



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

by

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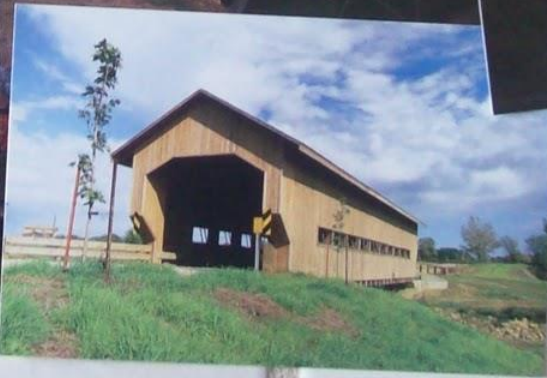
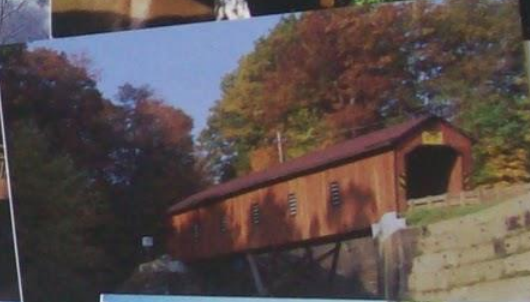
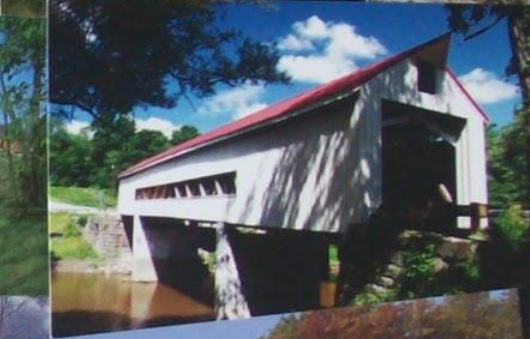
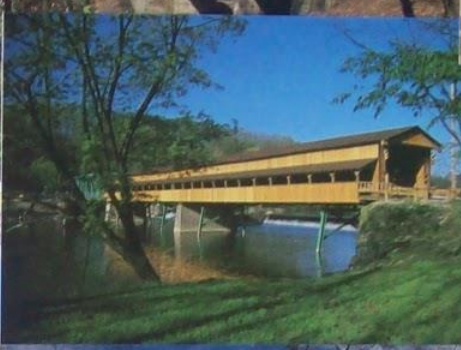
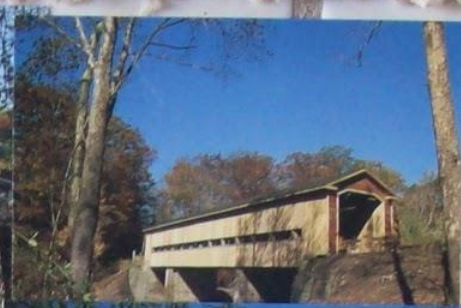
University of Illinois at Urbana-Champaign

102nd Annual Illinois Transportation and Highway Engineering

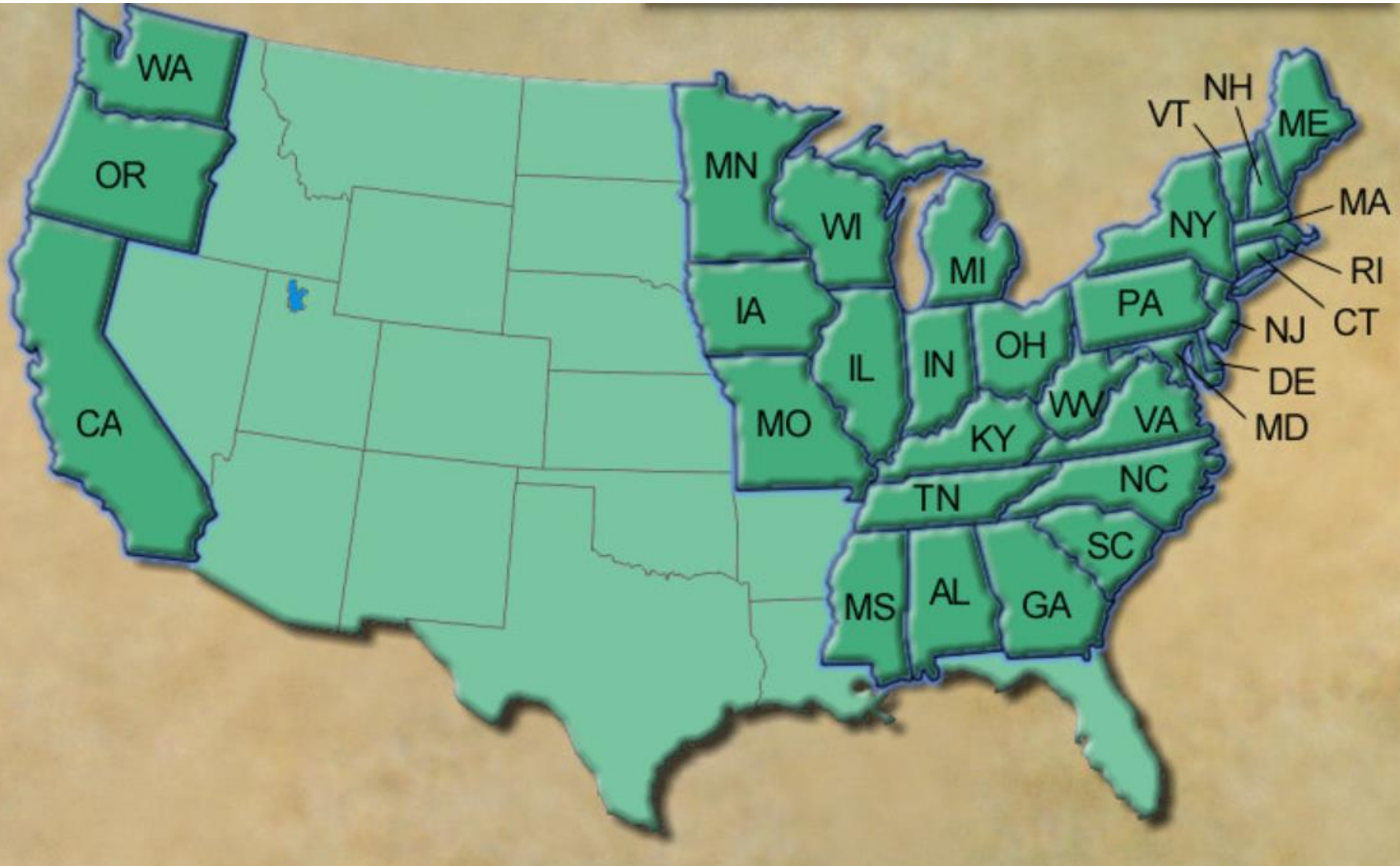
T.H.E. Conference, Champaign, IL

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

Welcome to the COVERED BRIDGE CAPITAL OF THE WORLD Parke County, IN

★ symbol represents location of the covered bridge. A star on the road represents bridge is open. A star near the road means bridge is not open to vehicular traffic.

- ★ **Beeson Bridge, 1906**
Closed, 55 feet, Entrance to Billie Creek Village.
- ★ **Big Rocky Fork, 1900**
Closed, 72 feet.
- ★ **Billie Creek Bridge, 1895**
Open, 62 feet, at Billie Creek Village.
- ★ **Bowsher Ford Bridge, 1915**
Open, 72 feet.
- ★ **Bridgeton Bridge, 2006**
Closed, 245 feet, Double-span.
- ★ **Catlin Bridge, 1907**
Closed, 54 feet, at the Parke County Golf Course.
- ★ **Conley's Ford Bridge, 1907**
Open, 192 feet.
- ★ **Cox Ford Bridge, 1913**
Open, 176 feet.
- ★ **Crooks Bridge, 1855-56**
Open, 132 feet.
- ★ **Harry Evans Bridge, 1908**
Open, 65 feet.
- ★ **Jackson Bridge, 1861**
Open, 207 feet, Longest Single Span in Parke County. White color.
- ★ **Leatherwood Station Bridge, 1899**
Closed, 72 feet, at Billie Creek Village.
- ★ **Mansfield Bridge, 1867**
Open, 247 feet, Double-span.
- ★ **Marshall Bridge, 1917**
Open, 56 feet.
- ★ **McAllister Bridge, 1914**
Open, 126 feet.
- ★ **Mecca Bridge, 1873**
Closed, 150 feet, Special Activities.
- ★ **Melcher Bridge, 1896**
Open, 83 feet.
- ★ **Mill Creek Bridge, 1907**
Open, 92 feet, (Tow Path Bridge)
- ★ **Narrows Bridge, 1882**
Closed, 121 feet, Over Sugar Creek at Turkey Run State Park.
- ★ **Neet Bridge, 1904**
Closed, 126 feet.
- ★ **Nevins Bridge, 1920**
Open, 155 feet.
- ★ **Phillips Bridge, 1909**
Open, 43 feet, King Post Truss Construction.
- ★ **Portland Mills Bridge, 1856**
Open, 130 feet, White Bridge.
- ★ **Roseville Bridge, 1910**
Open, 263 feet, Double-span.
- ★ **Rush Creek Bridge, 1904**
Open, 77 feet.
- ★ **Sim Smith Bridge, 1883**
Open, 84 feet, "Haunted Bridge".
- ★ **State Sanatorium Bridge, 1913**
Closed, 154 feet, Lightning Rods.
- ★ **Thorpe Ford Bridge, 1912**
Closed, 163 feet.
- ★ **West Union Bridge, 1876**
Closed, 315 feet, Longest Parke County, Indiana Covered Bridge, Double-span.
- ★ **Wilkins Mills Bridge, 1906**
Open, 102 feet.
- ★ **Zacke Cox Bridge, 1908**
Open, 54 feet.

All Covered Bridges Have Weight Limits of 5 Tons or Less.
765-569-5226 - Covered Bridge Info



- ### POINTS OF INTEREST
- ▲ Maple Syrup Camps (seasonal) - 765-569-5226
 - ▲ Art Gallery - 765-569-9428
 - ▲ Billie Creek Village - 765-569-3430
 - ▲ Bridgeton Mill - 765-548-0106
 - ▲ Dennis Hall - 765-569-9296
 - ▲ Evans-Loudermilk House - 765-569-9296
 - ▲ Governor Wright House - 765-569-3430
 - ▲ Historical Society Museum - 765-569-9293
 - ▲ Case 1822 Cabin - 765-548-0114
 - ▲ Lord Dound Barn - 765-569-9298
 - ▲ Lusk House - 765-597-8635
 - ▲ Marshall Mill - 765-544-1412
 - ▲ Marshall Arch - 765-569-9298
 - ▲ Mecca Schoolhouses - 765-569-9226
 - ▲ Old Jail Visitors Center - 765-569-9226
 - ▲ Depot Visitors Center - 765-569-3337
 - ▲ Parke County Courthouse
 - ▲ "3 Finger" Brown Memorial - 765-569-9226
- ### Golf Courses
- ▲ Parke County - 765-569-3556
 - ▲ Raccoon Lake - 765-544-1514
 - ▲ Turkey Dun - 765-435-9048
- ### Boat Rental & Canoeing
- ▲ Sugar Valley Canoeing & Cabins - 765-597-8564
 - ▲ Turkey Run Canoeing - 765-569-6705
 - ▲ Raccoon Lake Boat & Dock Rental - 765-544-1000
 - ▲ Raccoon Lake Boat Rental - 765-544-1889
 - ▲ Raccoon Creek Voyagers - 765-544-1005

- ### Horseback Riding
- ▲ Turkey Dun State Park - 765-597-9635
- ### National Historic Districts
- ▲ Bridgeton - 765-569-9296
 - ▲ Rockville - 765-569-9296
- ### CAMPING
- #### County Campgrounds
- ▲ Rockville Lake - 765-569-4541
 - ▲ Fairgrounds - 765-569-5686
- #### State Campgrounds
- ▲ Raccoon Lake - 765-544-1884
 - ▲ Turkey Dun - 765-597-9635
 - ▲ Shades - 765-435-8810

- ### Private Campgrounds
- ▲ Covered Bridge - 765-569-3911
 - ▲ Cherokee Village - 765-597-5029
 - ▲ Sugar Valley - 765-597-9264
 - ▲ Other/Seasonal - 765-569-9226
 - ▲ Country Haven Stables - 765-498-2532
 - ▲ McKinney's - 765-569-8567
 - ▲ Fuller Rock Park - 765-879-4351
 - ▲ Willow Grove RV Park - 765-546-4095
 - ▲ Sugar Creek - 765-597-9237
- ### HOSPITALS
- Located in Crawfordville, Greencastle, Brazil, Clinton and Danville, Illinois.

