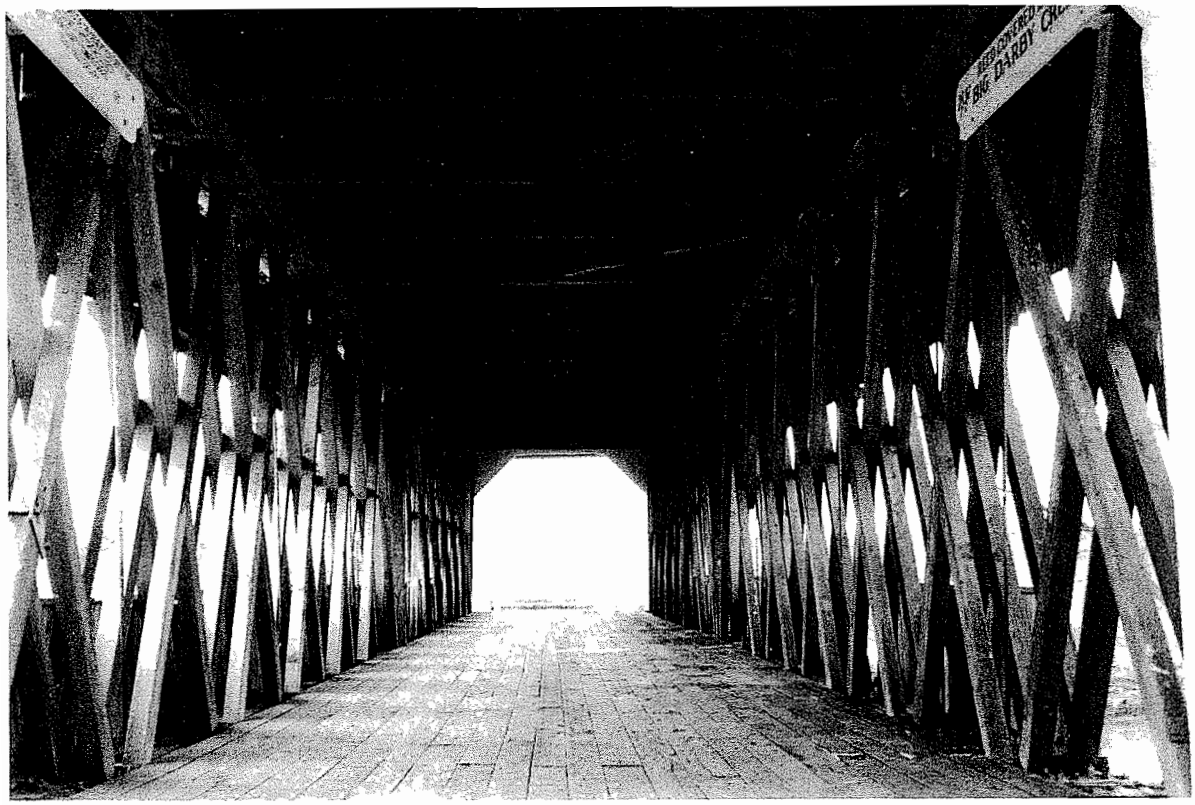

PARKS/SOUTH BRIDGE
MULTIPLE KINGPOST
MULTIPLE KINGPOST
CONNECTION DETAIL
ELEVATION VIEW OF
MULTIPLE KINGPOST TRUSS
ORIGINAL DRAWING PRODUCED BY
RICHARD A. WOOD

Figure 6

S of Marysville, Union County
Bypassed section of State Route 38
Crossing Big Darby Creek
Darby Township
OCBC No. 35-80-05
UTM Coordinates-17/297190/4469100

Reed Bridge
Partridge truss
Builder: Partridge and Grumman
Constructed: 1884
National Register



Reuben L. Partridge of Marysville, Union County, patented this all-wood truss design in 1872. Five Partridge truss covered bridges remain in Union County and all have had steel rods added at unknown dates. The 155 foot Reed Bridge features truss members cut from 10 inch by 10 inch timbers and was built at a cost of $13.50 per linear foot. In the 1960s the state relocated State Route 38 and the Reed Bridge was bypassed. It is now maintained by the county historical society.

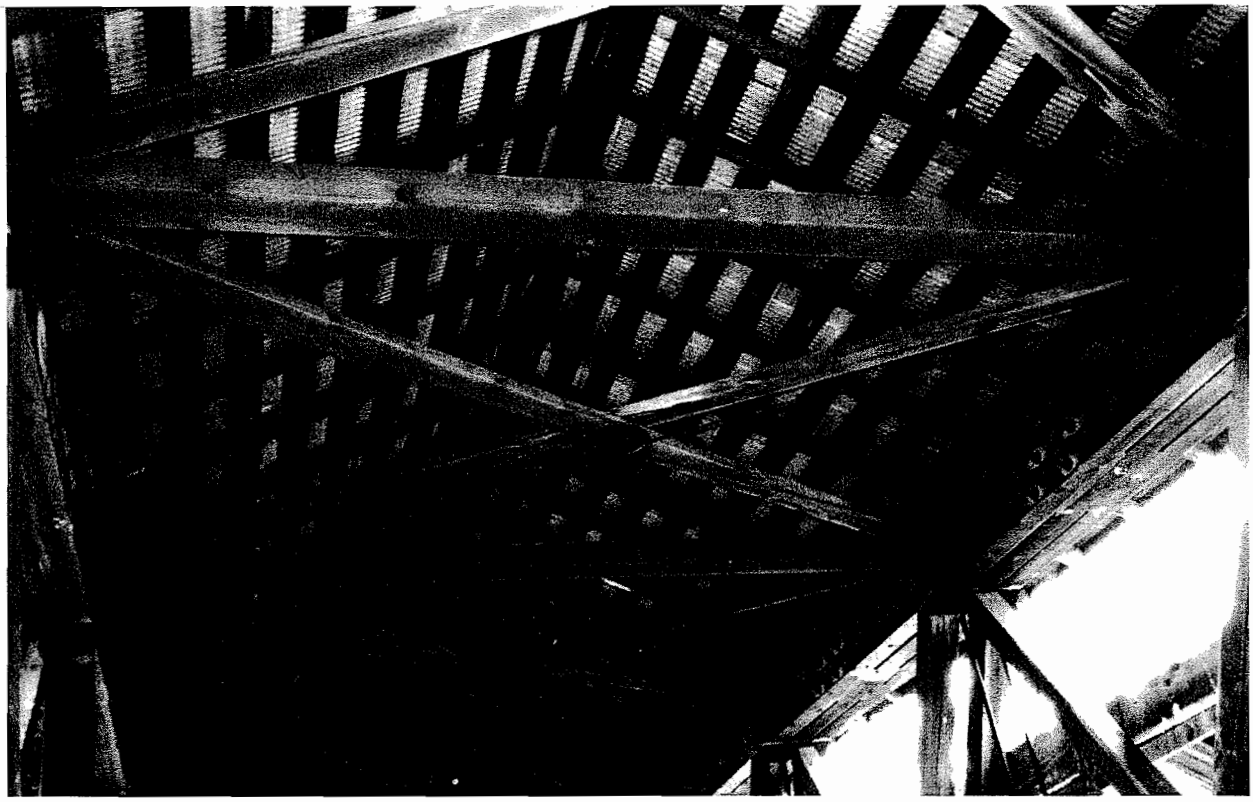
NE of Patten's Mills, Washington County
Township Route 447
Crosses West Branch of Wolf Creek
Palmer Township
OCBC No. 35-84-03
UTM Coordinates-17/434500/4368200

Shinn Bridge
Multiple kingpost with arches
Builder: Ebenezer Henderson
Constructed: 1886
Structure File No. 8437017
National Register

The remote and lovely Shinn Bridge is an excellent example of a multiple kingpost truss with an open center panel. Laminated arches, probably a later addition, strengthen the trusses. The well-maintained Shinn Bridge is a product of prolific bridge builder Ebenezer B. Henderson from Beverly in Washington County. (William Helsel, Photographer)

SE of Amanda, Fairfield County
County Route 69 (Clear Creek Road)
Crosses Clear Creek
Madison Township
OCBC No. 35-23-16
UTM Coordinates-17/357560/4385960

Johnson/Terry Mill Bridge
Howe truss
Builder: August Borneman
Constructed: 1887
Structure File No. 2338068



The 98 foot Johnson Bridge has an unusual top lateral bracing which consists of a metal ring in the center of each roof panel with four steel tension rods attached to this ring. These rods are bolted through the ring and extended to the upper chords. The threaded nut assembly at the ring can be used to put tension on the rods. August Borneman favored the use of this type of lateral bracing and it is found in all four of the Borneman built covered bridges still standing in Ohio. The John Bright Covered Bridge has the ring and rod bracing in its floor system, too (see page 169). (Miriam Wood, Photographer)

NE of Clearport, Fairfield County
Township Route 293
Crosses Arney Run
OCBC No. 35-23-43
UTM Coordinates-17/358400/4388770

Mink Hollow Bridge
Multiple kingpost truss
Builder: Unknown
Constructed: 1887
Structure File No. 2337185

Built about 1887 to span Arney Run in scenic Oil Mill Hollow, the Mink Hollow Bridge is an attractive 51 foot kingpost truss structure. It features a cross brace on the center panel, roofed windows on both sides and projected portals. (Miriam Wood, Photographer)

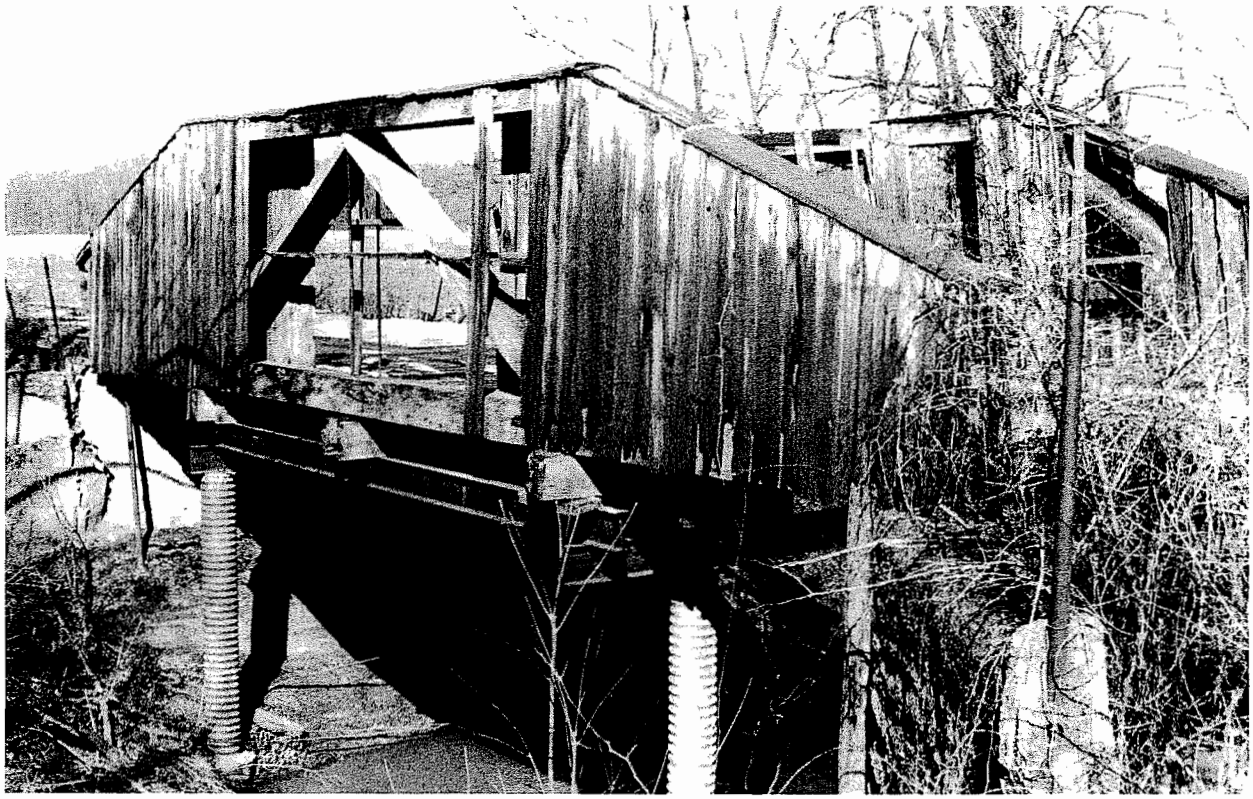
S of Canal Winchester, Franklin County
Ashbrook Road
Crosses Little Walnut Creek
Madison Township
OCBC No. 35-25-03
UTM Coordinates-17/344500/4410280

Bergstresser/Dietz Bridge
Partridge truss
Builder: Columbus Bridge Co.
Constructed: 1887
Structure File No. 2532212
National Register

The Bergstresser Bridge is an excellent example of the Partridge truss design, patented in 1872 by Reuben L. Partridge of Marysville, Ohio. The Bergstresser Bridge is a 134 foot, single span structure with double and triple truss members. Bypassed by a relocation of State Route 674 in the 1950s, the old covered bridge now serves only light local traffic.

NE of New Knoxville, Auglaize County
Private farm lane off Bay Rd.
Crosses Muddy Creek
Washington Township
OCBC No. 35-06-05
UTM Coordinates-17/730290/4488490

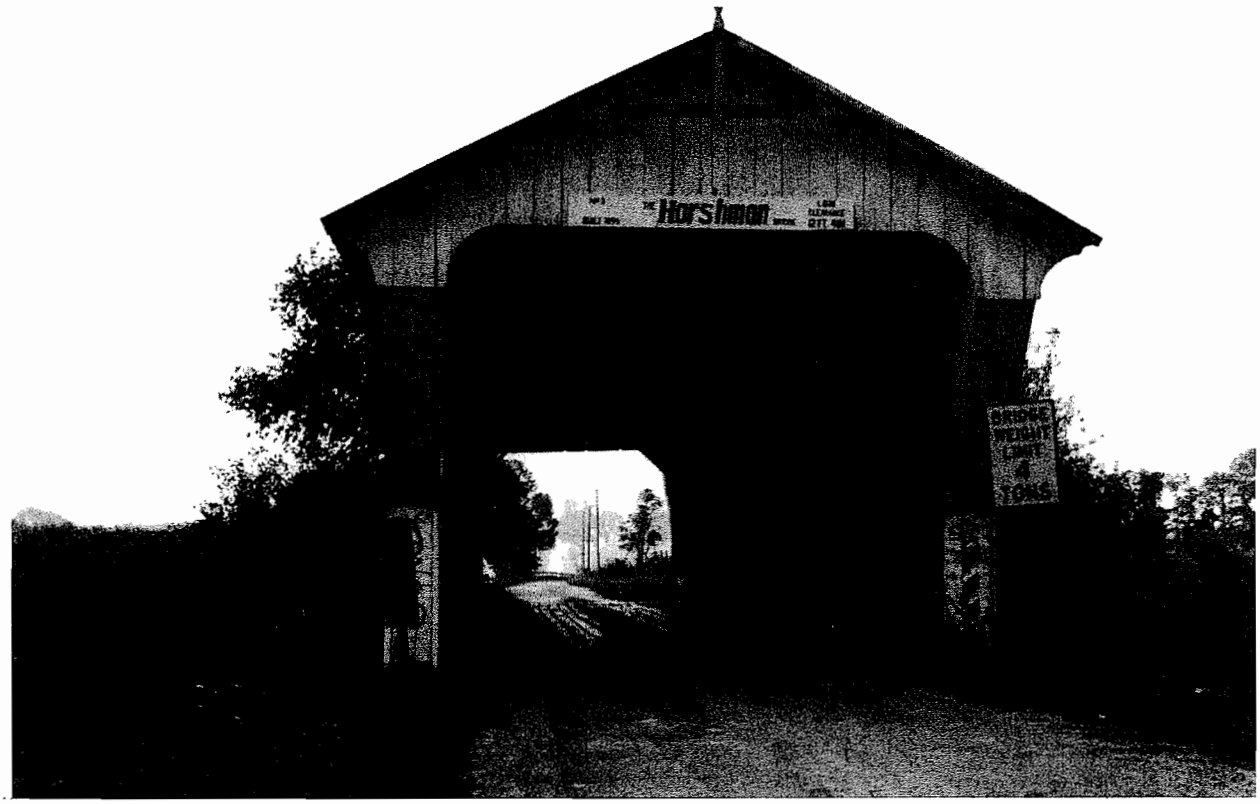
Wellman Bridge
Rafter truss
Builder: W.M. Fledderjohn
Constructed: 1891



The 43 foot Wellman Bridge is Ohio's last known surviving example of a covered pony truss. It was built to span Muddy Creek in 1891 by William Fledderjohn for $2.90 per linear foot. Hundreds of these inexpensive wood and combination wood and metal truss bridges were built in Ohio. The Wellman Bridge is a combination truss with wooden upper and lower chords and truss members with some metal tension rods. After being in service only 17 years on a public road , it was moved to a nearby farm lane where it can be seen today, heavily reinforced with steel. (Donald Burnell, Photographer)

N of Fairhaven, Preble County
Township Route 218
Crosses Four Mile Creek
Dixon Township
OCBC No. 35-68-03
UTM Coordinates-16/691240/4396480

Harshman Bridge
Childs truss
Builder: Everett S. Sherman
Constructed: 1894
Structure File No. 6836399
National Register



The Harshman Bridge, a single span 104 foot Childs truss is representative of the Childs truss covered bridges of Preble County. E. S. Sherman was the only known builder of this truss design patented in the 1840s. The Childs truss is very much like a multiple kingpost with the addition of metal counter braces. On all Sherman-built bridges the floor beams are suspended beneath the lower chords by iron stirrups. All Preble County Childs trusses are in good condition because of excellent maintenance over the years. No steel reinforcements were used in the maintenance. (Miriam Wood, Photographer)

SE of Middleburg, Noble County
Private farm lane
Crosses Middle Fork Duck Creek
Jefferson Township
OCBC No. 35-61-57

Huffman/Wood Bridge
Multiple kingpost truss
Builder: Unknown
Constructed: c. 1914
National Register

Over 100 covered bridges once served the transportation needs of Noble County. The well-built Huffman/Wood Bridge, a 60 foot, six panel multiple kingpost, is one of only four covered bridges standing in Noble County today. This bridge was bypassed about 60 years ago and has been privately-owned ever since. It serves a farm lane just off SR 564. (Miriam Wood Collection)

CHAPTER 10

COVERED BRIDGE REHABILITATION

Ashtabula County's rich heritage of original covered bridges is a source of community pride and the focus of an annual autumn covered bridge festival. The bridges are popular subjects with local photographers and painters and several have been the scenes of weddings. John W. Smolen, Ashtabula County Engineer, has undertaken an innovative program of rehabilitation of these picturesque structures , in some cases using volunteer help and college students. The following address was presented to the First Historic Bridges Conference held in 1985 by the Department of Civil Engineering of The Ohio State University and the Historic Preservation Division of the Ohio Historical Society. Mr. Smolen is a professional engineer, a graduate of The Ohio State University and has worked in Ashtabula County since 1969. He has been county engineer since 1975. In the years since the conference he has built a new covered bridge on Caine Road, renovated Doyle Road and Riverdale bridges and undertaken renovation of the Harpersfield bridge. Future projects include renovation of Dewey Road and Mechanicsville bridges and re-opening Wiswell bridge to traffic.

Covered Bridge Rehabilitation in Ashtabula County

John Smolen, Ashtabula County Engineer

The most desirable part of my job as county engineer has been my involvement in rehabilitating Ashtabula County's covered bridges. We have 13 authentic covered bridges, 11 of which carry traffic. This is the greatest number still carrying traffic of any county in Ohio. We have the longest covered bridges in Ohio with most of our covered bridges longer than 100 feet. We have nine bridges of the Town lattice design, three Howe trusses and one Howe truss with arch.

Our goals regarding covered bridges are as follows:

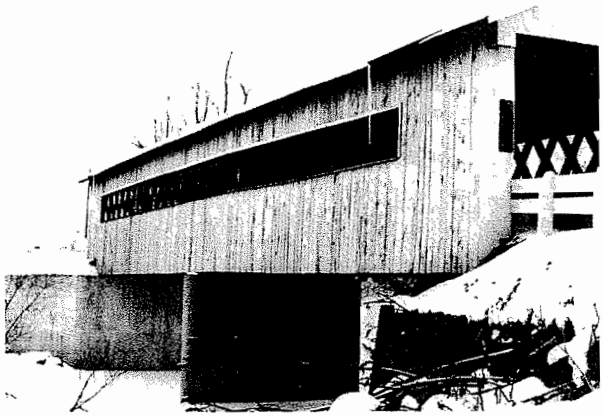
1. Completely rehabilitate one covered bridge each year,
2. Strengthen each covered bridge to carry triaxle truck traffic,
3. Preserve each covered bridge to last indefinitely,
4. Earn a reputation for well kept covered bridges,
5. Promote Ashtabula County covered bridges nationally as a tourist attraction.

How are we doing this? I personally set priorities, design and supervise construction work. Covered bridge repair requires four things: desire, determination, enthusiasm and - lest I forget - money. The taxpayer furnishes the money and I furnish the other three. Our desire, determination and enthusiasm are sustained when we see thousands of tourists and witness the pride of our citizens. That's why we preserve historic bridges in Ashtabula county.

All of our timber design is done according to the American Institute of Timber Construction. This manual is a necessity for those involved in covered bridge rehabilitation. Each covered bridge project requires much thought and design calculation. The process can't be rushed since it may take weeks to overcome a design problem. I should add that rehabilitating an old structure is more difficult to design and construct than is a new project.

We have used several methods of strengthening covered bridges. We have added supports. We have used laminated timber girders to give support and our most recent project utilized laminated wooden arches to increase strength. I hope that this presentation will motivate others to rehabilitate their covered bridges.

Root Road Covered Bridge



The Root Road Covered Bridge is a 114 foot Town lattice built in 1868. This bridge was rehabilitated in 1982-1983. This project included: raising the bridge 18 inches, constructing one new concrete abutment, a new concrete pier at mid-span, new floor beams and flooring, new laminated supporting girders, new siding and guardrail. The Root Road and Riverdale Road covered bridges were both strengthened in the same manner. This method has both advantages and disadvantages. Basically we used large laminated wood girders to construct a bridge within the old covered bridge.

These advantages include:

1. Effectiveness in bringing load carrying ability to modern truck loadings,
2. Relative ease in installing girders from within, rather than from below the bridge,

3. Ability to remove any sag in the bridge.

The main disadvantage is that some lateral clearance is lost. You may ask: Why not put girders underneath rather than inside? The answer is that usually there is not enough floodwaterclearance to allow deep section girders.

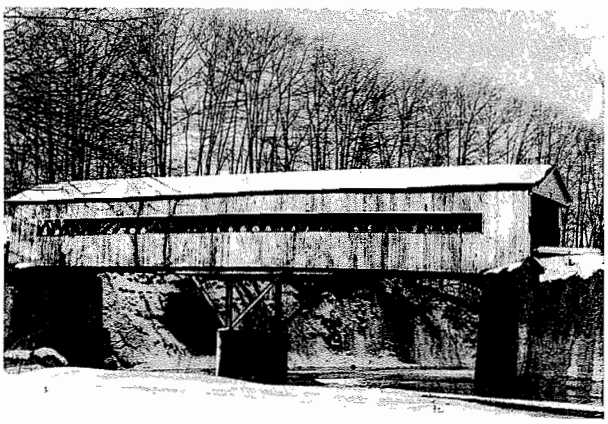
The new floor beams attached to the girders protrude out and underneath the existing intermediate chords to support the bridge itself. Of course, girders could be installed on most any other truss bridges with the new floorbeams going under the lower chords. From a purist point of view these girders could be removed completely without affecting the original bridge, so the work is completely reversible.

This project was designed, financed and built by Ashtabula County, except for the abutment and pier construction, which was contracted out.

Root Road Covered Bridge: What was unique in this rehabilitation?

1. The use of treated laminated girders to strengthen the bridge.
2. The use of a pier at midspan to shorten girder length.

Creek Road Covered Bridge



The Creek Road Covered Bridge spans Conneaut Creek. It is a 125 foot Town lattice that stands high above the river bed.

The concrete wall serves as a deflector since the river turns at this point. The steel bracing is effective in spreading out the support.

We are fortunate the Town lattice design is prevalent in Ashtabula County. Unlike other designs, additional supports can be added. The Town lattice can be considered as an open girder rather than a truss. Therefore, in general, when the span is halved, then the load carrying ability of the girder is quadrupled.

Creek Road Covered Bridge: What's unique in this rehabilitation?

1. The steel frame work effectively distributes the midspan support.
2. The wall type pier directs the river flow.

Olin Covered Bridge

The Olin Covered Bridge is a 132 foot span Town lattice built in 1873. For years it has had a center support constructed of used steel I-beams. The support would catch driftwood and trees. In early 1985, during the ice flow, the support was partially removed. In its place we constructed concrete wall type piers.

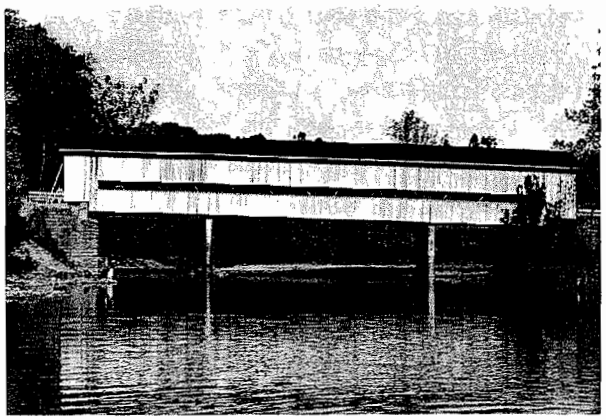
Olin Covered Bridge: What's unique?

1. A center support quadruples the ability of the lattice to carry loads.

Middle Road Covered Bridge

This bridge was the biggest challenge of all. It is a 152 foot span Howe truss built in 1868. For some time we knew that a difficult and expensive rehabilitation was imminent. In January of 1984 the north end of the bridge suddenly dropped 18 inches requiring us to close the bridge. I felt the bridge was in danger of collapsing completely if the snow load became great! After much thought I arrived at the obvious solution of temporarily shoring up the bridge until rehabilitation. From used material, we constructed a huge I-beam lever and fulcrum with 17 tons of concrete counterweight to hold the end of the bridge until it could be repaired. This would

have been obvious to an Egyptian architect in 3000 B.C.



To strengthen the Middle Road Covered Bridge, I settled on adding two wall type concrete piers at quarter points. The center half of the bridge remained a Howe truss span. The portion from the new piers back to the abutment would be supported with treated timber laminated girders. We had sufficient flood water clearance to put girders underneath. The girders are 10.75 inches wide, 31.5 inches deep and 35.5 feet long. Also, included in the rehabilitation were: new floor beams, floor planking, strengthening the lower chords, replacing and enlarging the vertical tension rods, residing the bridge, lengthening the eaves to two feet, reshingling the roof, rebuilding the ends and constructing new guardrails.

Since the county did not have money to contract this job out, we made a call for volunteers. Three men came forward who, along with four paid college students and several county employees, in six months under my personal supervision, successfully saved this historic landmark.

The first work included cribbing up the bridge with timber and constructing the piers. They were seated three feet into shale bedrock. The footers were poured directly from Readymix trucks. However, the walls were poured by wheelbarrowing concrete in the bridge and chuting it down into the forms.

Next, the bridge had to be jacked up and straightened. The lever and fulcrum assisted in raising the bridge. Fifty ton hydraulic jacks were used atop the cribbing supports. At this time the four laminated timber girders were installed and the bridge was set down. Backwalls had to be poured and cribbing had to be removed.

Through our initial calculations it was determined that the lower chords had to be upgraded since they were in tension from truss loading and at the same time bending due to the floor beam configuration. The upgrade was accomplished by adding a treated 3.5 inch by 11 inch southern yellow pine plank on each side of the lower chord. Split ring shear connectors and 3/4 inch bolts were used to connect the new plank to the original chord. Our calculations also found that the vertical tension rods needed to be replaced with a larger size. Another unique feature of this rehabilitation is the laminated distribution beam under the floor which ran the full length of the bridge for better wheel load distribution. The complete floor system on this bridge is white oak. The floor beams are 6 by 10 inch timbers with 4 by 10 inch floor planks.

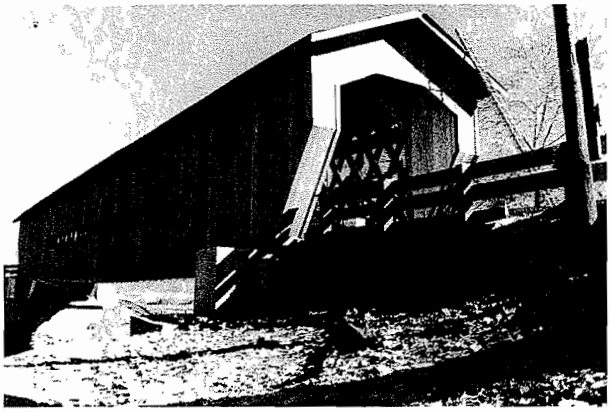
The problem associated with this covered bridge stemmed from the fact that the overhang on the eaves was only 8 inches. The bridge leaned at the north end and caused water to drip between the siding board onto the lower chords which resulted in rotting of the wood. We extended the eaves to two feet by scabbing on 2 by 4 inch extensions. After the bridge was finished it was dedicated at the first annual covered bridge festival.

Middle Road Covered Bridge: What is unique about this rehabilitation ?

1. The method of shortening the truss span,
2. The laminated girders under the ends of the bridge,

3. The work was done substantially with volunteers and college students,
4. The ends were rebuilt in the Greek Revival style of architecture.

Benetka Road Covered Bridge



The Benetka Road Covered Bridge is a 138 foot long Town lattice over Ashtabula River. It had several problems: (1) it had too little flood clearance (2) it was restricted to three ton traffic due to its general poor condition and past overloading (3) it had low traffic height clearance.

On this project I decided to use laminated timber arches for strengthening rather than additional piers and girders. Six months earlier I purchased a semi-truck load of locally cut yellow poplar lumber for Benekta arches. It was put on sticks to air dry. In April, one of our first activities was to plane and edge saw all lumber. It was then sent to Pittsburgh to be treated and then re-dryed since the rot treatment is waterbased.

The major design considerations were the calculations for the arches and the new abutments to withstand the 120 tons of horizontal push. To carry a loaded triaxle truck the arches had to be 9 by 38 inches in cross-section. They are 107 feet long. The abutments had to be designed with seats to receive the new arches. This was especially difficult to construct. The footer was 7 feet wide and the wall was 4 feet thick. One hundred cubic yards (250 tons) of concrete were used in the north abutment. The south abutment required only modification.

The arches proved to be very effective in this project. Our method of construction was to build arches in place. They are made up of one inch thick boards glued and spiked into each other. The glue we used was resorcinol which is a two part marine type adhesive. We used two barrels. Over 21,000 galvanized, 3 1/4 resin coated twist nails were used. We nailed each ply on 4 inch centers using a pneumatic nail gun. We first nailed three plies together flat on the floor of the bridge to serve as a starter. Next, we hoisted the starter into position and lag bolted it to the lattice. We erected scaffolding to facilitate the work.

The main function of the old lattice is to carry the load from the floor beams to the arches. We used one inch bolts, shear connectors and lag bolts to make the connection. Using the design charts from the Teco's Product Design and Specification Sheet and the AITC manual we installed enough fasteners to carry the weight of the triaxle truck.

In order to gain additional height clearance we attached the floor beams under the chords rather than on the chords. This change increased the clearance two feet inside the bridge. Four 3/4 inch galvanized bolts hold each floor beam. We used 4 inch thick white oak plank for flooring. They are lag bolted down with 1/2 by 8 inch lag bolts. All fasteners used on our covered bridge projects are galvanized, preferably hot dip galvanized. This way the bridge won't be lost because the steel rusted away. Redwood siding was used on this project.

The Benetka Road Covered Bridge was opened and dedicated at the second annual covered bridge festival.

