Guide to the *Historical Bridge Form*

Version 5.0

Florida Master Site File

Florida Department of State
Division of Historical Resources
Bureau of Historic Preservation

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INTRODUCTION

Identifying and surveying cultural resources is the first step toward preserving and protecting them. Recording a cultural resource with the Florida Master Site File creates a permanent record of the historic property at a point in time, and provides a safeguard against vandalism, theft, weathering processes, and damage from natural disasters.

This manual is designed to aid those documenting Florida's historical bridges using the *Historical Bridge Form, Version 5.0*. The Historical Bridge Form is intended to record historic era bridges that are still mostly intact. For bridges that are no longer extant (for example, only pilings remain) consider using the Archaeological Site Form. If you wish to record an archaeological site, structure or cemetery please use the corresponding Florida Master Site File form and not the Historical Bridge Form. If you wish to record a district, landscape or linear resource (such as a rail, canal or road), use the Resource Group Form. Contact the Florida Master Site File for guidance on which form to use for a particular resource. Site File forms can be downloaded from the Florida Master Site File website or obtained directly from the Site File at the address below.

Florida Master Site File
500 S. Bronough St.
Tallahassee, FL 32399-0250
Phone: 850.245.6440
Fax: 850.245.6439
e-mail: SiteFile@dos.state.fl.us
website: dos.myflorida.com/historical/preservation/master-site-file/

Digital PDF Forms

Those documenting historical bridges should use Site File Historical Bridge Forms in fillable PDF form format. Site File recording forms can be filled out, saved and printed using free **Adobe Acrobat Reader** software (version 8 or later). While third party PDF software may appear to work, only **Adobe Acrobat** software will ensure proper formatting of the form for use with Florida Master Site File data systems. Electronic site forms should be accompanied by the required map attachments, which are discussed in the next section. Please do not embed or append maps or other attachments within the site form PDF file. Attachments should be submitted as separate files using the State Site Number as a part of the file name. Site File fillable PDF forms can be obtained from our website or by contacting the Site File at SiteFile@dos.state.fl.us or 850.245.6440.

ATTACHMENTS FOR THE *HISTORICAL BRIDGE FORM*

General Requirements for Attachments

Required attachments for a complete *Historical Bridge Form* include maps and at least one photograph. All attachments should be labeled with the State Site Number (aka Site File number or Site ID) and the date of the field visit. Attachments should be submitted as separate files. Do not embed or append attachments within the site form PDF file.

Bridge Location on USGS 1:24,000 Scale Topographic Maps (Required)

To guarantee consistency in documenting all resources, we require that the bridge location be plotted as accurately and clearly as possible using 7.5 minute, 1:24,000 scale topographic maps of the U.S. Geological Survey (USGS) as the map background. A letter-size photocopy of the relevant portion of the map with the resource location marked is sufficient. If the map name and its publication or revision date are not visible within the part of the map shown, please label it with this information. The bridge location plot must be prominently labeled with the Site File number.

If you are using GIS software to generate your map products and resource locations, you are encouraged to include the GIS resource location data along with your form submission. When submitting GIS data, please include metadata (datum and projection information at a minimum).

Photographs (Required)

At least one photograph of the bridge, contemporary with the site form, is required for entry on the Florida Master Site File. Additional photographs showing distinctive bridge elements, tender stations or plaques are also strongly encouraged. Historical photographs of the bridge, perhaps taken many years ago, are also of great interest and may be included in your documentation of the resource.

Photos should be submitted in digital format (in addition to a plain-paper, hardcopy print) or as an archival black and white print. Please note that digital images should be submitted as a separate file (JPEG or TIFF) and **not embedded** in a PDF file or appended to the PDF form file. Image files should include the Site File number as a part of the file name. Refer to Appendix D for additional details of the photographic documentation standards for Site File resources.

Supplementary Information (Optional)

If you have information that does not fit into a form field, then you may use one or more supplementary pages. Supplementary pages should also be used if you would like to include important information that does not fit any of the standard fields. Include this information on a separate page and **do not embed** the page into the PDF form file. Make sure that every separate page is labeled with the Site Number and field date.

FIELD DESCRIPTIONS FOR THE *HISTORICAL BRIDGE FORM*

GENERAL INFORMATION

Original / Update

If you have verified with Site File records that the resource has never before been recorded, then check *Original*. If the resource has been previously recorded, check *Update* and enter the existing State Site Number and site name on your form. If the resource has been previously recorded but your new information would materially change its location, extent, or description, consult with Site File staff on what Site Number to use.

Site #8

This is the State Site Number (aka, Site File Number, SiteID or trinomial). The State Site Number is assigned to a cultural resource by the staff of the Florida Master Site File. Surveyors may use the Number Assignment Request Form or e-mail the Site File to get a number assigned before the form is submitted, and may subsequently reference the State Site Number in their survey reports.

Because so many county lines are defined by water features, bridges often pass from one county to another. If a bridge spans a county boundary, it will be issued a separate site number for each county it touches. The *Sunshine Skyway* over Tampa Bay has three numbers for this reason! In such cases the documentation for the bridge will be duplicated and a copy associated with each of the site numbers assigned to it. This ensures that the resource is associated with all of the counties it intersects. Consult site file staff if assistance is needed for this situation.

The State Site Number follows the Smithsonian trinomial numbering system, with a prefix of "8" for Florida, alphabetically the eighth U.S. state (prior to Alaskan statehood), a two letter abbreviation for the county and a five digit number (with leading zeros as needed). For convenience the "8" is usually omitted at the Site File because all resources in our inventory are located in Florida. The numbers are assigned in the order the request is received. For example, the 220th cultural resource documented in Leon County would be "`8LE00220`" or "`LE00220`". Occasionally, larger complexes will be split by the Site File into individual files with different suffixes, such as "`LE00220A`", "`LE00220B`", etc. Such properties are treated separately by the surveyor, who submits documentation on each one, and by the Florida Master Site File, which treats each submission as an independent record.

Field Date

Record the date that field work started or the date of the site visit, e.g. `9/2/1998`. This date will become the Form number in the Florida Master Site File database with the following format: YYYYMM. Using the date above as an example, the form number would be `199809`.

Form Date

Use this field to record the date that the form was actually completed.

Recorder

This optional field is for your convenience and represents your tracking number for the resource. While the Site File encourages assignment of State Site Numbers as early in the documenting process as possible, in many cases it is convenient for the recorder to use a temporary tracking number as a preliminary organizational tool. If no such designation was used in preliminary work, leave the field blank.

FDOT Bridge

If applicable, give the Florida Department of Transportation (FDOT) identification number for the bridge. This number is used to identify the bridge in FDOT's Bridge Inventory Database. The Structures and Facilities Engineer for each FDOT district assigns the number for bridges in their district. Each number is unique within the statewide database. The numbers are six digits long with the first two numbers defining the county and the last four as a unique number to identify the bridge. For example, 267705 could be a fictional bridge in Alachua County, 26 identifying Alachua County and the last four digits uniquely identifying the bridge. This number can usually be found stamped or painted on a portion of the bridge, often on the railing supports.

Please keep in mind that the FDOT occasionally "recycles" numbers for bridges that are no longer in existence: there may have previously been a bridge at another place with "your" FDOT number.

Bridge Name

Record all the principal or best known names for the bridge. If the name for the bridge is not known, use the route carried and featured crossed as reference points, i.e., 'US 41 Bridge over the Withlacoochee River'. If there are multiple bridges listed under the same name, please place the route carried in brackets next to the bridge's official name, i.e., 'Klutho-Hogan's Creek [Liberty Street]'.

Multiple Listing # – for use by Site File staff only – leave blank

This field is for the Site File number for a multiple listing file (that is, a district complex usually documented on a Resource Group Form) that includes the site. Most commonly, multiple listing numbers occur with those resources related to National Register nominations. This field is also used to tie two site numbers together in cases where the boundary of a cultural resource crosses county lines.

Project Name

This field documents the name of the survey or other project which resulted in the reporting of the cultural resource. Example: `CRAS of Piney Z Development, Leon County, Florida`. If the project is ongoing or informal, completing this field is still helpful.

FMSF Survey # – for use by Site File staff only – leave blank

This space is used for the survey or manuscript number assigned by the Site File to the survey report of fieldwork which identified or reexamined the cultural resource.

Ownership

This field records the *current* ownership category for the resource.

LOCATION & MAPPING

Routes Carried / Features Crossed

Give the road name or route number of the artery carried by the bridge. Also note the name of the feature (river, swamp, railroad, road, etc.) that the bridge crosses. For example, *US 41 Bridge over the Withlacoochee River* or *North Broad Street Overpass of the CSX Railroad Tracks*.

USGS 7.5' Map Name & Date

The name of the United States Geological Survey (USGS) 7.5 minute series topographic map on which the cultural resource is located. For every cultural resource, the Florida Master Site File requires that the location be plotted against a background of the 7.5 minute series, 1:24,000 scale topographic maps published by the USGS. If you have access to the paper version of the USGS map, the publication date will appear in the lower right-hand corner of the map sheet. If the map has been photorevised you may list the date of the photorevision as the map date.

