

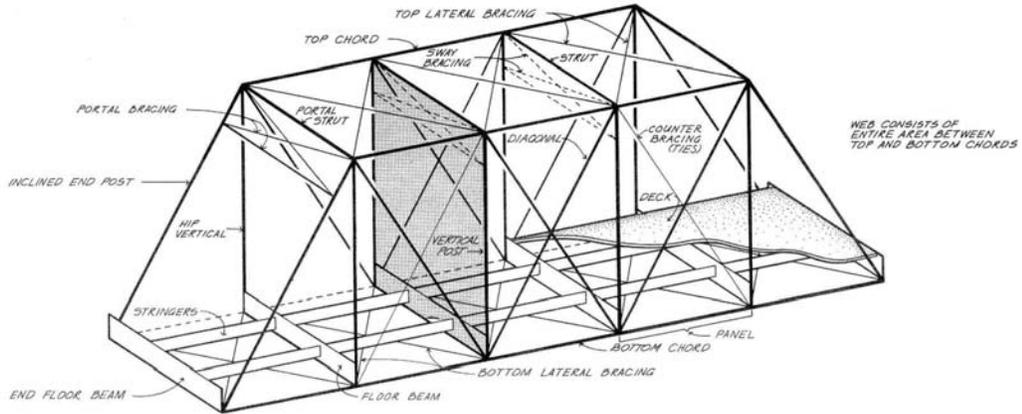
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## **Appendix C**

### ***Trusses, A Study of the Historic American Engineering Record***

**Provided by staff of the National Park Service/HAER for use in this document, June 2005**





# TRUSSES

## A STUDY BY THE HISTORIC AMERICAN ENGINEERING RECORD

A TRUSS IS COMPOSED OF STRUCTURAL TRIANGLES JOINED TOGETHER WITH PINNED OR RIVETED CONNECTIONS. THE MAIN PIECES OR MEMBERS MAY BE EITHER STIFF HEAVY STRUTS, POSTS OR THIN FLEXIBLE BARS. IT IS THE ARRANGEMENT OF THESE MEMBERS THAT DETERMINES THE SPECIFIC TRUSS TYPE.

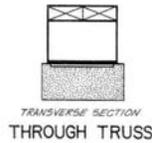
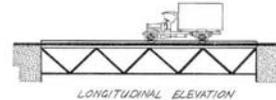
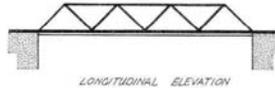
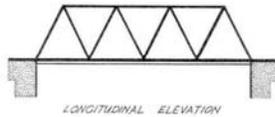
STRUCTURAL MEMBERS RESIST FORCES IN TWO PRIMARY WAYS — COMPRESSION AND TENSION. HEAVY RIGID MEMBERS MAY RESIST BOTH COMPRESSIVE AND TENSILE FORCES BUT THIN RODS CAN ONLY RESIST TENSION AND THESE CHARACTERISTICS ARE MAJOR CLUES IN TRUSS IDENTIFICATION. NOTE THAT THE MAIN STRUCTURAL MEMBERS OF A TRUSS PANEL MAY BE SUPPLEMENTED BY THIN DIAGONAL TIES. BECAUSE TRUSS TYPES ARE DETERMINED BY THEIR MAIN STRUCTURAL MEMBERS THESE COUNTER BRACES (INDICATED BY DOTTED LINES ON THE IDENTIFICATION SHEET) MAY BE IGNORED. AFTER MATCHING THE STRUCTURAL OUTLINE OF THE TRUSS IN QUESTION WITH THE DIAGRAM IT MOST RESEMBLES CHECK TO MAKE SURE THE ARRANGEMENT OF HEAVY COMPRESSION AND LIGHT TENSION MEMBERS IS COMPATIBLE WITH THE DIAGRAM. IF THERE IS AGREEMENT, THEN

THE BASIC TRUSS TYPE IS IDENTIFIED.