LODGING

ROCKVILLE

- ▲ Parke Bridge Motel
241 E. Ohio Street (US 30)
765-569-3325
www.parkebridgemotel.com
- ▲ Motel Forrest
107 E. 41st
765-569-9820
www.coveredbridge.com
- ▲ Covered Bridge Motel
107 E. 41st
765-569-9833
www.coveredbridgemotel.com
- ▲ Billie Creek Village & Inn
1826 E. US 30
765-569-2430
www.billiecreek.org
- ▲ Buckner House
103 N. Market Street
765-569-3430
www.billiecreek.org
- ▲ Miss Anna's
24 N. College Street
765-569-3660
www.annas.com
- ▲ Country Oak Resorts
2 miles North of Rockville
765-937-9639
www.countryoakresorts.com
- ▲ Knoll Inn Distinctive Suites
317 W. 110th Street
765-569-3445
www.knollinn.com
- ▲ Owl Nest Bed & Breakfast
303 Broadway Ave.
765-569-1855
www.owlnestinn.com

RACCOON LAKE

- ▲ Raccoon Lake Lodge
West side of Lake north of US 30
765-544-1002
www.raccoonlodge.com
- ▲ Eagle's Nest Bed & Breakfast
East of Butler Road (turn on 300 South)
765-544-1689
www.eaglesnestbfb.com
- ▲ Twin Lakes Gateway
103 East on Raccoon Lake
765-544-1337
www.twinklakesgateway.com

MANFIELD

- ▲ Mansfield Guest Inn
1/2 mile South of Mansfield Bridge
812-833-8111
www.coveredbridge.com
- ▲ Falls Rock Park
Restaurants & Campground
Located off US 41 in valley from US 30
765-478-4381
www.fallsrockpark.com

TURKEY RUN AREA

- ▲ Turkey Run Inn
Inside Turkey Run State Park
765-597-9231 or 877-500-8123
www.turkeyrun.org
- ▲ PCA National Conference Center
2.5 miles East of Turkey Run State Park
800-443-8781
www.pca.org
- ▲ Country Haven Cottage
East of America
765-498-9332
www.countryhaven.com
- ▲ Willow Mill Guesthouse
1/2 mile West of Turkey Run State Park
765-597-9246
www.willowmill.com
- ▲ Sugar Valley Camping Cabins
14 miles West of Turkey Run State Park
765-597-9239
www.sugarvalleycamping.com
- ▲ Cherokee Village Camping Cabins
1/2 mile West of Turkey Run State Park
765-597-9239
www.cherokeevillagecamping.com
- ▲ The Cabins at Robson Farms
1.8 miles North of Narrows Covered Bridge
765-574-7683
www.thecabinsatrobsonfarms.com

BRIDGETOWN (Downtown)

- ▲ Bridgeton House
765-548-0915
www.bridgetonhouse.com

MONTEZUMA

- ▲ Garwood's
103 W. in Walnut Street
765-416-8337
www.coveredbridge.com

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)

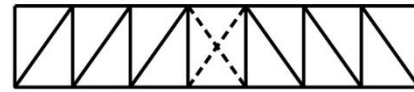


KINGPOST



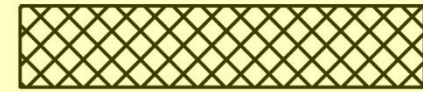
QUEENPOST

1



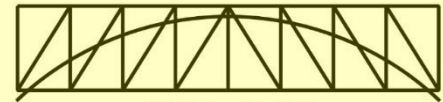
MULTIPLE KINGPOST

2



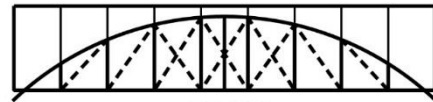
TOWN LATTICE

3



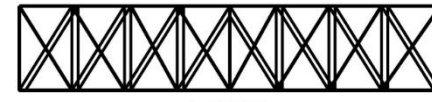
BURR ARCH

4



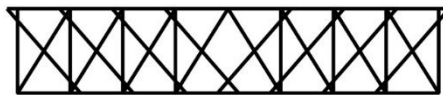
ARCH

5



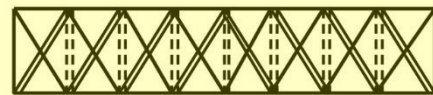
LONG

6



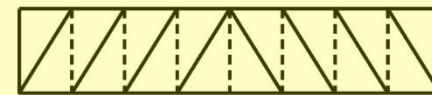
PADDFORD

7



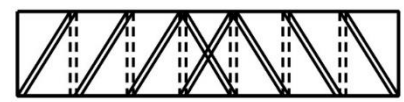
HOWE (Usual)

8



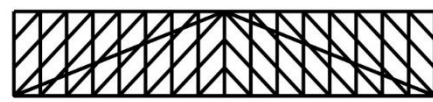
HOWE (Single)

9



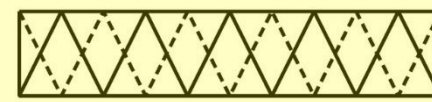
HOWE (Western)

10



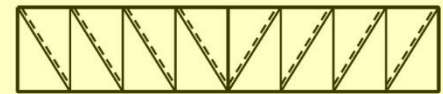
HAUPT

11



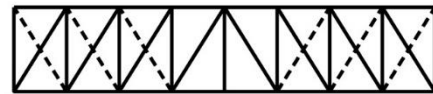
WARREN

12



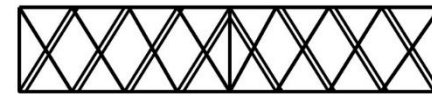
PRATT (Revised)

13



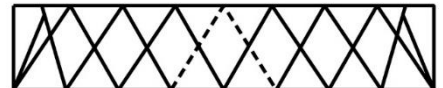
CHILDS

14



BROWN

15



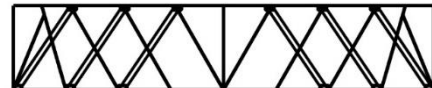
SMITH TYPE 2 & 3

16



SMITH TYPE 4

17



PARTRIDGE

18



POST

19



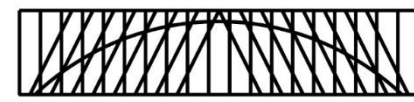
McCALLUM

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**

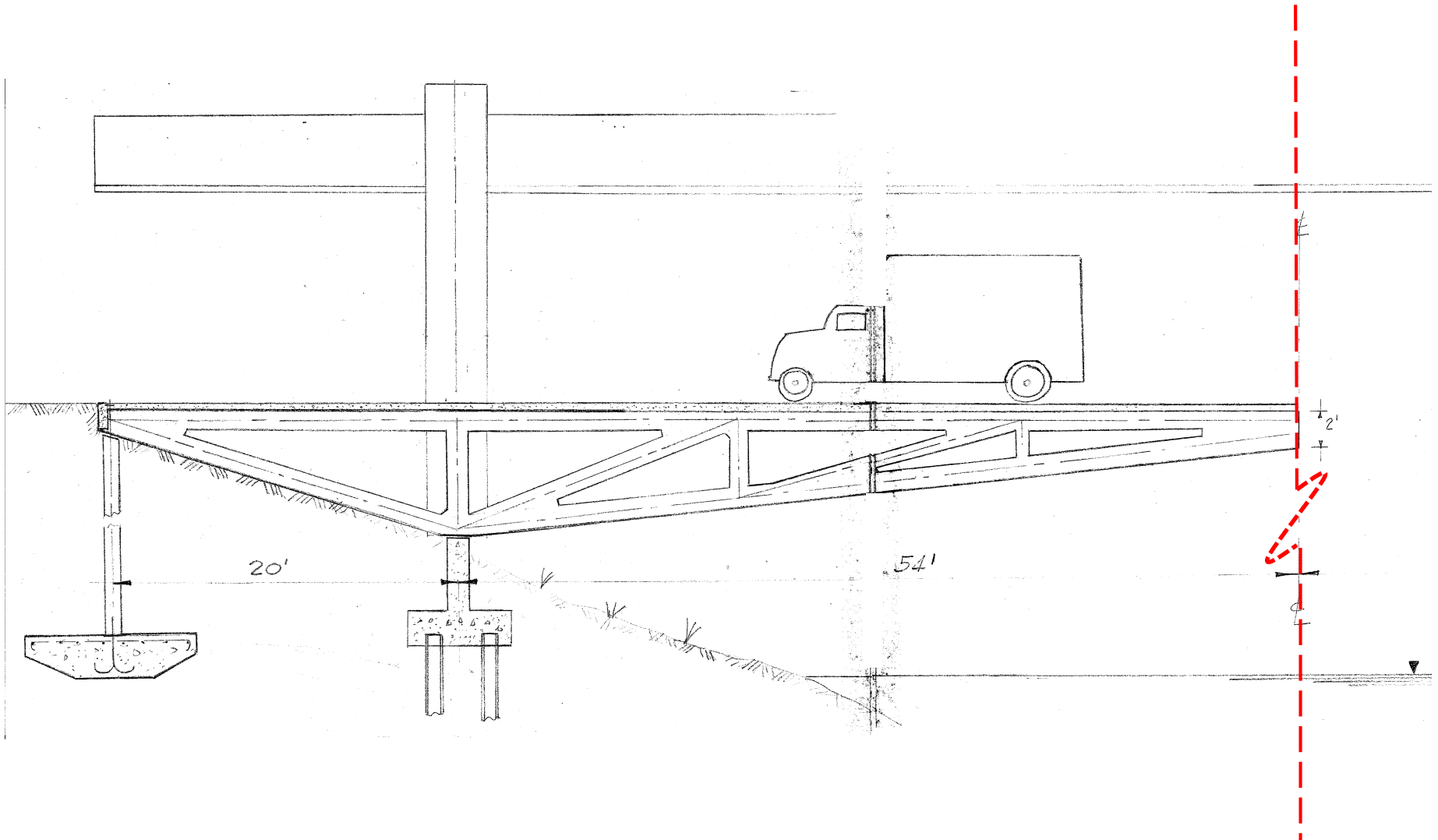
Cost: **\$ 71,000**



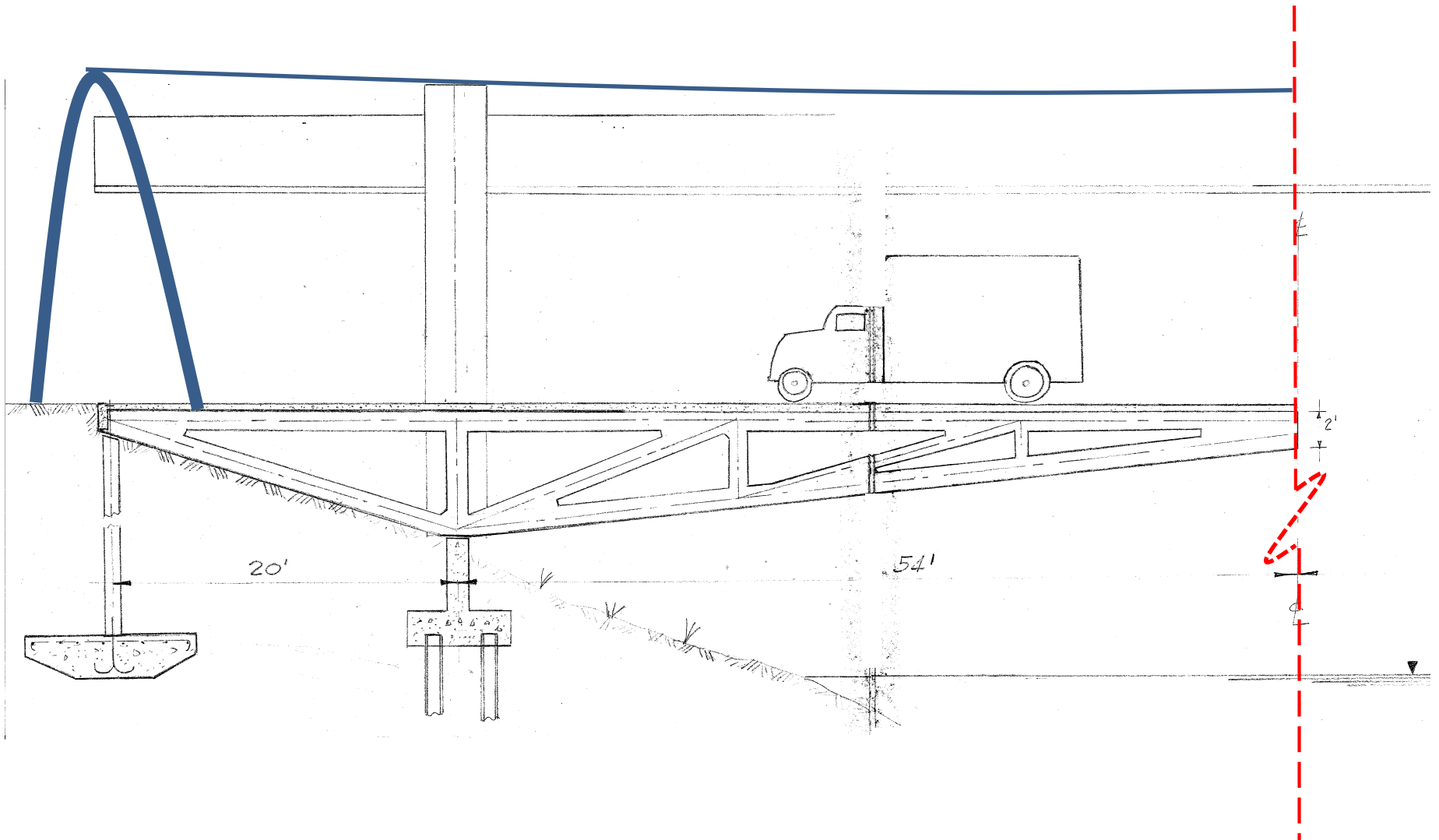
50TH ANNIVERSARY EVENT: 8.3.2015



POST-TENSIONED GIRDER PROPOSAL



POST-TENSIONED GIRDER PROPOSAL



'PEPPERELL BRIDGE' AND 'LAKE OF THE WOODS' BRIDGE



*you are invited to 36 S. of St. and it is a fine place
to visit. Hope it will reach you. All well. As*