Plat or other map

This space is for the name and public access location of any special or historical map used in compiling site data. For example: `Jones-Layton Map of 1843, Peebles Memorial Collection, University of Greater Florida.`

City/Town

Record the name of the town within which the resource lies or nearest town to the resource. If the resource is fairly near but not within the city limits (less than three miles), add "GV" for "general vicinity" after the town. If the resource is not within three miles of any named town you may leave this field blank.

In City Limits?

Is the resource within the legal boundaries of the city named in the previous field?

County

Please indicate the full county name with no abbreviations.

Because so many county lines are defined by water features, bridges often pass from one county to the next. If a bridge spans a county boundary, it will be issued a separate site number for each county it touches. In such cases the documentation for the bridge will be duplicated and a copy

associated with each of the site numbers assigned to it. This ensures that the resource is associated with all of the counties it intersects. Consult Site File staff if assistance is needed with recording multi-county resources.

Township, Range & Section

Townships, Ranges, and Sections are shown on the required 7.5 minute series USGS topographic map, and were derived from the original public lands surveys of American Florida. Each 36 square mile combination of Township and Range is divided into 36 Sections, each one mile square, and is part of the "legal description" of a parcel of land.

In landgrants and other unsurveyed lands, especially impenetrable wetlands, Township, Range and Section may not be decipherable. Some county property appraisers have extrapolated the grid into these areas and may use designations not shown on the USGS maps. Please contact Site File staff if you need assistance in determining the proper Township, Range and Section information for a particular resource.

Township

Record the Township, or north-south coordinates for the resource. These are six-mile blocks numbered North and South. For example, Townships in Florida run northward of the Tallahassee base line from 01 North to 07 North and southward from 01 South to 67 South. Each Township is two digits with an initial zero if necessary, followed by the north or south direction written as a single letter. Examples: `11S`, `01N`.

Range

Record the Range, or east-west map coordinates, for the resource. These are six-mile blocks numbered east and west. For example, Ranges in Florida run West of Tallahassee's prime meridian from 01 West to 34 West and East from 01 East to 43 East. Each Range is two digits with an initial zero if necessary, followed by the east or west direction, written as a single letter. Examples: `23E`, `03W`.

Section

The Section is usually a one mile square portion of a given Township and Range. The Section is usually a number from 1 to 36, derived from numbering rows of a Township-Range block alternately west to east and east to west. If the Section is an irregular subdivision of a land-grant, its number may be higher than 36, up to three digits long. Sometimes such Sections have non-numeric labels like "East Bay 2," and their Section names should be recorded in the space marked *Irregular-name*. If you need to record multiple Sections within the same Township and Range, you may use a comma separated list (i.e., `3,4,5`) or a range of numbers (i.e., `7-10`).

¼ Section

The ¼ Section field indicates which quadrant within the one square mile Section the resource occurs. If the section is square, use NE, NW, SE or SW (checking all that apply). If the Section is

not one of the regular sections numbered 1-36, then indicate the irregular Section name or number (but do not select a quarter-section).

Landgrant

Landgrants are Florida lands not formally surveyed under the standard public lands system. If the resource is located within a landgrant, enter the landgrant name in this line. Landgrants were often very large tracts of land originally recorded by Spanish and British governments in Florida, but later recognized and used in legal descriptions under American administrations. Land in pre-existing landgrants was normally not surveyed under the Public Lands Survey System using townships, ranges, and sections.

Tax Parcel

This is the number used by a local government to track land parcels. The basic content of a parcel identification number will vary from county to county. Florida property appraisers provide parcel information in searchable format on their websites. For further information on parcel identification numbers, please contact the county property appraiser's office and/or city planning department.

UTM Coordinates

This space is used to record the Universal Transverse Mercator (UTM) coordinates for the resource. These coordinates may be derived from the USGS 1:24,000 paper maps, various mapping websites, GIS software or GPS devices. Prior to the widespread use of handheld GPS devices, UTM coordinates derived from paper quad maps were the typical way to record site coordinates. Those doing much work with USGS maps and coordinates may be interested in further information. The National Park Service offers a publication, "Using the UTM Grid System to Record Historic Sites". Forestry and survey supply distributors offer transparent overlays for 1:24,000 maps which facilitate linear and acreage measurements.

UTM: Zone

For Florida, most of the panhandle counties are in Zone 16, while the rest of the state is in Zone 17. The dividing line is close to the Leon County-Jefferson County boundary.

UTM: Easting

This area is for the east-west UTM coordinate for the center of the resource, a six digit number measured in meters eastward from the zone origin. If deriving the number from paper maps, the coordinates should always be rounded to the nearest 10 meters, since greater accuracy is not possible with 1:24,000 USGS maps. The approximate statewide minimum value for easting in Zone 16 is 440000 meters (USGS Dogwood Creek 1:24,000 map), while the approximate maximum is 788000 meters (USGS Miccosukee NE). For Zone 17, the approximate minimum value is 213000 meters (USGS Metcalf), while the maximum is roughly 596000 meters (Palm Beach).

UTM: Northing

Please record the north-south UTM coordinate, a number of seven digits recording the distance north of the equator in meters, ranging from an approximate minimum of 2714000 (e.g., on the USGS 1:24,000 Marquesas Keys West sheet) to an approximate maximum of 3431000 meters (e.g., USGS Cottonwood).

Other Coordinates

The *Other Coordinates* section is intended to record Latitude(Y) and Longitude(X) location information such as coordinates obtained from a GPS unit. Alternate Coordinate system values such as State Plane or Albers may also be recorded in these fields. Please be sure to indicate the coordinate system used, the datum (i.e., NAD27, NAD83, WGS84), and the units (i.e., feet, meters) where applicable. For Latitude/Longitude coordinates please indicate whether the coordinates given are Degrees-Minutes-Seconds, Degrees-Decimal Minutes or Decimal Degrees.

Name of Public Tract

This field is intended record a publicly owned tract with a formal name, within which the resource is located, including a city park, a college campus or a national or state park or forest. Prefix the name with the government owning or an abbreviation for it. Examples: `US: Ocala National Forest` (for federal), `FLA: Ft Pickens State Aquatic Preserve` (for state); `Leon Co: Public Landfill` (the public landfill owned by Leon County); `City of Miami: Ponce De Leon Park` (a park owned by the city of Miami).

HISTORY

Year Built

Use this field to record the year that construction of the bridge began. If the year given is an estimate, select the appropriate qualifier check-box to the right of the year field.

Still in Use?

Use the check-boxes to indicate whether the bridge is still used for its original purpose. If use of the bridge is restricted, select the 'restricted use' box and describe the nature of the restriction in the space provided.

Prior Fords, Ferries, or Bridges at this Location

Indicate if historically known fords, ferries, or earlier bridges were present at the location of the current bridge. Please provide as much information as possible, including location with respect to the current bridge, dates in use, and the fullest possible description.

Bridge Use: Original and Current with Dates

Describe all uses of the bridge, including historical and current functions if the use has changed. For example, if the bridge began as a vehicular bridge and was later converted to a fishing pier,

please note these uses. Include the dates during which the bridge was used for each function listed.

Ownership History

Provide ownership information, especially the first owner and historically significant ones. Include owner name, dates ownership began and ended, owner profession if individual, and significant historical associations of the owner or family. If the bridge is in public ownership, identify the government and maintaining agency.

Designers / Engineers

Enter the full name of the designer or engineer responsible for the design of the bridge. If the principal designer/engineer of a firm was responsible for the design, enter her/his name. If an engineering firm bearing the name of an individual designer/engineer (i.e., Daniel Luten) was responsible for the design but you have no evidence the principal necessarily was responsible, enter the name and add "and Company"; for example, Daniel Luten and Company. If the engineering firm does not include the name of a designer/engineering, enter the name of the firm. If a design derives from stock plans of a company or government agency and is not credited to a specific individual, enter the name of the company or agency responsible; e.g. U.S. Army Corps of Engineers.

Builders / Contractors

Record the name of the builder, contractor, or firm responsible for construction of the bridge.

Text of Plaque or Inscription

If a plaque or inscription exists, document the text for historical background. A supplementary page may be used if text will not fit in the space provided.

Narrative History

The following are some of the questions that a historian might like to see answered about a bridge. What pre-bridge or post-bridge associations does the site have? What economic, demographic, or political trends and events led to the decision to build the bridge? What personages were associated with the bridging decision, financing, design, or building, or were memorialized by the bridge? What is the historical and/or economic significance of the routes carried? What is the history of traffic/utilization of the bridge and tolls on it? Use supplementary sheets if necessary.

DESCRIPTION

Overall Bridge Design

Select the design category from the dropdown list best describing the bridge, considering both the main spans and approach spans. This will usually be the same as the main span characterization. If the dropdown list does not contain the design of the bridge, an alternate design may be typed into the second answer space for bridge design.

Those unfamiliar with bridge designs or terminology should refer to Appendices A and B, where bridge terms are defined and illustrated.

Overall Condition

Characterize the general physical condition of the bridge by selecting from the choices provided. Generally, a bridge in 'deteriorated' condition is closed or abandoned. A bridge in 'ruinous' condition is not structurally whole. If you select 'ruinous' consider whether it may be more appropriate to record the bridge as an archaeological site.

Style and Decorative Details

Note any architectural or decorative details of the bridge. Examples include the presence of Neoclassical Style urns or Mediterranean Revival Style balustrades.

