The Covered Bridge at Lake of the Woods: History, Design and Construction

by

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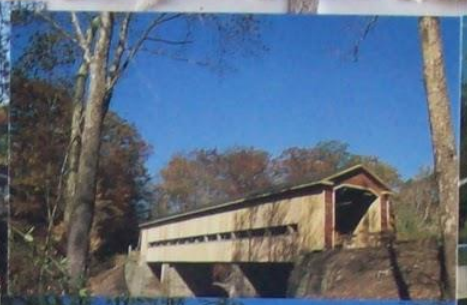
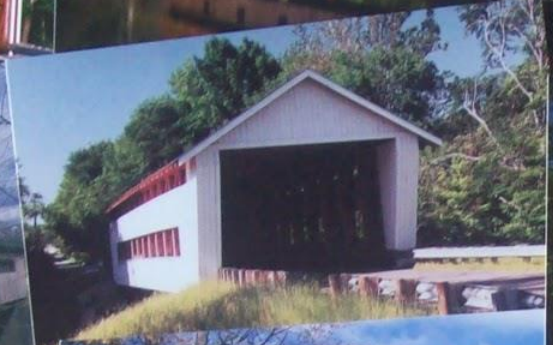
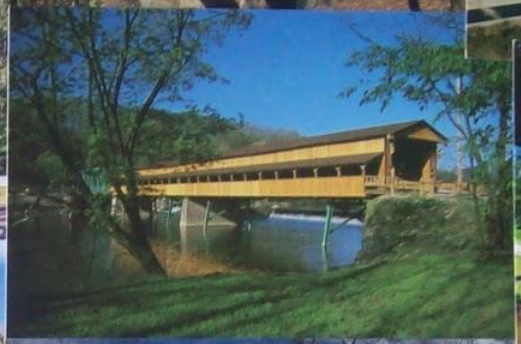
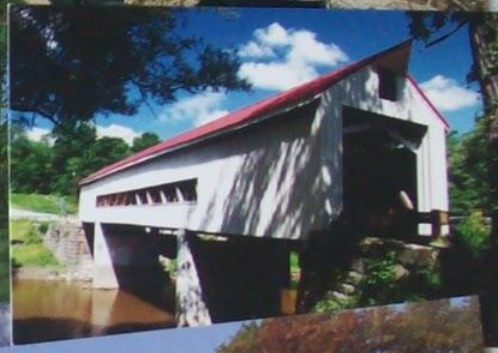
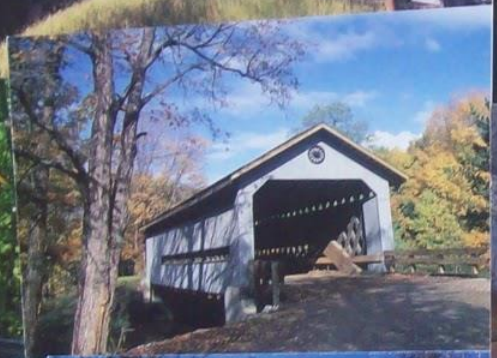
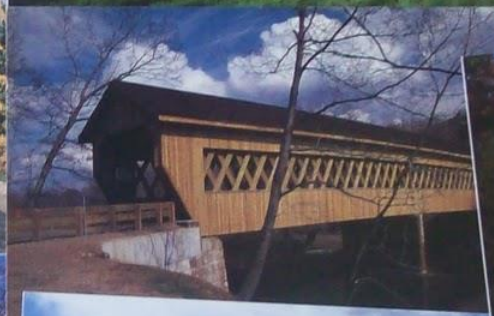
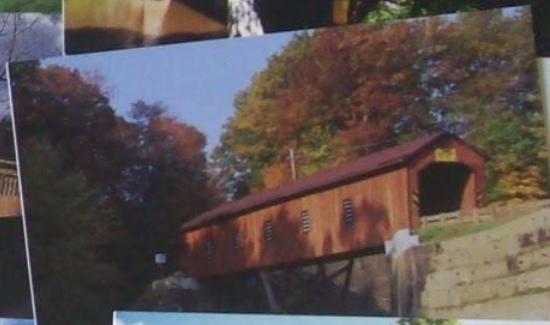
02.23.2016

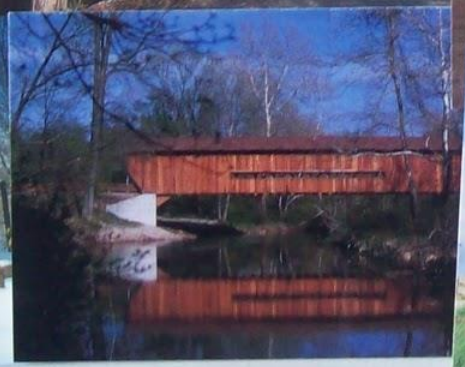
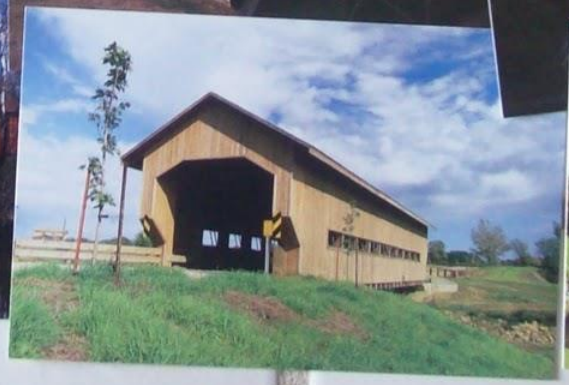
A BRIEF HISTORY OF COVERED BRIDGES



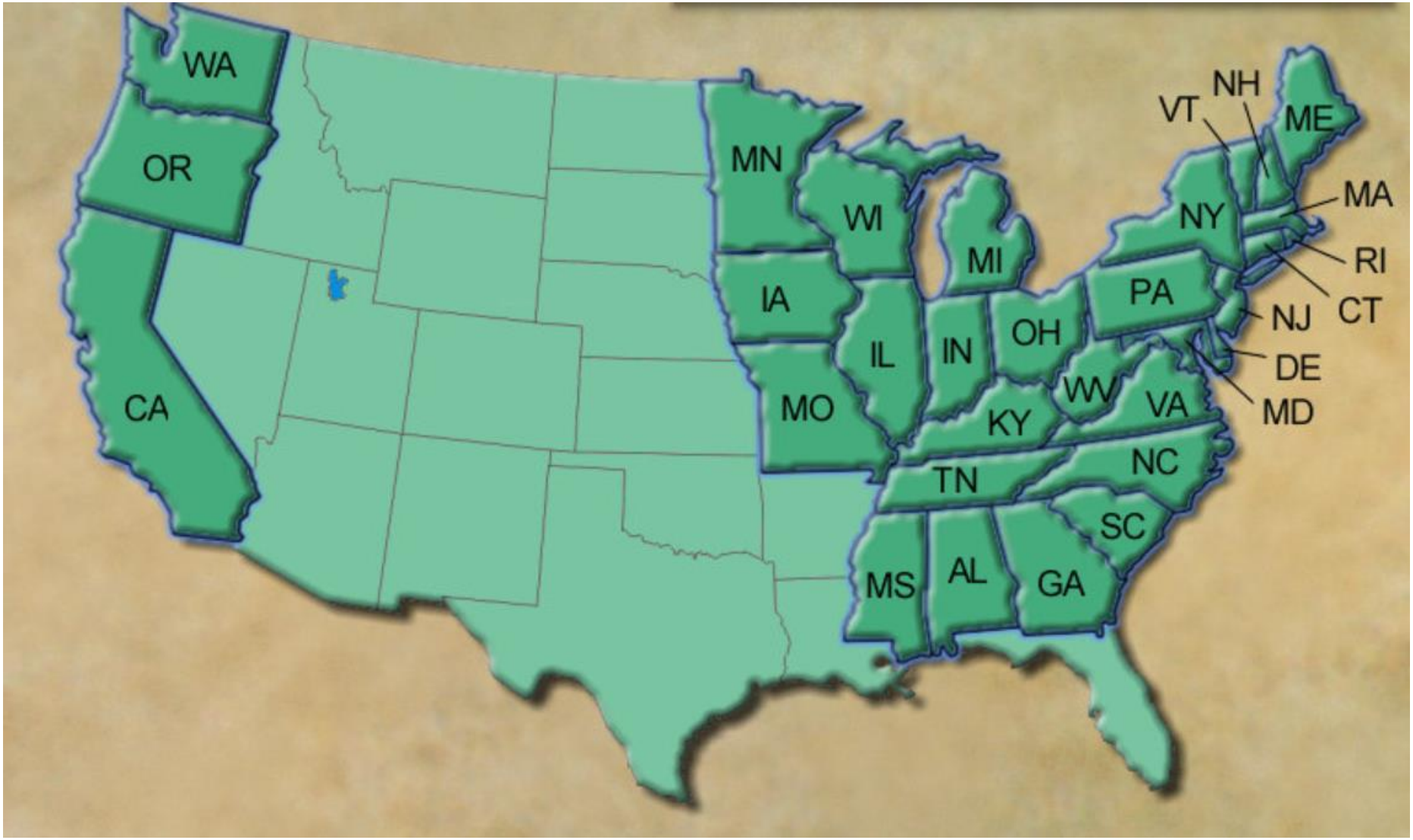



COVERED BRIDGE LOCATOR MAP



Ref.: The Educators Guide to Covered Bridges by FHWA, U.S.DOT, Forest Products Lab

PARKE COUNTY, INDIANA

COVERED TIMBER BRIDGES IN USA

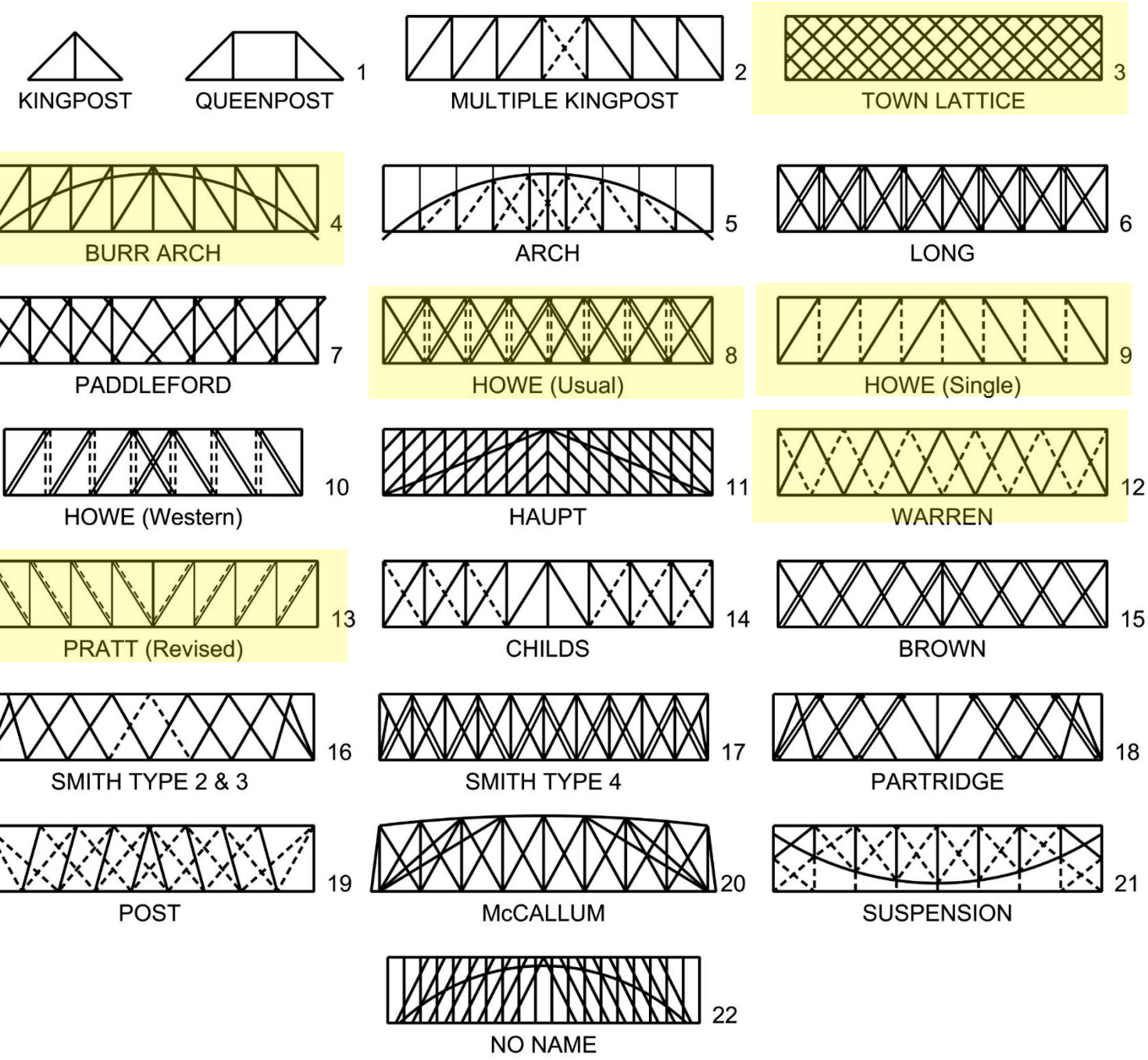
14,000+ total covered bridges were built
(Ref.: Covered Bridge Manual, 2005)

1805 – 1885 **10,000 covered bridges were built**

1955 **1564 remained**

1970 **990 remained**
(Ref. American Wooden Bridges, ASCE 1976)

2015 **672 remained**
(Ref.: Christianson and Marston, 2015)


KINGPOST
QUEENPOST
1
MULTIPLE KINGPOST
2
TOWN LATTICE
3
BURR ARCH
4
ARCH
5
LONG
6
PADDLEFORD
7
HOWE (Usual)
8
HOWE (Single)
9
HOWE (Western)
10
HAUPT
11
WARREN
12
PRATT (Revised)
13
CHILDS
14
BROWN
15
SMITH TYPE 2 & 3
16
SMITH TYPE 4
17
PARTRIDGE
18
POST
19
McCALLUM
20
SUSPENSION
21
NO NAME
22

THE COVERED BRIDGE AT LAKE OF THE WOODS

Courtesy: Prof. James Long

KEY FACTS

Structural Engineer/Designer: **Dr. German Gurfinkel,** S.E., F.ASCE
Emeritus Professor of Civil Engineering
University of Illinois at Urbana-Champaign