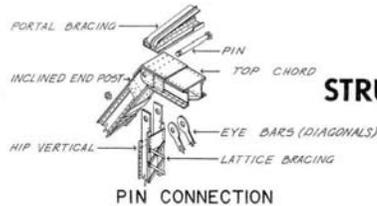
THE SHEET OF TRUSS DIAGRAMS PRESENTS ONLY THE STANDARD FORMS OF THE MOST COMMON TRUSSES. THERE ARE ALSO MANY VARIOUS TRUSSES THAT DO NOT FALL INTO EASILY-DEFINED CATEGORIES. IN SUCH CASES IDENTIFICATION SHOULD BE MADE AS CLOSELY AS POSSIBLE IN TERMS OF THE STANDARD DESIGNS. ADDITIONALLY, TRUSSES OFTEN ARE INVERTED, CREATING OUTLINES QUITE DIFFERENT FROM THE ORIGINAL — TENSION MEMBERS BECOMING COMPRESSION MEMBERS AND VICE VERSA BEING ASSUMING A TRUSS IS NOT REPRESENTED ON THE DIAGRAM, CHECK TO SEE IF IT IS AN INVERTED FORM.

MOST BRIDGE TRUSSES ARE OF THREE BASIC TYPES. IF THE DECK AND JOIST RAILS ARE LEVEL WITH THE BOTTOM CHORDS, IT IS A THROUGH TRUSS. A DECK TRUSS IS A THROUGH TRUSS WITH NO LATERAL BRACING BETWEEN TOP CHORDS. A DECK TRUSS CARRIES ITS TRAFFIC LOAD LEVEL WITH THE TOP CHORDS.

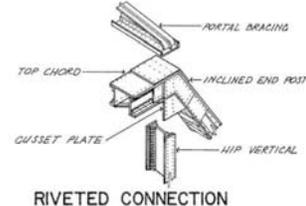
### TRUSS BRIDGES



### ROOF TRUSSES



### STRUCTURAL CONNECTIONS



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TECHNICAL INFORMATION PROJECT  
UNDER DIRECTION OF THE NATIONAL PARK SERVICE  
UNITED STATES DEPARTMENT OF THE INTERIOR

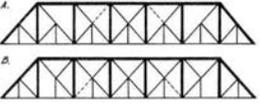
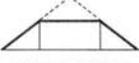
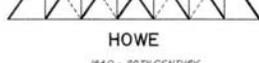
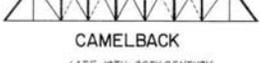
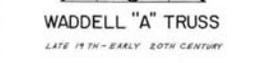
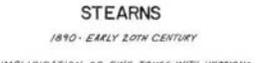
TRUSS IDENTIFICATION: NOMENCLATURE

RECORD NO. HAER T-1  
HISTORIC AMERICAN ENGINEERING RECORD  
SHEET 1 OF 2 SHEETS

IF REPRODUCED, PLEASE CREDIT: HISTORIC AMERICAN ENGINEERING RECORD, NATIONAL PARK SERVICE, NAME OF DELINEATOR, DATE OF THE DRAWING