The most unique features on this project were:
1. The use of laminated timber arches to strengthen a Town lattice,
2. The flood water clearance was increased

two feet,

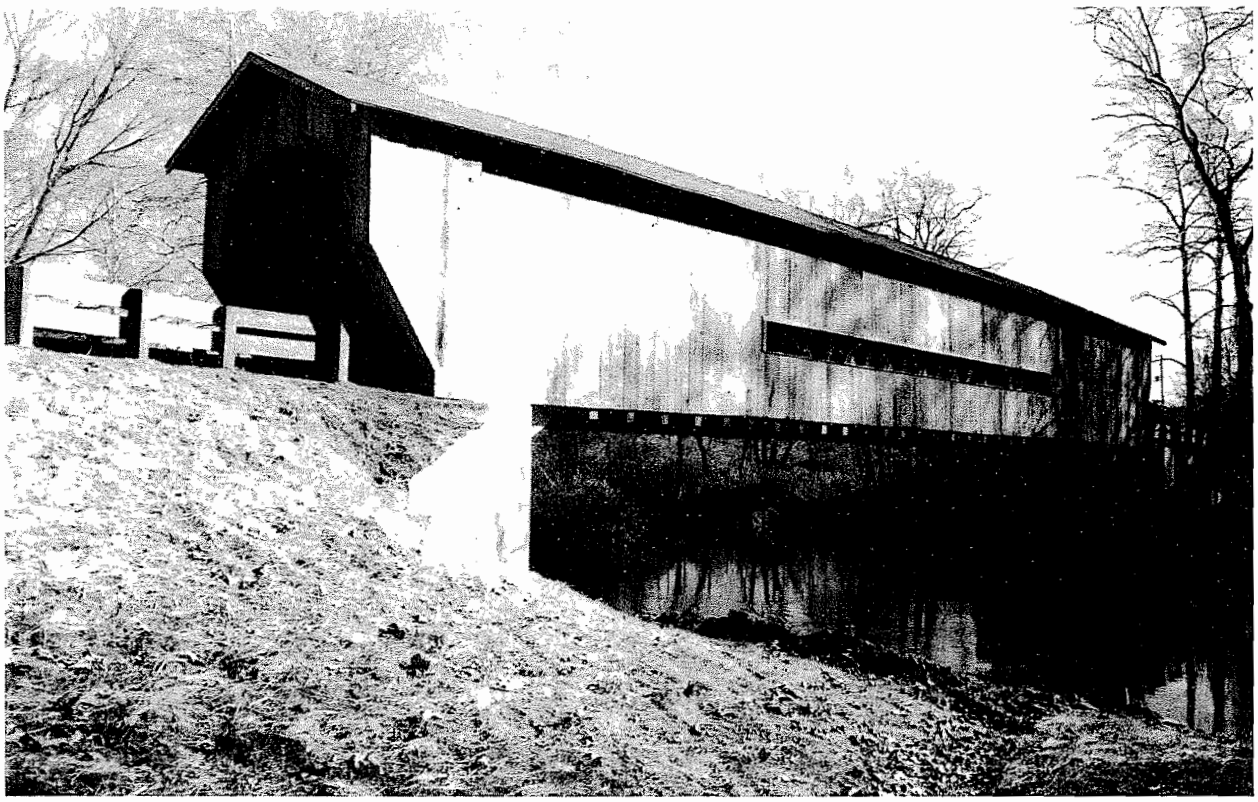
3. The vertical traffic clearance was increased two feet.

Conclusion:

As a result of our covered bridge activities, we cannot help but admire those who constructed them. They did not have the modern trucks, cranes and power tools that we have today. Yet, their 100 year old bridges will outlast steel and concrete bridges yet to be built. They did this with renewable resources and with very little adverse effect on the environment. (Photographs in this section by John Smolen)

NW of Sheffield, Ashtabula County
County Route 350B (Benetka Road)
Crosses Ashtabula River
Sheffield Township
OCBC No. 35-04-12
UTM Coordinates-17/525680/4632780

Benetka Road Bridge
Town lattice truss
Builder: Unknown
Date: Unknown
Structure File No. 0433195

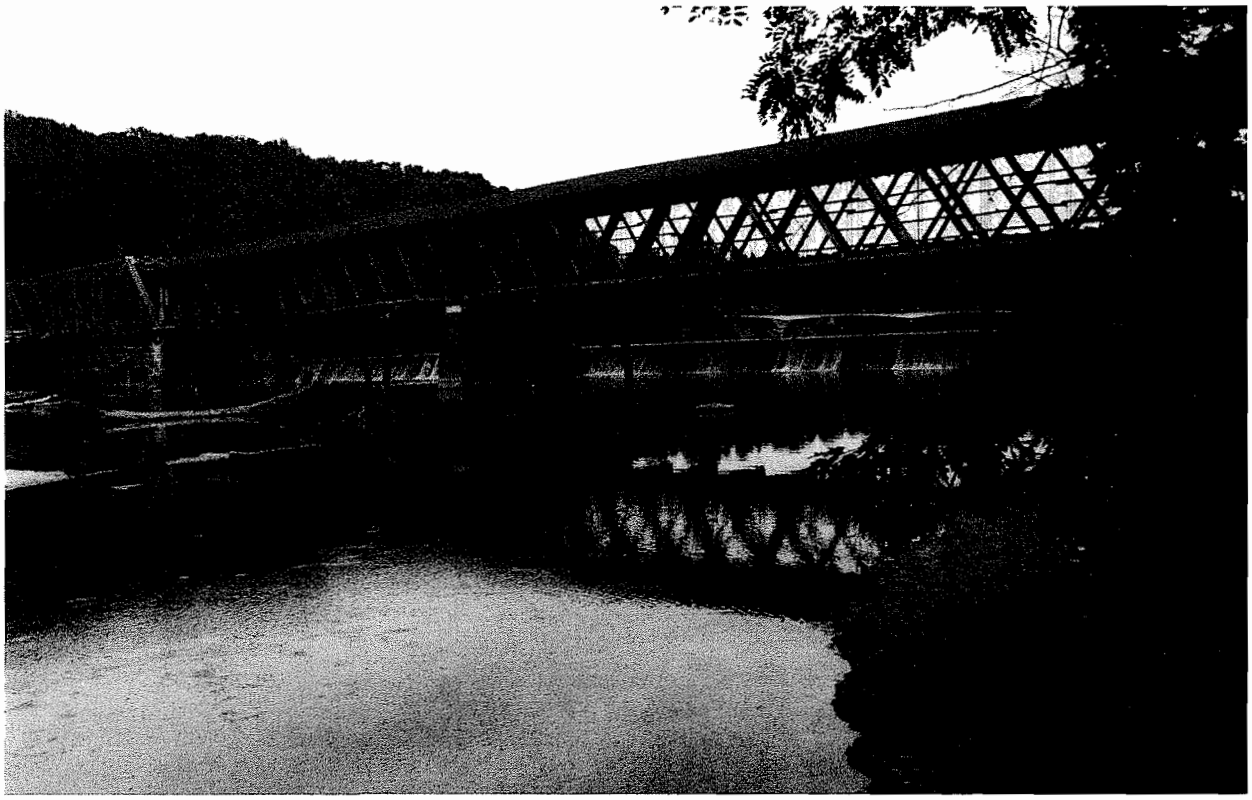


The Benetka Road Bridge is a one span 138 foot wooden pin-connected through Town lattice truss. Renovation by the county, undertaken in 1985, included laminated arches, a new floor system, new shingle roof, siding, additional projecting portals and an open approach span on one end. The original cut-stone foundations were included in the project. The north abutment was replaced by concrete; the south abutment was reinforced. Renovation has somewhat altered the outer appearance of this bridge but has in no way affected its historical integrity. (John Smolen, Photographer)

Ashtabula County
County Route 154
Crosses Grand River
Harpersfield Township
OCBC No. 35-04-19
UTM Coordinates-17/504620/4622490

Harpersfield Bridge
Howe truss
Builder: Unknown
Constructed: 1868
Structure File No. 0432482
National Register

Harpersfield Covered Bridge, over the Grand River, is the longest covered bridge in Ohio. It is a Howe truss with two spans, each 114 feet long. In the Harpersfield Bridge, the usual metal truss support blocks called for in the Howe patent were omitted and wooden blocks were used instead. The bridge is closed to traffic while undergoing an extensive rehabilitation. (John Smolen, Photographer)



The steel span, added after the 1913 flood cut a new channel around the north end of the covered bridge, was rehabilitated last year. Rusted members were replaced and the entire structure was repainted. The wooden structure is being rehabilitated in 1990. Vertical clearance will be increased, a new floor , new siding, shingles and an attached sidewalk are planned. The bridge will be the centerpiece of an annual autumn covered bridge festival.

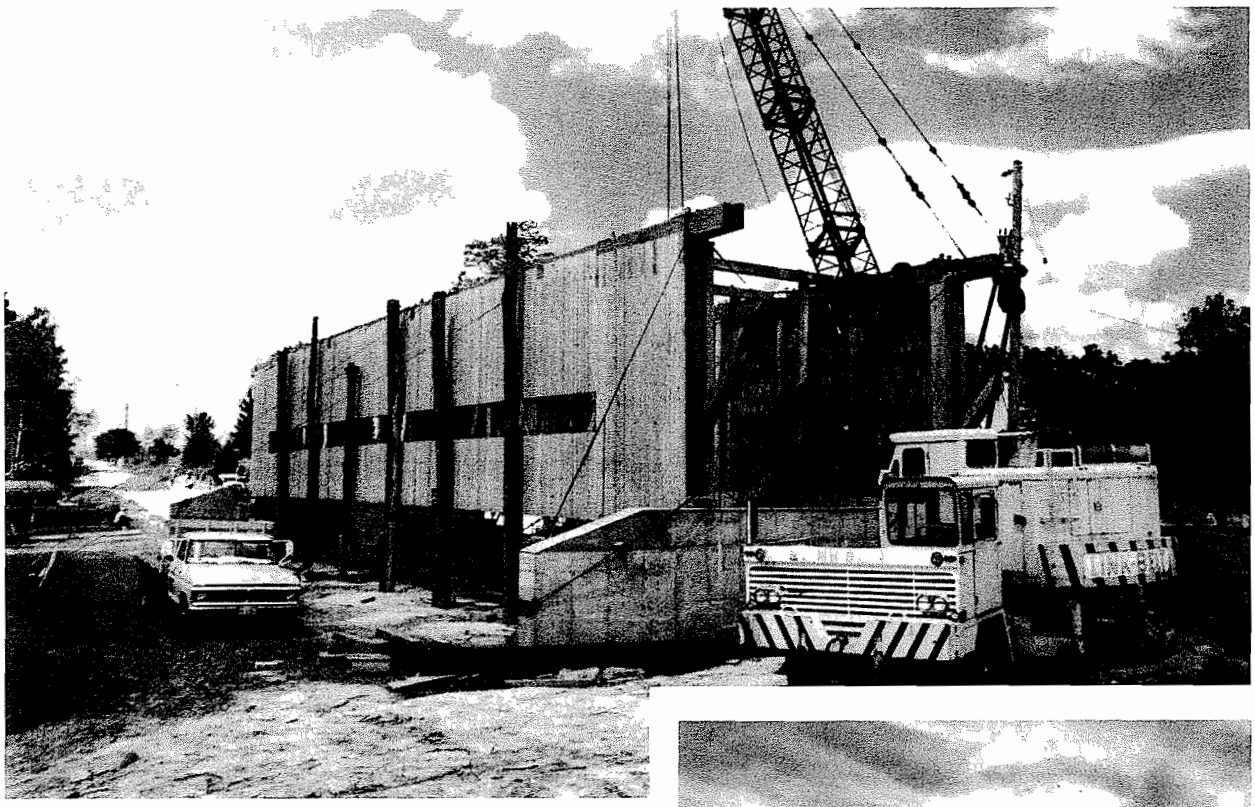
Ashtabula County
County Route 287
Crosses Mill Creek
OCBC No. 35-04-16
UTM Coordinates-17/511200/4623190

Doyle Road Bridge
Town lattice truss
Builder: Unknown
Constructed: c. 1876
Structure File No. 0432571

Doyle Road Covered Bridge, a 98 foot Town lattice truss, was rehabilitated in 1987 and rededicated during the 1987 Ashtabula County Covered Bridge Festival. During the renovation, the bridge was raised for flood clearance, widened for two lane traffic. A new roof, floor and siding were added. Laminated arches were added for additional weight bearing. Doyle Road bridge has long, narrow window-like openings on each side to allow those on the bridge to see approaching traffic. The bridge spans Mill Creek at an angle to the road and carries vehicular traffic. (John Smolen, Photographer)

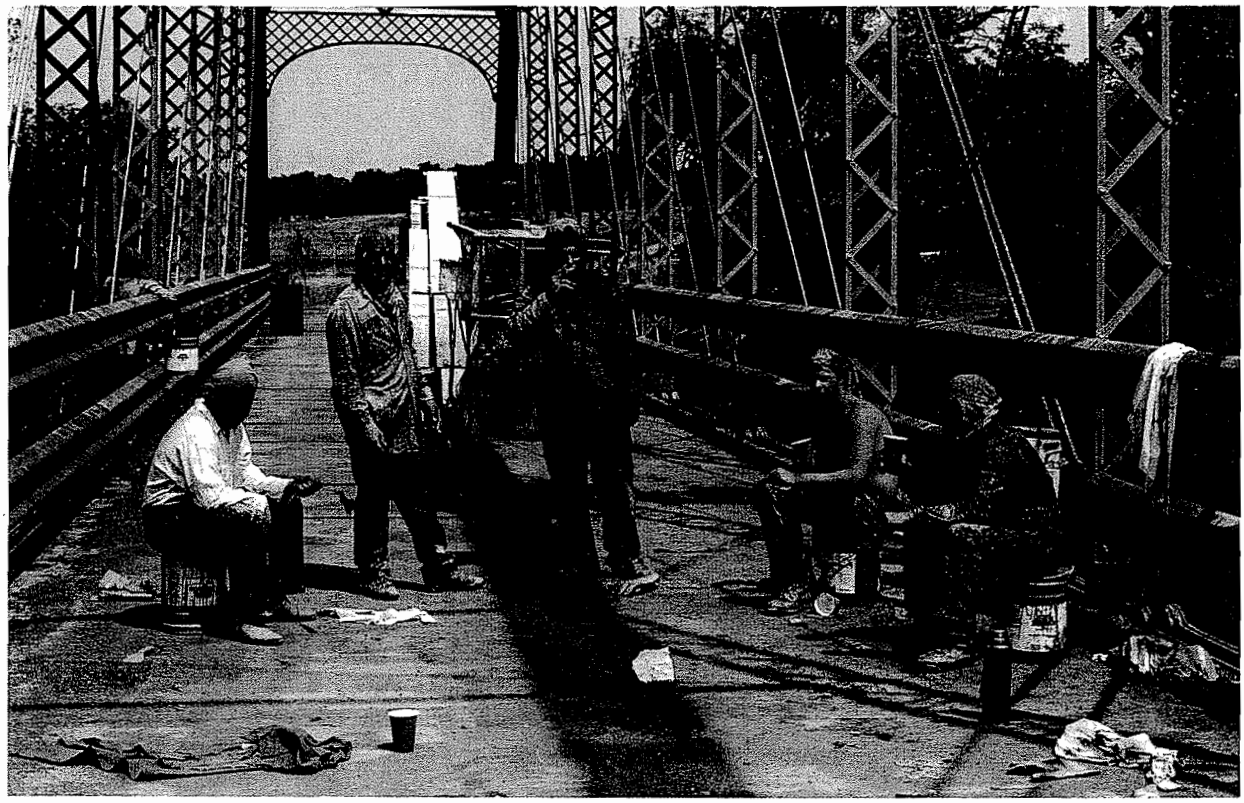
ENE of Jefferson, Ashtabula County
Township Route 579 (Caine Road)
Crosses Ashtabula River
Pierpont Township
OCBC No. 35-04-61
UTM Coordinates-17/531900/4623520

Caine Road Bridge
Pratt through truss
Builder: John Smolen
County Engineer
Constructed: 1986
Structure File No. 0433780



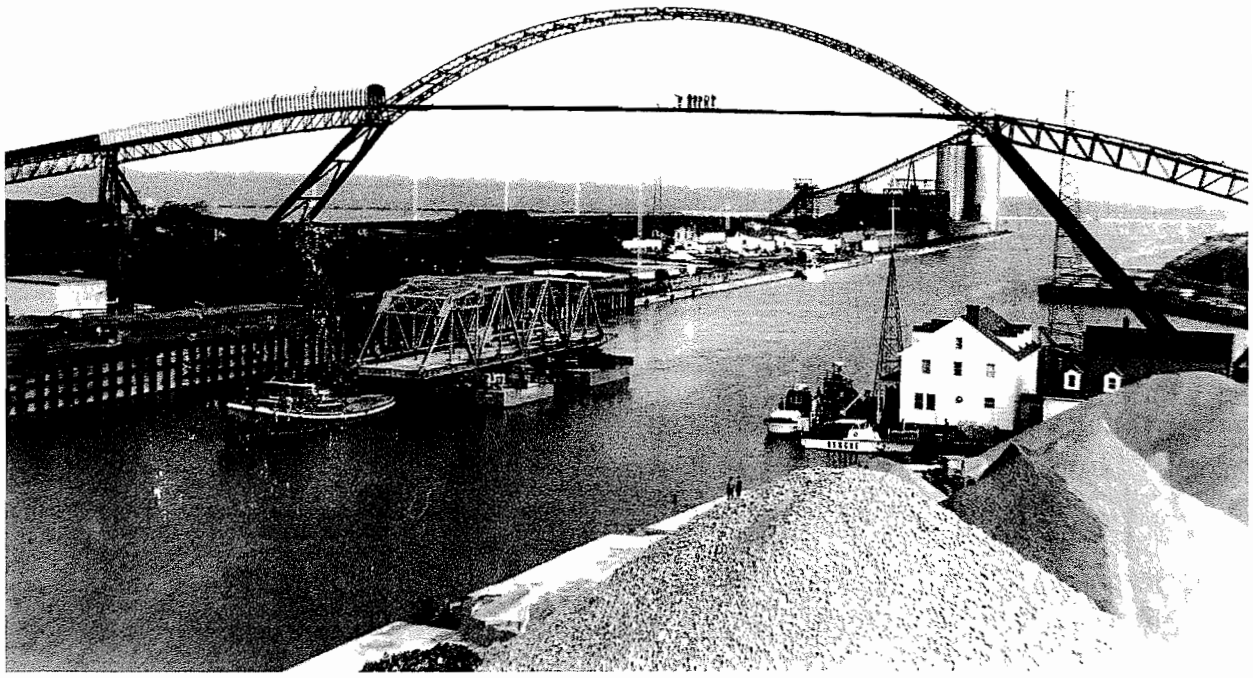
The Caine Road Bridge is an excellent example of a newly constructed covered bridge using the Pratt truss, a design commonly used for all-metal bridges but rarely found in a covered bridge. Designed and built by John Smolen, this bridge is a one span structure with an overall length of 104 feet. (John Smolen, Photographer)

PART IV



CHAPTER 11

REHABILITATED BRIDGES



In the above photograph the Ashtabula bascule bridge is being returned after off site renovation.

In the 1960s, Congress increased appropriations for bridge rehabilitation and replacement programs when it recognized that many of the nation's bridges were structurally deficient and functionally obsolete. With this increased funding available , many state transportation agencies made bridge replacement a top priority. But in the 1960s there was an increasing awareness of the need to protect our nation's historic resources, including many bridges that reflected the nation's technological and industrial history and represented contributions to our historic legacy. The desire to protect and preserve these resources was expressed in legislation which mandated that transportation departments consider the preservation of historic bridges.

The goals of these two programs - to rehabilitate and replace our aging bridges and to preserve our significant and historic structures - hardly seemed compatible or complementary. Indeed, they represent two frequently conflicting viewpoints. Transportation engineers emphasized the need to provide safe, strong and durable new bridges capable of handling increased traffic loads. In contrast, preservationists viewed many bridges as important and significant engineering structures. When a historic bridge becomes part of a transportation improvement project, preservationists and engineers view the same bridge differently. From the preservationist perspective it may be an excellent example of an era of bridge building in Ohio. The same bridge, from an engineer's perspective, is viewed as functionally obsolete because of inadequate width, or structurally deficient because of its incapacity to carry today's weight loads, or as having safety problems involving alignment and, in some cases, sight distance.

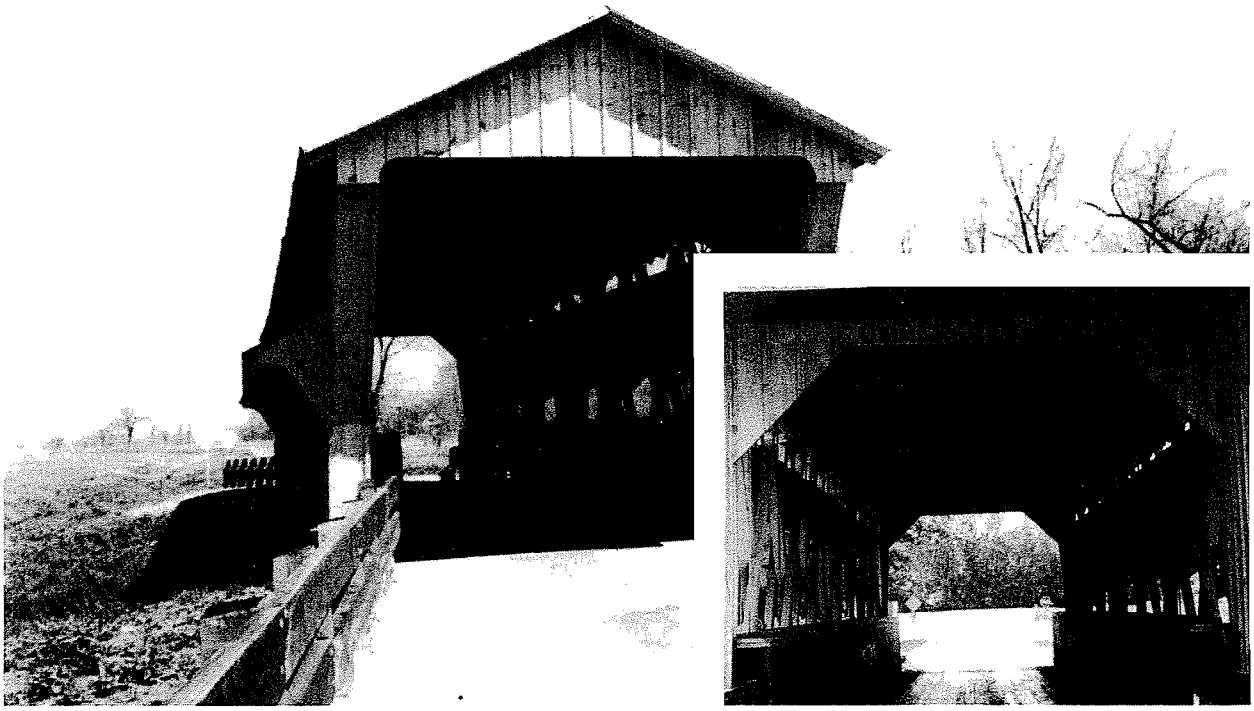
In the 1980s many preservationists and engineers began to seek solutions to these two conflicting mandates. In Ohio, the Department of Transportation, representing the engineer's perspective, and the Ohio State Historic Preservation Office, representing the preservationist's perspective, agreed to a Preservation Plan. This plan details the future obligations and responsibilities of both agencies in the care and disposition of historic bridges in Ohio. In 1985 the Civil Engineering Department of The Ohio State University and the Ohio Historical Society initiated a series of conferences for the purpose of exchanging ideas and learning from experiences among engineers and historians from several states. In addition, the Virginia Transportation Research Counci has developed guidelines for the preservation of historic bridges.

The Surface Transportation and Uniform Relocation Act passed by Congress in 1987 required each state to complete an inventory of all bridges on and off the federal highway system to determine their historic significance. This legislation encouraged owners and made funds available for the preservation and maintenance of historic bridges.

The following chapter highlights some of the bridge rehabilitation projects in Ohio. It is hoped that these examples will serve as models for preservation projects which will benefit both the traveling public and the heritage of future generations in Ohio.

NE of Lewisburg, Union County
County Route 163 (Cratty Road)
Crosses Spain Creek
OCBC No. 35-80-02
UTM Coordinates-17/285300/4456000

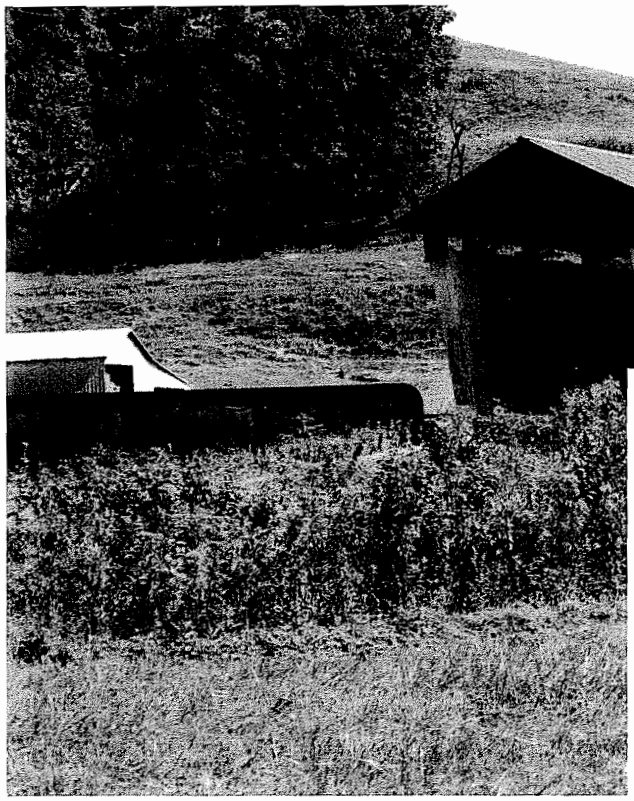
Spain Creek Bridge
Partridge truss
Builder: Reuben L. Partridge
Constructed: c. 1870
Structure File No. 8048908

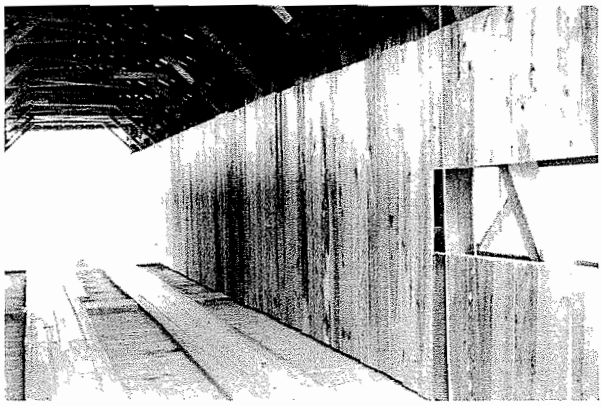


In 1988 the Spain Creek Bridge was completely renovated incorporating use of a bridge within a bridge or auxiliary bridge system to preserve the historic integrity of the original Partridge trusses. Original floor and floor beams were removed and two glue laminated girders were set inside (see above photograph). Rows of transverse glue laminated beams, butted against one another, were hung from the girders to make a solid floor system. Three inch tongue and groove planking makes up the floor system. The old truss system has been bolted into the new system at regular intervals to correct and prevent misalignments. (Miriam Wood, Photographer)

NNE of Glouster, Athens County
Township Route 347
Crosses Sunday Creek
OCBC No. 35-05-01
UTM Coordinates-17/407880/4375400

Palos Bridge
Multiple kingpost truss
Builder: Unknown
Constructed: c. 1875
Structure File No. 0541044
National Register

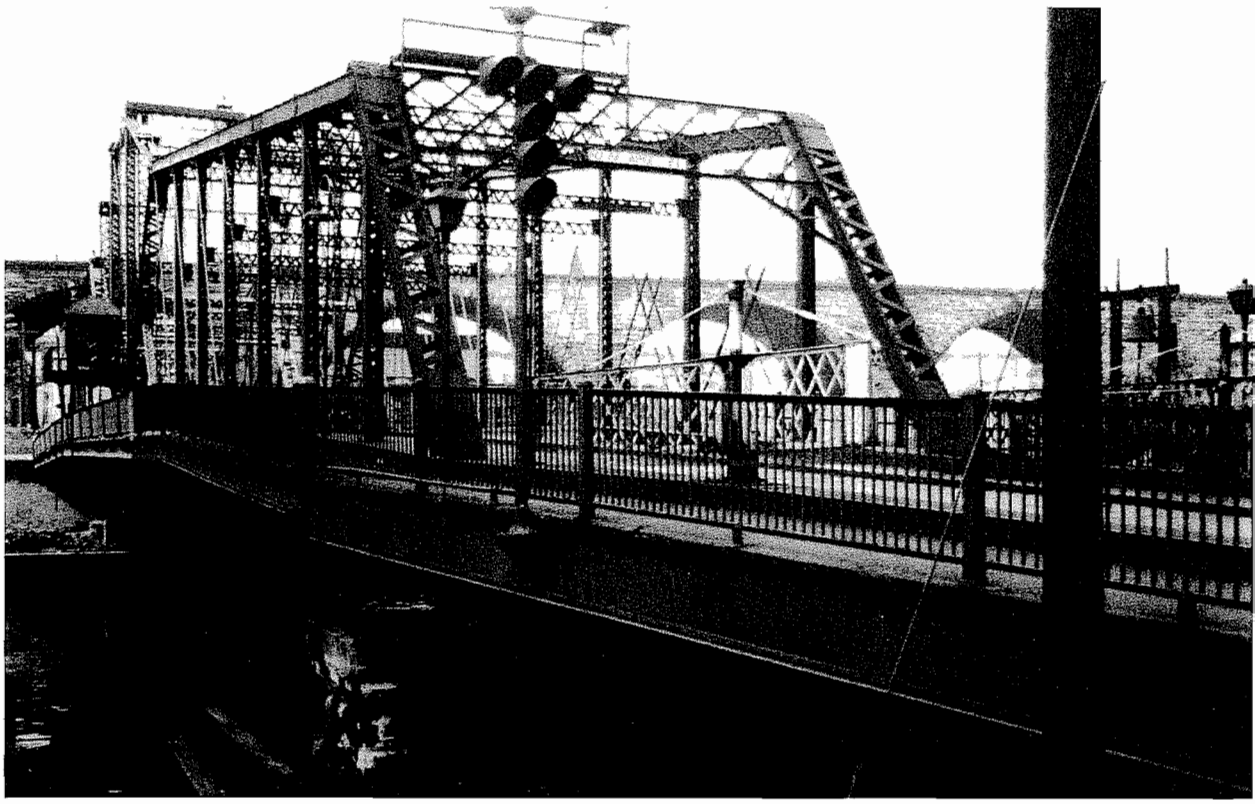




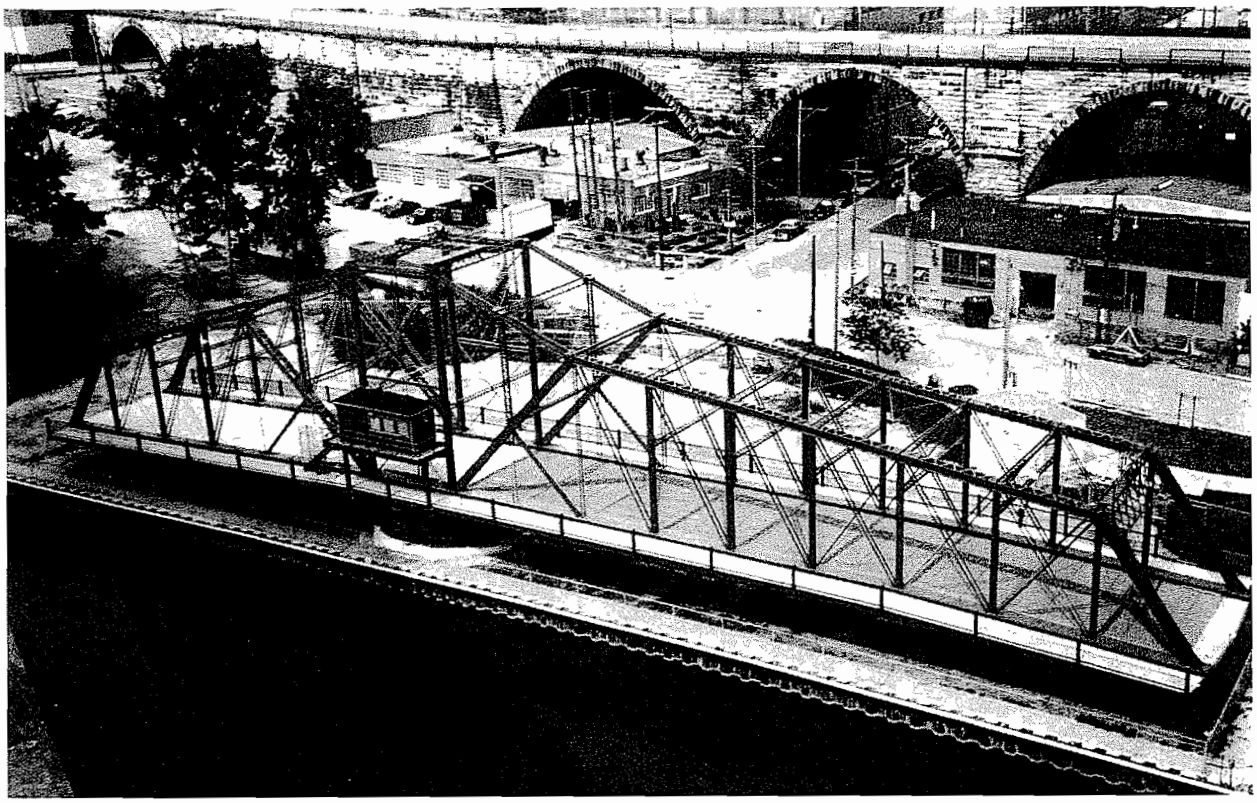
The Palos Bridge is a typical Ohio multiple kingpost truss, that is well over 100 years old. Strengthening modifications have been made over the years to keep this old structure in service. Steel tension rods were added to the trusses years ago. A steel pier on concrete foundations was placed under the center of the bridge in 1971. There are also steel I-beams supporting the bridge from abutment to abutment. The most unusual maintenance feature of this covered bridge is the interior boarding, completely covering the trusses. This was done to prevent loss of siding by vandals kicking it off from the inside and to prevent the accumulation of trash on the lower chords which is not only unsightly, but also a fire hazard and collects damaging moisture. While other covered bridges across the nation have been boarded up on the inside, the Palos Bridge is the only Ohio covered bridge so treated.
(Miriam Wood, Photographer)