Tender Station Description

Describe the bridgetender's station, if present. Then tender station is the station/room/building from which a movable bridge is operated. Descriptions may include historical associations, materials, design, placement of the station on the bridge, and any architectural detailing on the building. If machinery or bridgetender occupy a substantial building, consider whether a Historical Structure Form would best be suited to document the tender station.

Alterations: Dates and Descriptions

Document alterations to the bridge, such as road widening or the replacement of bridge decking or supports, as well as the dates the changes occurred.

Spans: Number, Total Length(ft)

Indicate the total number and total length in feet of spans for the entire bridge, including main spans and approach spans. For more information on spans and span types see Appendix B.

Main Spans: Number, Length(ft), Width(ft), Roadway Width(ft)

Record the number of main spans (excludes approach spans), total length in feet of all main spans, width of main spans (balustrade to balustrade) in feet, and roadway width carried by main spans (curb to curb) in feet.

Main Span Design

Select a design from the dropdown list provided that best describes the design of the main spans of the bridge. See Appendices A and B for more information on bridge design types and terminology.

Main Span Materials

Record the types of materials used in the construction of the main spans of the bridge. If materials were used that do not appear in the dropdown list provided, use the second answer space for main span materials to type in an alternative material.

Approach Spans: Number, Length(ft), Width(ft), Roadway Width(ft)

Record the number of approach spans, total length in feet of all approach spans, width of approach spans in feet, and roadway width carried by approach spans in feet.

Approach Span Design

Select a design from the dropdown list provided that best describes the design of the approach spans of the bridge. See Appendices A and B for more information on bridge design types and terminology.

Approach Span Materials

Record the types of materials used in the construction of the approach spans of the bridge. If materials were used that do not appear in the dropdown list provided, use the second answer space for approach span materials to type in an alternative material.

Deck Materials

Select the types of materials used to construct the deck (travel surface) of the bridge. If materials were used that do not appear in the dropdown list provided, use the second answer space to type in an alternative material.

Abutment Materials

Select the materials used to construct the abutments from the dropdown list provided. If materials were used that do not appear in the dropdown list provided, use the second answer space to type in an alternative material.

Abutment Description

Provide a short narrative description of bridge abutments. Note the general design and condition of the abutments in your description.

Pier Materials

Select the materials used to construct the bridge piers from the dropdown list provided. If materials were used that do not appear in the dropdown list, use the second answer space to type in alternative materials.

Pier Description

Provide a short narrative description of bridge piers. Note the general design and condition of the piers in your description.

RESEARCH METHODS

Research Methods

Indicate the methods used to research the resource. Please check all boxes that apply. If a method was used to research the bridge that is not listed on the form (windshield survey, for example) describe it on the 'Other Methods' line. Consider using the sources of information listed if they have not already been utilized in your research.

Bibliographic References

References should include sources used in background research. Use continuation sheet, if needed, and give FMSF Manuscript # if relevant.

OPINION OF RESOURCE SIGNIFICANCE

Your opinion of the significance of the resource and its eligibility for the National Register of Historic Places is important information and a critical part of the form. The National Register of Historic Places uses the following criteria to determine eligibility for listing of cultural resources:

Criterion A - The property or structure is associated with events that have made a significant contribution to the broad patterns of our history.

Criterion B - The property is associated with the lives of persons significant in our past.

Criterion C - The property embodies the distinctive characteristics of a type, period, or method of construction or represents the work of a master, or possesses high artistic values, or represents a significant and distinguishable entity whose components lack individual distinction.

Criterion D - The property has yielded, or is likely to yield, information important in prehistory or history.

Further information on National Register criteria may be obtained from (1) National Register of Historic Places, National Park Service, P. O. Box 37127, Washington, D.C. 20013-7127 or https://www.nps.gov/subjects/nationalregister/; (2) *National Register Bulletin 15: How to Apply the National Register Criteria for Evaluation*; or (3) Survey and Registration Section, Division of Historical Resources, R.A. Gray Building, 500 South Bronough Street, Tallahassee, Florida 32399-0250 (850.245.6333).

Please note that the National Register of Historic Places is referenced here because it sets de facto national standards for evaluating cultural resources. Completing a form for the Florida Master Site File, even if you argue the site is eligible for listing, does NOT start the process of nominating the resource for the National Register of Historic Places. Such a proposal is the responsibility of the surveyor, although the Florida Division of Historical Resources is charged with assisting persons with the task. Nomination of a cultural resource to the National Register

can be a complex and time-consuming process. If you believe your cultural resource might qualify and you are interested in the nomination process, contact the Survey and Registration Section of the Division of Historical Resources.

Potentially eligible individually for National Register of Historic Places?

Surveyor's opinion of the resource's eligibility for the National Register of Historic Places when the resource is considered as an independent entity -- not as a component or contributing property to a potential historic district. Select *yes* for eligible or *no* for not eligible. Professionals completing surveys mandated or funded by the state normally must make this evaluation. If you do not feel qualified to make such a judgment, please leave blank. Evaluations should be briefly justified in every case, positive or negative, using the *Explanation of Evaluation* field. Extended justifications can be made on a continuation sheet if needed.

Potentially eligible as contributor to a National Register district?

Surveyor's opinion of the resource's eligibility for the National Register of Historic places as a component or contributing property to a district or thematic nomination. Select *yes* for eligible or *no* for not eligible. Professionals completing surveys mandated or funded by the state normally must make this evaluation. If you do not feel qualified to make such a judgment, please leave blank. Evaluations should be briefly justified in every case, positive or negative, using the *Explanation of Evaluation* field. Extended justifications can be made on a continuation sheet if needed.

Explanation of Evaluation

Use this space to record a justification for the evaluations made in the previous two questions concerning National Register eligibility, referencing National Register criteria if possible. Even a brief explanation of the surveyor's opinion of eligibility is important because it can influence agency recommendations on projects potentially impacting the resource. Use a continuation sheet if needed.

Areas of Historical Significance

Indicate the broad themes or topics of historical significance relevant to the resource by selecting from the dropdown list provided. The Florida list is based on, but not identical to, those listed on page 8 of National Register Bulletin 15.

DOCUMENTATION

Accessible Documentation Not Filed with the Site File

Use these fields to document field notes, photos, plans or other important documents related to the resource that are permanently accessible. For each separately maintained collection, record the document types, maintaining organization, document description, and file or accession numbers in the spaces provided. *Maintaining organization* is used to indicate the archive, museum or other entity that has custody of the documentation. *File or accession number* refers to the identification number given to documents in the maintaining organization's filing system.

INFORMANT & RECORDER INFORMATION

Recorder Name

List the name of the person or persons involved in recording the resource (filling out this form).

Recorder Affiliation

Indicate the organization or institution that the primary recorder is employed by or affiliated with. Choose from the dropdown list of organizations or type in a response.

Recorder Contact Information

If the recorder has an affiliation with an organization, institution or Florida Anthropological Society chapter, give that organization's contact information. If the recorder is an unaffiliated private individual give the individual's contact information.

APPENDIX A: GLOSSARY OF BRIDGE TERMS

Abutment
Part of a structure which supports the end of a span or accepts the thrust of an arch; often supports and retains the approach embankment.

Anchor span
Located at the outermost end, it counterbalances the arm of span extending in the opposite direction from a major point of support. Often attached to an abutment.

Anchorage
Located at the outermost ends, the part of a suspension bridge to which the cables are attached. Similar in location to an abutment of a beam bridge.

Aqueduct
A pipe or channel, open or enclosed, which carries water. May also be used as part of a canal to carry boats. Sometimes carried by a bridge.

Arch
A curved structure which supports a vertical load mainly by axial compression.

Arch barrel
The inner surface of an arch extending the full width of the structure.

Arch ring
An outer course of stone forming the arch. Made of a series of **voussoirs.** An archivolt is an arch ring with decorating moldings.

Ballustrade
A decorative railing, especially one constructed of concrete or stone, including the top and bottom rail and the vertical supports called ballusters. May also include larger vertical supports called **stanchions.**

Baltimore truss
A subdivided Pratt truss commonly constructed for the Baltimore and Ohio Railroad. It has angled end posts and a top chord which is straight and horizontal. Compare to **camelback truss** and **Pennsylvania truss.**

Bascule bridge
From the French word for "see-saw," a bascule bridge features a movable span (leaf) which rotates on a horizontal hinged axis (trunnion) to raise one end vertically. A large counterweight is used to offset to weight of the raised leaf. May have a single raising leaf or two which meet in the center when closed. Compare to **swing bridge** and **vertical lift bridge.**

Beam
A horizontal structure member supporting vertical loads by resisting bending. A girder is a

larger beam, especially when made of multiple plates. Deeper, longer members are created by using trusses.

Bearing
A device at the ends of beams which is placed on top of a pier or abutment. The ends of the beam rest on the bearing.

Bent
Part of a bridge substructure. A rigid frame commonly made of reinforced concrete or steel which supports a vertical load and is placed transerse to the length of a structure. Bents are commonly used to support beams and girders. An **end bent** is the supporting frame forming part of an abutment.

Each vertical member of a bent may be called a **column**, **pier**, or **pile**. The horizontal member resting on top of the columns is a **bent cap**. The columns stand on top of some type of foundation or footer which is usually hidden below grade.