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 <p><b>KING POST</b> (WOOD) A TRADITIONAL TRUSS TYPE WITH ITS ORIGINS IN THE MIDDLE AGES. LENGTH: 20-60 FEET 6-18 METERS</p>	 <p><b>PRATT</b> 1844 - 20TH CENTURY DIAGONALS IN TENSION, VERTICALS IN COMPRESSION. (EXCEPT FOR HIP DETAILS ADJACENT TO INCLINED END POSTS) LENGTH: 30-250 FEET 9-75 METERS</p>	 <p><b>BALTIMORE (PETIT)</b> 1871 - EARLY 20TH CENTURY A. A PRATT WITH SUB-STRUTS. B. A PRATT WITH SUB-TIES LENGTH: 250-600 FEET 75-180 METERS</p>	 <p><b>WARREN</b> 1840 - 20TH CENTURY TRIANGULAR IN OUTLINE, THE DIAGONALS CARRY BOTH COMPRESSIVE AND TENSILE FORCES. A TRUE WARREN TRUSS HAS EQUILATERAL TRIANGLES. LENGTH: 50-400 FEET 15-120 METERS</p>
 <p><b>QUEEN POST</b> (WOOD) A LENGTHENED VERSION OF THE KING POST. LENGTH: 20-80 FEET 6-24 METERS</p>	 <p><b>PRATT HALF-HIP</b> LATE 19TH-EARLY 20TH CENTURY A PRATT WITH INCLINED END POSTS THAT DO NOT HORIZONTALLY EXTEND THE LENGTH OF A FULL PANEL. LENGTH: 30-150 FEET 9-45 METERS</p>	 <p><b>PENNSYLVANIA (PETIT)</b> 1875-EARLY 20TH CENTURY A. A PARKER WITH SUB-STRUTS. B. A PARKER WITH SUB-TIES LENGTH: 250-600 FEET 75-180 METERS</p>	 <p><b>WARREN WITH VERTICALS</b> MID 19TH-20TH CENTURY DIAGONALS CARRY BOTH COMPRESSIVE AND TENSILE FORCES. VERTICALS SERVE AS BRACING FOR TRIANGULAR WEB SYSTEM. LENGTH: 50-400 FEET 15-120 METERS</p>
 <p><b>BURR ARCH TRUSS</b> 1804-LATE 19TH CENTURY (WOOD) COMBINATION OF A WOODEN ARCH WITH A MULTIPLE KING POST ARCH ALSO COMBINED WITH LATER WOODEN TRUSSES. LENGTH: 50-175 FEET 15-50 METERS</p>	 <p><b>TRUSS LEG BEDSTEAD</b> LATE 19TH-EARLY 20TH CENTURY A PRATT WITH VERTICAL END POSTS IMBEDDED IN THEIR FOUNDATIONS. LENGTH: 30-100 FEET 9-30 METERS</p>	 <p><b>LENTICULAR (PARABOLIC)</b> 1870-EARLY 20TH CENTURY A PRATT WITH BOTH TOP AND BOTTOM CHORDS PARABOLICALLY CURVED OVER THEIR ENTIRE LENGTH. LENGTH: 50-360 FEET 15-110 METERS</p>	 <p><b>DOUBLE INTERSECTION WARREN</b> LATTICE MID 19TH-20TH CENTURY STRUCTURE IS INDETERMINATE. MEMBERS ACT IN BOTH COMPRESSION AND TENSION. TWO TRIANGULAR WEB SYSTEMS ARE SUPERIMPOSED UPON EACH OTHER WITH NO VERTICALS. LENGTH: 75-400 FEET 25-120 METERS</p>
 <p><b>TOWN LATTICE</b> 1820-LATE 19TH CENTURY (WOOD) A SYSTEM OF WOODEN DIAGONALS WITH NO VERTICALS. MEMBERS TAKE BOTH COMPRESSION AND TENSION. LENGTH: 50-210 FEET 15-68 METERS</p>	 <p><b>PARKER</b> MID-LATE 19TH-20TH CENTURY A PRATT WITH A POLYGONAL TOP CHORD LENGTH: 40-250 FEET 12-75 METERS</p>	 <p><b>GREINER</b> 1899-EARLY 20TH CENTURY PRATT TRUSS WITH THE DIAGONALS REPLACED BY AN INVERTED BOWSTRING TRUSS LENGTH: 75-250 FEET 23-75 METERS</p>	 <p><b>PEGRAM</b> 1887-EARLY 20TH CENTURY A HYBRID BETWEEN THE WARREN AND PARKER TRUSSES, UPPER CHORDS ARE ALL OF EQUAL LENGTH. LENGTH: 150-450 FEET 45-135 METERS</p>
 <p><b>HOWE</b> 1840-20TH CENTURY (WOOD, VERTICALS OF METAL) DIAGONALS IN COMPRESSION, VERTICALS IN TENSION. LENGTH: 30-150 FEET 9-45 METERS</p>	 <p><b>CAMELBACK</b> LATE 19TH-20TH CENTURY A PARKER WITH A POLYGONAL TOP CHORD OF EXACTLY FIVE SLOPES. LENGTH: 100-300 FEET 30-90 METERS</p>	 <p><b>DOUBLE INTERSECTION PRATT</b> 1847-20TH CENTURY (WHIPPLE, WHIPPLE-MURPHY, LINVILLE) AN INCLINED END POST PRATT WITH DIAGONALS THAT EXTEND ACROSS TWO PANELS. LENGTH: 70-300 FEET 21-90 METERS</p>	 <p><b>POST</b> 1845-LATE 19TH CENTURY A HYBRID BETWEEN THE WARREN AND THE DOUBLE INTERSECTION PRATT. LENGTH: 100-300 FEET 30-90 METERS</p>