Construction Year: **1965**

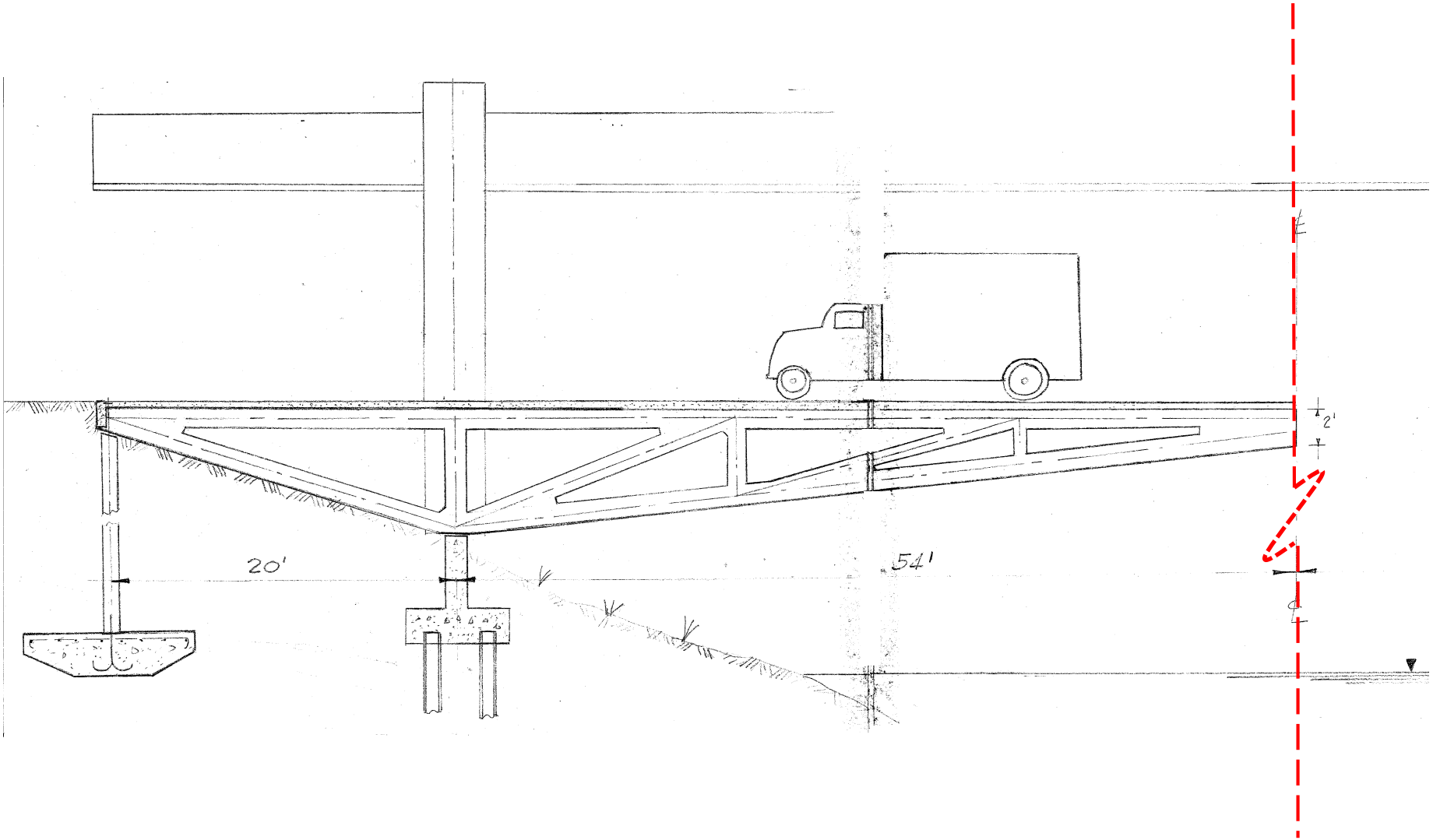
Span: **140 ft.**

Structural System: **WF Steel Girders**

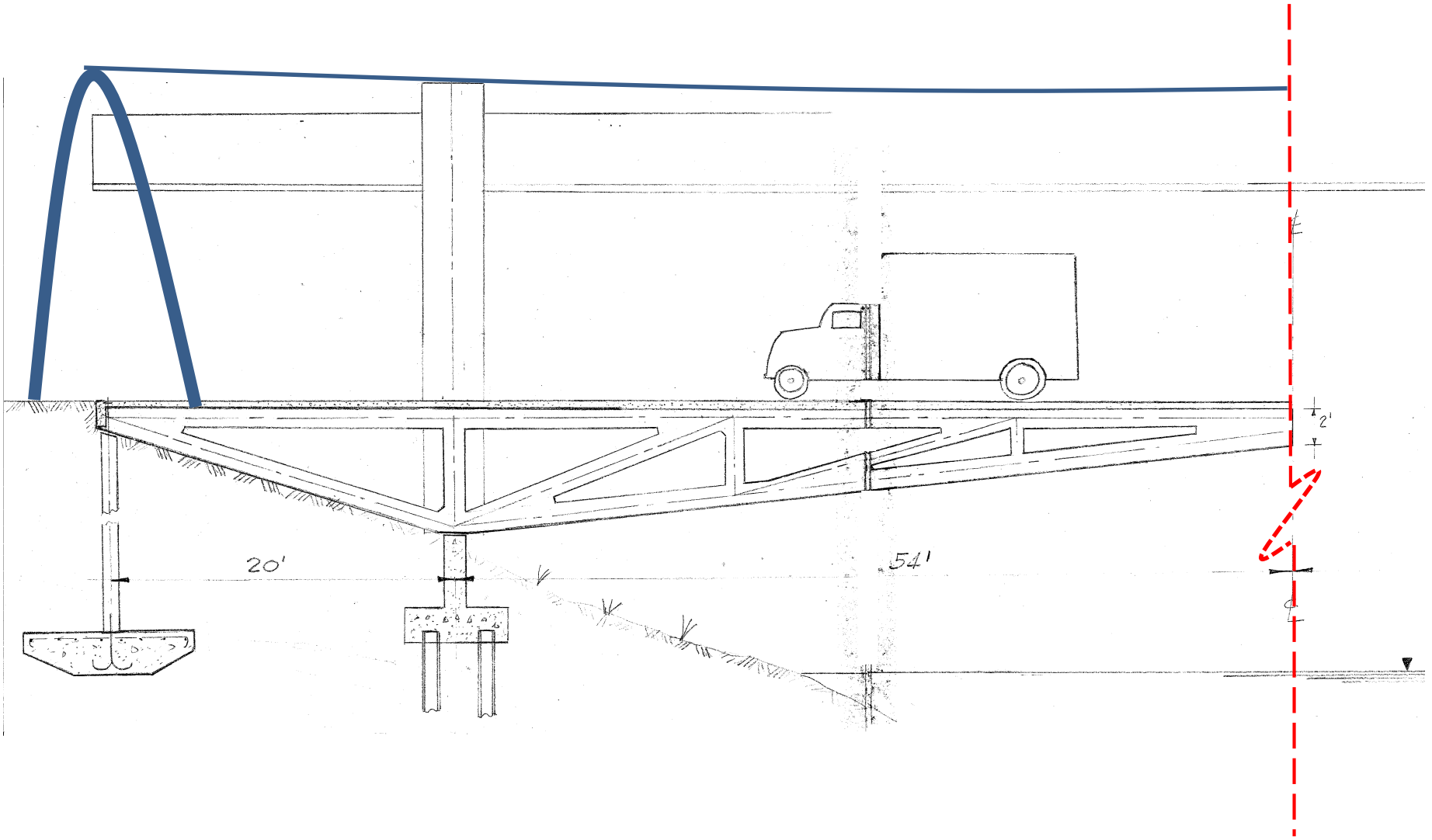
Cost: **$ 71,000**

50TH ANNIVERSARY EVENT: 8.3.2015

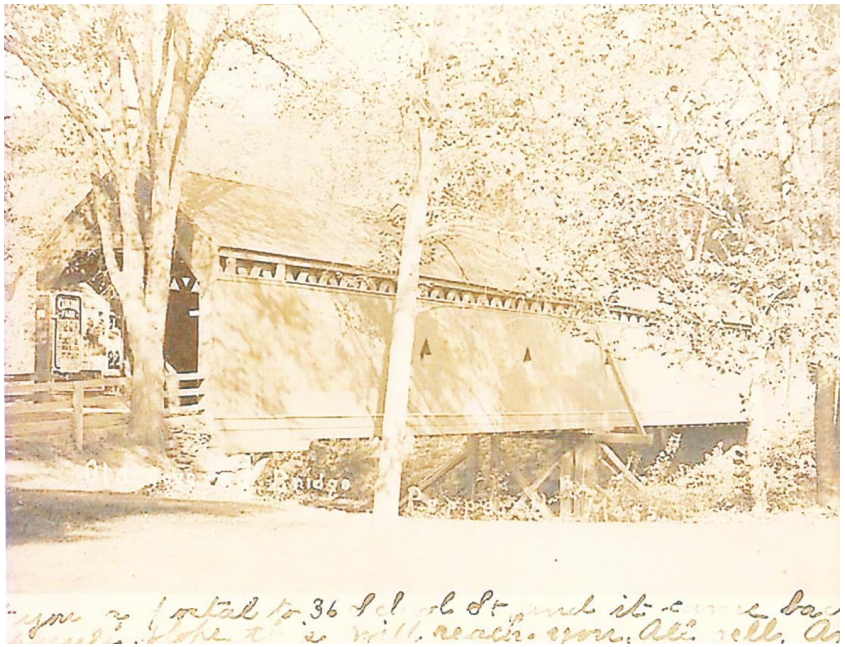
POST-TENSIONED GIRDER PROPOSAL



POST-TENSIONED GIRDER PROPOSAL

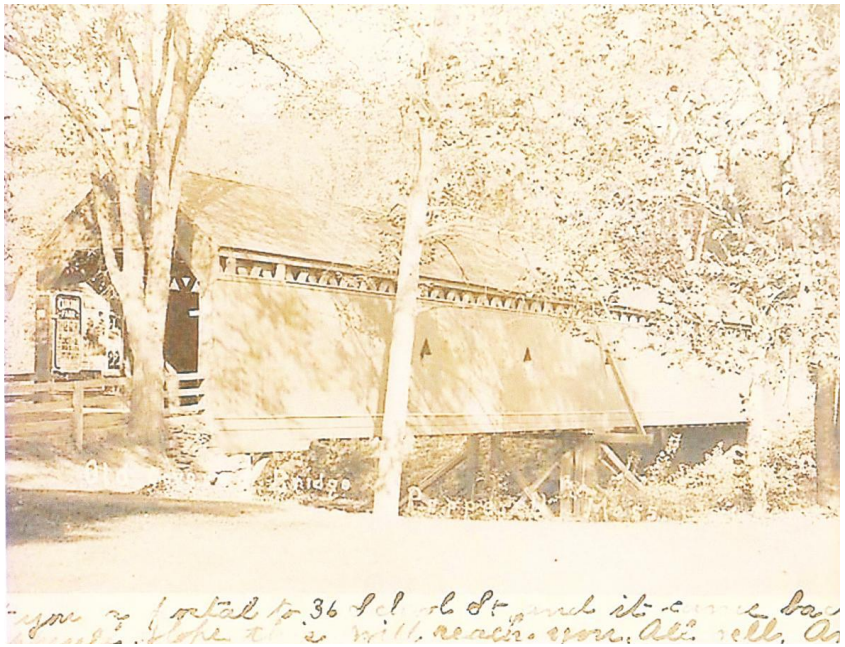


‘PEPPERELL BRIDGE’ AND ‘LAKE OF THE WOODS’ BRIDGE



PEPPERELL BRIDGE

‘PEPPERELL BRIDGE’ AND ‘LAKE OF THE WOODS’ BRIDGE



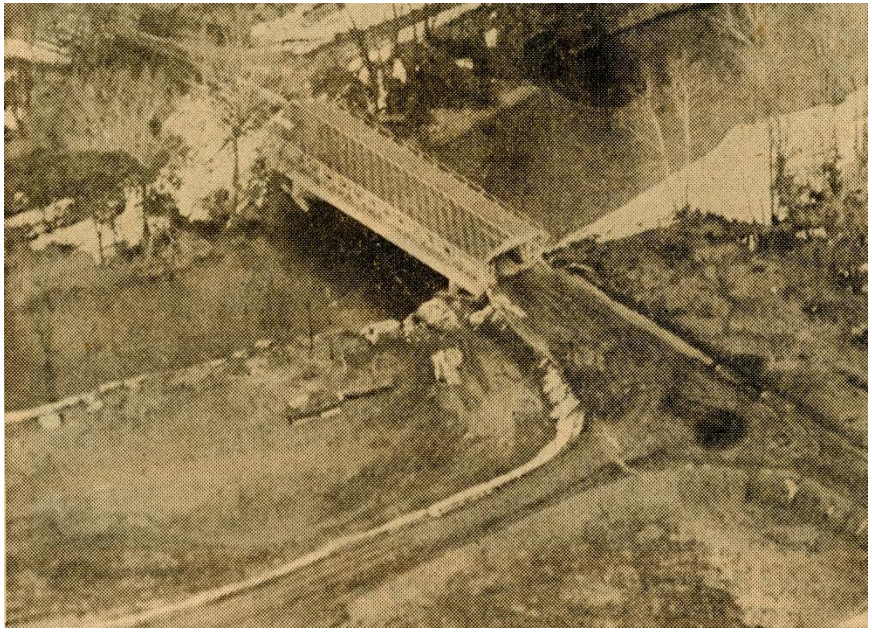
PEPPERELL BRIDGE

LAKE OF THE WOODS BRIDGE

‘LAKE OF THE WOODS’ BRIDGE

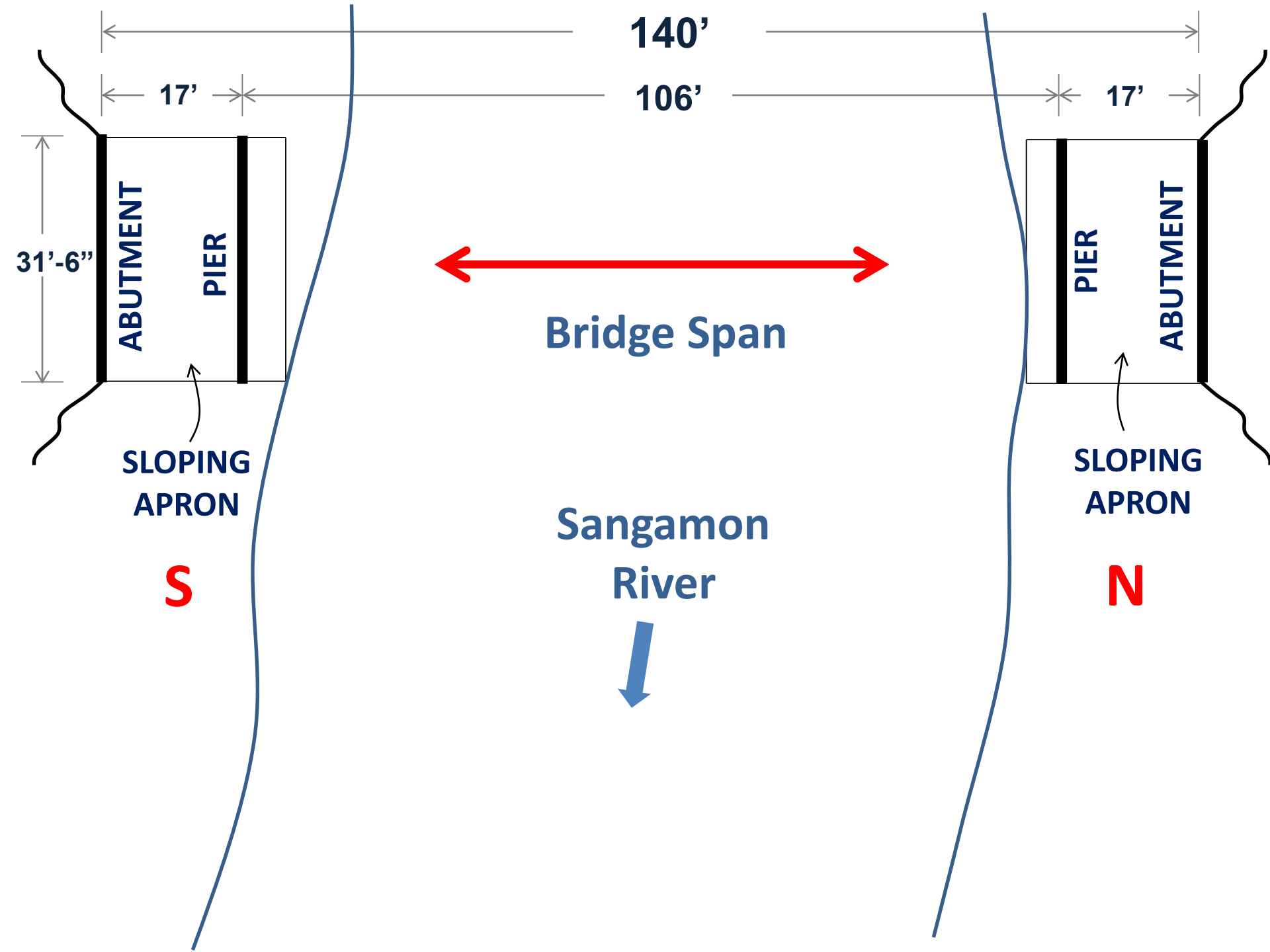

Illinois Route 47
County Rd 350 E
Museum of the
Grand Prairie
Explore

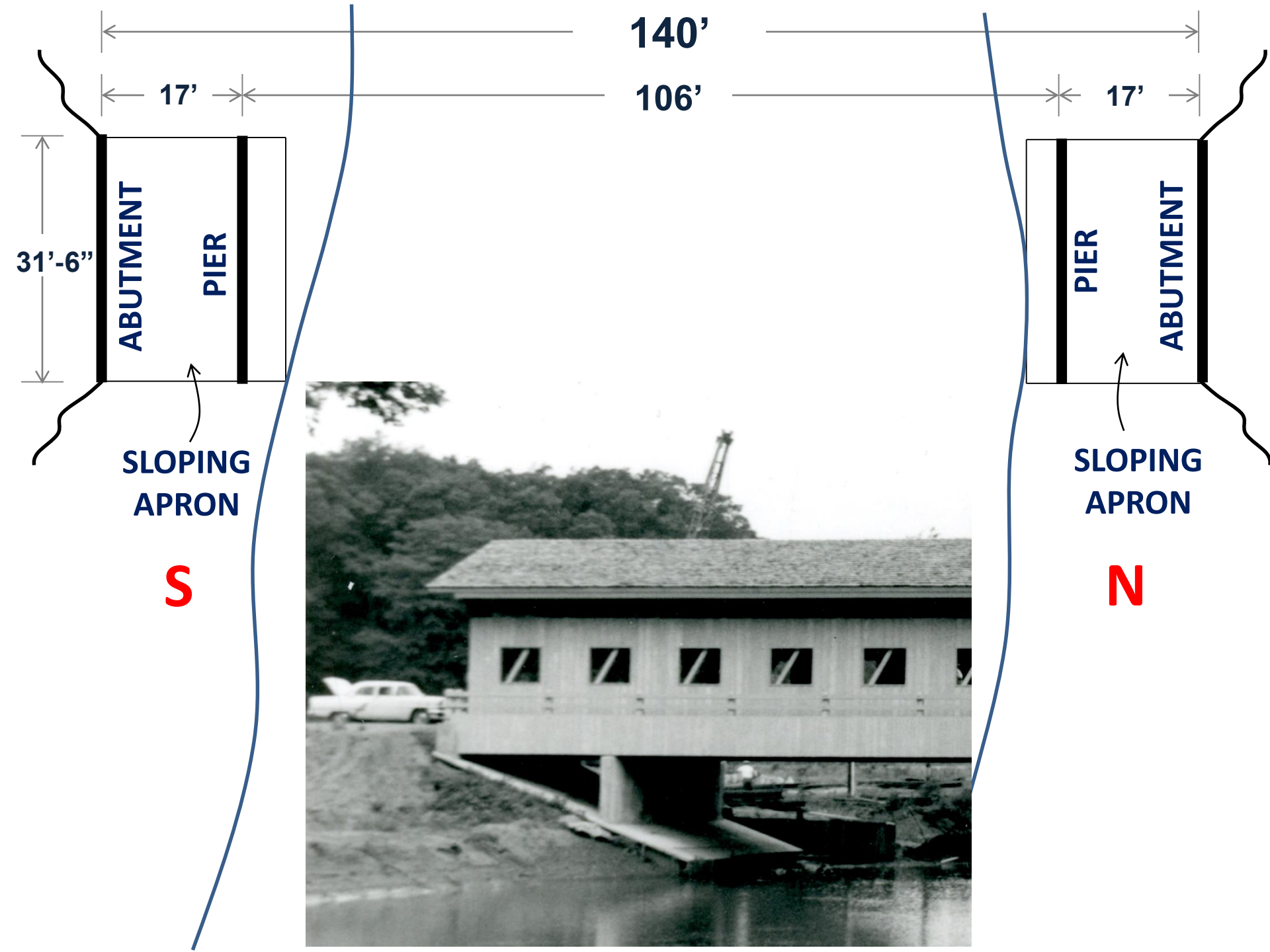

Explore




Explore

STRUCTURAL SYSTEM


140’
17’
106’
17’
31’-6”
ABUTMENT
PIER
PIER
ABUTMENT
Bridge Span
SLOPING APRON
SLOPING APRON
Sangamon River
S
N