A bent commonly has at least two or more vertical supports. Another term used to describe a bent is **capped pile pier**. A support having a single column with bent cap is sometimes called a **"hammerhead" pier**.

Bowstring truss
A truss having a curved top chord and straight bottom chord meeting at each end.

Box girder
A steel beam built-up from many shapes to form a hollow cross-section.

Brace-ribbed arch (trussed arch)
An arch with parallel chords connected by open webbing.

Bridge
A raised structure built to carry vehicles or pedestrians over an obstacle.

Buttress
A wall projecting perpendicularly from another wall which prevents its outward movement. Usually wider at its base and tapering toward the top.

Cable
Part of a suspension bridge extending from an anchorage over the tops of the towers and down to the opposite anchorage. Suspenders or hangers are attached along its length to support the deck.

Cable-stayed bridge
A variation of suspension bridge in which the tension members extend from one or more towers at varying angles to carry the deck. Allowing much more freedom in design form, this type does not use cables draped over towers, nor the anchorages at each end, as in a traditional suspension bridge.

Camber
A positive, upward curve built into a beam which compensates for some of the vertical load and anticipated deflection.

Camelback truss
A truss having a curved top chord and straight bottom chord meeting at each end, especially when there are more than one used end to end. Compare to **Baltimore truss** and **Pennsylvania truss.**

Cantilever
A structural member which projects beyond a supporting column or wall and is counterbalanced and/or supported at only one end.

Castellated girder
A steel beam fabricated by making a zig-zag cut along its web, then welding the two sides together at their peaks. This creates a beam which has increased depth and therefore greater strength, but is not increased in weight.

Catenary
Curve formed by a rope or chain hanging freely between two supports. The curved cables or chains used to support suspension bridges may be referred to as catenaries.

Centering
Temporary structure or falsework supporting an arch during construction.

Chord
Either of the two principal members of a truss extending from end to end, connected by web members.

Column
A vertical structural member used to support compressive loads. Also see **pier** and **pile**.

Continuous span
A superstructure which extends as one piece over multiple supports.

Corbelled arch
Masonry built over an opening by progressively overlapping the courses from each side until they meet at the top center. Not a true arch as the structure relies on strictly vertical compression, not axial compression.

Counter
A truss web member which functions only when a structure is partially loaded.

Cradle
Part of a suspension bridge which carries the cable over the top of the tower.

Cripple
A structural member which does not extend the full height of others around it and does not carry as much load.

Crown
On road surfaces, where the center is the highest point and the surface slopes downward in opposite directions, assisting in drainage. Also a point at the top of an arch.

Culvert
A drain, pipe or channel which allows water to pass under a road, railroad or embankment.

Deck
The top surface of a bridge which carries the traffic.

Deck truss
A truss which carries its deck on its top chord. Compare to **pony truss** and **through truss.**

Elliptical arch
An arch formed by mutiple arcs each of which is drawn from its own center. Compare to a roman arch which is a semi-circular arc drawn from a single centerpoint.

Embankment
Angled grading of the ground.

End post
The outwardmost vertical or angled compression member of a truss.

Expansion joint
A meeting point between two parts of a structure which is designed to allow for movement of the parts due to thermal or moisture factors while protecting the parts from damage. Commonly visible on a bridge deck as a hinged or movable connection.

Extrados
The outer exposed curve of an arch; defines the lower arc of a spandrel.

Eye bar
A structural member having a long body and an enlarged head at each end. Each head has a hole though which a pin is inserted to connect to other members.

Falsework
Temporary structure used as support during construction. Falsework for arch construction is called "centering."

Fill
Earth, stone or other material used to raise the ground level, form an embankment or fill the inside of an abutment, pier or closed spandrel.

Finial
A sculpted decorative element placed at the top of a spire or highpoint of a structure.

Fixed arch
A structure anchored in its position. Compare to **hinged arch.**

Floor beam
Horizontal members which are placed transversely to the major beams, girders, or trusses; used to support the deck.

Footing
The enlarged lower portion of the substructure or foundation which rests directly on the soil, bedrock, or piles; usually below grade and not visible.

Gabion
A galvanized wire box filled with stones used to form an abutment or retaining wall.

Girder
A horizontal structure member supporting vertical loads by resisting bending. A girder is a larger beam, especially when made of multiple metal plates. The plates are usually riveted or welded together.

Gusset plate
A metal plate used to unite multiple structural members of a truss.

Haunch
The enlarged part of a beam near its supported ends which results in increased strength; visible as the curved or angled bottom edge of a beam.

Hinged arch
A two-hinged arch is supported by a pinned connection at each end. A three-hinged arch also includes a third pinned connection at the crown of the arch near the middle of a span. Compare to **fixed arch.**

Howe truss
A type of truss in which vertical web members are in tension and diagonal web members in compression. Maybe be recognized by diagonal members which appear to form an "A" shape (without the crossbar) toward the center of the truss when viewed in profile. Compare to **Pratt truss** and **Warren truss.**

Humpback
A description of the sideview of a bridge having relatively steep approach embankments leading to the bridge deck.

Impost
The surface which receives the vertical weight at the bottom of an arch.

Intrados
The interior arc of an arch.

Jersey barrier
A low, reinforced concrete wall wider at the base, tapering vertically to near mid-height, then continuing straight up to its top. The shape is designed to direct automotive traffic back toward its own lane of travel and prevent crossing of a median or leaving the roadway. Commonly used on new and reconstructed bridges in place of decorative ballustrades, railings or parapets.

Keystone
The uppermost wedge-shaped voussoir at the crown of an arch which locks the other voussoirs into place.

King Truss
Two triangular shapes sharing a common center vertical member (king post); the simplest triangular truss system. Compare to **queen truss.**

Knee brace
Additional support connecting the deck with the main beam which keep the beam from buckling outward. Commonly made from plates and angles.

Lag
Crosspieces used to connect the ribs in centering.

Lateral bracing
Members used to stabilize a structure by introducing diagonal connections.

Lattice
An assembly of smaller pieces arranged in a gridlike pattern; sometimes used a decorative element or to form a truss of primarily diagonal members.

Lenticular truss
A truss which uses curved top and bottom chords placed opposite one another to form a lens shape. The chords are connected by additional truss web members.

Member
One of many parts of a structure, especially one of the parts of a truss.

Parabola
A form of arch defined by a moving point which remains equidistant from a fixed point inside the arch and a moving point along a line. This shape when inverted into an arch structure results in a form which allows equal vertical loading along its length.

Parapet
A low wall along the outside edge of a bridge deck used to protect vehicles and pedestrians.

Pennsylvania truss
A subdivided Pratt truss invented for use by the Pennsylvania Railroad. The Pennsylvania truss is similar in bracing to a Baltimore truss, but the former has a camelback profile while the latter has angled end posts only, leaving the upper chord straight and horizontal. Compare to **camelback truss** and **Baltimore truss.**

Pier
A vertical structure which supports the ends of a multi-span superstructure at a location between abutments. Also see **column** and **pile**.

Pile
A long column driven deep into the ground to form part of a foundation or substructure. Also see **column** and **pier**.

Pin
A cylindrical bar which is used to connect various members of a truss; such as those inserted through the holes of a meeting pair of eyebars.

Pony truss
A truss which carries its traffic near its top chord but not low enough to allow crossbracing between the parallel top chords. Compare to **deck truss** and **through truss.**

Portal
The opening at the ends of a **through truss** with forms the entrance. Also the open entrance of a tunnel.

Post
One of the vertical compression members of a truss which is perpendicular to the bottom chord.

Pratt truss
A type of truss in which vertical web members are in compression and diagonal web members in tension. Many possible configuartions include pitched, flat, or camelback top chords. Maybe be recognized by diagonal members which appear to form a "V" shape toward the center of the truss when viewed in profile. Variations include the **Baltimore truss** and **Pennsylvania truss.** Compare to **Warren truss** and **Howe truss.**

Pylon
A monumental vertical structure marking the entrance to a bridge or forming part of a gateway.

Queen Truss
A truss having two triangular shapes spaced on either side of central apex connected by horizontal top and bottom chords. Compare to **king truss.**

Reinforcement
Adding strength or bearing capacity to a structural member. Examples include the placing of metal rebar into forms before pouring concrete, or attaching gusset plates at the intersection of multiple members of a truss.

Revet
The process of covering an embankment with stones.

Revetment
A facing of masonry or stones to protect an embankment from erosion.

Rib
Any one of the arched series of members which is parallel to the length of a bridge, especially those on a metal arch bridge.

Rigid frame bridge
A type of girder bridge in which the piers and deck girder are fastened to form a single unit. Unlike typical girder bridges which are constructed so that the deck rests on bearings atop the piers, a rigid frame bridge acts as a unit. Pier design may vary.

Rise
The measure of an arch from the spring line to the highest part of the intrados, which is to say from its base support to the crown.

Segmental arch
An arch formed along an arc which is drawn from a point below its spring line, thus forming a less than semicircular arch. The intrados of a Roman arch follows an arc drawn from a point on its spring line, thus forming a semi-circle.

Simple span
A span in which the effective length is the same as the length of the spanning structure. The spanning superstructure extends from one vertical support, abutment or pier, to another, without crossing over an intermediate support or creating a cantilever.