 <p><b>BOWSTRING ARCH-TRUSS</b> 1840-LATE 19TH CENTURY A TIED ARCH WITH THE DIAGONALS SERVING AS BRACING AND THE VERTICALS SUPPORTING THE DECK. LENGTH: 30-150 FEET 9-45 METERS</p>	 <p><b>CAMELBACK WITH SUBDIVIDED PANELS</b> LATE 19TH-EARLY 20TH CENTURY A. A PENNSYLVANIA TRUSS WITH A POLYGONAL TOP CHORD OF EXACTLY FIVE SLOPES. B. SAME AS A. WITH HORIZONTAL STRUTS. LENGTH: 100-300 FEET 30-90 METERS</p>	 <p><b>SCHWEDLER</b> LATE 19TH CENTURY A DOUBLE INTERSECTION PRATT POSITIONED IN THE CENTER OF A PARKER. LENGTH: 100-300 FEET 30-90 METERS</p>	 <p><b>BOLLMAN</b> 1852-MID-LATE 19TH CENTURY (RAK) VERTICALS IN COMPRESSION, DIAGONALS IN TENSION. DIAGONALS RUN FROM END POSTS TO EVERY PANEL POINT. LENGTH: 75-100 FEET 23-30 METERS</p>
 <p><b>WADDELL "A" TRUSS</b> LATE 19TH-EARLY 20TH CENTURY EXPANDED VERSION OF THE KING POST TRUSS. USUALLY MADE OF METAL. LENGTH: 25-75 FEET 8-23 METERS</p>	 <p><b>KELLOGG</b> LATE 19TH CENTURY A VARIATION ON THE PRATT WITH ADDITIONAL DIAGONALS RUNNING FROM UPPER CHORD PANEL POINTS TO THE CENTER OF THE LOWER CHORDS. LENGTH: 75-150 FEET 23-30 METERS</p>	 <p><b>K-TRUSS</b> EARLY 20TH CENTURY SO CALLED BECAUSE OF THE DISTINCTIVE OUTLINE OF THE STRUCTURAL MEMBERS. LENGTH: 200-800 FEET 60-240 METERS</p>	 <p><b>FINK</b> 1851-MID-LATE 19TH CENTURY (RAKE) VERTICALS IN COMPRESSION, DIAGONALS IN TENSION. LONGEST DIAGONALS RUN FROM END POSTS TO CENTER PANEL POINTS. LENGTH: 75-100 FEET 23-45 METERS</p>
 <p><b>WICHERT</b> 1932-MID-LATE 20TH CENTURY IDENTIFIED BY A CHARACTERISTIC PIN-CONNECTED SUPPORT SYSTEM OVER THE PIERS. TRUSS IS CONTINUOUS OVER PIERS. LENGTH: 400-1000 FEET 122-305 METERS</p>	<h2>TRUSSES</h2> <p>A STUDY BY THE <b>HISTORIC AMERICAN ENGINEERING RECORD</b></p> <ul style="list-style-type: none"> <li>BOLLER, ALFRED P. PRACTICAL TRUSSING</li> <li>COOPER, THEODORE. AMERICAN RAILROAD BRIDGES</li> <li>BOHMAN, H.L. AND BUTNER, HALE STRUTS</li> <li>COMMITTEE OF HISTORY AND HERITAGE OF AMERICAN CIVIL ENGINEERING SOCIETY. WOODEN BRIDGES</li> <li>CONVIT, CARL W. AMERICAN BUILDING ART</li> <li>COOPER, THEODORE. AMERICAN RAILROAD BRIDGES</li> <li>DISLER, DAVID. A SURVEY OF PROGRESSIVE TRUSSING</li> <li>RESEARCH COUNCIL, 1978</li> <li>YORK, PARKER PUBLISHERS, 1970</li> <li>JACOBY, HENRY S. AND MERRIAM, MARY E. NEW YORK UNIVERSITY PRESS, 1948</li> <li>WADDELL, J.A.L. BRIDGE ENGINEERING VOL. I</li> <li>WILLY, JOHN WILLY SONS, 1914</li> <li>WILLY, JOHN WILLY SONS, 1914</li> </ul>		 <p><b>STEARNS</b> 1890-EARLY 20TH CENTURY SIMPLIFICATION OF FINK TRUSS WITH VERTICALS OMITTED AT ALTERNATE PANEL POINTS. LENGTH: 50-200 FEET 15-60 METERS</p>
<p>OFFICE OF ARCHEOLOGY AND HISTORIC PRESERVATION TECHNICAL INFORMATION PROJECT UNDER DIRECTION OF THE NATIONAL PARK SERVICE, UNITED STATES DEPARTMENT OF THE INTERIOR</p>	<p>TRUSS IDENTIFICATION: BRIDGE TYPES</p>		<p>RECORD NO. HAER T-1 HISTORIC AMERICAN ENGINEERING RECORD SHEET 2 OF 2 SHEETS</p>