140’
17’
106’
17’
31’-6”
ABUTMENT
PIER
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ABUTMENT
SLOPING APRON
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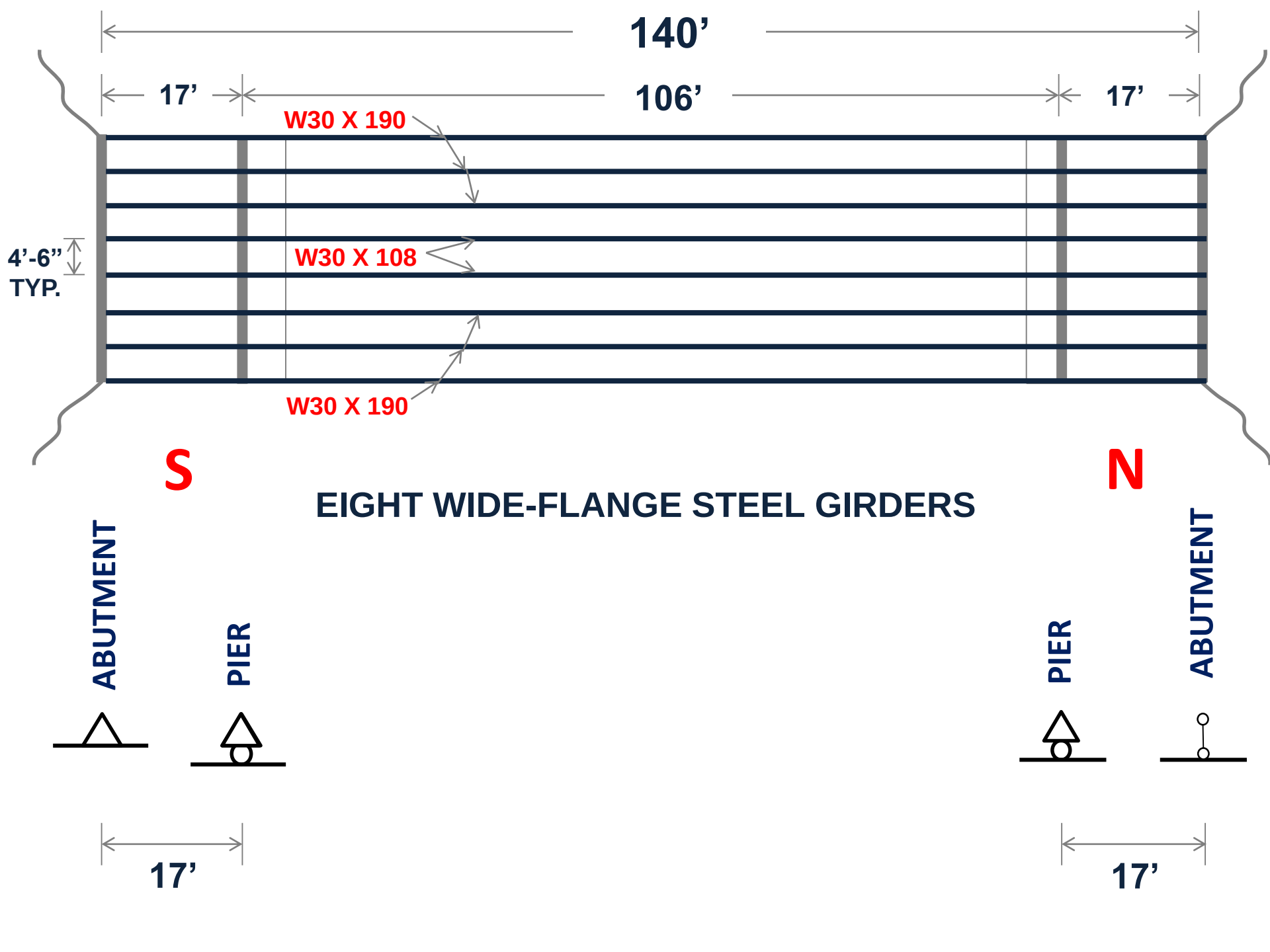
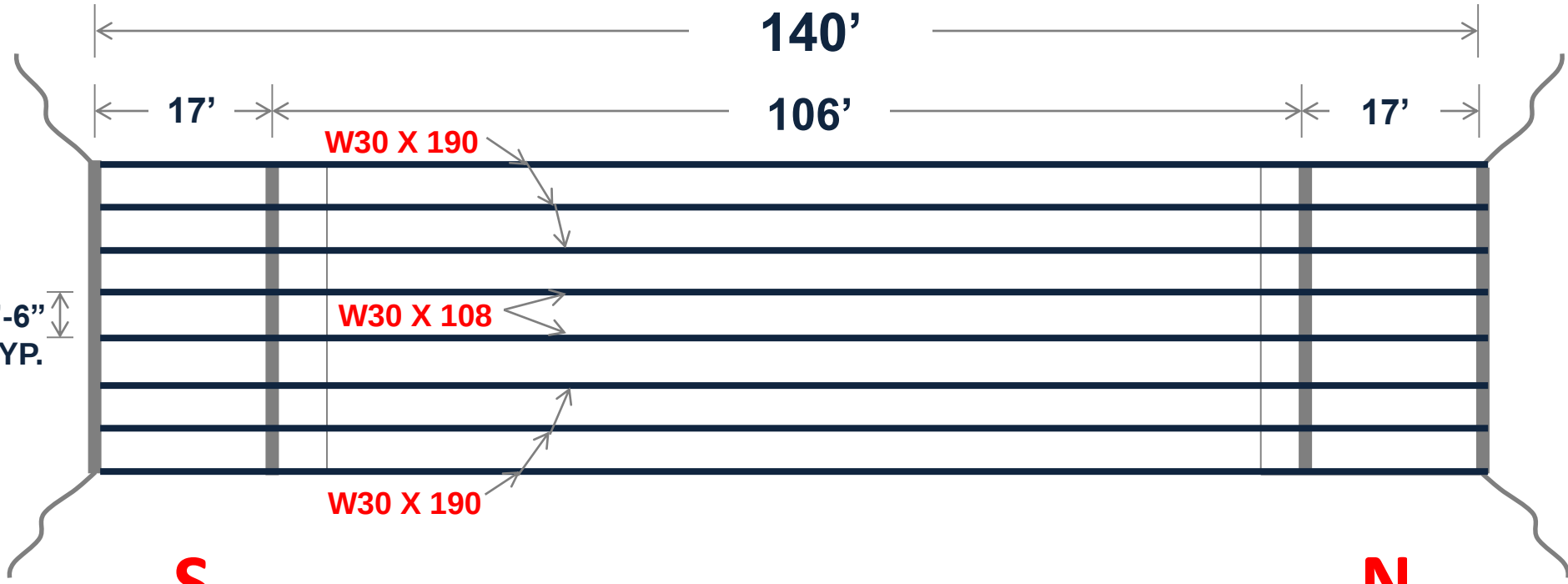
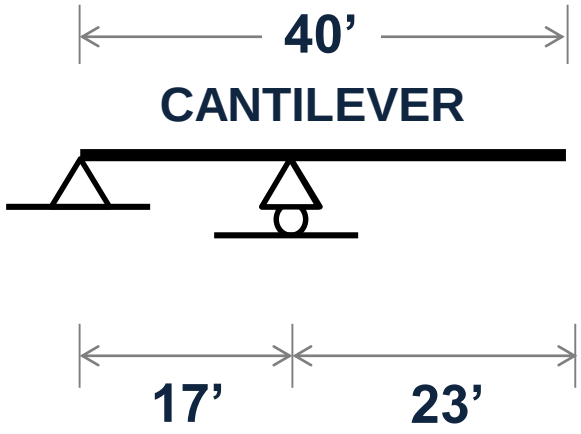
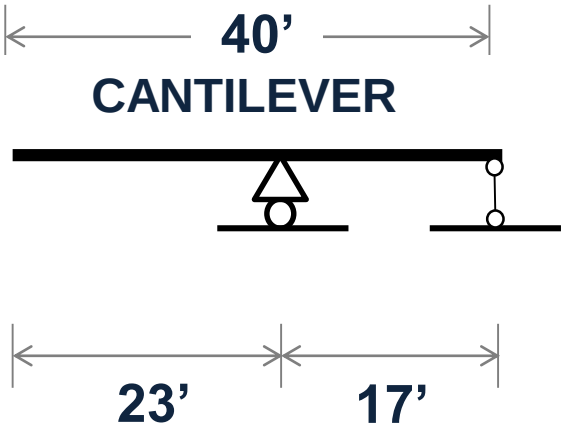
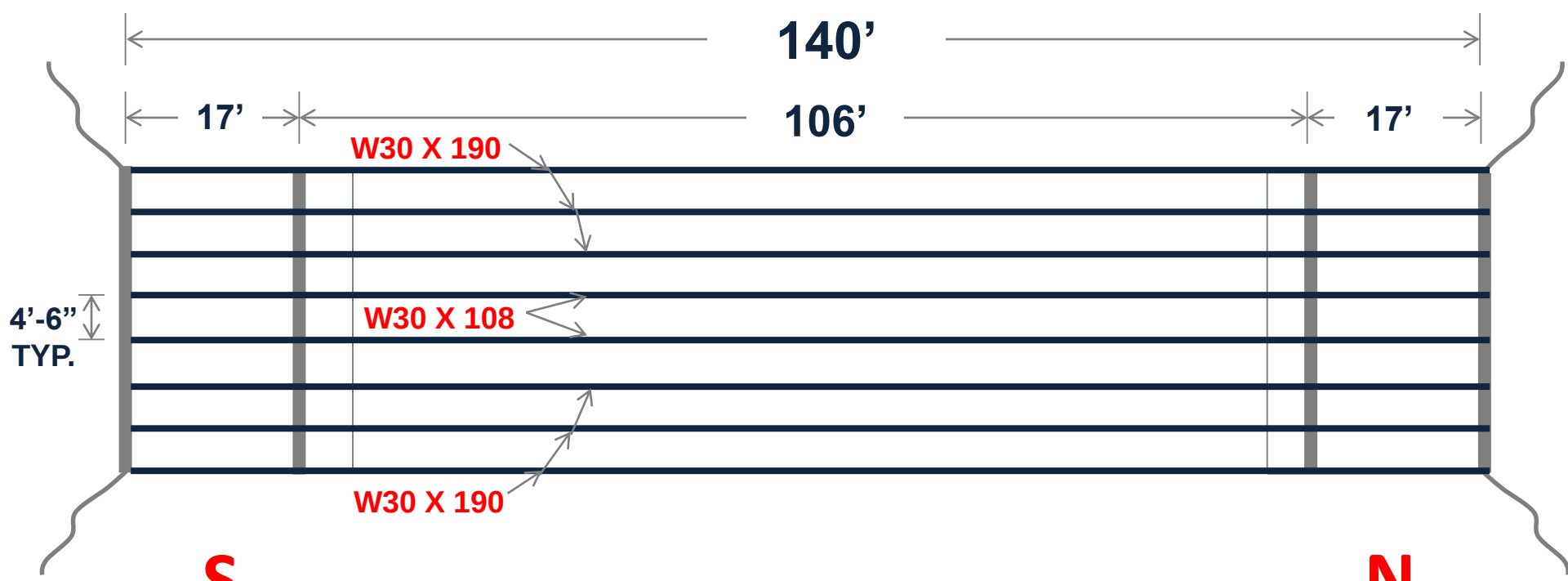

140’
17’
106’
17’
W30 X 190
W30 X 108
W30 X 190
4’-6”
TYP.
S
N
EIGHT WIDE-FLANGE STEEL GIRDERS
ABUTMENT
PIER
PIER
ABUTMENT
17’
17’