PEPPERELL BRIDGE

'PEPPERELL BRIDGE' AND 'LAKE OF THE WOODS' BRIDGE



PEPPERELL BRIDGE

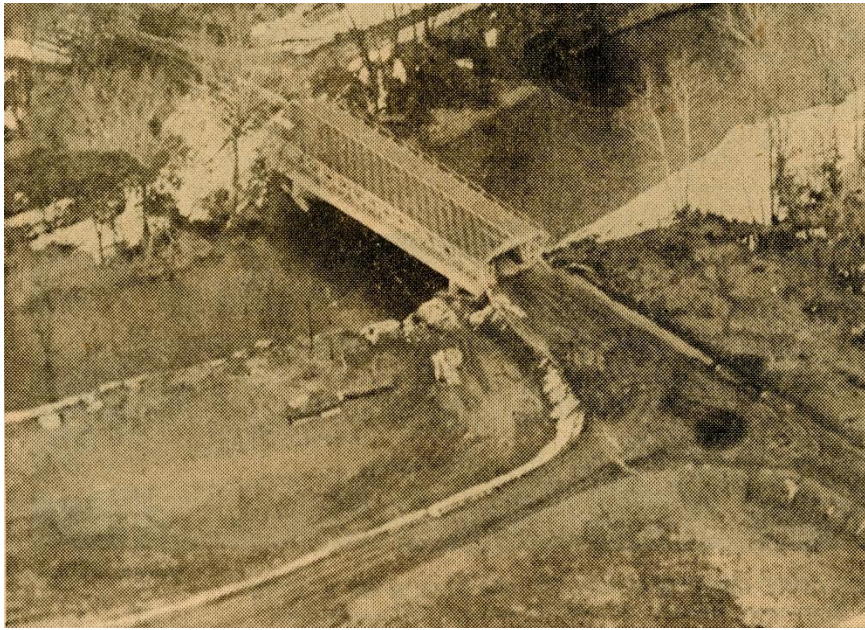


LAKE OF THE WOODS BRIDGE

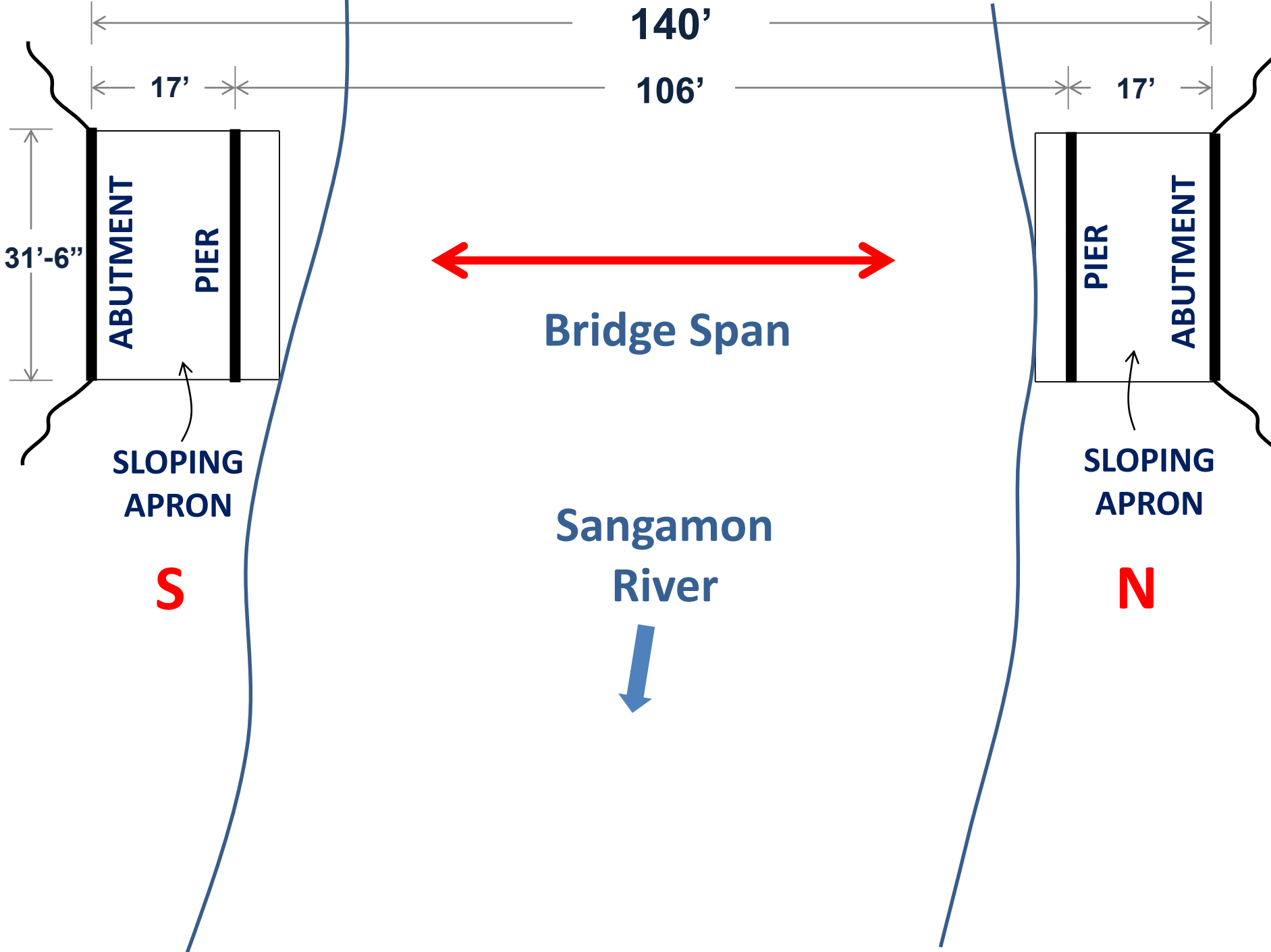
'LAKE OF THE WOODS' BRIDGE

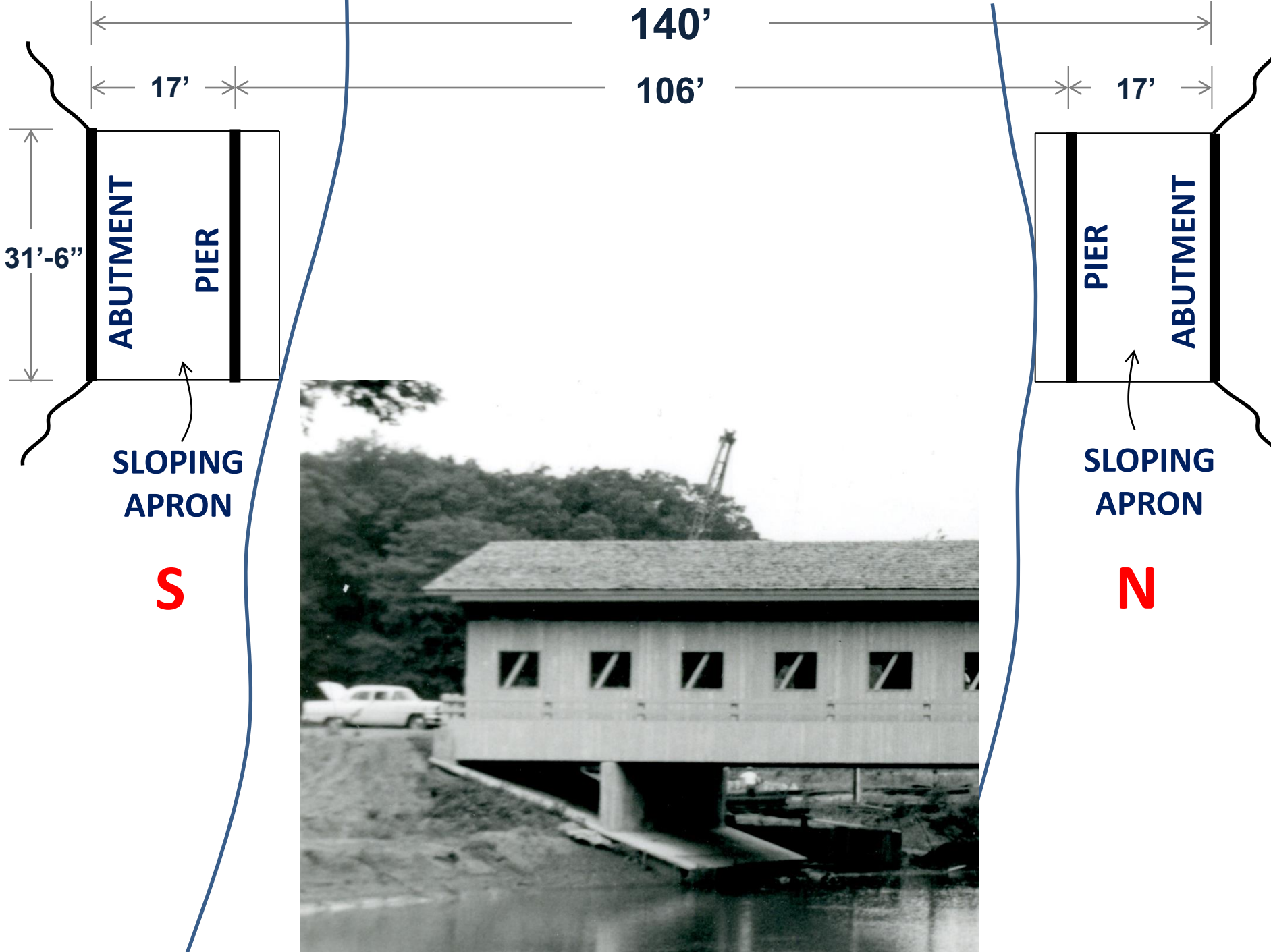


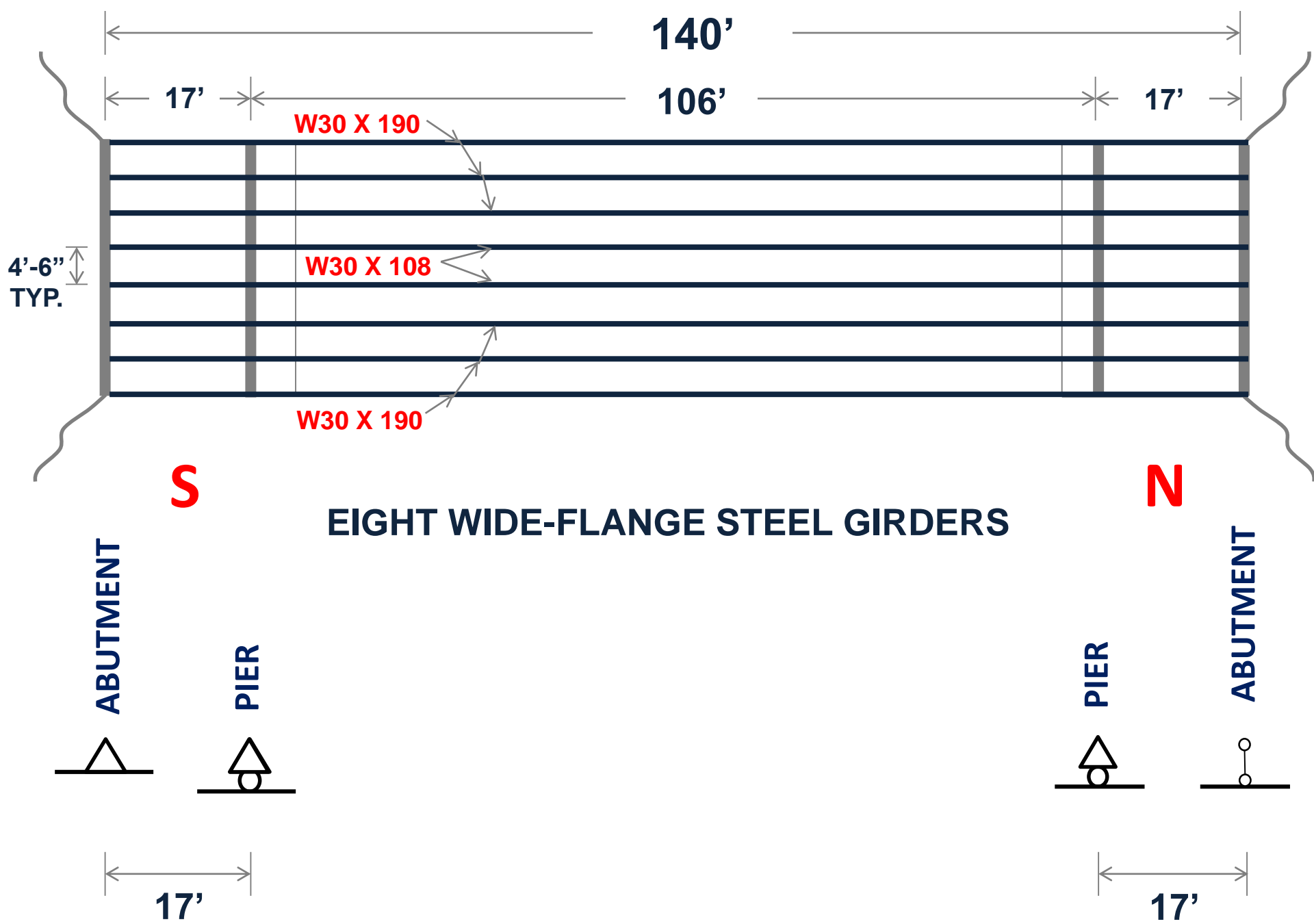