Skew
When the superstructure is not perpendicular to the substructure, a skew angle is created. The skew angle is the acute angle between the alignment of the superstructure and the alignment of the substructure.

Span
The horizontal space between two supports of a structure. Also refers to the structure itself. May be used as a noun or a verb.

The **clear span** is the space between the inside surfaces of piers or other vertical supports. The **effective span** is the distance between the centers of two supports.

Spandrel
The roughly triangular area above an arch and below a horizontal bridge deck. A **closed spandrel** encloses fill material. An **open spandrel** carries its load using interior walls or columns.

Splice plate
A plate which joins two girders. Commonly riveted or bolted.

Springer
The first voussoir resting on the impost of an arch.

Spring line
The place where an arch rises from its support; a line drawn from the impost.

Stanchion
One of the larger vertical posts supporting a railing. Smaller, closely spaced vertical supports are ballusters. Also see **ballustrade.**

Stiffener
On plate girders, structural steel shapes, such as an **angle**, are attached to the **web** to add intermediate strength.

Stringer
A beam aligned with the length of a span which supports the deck.

Strut
A compressive member.

Substructure
The portion of a bridge structure including abutments and piers which supports the superstructure.

Superstructure
The portion of a bridge structure which carries the traffic load and passes that load to the substructure.

Suspended span
A simple beam supported by cantilevers of adjacent spans, commonly connected by pins.

Suspenders
Tension members of a suspension bridge which hang from the main cable to support the deck. Also similar tension members of an arch bridge which features a suspended deck. Also called hangers.

Suspension bridge
A bridge which carries its deck with many tension members attached to cables draped over tower piers.

Swing bridge
A movable deck bridge which opens by rotating horizontally on an axis. Compare to **bascule bridge** and **vertical lift bridge.**

Through truss
A truss which carries its traffic through the interior of the structure with crossbracing between the parallel top and bottom chords. Compare to **deck truss** and **pony truss.**

Tie
A tension member of a truss.

Tied arch
An arch which has a tension member across its base which connects one end to the other.

Tower
A tall pier or frame supporting the cable of a suspension bridge.

Trestle
While **Bridge** is the more general term (which may be a single span or multi-span, typically one span is longer than the others), **Trestle** is a longer, multi-span structure -- a series of shorter spans in which most of the spans are of similar length. **Trestle** is a more common term in relation to railroads, while **viaduct** is a similar long, multi-span structure for streets. Neither term seems to be exclusive.

Truss
A structural form which is used in the same way as a beam, but because it is made of an web-like assembly of smaller members it can be made longer, deeper, and therefore, stronger than a **beam** or **girder** while being lighter than a beam of similar dimensions.

Trussed arch
A metal arch bridge which features a curved truss.

Upper chord
Top chord of a truss.

Vault
An enclosing structure formed by building a series of adjacent arches.

Vertical lift bridge
A movable deck bridge in which the deck may be raised vertically by synchronized machinery at each end. Compare to **swing bridge** and **vertical lift bridge.**

Viaduct
A long, multi-span structure, especially one constructed of concrete. More commonly used in relation to structures carrying motor vehicles. **Trestle** is the term for a similar structure when used in relation to railroads.

Voussoir
Any one of the wedge shaped block used to form an arch.

Warren truss
A type of truss in which vertical web members inclined to form equilateral triangles. May be be recognized by diagonal members which appear to form a series of alternating "V" and "A" shapes (without the crossbar) along the length of the truss when viewed in profile. Often the triangles are bisected by vertical members to reduce the length of the members of the top chord. Compare to **Pratt truss** and **Howe truss.**

Web
The system of members connecting the top and bottom chords of a truss. Or the vertical portion of an I-beam or girder.

Wing walls
Extensions of a retaining wall as part of an abutment; used to contain the fill of an approach embankment.

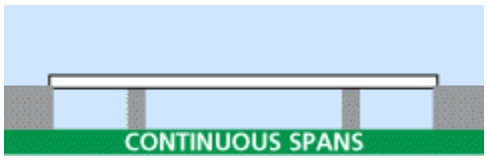
APPENDIX B: BRIDGE BASICS – A SPOTTER'S GUIDE TO BRIDGE DESIGN

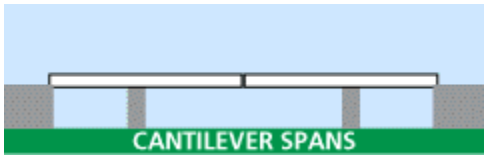
Because of the wide range of structural possibilities, this Spotter's Guide shows only the most common fixed (non-movable) bridge types. Other types are listed in the **Bridge Terminology** page. The drawings are not to scale. Additional related info is found on the other **Terminology** pages which are linked to the left.

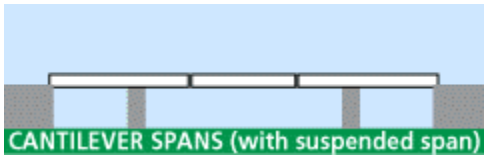
The four main factors are used in describing a bridge. By combining these terms one may give a general description of most bridge types.

- span (simple, continuous, cantilever),
- material (stone, concrete, metal, etc.),
- placement of the travel surface in relation to the structure (deck, pony, through),
- form (beam, arch, truss, etc.).

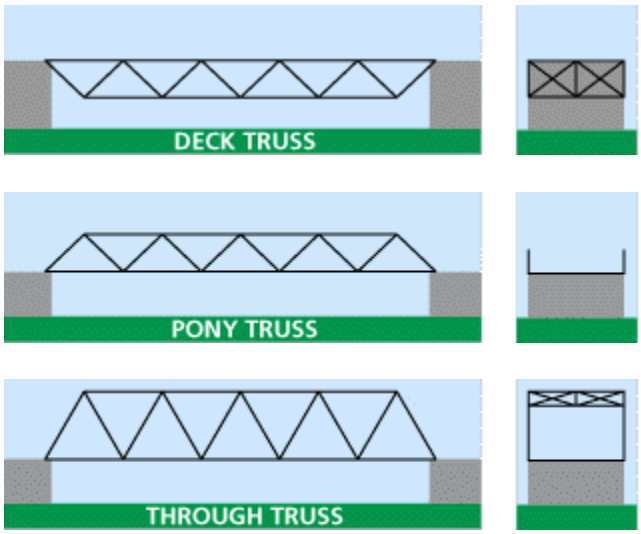
The three basic types of spans are shown below. Any of these spans may be constructed using beams, girders or trusses. Arch bridges are either simple or continuous (hinged). A cantilever bridge may also include a suspended span.





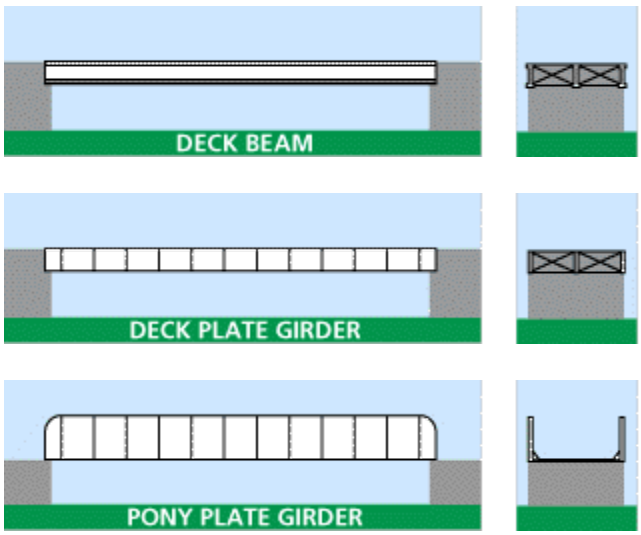


Examples of the three common travel surface configurations are shown in the Truss type drawings below. In a **Deck** configuration, traffic travels on top of the main structure; in a **Pony** configuration, traffic travels between parallel superstructures which are not cross-braced at the top; in a **Through** configuration, traffic travels through the superstructure (usually a truss) which is cross-braced above and below the traffic.

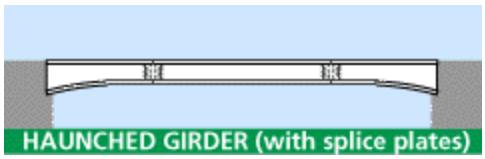


Beam and Girder types

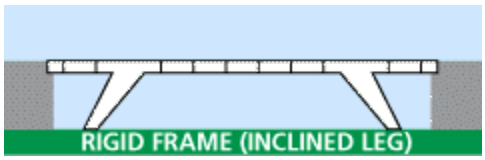
Simple deck beam bridges are usually metal or reinforced concrete. Other beam and girder types are constructed of metal. The end section of the two deck configuration shows the cross-bracing commonly used between beams. The pony end section shows knee braces which prevent deflection where the girders and deck meet.

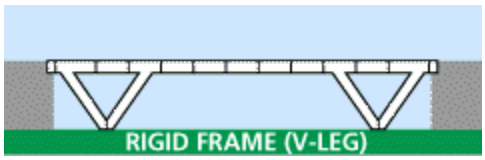


One method of increasing a girder's load capacity while minimizing its web depth is to add haunches at the supported ends. Usually the center section is a standard shape with parallel flanges; curved or angled flanged ends are riveted or bolted using splice plates. Because of the restrictions incurred in transporting large beams to the construction site, shorter, more manageable lengths are often joined on-site using splice plates.