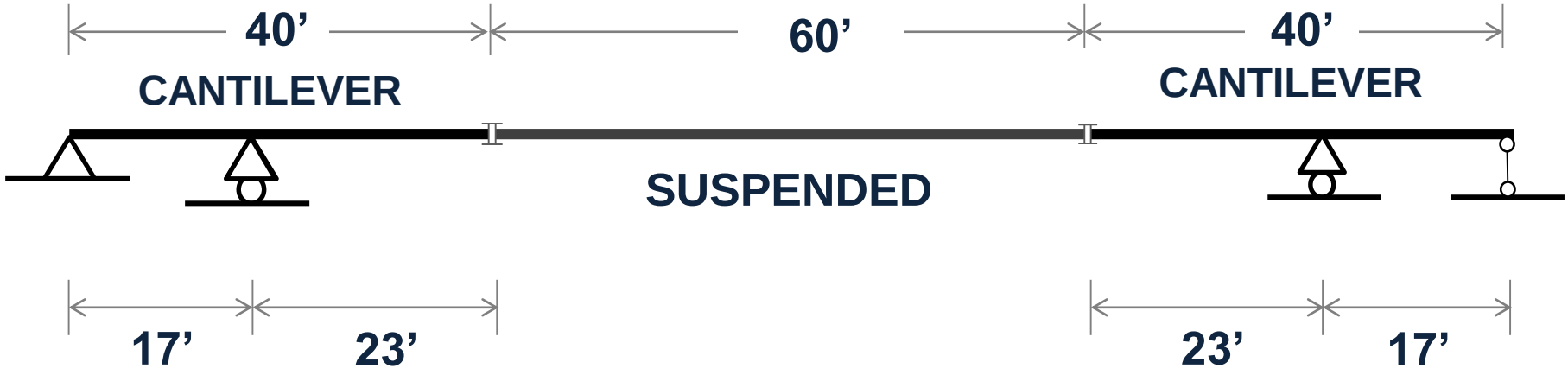
EIGHT WIDE-FLANGE STEEL GIRDERS

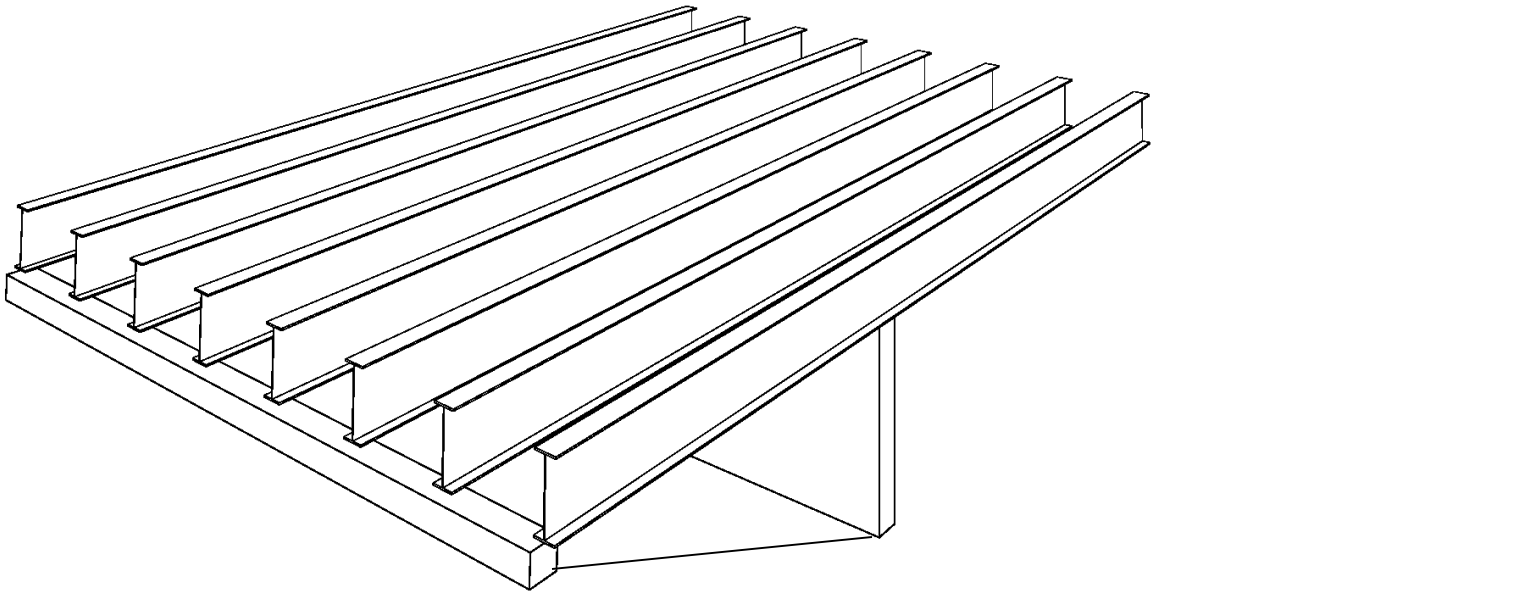


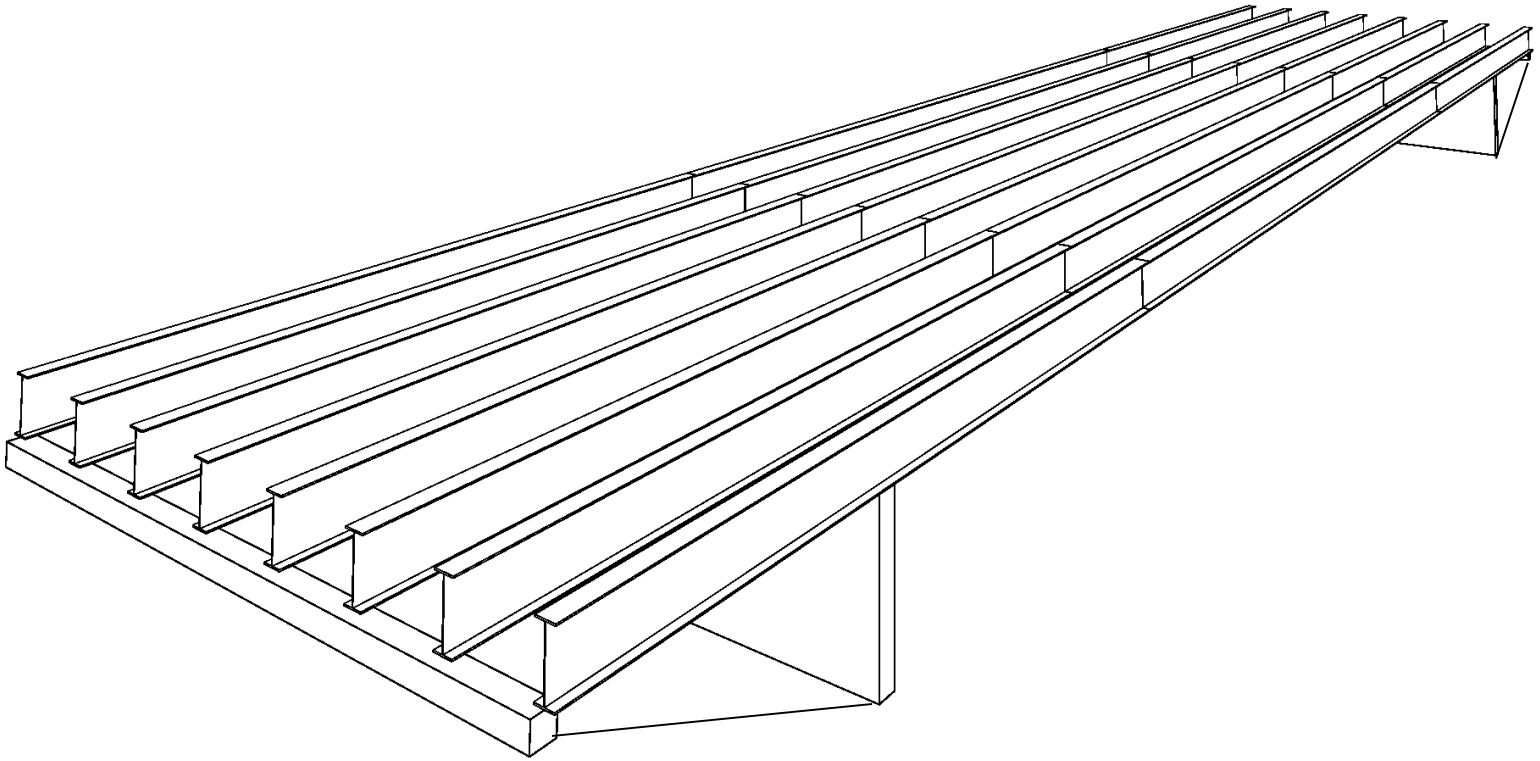


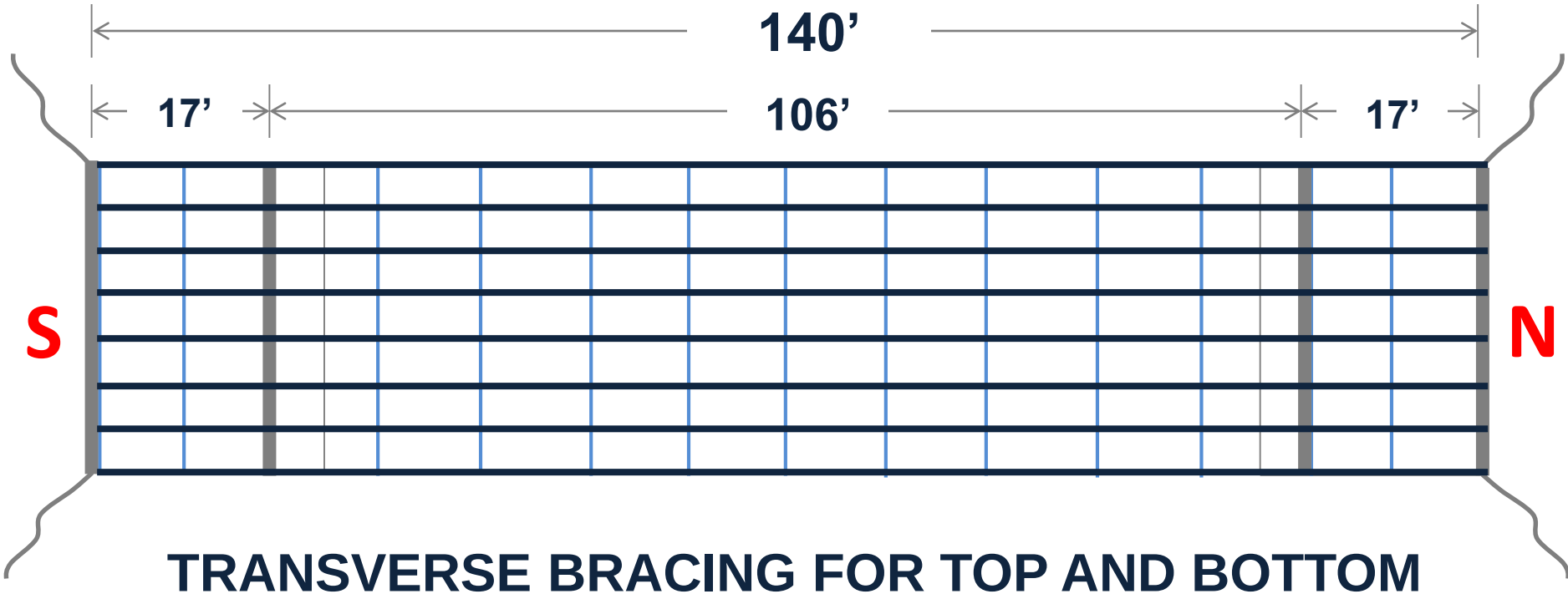


EIGHT WIDE-FLANGE STEEL GIRDERS

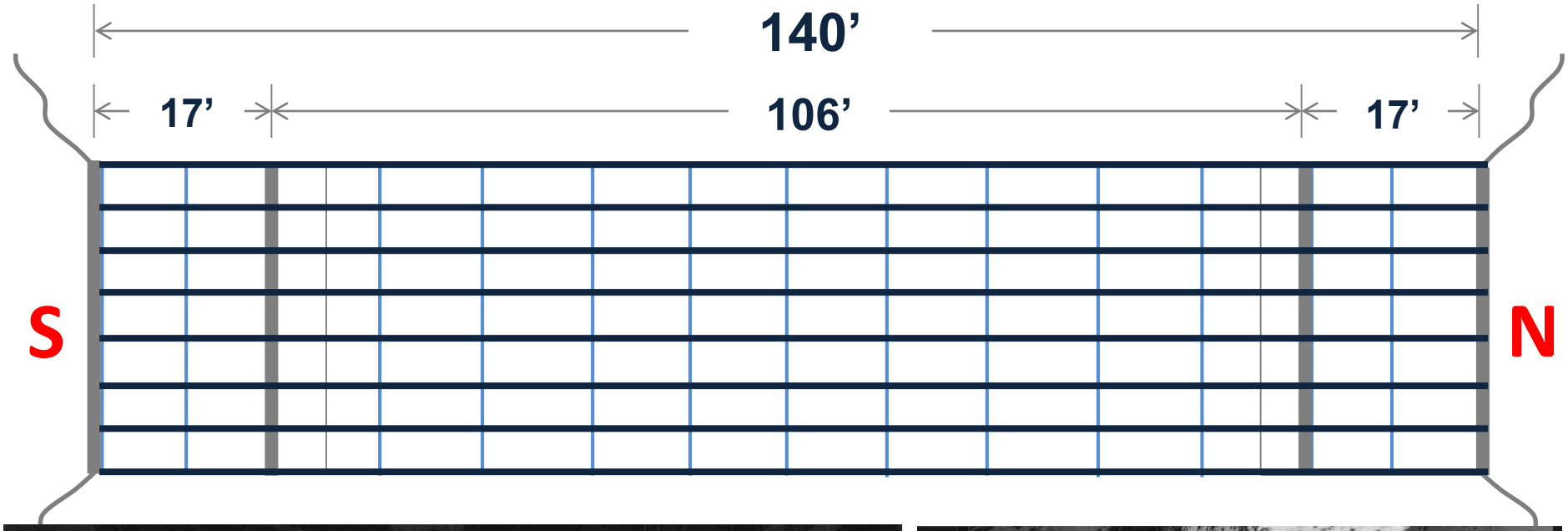






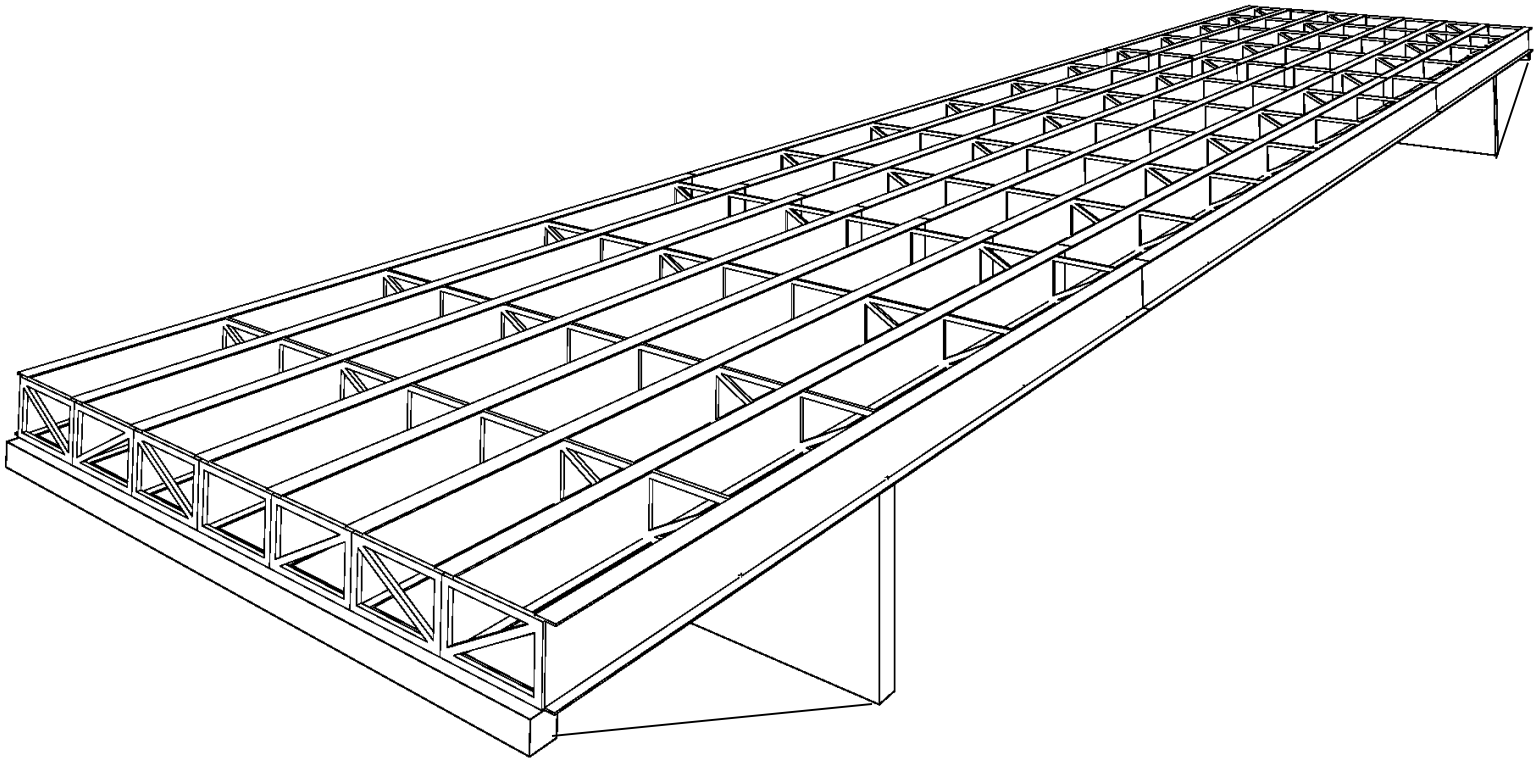


TRANSVERSE BRACING FOR TOP AND BOTTOM FLANGES OF GIRDERS AT APPROX. 10 ft. o.c.