Cleveland, Cuyahoga County
Center Street
Crosses Cuyahoga River
UTM Coordinates-17/441320/4593640

Center Street Bridge
Swing truss
Builder: King Bridge Co.
Constructed: 1901
Structure File No. 1869345
Selected As Eligible



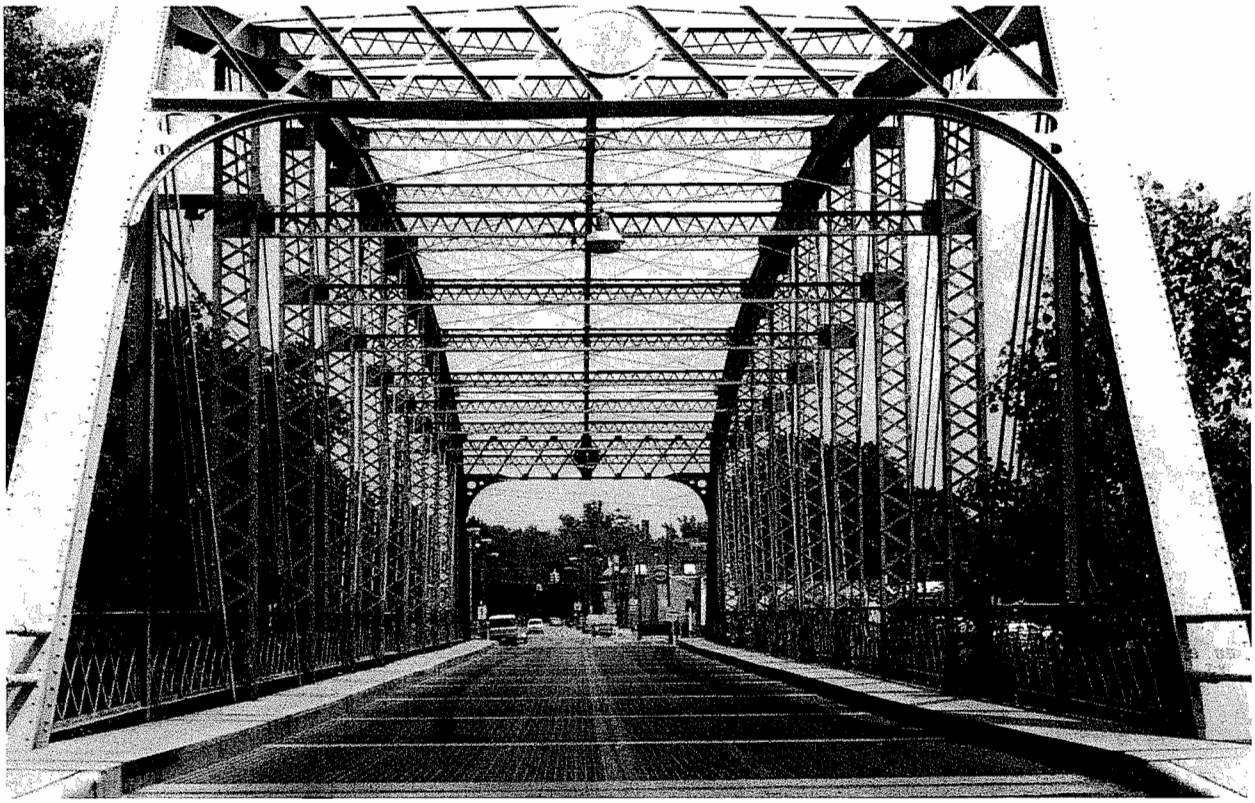
The Center Street Bridge is one of the only remaining operable swing bridges in the state. It consists of a Pratt through truss, swing span 245 feet long and a girder span 62 feet long. It is called a rim-bearing, bobtail, swing bridge. "Rim-bearing" means that the dead load of the swing span is supported by a circular girder near the periphery of the pivot pier instead of near its axis (Miller-HAER Inventory Form). "Bobtail" means that the arms of the bridge projecting from the pivot pier are of unequal lengths. The bridge was extensively rehabilitated in 1950. At that time repairs were made to the trusses. The new floor system, roller assembly, track base and turning machinery were replaced. By 1982 the bridge was in generally poor condition. An inspection indicated that several structural members were severely deteriorated and the bridge needed major rehabilitation.



The City of Cleveland, working closely with the State Historic Preservation Office, was able to rehabilitate the deficiencies without affecting the appearance or configuration of the bridge. The top and bottom chord members of the exterior trusses including the end diagonals, the vertical build-up members, the portals and sway bracings, the center pier, west abutment and wing wall, the east abutment and wingwall and the end shanty were retained. The interior diagonals were replaced in kind along with all the pin-connections. At the pin-connections, the truss members were rebuilt in kind only to the extent necessary to accomplish rehabilitation. The floor beams, stringers, sidewalk decking, handrailing, bridge operator's house and the traffic and pedestrian gates were replaced. The existing electrical and mechanical systems were replaced with modern equipment which maintains the original character and operation of the bridge. The east approach girder span was also replaced. The bridge was re-opened to traffic in the summer of 1989. (USDOT-FHWA, ODOT 1986:l). (Federal Aid Project) (Emmanuel Voikus, Photographer)

Prospect, Marion County
State Route 47
Crosses Scioto River
UTM Coordinates-17/312400/4479780

Prospect Bridge
Parker through truss
Builder: Standard Eng. Co.
Constructed: 1913
Structure File No. 5102251
Selected As Eligible



Because this bridge, which spans the Scioto River in Prospect, Ohio, carries a significant amount of traffic, it required upgrading to current load carrying requirements. The problem facing the engineers was to achieve this goal without endangering the bridge's eligibility for the National Register of Historic Places. Inspection of the bridge showed the existing floor system was badly deteriorated and had to be replaced. However, the existing steel truss was in good condition and could be retained, thus maintaining the bridge's historic value. Load rating procedures were applied to the existing truss. Various floor and sidewalk systems were investigated and compared to determine the best system for rehabilitation. A new open grid floor system of galvanized steel was used because it was lightweight and provided the greatest live load capacity. The problem of preventing salt - laden drainage from deteriorating the new structure was solved by filling portions of the open grid with concrete to protect the new floor beams. The concrete-filled sidewalk grid and the closed curb also helped prevent deterioration of structural steel (Historic Bridge Restored, 1986). (Federal Aid Project)

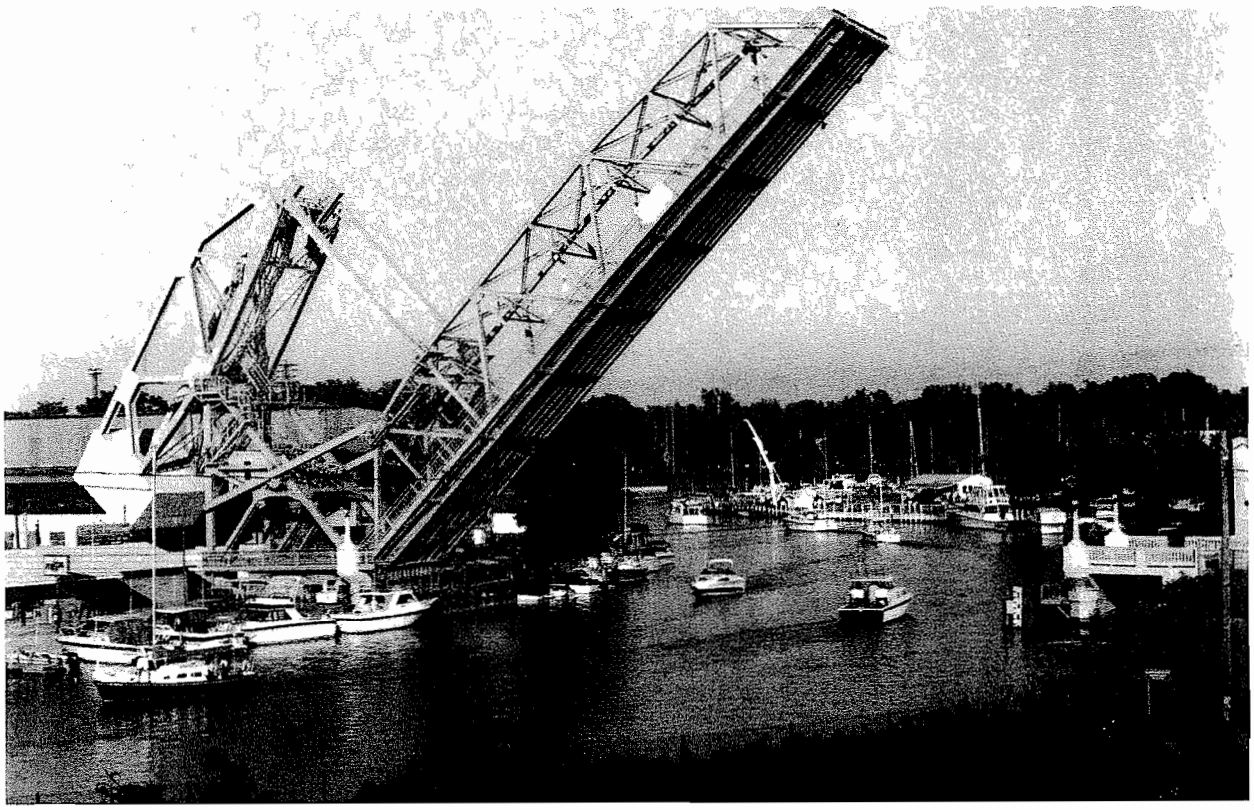
NW of Circleville, Pickaway County
County Route 4
Crosses Scioto River
Jackson Township
UTM Coordinates-17/331600/4388660

Camelback through truss
Builder: Oregonia Bridge Co.
Constructed: 1914
Structure File No. 6533159
Selected As Eligible

One of the most frequent problems encountered with the rehabilitation of older truss bridges is the roadway width that is generally too narrow for current roadway design standards. Because the approach roadway was narrow and the average daily traffic under 500 vehicles per day, a design exception was granted for this bridge. To upgrade the bridge to current safety standards the existing deck, railing and stringers were replaced on each of the three 233 foot spans. In addition, the floor beams were plated; the concrete repaired at the bearings; the bearings cleaned and replaced where necessary and the entire structure was painted. This rehabilitation, which should extend the life of the bridge by at least 20 years, was accomplished without affecting the appearance or historic integrity of the structure. (Federal Aid Project)

City of Ashtabula, Ashtabula County
West 5th Street
Crosses Ashtabula River
UTM Coordinates-17/516760/4638520

West 5th Street Bridge
Bascule
Builder: Kell-Atkinson Con.Co.
Constructed: 1925
Structure File No. 0406635
Selected As Eligible



Through the cooperative efforts of public officials, engineers and local citizens the West 5th Street Bridge across Ashtabula River was preserved. This is the last single-leaf bascule bridge on the state highway system and is an unusual example of the Mystic Type of Brown bascule invented by Thomas E. Brown of New York City. When it became apparent that the bridge's condition was deteriorating local support grew for its preservation. Transportation experts initially were skeptical that the bridge's weight bearing capacity and width restrictions could be increased to accomodate modern traffic loads. Agreement was reached to bring the weight capacity up to that of a new structure but to compromise on the width as technically the bridge is wide enough to carry two lanes of traffic. The truss was moved off site for painting and renovation (page 143). Thus, rehabilitation increased the loading capacity of the bridge while preserving its historic appearance. It was re-opened to traffic in 1986. (Simmons 1982:5) (Federal Aid Project)

W of Rushville, Fairfield County
County Route 77
Crosses Rush Creek and Conrail
Richland Township
UTM Coordinates-17/376690/4402330

Pratt deck truss
Builder: Unknown
Constructed: 1928
Structure File No. 2340208
Selected As Eligible

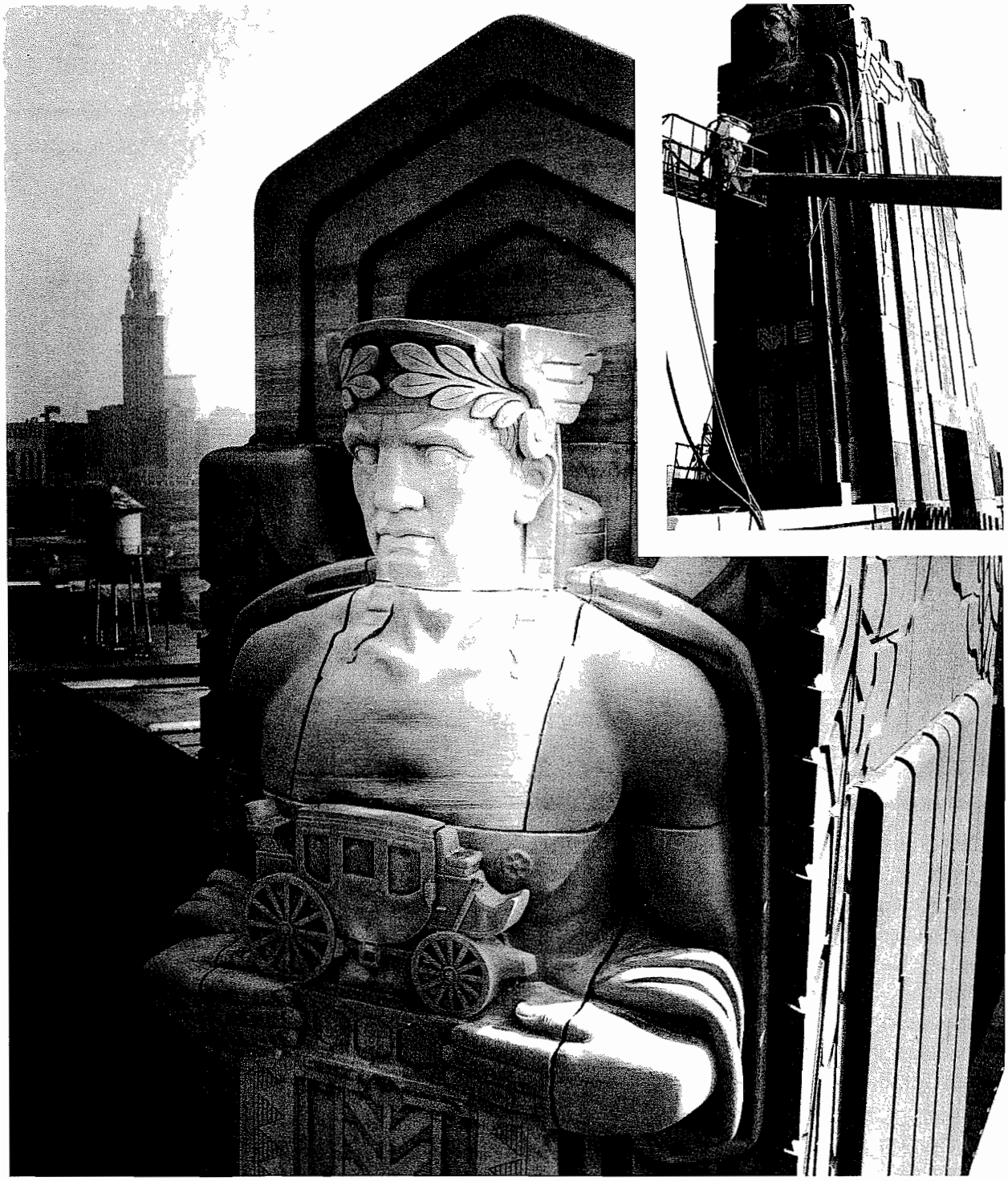
This two span bridge was one of only three Pratt deck trusses identified in the first historic bridge inventory. It consists of a steel deck truss which extends 100 feet across Rush Creek and a curved concrete beam span which crosses Conrail. In 1986, because of the deterioration of the concrete deck and the transverse floor beam support members in the truss, the bridge was closed to traffic. The rehabilitation of the bridge included repairing portions of the top chord of the truss by replacing channel and flange plate members where deteriorated. High strength bolts were used to replace original rivet fasteners. The transverse floor beams were totally replaced with rolled beams of a similar configuration before the new concrete deck was put into place. The new solid concrete railing has recessed insets on the exterior face. This gives a similar appearance to the original railing and still meets safety standards. This rehabilitation has preserved the appearance of this unique bridge which was re-opened to traffic in 1989. (Federal Aid Project)

City of Cleveland, Cuyahoga County
Lorain-Carnegie Avenue
Crosses Cuyahoga River
UM Coordinates-17/442090/4593090
Structure File No. 1801503

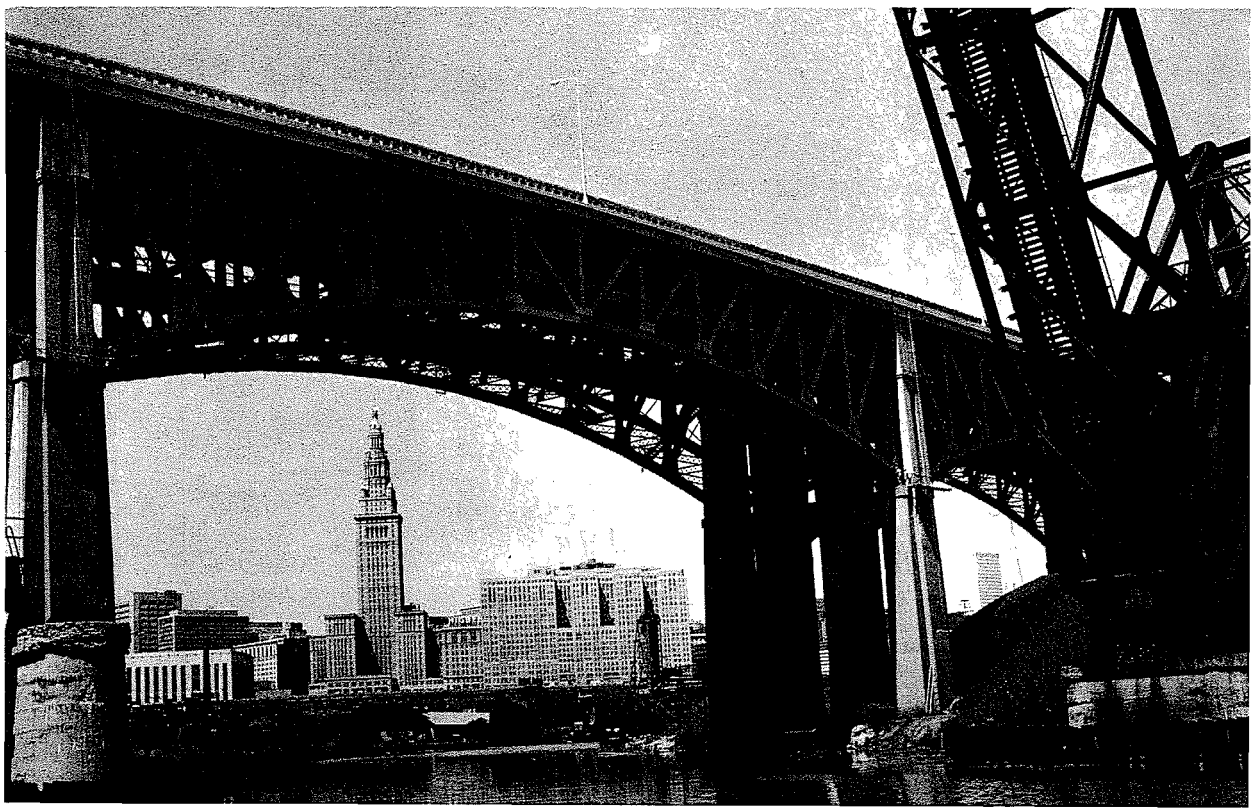
Lorain-Carnegie High Level/
Hope Memorial Bridge
Cantilevered truss
Builder: Mt. Vernon Bridge Co.
Constructed: 1932
National Register

There are times when a bridge is so unusual that all interested parties agree that it is worth rehabilitation. The Lorain-Carnegie Bridge was recognized from both preservationist and engineering perspectives as an important structure. The bridge was designed by Wilbur J. Watson. It has decoratively curved bottom chords and four carved stone pylons. The massive pylons were designed by world-renowned sculptor, Henry Herring. Carved into each structure are two giant mythical figures holding symbols representing the history of transportation: a stage coach, a covered wagon, an automobile and several motorized trucks. The bridge opened on December 5, 1932, and the American Institute of Steel Construction declared it one of the most beautiful bridges built that year (HAER Inventory Form). The superstructure consists of 14 cantilevered truss spans varying in length from 132 feet at the ends to 299 feet over the Cuyahoga River with a total length of 4,490 feet. The bridge has two decks. The lower deck, designed for rapid transit tracks and trucks, has never been used. By the mid 1970s extensive and continuing maintenance was required to keep the bridge open to traffic. (Federal Aid Project)

1932 photograph of stonecutters and carvers.



Cleaning, upper right, and after, 1983.

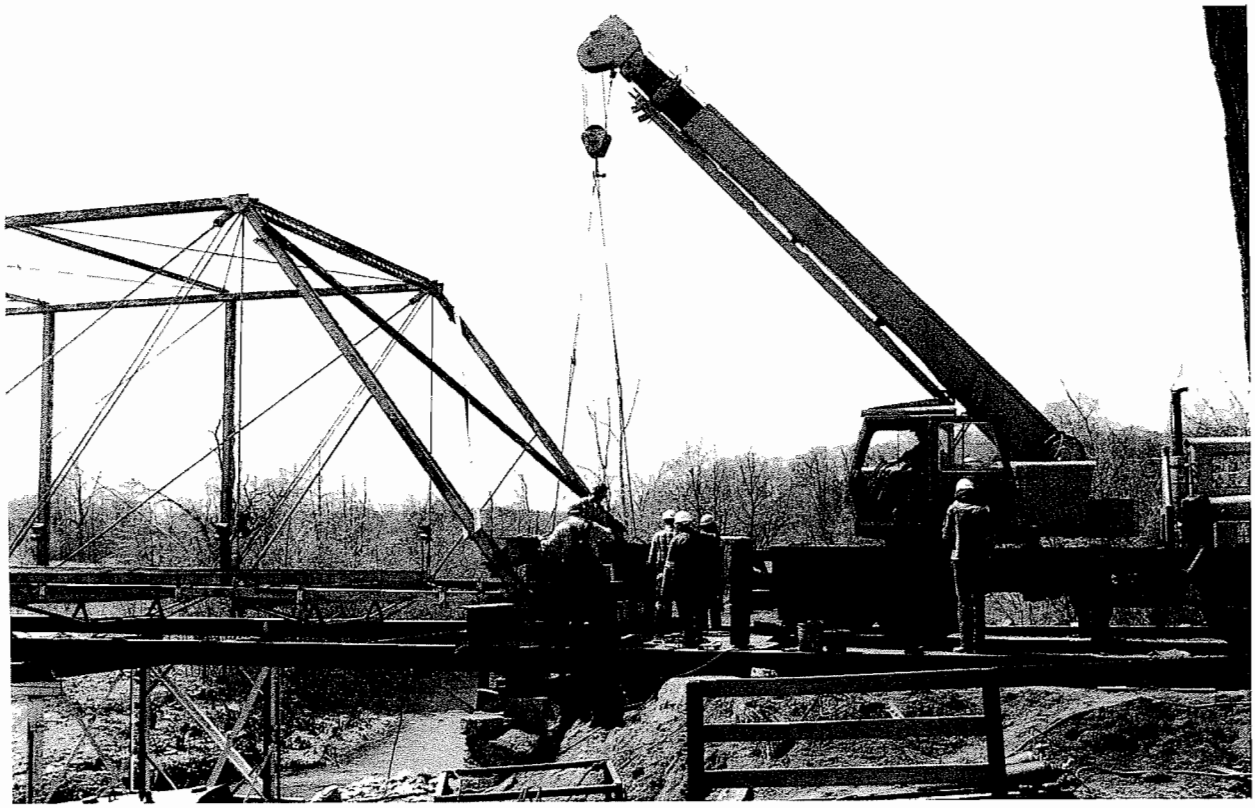


After a design analysis, it was determined that repairs to existing members of the bridge were needed to restore original strength and to impede further deterioration. Thus, the bridge was closed for rehabilitation on October 3, 1980. Deteriorated members and components of the bridge included all the expansion joints, the curb stringers and floor beams, the west pylon floor beams, the entire drainage system and the west abutment. The cut stone railings had to be replaced and the pylons needed to be cleaned.

The three year bridge rehabilitation was completed September 1, 1983. The rehabilitated bridge meets current safety standards and retains its architectural significance. The new railing maintains the architectural qualities of the original railing and meets current design standards (ODOT 1977). The stone pylons were cleaned carefully with crushed walnut shells, a non-abrasive method which did not damage the surface of the stone. When it was re-opened to traffic it was re-named the Hope Memorial Bridge in honor of comedian Bob Hope's father, Harry Hope one of the stonecutters of the bridge pylons. (Photographs, Archives of Cuyahoga County Engineers)

CHAPTER 12

NEW USES FOR OLD BRIDGES



Sometimes a practical and economical solution for an old bridge is to move it to a new location with fewer traffic demands so it can continue to carry vehicular traffic. Bridges have been moved to different locations during the past century as local circumstances demanded it. The commonness of pin-connected bridges, in fact, facilitated this reuse. Today, a bridge, the inadequate width and load bearing capacity of which make it obsolete at one location, can be moved to a new crossing with less traffic. When it is not possible to keep a bridge in service for vehicular traffic, it often is possible to preserve the bridge by finding another, less demanding, use. The possibilities for adaptive reuse of bridges are limited only by the imagination of concerned individuals.

The Surface Transportation and Uniform Relocation Act of 1987 encourages the adaptive use of historic bridges. It makes funds available for reimbursement of cost incurred in preservation and reuse efforts. To be eligible for reimbursement an organization or individual must agree to maintain a bridge and the features that make it historically

future legal and financial responsibility for the bridge.

Preservationists in Ohio, a group which includes business representatives, engineers, farmers, government officials, historians, private citizens, park managers and many others have found a variety of new uses for old bridges. It is encouraging to see continued solutions for reuse of old bridges. In general, solutions have required minor changes to the old bridges. Often little more than normal maintenance and repair and minimal alterations are necessary when a bridge is reused in its original location . However, moving a bridge to a new location obviously requires more work.

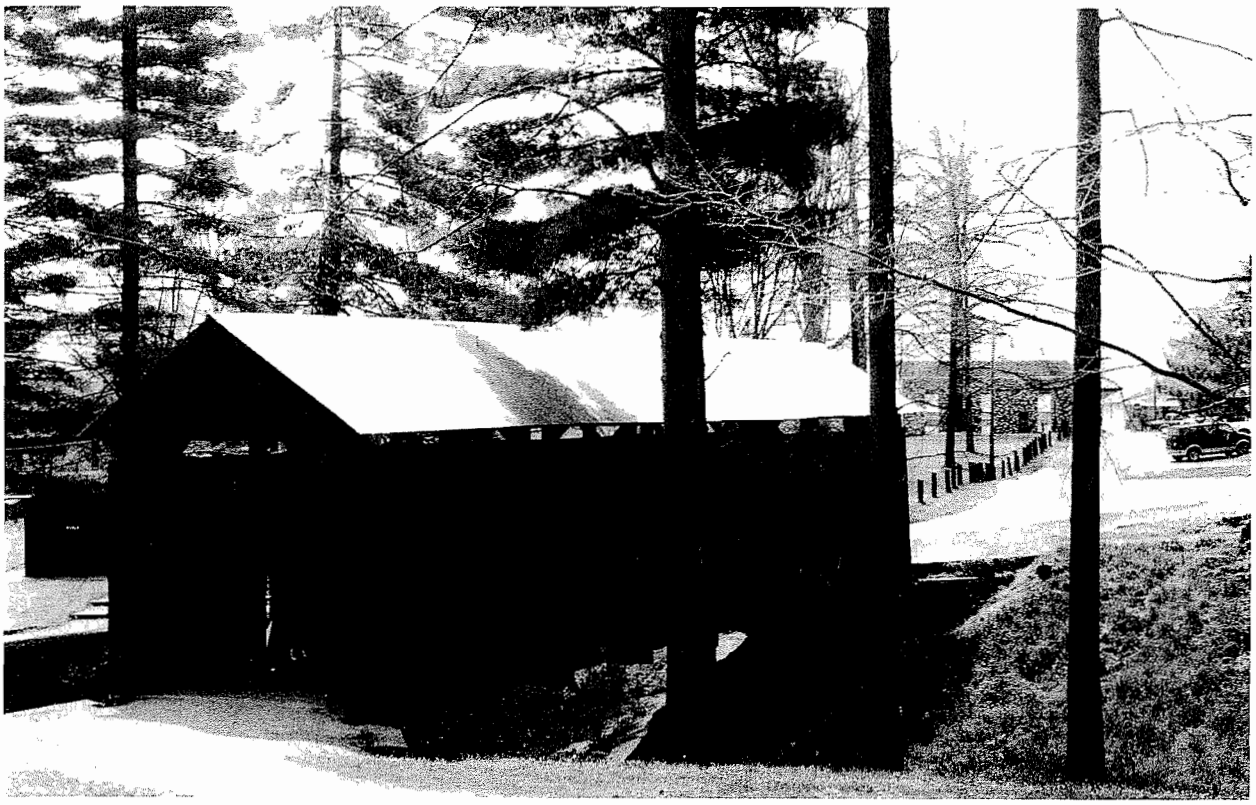
Some of the metal bridges are disassembled prior to the move. But even in these cases, there are very few changes required when the bridges are reassembled. Generally, only the width of the bridge is altered to meet requirements of the new location.

For a long time, farmers have been moving and reusing old bridges on their properties to span small streams and drainage ditches. "Ohio Historic Bridge Guide," a pamphlet published by the Southern Ohio Covered Bridge Association, identified nine covered bridges that were moved to farms for reuse. The first occurred in 1912 when an 1874 covered bridge was moved to a private farm. Some bridges are used over streams, farm ponds and lakes. Two of the bridges are used for storage sheds. Complementing this private agricultural reuse is the reutilization by local fairboards. Since 1953, when the Rosseau Covered Bridge was moved to the Morgan County Fairgrounds, a total of six covered bridges has been moved to local fairgrounds for pedestrian use.