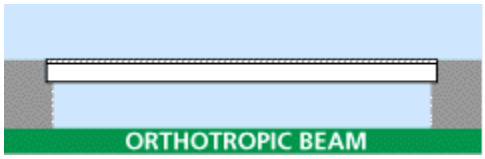


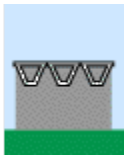
Many modern bridges use new designs developed using computer stress analysis. The **rigid frame** type has superstructure and substructure which are integrated. Commonly, the legs or the intersection of the leg and deck are a single piece which is riveted to other sections.





Orthotropic beams are modular shapes which resist stress in multiple directions at once. They vary in cross-section and may be open or closed shapes.

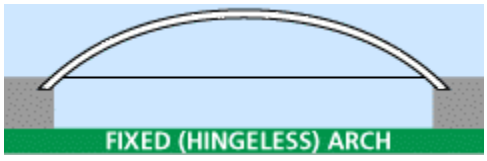


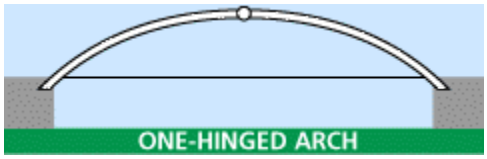


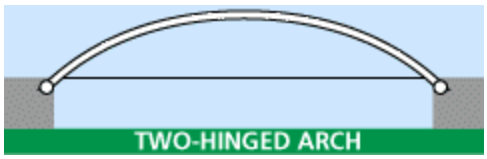
Arch types

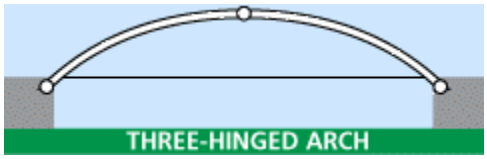
There are several ways to classify arch bridges. The placement of the deck in relation to the superstructure provides the descriptive terms used in all bridges: deck, pony, and through.

Also the type of connections used at the supports and the midpoint of the arch may be used - - counting the number of **hinges** which allow the structure to respond to varying stresses and loads. A through arch is shown, but this applies to all type of arch bridges.

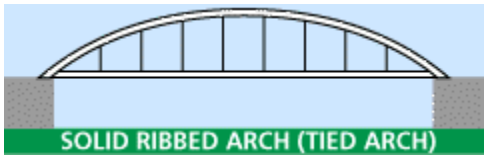








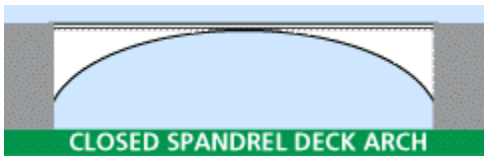
Another method of classification is found in the configuration of the arch. Examples of **solid-ribbed, brace-ribbed** (trussed arch) and **spandrel-braced** arches are shown. A solid-ribbed arch is commonly constructed using curved girder sections. A brace-ribbed arch has a curved through truss rising above the deck. A spandrel-braced arch or open spandrel deck arch carries the deck on top of the arch.



Some metal bridges which appear to be open spandrel deck arch are, in fact, **cantilever**; these rely on diagonal bracing. A true arch bridge relies on vertical members to transmit the load which is carried by the arch.

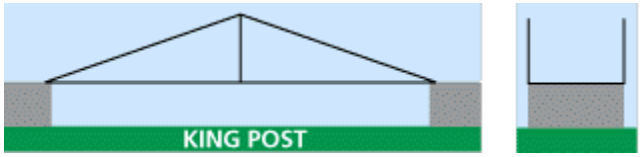
The tied arch (bowstring) type is commonly used for **suspension** bridges; the arch may be trussed or solid. The trusses which comprise the arch will vary in configuration, but commonly use Pratt or Warren webbing. While a typical arch bridge passes its load to bearings at its abutment; a tied arch resists spreading (drift) at its bearings by using the deck as a tie piece.

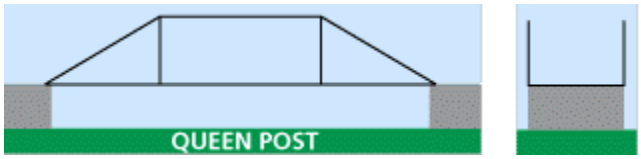
Masonry bridges, constructed in stone and concrete, may have open or closed spandrels A closed spandrel is usually filled with rubble and faced with dressed stone or concrete. Occasionally, reinforced concrete is used in building pony arch types.



Truss - simple types

A truss is a structure made of many smaller parts. Once constructed of wooden timbers, and later including iron tension members, most truss bridges are built of metal. Types of truss bridges are also identified by the terms **deck, pony** and **through** which describe the placement of the travel surface in relation to the superstructure (see drawings above). The **king post truss** is the simplest type; the **queen post truss** adds a horizontal top chord to achieve a longer span, but the center panel tends to be less rigid due to its lack of diagonal bracing.



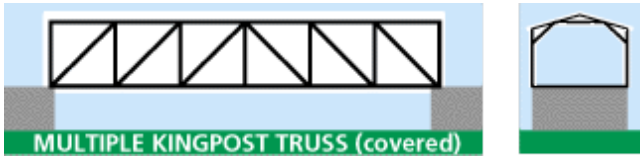


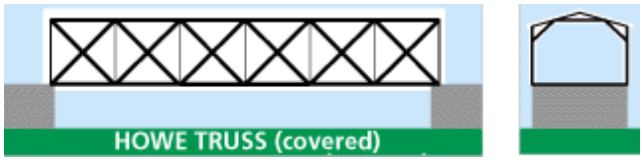
Covered bridge types (truss)

Covered bridges are typically wooden truss structures. The enclosing roof protected the timbers from weathering and extended the life of the bridge.

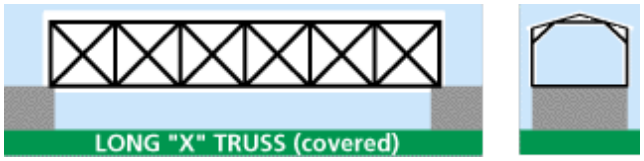
One of the more common methods used for achieving longer spans was the **multiple kingpost truss.** A simple, wooden, kingpost truss forms the center and panels are added

symmetrically. With the use of iron in bridge construction, the **Howe truss** - - in its simplest form - - appears to be a type of multiple kingpost truss.

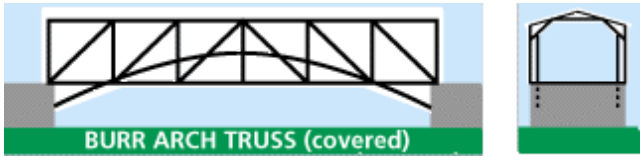




Stephen H. Long (1784-1864) was one of the U.S. Army Topographical Engineers sent to explore and map the United States as it expanded westward. While working for the Baltimore and Ohio Railroad, he developed the X truss in 1830 with further improvements patented in 1835 and 1837. The wooden truss was also known as the **Long truss** and he is cited as the first American to use mathematical calculations in truss design.

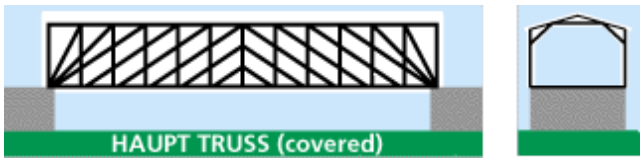


Theodore Burr built a bridge spanning the Hudson River at Waterford, NY in 1804. By adding a arch segments to a multiple kingpost truss, the **Burr arch truss** was able to attain longer spans. His truss design, patented in 1817, is not a true arch as it relies on the interaction of the arch segments with the truss members to carry the load. There were many of this type in the Pittsburgh area and they continue to be one of the most common type of covered bridges. Many later covered bridge truss types used an added arch based on the success of the Burr truss.

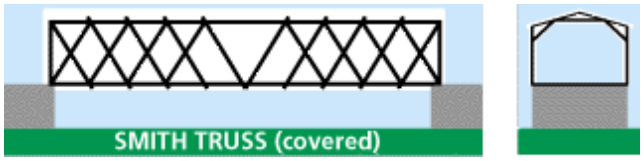


The **Town lattice truss** was patented in 1820 by Ithiel Town. The lattice is constructed of planks rather than the heavy timbers required in kingpost and queenpost designs. It was easy to construct, if tedious. Reportedly, Mr. Town licensed his design at one dollar per foot - - or two dollars per foot for those found not under license. The second Ft. Wayne railroad bridge over the Allegheny River was an unusual instance of a Town lattice constructed in iron.

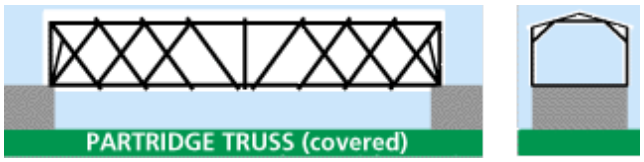
Herman Haupt designed and patented his truss configuration in 1839. He was in engineering management for several railroads including the Pennsylvania Railroad (1848) and drafted as superintendent of military railroads for the Union Army during the Civil War. The **Haupt truss** concentrates much of its compressive forces through the end panels and onto the abutments.