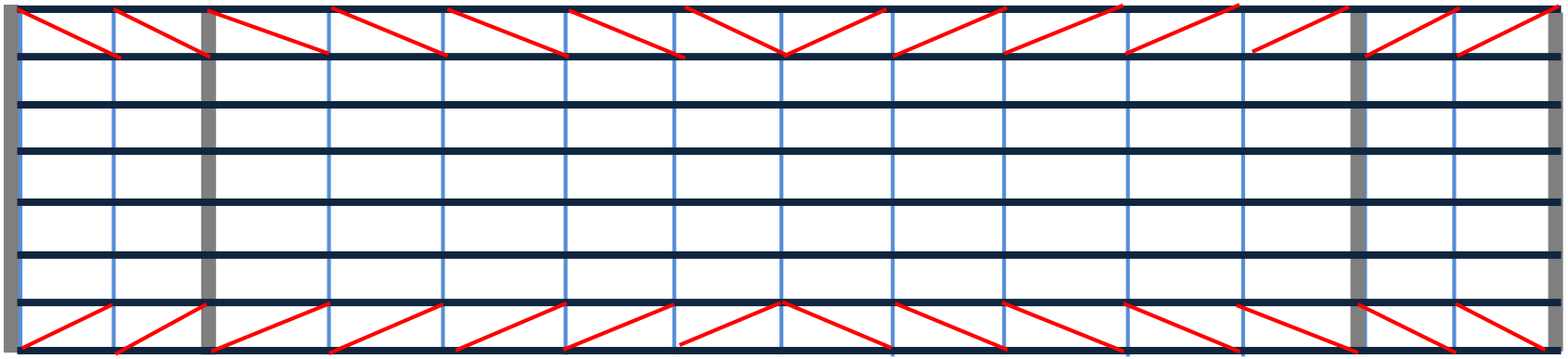


FULL CROSS-SECTION

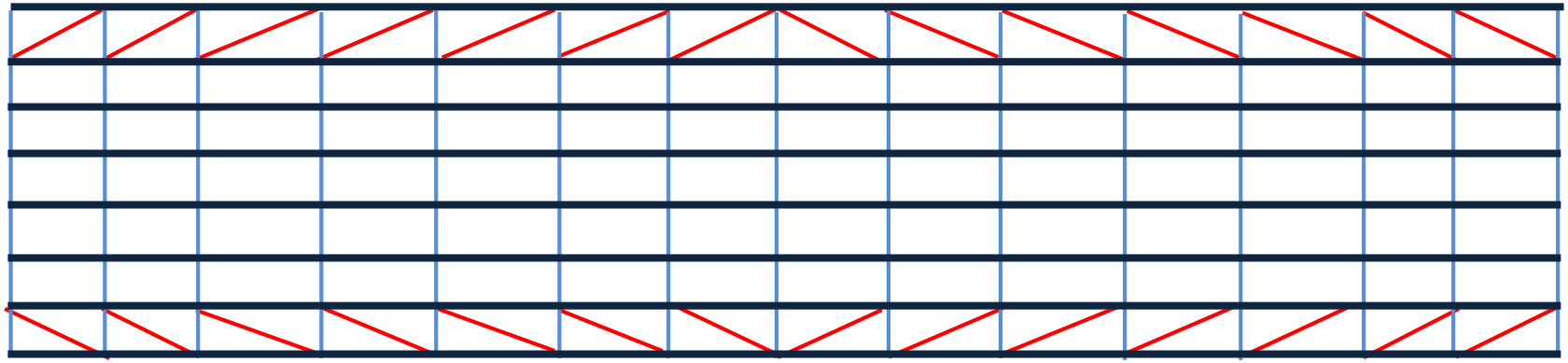
PARTIAL CROSS-SECTION



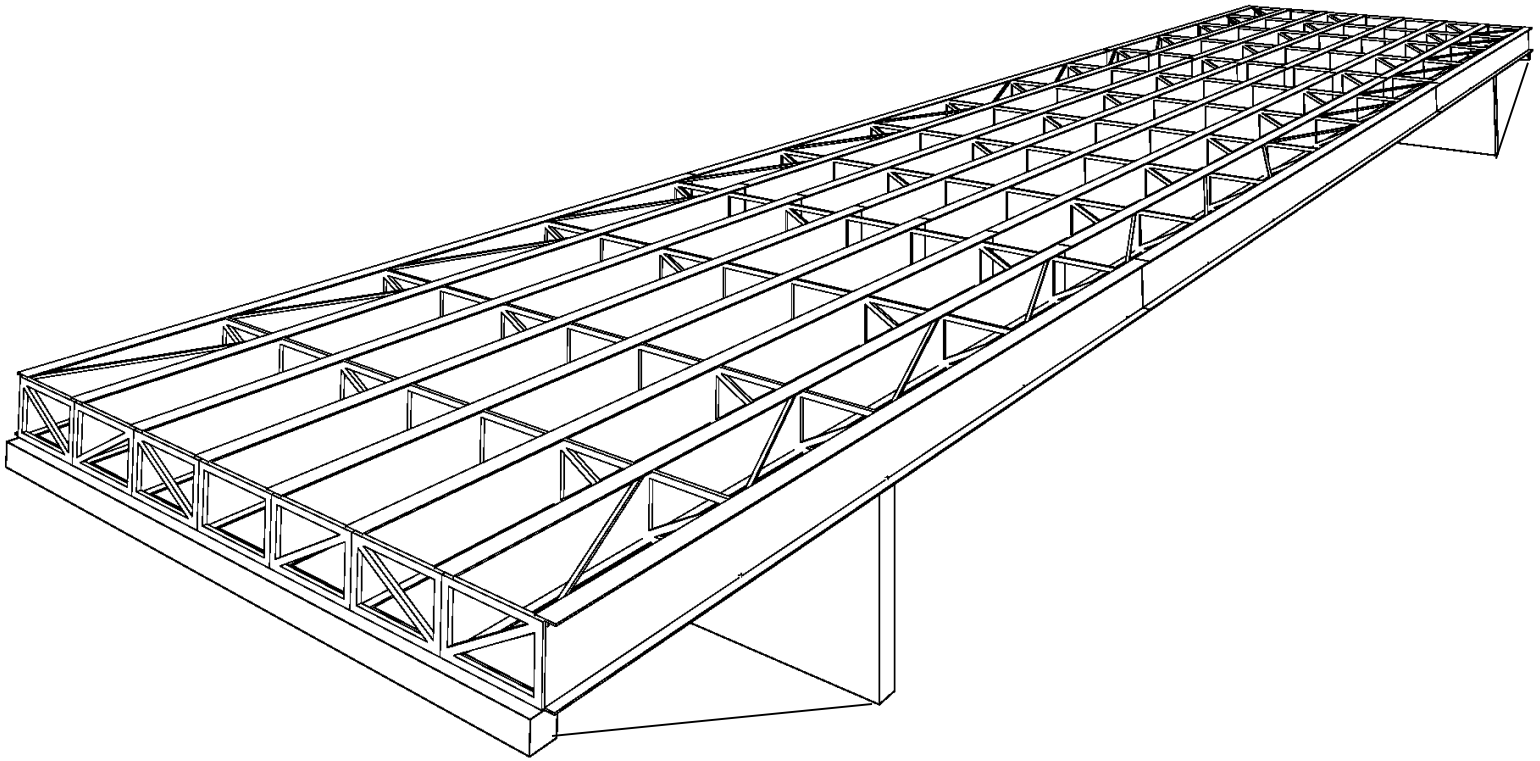
TWO LONGITUDINAL TRUSSES TO RESIST WIND EFFECTS



TOP FLANGE



BOTTOM FLANGE



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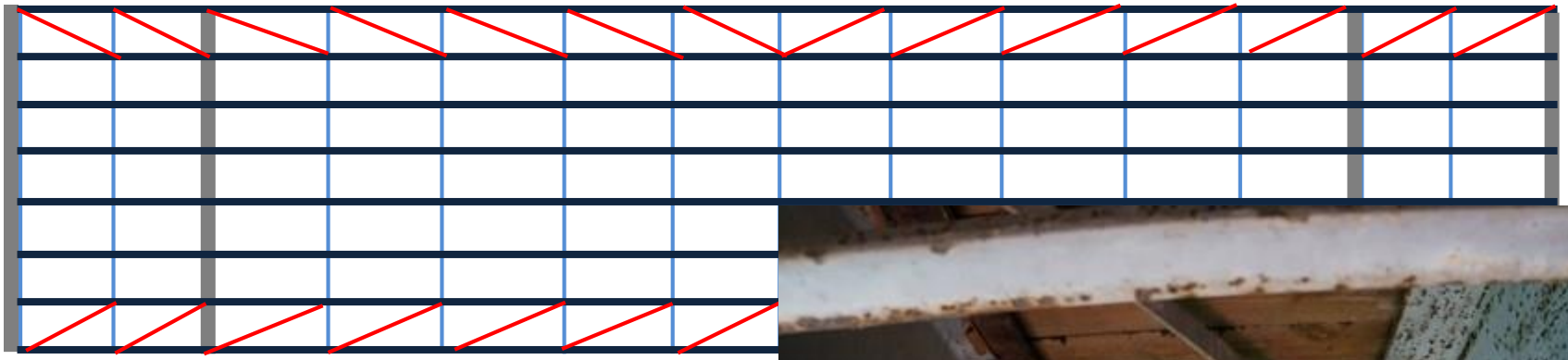
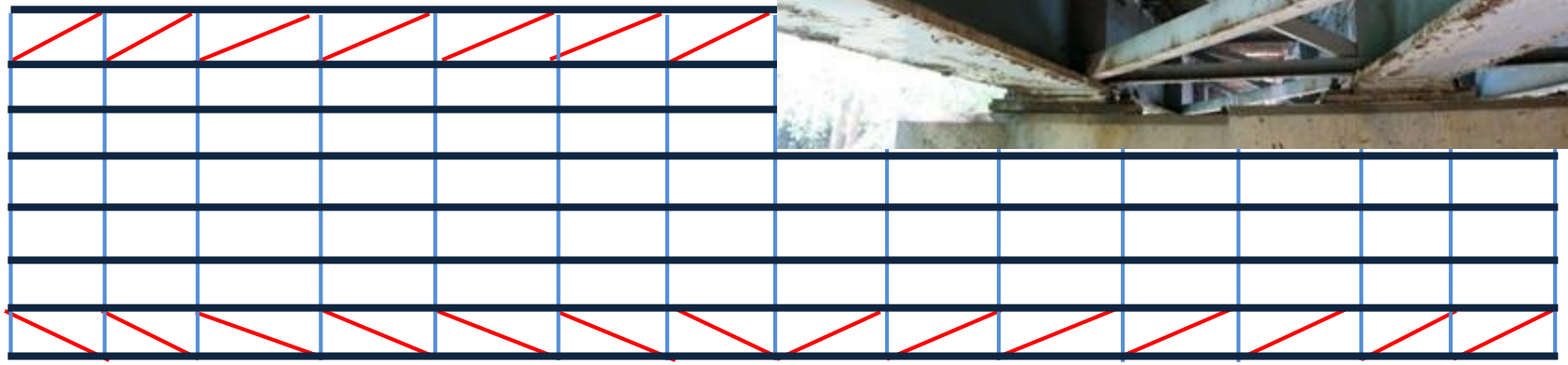
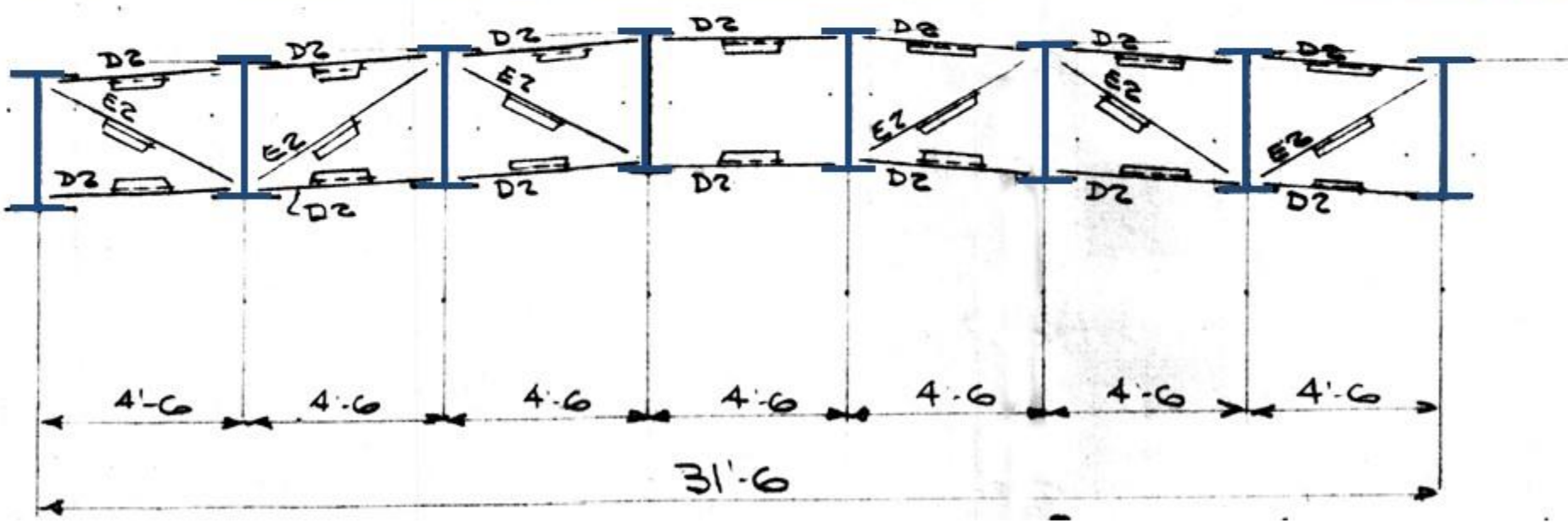