The most popular reuse of bridges is in parks. In some cases the parks are created around bridges located on abandoned sections of roads and in other cases the bridges are moved to existing parks where they can be used by pedestrians. Perhaps the most interesting, innovative new use for an old bridge is the conversion of a 126 foot, 55 ton covered bridge into two pizza parlors in northern Ohio .

City of Cambridge, Guernsey County
Cambridge City Park
Crosses a Gully
OCBC No. 35-30-12

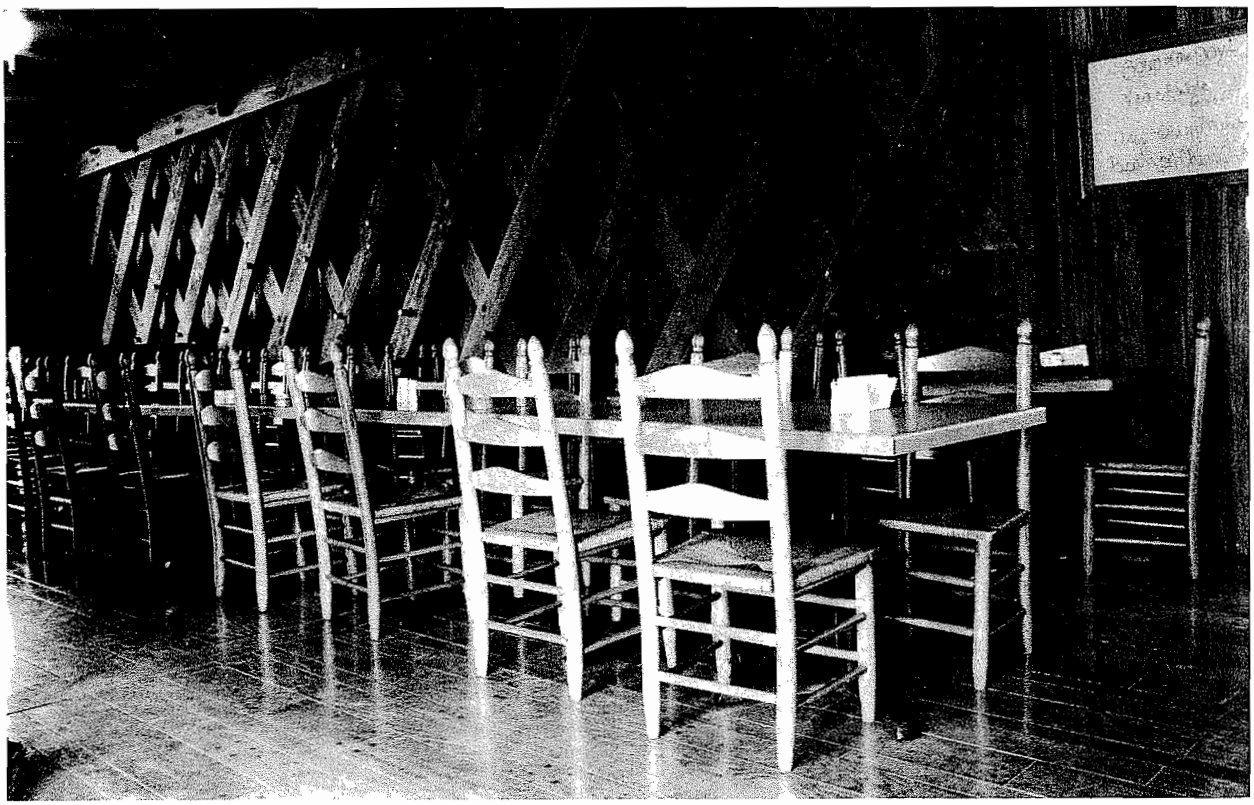
Armstrong Bridge
Multiple kingpost truss
Builder: Abraham Armstrong
Constructed: 1849



The Armstrong Bridge is an all-timber multiple kingpost truss, once common in Ohio. It has ten panels and is 74 feet 6 inches long. The bridge has high boarded red siding, metal connections, straight portals with decorative pilasters, and a metal roof. It was placed on cut stone abutments from the original site. The bridge was moved in 1967 to the city park to prevent its destruction by the creation of Salt Fork Reservoir. In preparation for the move, the bridge timbers were marked and then dismantled and trucked to the new site. It now is a local historic site.

Ashtabula County
Andover and N. Kingsville

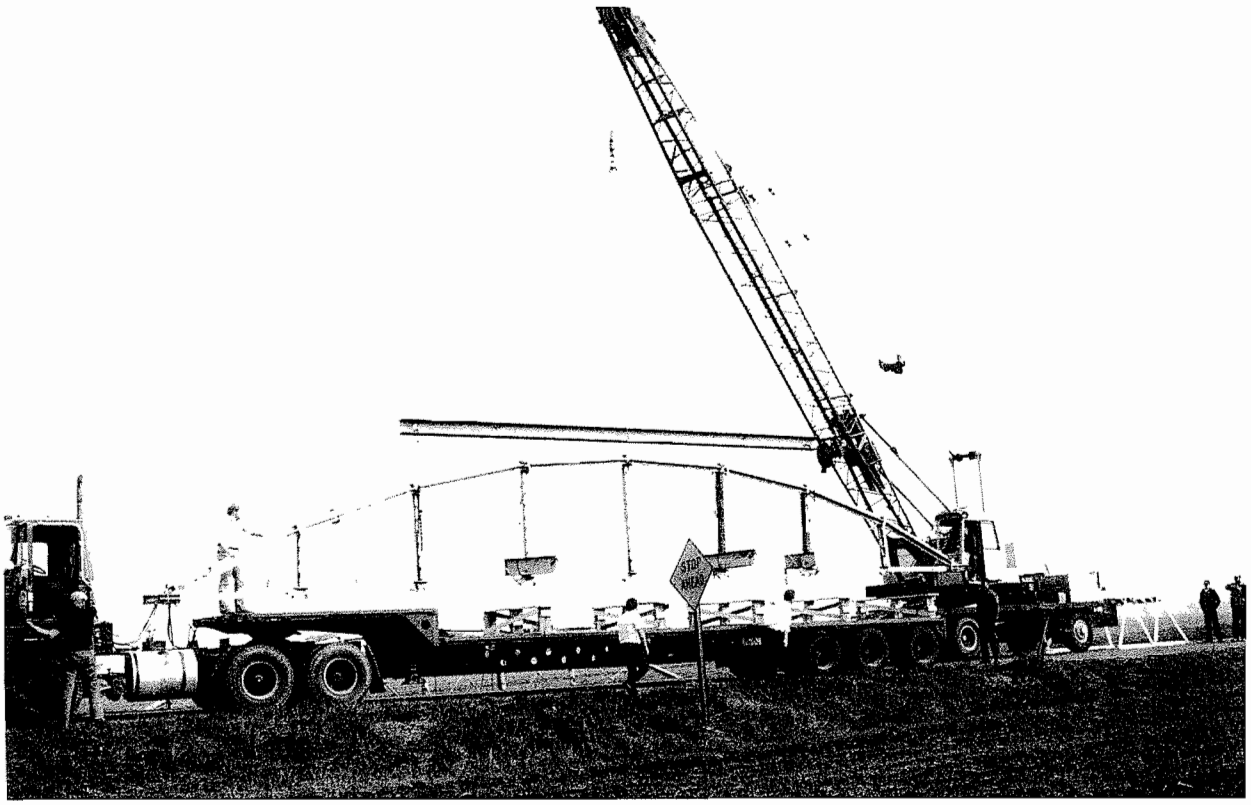
Covered Bridge Pizza Parlors
Town lattice truss
Builder: Unknown
Constructed: 1862



Perhaps the most interesting, innovative, new use for an old bridge is the conversion of a 126 foot, 55 ton covered bridge into two pizza parlors. In 1972, Gary Hewitt wanted to open a pizza parlor and he wanted a building that would look like a covered bridge. Coincidentally, one of the abutments on the Forman Road Covered Bridge had started to wash away and the county was considering replacing rather than repairing the old bridge. The county engineer offered the bridge for sale and Mr. Hewitt, the only bidder, purchased the bridge for $5.00. He was given 60 days to remove the bridge. Prior to removal he numbered and photographed each member of the bridge. It was then dismantled and stored. In 1975, he opened his first pizza parlor, housed in one-half of the old bridge. In 1977, using the other half of the bridge, he opened a second Covered Bridge Pizza Parlor. The customers are seated in the original sections of the bridge and if they are curious about the unusual setting they can read a detailed history of the bridge on the back of the menu.

New Bremen, Auglaize County
Pedestrian Access in Lions Club Park
Crosses Miami and Erie Canal

Cast Iron Bowstring Bridge
Builder: D.H. Morrison
Constructed: 1864
Selected as Eligible



An important Civil War cast iron bridge was preserved through cooperative efforts of the Auglaize County Engineer's Office and the New Bremen Bridge Committee. The county commissioners, who recognized the significance of the 57 foot cast iron structure, decided to sell the old trusses in the hopes of fostering their preservation on a new location. Learning of the impending removal , the New Bremen Bridge Committee established itself and formulated plans to move the historic bridge to their nearby village. Dan Bennett of the county engineer's office provided important engineering advice on the design of the abutments at the new site over the Miami and Erie Canal. Labor and equipment for the construction of the abutments were donated by a local contractor. County forces in the meantime prepared the bridge for moving by stripping off the floor and removing the stringers and floor beams. The county engineer's crane was also used to lift the trusses onto a flat bed semi-truck provided by a local contractor. Several damaged cast iron verticals were duplicated at a local foundry and replaced. (David Simmons, Photographer)

Only the width of the floor beams was changed to narrow the roadway to that needed for pedestrian use. A new wood floor, guard rails and paint completed the restoration.

The village council agreed to maintain the structure after it was installed and assume liability for it in the future (Simmons 1985:15).

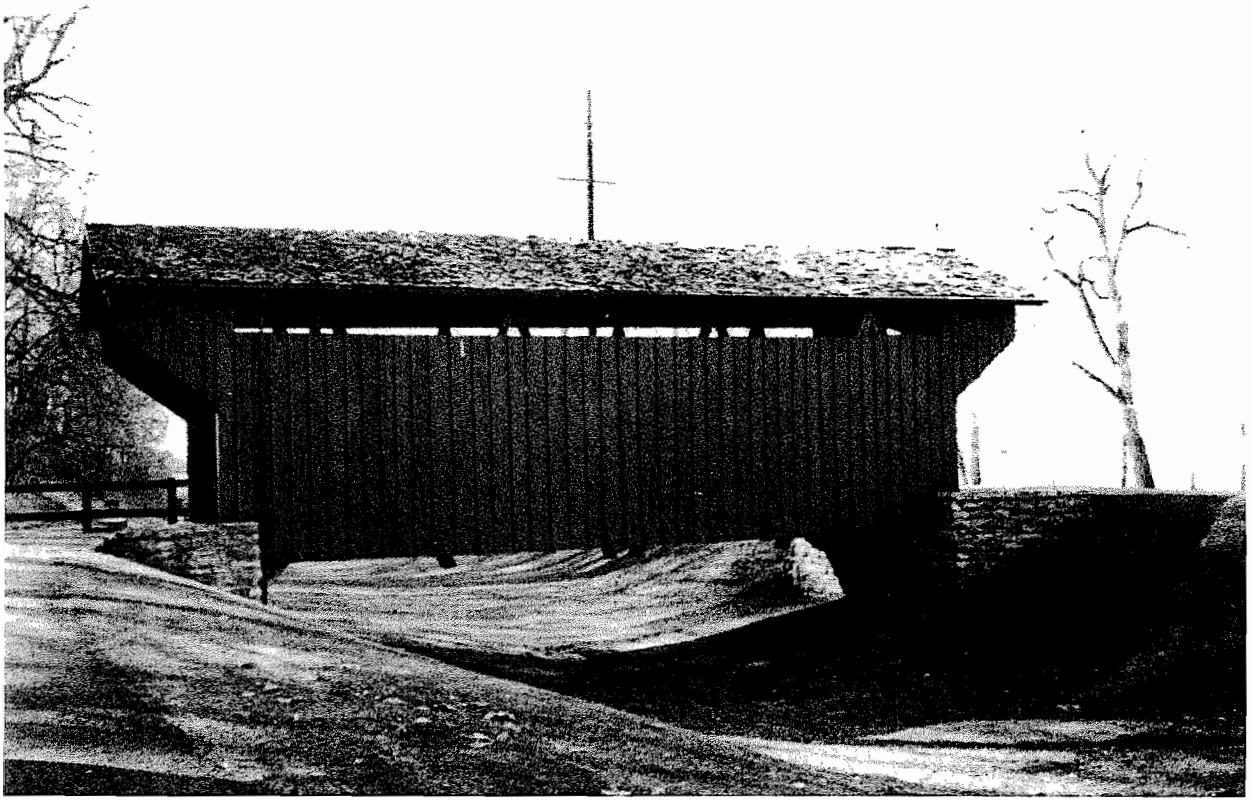
City of Columbus, Franklin County
Ohio Historical Center
HAER No. OH-46

Smith Road Bridge
Bowstring arch
Builder: The King Iron Bridge
And Manufacturing Co.
Constructed: c. 1870
National Register

This bridge formerly was located over Sycamore Creek in Lykens Township in Crawford County, Ohio. It was the oldest existing bridge in Crawford County and a prime example of a wrought iron tubular arch design. The design was patented in 1861 by Cleveland's Zenas King, founder of The King Iron Bridge and Manufacturing Company. The patent design was improved in 1867. The patenting and manufacturing of the prototype of this tubular design launched the career of this bridge designer and builder (HAER, Randall S. Gooden). In 1986 it became apparent that the bridge could no longer serve vehicular traffic. Crawford County Engineer Gerald W. Riedel, notified interested agencies that the bridge would be removed from service and offered it to anyone who could reuse it for nonvehicular purposes. As a result the bridge was dismantled and moved to the Ohio Historical Center in Columbus, Ohio. In 1989, it was re-erected over an artificial pond in an area between the Ohio Historical Center and Ohio Village.

City of Dayton, Montgomery County
Carillon Park
Crosses Miami and Erie Canal
OCBC No. 35-57-03

Feedwire Road Covered Bridge
Warren truss
Builder: R. W. Smith
Constructed: 1870



The Feedwire Road Covered Bridge served neighboring Greene County farmers until after World War II when officials decided the time had come to replace it with a modern structure. Colonel Edward A. Deeds had begun the development of a 65-acre historic park known as Carillon Park. His desire to have a covered bridge in the park coincided with the intent to replace the bridge. The two sites were only a few miles apart, so the bridge was moved to the park in 1948. Later a new wooden arch was added to the original framework of the bridge. This was a traditional method of increasing the strength of an old bridge. It complements the design of the structure. A new roof with a small projection over each end to provide protection also was added. This was the first Ohio covered bridge to be moved for preservation purposes. (Shannon and Simmons 1986:19). (Miriam Wood, Photographer)

McConnelsville, Morgan County
County Fairgrounds Crosses a gully
Malta Township
OCBC No. 35-58-32

Rosseau Covered Bridge
Multiple kingpost truss
Builder: Unknown
Constructed: c. 1870

The Rosseau Covered Bridge is a typical Ohio multiple kingpost truss with high boarded siding, projecting portals and a red metal roof. This bridge, which probably dates back to the 1870s, was built to span a branch of Wolf Creek just south of Rosseau in southwest Morgan County. In 1953 the county engineer, Ed Ervin dismantled and moved the Rosseau Bridge to the county fairgrounds, using county resources at the cost of $1,642. This was one of the first times an Ohio covered bridge was moved to a county fairground for preservation purposes.

Fairfield County
Fairfield-Union High School
Crosses inlet
OCBC No. 35-23-33

Baker Covered Bridge
Multiple kingpost truss
Builder: James Arnold
Constructed: 1871
National Register

In 1981 the Baker Covered Bridge was going to be flooded by the Rush Creek Watershed Flood Protection Project and was moved 6 miles to Fairfield-Union High School. The United States Department of Agriculture's Soil Conservation Service funded the move as stipulated for a federal project. The bridge was placed in the school's outdoor land laboratory over an inlet feeding two pools. The land laboratory, a 125 acre area adjacent to the high school, features nature trails, woodlands, and cultivated fields which provide the school district with a unique teaching tool. Teachers of elementary grades through high school use the land laboratory in history, biology, social studies and environmental classes. The covered bridge has become an invaluable asset to this program. It serves as an outdoor classroom and setting for various educational activities and it has been incorporated into the subject matter of the history and social studies classes.

Perry County
Private farm road
Crosses farm pond
OCBC No. 35-64-84

Ruffner/Moore Bridge
Smith truss
Builder: William Black
Constructed: 1875

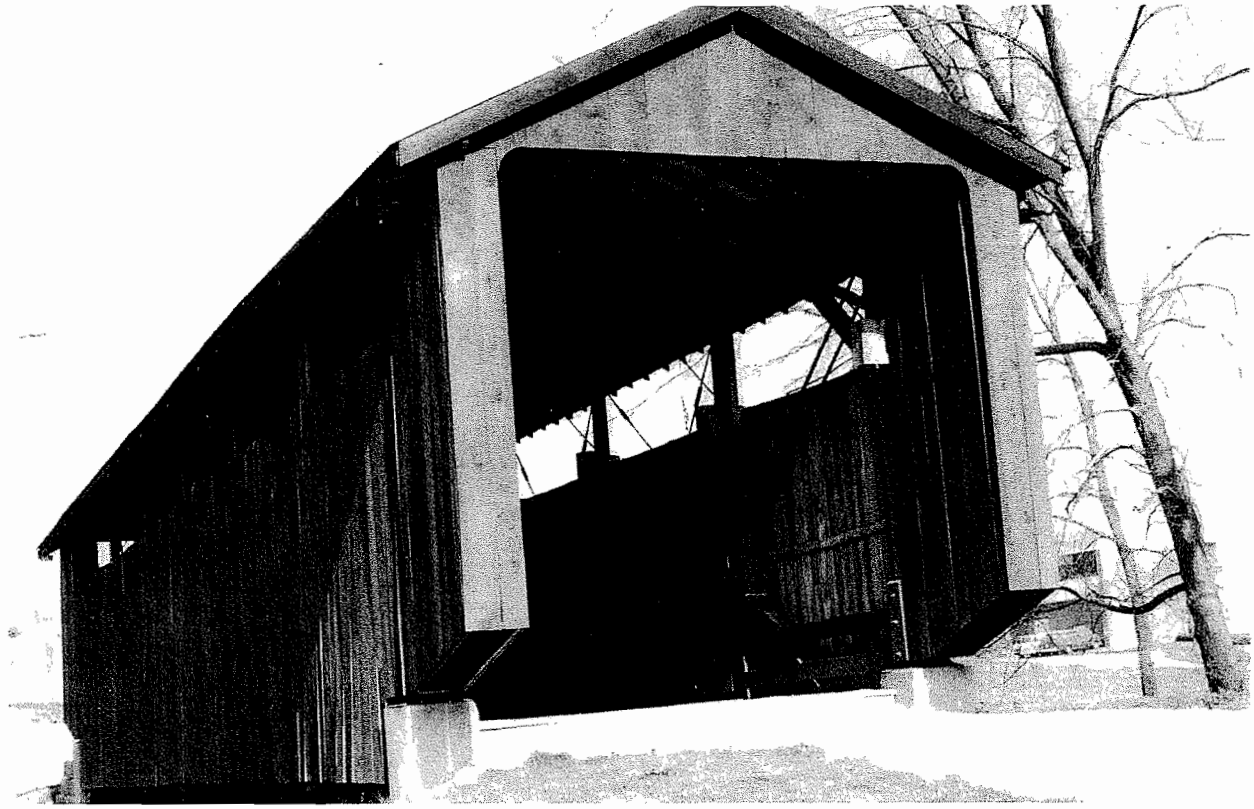
The Ruffner/Moore Bridge is an outstanding example of the preservation of a covered bridge moved to private property. The Ruffner/Moore Bridge was built in 1875 to span the Little Rush Creek on Gun Barrel Road north of Rushville in Fairfield County. About 1980, Fairfield County began offering covered bridges to any individual or organization willing to move and preserve these old structures. The Ruffner Bridge had been closed for some time when Carroll Moore of neighboring Perry County offered to take it. The bridge was moved intact to the Moore farm on SR 13 where it was placed over a small pond. The pond has been enlarged to a small lake, well stocked with fish for the Covered Bridge Fishing Club. Structurally, the bridge remains in its original condition.

New Holland, Pickaway County
Bowstring arch pony truss
Builder: Champion Bridge Co.
Crosses Mud Run
Constructed: 1877
UTM Coordinates-17/305900/4380840
Selected as Eligible

Of more than 168 bridges identified as significant in the historic bridge survey completed by the Ohio Department of Transportation in 1983, only one Champion bowstring was included. It is a diminutive structure located on a county road on the north edge of New Holland in Pickaway County. This bridge was a rare survivor of a patented bridge technology from the 19th century. It was built in 1877 by the Champion Bridge Company of Wilmington, Ohio, based on patents granted to Jonathan and Zimri Wall several years earlier. After serving admirably for almost a century the bridge was eventually upgraded for the roadway of this small stream crossing. The crossing also included a sidewalk which provided access to the village cemetery just beyond the stream. Instead of simply removing and destroying the old bowstring trusses, the Pickaway County Engineer, Robert Parker, incorporated them into the new project to carry the sidewalk over the stream. The old trusses continue to serve a useful transportation function, an important facet of any good bridge preservation project (Simmons 1988: 16).
(David Simmons, Photographer)

N of Lancaster, Fairfield County
Ohio University Campus-Lancaster Branch
Crosses Fetters Run
Pleasant Township
OCBC No. 35-23-10
UTM Coordinates-17/364200/4399610

John Bright Bridge #2
Suspension truss
Builder: August Borneman
Constructed: 1881
National Register

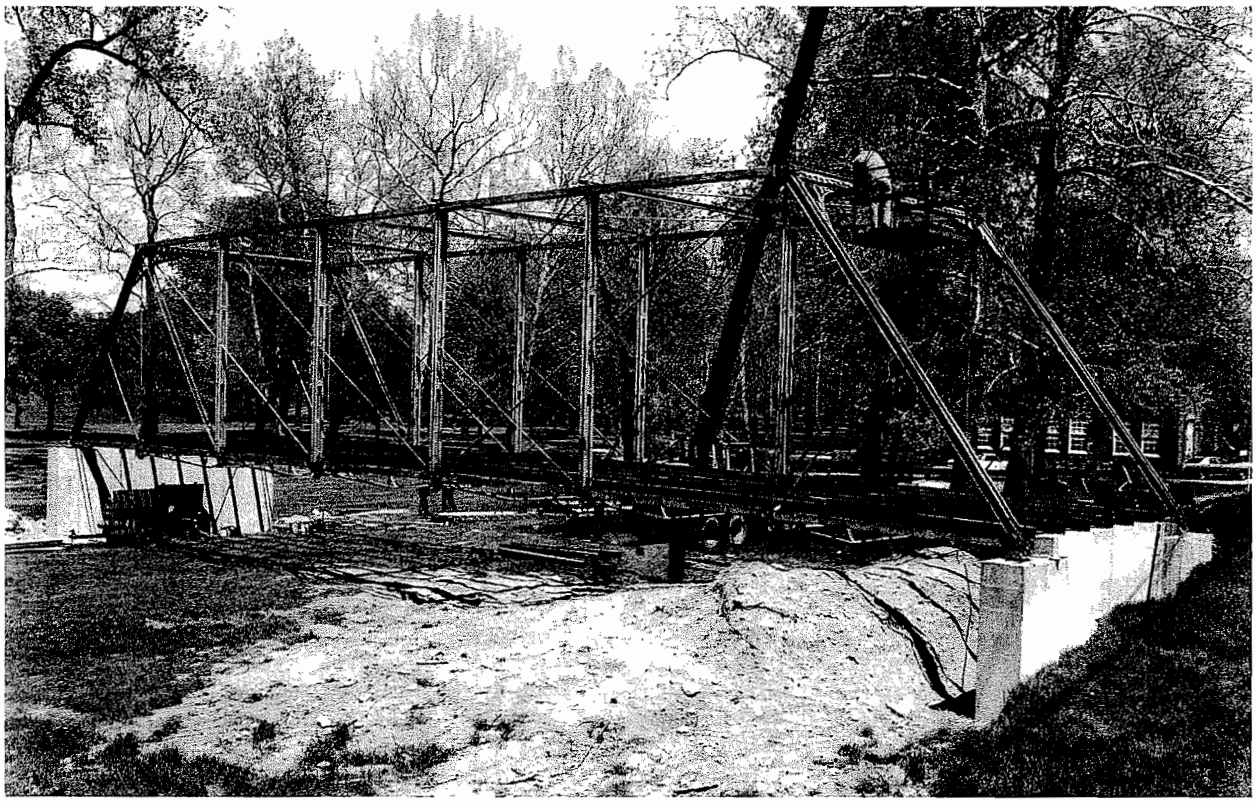


The John Bright #2 was built in 1881 by August Borneman, a Prussian immigrant who was a prolific bridge designer and builder in Ohio. This 74 foot long, single span bridge has an inverted arch bowstring suspension truss closely resembling the 1875 patent for a metal truss designed by William Black, a former partner of Mr. Borneman. The bridge features wooden upper chords, end posts and intermediate verticals with metal rod cross bracing. An inverted eyebar arch is suspended from the top of the end posts. The bridge also has a wooden arch, probably a later addition. In spring 1988, the bridge was transported with only the roof removed to the campus of the Lancaster Branch of Ohio University. Most of the siding had been removed by vandals. The bridge was moved 12 miles from its original site over Poplar Creek on Bish Road in Liberty Township. Money for the move was raised by numerous financial and in-kind contributions. The John Bright Covered Bridge now spans Fetters Run resting on concrete foundation. The top course of the original sandstone abutments was moved and reused at the new site of the bridge.

City of Dayton, Montgomery County
Carillon Park
Crosses Miami and Erie Canal

Lower Gratis Road Bridge
Double intersection Pratt through truss
Builder: Columbia Bridge Works
Constructed: 1881
National Register

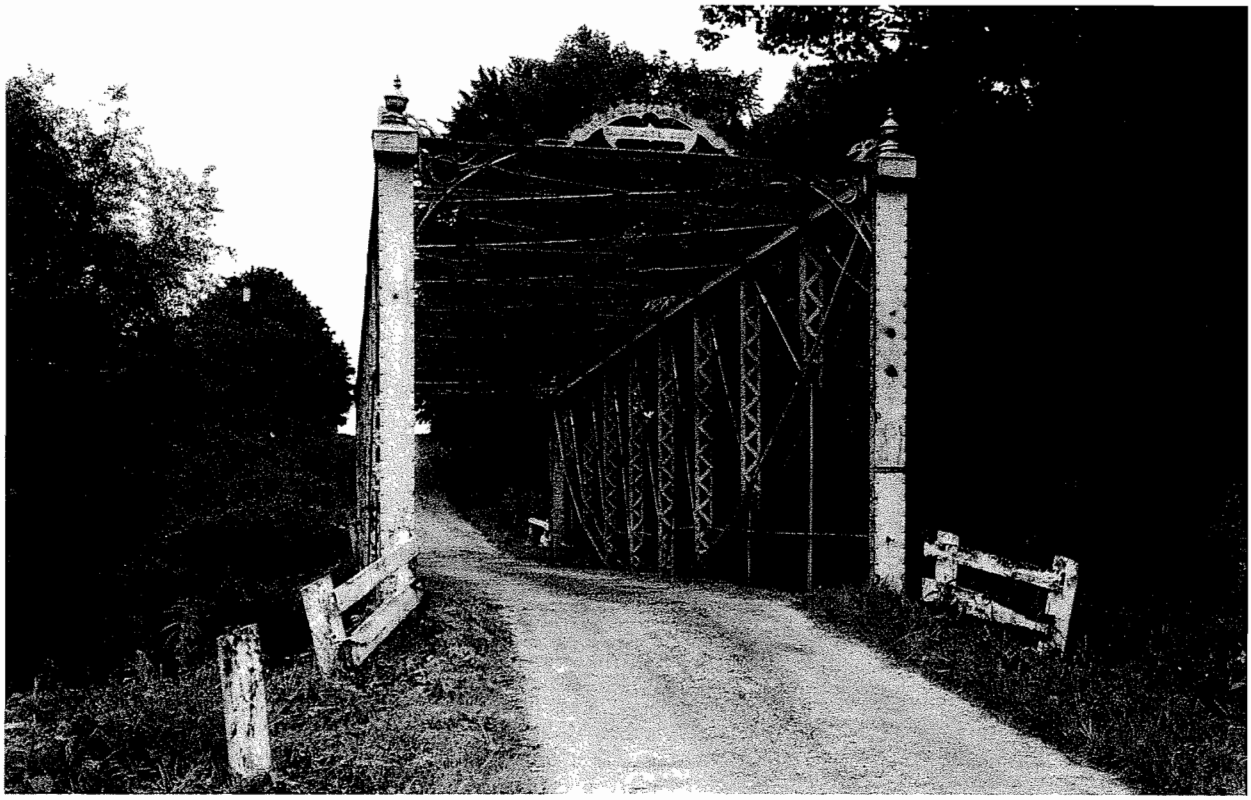
Located west of Dayton, the community of Farmersville was isolated from surburban expansion. Consequently, it was 1976 before the Montgomery County Engineer initiated steps to replace the Tom's Run Bridge. The bridge was still structurally sound but placed a hardship on farmers with oversized equipment and loaded grain trucks. The Montgomery County Engineer's office applied for federal funds to replace it. When the Ohio State Historic Preservation Office heard about the project, they identified the historical significance of the bridge and investigated the possibility of its relocation to Carillon Park. A six ton load limit was placed on the bridge in 1979, limiting its use to automobiles and small trucks. In the spring of 1984 on-site work on the relocation started. Moving the bridge back to Dayton was the reverse of the original construction. The wooden flooring was removed and stacked on the bank. I-beams were bolted to the batter posts at each end for use in raising and lowering the structure. A new welded steel falsework was fabricated in the stream bed beneath the bridge.