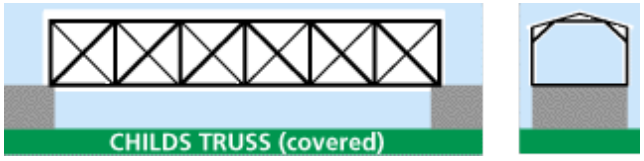
Other bridge designers were busy in the Midwest. An OhioDOT web page cites examples of designs used for some covered bridges in that state. Robert W. Smith of Tipp City, OH, received patents in 1867 and 1869 for his designs. Three variations of the **Smith truss** are still standing in Ohio covered bridges.



Reuben L. Partridge received a patent for his truss design which is appears to be a modification of the Smith truss. Four of the five **Partridge truss** bridges near his home in Marysville, Union County, OH, are still in use.



Horace Childs' design of 1846 was a multiple king post with the addition of iron rods. The **Childs truss** was used exclusively by Ohio bridge builder Everett Sherman after 1883.

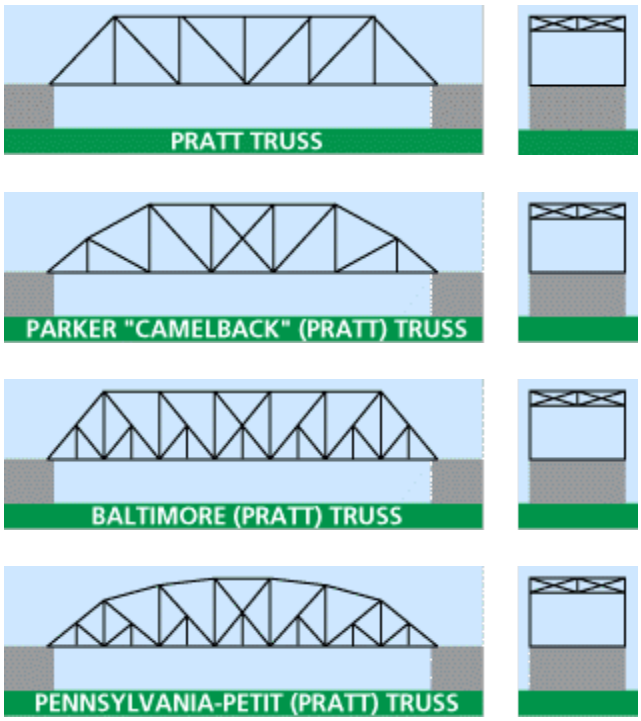


Truss - Pratt variations

The **Pratt truss** is a very common type, but has many variations. Originally designed by Thomas and Caleb Pratt in 1844, the Pratt truss successfully made the transition from wood designs to metal. The basic identifying features are the diagonal web members which form a V-shape. The center section commonly has crossing diagonal members. Additional counter braces may be used and can make identification more difficult, however the Pratt and its variations are the most common type of all trusses.

Charles H. Parker modified the Pratt truss to create a "camelback" truss having a top chord which does not stay parallel with the bottom chord. This creates a lighter structure without losing strength; there is less dead load at the ends and more strength concentrated in the center. It is somewhat more complicated to build since the web members vary in length from one panel to the next.

When additional smaller members are added to a Pratt truss, the various subdivided types have been given names from the railroad companies which most commonly used each type, although both were developed by engineers of the Pennsylvania Railroad in the 1870s.

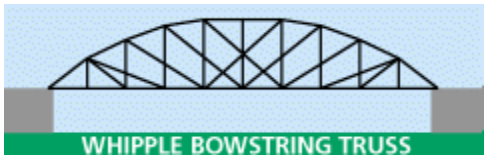


The **Whipple truss** was developed by Squire Whipple as stronger version of the Pratt truss. Patented in 1847, it was also known as the "Double-intersection Pratt" because the diagonal tension members cross two panels, while those on the Pratt cross one. The Indiana Historical Bureau notes one bridge as being a "Triple Whipple" -- possibly the only one -- built with the thought that if two are better than one, three must be stronger yet.

The Whipple truss was most commonly used in the trapezoidal form -- straight top and bottom chords -- although bowstring Whipple trusses were also built.

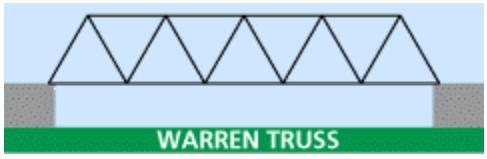
The Whipple truss gained immediate popularity with the railroads as it was stronger and more rigid than the Pratt. It was less common for highway use, but a few wrought iron examples survive. They were usually built where the span required was longer than was practical with a Pratt truss.

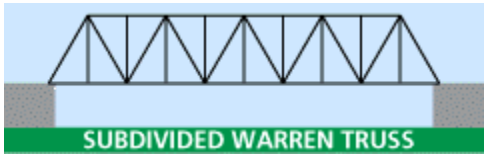
Further developments of the subdivided variations of the Pratt, including the Pennsylvania and Baltimore trusses, led to the decline of the Whipple truss.

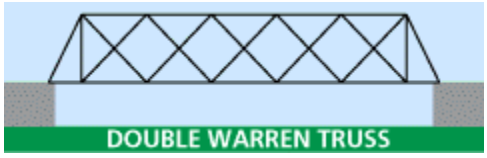


Truss - Warren variations

A **Warren truss**, patented by James Warren and Willoughby Monzoni of Great Britain in 1848, can be identified by the presence of many equilateral or isoceles triangles formed by the web members which connect the top and bottom chords. These triangles may also be further subdivided. Warren truss may also be found in covered bridge designs.





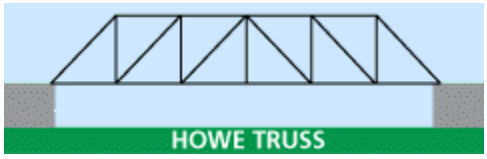


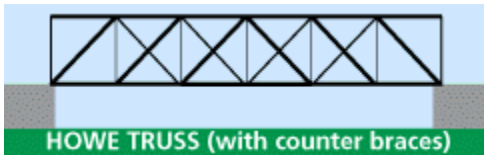
Truss - other types

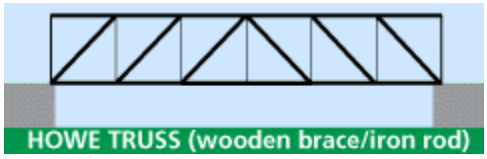
The other truss types shown are less common on modern bridges.

A **Howe truss** at first appears similar to a Pratt truss, but the Howe diagonal web members are inclined toward the center of the span to form A-shapes. The vertical members are in tension while the diagonal members are in compression, exactly opposite the structure of a Pratt truss. Patented in 1840 by William Howe, this design was common on early railroads. The three drawings show various levels of detail. The thicker lines represent wood braces;

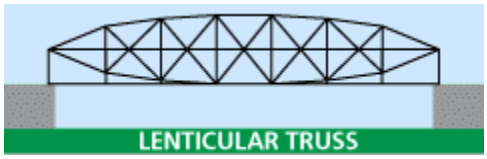
the thinner lines are iron tension rods. The Howe truss was patented as an improvement to the Long truss which is discussed with covered bridge types.





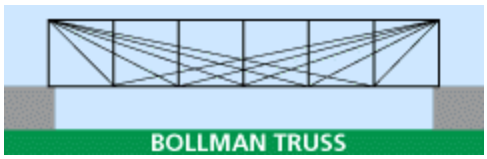


Friedrich August von Pauli (1802-1883) published details of his truss design in 1865. Probably the most famous **Pauli truss**, better known as the **lenticular truss** -- named because of the lens shape, is Pittsburgh's Smithfield Street Bridge. Its opposing arches combine the benefits of a suspension bridge with those of an arch bridge. But like the willow tree, some of its strength is expressed in its flexibility which is often noticeable to bridge traffic.

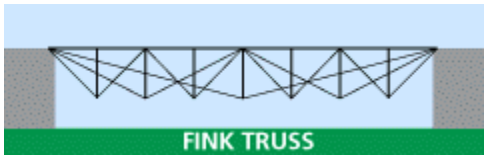


Before the use of computers, the interaction of forces on spans which crossed multiple supports was difficult to calculate. One solution to the problem was developed by E. M. Wichert of Pittsburgh, PA, in 1930. By introducing a open, hinged quadrilateral over the intermediate piers, each span could be calculated independently. The first **Wichert truss** was the Homestead High Level Bridge over the Monongahela River in 1937.

The composite cast and wrought iron **Bollman truss** was common on the Baltimore and Ohio Railroad. Of the hundred or so following Wendell Bollman's design, the 1869 bridge at Savage, MD, is perhaps the only intact survivor. Some of the counter bracing inside the panels has been omitted from the drawing for clarity.



Also somewhat common on early railroads, particularly the B&O, was the **Fink truss** - - designed by Albert Fink of Germany in the 1860s.



Cantilever types - truss

A cantilever is a structural member which projects beyond its support and is supported at only one end. Cantilever bridges are constructed using trusses, beams, or girders. Employing the cantilever principles allows structures to achieve spans longer than simple spans of the same superstructure type. They may also include a suspended span which hangs between the ends of opposing cantilever arms.