TOP FLANGE

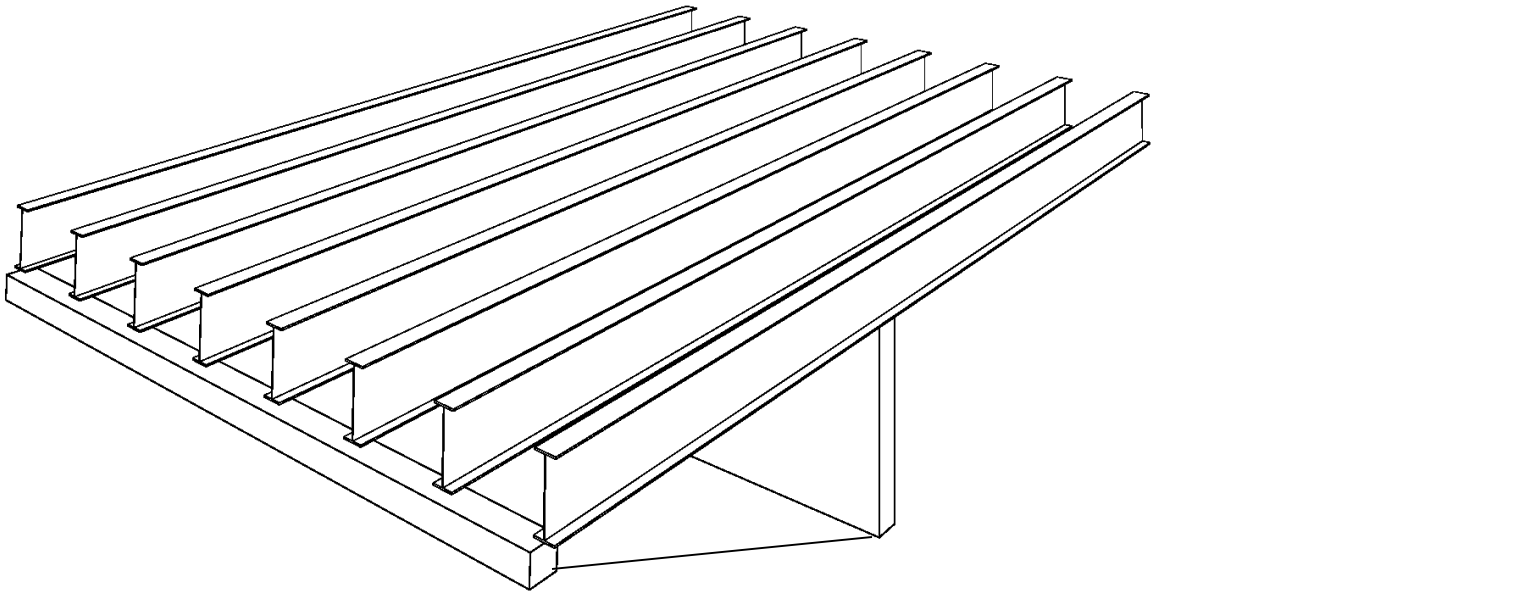


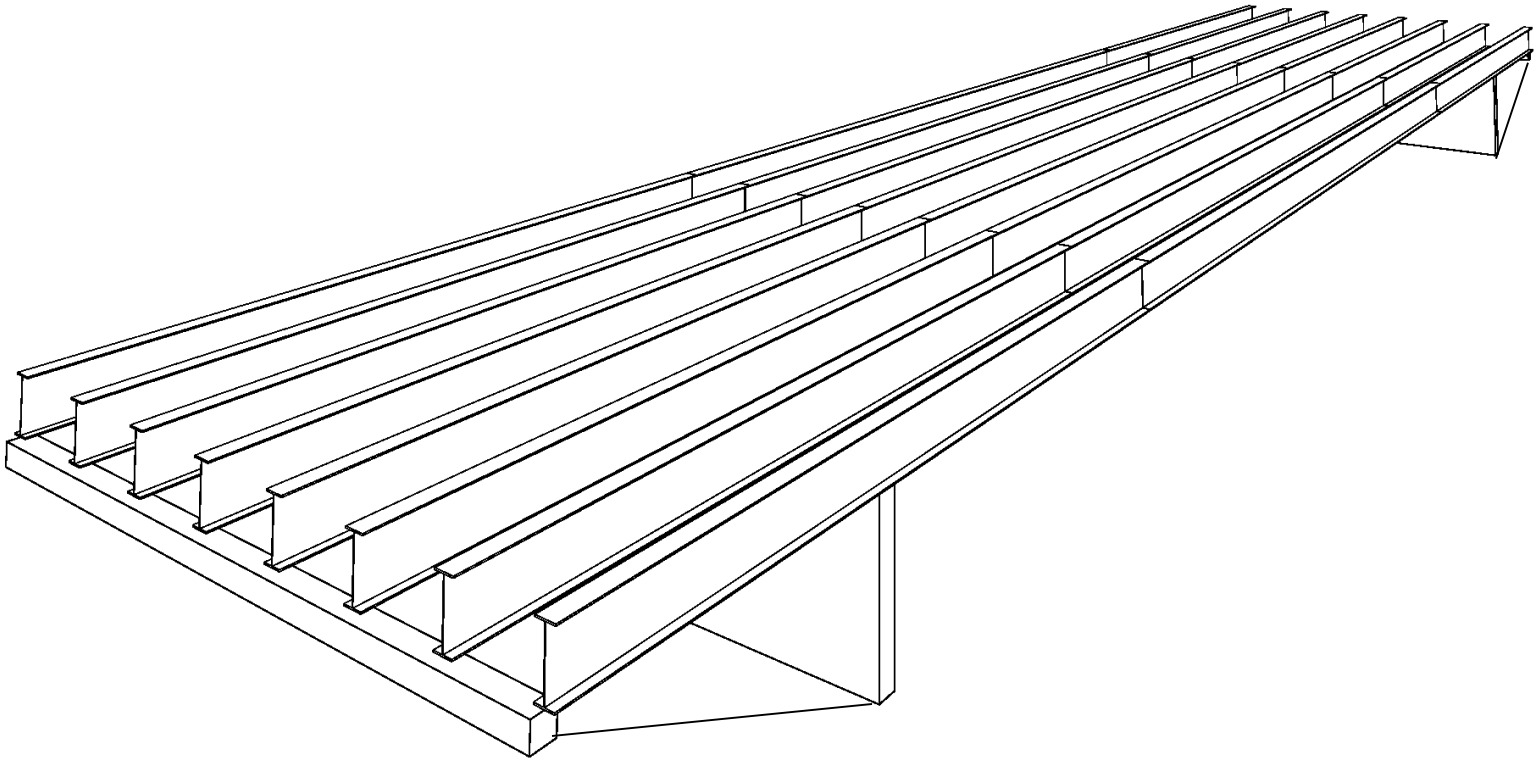
BOTTOM FLANGE

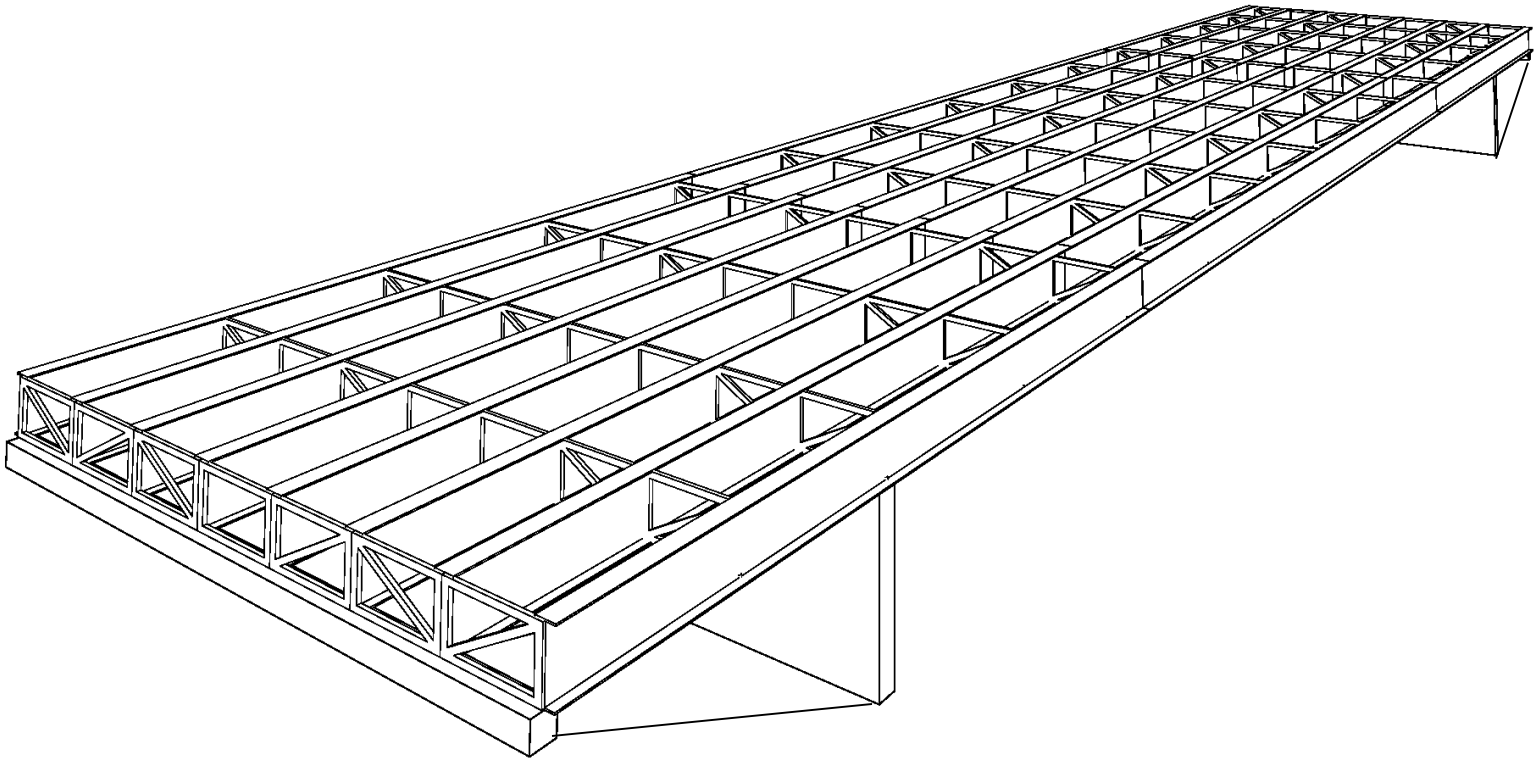


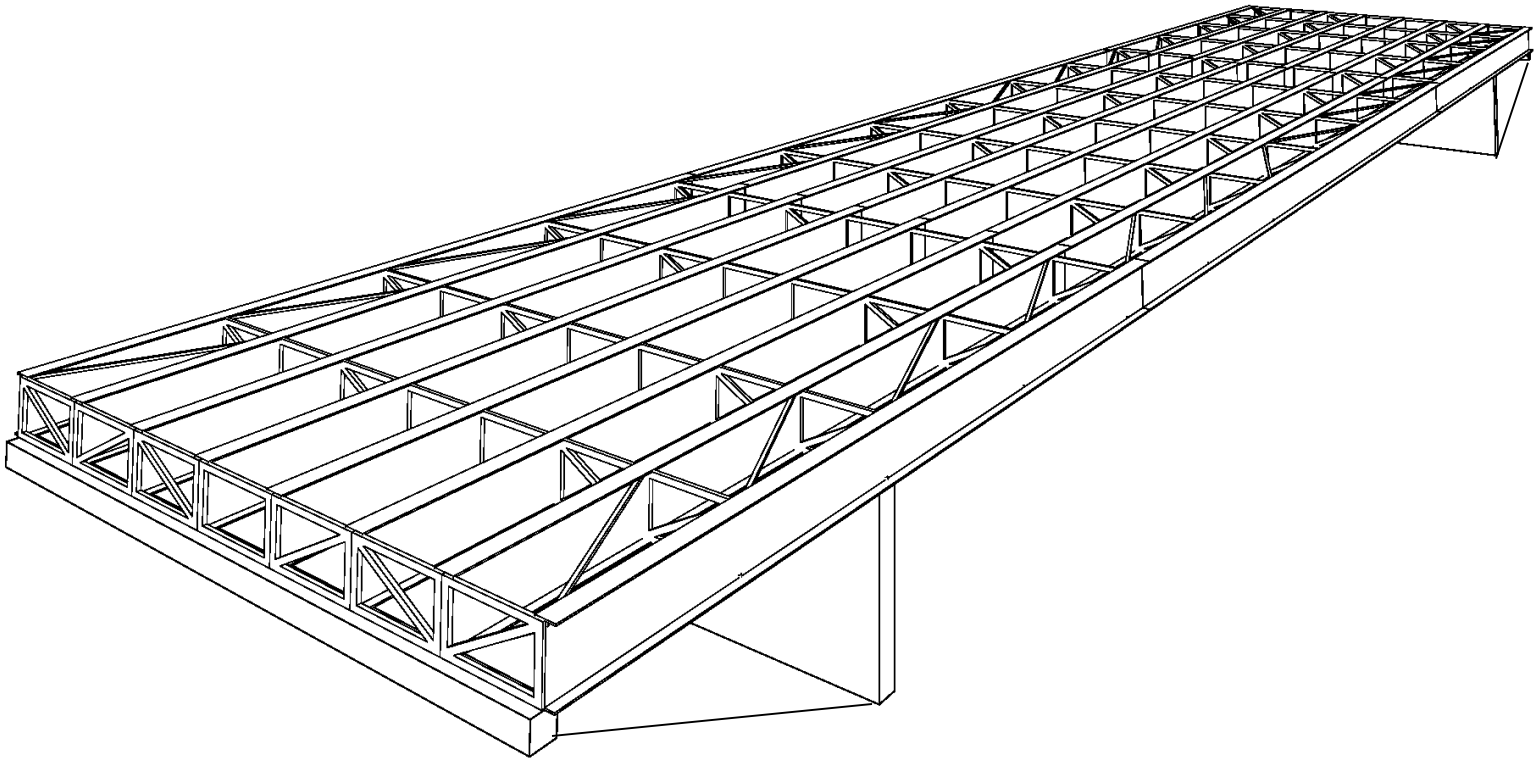
TRANSVERSE CAMBER (3 in.)

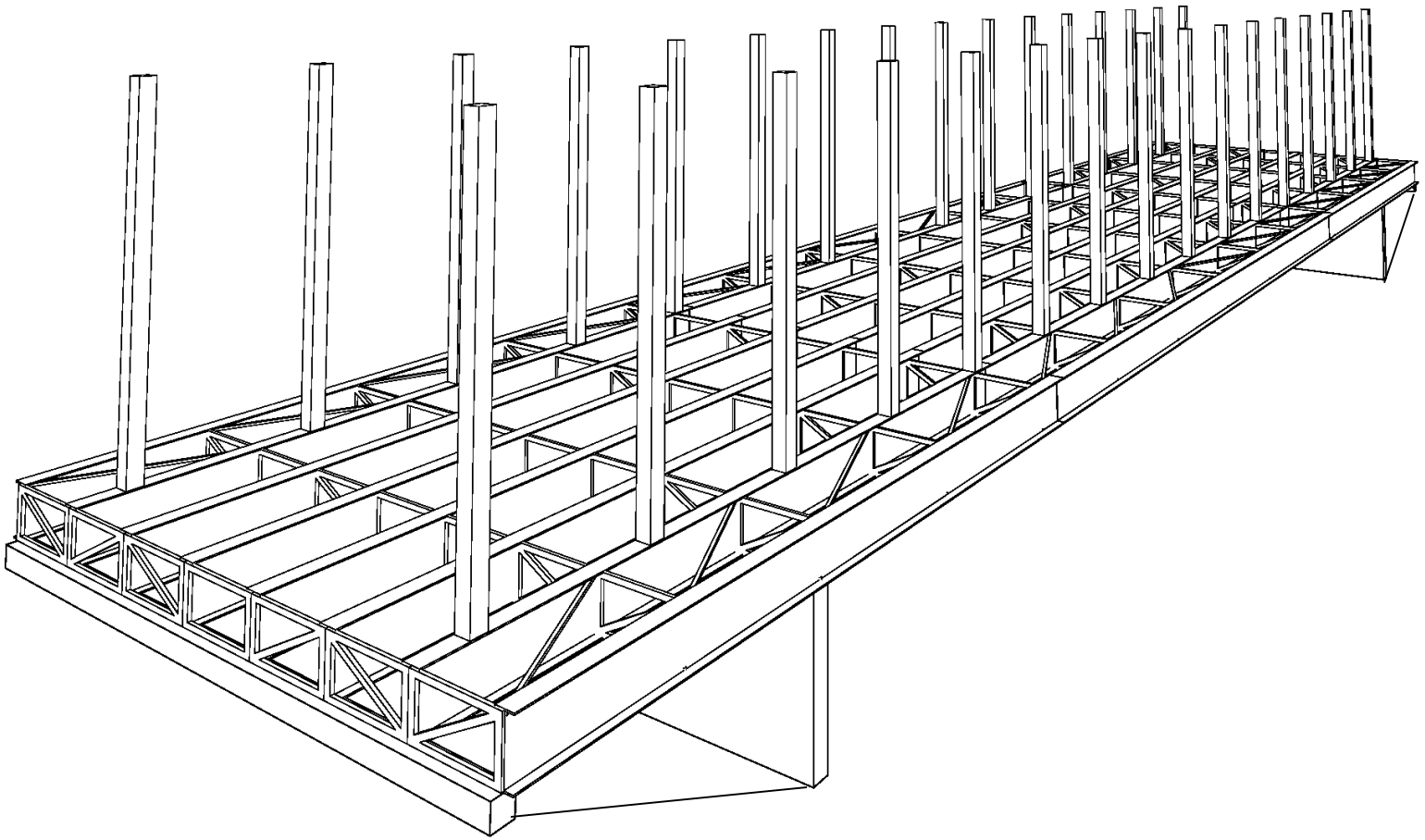

LONGITUDINAL
CAMBER (4 in.)