Rollers were clamped to each of the "shoes" or bearing points of the bridge and the trusses were pulled slowly across the falsework to the bank. Here the bridge was disassembled and shipped to Dayton, where it was reassembled and erected on the new abutments at the park. A much wider reinforced concrete bridge now crosses Tom's Run on the Lower Gratis Road (Shannon and Simmons 1986:21-23).
(David Simmons, Photographer)

N of Lancaster, Fairfield County
Ohio University Campus-Lancaster Branch
Pleasant Township
HAER No. OH-44

John Bright Bridge #1
Suspension truss
Builder: Hocking Valley Bridge Works
Constructed: 1884
National Register



In 1884 August Borneman contracted with Fairfield County Commissioners to build the Smith Mill Bridge over Poplar Creek in Liberty Township. The new bridge replaced a covered combination truss bridge built in 1876. Nearby stood the covered John Bright #2 bridge, a bowstring suspension truss of wood and iron built in 1881 by Borneman. The new Smith Mill Bridge (later known as the John Bright #1) also was an inverted bowstring suspension truss built entirely of metal. The vertical end posts bear ornamental urns and there is a decorative plaque on the north portal stating that the bridge was built by the Hocking Valley Bridge Works (owned by Borneman). The John Bright #1 Bridge features elements of the truss design patented in 1875 by William Black, a former partner with Borneman in the Ohio Bridge and Iron Company in the early 1870s. Black and Borneman built combination wood and metal bridges which may have been similar to the John Bright bridges. The drawings and photographs used here clearly illustrate the unique design of John Bright #1 (HAER OH-44). (Louise Taft Cawood, Photographer)

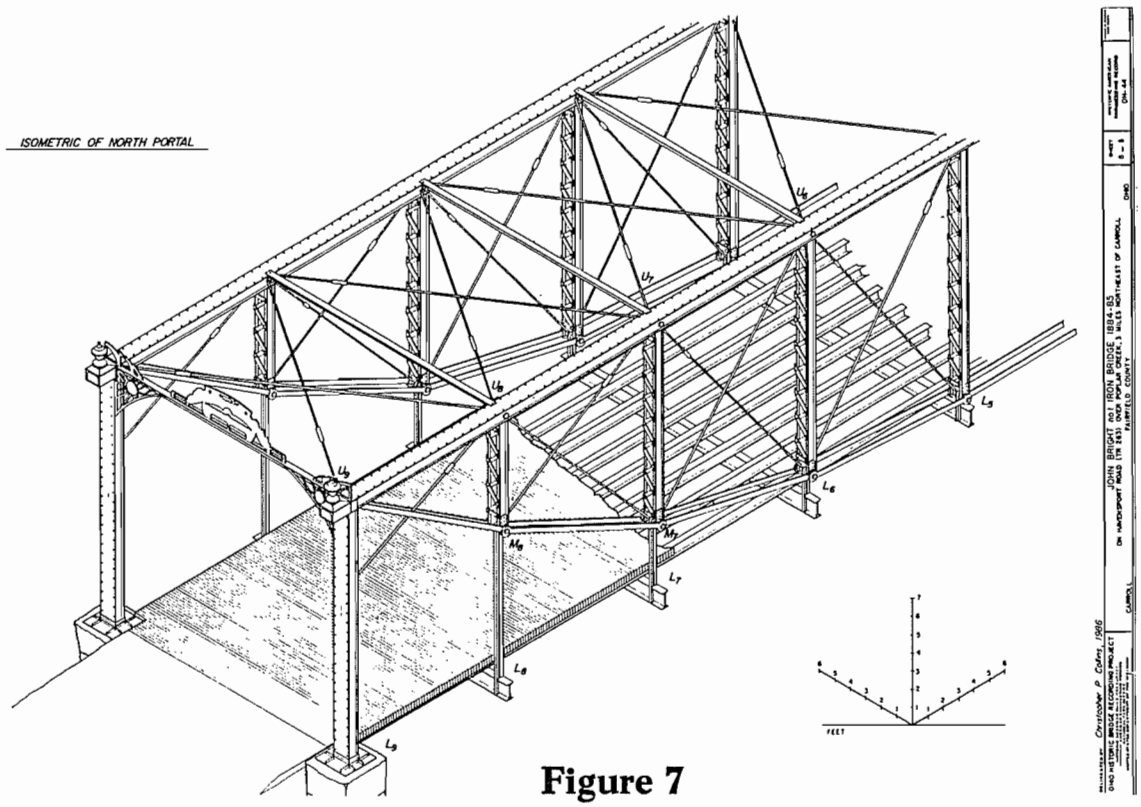


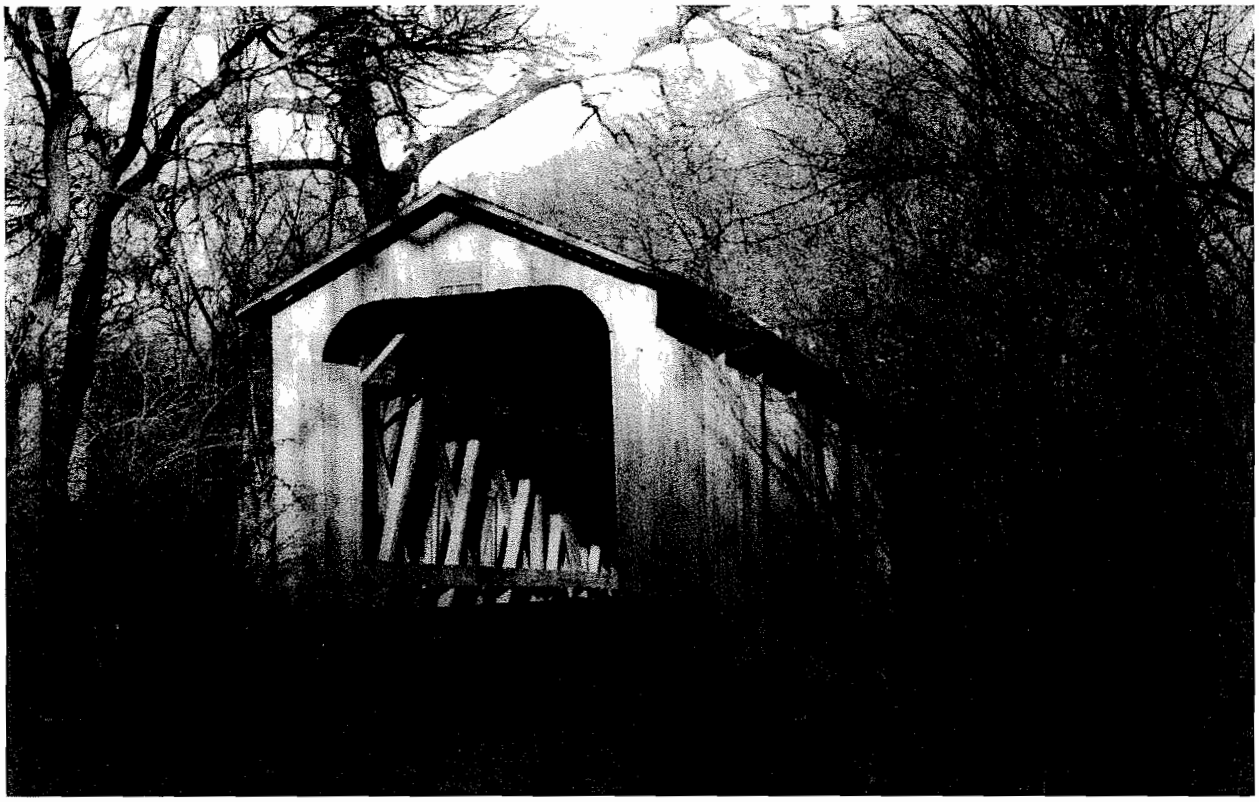
Figure 7

In the summer of 1989, Fairfield County dismantled the old metal truss and moved it to the Lancaster Campus of Ohio University where it will be rebuilt near John Bright #2 Covered Bridge which was moved to the campus in 1988.

The John Bright bridges are outstanding examples of the innovative bridge design skills of August Borneman and it is fitting that they be maintained and reused together in a protected environment. (HAER photograph and isometric)

Yellow Springs, Greene County
Glen Helen off County Route 27
Crosses Yellow Springs Creek
OCBC No. 35-29-01
UTM Coordinates-17/252550/4407720

Cemetery Road/Glen Helen Bridge
Howe truss
Builder: Henry Hebble
Constructed: 1886

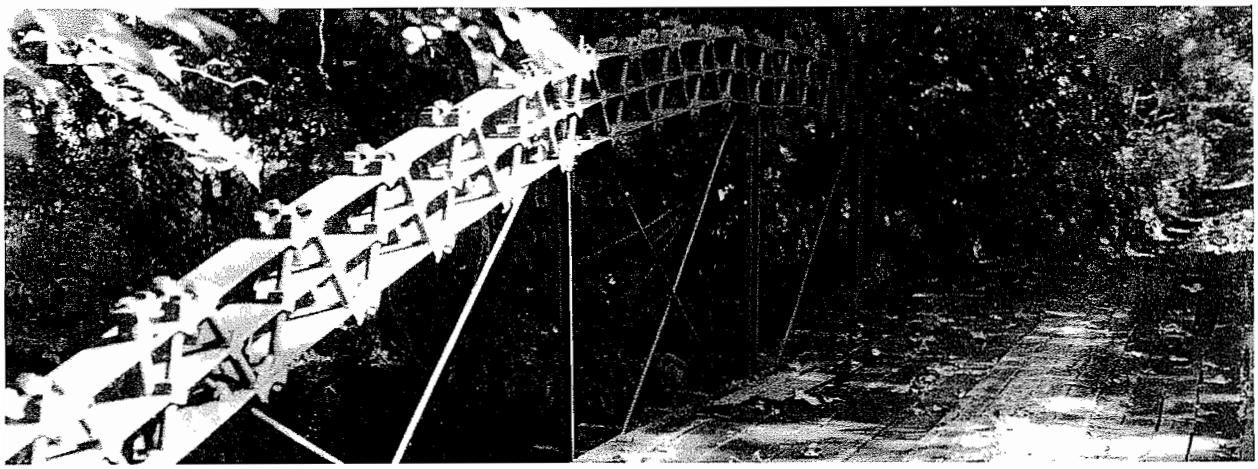


The Cemetery Road/Glen Helen Bridge was built to span Anderson's Fork of Caesar's Creek, east of New Burlington. The bridge had to be moved when Caesar's Creek Reservoir was built. It was moved to Glen Helen Nature Preserve in 1979 through the efforts of Ralph Ramey, former Director of the Preserve. A 60 foot center section of the more than 130 foot bridge was moved intact and placed over Yellow Springs Creek. The bridge has high boarded unpainted siding, a metal roof and straight portals.

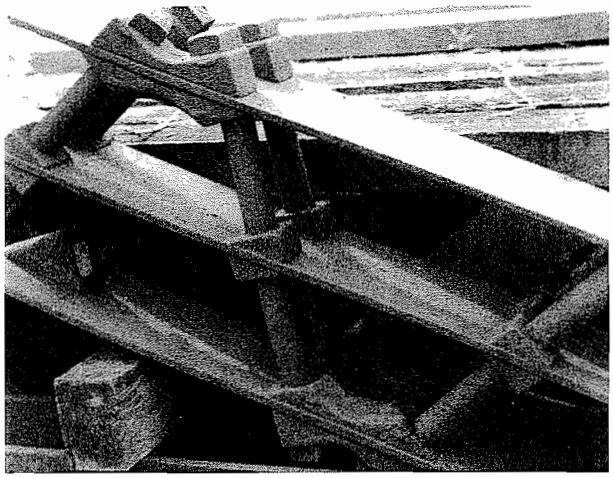
Lewisburg, Preble County
Civitan Park
OCBC No. 35-68-04

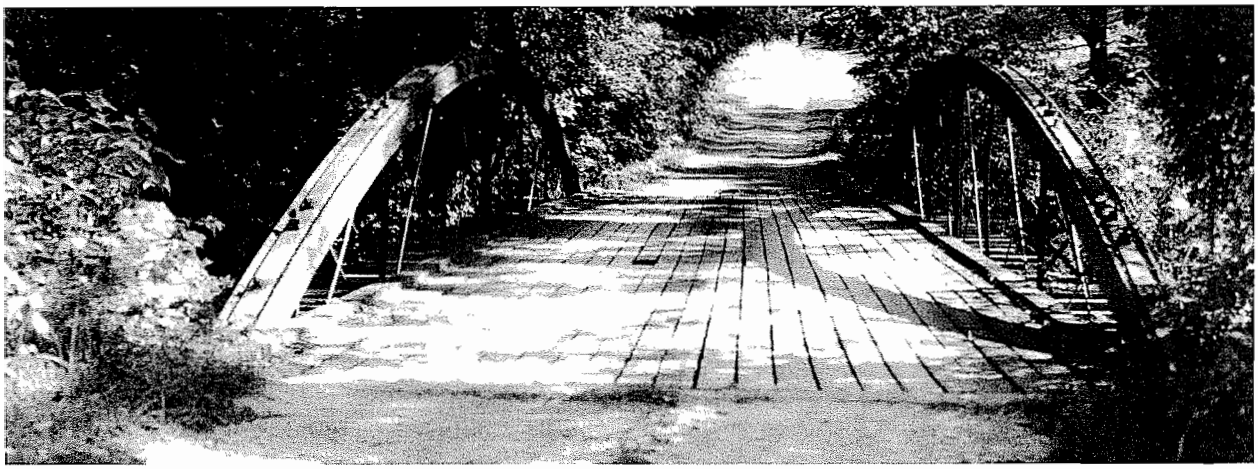
Dixon's Branch Bridge
Childs truss
Builder: Everett S. Sherman
Constructed: 1887

In Ohio, the Childs truss, patented in 1846 by Horace Childs of Henniker, New Hampshire, was used only in Delaware and Preble Counties. In Preble County, Everett Sherman built 15 covered bridges, all using the Childs truss. The Dixon's Branch Bridge was built to replace a steel bridge that had washed out and like Sherman's pre-1890 bridges, it was of light construction. Top chords were 6 by 6 inch and 7 by 7 inch, vertical posts were 6 by 7 inch, bottom chords two 3 by 12 inch timbers dowelled together and a little trim at the portals. In 1963 the new replacement roof was torn off in a windstorm and the county decided against repairs and offered the bridge to any organization which would take it. The Civitan Club of Lewisburg had the bridge dismantled and moved to a local park. Work was done under the supervision of Seth Schlotterbeck, maintenance engineer for Preble County for many years and an expert on wooden truss bridges. He spearheaded the movement to get the bridge moved to Civitan Park and did much of the work himself. The bridge has been preserved as an excellent example of the Childs truss and also as a memorial to the work and knowledge of the late Seth Schlotterbeck. (Miriam Wood, Photographer)

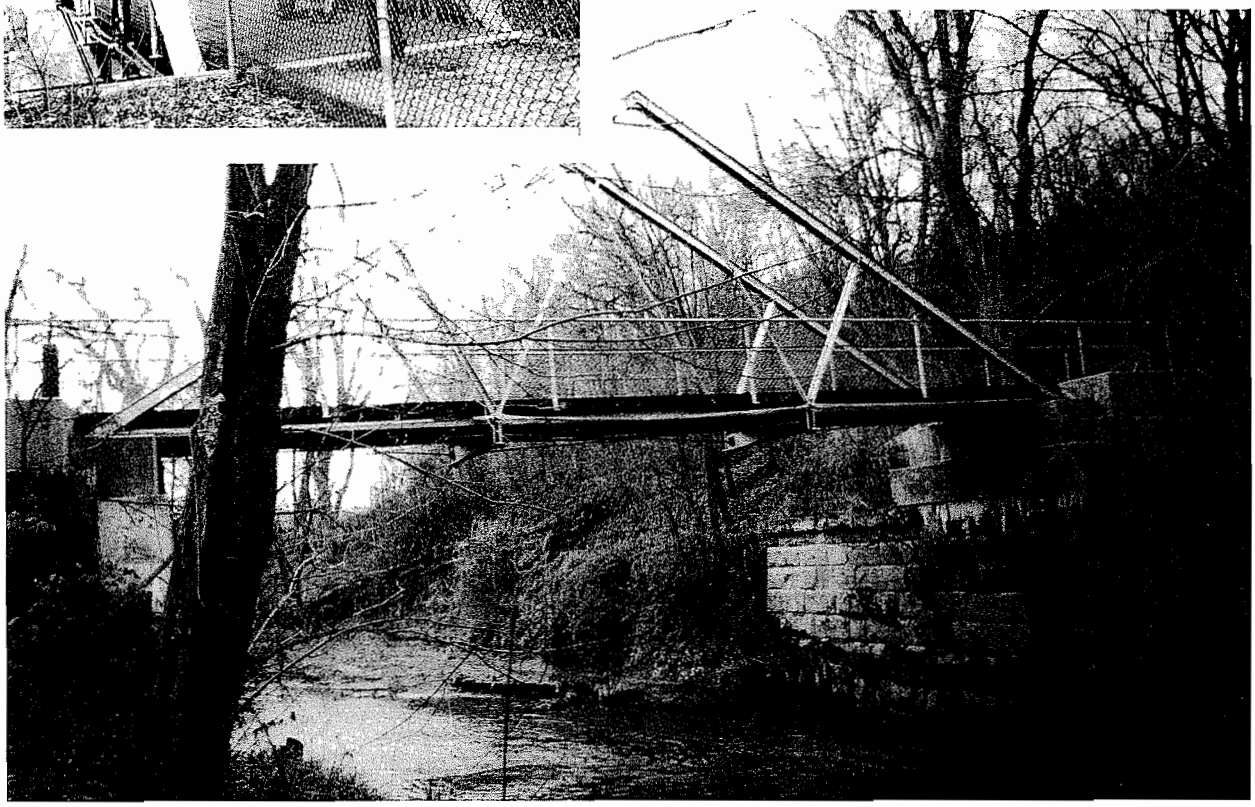


These two metal bow string bridges were discovered on private lanes by Greene County Engineer Richard P. Eastman. They span Oldtown Run and probably were moved there from township roads. While obviously old, they are still in service. The bridge in the top photo was built by the Champion Bridge Company of Wilmington and shows the company's characteristic design of three parallel curved bars joined by a latticework of short pipes. The bridge in the bottom photo was built by the Wrought Iron Bridge Company sometime in the late 1870s.





Licking County
Blackhand Gorge Nature Preserve
King post truss
Builder: Unknown
Date: Unknown
Selected as Eligible



Minimal changes were made to this 49 foot modified king post when it was moved to a bike path in 1983. When faced with the loss of this unique bridge in Ohio, the Licking County Engineer decided that moving it was necessary for its preservation. The county removed the trusses intact and placed them in an open field adjacent to the bridge site while the Ohio Department of Transportation reviewed alternative new sites. Although the bridge could not safely handle the traffic loads of the gas and oil trucks at its original location, there were several sites where it could be safely used and preserved. The bridge was moved approximately seven miles to a site in Blackhand Gorge Nature Preserve, where it could be used as part of a bike path developed by the Ohio Department of Natural Resources. The path followed the route of an abandoned interurban line and a bridge span approximately the same length as the king post was required. Although the bridge was narrowed to match the bike path, the trusses were not altered and the bridge still serves as a reminder of the past and fulfills current public need.

Elyria, Lorain County
Adjacent to State Route 20
Crosses West Branch Black River
UTM Coordinates-17/406200/4576520

Concrete rainbow arch
Builder: Unknown
Constructed: 1923
Structure File No. 4702042
Selected as Eligible

The concrete bowstring, as was the case with most concrete technology, originated in Europe in the early years of the 20th century. The first recorded example was designed and built in France in 1904. This structure essentially duplicated in reinforced concrete the lines of a 19th century bowstring metal truss with its main arches, diagonal braces and vertical "bow" and the horizontal lower chord in tension as "the string". The first American example of what has become known as the "concrete rainbow arch" was built in 1908 in Tennessee. In Ohio, the first one was built in 1909-1910 in Hamilton County (see page 35). In the years that followed, the concrete rainbow arch gradually gained popularity among state highway bridge builders and significant numbers were erected throughout Ohio in the 1920s. There are twelve rainbow arches remaining in the state. Faced with the loss of this diminishing resource, preservationists continue to look for alternatives to demolition. One of these alternatives is bypassing which permits the bridge to be preserved in place.

This option was selected when the subject bridge had to be removed from service. In 1989 it was bypassed and the new bridge was placed adjacent to this 120 foot two lane rainbow arch. At the present time there is no specific new use for this bridge. However, its location adjacent to the new bridge allows the public to see and appreciate it and in the future it could be used for a bike path or a pedestrian bridge.

NNW of Jeffersonville, Fayette County
Township Route 101
Crosses Sugar Creek
Jefferson Township
UTM Coordinates-17/279060/4396660

Warren pony truss
Builder: The International Derrick and Equipment Company
Constructed: 1931
Structure File No. 2432862

In 1983 when the Fayette County Engineer was planning to replace a bridge, he learned a metal truss bridge was available in Franklin County. Although the metal truss bridge was inadequate for the traffic demands at its urban location, it would be adequate for the smaller traffic volumes in the rural setting. The bridge was dismantled before moving. The Fayette County Engineer's staff cleaned and painted the bridge and constructed new abutments. After the bridge was in place, a new concrete deck was added. The county expects the bridge to last another 30 years. The final cost of the project was half of the expected cost of a new bridge at this location ("Recycled Bridge Saves Almost Half of Replacement Estimate" 1985:19).

Appendix A

HAER DOCUMENTATION PROJECT

In 1986 the Ohio Department of Transportation , the Federal Highway Administration and the Historic American Engineering Record in consultation with the Advisory Council on Historic Preservation and the Ohio State Historic Preservation Office jointly sponsored an engineering documentation project. The documentation included detailed design drawings, field measurements if design drawings were not available, large format photographs and a descriptive record of historic bridges in Ohio. The project was undertaken by a professionally qualified team consisting of a project supervisor, photographer, project historian, historian, three architects and one engineer.

The following bridges were documented by HAER. Documentation was transmitted to HAER's State of Ohio collection at the Library of Congress and is available for future researchers.

Crawford County HAER No. OH-46	Smith Road Bowstring Arch Bridge Spanning Sycamore Creek at Smith Road (TR 62) Lykens vicinity
Cuyahoga County HAER No. OH-56	Carter Road Lift Bridge Spanning Cuyahoga River at Carter Road Cleveland
Cuyahoga County HAER No. OH -55	Columbus Road Lift Bridge Spanning Cuyahoga River at Columbus Road Cleveland
Fairfield County HAER No. OH-43	Fosnaugh Truss Leg Bedstead Bridge Spanning Scippo Creek at TR 128 Stoutsville vicinity
Fairfield County HAER No. OH-44	John Bright No. 1 Iron Bridge Spanning Poplar Creek at Havenport Road (TR263) Carroll vicinity
Fairfield County HAER No. OH-45	John Bright No. 2 Covered Bridge Spanning Poplar Creek at Bish Road (TR263) Carroll vicinity

Hamilton County HAER No. OH-50	Benson Street Concrete Bowstring Bridge Spanning Mill Creek at Benson Street Lockland/Reading
Hamilton County HAER No. OH-54	Old Colerain Pennsylvania Through Truss Bridge Spanning Great Miami River at (CR 463) Ross
Hamilton County HAER No. OH-49	Harrison Road CamelbackThroughTrusBridge Spanning Great Miami River at Harrison Road (CR 457) Miamitown vicinity
Knox County HAER No. OH-52	Bladensburg Concrete Bowstring Bridge Spanning Wakatomika Creek at (SR 541) Bladensburg vicinity
Mahoning County HAER No. OH-40	Main Street Parker Pony Truss Bridge Spanning Yellow Creek at Main Street (SR 170) Poland
Mahoning County HAER No. OH-39	White Bowstring Arch Truss Bridge Spanning Yellow Creek at Cemetery (Riverside Drive) Poland
Mahoning County HAER No. OH-41	Mahoning Avenue Pratt Double-Deck Bridge Spanning Mill Creek at Mahoning Avenue (CR 319) Youngstown
Muskingum County HAER No. OH-47	First Street Reinforced Concrete Bridge Spanning Moxahala Creek at First Street (CR 7) Roseville
Paulding County HAER No. OH-42	"Forder" Pratt Through Truss Bridge Spanning Maumee River at (CR 73) Antwerp vicinity
Scioto County HAER No. OH-53	Scioto Pennsylvania Through Truss Bridge Spanning Scioto River at (SR 73) Portsmouth
Seneca County HAER No. OH-48	"Abbotts" Parker Through Truss Bridge Spanning Sandusky River at Abbott Road (CR 33) Tiffin vicinity
Van Wert County HAER No. OH-51	Town Creek Truss Leg Bedstead Bridge Spanning Town Creek at (CR 82) Van Wert vicinty

Appendix B

OHIO COVERED BRIDGE BUILDERS

The following list represents the known builders
of covered bridges in Ohio and dates of their greatest activity.

Key

* Prolific Builders
# Also a Stone Mason

Abraham Armstrong
c. 1850

Perry Armstrong
c. 1860

James Arnold
1870s

*Anderson Green Company
1870s

Jacob Balthaser
1870s

*William Black
1870s

*August Borneman (Hocking Valley Bridge Works)
1870s-1880s

**Jacob Bower & Sons (See Page 187)

*Jacob R. Brandt
1860s-1901

*Josiah Bryant
1878

J.C. Brown
1870s-1880s

*James W. Buchanan
1880s-1916

#Gottlieb Bunz
1850s-1870s

Columbus Bridge Company
1880s

J.C. Davis
1870s

Hiram Dennison
1870s

William Dean
1870s-1880s

Milton Dye
1915

Diltz & Steele
1880s

*Thomas Fisher
1860s-1880

William Fledderjohn
1890s

William Funk
1880s

Grave and Scott
1870s

Gilman and Ward
1870s

*John C. Gregg
1860s-1870s

*John Griffith
1870s-1880s

*A.B. Gillette
1870s

#James and William Hamilton
1860s

#*Henry Hebble
1850s-1880s

Jediah Hill
c. 1850

#*Ebenezer B. Henderson
1870s-1900

*Hocking Valley Bridge Works
1870s-1900s

*F. Mayer
1870s-1880s

*Rolla Merydith
1870s-1890

J. W. McLane
1870s

Samuel Miller
1870s-1880s

*D.H. Morrison
1850s-1870s

McGrath and Wells
1870s

*Reuben L. Partridge
1860s-1900

Partridge and Grumman
1860s-1880s

#*G. W. Pilcher
1860s-1870s

F. Phillips
1870s

Orlistus Roberts
1829

Robinson and McCracken
1870s

*Everett S. Sherman
1860s-1890s

*John Shrake
1850s-1870s

John Smolen
1980s

*Robert W. Smith (Smith Bridge Company)
1860s-1890s

William Thompson
1870s

E.P. Warne
1880s

*Zimri Wall
1860s-1890s

**Jacob Bower was an outstanding bridge builder who came to Brown County, Ohio, from Maryland c. 1860. He and his sons were active in bridge building in Ohio until the early 1900s when they moved to Flemingsburg, Kentucky. The Bowers continued bridge building and repair work in both Kentucky and Ohio. Their period of greatest activity in Ohio stretched from the 1870s through the 1970s. While no covered bridges built in Ohio by the Bowers are still standing , two existing covered bridges were renovated by the Bowers .

Appendix C

CONTINUOUS BRIDGES, THE OHIO EXPERIENCE

Mr. B. D. Hanhilammi, Engineer of Bridges and Design, in the Ohio Department of Transportation's Bridge Bureau presented the following speech in an address to the Steel Bridge Symposium held by the American Institute of Steel in 1989.

This presentation must begin with a resume of the history of Ohio's introduction to continuity use of continuous beam structure and our progress with its continued use. It is with the utmost pride that I relate this history because it reveals the innovative nature of the engineers that preceded us in the Bridge Bureau. Because of these engineers, Ohio was one of the leaders in many facets of bridge technology, including jointless bridges.

Prior to 1930, multiple span bridges were generally constructed as a series of simple spans. In 1930, Mr. Hardy Cross published a paper entitled, "Analysis of Continuous Frames Distributing Fixed End Moments" in the proceedings of the American Society of Civil Engineers. The introduction of this concept revolutionized bridge design and construction. Bridge engineers began designing to eliminate deck joints over piers by providing continuous superstructures. Highway departments began to change their bridge design practices. Foremost among them was Ohio.

The Ohio Department of Transportation was one of the first agencies to incorporate the routine use of continuous construction. Of 30 state transportation departments responding to a recent survey, only Ohio and Oregon made routine use of continuous construction in the 1930s. It wasn't until the 1960s and 1970s that most of the states in the survey routinely used continuous construction.

Ohio engineers started using the continuity concept in their design early in the 1930s soon after the publication of the Hardy Cross paper. The last non-continuous steel beam bridge built in Ohio was in 1932. Our first continuous beam structures were built in 1931. They employed the riveted field splice. Our first continuous riveted plate girder bridge was built in 1932. The steel beam design was used with such regularity that standard drawings were issued in 1939. The standard drawing has a riveted splice to maintain beam continuity. The first butt-welded field splice was devised by the Bridge Bureau in 1937. Following some revising of the details dictated by construction experience, the Bureau felt comfortable enough with the detail to issue the welded splice standard drawings in 1940.

These standard drawings allow designers to rapidly design continuous steel beam bridges of various total lengths by inserting the standard drawing in the plans with very little additional detailing by the designer. The beam size, beam spacing, concrete and reinforcing steel qualities and other information were shown in the drawings for structures of various total length with span ratios of .8-1-.8. Using these standards, designers could turn out construction plans with a minimum of drafting.

The riveted splice design was replaced by the welded splice; only the welded design has continued to be revised and updated. It is interesting to note that the 1940 standard

drawing which was revised later in the year was used until 1945. This standard drawing was then replaced and was supplemented with other standard drawings for continuous steel beam bridges with various roadway widths and parapet types.

From the outset, the beam splices were made over the piers. This was done to facilitate construction even though it was recognized that this splice location wasn't ideal. The beams were butt-welded. Cope holes were provided in the web to allow for continuous flange welds and welded cover plates were added. Usually the beam size was based on the maximum positive moment multiplied by a factor proportional to the anticipated traffic. The size and length of the cover plates (or moment plates) were based on the maximum negative moment times a larger factor than above, and on traffic and the fatigue characteristics of the member, in this case, the partial length cover plates. Fatigue details were generally not recognized at that time in these locations, except by our Bridge Engineer, Mr. Henry Overman.

Mr. Overman tried to get the country thinking in terms of fatigue through stress reversals. In the 1950s , he modified our loadings into CF loadings based on projected traffic counts. We had four loadings, CF30, CF130, CF400, and CF2000, which were dependent upon the number of tractor trailer trucks on a single lane in one hour. In addition, we had four sets of coefficients, based on the fatigue characteristics of the member under consideration, which we used to further modify our loadings. These loadings were in effect for many years until pressures for conformity with AASHTO mandated Ohio's adoption of AASHTO loadings. We are realizing now as we rehabilitate structures that CF2000 is equivalent at least to HS 20-44, where as shear connectors are required on many CF400 structures. CF30 and CF130 cannot be brought to HS 20-44 through composite design. Mr. Overman was ahead of his time.

In the late 1950s the Patterson-Riverside Bridge, a structure in Dayton, Ohio was designed with a bolted field splice, using high strength steel bolts. This was one of the first bridge applications for high strength bolting in the United States. Please note that Ohio was again in the forefront of new technology. The field bolted splice is not over the pier but rather at the point of contraflexure.

By 1963, high strength bolting had replaced field butt-welding in Ohio as the method of choice for integrating multi-span steel bridges to achieve full continuity. Another big nudge was the order from the Federal Highway which mandated radiographing of field welds.

It might be interesting to note here some preliminary results of a research project we have with the University of Akron to examine the splices on some rehabilitation projects to determine the condition of all the welds in the field splices. We are not only looking at the welds on the cover plates, especially at the ends of the cover plate, but also the butt weld between the webs. We included the butt-weld because we found a couple of instances where inspectors found cracks in this weld. So far, except for one weld at the end of one cover plate in this category "E" area, no problems have been detected which require retrofit. This one weld and the cracks in the web weld appear to be the result of poor welding during construction, rather than fatigue problems. Please understand, these are very preliminary results. We do have a bolted splice detail to retrofit the joint if and when a splice is found with fatigue problems.

Thus far this presentation has been exclusively concerned with steel beam structures. Ohio also has an interesting history with respect to plate girder bridges.

Naturally, the riveted field splice used for the beams in 1939 was an appropriate concept for

riveted plate girders as well, however, it was not placed over the piers. The location of the field splice for plate girder bridge has always been at the point of contraflexure.

It is interesting and humorous to relate the means by which Ohio was thrust into the technology of fully welded steel girders. Mr. Fred Ray was designated as the designer for a six span girder bridge over the Scioto River in Pickaway County which is south of Columbus, in 1956. The spans are 90'-4 @ 112.5'-90' c/c bearings with a roadway width of 28' with two 3' sidewalks. Naturally the supervisors expected a riveted girder design. Fred decided, on his own, to design it fully welded. We had a system whereby the supervisors made monthly checks on the progress of the design jobs. Naturally, if Fred had shown them the design drawings, they would have realized his intent. He therefore designed the bridge as a riveted structure for monthly review and as a welded structure as well, which he kept in his plan drawer. When he reported the job complete, he submitted both designs. This placed the supervisors in an awkward position of choosing the design to be constructed. The welded design was chosen mainly as a result of the cost savings in materials . Consequently, Ohio constructed its first totally welded plate girder bridge in 1957.

We were designing our bridges with continuity to eliminate joints over piers. We did not have a good answer for the joints at the abutments for steel beam and girder bridges. Of course with concrete slab bridges, expansion joints have been eliminated for over 60 years.

The joints used at the abutments for steel beams and plate girder bridges were the sliding plate type with the top leg of the steel angle on the superstructure riding over the top leg of the steel anchored to the abutment backwall. The angle leg on the abutment has a bar welded to it at the end of the leg. The angle leg extending from the superstructure overlaps the backwall angle and an opening of two inches or greater was provided for expansion and contraction. This system was used from the time of our first standard drawings for continuous structures. This detail provides very good riding qualities, if the settlement of the abutment is controlled. It does not prevent water from leaking to the beams, the abutment backwall, bridge seat and the bearings. The use of deicing salts in the winter had an increased effect on the durability and integrity of the structure components. Constant expensive maintenance was required to keep the bridges from deteriorating to failure. To minimize, or if possible, eliminate the problems, Ohio went to integral abutments and after much experimentation, sealed joints.