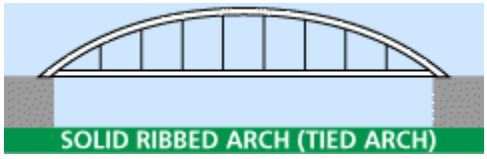
Some bridges which appear to be arch type are, in fact, cantilever truss. These may be identified by the diagonal braces which are used in the open spandrel. A true arch bridge relies on vertical members to transfer the load to the arch. Pratt and Warren bracing are among the most commonly used truss types.

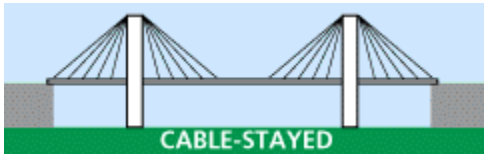
The classic cantilever design is the through truss which extends above the deck. Some have trusses which extend both above and below the deck. The truss configuration will vary.

Suspension types

The longest bridges in the world are suspension bridges or their cousins, the cable-stayed bridge. The deck is hung from suspenders of wire rope, eyebars or other materials. Materials for the other parts also vary: piers may be steel or masonry; the deck may be made of girders or trussed. A tied arch resists spreading (drift) at its bearings by using the deck as a tie piece.

Though Pittsburgh has been a pioneer in bridge design and fabrication, it has had few suspension bridges. The Pennsylvania Mainline Canal entered the city on John Roebling's first wire-rope suspension bridge in 1845 (replacing a failing 1829 wooden structure). A similar structure still stands at Minnisink Ford, NY, crossing the Delaware River. Roebling and his son Washington Roebling, later famous in building the Brooklyn Bridge, began their work in Saxonburg, PA, north of Pittsburgh.





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Last modified: 03-Jun-2008

APPENDIX C: TIPS FOR SURVEY PROJECTS THAT PRODUCE RESOURCE FORMS

In the interest of preventing errors and inefficiencies by both surveyors and the Site File, we offer the following suggested sequence of steps for cultural resource surveyors conducting a project in Florida.

Planning and Preparation

- In the earliest planning phases **prepare to use Site File digital PDF recording forms** for both creating the forms and submitting them to the Site File. Submission of digital PDF forms is required for grant-funded projects.
- The *Historical Bridge Form*, version 5.0, is the most current form, and it is available for download on our website. Earlier versions of the form will be accepted, but some fields have been changed significantly and **we encourage use of the current, accepted form**.
- Most local **city or county governments have useful information for your project area** in the form of Geographic Information System data or general computer databases, often online. If available, please include tax identification numbers (or *STRAP* numbers) or other cross-references to local databases in your forms. Sometimes local databases may contain ownership history, general historical information, large scale maps, building footprints or photographs.
- **Identify and examine reports of past surveys in the project area** whose findings and methods may affect planning of your project. Contact the Site File for assistance in identifying previous surveys in your project area.
- **Identify previously recorded cultural resources in the project area**. This step is important because State Site Numbers cannot be assigned until it is established that the resource is not already recorded. Normally, searches for previously recorded resources can be conducted through legal description of the project location (township, range, and section) or addresses for individual cases. Also, GIS and database information are available for all previously recorded resources, and may be obtained by contacting the Site File.

Preliminary and Survey-Level Records

- As soon as you have a list of unrecorded resources for which new forms will be prepared, contact the Site File to **request State Site Numbers for the new resources**. Numbers may be requested using the *Number Assignment Request/Confirmation Form* available on the Site File website. For large projects numbers may be pre-assigned in blocks. Before requesting new site numbers please check Site File records to ensure that each resource does not already have a State Site Number.
- If this form is being submitted as part of a **field survey project or includes a report manuscript**, please complete the Site File's ***Survey Log Sheet***. The Survey Log Sheet serves as the data entry form for manuscripts and has one required attachment, a portion of the 1:24,000 (7.5 minute) USGS topographic map with the survey project area clearly marked. To assist future researchers and aid the Site File in processing survey projects please adhere to the following guidelines:

- In the survey report, use the State Site Number for historic properties which are referred to in text or tabulated. The report should include a table of all resources correlating Site File numbers with name, location or other important information.
- On the *Survey Log Sheet*, please list all site numbers of resources for which you are submitting forms.
- Separate forms for newly recorded properties ("originals") from forms for previously recorded properties ("updates").
- Refer to Florida Administrative Rule 1A-46.001 for official standards and guidelines for survey reports.

Packaging Resource Forms

- Clip continuation/supplement pages, photographs, marked USGS and large scale maps, and other material documenting individual resources to the completed form. Ensure that all materials are labeled with the State Site Number.
- Arrange submitted forms in State Site Number order.
- If you are using GIS software to generate your map products and resource locations please include the GIS data along with your hard copy forms and maps. When submitting GIS data, please include metadata (datum and projection information at a minimum).
- When submitting Site File digital PDF forms, please include digital media containing your files, maps and photos. Unless otherwise instructed, all submitted files (PDF forms, image files, and any supplementary information) should be named with the State Site Number. **Do not embed image and map files** within the PDF form file. All attachments should be separate files.

Transmitting Project Results

- Consultants often have to transmit at least two sets of project documentation, one to the client and one to SHPO. When transmitting project results, especially if your product passes through other hands (such as your client) before reaching us, take reasonable steps to ensure that the Site File receives a comprehensive set of documents.
- For compliance projects, transmit only *one* package of all documentation to the Compliance Review Section in Tallahassee. When their review process is complete they will pass all materials on to the Site File.
- For projects funded by the State of Florida's historic preservation grant in-aid program, follow instructions in your grant award agreement, confirmed by your grant administrator (Grants and Education Section, Division of Historical Resources, 850.245.6333). While multiple copies of the survey report are required, only one complete set of hard copy resource recording forms (site forms) is normally submitted. Transmit all products to the Grants office and they will pass the materials on to the Site File.

APPENDIX D: FMSF PHOTO POLICY

The Florida Master Site File requires photographic documentation of resources as a component of a completed Historical Structure Form, Historical Bridge Form, Historical Cemetery Form or Resource Group Form. Photographs may be submitted as a digital image file ***OR*** as an archival Black and White photographic print. In either case the overall quality of the image (resolution, exposure, texture, focus, etc.) should be sufficient to display architectural details, where applicable. Such details include but are not limited to: ornamentation, window types, masonry patterns and materials, and distinctive roof materials.

If Submitting Digital Image Files…
The image files must be submitted on CD or other digital media *and* as a hard copy printout on plain paper (photo paper or archival processing is *not* required). Note that the image file should be a separate JPEG or TIFF image and not inserted or appended to the PDF form file. The image files should include the site number as part of the file name and must adhere to the following specifications*:

Size/Resolution: 1600 x 1200 pixels at 300 ppi (pixels per inch) or larger. This works out to approximately 2 megapixels.

Color Format: RGB color saved at 8-bit (or larger) per channel format. This results in a 24-bit color image (8-bits each for the Red, Green and Blue channels).

File Format: JPEG or uncompressed TIFF files are acceptable. Note that there are different levels of JPEG compression and that low or medium compression should be used when saving files in JPEG format. High JPEG compression may result in unacceptable image quality.

*Note: 24-bit color JPEG images are the default image format for most digital cameras. Image resolution and compression are usually adjustable and should be checked prior to capturing images for submission to the Site File.

If Submitting Archival Black and White Photographic Prints…
The Site File requires a glossy Black and White photographic print produced by photographic chemistry on a quality Black and White photographic paper. Color photographic paper is not acceptable because it does not meet the stability requirements for archival storage. Paper rated for at least a 50-year life is acceptable. The print must be large enough, at least 3”x5”, to show detail without magnification and to show further detail under low magnification.

APPENDIX E: SUGGESTED READING

Dykman, Pieter T., James B. Norman, and Dwight A. Smith
1985 *Historic Highway Bridges of Oregon*. Environmental Section, Oregon Department of Transportation, Salem.

Firmage, D. A., and C. P. Heins
1979 *Design of Modern Steel Highway Bridges*. John Wiley & Sons, New York.

Jackson, Donald C.
1988 *Great American Bridges and Dams*. The Preservation Press, Washington, D. C.

Jackson, Donald C. and T. Allen
1977 *Truss Bridge Types: A Guide to Dating and Identifying*. American Association for State and Local History, Nashville, Tennessee.

Jackson, Roy A., editor
1992 *The Historic Highway Bridges of Florida*. Environmental Management Office, Florida Department of Transportation, Tallahassee.

Mock, Elizabeth B.
1949 *The Architecture of Bridges*. Museum of Modern Art, New York.

Ohio Department of Transportation
1983 *The Ohio Historic Bridge Inventory Evaluation and Preservation Plan*. Ohio Department of Transportation, Columbus.

Transportation Research Board
1983 *Historic Bridge-Criteria for Decision Making*. Transportation Research Board, Washington, D.C..

Tyrrell, Henry G.
1911 *History of Bridge Engineering*. Published by the author, Chicago.

Whitney, Charles S.
1983 *Bridges: A Study in Their Art, Science, and Evolution*. Greenwich House, New York.