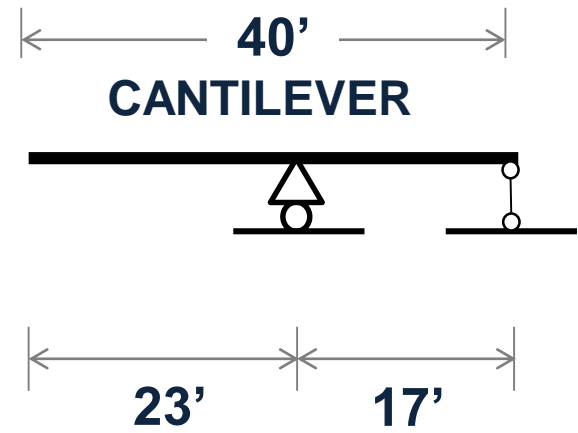
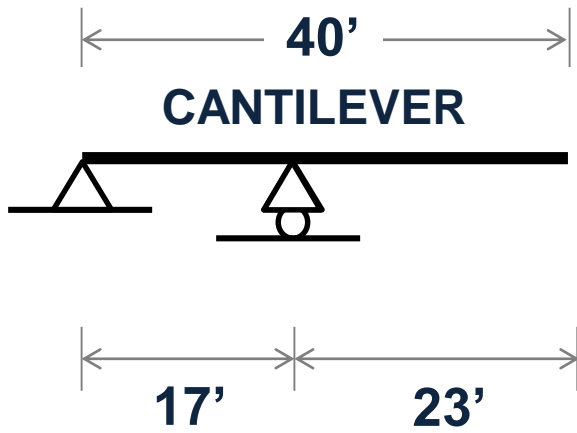
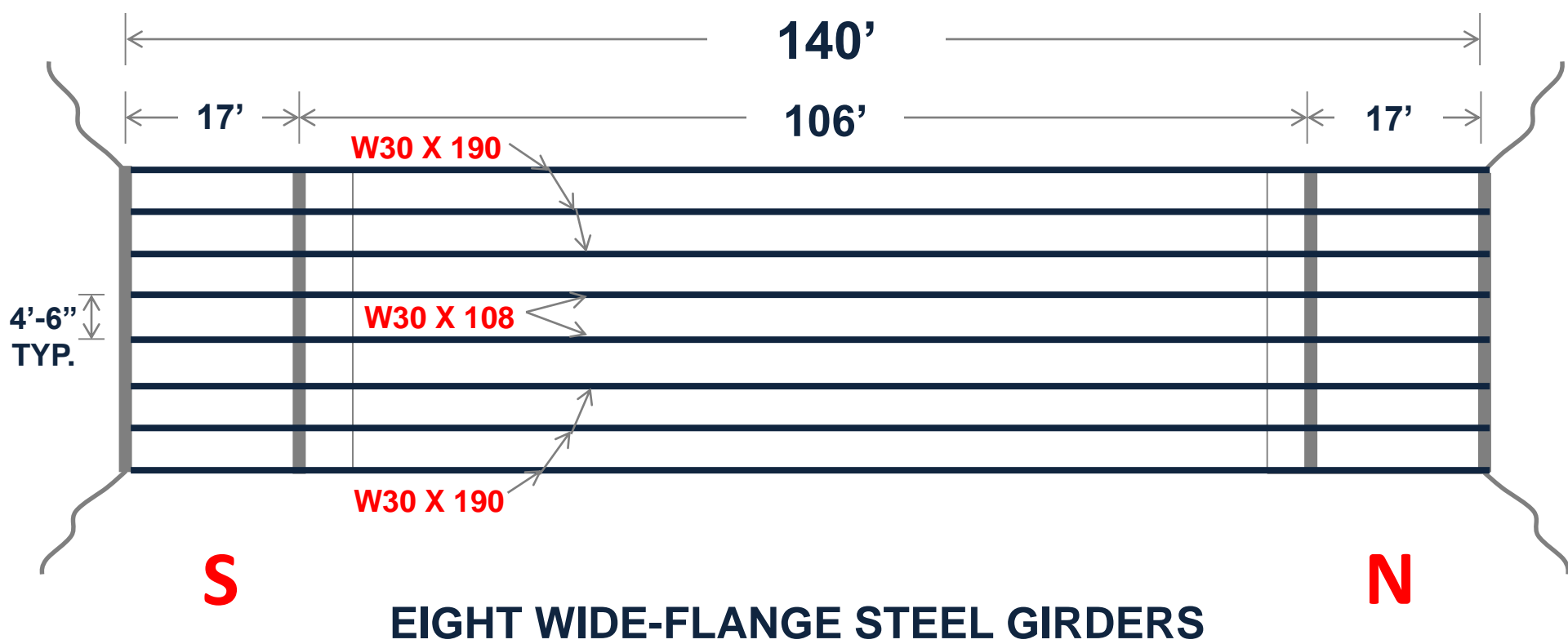


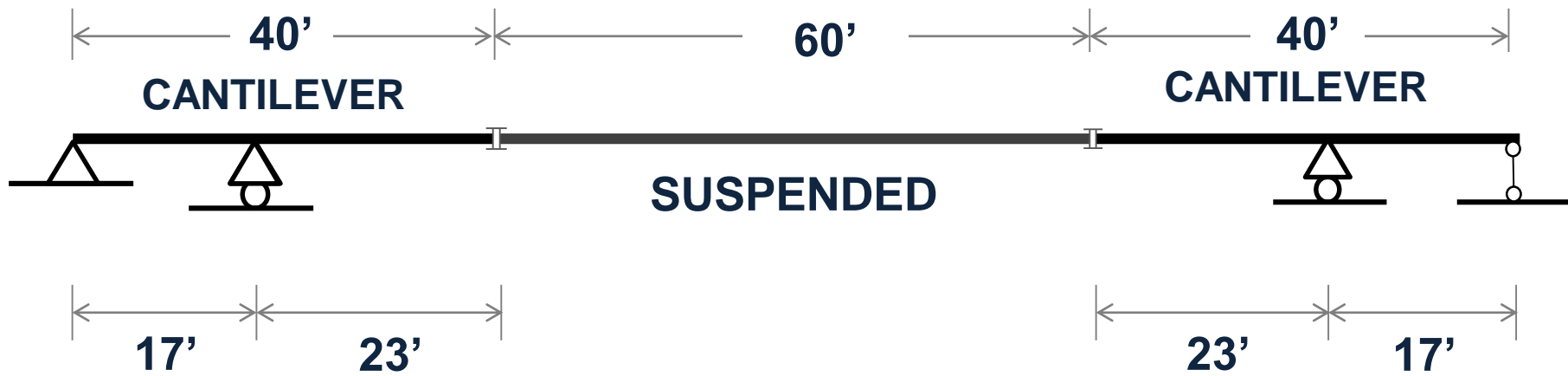
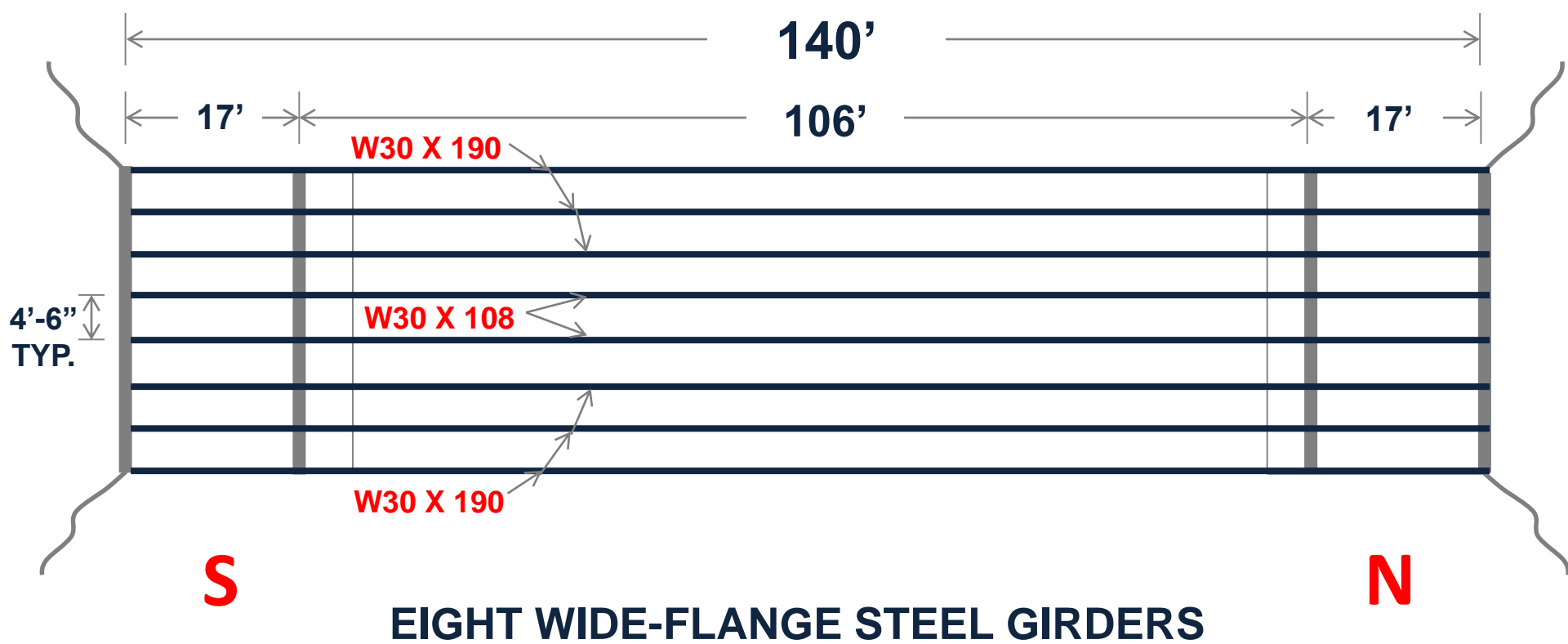
STRUCTURAL SYSTEM

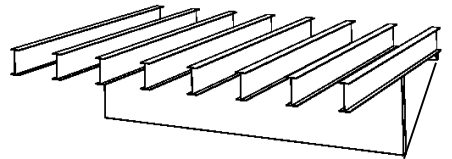
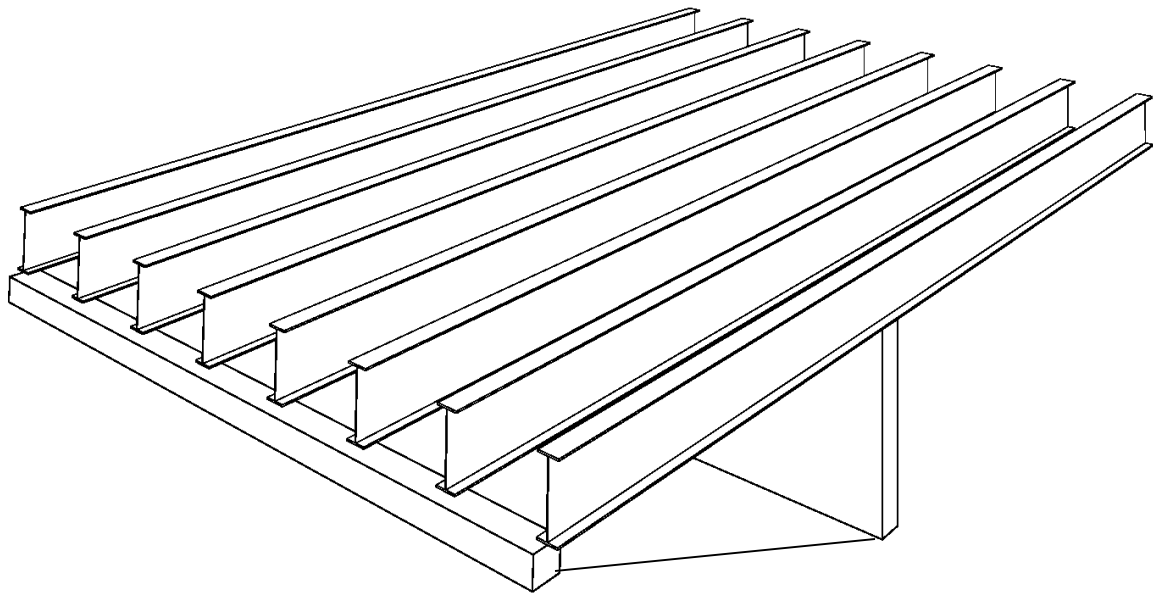