Many of us began noticing on bridge inspections that a great number of our steel beam bridges had closed end dams. Not only were the end dams closed, the beams were pressed against the backwalls causing crushing of the concrete and destruction of the backwall. This situation was apparent on stub abutments on piles or pedestals and on vertical wall abutments that were supposedly fixed to eliminate rotation.

At first, our retrofits were pointed at restoring the expansion as originally designed. This was accomplished by removing the backwalls and reconstructing them behind the original position which restored the design expansion provisions. This left us with the same problem with water leakage that we had before. Also, we began to notice that the abutment backwall continued to come forward. We then retrofitted many short single span structures by placing reinforced concrete around the beams over the bridge seat to make the abutments integral with the superstructures. These bridges were our first attempts at integral abutment design. We reasoned that if the bridge had worked for

many years with the beams against the backwall, we might just as well make the superstructure to abutment connection permanent to eliminate the backwall deterioration, both from pressure, deicing and salt intrusion. This worked well but we hadn't solved the basic problem of why the abutments were moving.

Mr. Martin Burke, then with our Bureau began an intensive search of the literature and research being done. He concluded after much study that the problem was pressure from the approach concrete pavement . He found that the cumulative total force due to these pressures can exceed 650 tons per lane of approach pavement. Can you imagine trying to resist that kind of force? Mr. Burke's answer was to design pressure relief points in the pavement near the bridge at the end of the approach slab. This same design was used in our pavements to eliminate the blow-ups which occurred in the hot weather. The system seems to be working well.

Ohio now proceeded to attack the problem of the abutment joint. Our first thoughts were to keep the joints, but to seal them to prevent water intrusion. Mr. Burke again took on the task to find the perfect joint sealer. His findings were not encouraging. Allow me to quote from a paper he wrote titled "Integral Bridges - Development and Design".

"Beginning in the early 1960s, the first elastomeric compression seals were installed in bridges in the United States to seal deck joints. Since these first installations, numerous types of elastomeric joint seals have been developed and improved in an attempt to achieve a joint seal design that would be both effective and durable. Most designs have been disappointing. Many leaked. Some required more maintenance than the original bridge built without seals. By and large, the many disappointments associated with various types of seals have caused bridge engineers to consider other options".

I recall Mr. Burke agonizing for what seemed like years to try to develop a sealed joint developed from all the information he gathered from suppliers and manufacturers. He worked on the shape of the strip seals, compression seals and the end dam armoring systems to hold them in place. Work was also done on using finger joints with neoprene troughs beneath to intercept and channel the water. He also worked long and hard on the modular joints being developed for long multi-span bridges with large expansion requirements.

Our early use of the modular joints resulted in some expensive failures within a year of opening the bridge to traffic. The retrofit to replace the modular joint with a finger joint while maintaining traffic resulted in a very expensive experience. We, of course, did begin looking at other options to seal the joint. The obvious answer was to eliminate the abutment joint altogether, the integral abutment.

As I noted before, our first integral abutments were for retrofit projects where the abutments had moved forward so that the beams were against the backwall and had eliminated the possibility of expansion. The results of these retrofits appeared encouraging.

Again the Bureau called on Mr. Burke to devise an integral abutment design to replace our standard end dam design for future projects. After much research and discussion with other states, he developed our first integral abutment design. I should say designs, since he drew many versions before agreement was reached on the final design.

In 1962 Ohio constructed its first single span steel beam bridge, and in 1968 we constructed our first multi-span bridge, both with integral abutments - jointless bridges. Since then, we have used the integral abutment detail

whenever possible within the constraints which we imposed in its use.

It is interesting here to note that in the 1946 standard drawing for continuous concrete slab bridges, the total length was limited to two extra interior spans, or a total length of 184 feet. In the revised 1954 standard drawing the total length limitation was eliminated. Theoretically there is no limit. Practically, however, we haven't set one for continuous slab bridges.

Similarly, Ohio was tentative in its first uses of integral abutments for continuous steel beam bridges. When we issued preliminary standard drawings, the length limit was placed at 200 feet. We have now increased the length to 300 feet and it is contemplated that this length will increase. The maximum skew angle limitation has always been 30 degrees.

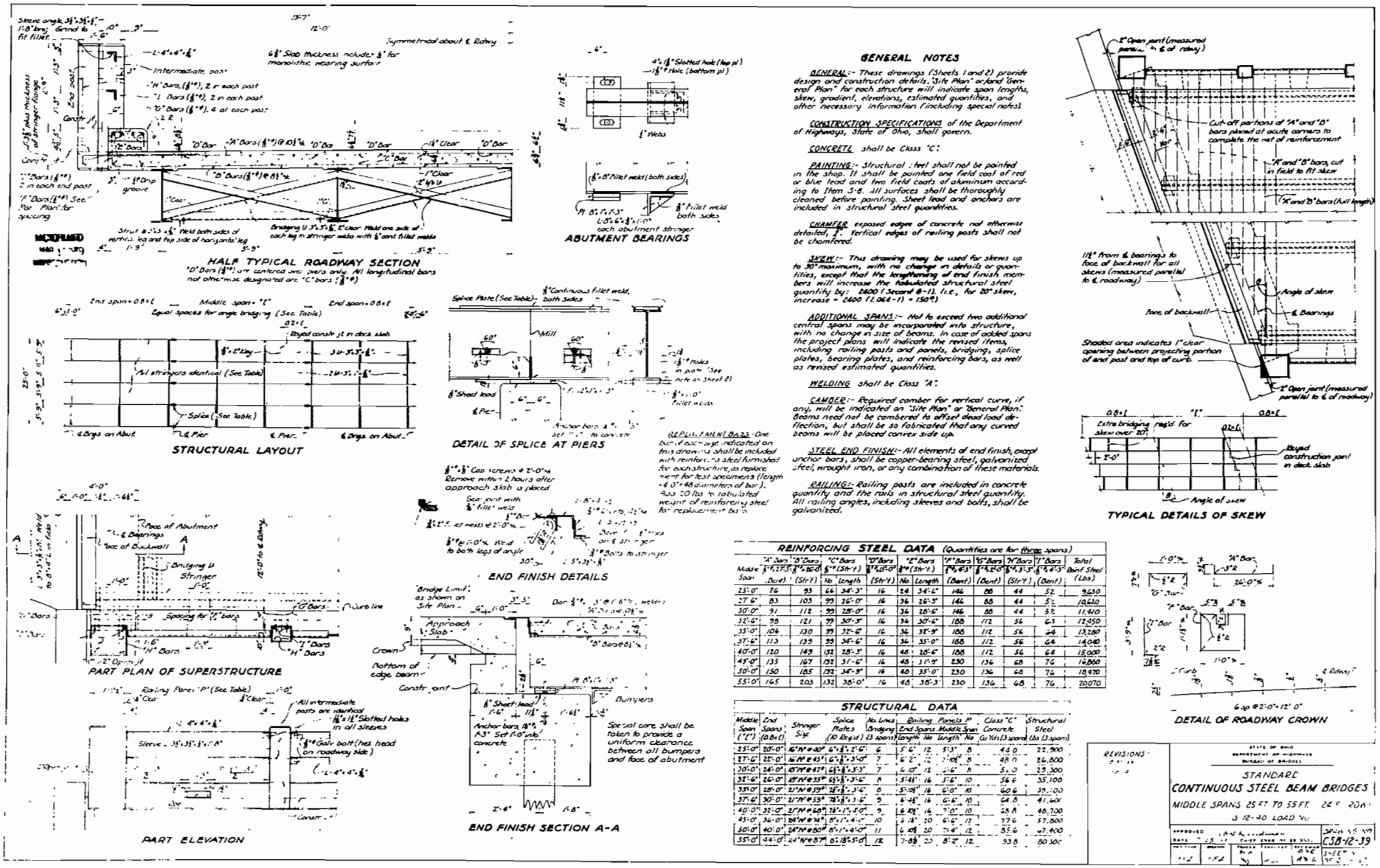
The details of the abutment have also changed. Originally the construction joint was at the bottom flange of the beam. After a few bridges were constructed, it was noted that water was penetrating the water proofing at the construction joint to appear at the face of the abutment. To rectify this detail the construction joint was moved down to one foot minimum below the bottom flange. The beam is held in place by leveling bolts seated on the abutment cross beam and sometimes by blocking. This detail appears to be working very well. However, care must be exercised during steel erection.

Our first integral abutments were constructed on one row of piles with the strong axis in the direction of bridge movement. This has been corrected in the new detail by rotating the piles so that the weak axis is in that direction.

Our experience with the jointless multi-span steel bridges is very good. We have noted cracking in the corners of the deck at the abutments on skewed structures. The pattern appears to indicate that they are the result of the fixity with the abutments, but we have no data to support this. No serious problems have been detected. The Bridge Maintenance Engineer continues to encourage us to design more of this type with longer total length.

Since we have no precise theoretical or actual evidence of what is happening in these structures as they are made longer and longer, we have been reluctant to push the limits of technology as Ohio did in the past. At this time we prefer the more moderate approach of sealing our abutment joints with compression seals and strip seals until we feel comfortable using longer total spans with integral abutments.

In closing I must again pay respect to the brilliant engineers in our Bureau who, through their innovation, have brought us to this point in steel bridge design. Mr. Ked Dumbauld and Mr. Harry Hawley who designed our first continuous plate girder bridges, Mr. Henry Overman for his insight into fatigue and stress reversal, and Mr. Fred Ray, and the checker of his design Mr. Martin Ward, for their design of the fully welded continuous plate girder bridge and to Mr. Martin Burke for his diligent work on sealing joints and designing our integral abutment, but particularly for his interest and research of this subject which is the basis of this presentation. Thank you for allowing me to relate Ohio's history and experiences with jointless bridges.



GENERAL NOTES

GENERAL:- These drawings (Sheets 1 and 2) provide design and construction details. "Site Plan" or/and "General Plan" for each structure will indicate span lengths, skew, gradient, elevations, estimated quantities, and other necessary information (including special notes).

CONSTRUCTION SPECIFICATIONS of the Department of Highways, State of Ohio, shall govern.

CONCRETE shall be Class "C".

PAINTING:- Structural steel shall not be painted in the shop. It shall be painted one field coat of red or blue lead and two field coats of aluminum according to Item 514. All surfaces shall be thoroughly cleaned before painting. Sheet lead and anchors are included in structural steel quantities.

CHAMFER exposed edges of concrete, not otherwise detailed, ¾". Vertical edges of railing posts shall not be chamfered.

SKEW:- This drawing may be used for skews up to 30° maximum, with no change in details or quantities, except that the lengthening of end finish members will increase the tabulated structural steel quantity by: 2400 (Secant θ-1), i.e., for 20° skew, increase = 2400 (1.064-1) = 150#.

ADDITIONAL SPANS:- Not to exceed two additional central spans may be incorporated into structure, with no change in size of beams. In case of added spans the project plans will indicate the revised items, including railing posts and panels, bridging, splice plates, bearing plates, and reinforcing bars, as well as revised estimated quantities.

WELDING shall be Class "A".

CAMBER:- Required camber for vertical curve, if any, will be indicated on "Site Plan" or "General Plan". Beams need not be cambered to offset dead load deflection, but shall be so fabricated that any curved beams will be placed convex side up.

STEEL END FINISH:- All elements of end finish, except anchor bars, shall be copper-bearing steel, galvanized steel, wrought iron, or any combination of these materials.

RAILING:- Railing posts are included in concrete quantity and the rails in structural steel quantity. All railing angles, including sleeves and bolts, shall be galvanized.

REPLACEMENT BARS:- One bar of each size indicated on this drawing shall be included with reinforcing steel furnished for each structure, as replacement for test specimens (length = 60 × 48 diameters of bar). Add 20 lbs. to tabulated weight of reinforcing steel for replacement bars.

REINFORCING STEEL DATA (Quantities are for three spans)

Middle Span ("L")	"A" Bars (Det)	"B" Bars (Str'l)	"C" Bars No	"C" Bars Length	"D" Bars (Str'l)	"E" Bars No	"E" Bars Length	"F" Bars (Bent)	"G" Bars (Bent)	"H" Bars (Str'l)	"I" Bars (Bent)	Total Reinf. Steel (Lbs)
25'-0"	76	93	66	34'-3"	16	24	34'-6"	146	88	44	52	9,630
27'-6"	83	103	99	26'-0"	16	36	26'-3"	146	88	44	52	10,620
30'-0"	91	112	99	28'-0"	16	36	28'-6"	146	88	44	52	11,410
32'-6"	98	121	99	30'-3"	16	36	30'-6"	188	112	56	64	12,850
35'-0"	106	130	99	32'-6"	16	36	32'-9"	188	112	56	64	13,280
37'-6"	113	139	99	34'-6"	16	36	35'-0"	188	112	56	64	14,040
40'-0"	120	149	132	28'-3"	16	48	28'-6"	188	112	56	64	15,000
45'-0"	135	167	132	31'-6"	16	48	31'-9"	230	136	68	76	16,860
50'-0"	150	185	132	34'-9"	16	48	35'-0"	230	136	68	76	18,470
55'-0"	165	203	132	38'-0"	16	48	38'-3"	230	136	68	76	20070

STRUCTURAL DATA

Middle Span ("L")	End Spans (0.8×L)	Stringer Size	Splice Plates (10 Req'd)	No. Lines Bridging (3 spans)	Railing Panels End Spans	Railing Panels End Spans No.	Railing Panels Middle Span	Railing Panels Middle Span No.	Class "C" Concrete Cu Yds (3 spans)	Structural Steel Lbs (3 spans)
25'-0"	20'-0"	16"W@40#	6"×¾"×2'-6"	6	5'-6"	12	5'-3"	8	44.0	22,900
27'-6"	22'-0"	16"W@45#	6"×¾"×3'-0"	7	6'-2"	12	5'-10"	8	48.0	26,600
30'-0"	24'-0"	18"W@47#	6"×¾"×3'-3"	7	6'-10"	12	6'-6"	8	54.0	29,300
32'-6"	26'-0"	18"W@55#	6"×¾"×3'-6"	8	5'-11"	16	5'-6"	10	56.6	35,100
35'-0"	28'-0"	21"W@59#	8"×¾"×3'-6"	6	5'-10"	16	6'-0"	10	60.6	39,100
37'-6"	30'-0"	21"W@59#	8"×¾"×3'-6"	9	6'-4"	16	6'-6"	10	64.8	41,400
40'-0"	32'-0"	21"W@68#	8"×1"×3'-9"	9	6'-10"	16	7'-0"	10	68.8	46,700
45'-0"	36'-0"	24"W@76#	8"×1"×4'-0"	10	6'-8"	20	6'-6"	12	77.6	57,800
50'-0"	40'-0"	24"W@80#	8"×1"×4'-0"	11	6'-10"	20	7'-4"	12	85.6	67,400
55'-0"	44'-0"	24"W@87#	8"×1¼"×5'-0"	12	7'-6"	20	8'-2"	12	93.8	80,300

Figure 8

Appendix D

OHIO BRIDGES

COUNTY

ADAMS

National Register Bridges

Harshaville Covered Bridge, multiple kingpost truss, CR 1, crosses Cherry Fork, Unknown builder, 1855 Structure File No. 0130192 pg. 99

Kirker Covered Bridge, multiple kingpost truss, SW of West Union off SR 136, crosses East Fork of Eagle Creek (closed), Unknown Builder, Unknown Date

Selected Bridges

Parker Through, SR 348, crosses Ohio Brush Creek, Champion Bridge Co., 1924, Structure File No. 0104140

Pennsylvania Through, CR 1, crosses Ohio Brush Creek, Unknown Builder, 1888, Structure File No. 0132012 pg. 26

Continuous Steel Deck Girder, US 52, crosses Isaacs Creek, Brewer, Brewer and Sons, Inc., 1931, Structure File No. 0101834 pg. 49

Continuous Steel Deck Girder, SR 125, crosses Ohio Brush Creek, George W. Timmons Co., 1932-1933, Structure File No. 01030098 pg. 50

ALLEN

Selected Bridges

Baltimore Through, Metcalf Street, crosses railroads, American Bridge Co., 1923, Structure File No. 0249696

Reserve Pool Bridges

Stone, Unknown Builder, Unknown Date, Delphos, Second St., Structure File No. 0260703

Concrete Filled Arch, CR 270 (Main St.) Pandora Cement Block, 1926, Structure File No. 0247596

Concrete Filled Arch, CR 270 (Metcalf St.) Z. Blodgett, 1920, Structure File No. 0260290

COUNTY

ASHTABULA

National Register Bridges

Harpersfield Covered Bridge, Howe truss, CR 154, crosses Grand River, Unknown Builder, 1868, Structure File No. 0432482 pg. 136-137

Wiswell Road (Warner Hollow) Covered Bridge, Town truss, CR 537, crosses Phelps Creek (closed), Unknown Builder, 1867

Selected Bridges

Bascule, SR 531, (West 5th Street), crosses Ashtabula River, Kell-Atkinson Construction Co., 1925 Structure File No. 0406635 pg. 151

Concrete Open Spandrel Arch, US 20 (Prospect Road), crosses Ashtabula River, Standish Engineering, 1926, Structure File No. 0402192

Concrete Rainbow Arch, Old Route 7, crosses Conneaut Creek, Unknown Builder, 1926, Structure File No. 0432156

Reserve Pool Bridges

Concrete Open Spandrel Arch, US 322, crosses Phelps Creek, Unknown Builder, 1933, Structure File No. 0406120

Concrete Open Spandrel Arch, US 20, Unknown Builder, 1922, Structure File No. 0402281

Pratt Through, TR 197, crosses Mill Creek, King Bridge Co., 1897, Structure File No. 0431737

ATHENS

National Register Bridges

Palos Covered Bridge, multiple kingpost truss, 1 mile N of Glouster off SR 13, TR 347, crosses Sunday Creek, Unknown Builder, 1875, Structure File No. 0541044 pg. 146

Kidwell Covered Bridge, Howe truss, just SR 13 on TR 583, 1 mile N of Truetown, crosses Sunday Creek (closed), August Borneman Hocking Valley Bridge Works, 1881

COUNTY
ATHENS

Blackwood Covered Bridge, multiple kingpost truss, S of Athens on CR 46, crosses Pratt Fork, Unknown Builder, 1881, Structure File No. 0549568

Selected Bridges

Pratt Pony, Glouster, Allen Street, crosses Sunday Creek, Massillon Bridge Co., 1884, Structure File No. 0535842

Pratt Through, TR 331, crosses Sunday Creek, Wrought Iron Bridge Co., 1876, Structure File No. 0544280

Warren Pony, TR 80, crosses Middle Branch of Shade River, Capitol Construction Co., 1912, Structure File No. 0549533

Warren Polygonal Chord Pony Truss CR 28C, crosses Monday Creek, Unknown Builder, 1950, Structure File No. 0544272 pg. 78

Continuous Steel Beam, SR 78, crosses Sunday Creek, Simon Straley, 1933, Structure File No. 0502944 pg. 51

AUGLAIZE

Selected Bridges

Concrete Filled Arch, St. Mary's, SR 29 (Spring Street), crosses Miami and Erie Canal, Roberts Supply Co.,1921, Structure File No. 0600067

Truss Leg Bedstead, TR 215, crosses Wrestle Creek, Lanfersieck and Grothaus, 1904, Structure File No. 0637572

Bowstring Arch Pony, crosses Miami & Erie Canal, Moved to Park in New Bremen, D. H. Morrison, 1864, 1985 pg. 161

BELMONT

National Register Bridges

B & O Railroad Viaduct, 31st Street in Bellaire, Structure File No. 0700428

Selected Bridges

Concrete Filled Arch, CR 10, crosses Wheeling Creek, Colerain Township, Luten Bridge Co., 1931, Structure File No. 0730750

COUNTY
BELMONT

Concrete Open Spandrel Arch, US 40, crosses Wheeling Creek and B&O Railroad, Unknown Builder, 1932, Structure File No. 0701599

Stone, Blaine, TR 649 (National Road), crosses Wheeling Creek, Unknown Builder, 1928, Structure File No. 0732141

Stone, SR 40B, crosses tributary of Wheeling Creek, Unknown Builder, 1828, Structure File No. 0733504

Stone, SR 40, crosses Barkcamp Creek, Union Township, Unknown Builder, 1828, Structure File No. 0733806

Reserve Pool Bridges

Concrete Filled Arch, CR 10, crosses Wheeling Creek, Luten Bridge Co., 1929, Structure File No. 0730696

BROWN

National Register Bridges

Eagle Creek Covered Bridge, Smith truss, SR 763, crosses Eagle Creek, Smith Bridge Co. Structure File No. 0804088 pg. 107

Reserve Pool Bridges

Camelback Through, CR 49, crosses Eagle Creek, Brackett Bridge Co., Unknown Date, Structure File No. 0830747

Warren Pony Truss, TR1, crosses Five Mile Creek, Champion Bridge Co., 1945, Structure File No. 0830860

Concrete Rainbow Arch, CR 62, crosses Red Oak Creek, Unknown Builder, 1930, Structure File No. 0833541

Parker Through, US 52, crosses Straight Creek, Massillon Bridge Co., 1930, Structure File No. 0800848

BUTLER

National Register Bridges

Black (Pugh's Mill) Covered Bridge, Long truss, 1 mile north of Oxford off SR 732 (closed), crosses Four Mile Creek, Unknown Builder, c. 1870 pg. 102

Stone, Railroad Bridge, Rossville Historic District, crosses Great Miami River, Structure File No. 0931764

COUNTY
BUTLER

Selected Bridges
Warren Polygonal Chord Pony Truss
CR 71, crosses Nine Mile Creek , Unknown Builder, 1945, Structure File No. 0934151 pg. 63

CLARK

Selected Bridges
Pratt Pony, TR 181, crosses Jackson Creek, (closed)
Reserve Pool Bridges
Pratt Through, TR 146, crosses Mad River, Home Engineering and Contracting, 1913, Structure File No. 1245988 .
Concrete Arch, CR 203, crosses Buck Creek, Unknown Builder, 1950, Structure File No. 1260693 pg. 79
Stone, Springfield, York Street, crosses Mill Run, Unknown Builder, 1930, Structure File No. 1262076
Three Hinged Arch, Springfield, Snyder Park, crosses Buck Creek, Unknown Builder, Unknown Date, Structure File No. 1260529

CLERMONT

National Register Bridges
Stonelick Covered Bridge, Howe truss, E of Perintown on CR 116, crosses Stonelick Creek, Unknown Builder, 1878, Structure File No. 1359975 pg. 112
Selected Bridges
Pratt Through, Williamsburg, CR 80, crosses East Fork of Little Miami River, Smith Bridge Co., 1879, Structure File No. 1358049
Bowstring Arch Pony - in storage at county garage
Reserve Pool Bridges
Camelback Through, CR 15, crosses E. Fork of Little Miami River, Champion Bridge Co., 1898, Structure File No. 1358685
Parker Through, CR 113, crosses E. Fork of Little Miami River, Rochester Bridge Co., 1916, Structure File No. 1359703
Pratt Through, CR 116, crosses Stonelick Creek, Champion Bridge Co., 1904, Structure File No. 1330004

COUNTY
CLINTON

National Register Bridges
Martinsville Road Covered Bridge, multiple kingpost truss, W of Martinsville, CR 80, crosses Todd Fork, Zimri Wall, Champion Bridge Co., 1871, Structure File No. 1432001
Selected Bridges
Bowstring Arch Pony, TR 272, crosses East Fork of Little Miami River, Massillon Bridge Co., Unknown Date, Structure File No. 1448110
Warren Polygonal Chord Pony, CR 11, crosses Todd's Fork, Union Township, Champion Bridge Co., 1934, Structure File No. 1431560
Warren Polygonal Chord Pony Truss CR 30, crosses east fork of Todd's Fork, Champion Bridge Co., 1942, Structure File No. 1433326 pg. 60
Warren Polygonal Chord Pony Truss CR 58, crosses Anderson Fork, Champion Bridge Co., 1947, Structure File No. 1435191 pg. 71
Reserve Pool Bridges
Warren Polygonal Chord Pony, CR5, crosses Anderson Fork, Champion Bridge Co., 1947, Structure File No. 1430602

COLUMBIANA

National Register Bridges
Church Hill Road Covered Bridge, single kingpost truss, (moved by Elkton Historical Society to Elkton and erected near the Sandy and Beaver Canal at Lock 24 Restaurant), Unknown Builder, c. 1870
Selected Bridges
Stone, TR 842, crosses Cold Run Creek, Center Township, Ross Rue, 1877, Structure File No. 1537202
Warren Polygonal Chord Pony Truss Camp Road, TR 914, crosses west fork of Little Beaver, Unknown Builder, 1950, Structure File No. 1537644 pg. 80
Reserve Pool Bridges
Double Intersection Pratt Through, TR 1042, crosses Little Beaver Creek, Wrought Iron Bridge Co., 1884, Structure File No. 1538241

COUNTY
COLUMBIANA

Double Intersection Pratt Through, TR 1026, crosses Little Beaver Creek, Columbia Bridge Works, 1882, Structure File No. 1530291

COLUMBIANA

Pratt Deck, TR 843, crosses railroad, Unknown Builder, Unknown Date, Structure File No. 1536915

Stone, TR 1030, crosses unnamed stream, Unknown Builder, 1912, Structure File No. 1539248

Stone, TR 929, crosses unnamed stream, Unknown Builder, 1921, Structure File No. 1537733

Warren Polygonal Chord Pony, CR 428, crosses Little Beaver Creek, Unknown Builder, 1950, Structure File No. 1533266

COSHOCTON

National Register Bridges

Helmick Covered Bridge, multiple kingpost truss, E of Blissfield on TR 25, crosses Killbuck Creek, John Shrake, 1860, Structure File No. 1631322 (closed)

Rodrick Bridge, Metal Bowstring, 9 miles SE of Coshocton on abandoned TR 144, crosses Wills Creek (closed) Coshocton Iron Works, 1872

Selected Bridges

Pennsylvania Through, SR 715, crosses Walhonding River, Newcastle Township, Central Concrete & Construction Co., 1914, Structure File No. 1602888

CRAWFORD

Selected Bridges

Concrete Filled Arch, TR 26, crosses branch of Sycamore Creek, Lykens Township, Luten Bridge Co., 1927, Structure File No. 1737279

Lattice, TR 60 (Shafer Road), crosses branch of Broken Sword Creek, Tod Township, Canton Bridge Co., 1890, Structure File No. 1741284

Reserve Pool Bridges

Warren Pony, TR 87, crosses Olentangy River, Champion Bridge Co., 1937, Structure File No. 1743422

COUNTY
CRAWFORD

Warren Polygonal Chord Pony, TR 104, crosses Sycamore Creek, Brookville Bridge Co., 1925, Structure File No. 1743961

CUYAHOGA

National Register Bridges

Cleveland and Pittsburgh Railroad Bridge, Bedford vicinity, crosses Tinkers Creek

Detroit-Superior High Level Bridge, Concrete and Metal arches, Cantilevered Truss, Cleveland, crosses Cuyahoga River, Structure File No. 1800930

Lorain-Carnegie (Hope Memorial) Bridge, Cleveland, crosses Cuyahoga River Valley, Mt. Vernon Bridge Co., 1932, Structure File No. 1801503 pg. 153-156

Detroit Avenue Bridge (Rocky River Bridge), Lakewood, crosses Rocky River (partially removed)

Rockefeller Park Bridges :

Superior Avenue, Structure File No. 1801023

Penn Central Railroad Bridge, Structure File No. 1869531

St. Clair Avenue, Structure File No. 1831445

Wade Park, Structure File No. 1869485

Station Road Bridge, Whipple Truss, E of Brecksville on CR 257, crosses Cuyahoga River, Structure File No. 1831674 (closed)

Superior Avenue Viaduct, Cleveland (abandoned)

Pratt Through Gates Mills Historic District Bridge, crosses Chagrin River, old interurban, now pedestrian

Main Street Bridge, Chagrin Falls Triangle Park Historic District, crosses Chagrin River, Structure File No. 1812483

Selected Bridges

Concrete Open Spandrel Arch, Cleveland, SR 17 (Brookpark Road), crosses Rocky River, Unknown Builder, 1933, Structure File No. 1802046

COUNTY
CUYAHOGA

Steel Arch, Cleveland, Lorain Road, crosses Rocky River, Unknown Builder, 1935, Structure File No. 1801325

Stone, Cleveland, Detroit Avenue, crosses Erie- Lackawana Railroad, Cleveland & Mahoning Valley Railway Co., 1853, Structure File No. 1867644

Stone, Cleveland Brookside Park Drive (Cleveland Zoo), crosses Big Creek, Unknown Builder, 1909, Structure File No. 1867318

Stone, Bedford, SR 14E (Union Street), crosses Tinkers Creek, Unknown Builder, 1933, Structure File No. 1801929

Stone, Bay Village, US 6 (Lake Road), crosses Porter Creek and Park Drive, Unknown Builder, 1937, Structure File No. 1800426

Swing, Cleveland, Center Street, crosses Cuyahoga River, King Bridge Co., 1901, Structure File No. 1869345 pg. 147-148

Vertical Lift Cleveland, Eagle Avenue, crosses Cuyahoga River, Unknown Builder, 1831, Structure File No. 1869604

Vertical Lift Cleveland, West Third Street, crosses Cuyahoga River, R.C. Mahon, 1940, Structure File No. 1869728

Vertical Lift Cleveland, Columbus Road, crosses Cuyahoga River, Wisconsin Bridge Co., 1940, Structure File No. 1833758

Vertical Lift Cleveland, Carter Road, crosses Cuyahoga River, Mt. Vernon Bridge Co., 1940, Structure File No. 1869264

Baltimore Through, Cleveland, Stone's Levee, crosses B&O Railroad, Interstate Engineering, 1908, Structure File No. 1866389 pg. 34

Continuous Steel Deck Girder, SR 8, crosses Pennsylvania Railroad, William E. McHugh Co., 1936, Structure File No. 1801201 pg. 55

Reserve Pool Bridges

COUNTY
CUYAHOGA

Cantilevered Deck, Cleveland, SR 2 Cuyahoga River (Main Ave.), R.C. Mahon, 1939, Structure File No. 1800035

Concrete Open Spandrel Arch, CR 178, crosses Barrett Rd., Unknown Builder, 1909, Structure File No. 1840053

Concrete Open Spandrel Arch, CR 73 (South Euclid), crosses west branch of Euclid Creek, Unknown Builder, 1940, Structure File No. 1830082

Concrete Open Spandrel Arch, SR 21, crosses Chippewa Creek, Unknown Builder, 1932, Structure File No. 1802852

Pratt Deck, US 42, crosses railroads, Unknown Builder, 1917, Structure File No. 1803301

Stone, Cleveland, East Blvd., crosses Doan Brook, Unknown Builder, 1897, Structure File No. 1869418

Stone, Cleveland, Martin Luther King Blvd., crosses Doan Brook, Unknown Builder, 1897, Structure File No. 1869515

Stone, Richmond Heights, SR 175, crosses East branch of Euclid Creek, Unknown Builder, 1936, Structure File No. 1809873

Stone, Cleveland, Martin Luther King Blvd., crosses Doan Brook, Unknown Builder, 1899, Structure File No. 1869469

DARKE

Reserve Pool Bridges

Concrete Open Spandrel Arch, CR 35, crosses Stillwater River, Unknown Builder, 1930, Structure File No. 1946226

Double Intersection Pratt Through, TR 172, crosses Greenville Creek, Massillon Bridge Co., 1881, Structure File No. 1945580

Lattice, TR 133, crosses tributary of Mississinawa River, Unknown Builder, 1901, Structure File No. 1953753

COUNTY
DARKE

Warren Polygonal Chord Pony, TR 294, crosses Stillwater River, Massillon Bridge Co., 1930, Structure File No. 1946838

DEFIANCE

Selected Bridges
Pratt Through, CR 42, crosses Tiffin River, Toledo Massillon Bridge Co., 1906, Structure File No. 2033739 pg. 33
Warren Pony, CR 140, crosses Prairie Creek, Unknown Builder, 1903, Structure File No. 2041227 pg. 31