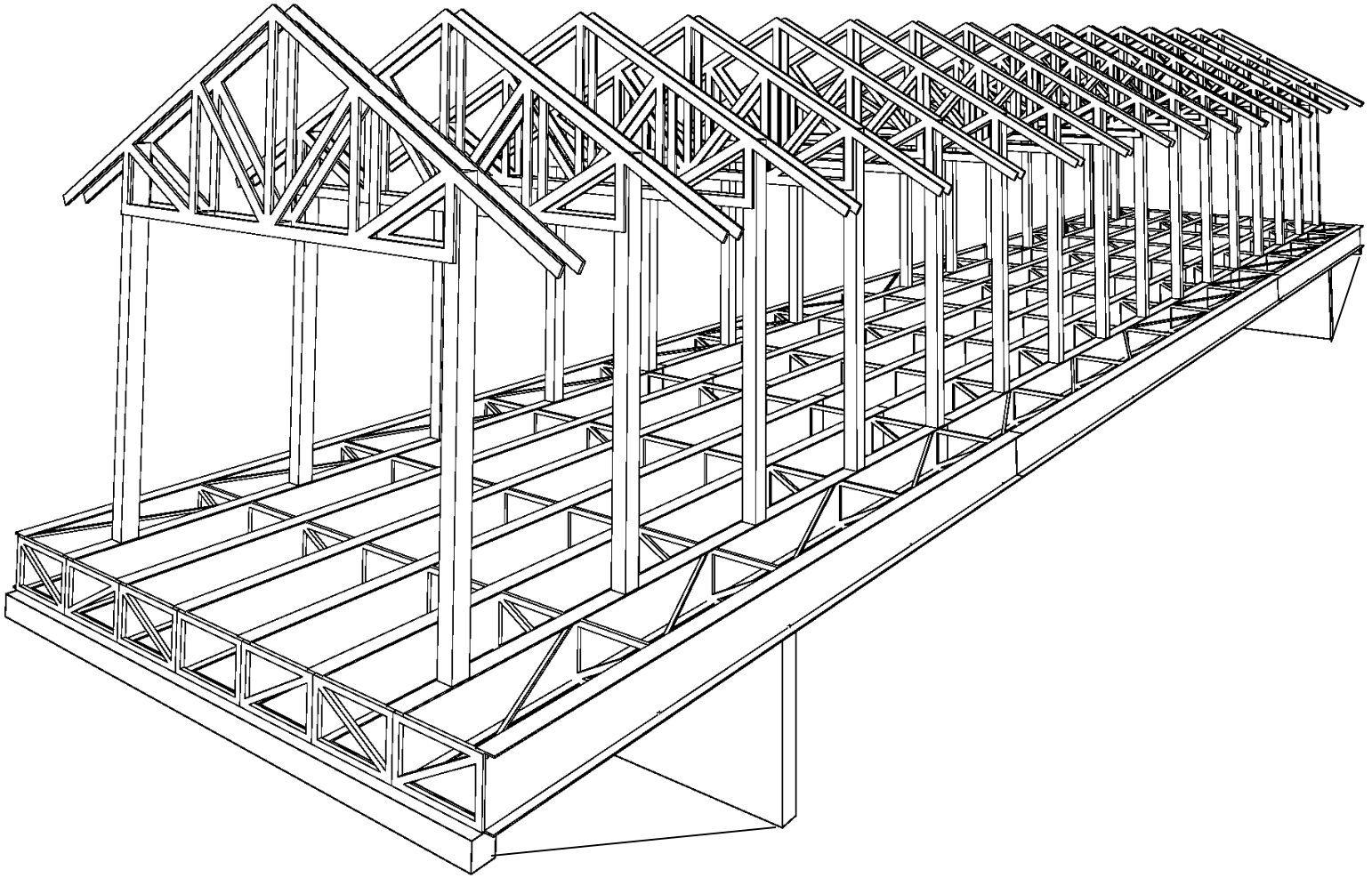


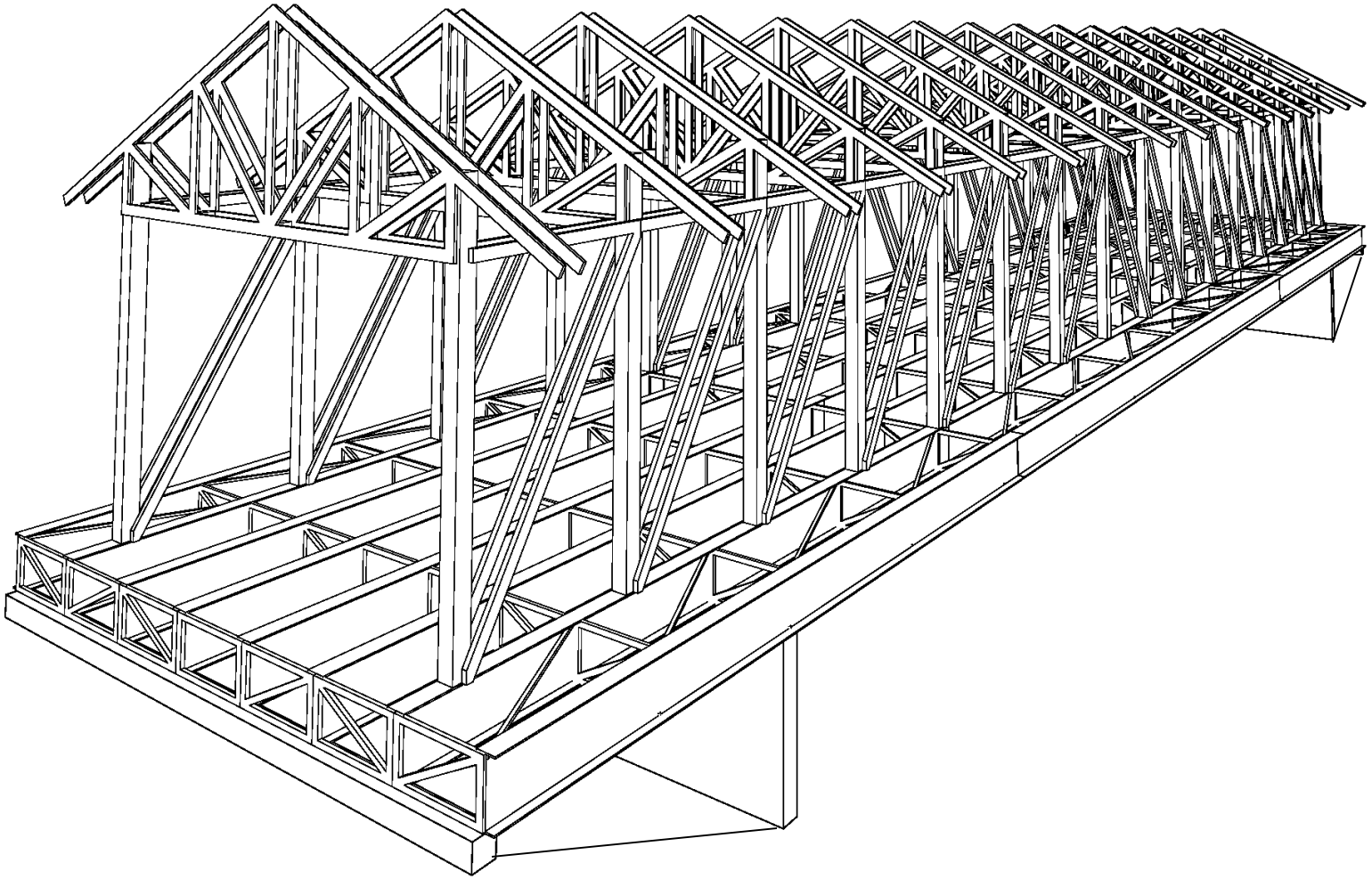


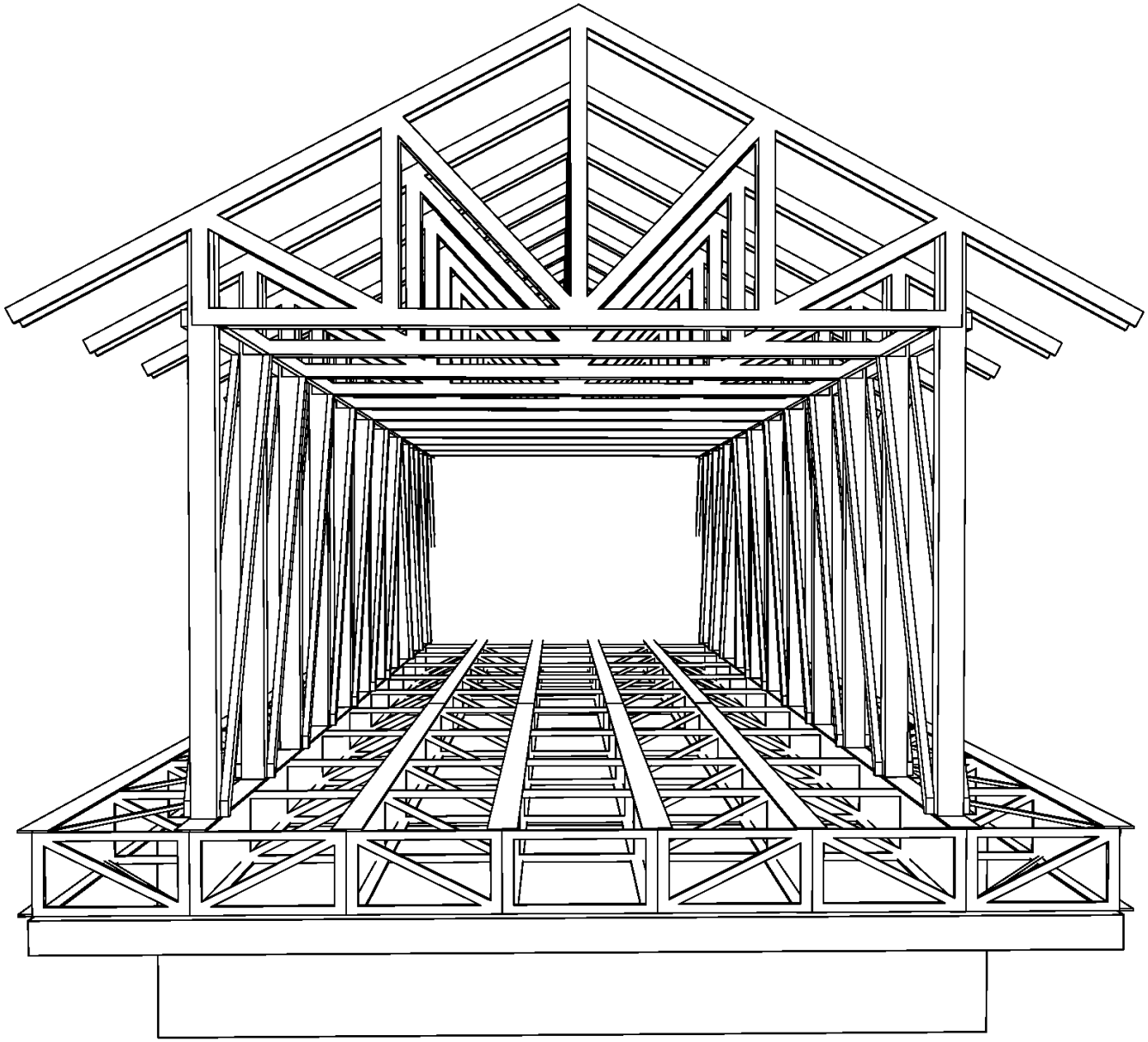






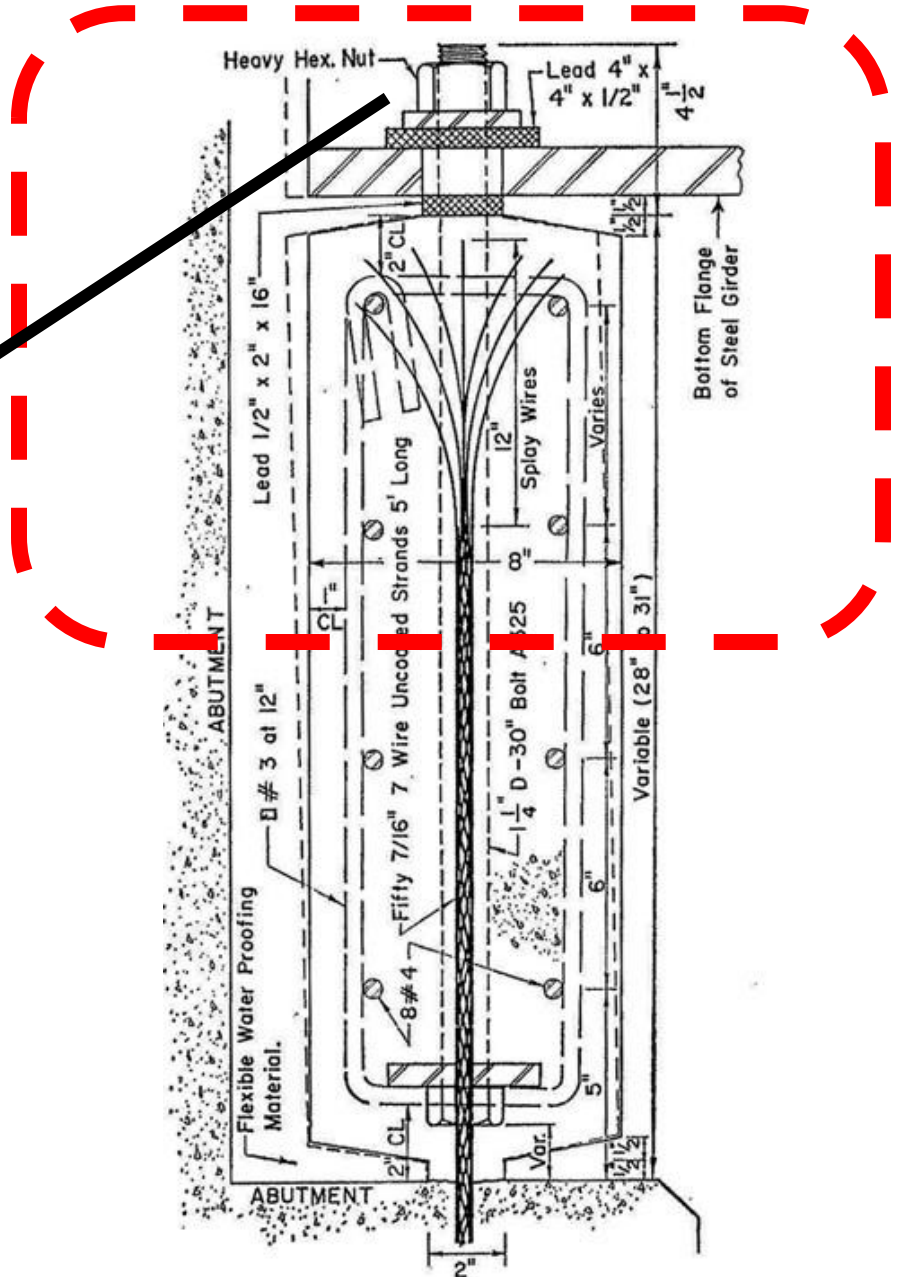






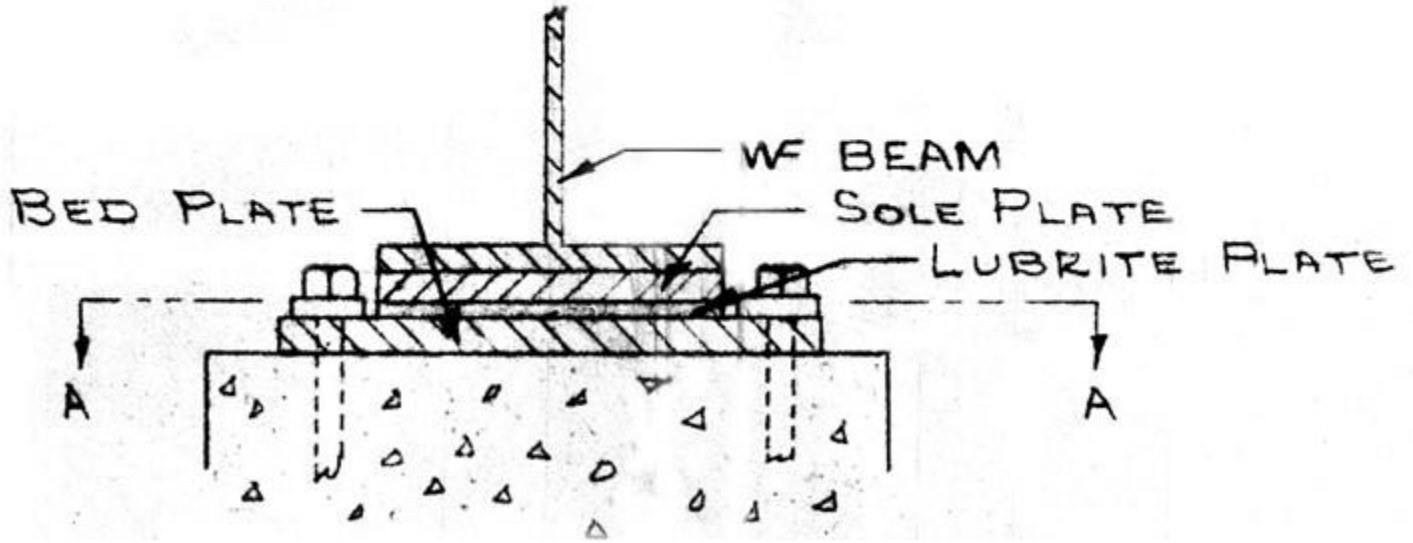
DETAILS

FIXED END OF A TYPICAL GIRDER

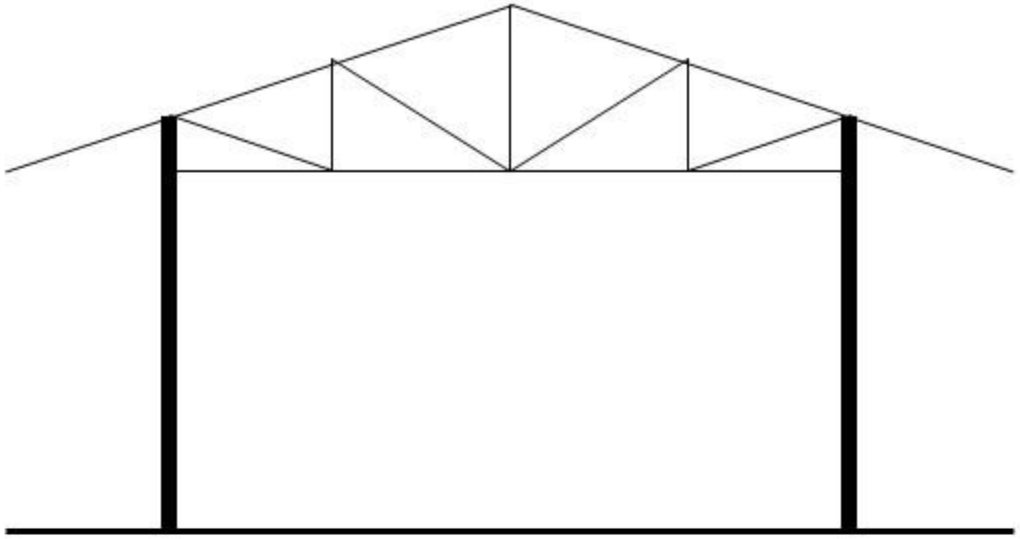


STEEL GIRDER END SUPPORTED BY CONCRETE ROCKER

ROCKER ALLOWS LONGITUDINAL MOTION WHILE PREVENTING UPLIFT

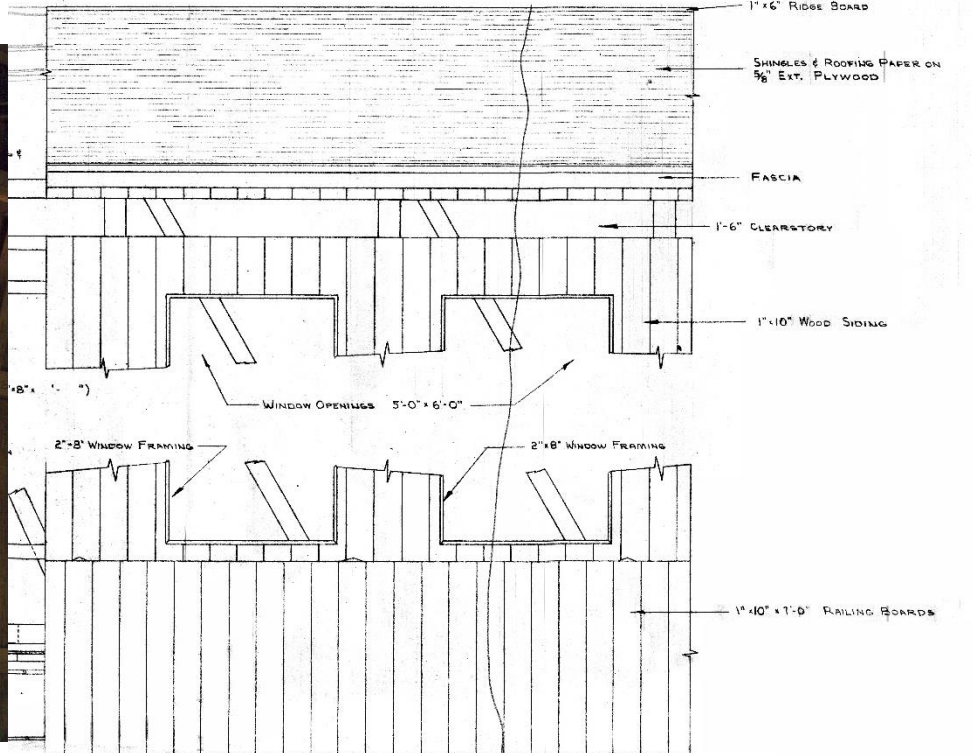


BEAM EXPANSION PLATE ASSEMBLY

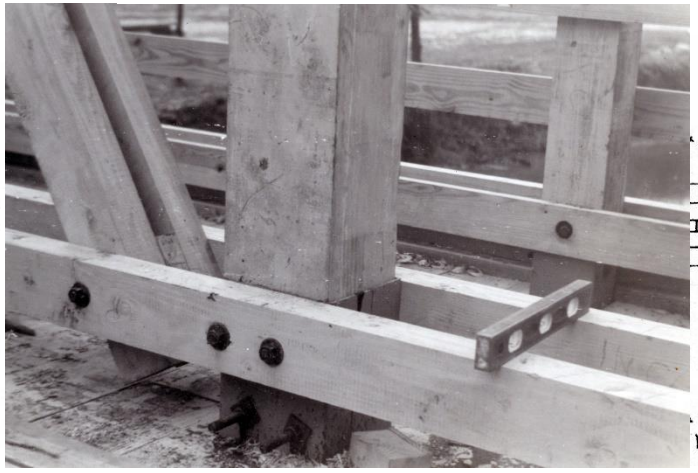


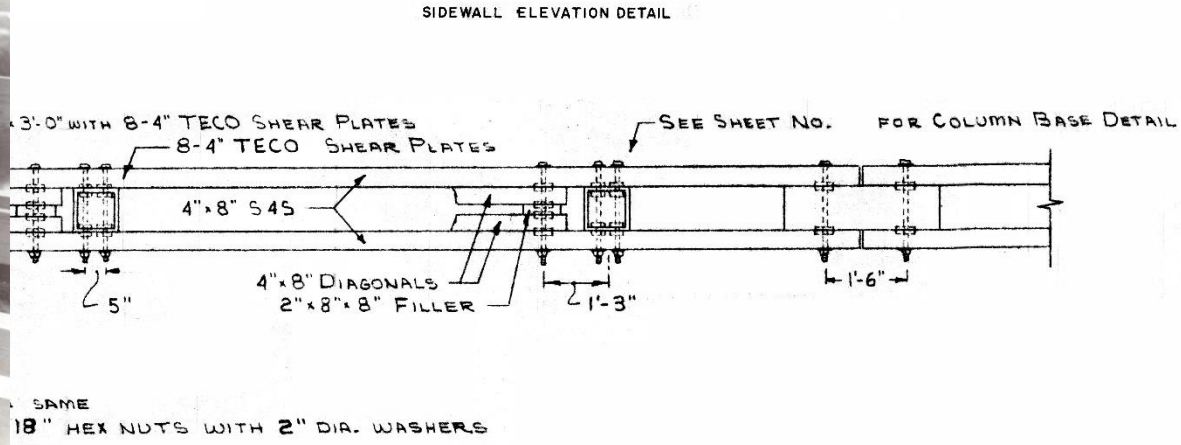
SCHEMATIC DIAGRAM OF MOMENT CONNECTION CREATED BY EXTENDING THE COLUMN TO THE RAFTER

18 in. long HSS STEEL SOCKET 10 x 10 x ¼ in. cross-section

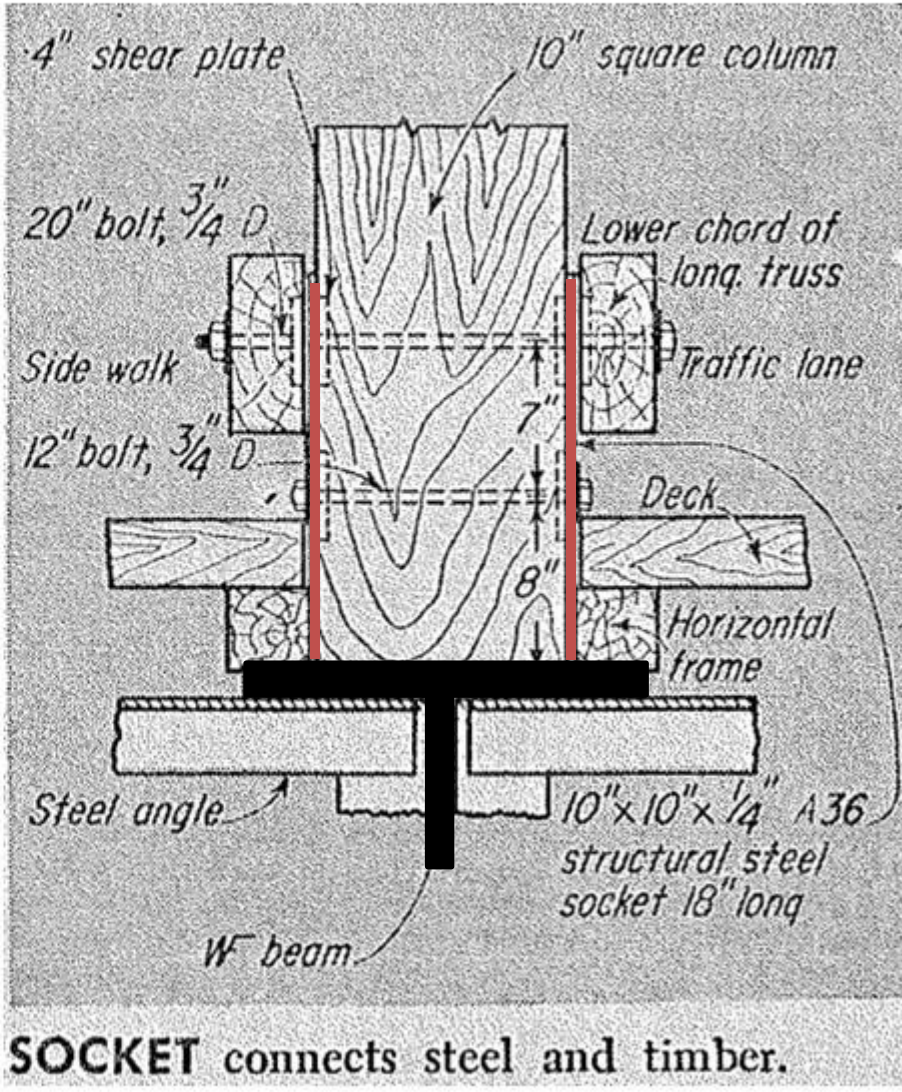


FRAMING AND SIDE WALL ELEVATION

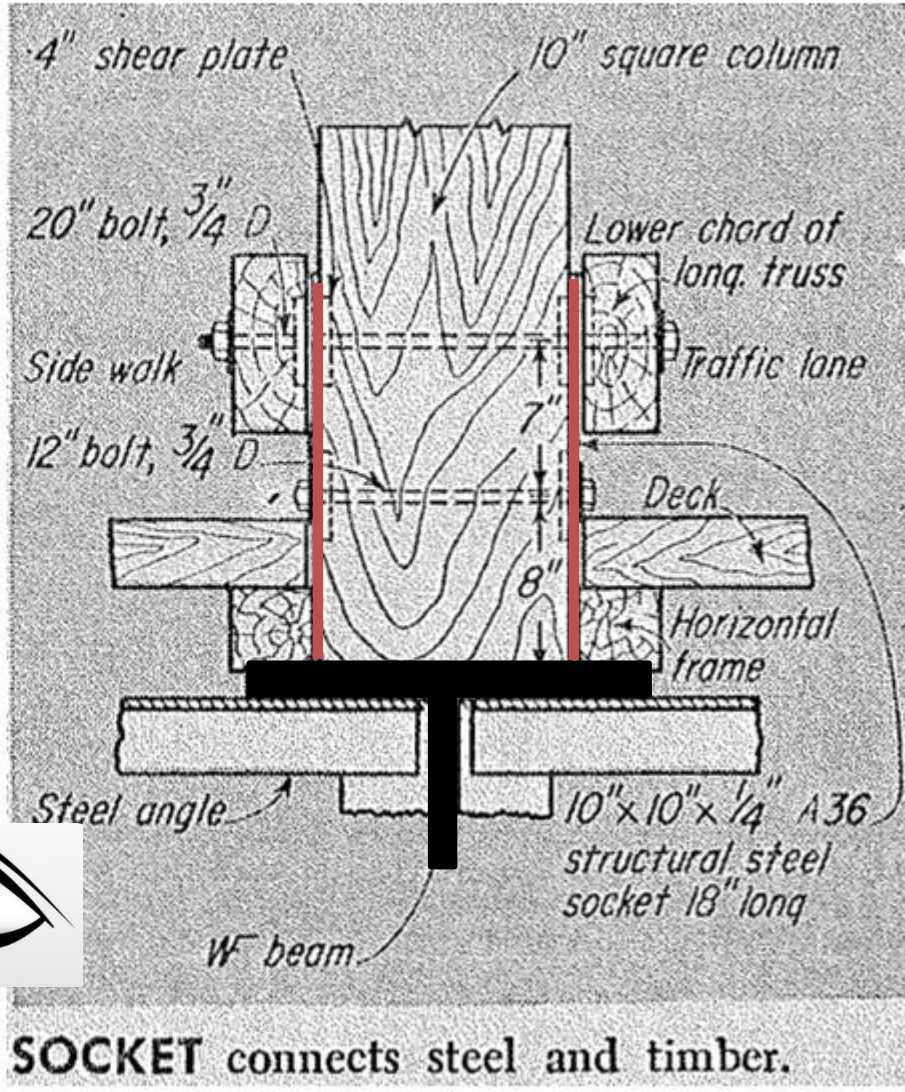




PLAN OF BOTTOM CHORD

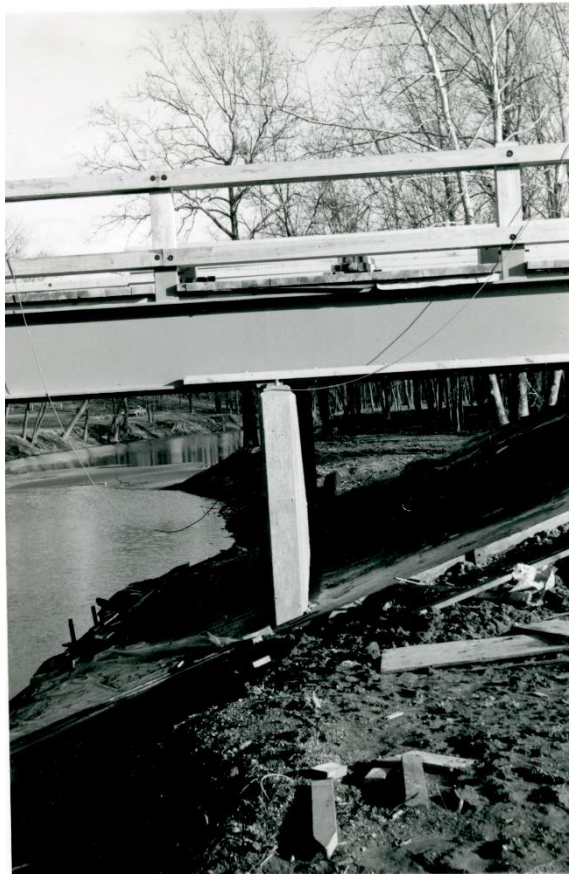


SOCKET connects steel and timber.



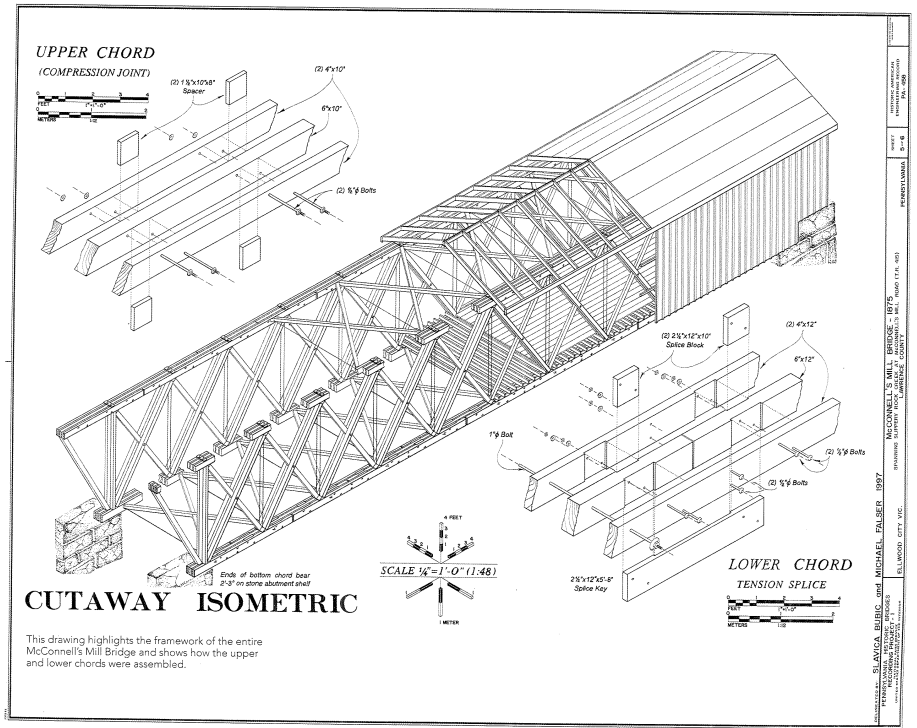
SOCKET connects steel and timber.

CONSTRUCTION




DANGER
KEEP OFF
BRIDGE

CONCLUDING REMARKS