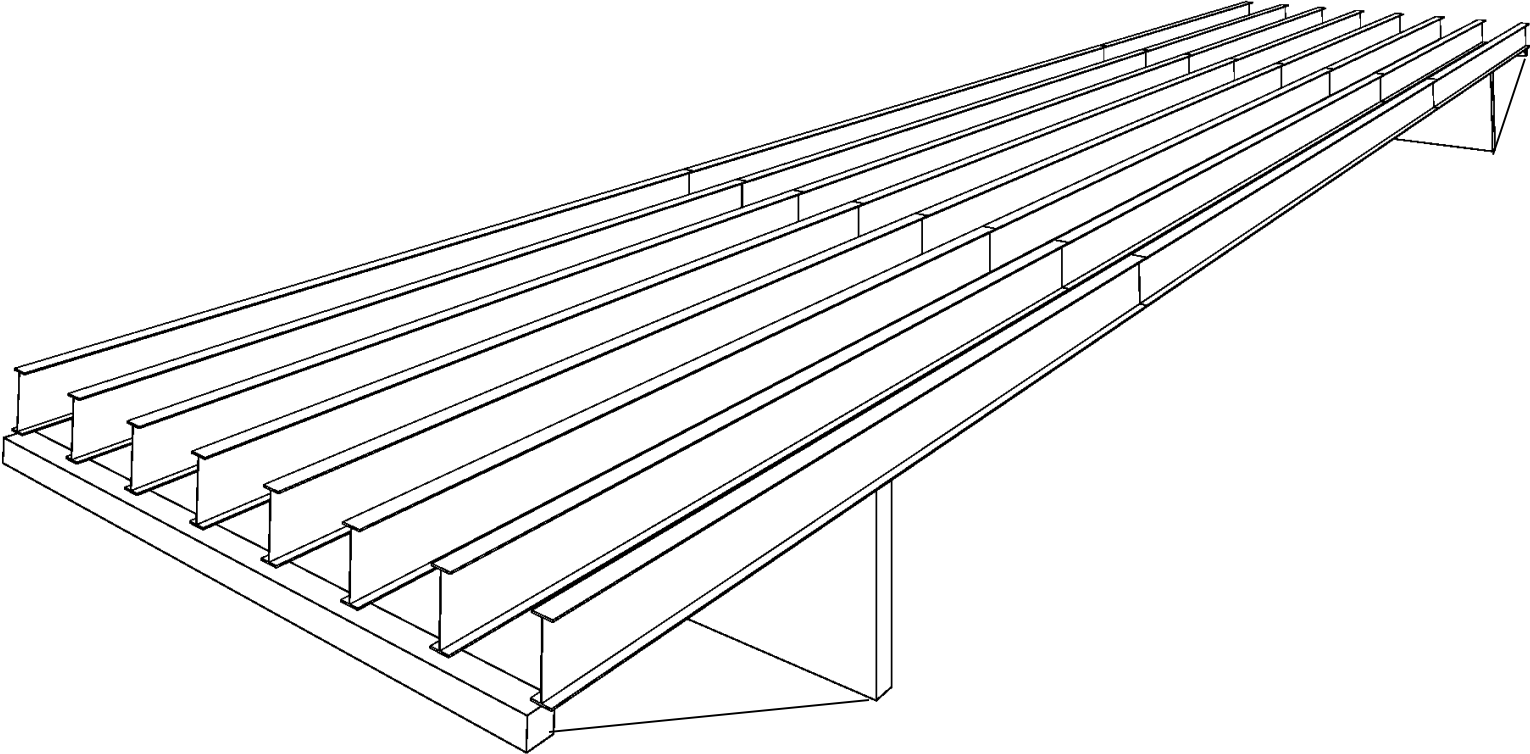


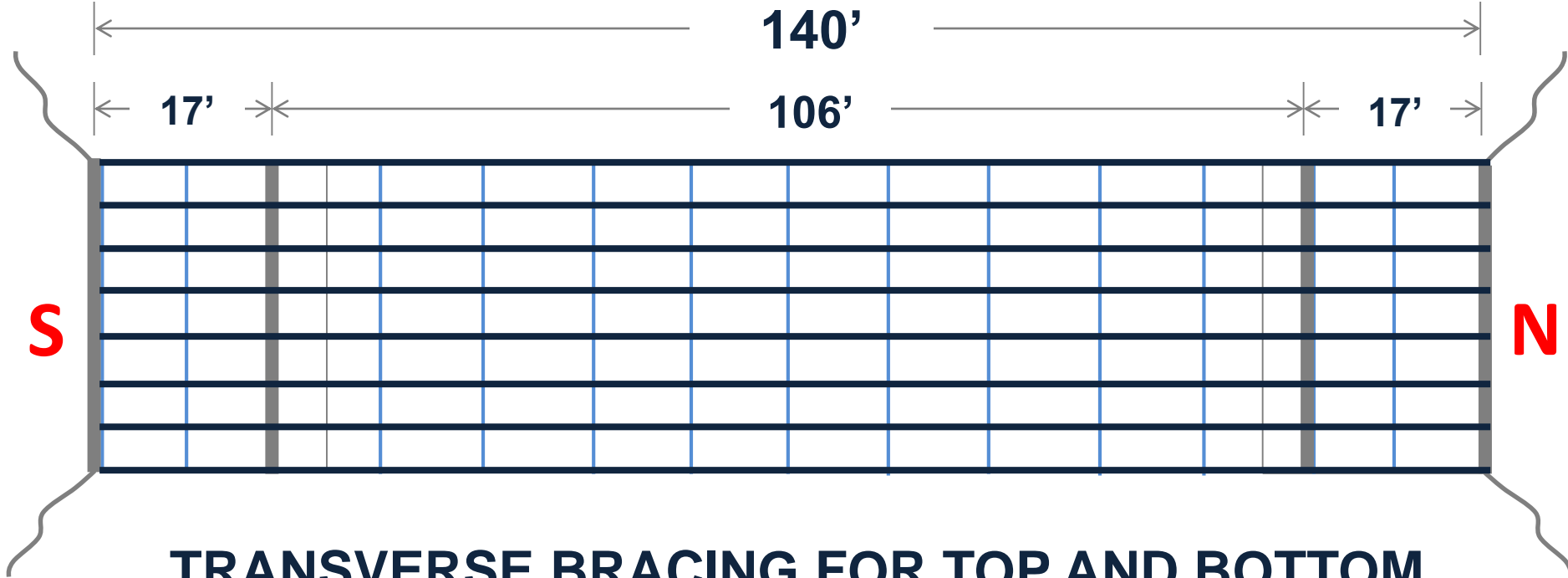




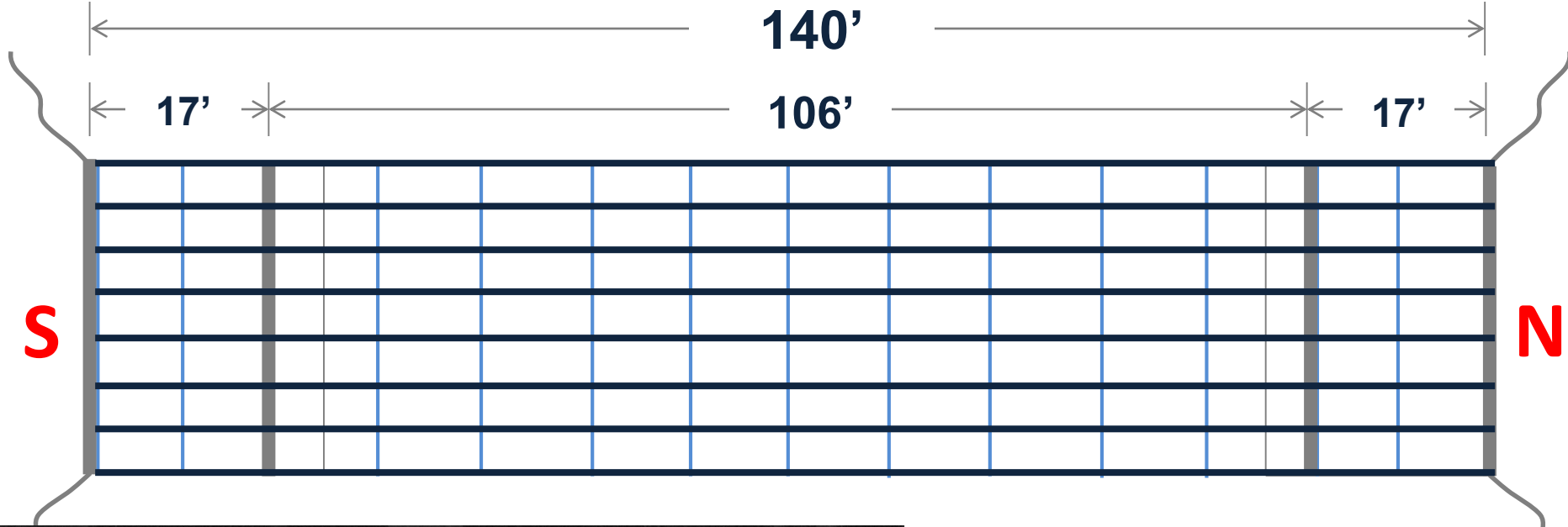








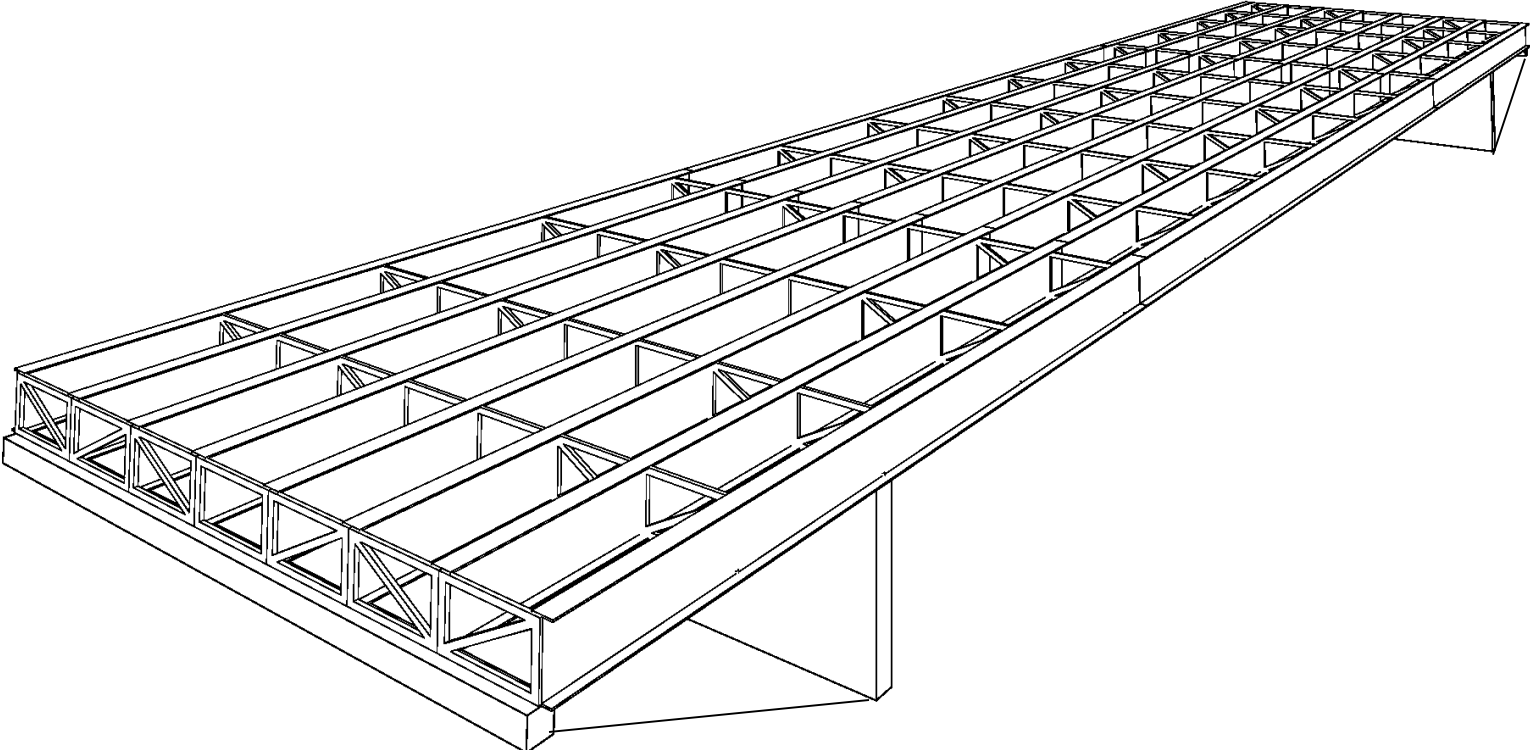
**TRANSVERSE BRACING FOR TOP AND BOTTOM
FLANGES OF GIRDERS
AT APPROX. 10 ft. o.c.**