DELAWARE

National Register Bridges
Chambers Road Covered Bridge, Childs Truss, 2 miles NE of Olive Green, TR 63, crosses Big Walnut Creek,E. S. Sherman, 1883, Structure File No. 2131706 pg. 116
Selected Bridges
Parker Through, Rathbone, TR 124, crosses Scioto River, S.C. Kissner & Sons, 1938, Structure File No. 2130998
Warren Pony, CR 183, crosses Scioto River, Radnor Township, Bellefontaine Bridge & Steel Co., 1915, Structure File No. 2132788
Parker Through, CR 213, crosses Olentangy River, Bellefontaine Bridge Co., 1915, Structure File No. 2132850 pg. 39
Reserve Pool Bridges
Pratt Through, TR 114, crosses Olentangy River, Toledo Bridge Co., 1898, Structure File No. 2132184

ERIE

Selected Bridges
Stone, Sandusky, SR 6, crosses Mills Creek, G.W. Doerzbach, 1894, Structure File No. 2201569
Reserve Pool Bridges
Pennsylvania Through, Vermillion, US 6, crosses Vermillion River, Fort Pitt Bridge Works, 1928, Structure File No. 2202344

COUNTY
FAIRFIELD

National Register Bridges
John Bright #2 Covered Bridge, Suspension truss, originally 2.5 miles SW of Baltimore, crossed Poplar Creek, (HAER 1986 - moved to OU campus Lancaster branch 1988), August Borneman, 1881, pg. 169
Hizey Covered Bridge, originally E of Pickerington on TR 235, crossed Poplar Creek, (moved to private property)
Rock Mill Covered Bridge, queenpost truss, Rock Mill on CR 39, crosses Hocking River, Jacob Brandt, 1901, Structure FIle No. 2332191
R.F. Baker Covered Bridge, multiple kingpost truss, moved to Fairfield Union School Grounds, James Arnold, 1871, pg. 166
John Bright #1 Iron Bridge, originally 2 miles NE of Carroll on Havenport Road, TR 263, crossed Poplar Creek (HAER 1986 - moved to OU Lancaster Campus 1989), Hocking Valley Bridge Works, 1884, pg. 172
Selected Bridges
Pratt Deck, CR 77, crosses Rush Creek, Unknown Builder, 1928, Structure File No. 2340208 pg. 152
Borneman Truss, TR 128, crosses Salt Creek, Hocking Valley Bridge Works, Unknown date, Structure File No. 2336243 pg. 44-45

FAYETTE

Selected Bridges
Pratt Through, TR 54, crosses Sugar Creek, Union Township, Wrought Iron Bridge Co., 1883, Structure File No. 2430959

FRANKLIN

National Register Bridges
Bergstresser Covered Bridge, Partridge truss, Ashbrook Road, crosses Little Walnut Creek, Columbus Bridge Co., 1887, Structure File No. 2532212 pg. 124
Town Street, concrete filled arches - Columbus, Scioto River, Part of Civic Center District, Structure File No. 2503697

COUNTY
FRANKLIN

Stone-faced arch, Indianola - Columbus, Part of Iuka Ravine District, Unknown Builder, 1912, Structure File No. 2561433 pg. 37
Stone, Columbus, US 23, crosses Iuka Avenue, Part of NR District, Structure File No. 2500930
Smith Road Bridge, Crawford County (moved to Ohio Historical Society, Columbus, Ohio) King Iron Bridge Co.,c 1870 pg. 163
Concrete Open Spandrel Arch, Columbus, US 62 (Main Street), crosses Scioto River, Part of NR District, Structure File No. 2503212

Reserve Pool Bridges

Concrete Open Spandrel Arch, Columbus, Spring Street US 33, Unknown Builder, 1932, Structure File No. 2501449
Double Intersection Pratt Through, TR 150, crosses Big Darby Creek, Columbus Bridge Co., 1888, Structure File No. 2530139
Pennsylvania Through, CR 11 (Alkire Rd.) crosses Big Darby Creek, Case Crane and Engineering Co., 1914, Structure File No. 2531127
Stone, (Alkire Road) crosses Chessie System, Unknown Builder, 1902, Structure File No. 2530252
Stone, Columbus, Eureka Ave., crosses Dry Run, Unknown Builder, 1930, Structure File No. 2562979

FULTON

Reserve Pool Bridges

Warren Through, TR 21, crosses Bean Creek, Toledo Bridge Co., 1913, Structure File No. 2634538

GALLIA

Selected Bridges

Continuous Steel Deck Girder, SR 160, crosses Raccoon Creek, W. C. Moore and E. Elford and Son, 1934, Structure File No. 2702371 pg. 52

GEAUGA

Selected Bridges

Concrete Filled Arch, Bundysburg, CR 38, crosses Swine Creek, Heveth Construction Co., 1930, Structure File No. 2831511

COUNTY
GREENE

National Register Bridges

Ballard Road Covered Bridge, Howe truss, TR 6, NW of Jamestown on Ballard Road, crosses North Fork of Caesar Creek, J.C. Brown, 1883 Structure File No. 2934744 pg. 117

Selected Bridges

Stone, CR 81, crosses Massies Creek, Cedarville Township, Unknown Builder, Unknown Date, Structure File No. 2931354

Reserve Pool Bridges

Pratt Through, CR 142, crosses Little Miami River, Smith Bridge Co., 1884, Structure File No. 2930781
Stone, Xenia, US 42, crosses Shawnee Creek, Unknown Builder, 1928, Structure File No. 2900939

GUERNSEY

National Register Bridges

"S" Bridge, Stone Arch, National Road, 4 miles E of Old Washington on US 40, Structure File No. 3030970

Selected Bridges

Pratt Through, TR 186, crosses Wills Creek, Wheeling Township, Wrought Iron Bridge Co., 1894, Structure File No. 3031705
Stone, US 40, crosses tributary of Salt Fork, Wills Township, Structure File No. 3032868
Stone, Cambridge, CR 430 (National Road), crosses Crooked Creek, Structure File No. 3031691
Stone, Roadside Park, Adams Township

HAMILTON

National Register Bridges

Covington and Cincinnati Suspension Bridge, Cincinnati, crosses Ohio River, John Roebling, 1846-1867
Ida Street Bridge, Mt. Adams and Eden Park, Cincinnati, Structure File No. 3160076
Jediah Hill Covered Bridge, queenpost truss, 7 miles N of Cincinnati off US 127 on Covered Bridge Road, Structure File No. 3139778 (supported by steel beams - built 1981) Jediah Hill, 1850

COUNTY
HAMILTON

Selected Bridges

Concrete Filled Arch, Cincinnati, Eden Park, crosses Eden Park Drive, Unknown Builder, 1895, Structure File No. 3160726

Concrete Open Spandrel Arch, Cincinnati, US 52, crosses Mill Creek Valley, railroad I-75, Unknown Builder, 1931, Structure File No. 3105458

Concrete Open Spandrel Arch, Cincinnati, Victory Parkway, crosses Kemper Lane, D.P. Foley, 1917, Structure File No. 3160777

Parker Through, New Baltimore, CR 71, crosses Great Miami River, Brackett Bridge Co., 1914, Structure File No. 3130762

Parker Through, Cleves, US 50, crosses Great Miami River, Penn Bridge Co., 1913, Structure File No. 3102556 (Closed)

Pennsylvania Through, Milford, US 50, crosses Little Miami River, Unknown Builder, 1924, Structure File No. 3104176 (closed)

Pennsylvania Through, CR 463, crosses Great Miami River, Crosby Township, King Bridge Co., 1894, Structure File No. 3133516

Concrete Rainbow Arch, Lockland, Benson Street, crosses West Fork of Mill Creek, Hamilton County Engineers, 1909, Structure File No. 3137600 pg. 35-36

Reserve Pool Bridges

Baltimore Through, Cincinnati, City Street 1608, Chessie System, McClintic-Marshall, 1931, Structure File No. 3161153

Bowstring Arch Through, Cincinnati, SR 4, crosses Mill Creek, Unknown Builder, Unknown Date, Structure File No. 3100510

Concrete Rainbow Arch, CR 63, crosses Paddys Run Creek, Unknown Builder, 1931, Structure File No. 3130622

Pennsylvania Through, CR 307, crosses Miami River, Unknown Builder, 1922, Structure File No. 3132463

COUNTY
HANCOCK

Selected Bridges

Double Intersection Pratt Through, Mt. Blanchard, CR 24, crosses Blanchard River, Columbia Bridge Works, 1884, Structure File No. 3261212

Warren Polygonal Chord Pony Truss CR 204, crosses Eagle Creek, Unknown Builder, 1945, Structure File No. 3233863 pg. 64

Reserve Pool Bridges

Concrete Rainbow Arch, CR 26, crosses Eagle Creek, Unknown Builder, 1930, Structure File No. 3231135

Pratt Through, Mt. Blanchard, TR 22, crosses Blanchard River, Canton Bridge Co., 1896, Structure File No. 3261107

Pratt Through, CR 205, crosses Blanchard River, Wrought Iron Bridge Co., 1876, Structure File No. 3230325

Stone, CR 203, crosses Stephen Otto Ditch, Unknown Builder, 1940, Structure File No. 3233820

HARDIN

Reserve Pool Bridges

Warren Pony, CR 64, crosses Blanchard River, Edwards Sheet Metal, 1922, Structure File No. 3344487

HENRY

Selected Bridges

Stone, US 24, crosses Bad Creek, Washington Township, Unknown Builder, 1842, Structure File No. 3501620

Stone, SR 424, crosses Benier Creek, Napoleon Township, Unknown Builder, 1850, Structure File No. 3503631

Reserve Pool Bridges

Stone, SR 424, crosses Oberhaus Creek, Unknown Builder, 1850, Structure File No. 3503720

Stone, SR 24, crosses Dry Creek, Unknown Builder, Unknown Date, Structure File No. 3501590

COUNTY
HIGHLAND

National Register Bridges

Lynchburg Covered Bridge, Long truss, East Fork of Little Miami River on Clinton- Highland County line (bypassed) John C. Gregg, 1870

Selected Bridges

Bowstring Arch Through, TR 42, crosses East Fork of Little Miami River, Dodson Township, Wrought Iron Bridge Co., 1874 (closed)

Reserve Pool Bridges

Pratt Pony, TR 328, crosses Lees Creek Champion Bridge Co., 1915, Structure File No. 3633233

Warren Polygonal Chord Pony, TR 240, crosses Middle Fork, Unknown Builder, 1945, Structure File No. 3632652

HOCKING

Reserve Pool Bridges

Pennsylvania Through, SR 664, crosses Hocking River, Unknown Builder, 1914, Structure File No. 3704629

HOLMES

Selected Bridges

Lattice, TR 655, crosses middle fork of Sugar Creek, Unknown Builder, 1900, Structure File No. 3841278 pg. 30

HURON

Selected Bridges

Lattice, Greenwich, Tilton Street, crosses County Ditch, 1851, Greenwich Township, Unknown Builder, Unknown Date, Structure File No. 3978028

Pratt Pony, TR 109, crosses West Branch of Huron River, New Haven Township, Mt. Vernon Bridge Co., 1881, Structure File No. 3946304

Reserve Pool Bridges

Concrete Open Spandrel Arch, US 20, crosses Vermillion River, Unknown Builder, 1933, Structure File No. 3901505

Lattice, TR 14, crosses County Ditch No. 3, Unknown Builder, Unknown Date, Structure File No. 3945251

Stone, Norwalk, US 250, crosses Norwalk Creek, Unknown Builder, 1865, Structure File No. 3903540

COUNTY
JACKSON

National Register Bridges

Byer Covered Bridge,, Smith truss, CR 31, crosses Pigeon Creek, Smith Bridge Co., 1872, Structure File No. 4031113

Buckeye Furnace Covered Bridge, Smith truss, 3 miles SE of Wellston on TR 165, crosses Little Raccoon Creek,Smith Bridge Co., 1872, Structure File No. 4032292 pg. 103

Johnson Road Covered Bridge, Smith truss, Smith Bridge Co., 1869, Structure File No. 4032977

Selected Bridges

Double Intersection Warren Through, CR 40, crosses Little Raccoon Creek, Unknown Builder, 1909, Structure File No. 4031245 (closed)

JEFFERSON

Selected Bridges

Baltimore Through, Steubenville, crosses Ohio River and SR 7, Unknown Builder, 1927, Structure File No. 4100999 pg. 41

Reserve Pool Bridges

Concrete Filled Arch, SR 164, crosses Brush Creek, Luten Bridge Co., 1928, Structure File No. 4103092

Stone, TR 304, crosses Conrail Railroad, Unknown Builder, Unknown Date, Structure File No. 4133730

Suspension, TR 125, crosses Piney Fork, Unknown Builder, 1900, Structure File No. 4133773

Warren Deck, CR 74, crosses N & W Railroad, Unknown Builder, 1903, Structure File No. 4133633

KNOX

National Register Bridges

Mill Road Bowstring Bridge, Mill Road near Bladensburg on TR 184, Wakatomika Creek, Structure File No. 4236157 (closed)

Pratt Through, Lehmon Road Bridge, TR 259, Kokosing River , 1883, Mt. Vernon Bridge Co. (closed)

COUNTY
KNOX

Selected Bridges
Concrete Rainbow Arch, SR 541, crosses Wakatomika Creek, Unknown Builder, 1928, Structure File No. 4203240
Double Intersection Pratt Through, CR 35, crosses Kokosing River, Howard Township, Columbia Bridge Co., 1872 , Structure File No. 4231341(closed)
Double Intersection Warren Pony, TR 384, crosses Granny Creek, Wayne Township, Unknown Builder, 1900, Structure File No. 4237609 (closed)
Stone, Mt. Vernon, SR 13, crosses Kokosing River, T.B. Townsend & Co., 1892, Structure File No. 4200632
Warren Polygonal Chord Through, CR 54, crosses Kokosing River, College Township, Mt. Vernon Bridge Co., 1915, Structure File No. 4232828
Reserve Pool Bridges
Pratt Through, TR 218, crosses Mohican River, Mt. Vernon Bridge Co., 1915, Structure File No. 4237374
Stone, CR 46, crosses Coleman Branch, Unknown Builder, 1900, Structure File No. 4234073
Pratt Pony, TR 171, crosses Wakatomika Creek, Mt. Vernon Bridge Co., 1900, Structure File No. 4236203

LAKE

Selected Bridges
Double Intersection Pratt Through, Willoughby Hills, Pleasant Valley Drive, crosses Chagrin River, Wrought Iron Bridge Co., 1881, Structure File No. 4352165
Warren Polygonal Chord Pony Truss Maple Grove Road, crosses unnamed stream, Unknown Builder, 1950, Structure File No. 4352068 pg. 81
Reserve Pool Bridges
Concrete Rainbow Arch, Painesville, St. Clair St., crosses Grand River & St. Clair St., N.R. Porterfield, 1924, Structure File No. 4345843

COUNTY
LAWRENCE

National Register Bridges
Scottown Covered Bridge, multiple kingpost truss variant, E of Scottown on CR 67, crosses Indian Guyan Creek, W. Thompson, 1877, Structure File No. 4441923 pg. 110
Selected Bridges
Cantilevered Through, Ironton, SR 93, crosses Ohio River, Unknown Builder, 1922, Structure File No. 4401255
Stone, CR 29, crosses Storms Creek, Elizabeth Township, WPA, 1940, Structure File No. 4436628
Warren Pony, CR 48, crosses Johns Creek, Symmes Township, Huston-Cleveland Bridge Co., 1905, (to be removed September 1990, will be rebuilt on a golf course), Structure File No. 4439481
Reserve Pool Bridges
Warren Deck, Ironton, Second St., crosses N & W Railroad, Unknown Builder, 1936, Structure File No. 4460014

LICKING

National Register Bridges
Belle Hall Covered Bridge, Dutch cross road, TR 56, crosses Otter Fork, Structure File No. 4534840
Selected Bridges
Double Intersection Pratt Through, TR 207, crosses north fork of Licking River, Washington Township, Mt. Vernon Bridge Co., 1884, Structure File No. 4532902
King Post, TR 332, originally crossed Valley Run, Bowling Green Township (Moved to Blackhand Gorge Nature Preserve 1983), now crosses Claylick Creek, Unknown Builder, Unknown Date pg. 177
Reserve Pool Bridges
Warren Polygonal Chord Pony, CR 210, crosses Rocky Fork, Pittsburgh-Des Moines Steel Co., 1928, Structure File No. 4531221

COUNTY
LOGAN

National Register Bridges
McColly Covered Bridge, Howe truss, 2 miles SE of Bloom Center on CR 13, crosses Miami River,Anderson Green Co., 1876, Structure File No. 4631137
Selected Bridges
Lattice, TR 201, crosses McKees Creek, Bellefontaine Bridge & Iron Co., 1896, Structure File No. 4648943
Pratt Pony, TR 79, crosses Brandywine Creek, Bellefontaine Bridge Co., 1896, Structure File No. 4637364 pg. 28
Truss Leg Bedstead, TR 157, crosses Little Darby Creek, Bellefontaine Bridge & Iron Co., 1896, Structure File No. 4644832 pg. 29
Reserve Pool Bridges
Double Intersection Pratt Through, CR 21, crosses Miami River, Massillon Bridge Co., Unknown Date, Structure File No. 4631838

LORAIN

National Register Bridges
Dean Road Bridge, W of South Amherst at Dean Road and Vermillion River
Selected Bridges
Bascule, Lorain, US 6, crosses Black River, Mt. Vernon Bridge Co., 1939, Structure File No. 4700813
Cantilevered Through, Lorain, SR 611, crosses Black River, Unknown Builder, 1939, Structure File No. 4707443
Stone, Amherst, TR M-32, crosses Beaver Creek, Unknown Builder, 1885, Structure File No. 4737393
Stone, Elyria, CR 3, crosses east branch of Black River, Unknown Builder, 1907, Structure File No. 4770579
Warren Polygonal Chord Pony, TR 64, crosses west branch of Black River, Wellington Township, Bellefontaine Bridge & Steel Co., 1915, Structure File No. 4738845

COUNTY
LORAIN

Warren Polygonal Chord Pony, TR 71, crosses Wellington Creek, Wellington Township, Massillon Bridge & Structural Co., 1916, Structure File No. 4740823
Reserve Pool Bridges
Concrete Rainbow Arch, Elyria, bypassed-SR 20, crosses West branch Black River, Unknown Builder, 1923, Structure File No. 4702042 pg. 178
Stone, Oberlin, US 58, crosses Plum Creek, V.C. Berg Stone Co., 1883, Structure File No. 4703278
Stone, Elyria, Lake Ave., crosses West branch Black River, J. Berg Contractor, 1894, Structure File No. 4770455
Stone, Amherst, W. Martin Ave., crosses Beaver Creek,Unknown Builder, 1930, Structure File No. 4760271
Stone, CR 30, crosses Haul Road - Stone Road, Unknown Builder, 1902, Structure File No. 4739469
Stone, Elyria, Mussey Road, crosses West branch Black River, Unknown Builder, 1904, Structure File No. 4770242
Stone, M 158, crosses Wellington Creek, Unknown Builder, Unknown Date, Structure File No. 4734173
Stone, TR 18, crosses Beaver Creek, Unknown Builder, 1883, Structure File No. 4735323
Warren Pony, Amherst, Jackson St., crosses Beaver Creek, Toledo Bridge Co., 1911, Structure File No. 4760220

LUCAS

National Register Bridges
Interurban Bridge, 1 mile S of Waterville, crosses Maumee River (abandoned)
Selected Bridges
Bascule, Toledo, Washington Street, crosses Swan Creek, Unknown Builder, 1920, Structure File No. 4860926
Concrete Filled Arch with Movable Span, Toledo, Cherry Street, crosses Maumee River, Unknown Builder, 1914, Structure File No. 4860004

COUNTY
LUCAS

Double Intersection Warren Pony, Toledo, carries N&W Railroad, crosses Collingwood Road, Detroit Bridge & Iron Works, 1888, Structure File No. 4860624
Steel Arch, Toledo, Marengo Street, crosses ravine to Delaware Creek, Unknown Builder, 1915, Structure File No. 4861035
Stone, CR 47, crosses Langenderfer Ditch, Spencer Township, Unknown Builder, 1938, Structure File No. 4831284
Suspension Bridge, Toledo, SR 2, crosses Maumee River, McClintic-Marshall Co., 1929, Structure File No. 4800303

MADISON

Selected Bridges
Warren Polygonal Chord Through, CR59, crosses Deer Creek, Pleasant Township, Grant Boulton Co., 1924, Structure File No. 4931467

MAHONING

National Register Bridges
Mill Creek Park Suspension Bridge, Youngstown, Structure File No. 5059941
Bowstring Arch Pony, Poland, Cemetery Drive, crosses Yellow Creek, Poland Township, Unknown Builder, Unknown Date , Structure File No. 5052289 (closed)
Selected Bridges
Double Intersection Warren Deck, Youngstown, CR 105, crosses west tributary of Mill Creek, Unknown Builder, 1895, Structure File No. 5059968
Parker Pony, Poland, SR 170, crosses Yellow Creek, Huston-Cleveland Bridge Co., 1904, Structure File No. 5004144
Pratt Double Deck, Youngstown, Mahoning Avenue, crosses Mill Creek, Unknown Builder, 1903, Structure File No. 5058449 (closed)
Steel Arch, Youngstown, CR 107, crosses Cascade Ravine, Youngstown Bridge Co., 1895, Structure File No. 5059976

COUNTY
MAHONING

Stone, Youngstown, CR 110, crosses east tributary of Mill Creek, Unknown Builder, 1895, Structure File No. 5059992
Steel Arch, CR 18, crosses Mahoning River, Mt. Vernon Bridge Co., 1949, Structure File No. 5058082 pg. 75
Reserve Pool Bridges
Baltimore Through, Struthers, Bridge St., crosses Mahoning River, Unknown Builder, 1935, Structure File No. 5005949
Baltimore Through, Youngstown, West Ave., crosses Mahoning River, Unknown Builder, 1929, Structure File No. 5060524
Concrete Open Spandrel Arch, Youngstown, Ohio Ave., crosses Crandall Run, Unknown Builder, 1920, Structure File No. 5060850 (closed)
Concrete Open Spandrel Arch, Youngstown, Fifth Ave., crosses Crandall Run, Unknown Builder, 1920, Structure File No. 5060540
Double Intersection Pratt Through, Campbell, SR 289, pedestrian, Unknown Builder, 1927, Structure File No. 5005019
Double Intersection Warren Pony, TR 15, Fish Creek Rd., crosses Fish Creek, Unknown Builder, Unknown Date, Structure File No. 5054079 (closed)
Pennsylvania Through, Youngstown, Division St., crosses Mahoning River, Atlas Engineering, 1939, Structure File No. 5058325
Stone, Youngstown, McCollum Rd., crosses Bears Den Creek, Unknown Builder, Unknown Date, Structure File No. 5058376
Stone, Youngstown, S. Schenley Ave., crosses Axe Factory Run, Unknown Builder, 1937, Structure File No. 5060451
Warren Through, Youngstown, CR 313, crosses Mahoning River, American Bridge Co., 1911, Structure File No. 5058368

COUNTY
MAHONING

Warren Polygonal Chord Through, Youngstown, Marshall St., crosses Mahoning River, Bethlehem Steel Co., 1940, Structure File No. 5060230

MARION

National Register Bridges
Caledonia Bowstring Bridge, N of Caledonia, crosses Olentangy River in a park
Selected Bridges
Lattice, TR 68J, crosses Linn Ditch, Grand Prairie Township, Unknown Builder, Unknown Date, Structure File No. 5131480
Parker Through, Prospect, SR 47, crosses Scioto River, Standard Engineering Co., 1913, Structure File No. 5102251 pg.
Pratt Pony, TR 24B, crosses Tymochtee Creek, Grand Township, Wrought Iron Bridge Co., 1874, Structure File No. 5130298
Pratt Pony, TR 154A, crosses Olentangy River, Richland Township, New Columbus Bridge Co., 1897, Structure File No. 5132592
Pratt Through, CR 67R, crosses Olentangy River, Tully Township, Wrought Iron Bridge Co., 1876, Structure File No. 5131464
Pratt Through, CR 35G, crosses Scioto River, Bowling Green Township, Canton Bridge Co., 1897, Structure File No. 5130891
Reserved Pool Bridges
Pratt Pony , TR 164B, crosses Riffle Creek, Unknown Builder, 1948, Structure File No. 5132797

MEIGS

Selected Bridges
Concrete Rainbow Arch, Chester, SR 248, crosses Shade River, Unknown Builder, 1926, Structure File No. 5302587
Reserve Pool Bridges
Warren Pony, TR 351, crosses Leading Creek, Capitol Construction Co., 1909, Structure File No. 5338816

COUNTY
MERCER

Selected Bridges
Double Intersection Pratt Through, CR 223, crosses St. Mary's River, Union Township, Columbia Bridge Works, 1887, Structure File No. 5457467
Warren Polygonal Chord Pony Truss Celina-Mendon Road, crosses Twelve Mile Creek, Unknown Builder, 1950, Structure File No. 5457173 pg. 82

MIAMI

National Register Bridges
Eldean Covered Bridge, Long truss, N of Troy, old section of CR 33 over Great Miami River, Jas. & Wm. Hamilton, 1860 pg. 100
Reserve Pool Bridges
Pennsylvania Through, Tipp City, CR 166, crosses Miami River, Central States Bridge Co., 1926, Structure File No. 5535301

MONROE

National Register Bridges
Foraker Covered Bridge, multiple kingpost truss, 3 miles E of Graysville on CR 40, crosses Muskingum River, Unknown Builder, 1886, Structure File No. 5633354
Knowlton Covered Bridge, multiple kingpost truss, N of Rinards Mills on TR 88, crosses Little Muskingum River, Unknown Builder, 1887, (closed)
Reserve Pool Bridges
Concrete Filled Arch, SR 537, crosses Rias Run, Luten Bridge Co., 1927, Structure File No. 5602947
Concrete Filled Arch, CR 2, crosses unnamed stream, Luten Bridge Co., 1927, Structure File No. 5630703
Concrete Open Spandrel Arch, CR 12, crosses Little Muskingum River, WPA, 1936, Structure File No. 5630452
Double Intersection Pratt Through, CR 15, crosses Clear Fork, King Iron Bridge Co., 1883, Structure File No. 5632854
Stone, TR 691, crosses Jims Run, Unknown Builder, Unknown Date, Structure File No. 5635357

COUNTY
MONTGOMERY

National Register Bridges

Germantown Covered Bridge, Suspension truss, Germantown, Center Street, crosses Little Twin Creek, D.H. Morrison, 1865, Structure File No. 5767172 (closed) pg. 101

Double Intersection Pratt Through , originally on Lower Gratis Road, crossed Tom Run (moved to Carillon Park, Dayton) Columbia Bridge Works, 1881 pg. 170

Selected Bridges

Concrete Filled Arch, Dayton, Moses Drive, crosses Wolf Creek, Unknown Builder, 1926, Structure File No. 5760607

Warren Through, CR 64 (Manning Road), crosses Twin Creek, Central States, 1913, Structure File No. 5734207

Reserve Pool Bridges

Camelback Through, Dayton, Bridge St., crosses Wolf Creek, Central States Bridge Co., 1926, Structure File No. 5760887

Pennsylvania Through, Unknown Builder, 1927, Structure File No. 5740509 (Hemple Road)

Pennsylvania Through, Wagoner Ford, crosses E. branch Great Miami River, Unknown Builder, 1924, Structure File No. 5760526

Pennsylvania Through, Dayton, Rip Rap Rd., crosses Miami River, Unknown Builder, 1923, Structure File No. 5760577

Pennsylvania Through, Dayton, Siebenthaler Rd., crosses Stillwater River, Unknown Builder, 1928, Structure File No. 5761549

Pennsylvania Through, Miamisburg, crosses Bear Creek, Unknown Builder, 1929, Structure File No. 5767725

Stone, Dayton, Gettysburg Ave., crosses VA Lake, Unknown Builder, Unknown Date, Structure File No. 5761980

COUNTY
MORGAN

National Register Bridges

Old Iron Bridge, connects Malta and McConnelsville, crosses Muskingum River, Oregonia Bridge Co., Structure File No. 5835712

Selected Bridges

Double Intersection Warren Through, Unionville, CR 11, crosses Meigs Creek, Unknown Builder, 1913, Structure File No. 5835100 (closed)

Warren Polygonal Chord Pony Truss CR 79, crosses west branch of Wolf Creek, Unknown Builder, 1950, Structure File No. 5834686 pg. 83

MORROW

Selected Bridges

Pratt Pony, TR 25, crosses Shaw Creek, Westfield Township, Massillon Bridge Co., 1880, Structure File No. 5930251

Pratt Pony, TR 136, crosses Whetstone Creek, Gilead Township, Wrought Iron Bridge Co., 1874, Structure File No. 5930146

Warren Polygonal Chord Pony, TR 221, crosses Alum Creek, Peru Township, Capitol Construction Co., 1906, Structure File No. 5932602

Bowstring Arch Truss, TR 127, crosses Whetstone Creek,Wrought Iron Bridge Co., 1879, Structure File No. 5930197 pg. 24

Reserve Pool Bridges

Pratt Pony, TR 126, crosses Whetstone Creek, Wrought Iron Bridge Co., 1874, Structure File No. 5930073

Pratt Pony, TR 138, crosses Shaw Creek, Massillon Bridge Co., 1887, Structure File No. 5931339

MUSKINGUM

National Register Bridges

Dresden Suspension Bridge, SR 208 and SR 666, crosses Muskingum River, Structure File No. 6005284 (closed)

"S" Bridge , US 40 W of New Concord, crosses Fox Creek

COUNTY
MUSKINGUM

Salt Creek Covered Bridge, Warren truss, 3 miles NW of Norwich off CR 82, crosses Salt Creek, Thos. Fisher, 1876, owned by the SOCBA pg. 109

Selected Bridges

Camelback Pony, TR 209, crosses Buffalo Fork, Salt Creek Township, Unknown Builder, Unknown Date, Structure File No. 6032613

Concrete Filled Arch, Roseville, CR 7 (Cannelville Road), crosses Moxahala Creek, C.A. Warner, 1909, Structure File No. 6036023

Stone, TR 420 (National Road), crosses tributary of Timber Run, Falls Township, John Carnahen, 1830, Structure File No. 6040349

Stone, Abandoned section of road just north of US 40, edge of Mt. Sterling, Hopewell Township, Unknown Builder, 1828

Stone, TR 26 (National Road), crosses Valley Run, Hopewell Township, Unknown Builder, 1830, Structure File No. 6039154

Warren Through, Zanesville, US 22 (6th Street), crosses Muskingum River, J.A. Swingle, 1914, Structure File No. 6000487

Reserve Pool Bridges

Warren Pony, TR 442, crosses Salt Creek, Mt. Vernon Bridge Co., 1909, Structure File No. 6048412

NOBLE

National Register Bridges

Huffman Covered Bridge, multiple kingpost truss, 1.5 miles S of Middleburg off SR 564, crosses Middle Fork of Duck Creek on private property (closed), Unknown Builder, c. 1914 pg. 127

OTTAWA

Selected Bridges

Bascule, Port Clinton, SR 163, crosses Portage River, A. Bentley & Sons, 1933, Structure File No. 6201628

Reserve Pool Bridges

Warren Polygonal Chord Pony, CR 19, crosses Toussaint Creek, Unknown Builder, 1950, Structure File No. 6231985

COUNTY
PAULDING

Selected Bridges

Pratt Through, Intersection CR 73 and 192, crosses Maumee River, Crane Township, Milwaukee Bridge & Iron Works, Unknown Date, Structure File No. 6331041

Reserve Pool Bridges

Pratt Through, SR 66, crosses Auglaize River, Vincennes Steel Corp., 1950, Structure File No. 6300510

PERRY

National Register Bridges

Parks Covered Bridge, multiple kingpost, N of Somerset on CR 33, crosses Painter's Fork, Wm. Dean , 1883, Structure File No. 6431232 pg. 118-119

Bowman Mill Covered Bridge, multiple kingpost, originally S of New Reading on SR 86, crossed Little Rush Creek (moved to fairgrounds), Gottlieb Bunz, 1859

Reserve Pool Bridges

Warren Polygonal Chord Pony, Glenford, Main St., crosses Jonathon Creek, Capitol Construction Co., 1915, Structure File No. 6434053 (closed)

PICKAWAY

Selected Bridges

Bowstring Arch Pony, New Holland, CR 25 (Egypt Pike), crosses Mud Run, pedestrian bridge, Champion Bridge Co., 1877 pg. 168