UPPER CHORD
(COMPRESSION JOINT)
(2) 1⅛"x10"x8" Spacer
(2) 4"x10"
6"x10"
(2) ⅝"ϕ Bolts
(2) 2½"x12"x10" Splice Block
(2) 4"x12"
6"x12"
1"ϕ Bolt
(2) ⅝"ϕ Bolts
(2) ⅝"ϕ Bolts
2½"x12"x5'-8" Splice Key
LOWER CHORD
TENSION SPLICE
Ends of bottom chord bear 2'-3" on stone abutment shelf
SCALE ¼"=1'-0" (1:48)
CUTAWAY ISOMETRIC
This drawing highlights the framework of the entire McConnell's Mill Bridge and shows how the upper and lower chords were assembled.
McCONNELL'S MILL BRIDGE - 1875
SLAVICA BUBIC and MICHAEL FALSER 1997
ELLWOOD CITY VIC.
PENNSYLVANIA


COVERED BRIDGE

USEFUL RESOURCES/ REFERENCES

Historic American Engineering Record (HAER)

National Historic Covered Bridge Preservation (NHCBP)
A program of the **Federal Highway Administration (FHWA)**

Covered Bridge Manual, FHWA
(contains an exhaustive list of references)

National Center for Wood Transportation Structures
http://www.woodcenter.org (overseen by Iowa State University)

National Society for Preservation of Covered Bridges (NSPCB)

Covered Bridges: A Close-up Look, by Alan Giagnocavo