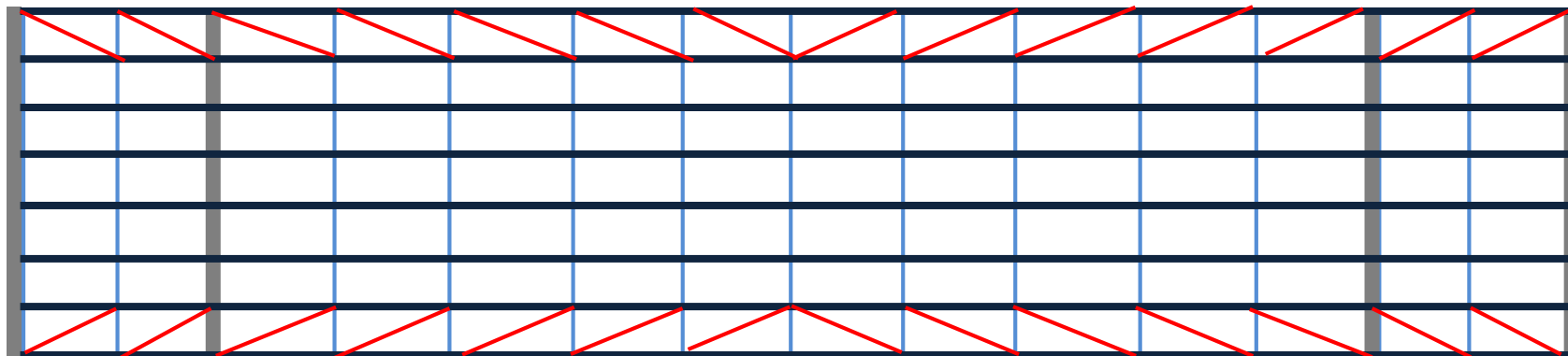
FULL CROSS-SECTION



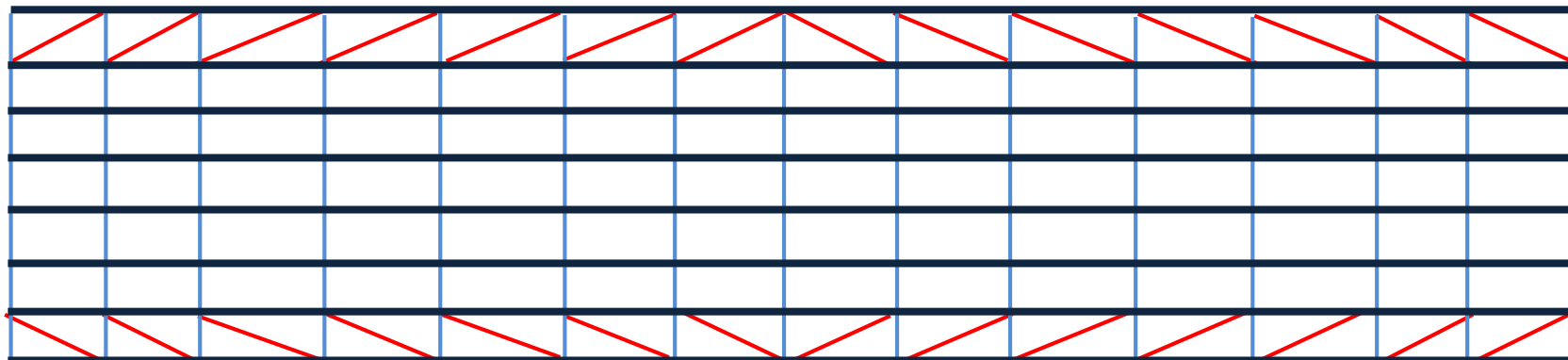
PARTIAL CROSS-SECTION



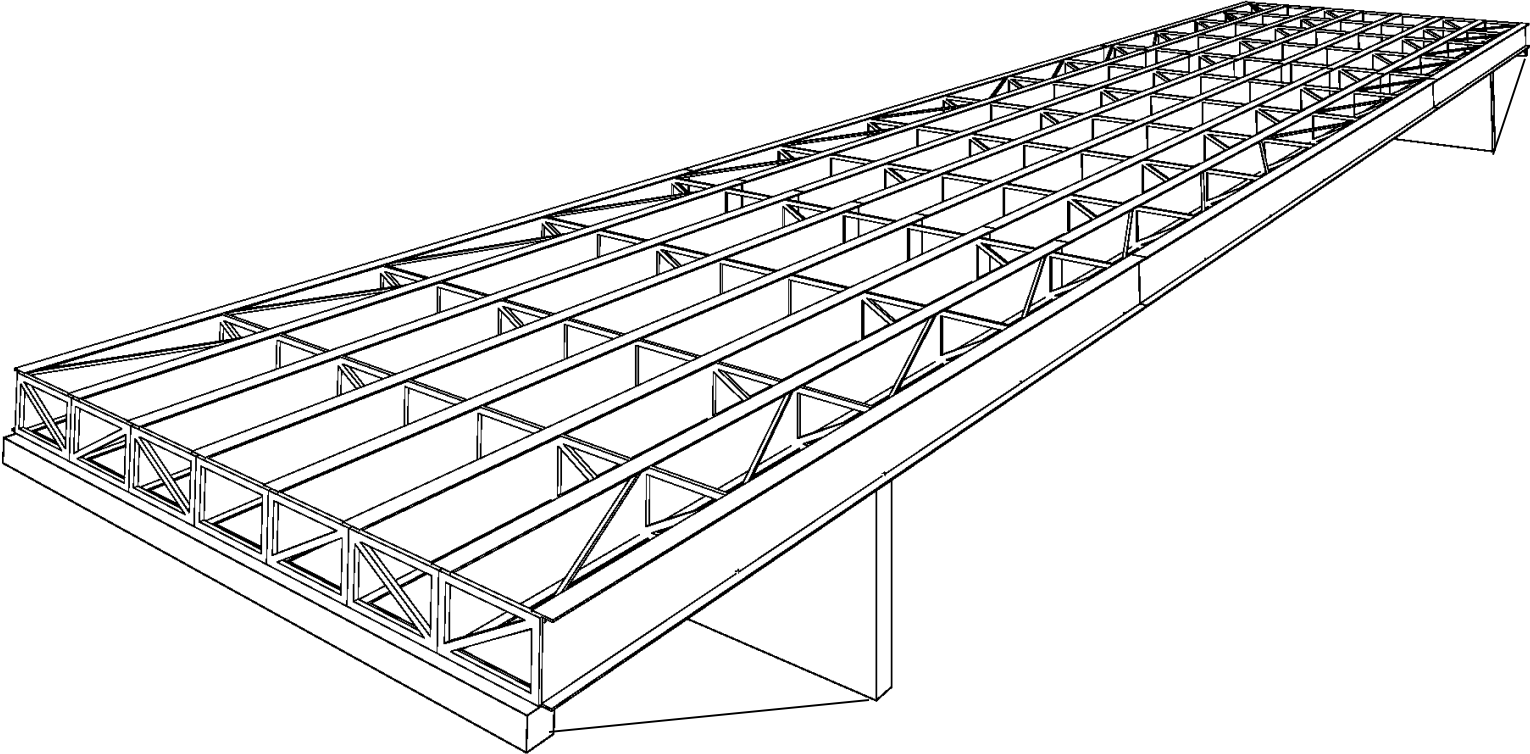
TWO LONGITUDINAL TRUSSES TO RESIST WIND EFFECTS



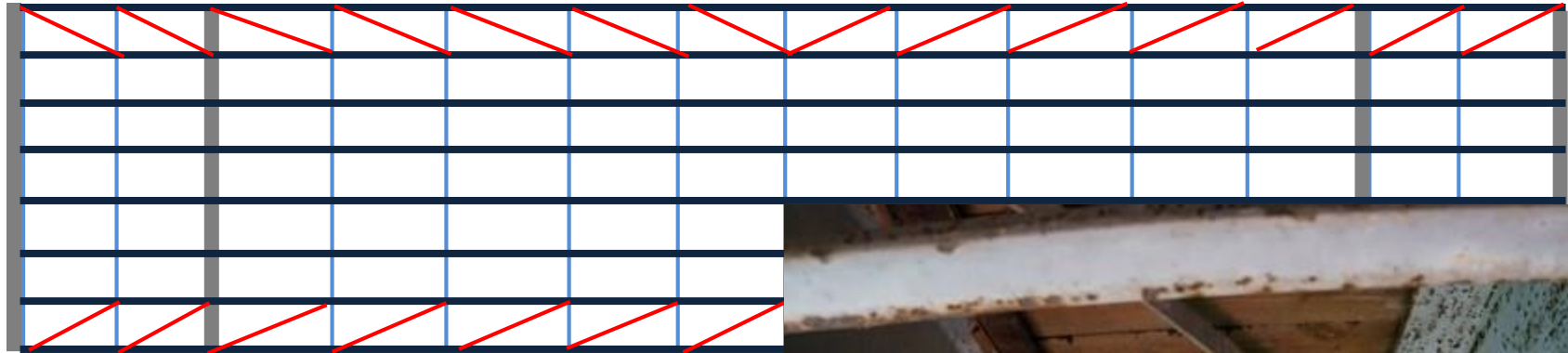
TOP FLANGE



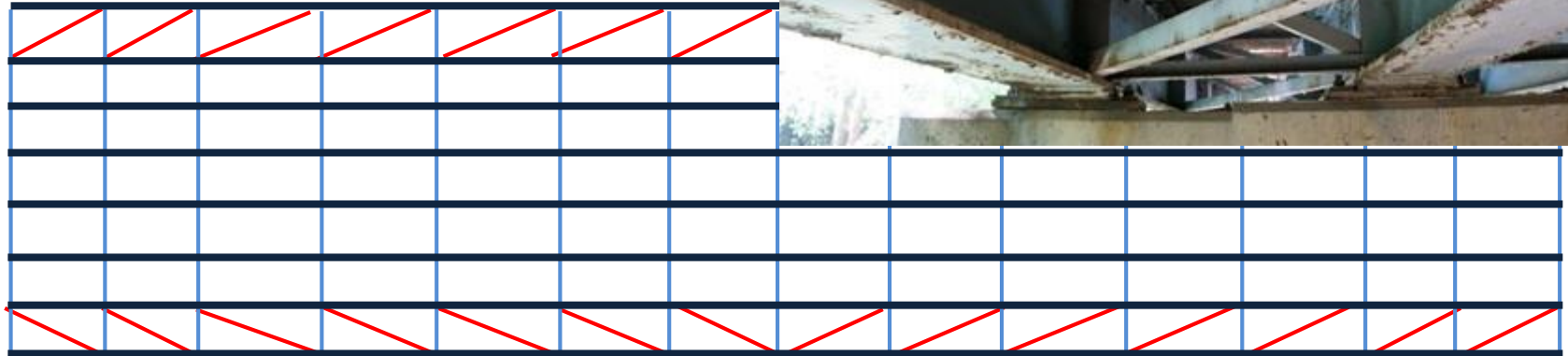