Camelback Through, CR 4, crosses Scioto River, Jackson Township, Oregonia Bridge Co., 1914, Structure File No. 6533159 pg. 150

Double Intersection Pratt Through, SR 762, crosses Big Darby Creek, Darby Township, Cleveland Bridge & Iron Co., 1885 , (bypassed)

Warren Through, TR 127, crosses Big Darby Creek, Jackson Township, Oregonia Bridge Co., 1912, Structure File No. 6533167

COUNTY
PICKAWAY

Reserve Pool Bridges
Camelback Through, SR 752, crosses Walnut Creek, Bellefontaine Bridge Co., 1914, Structure File No. 6503667
Parker Pony, SR 56, crosses Salt Creek, Unknown Builder, 1935, Structure File No. 6501567
Pratt Pony, TR 29, crosses Little Walnut Creek, Massillon Bridge Co., 1890, Structure File No. 6532985

PIKE

Selected Bridges
Warren Polygonal Chord Pony Truss TR 338, crosses Sunfish Creek, Unknown Builder, 1945, Structure File No. 6633242 pg. 65

PORTAGE

National Register Bridges
Main Street Bridge, Kent, Structure File No. 6737080 (closed)

PREBLE

National Register Bridges
Christman Covered Bridge, Childs truss,TR 142, 1.5 miles NW of Eaton, crosses Seven Mile Creek, E.S. Sherman, 1895, Structure File No. 6839258
St. Clair Street Bridge, Childs truss, Eaton, crosses Seven Mile Creek, Columbia Bridge Works, 1887
Harshman Covered Bridge, Childs truss, 4 miles N of Fairhaven on TR 218 (Concord-Fairhaven Road), crosses Four Mile Creek, E.S. Sherman, 1894 Structure File No. 6836399 pg. 126
Brubaker Covered Bridge, Childs truss, W of Gratis on TR 328 (Aukerman Creek Road), crosses Sams Creek, E.S. Sherman, 1887, Structure File No. 6832377
Geeting Covered Bridge, Childs truss, 2 miles W of Lewisburg on TR 436 (Price Road), crosses Price Creek, E.S. Sherman, 1894, Structure File No. 6830072
Warnke Covered Bridge, Childs truss, NE of Lewisburg on TR 403 (Swamp Creek Road), crosses Swamp Creek, E.S. Sherman, 1895, Structure File No. 6837344

COUNTY
PREBLE

Roberts Covered Bridge, Burr truss, 3 miles south of Eaton on Old Camden Pike, crosses Seven Mile Creek, 1829, (partially destroyed by fire 1986 , to be moved to Eaton 1990)

Selected Bridges
Pratt Pony, TR 347, crosses Aukerman Creek, Central States Bridge Co., 1913, Structure File No. 6838235 pg. 38
Warren Through, CR 15, crosses Twin Creek, Brookville Bridge Co., 1915, Structure File No. 6837166 pg. 40
Bowstring Arch Through, TR 235, crosses Four Mile Creek, Israel Township, Unknown Builder, Unknown Date, Structure File No. 6841295
Concrete Arch, CR 30, crosses Big Cave Run, Unknown Builder, 1942, Structure File No. 6835678 pg. 61
Pegram Through, TR 331, crosses Seven Mile Creek, Gasper Township, Indiana Bridge Co., 1906, Structure File No. 6831826
Warren Polygonal Chord Pony, US 40, crosses Twin Creek, Harrison Township, Brookville Bridge Co., 1925, Structure File No. 6800602
Camelback Through, TR 453, crosses Twin Creek, Indiana Bridge Co., 1904, Structure File No. 6833861 pg. 32

PUTNAM

National Register Bridges
Gilboa Bridge, Gilboa, crosses Blanchard River, Structure File No. 6930077

Selected Bridges
Bowstring Arch Pony, CR M-6, crosses Riley Creek, D.H. Morrison, 1876, Structure File No. 6932509
Lattice, CR 18, crosses South Powell Creek, Monroe Township, Canton Bridge Co., 1897, Structure File No. 6931871

Reserve Pool Bridges
Camelback Through, TR 25, crosses Auglaize River, Oregonia Bridge Co., 1912, Structure File No. 6932002

COUNTY
PUTNAM

Pratt Pony, TR 25, crosses Little Auglaize River, Canton Bridge Co., Unknown Date, Structure File No. 6931472

Pratt Through, CR 19, crosses Ottawa River, Canton Bridge Co., 1894, Structure File No. 6930298

RICHLAND

National Register Bridges

Shelby Center Historic District Bridge

Selected Bridges

Pratt Pony, TR 230, crosses Brubaker Creek, Weller Township, Massillon Bridge Co., 1883, Structure File No. 7032730

Pratt Pony, TR 340, crosses Clear Fork Mohican River, Massillon Bridge Co., 1884, Structure File No. 7034962 pg. 25

Reserve Pool Bridges

Stone, Mansfield, W. Fourth St., crosses Maple Run, Unknown Builder, 1897, Structure File No. 7060319

Stone, Ontario, Rock Rd., crosses Conrail, Unknown Builder, 1868, Structure File No. 7064799

ROSS

National Register Bridges

South Salem Covered Bridge, Smith truss, W of South Salem on CR 54 (Lower Twin Road), crosses Buckskin Creek, Smith Bridge Co., 1873 Structure File No. 7132603 pg. 104

Selected Bridges

Continuous Steel Deck Girder, US 35, crosses north fork of Paint Creek, C. A. Baker and Midland Construction Co., 1935, Structure File No. 7101503 pg. 53

Continuous Steel Beam, US 35, crosses Walnut Creek, Midland Construction Co., 1935-36, Structure File No. 7102496 pg. 54

Reserve Pool Bridges

Pratt Through, CR 278, crosses Scioto River, Smith Bridge Co., 1887, Structure File No. 7150547

COUNTY
SANDUSKY

National Register Bridges

Mull Covered Bridge, Town truss, E of Burgoon between SR 12 and 53 off TR 9, over East Branch of Wolf Creek Unknown Builder, 1842, (closed)

Reserve Pool Bridges

Warren Pony, TR7, crosses West Branch Wolf Creek, Kline Structural Steel, 1944, Structure File No. 7234090

SCIOTO

National Register Bridges

Otway Covered Bridge, Smith truss, Otway, off SR 348 crosses Sciot Brush Creek, Smith Bridge Co., 1874, pg. 106

Bennett Schoolhouse Road Covered Bridge, originally SE of Minford on TR 12, crossed Little Scioto River, (dismantled and in storage in South Webster Area)

Selected Bridges

Bowstring Arch Through, TR 238, crosses Little Scioto River, Harrison Township, Brackett Bridge Co., 1900, Structure File No. 7334303

Pennsylvania Through, Portsmouth, SR 73, crosses Scioto River, Mt. Vernon Bridge Co., 1915, Structure File No. 7303009

Truss Leg Bedstead, CR 40, crosses Rocky Fork, Unknown Builder, Unknown Date,Structure File No. 7331134 pg. 46

Pratt Through Truss, CR 48, crosses Scioto Brush Creek, Unknown Builder, 1944, Structure File No. 7332521 pg. 62

Pratt Pony, CR 277, crosses Ginat Stream, Champion Bridge Co., 1950, Structure File No. 7332270 pg. 84

Pratt Pony Truss, TR 213, crosses McConnel Creek, Champion Bridge Builder, 1945, Structure File No. 7334117 pg. 66

Reserve Pool Bridges

Suspension, crosses Ohio River, Railroad & First Street, Unknown Builder, 1927, Structure File No. 7300018

COUNTY

SCIOTO

Warren Polygonal Chord Through, CR 15, crosses Little Scioto River, Unknown Builder, 1940, Structure File No. 7330464

SENECA

Selected Bridges

Concrete Arch, TR 75, crosses Indian Creek, Unknown Builder, 1950, Structure File No. 7443943 pg.85

Parker Through, CR 33, crosses Sandusky River, Pleasant Township, Massillon Bridge Co., 1897, Structure File No. 7443889

Reserve Pool Bridges

Concrete Rainbow Arch, SR 19, crosses Beaver Creek, Unknown Builder, 1925, Structure File No. 7401329

Pennsylvania Through, CR 51, crosses Sandusky River, American Bridge Co., 1924, Structure File No. 7443781

Stone, SR 19, crosses B & O Railroad, Unknown Builder, 1900, Structure File No. 7401086

SHELBY

Selected Bridges

Pratt Pony, CR 132, crosses Great Miami River, Washington Township, Brackett Bridge Co., 1895, Structure File No. 7530722

Reserve Pool Bridges

Pratt Through, CR 141, crosses Great Miami River, Champion Bridge Co., 1906, Structure File No. 7540183

STARK

National Register Bridges

Stone Arch, Market Street Bridge, Canal Fulton Historic District, crosses Tuscarawas River, Structure File No. 7633041

Pratt Pony ,Cherry Street Bridge, crosses Tuscarawas River Canal Fulton Historic District, Structure File No. 7605137

Selected Bridges

Pratt Pony , CR 3, crosses Deer Creek, WPA, 1941, Structure File No. 7632053 pg. 59

COUNTY

STARK

Pratt Through Truss, CR 13, crosses Mahoning River, Wrought Iron Bridge Co., 1948, Structure File No. 7632681 pg. 73

Concrete Arch, Cherry Avenue, crosses east branch of Nimishillin Creek, Geraux Brothers Co. , 1949, Structure File No. 7631375 pg. 77

Reserve Pool Bridges

Parker Pony, Alliance, Walnut Ave., E.O. Vogt, 1938, Structure File No. 7663099 (closed)

Parker Pony , SR 44, Louisville, crosses branch of Nimishillen Creek, WPA, 1938, Structure File No. 7601778

Stone, Canton, 7th St., NW, crosses West branch Nimishillen Creek, Unknown Builder, 1903, Structure File No. 7661274

Pratt Through Truss, TR 356, crosses the Tuscarawas River, Massillon Bridge Co., 1948, Structure File No. 7630190

SUMMIT

National Register Bridges

Everett Road Covered Bridge, Smith truss, SW of Peninsula on TR 47 (Everett Road), crosses Furnace Run, Structure File No. 7733100

Selected Bridges

Concrete Open Spandrel Arch, SR 82, crosses Cuyahoga River & B & O Railroad, Highway Construction Co., 1930, Structure File No. 7706871 pg. 42-43

Cantilevered Deck, Old State Route 8, crosses the Cuyahoga River, Mt. Vernon Bridge Co., 1947-48, Structure File No. 7730306 pg. 72

Reserve Pool Bridges

Concrete Open Spandrel Arch, CR 12, crosses Tinkers Creek, Unknown Builder, 1917, Structure File No. 7756046

TRUMBULL

National Register Bridges

Newton Falls Covered Bridge, Town truss, Arlington Ave., crosses East Branch of Mahoning River, Unknown Builder, 1831, Structure File No. 7830165 pg. 97

COUNTY
TRUMBULL

Selected Bridges

Warren Pony Truss, CR 68C, crosses Mahoning River, Unknown Builder, 1948 , Structure File No. 7837283 pg. 74

Reserve Pool Bridges

Concrete Open Spandrel Arch, Niles, Main Street, crosses Railroad, Water St., Mahoning River, E.H. Latham Co., 1932, Structure File No. 7802439

Concrete Open Spandrel Arch, Unknown Builder, 1918, Structure File No. 7802072

Warren Polygonal Chord Pony, CR 114F, crosses Eagle Creek, Unknown Builder, 1950, Structure File No. 7841779

TUSCARAWAS

Selected Bridges

Concrete Filled Arch, Uhrichsville, East 4th Street, crosses Little Stillwater Creek, W.M. Brode & Co.,1908, Structure File No. 7960298

Fink Through, Abandoned section of TR 212, crosses Conotton Creek, vicinity of Zoarville, Smith, Latrobe & Co., 1868 , Frontispiece

Pratt Through, Abandoned section of CR 82, crosses Tuscarawas River, Lawrence Township, Wrought Iron Bridge Co., 1883

Camelback Through Truss, US 36, crosses Tuscarawas River, American Bridge Co., 1949, Structure File No. 7900333 pg. 76

Reserve Pool Bridges

Pratt Pony, TR 52, crosses Indian Trail Creek, Unknown Builder, 1920, Structure File No. 7935641

TUSCARAWAS

Double Intersection Pratt Through, TR 27, crosses Big Stillwater Creek, Wrought Iron Bridge Co., 1914, Structure File No. 7931468

Warren Deck, Mineral City, Huff Rd., crosses B & O Railroad, Unknown Builder, 1899, Structure File No. 7930801

COUNTY
UNION

National Register Bridges

Reed Covered Bridge, Partridge truss, 3.5 miles S of Marysville off SR 38, crosses Big Darby Creek (closed) R.L. Partridge, 1884, pg. 120

Selected Bridges

Pratt Through, TR 67, crosses Big Darby Creek, Union Township, Central Concrete Construction Co., 1914, Structure File No. 8031401

Warren Pony, CR 113 (White Stone Road), crosses Blue Creek, Dover Township, Capitol Construction Co., 1923, Structure File No. 8051100

VAN WERT

Selected Bridges

Truss Leg Bedstead, CR 208, crosses North Creek, Scott Township, Wrought Iron Bridge Co., 1893, Structure File No. 8131538

Truss Leg Bedstead, CR 82, crosses Town Creek, Liberty Township, Brackett Bridge Co., 1894, Structure File No. 8135150

Reserve Pool Bridges

Lattice, CR 114, crosses Maddox Creek, Unknown Builder, 1900, Structure File No. 8135304

VINTON

National Register Bridges

Mt. Olive Road Covered Bridge, queenpost truss, 1 mile NE of Allensville on Mt. Olive Road, crosses Middle Fork Salt Creek, G.W. Pilcher, 1875, Structure File No. 8234922 pg. 108

Eakin Mill Covered Bridge, double multiple kingpost truss w/arches, CR 38 (Mound Hill Road) near Arbaugh, crosses Big Raccoon Creek (closed) Gilman and Ward, 1870-71

Humpback/Ponn Covered Bridge, 3 span multiple kingpost truss w/arches, 4 miles SW of Wilkesville on TR 4, crosses Raccoon Creek, McGrath and Wells, 1874, Structure File No. 8235988 pg. 105

Selected Bridges

Pratt Pony, TR 5, crosses Middle Fork of Salt Creek, Harrison Township, Smith Bridge Co., 1910, Structure File No. 8233209

GLOSSARY

AASHTO American Association of State Highway Transportation Officials

abutment a substructure supporting the end of a single span or the extreme end of a multispan structure and, in general, supporting the approach embankment placed in contact therewith.

AITC American Institute of Timber Construction

Baltimore a variation of a Pratt truss with sub-struts and/ or sub-ties which provide greater rigidity and permit construction of longer spans than the basic Pratt; also called Petit.

balustrade a railing or parapet consisting of a handrail on balusters, sometimes on a base member.

bascule an arrangement of a movable bridge by which the rising floor or section is counterbalanced by a weight; allows traffic to cross navigable waterways.

bas-relief sculpture or carving with slight projection from the background.

BES Bureau of Environmental Services, Ohio Department of Transportation.

bevel a sloped surface contiguous with a vertical or horizontal one.

bolster a horizontal member used on top of a post or column to lengthen the bearing

bowstring arch a tied arch with the diagonals serving as bracing with the verticals supporting the deck.

bridge any structure, including supports, of 20 feet or more clear span on, above or below a highway.

Burr truss a basic multiple kingpost with arches that are seated into the abutments.

butttress an abutting pier which strengthens a wall, sometimes taking the thrust of an inner pier.

camelback a Parker with a polygonal top chord of exactly five slopes.

cantilever any rigid structural member projecting from a vertical support, especially one in which the projection is great with relation to the depth, so that the upper part is in tension and the lower part in compression.

cast iron an alloy of iron, carbon and other elements, cast as a hard and brittle, or a soft and strong iron.

Child's truss a multiple kingpost with iron tension rods used as counterbraces.

chord the upper and lower longitudinal members which extend the full length of the truss.

compression members generally stiff, heavy posts composed of channel and I-bars which withstand pressure that tends to push them together.

corbel a bracket form, usually produced by extending successive courses of masonry beyond the wall surface.

counter the adjustable diagonal in a truss, not liable to stress except upon partial application of live loads.

crenelated describing a parapet in which the top is notched as in a battlement.

culvert a drain or channel crossing under a road.

deck a bridge type in which the roadway is constructed atop the truss framework.

double intersection Pratt an inclined end post Pratt with diagonals that extend across two panels; also called Whipple.

FHWA Federal Highway Administration.

finial a relatively small, ornamental, terminal feature at the top of an end post.

gusset plates a triangular piece stiffening an angular meeting of two or more members in a framework.

HAER Historic American Engineering Record, a part of the National Park Service within the Department of the Interior.

Howe truss very similar to Long truss but with iron tension rods in place of the wooden verticals.

king post a basic truss type which forms a single triangle.

lattice a bridge type that consists of a system of cross-hatched diagonals with no verticals.

latticework work consisting of crossed strips usually arranged to form a diagonal pattern.

Long truss a multiple kingpost with counterbraces-an all-timber truss.

metal truss a jointed structure having an open built web construction so arranged that the frame is divided into a series of triangular figures.

Multiple kingpost a series of kingposts and diagonals.

Mystic-type bascule this type of bascule features an overhead counterweight system which reduces the overall weight and steel of the structure with resultant savings in cost. The first bridge of this type was constructed in Mystic, Connecticut, by Thomas E. Brown and his son. Sometimes known as a Brown bascule.

NHPA National Historic Preservation Act passed in 1966

OCBC Ohio Covered Bridge Committee.

ODOT Ohio Department of Transportation.

OHPO Ohio Historic Preservation Office; also called State Historic Preservation Office.

parapet a low, retaining wall.

Parker a Pratt with a polygonal top chord.

Partridge truss all timber truss very similar to Smith truss.

Pegram a hybrid between the Warren and Parker trusses, upper chords are all of equal length.

Pennsylvania a Parker with sub-struts and/or sub-ties; also called Petit.

pier a structure which supports the ends of the spans of a multi-span superstructure at an intermediate location between its abutments.

polygonal having many angles.

pony low through truss that has no overhead truss work.

portal the entrance to a through truss bridge, with top laterals, top struts and sway bracing.

Pratt a bridge truss type with diagonals in tension, verticals in compression, except for hip verticals adjacent to inclined end posts.

quatrefoil a panel-like ornament composed of four lobes radiating from a common center.

Queenpost truss two kingposts with an extra horizontal timber between them. The true queenpost always has this extra horizonal timber and is not to be confused with a multiple kingpost with open center panel.

quoins corner stones emphasized by size, by more formal cutting, by more conspicuous jointing, or by difference in texture.

Rafter truss a low or pony truss of timber construction.

rainbow arch a concrete arch configuration typical in the 1920s and 1930s.

Scherzer Rolling Lift Bridge a type of bascule or drawbridge, patented by William Scherzer in 1893, that uses a curved, geared girder on which the bridge rolls as it lifts.

Section 106 refers to the section of the NHPA which requires Federal agencies to take into account how an undertaking will affect a historic property. The Section 106 Review Process refers to the rules and regulations designed to ensure that historic properties are taken into account in projects using federal funds or permits.

skewed having the centerline of its opening forming an oblique angle in the direction in which its spanning structure is built.

SOCBA Southern Ohio Covered Bridge Association.

soffit the curved surface of an arch nearest its longitudinal axis or axes.

Smith truss an all timber truss with braces set at 45 degrees and counterbraces at 60 degrees.

span the distance between the supports of a beam, arch, or the like.

spandrel an area between the exterior curves of two adjoining arches.

Spring line The line within the face surface of an abutment or pier at which the soffit of an arch takes its beginning or origin.

suspension bridge a bridge that suspends the roadway from high towers through a combination of cables.

swing bridge a movable bridge which uses counterweights and a pivoting pier, that turns horizontally about a vertical axis, to allow navigation of ships.

tension members slender, attenuated members of a bridge which resist forces that pull them apart.

through form of truss bridge in which traffic actually moves through the framework of the bridge.

Town lattice truss a web of diagonal planks which form a lattice. There are no verticals in a Town lattice truss.

trunnel a wooden pin used to connect wood trusses, contraction of "tree-nail".

truss leg bedstead a Pratt without inclined end posts.

vertical lift bridge a movable bridge which can be raised vertically by weights and pulleys operating in towers at each end of the structure. During raising and lowering ,the bridge remains in a horizontal position.

Warren a bridge type that has a triangular web system. The diagonals carry both compressive and tensile forces.

Warren polygonal a Warren with a polygonal top chord.

Wernwag truss a basic multiple kingpost truss design with arches in which the kingposts are slightly facing away from the center of the bridge.

WPA Works Projects Administration, a federal agency (1935-1943) charged with instituting and administering public works. Its original title was "Works Progress Administration.

wrought iron a comparatively pure form of iron, almost entirely free of carbon and having a fibrous structure that is readily forged and welded.

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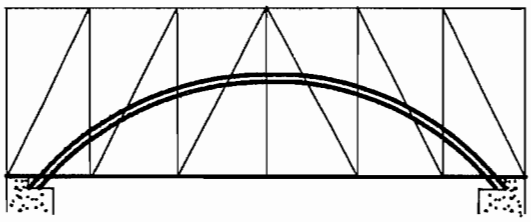
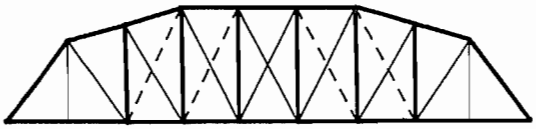
 Burr Truss	Coshocton	1879	F. Mayer	115
 Camelback Pony Truss Camelback Through Truss	Preble	1904	Indiana Bridge Co.	32
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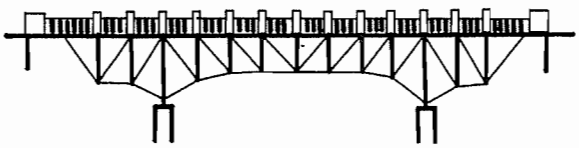 Cantilevered Deck	Cuyahoga	1932	Mt. Vernon Bridge Co.	153
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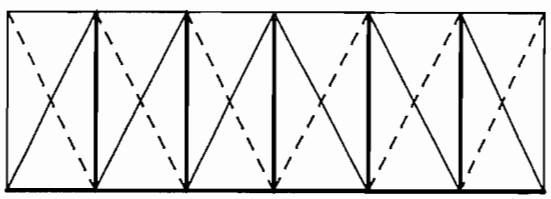 Childs Truss	Delaware	1883	E.S. Sherman	116
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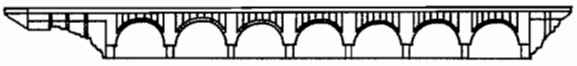	Cuyahoga & Summit	1931	Highway Construction Co.	42
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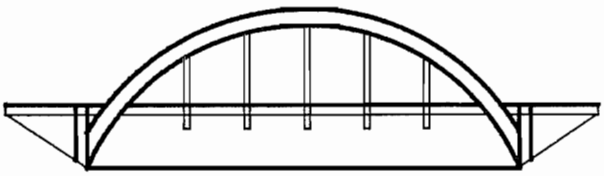	Hamilton	1909	Hamilton County Engineers	35
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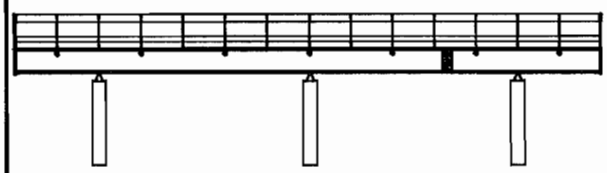	Adams	1931	Brewer, Brewer & Sons	49
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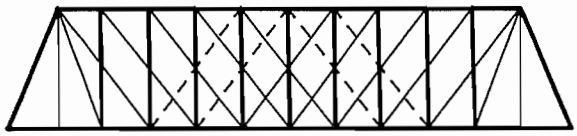
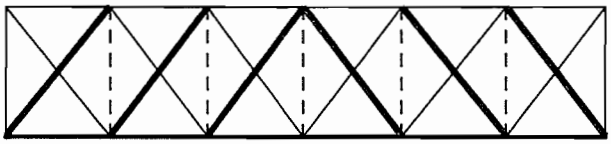
 Double Intersection Pratt Through Truss (Whipple)	Montgomery	1881	Columbia Bridge Works	170
 Howe Truss	Ashtabula	1868	Unknown	136
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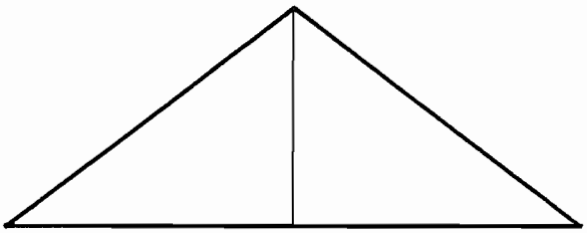
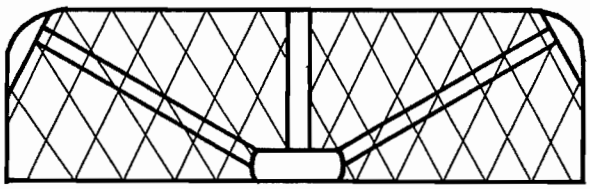
 King Post	Licking	nd	Unknown	177
 Lattice	Holmes	1900	Unknown	30

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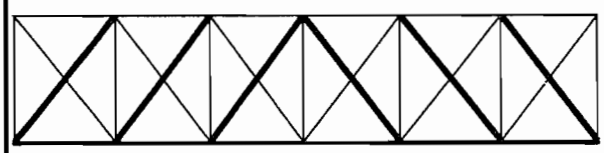	Miami	1860	Jas. & Wm. Hamilton	100
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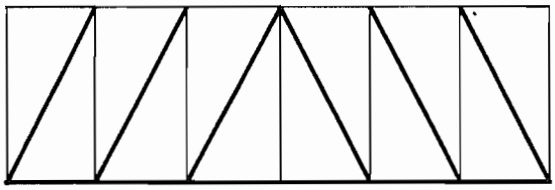	Guernsey	1849	A. Armstrong	159
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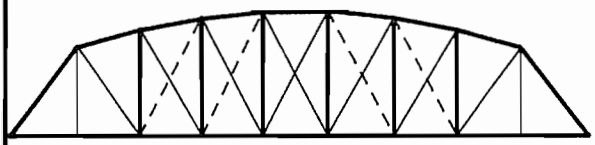	Marion	1913	Standard Engineering Co.	149
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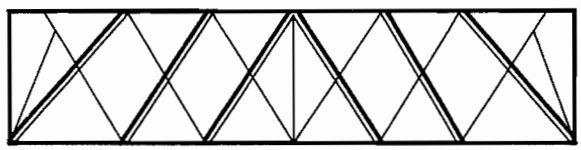	Union	1870	Reuben Partridge	145
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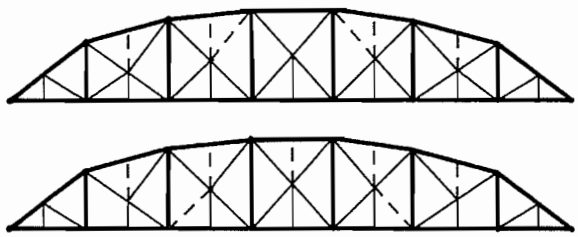
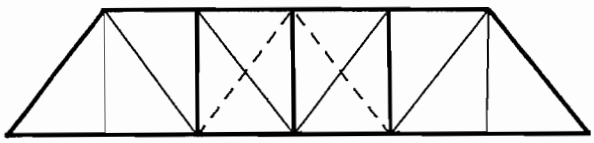
 Pennsylvania Through Truss	Adams	1888	Unknown	26
 Pratt Pony Truss Pratt Deck Truss Pratt Through Truss	Richland	1884	Massillon Bridge Co.	25
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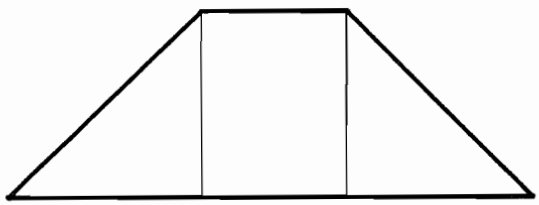
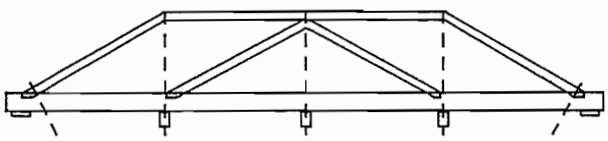
 Queenpost Truss	Vinton	1875	G.W. Pilcher	108
 Rafter Truss	Auglaize	1891	Wm. Fledderjohn	125

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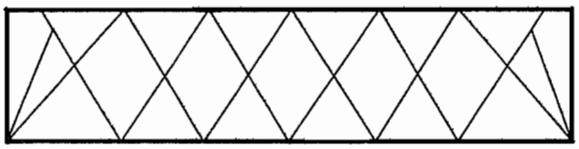	Jackson	1872	Smith Bridge Co.	103
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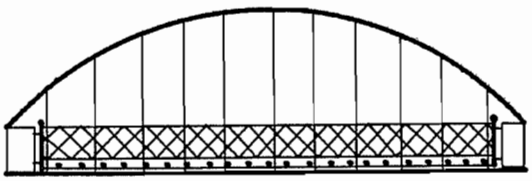	Mahoning	1949	Mt. Vernon Bridge Co.	75
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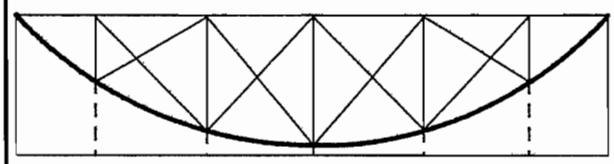	Montgomery	1865	D.H. Morrison	101
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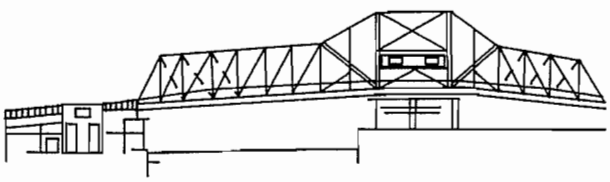
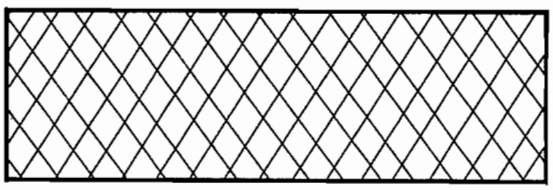
 Swing	Cuyahoga	1901	King Bridge Co.	147-148
 Town Lattice Truss	Trumbull	1831	Unknown	97
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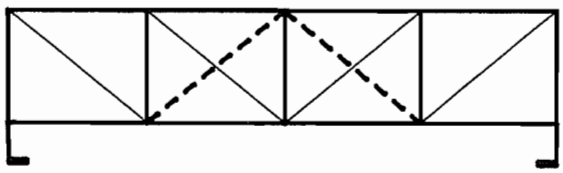 Truss Leg Bedstead	Wayne	1890	The Canton Bridge Co.	27
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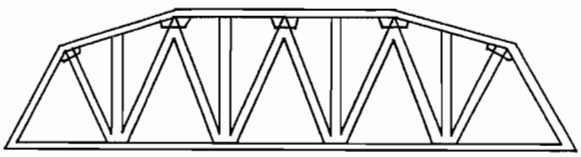 Warren Polygonal Chord Pony Truss	Clinton	1942	Champion Bridge Co.	60
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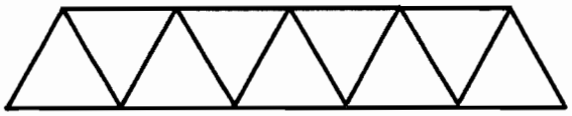 Warren Pony Truss Warren Through Truss	Montgomery	1870	R.W. Smith	164
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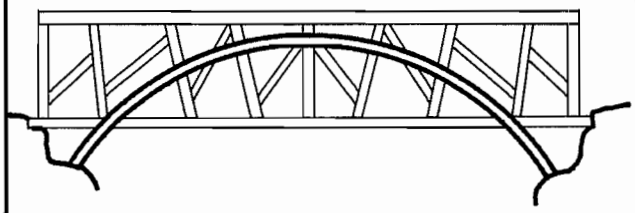 Wernwag	Butler	1850	Unknown	98