BOTTOM FLANGE



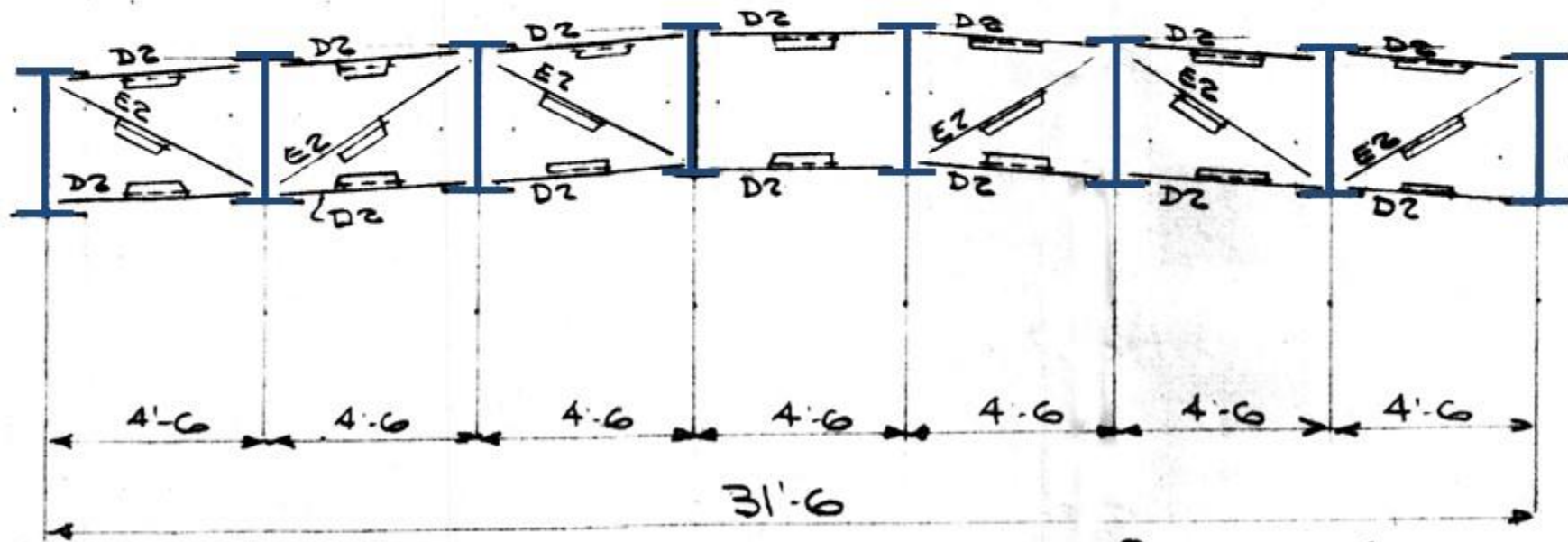
TWO LONGITUDINAL TRUSSES TO RESIST WIND EFFECTS



TOP FLANGE



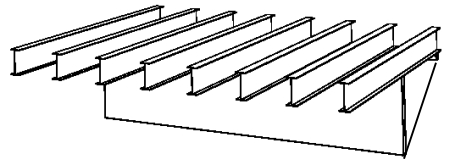
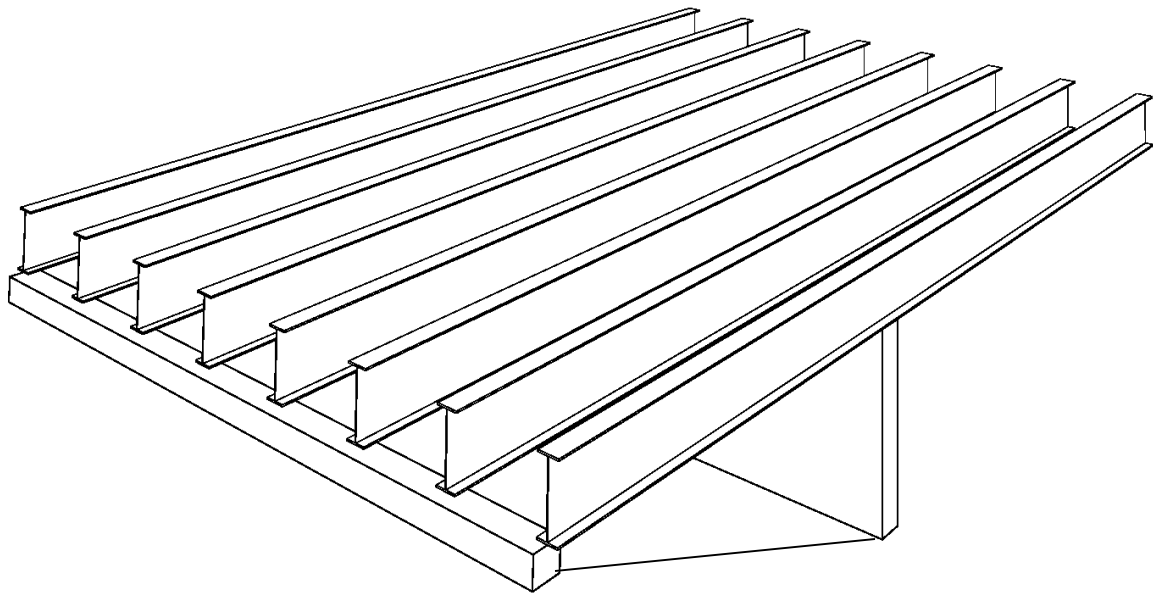
BOTTOM FLANGE

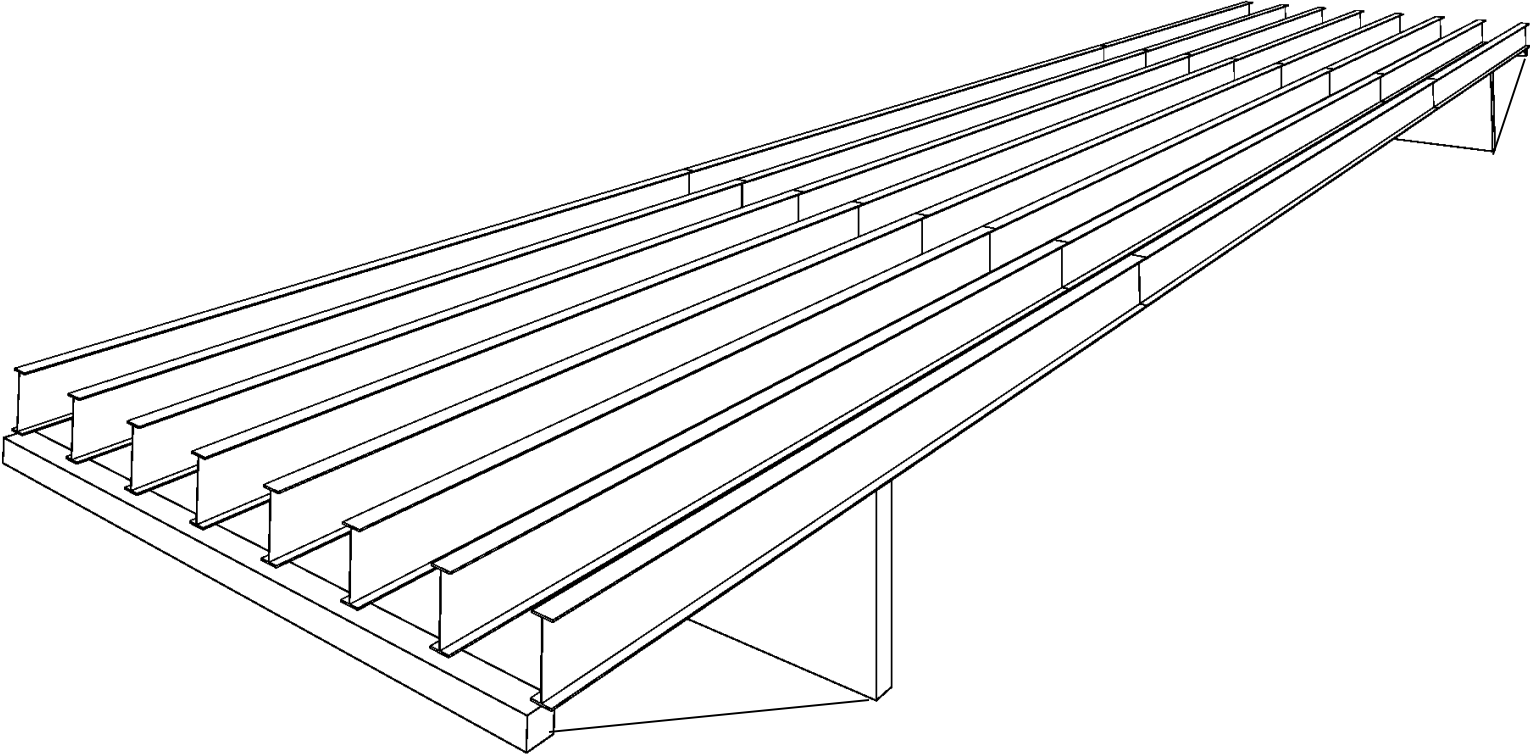


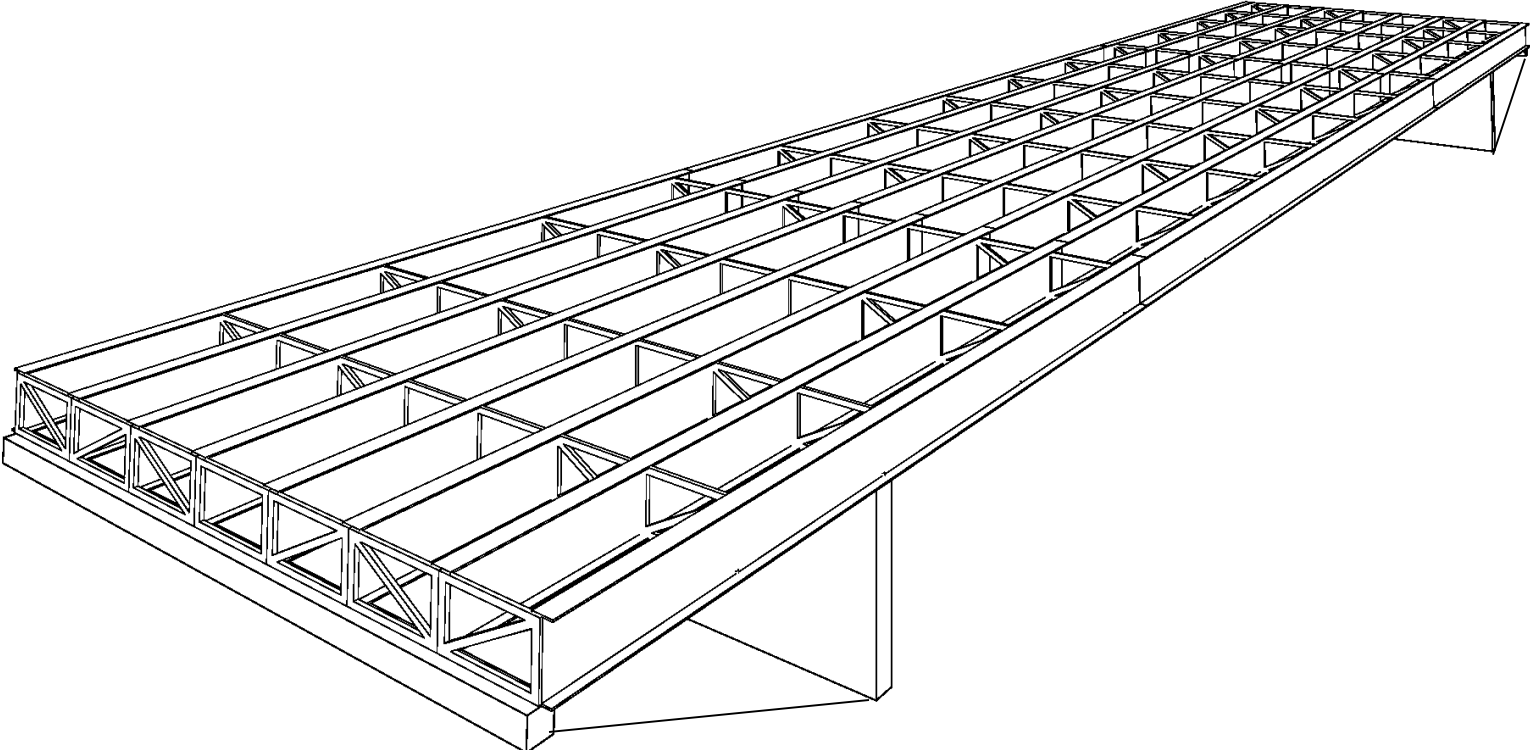
TRANSVERSE CAMBER (3 in.)

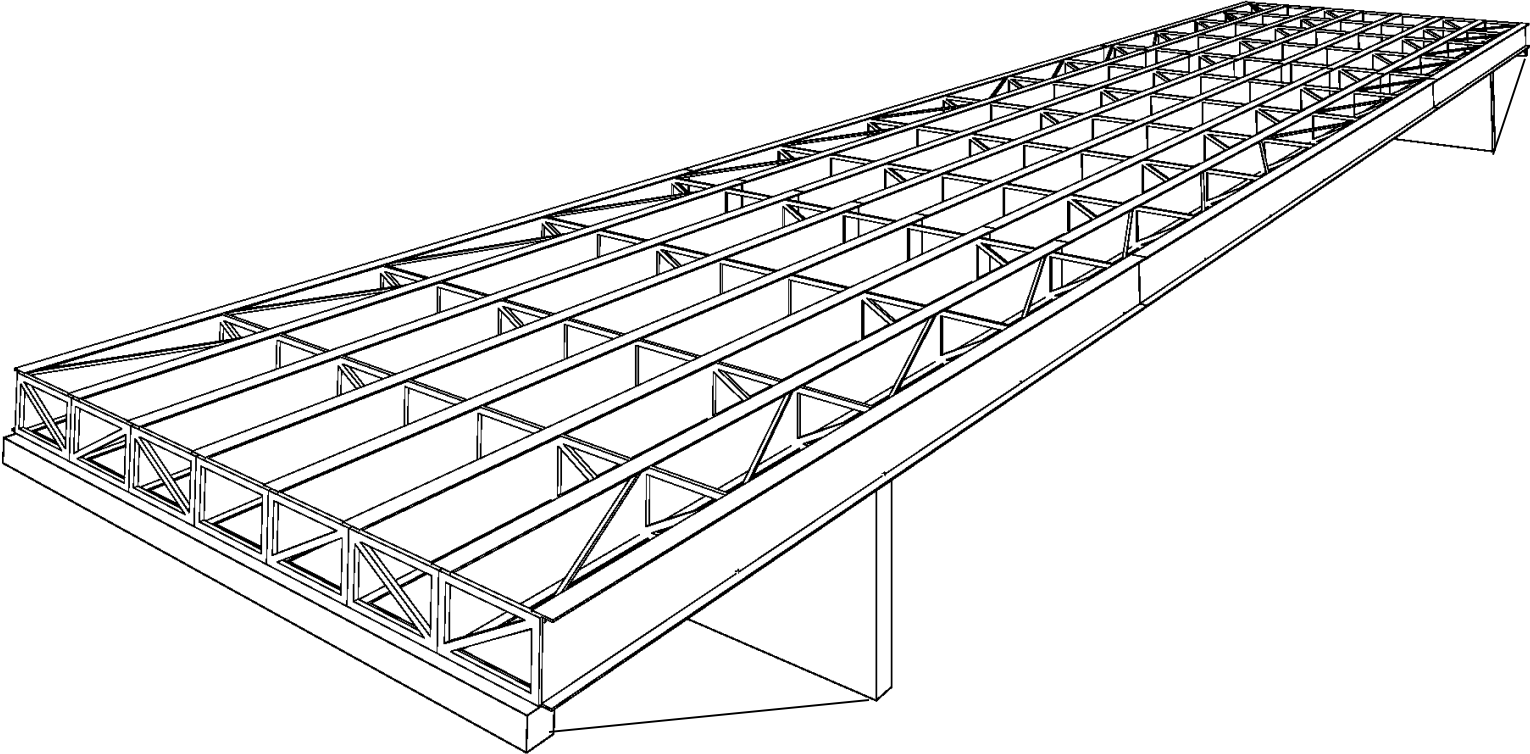


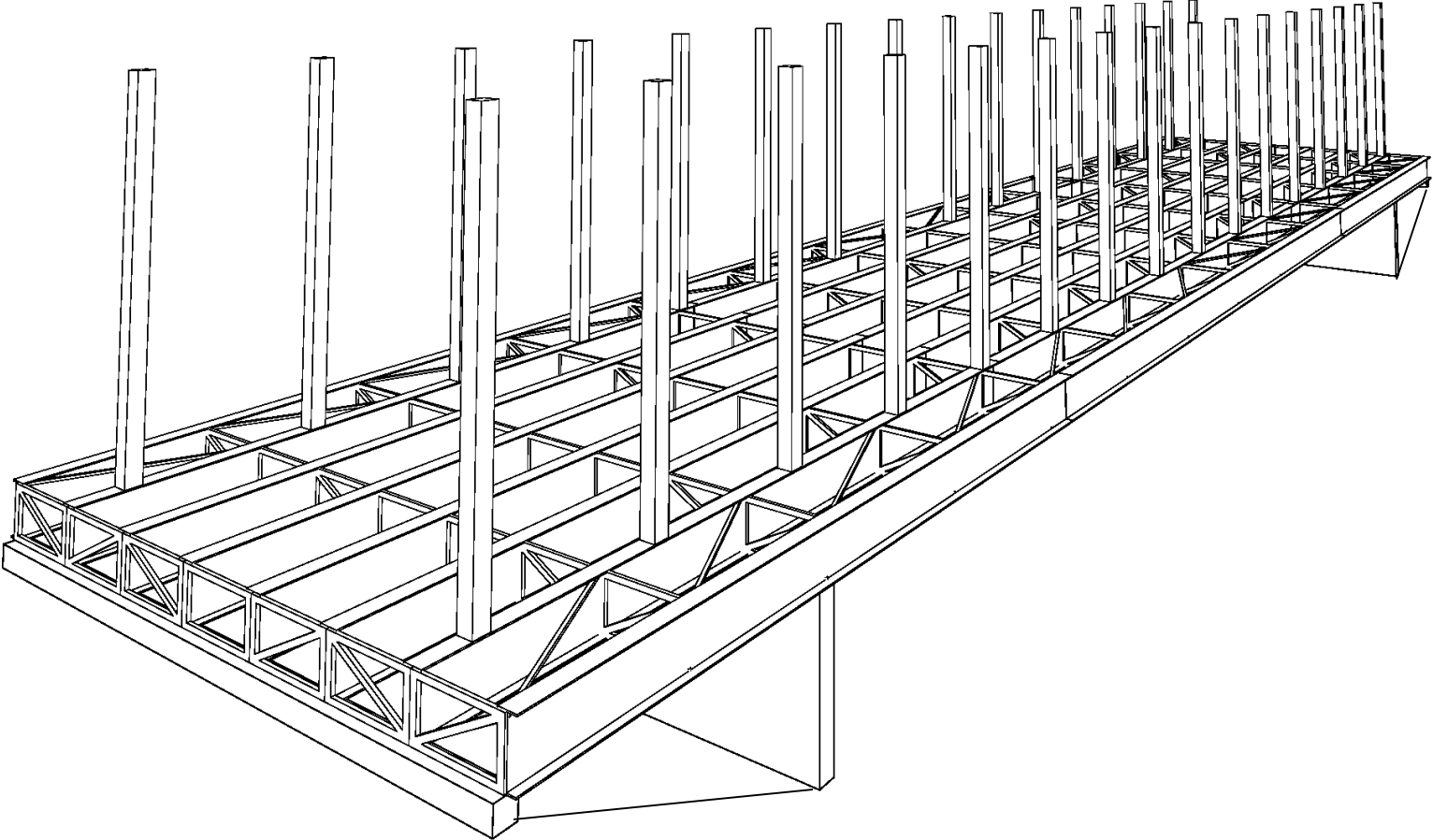
**LONGITUDINAL
CAMBER (4 in.)**

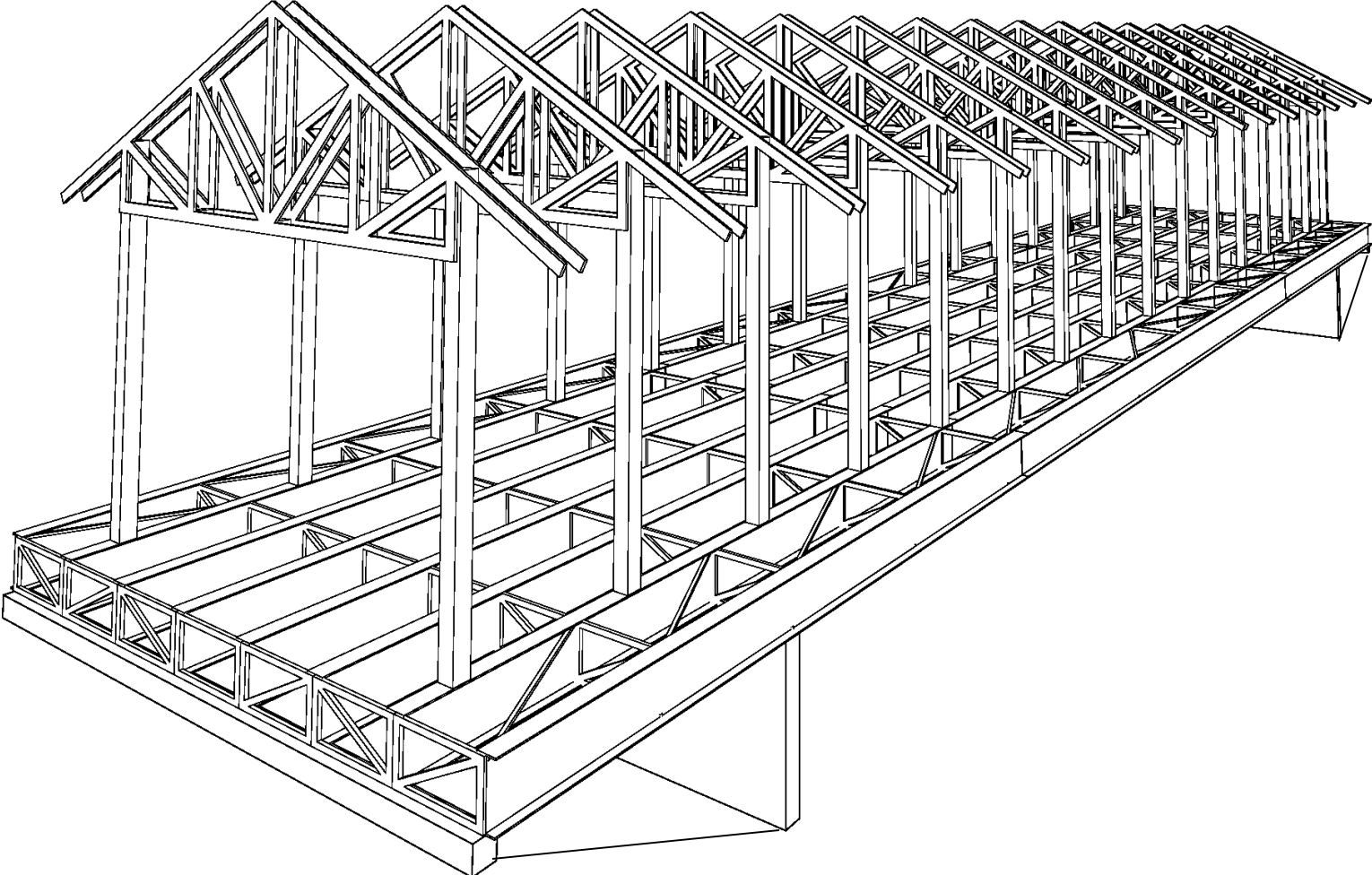


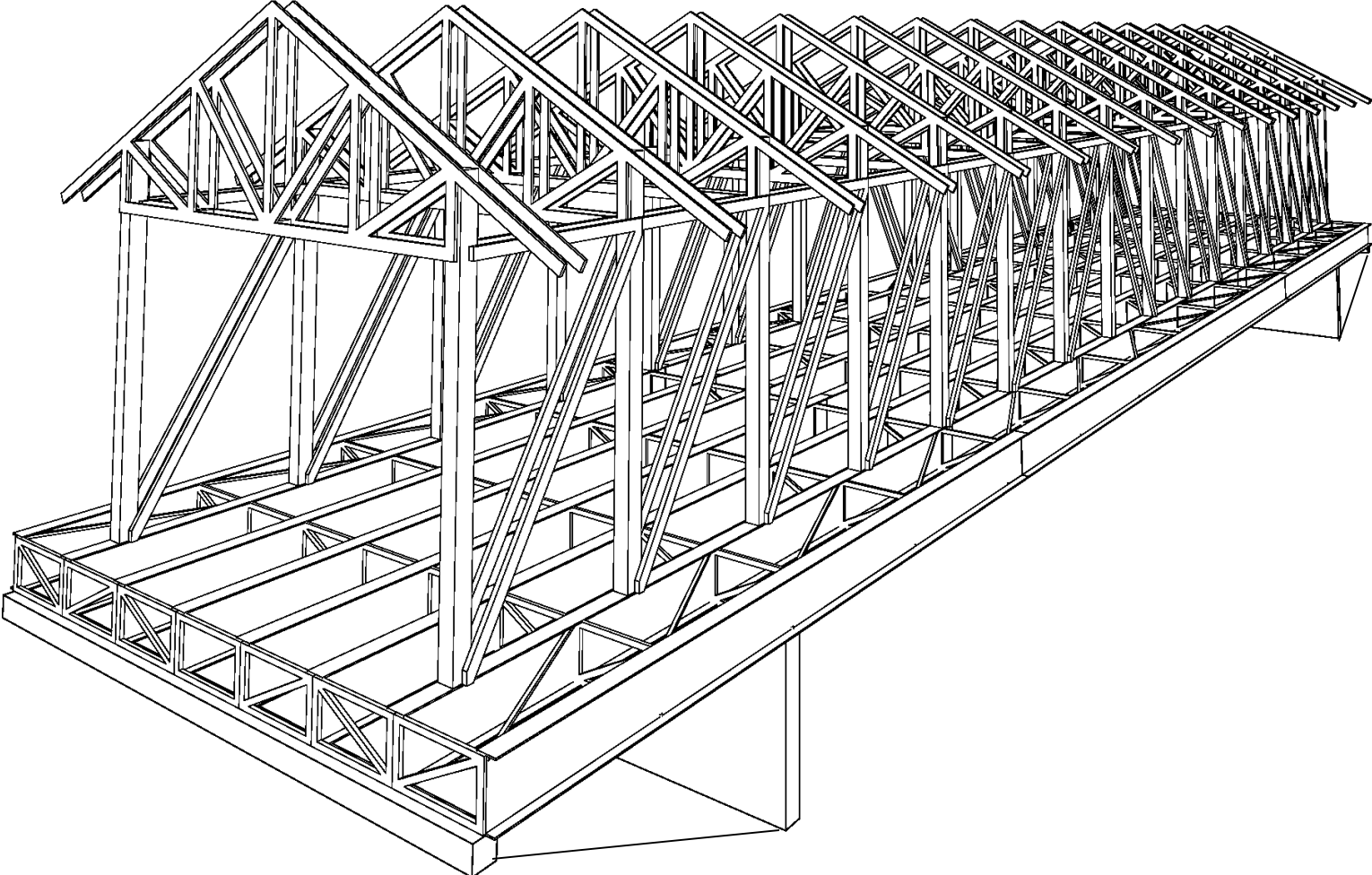


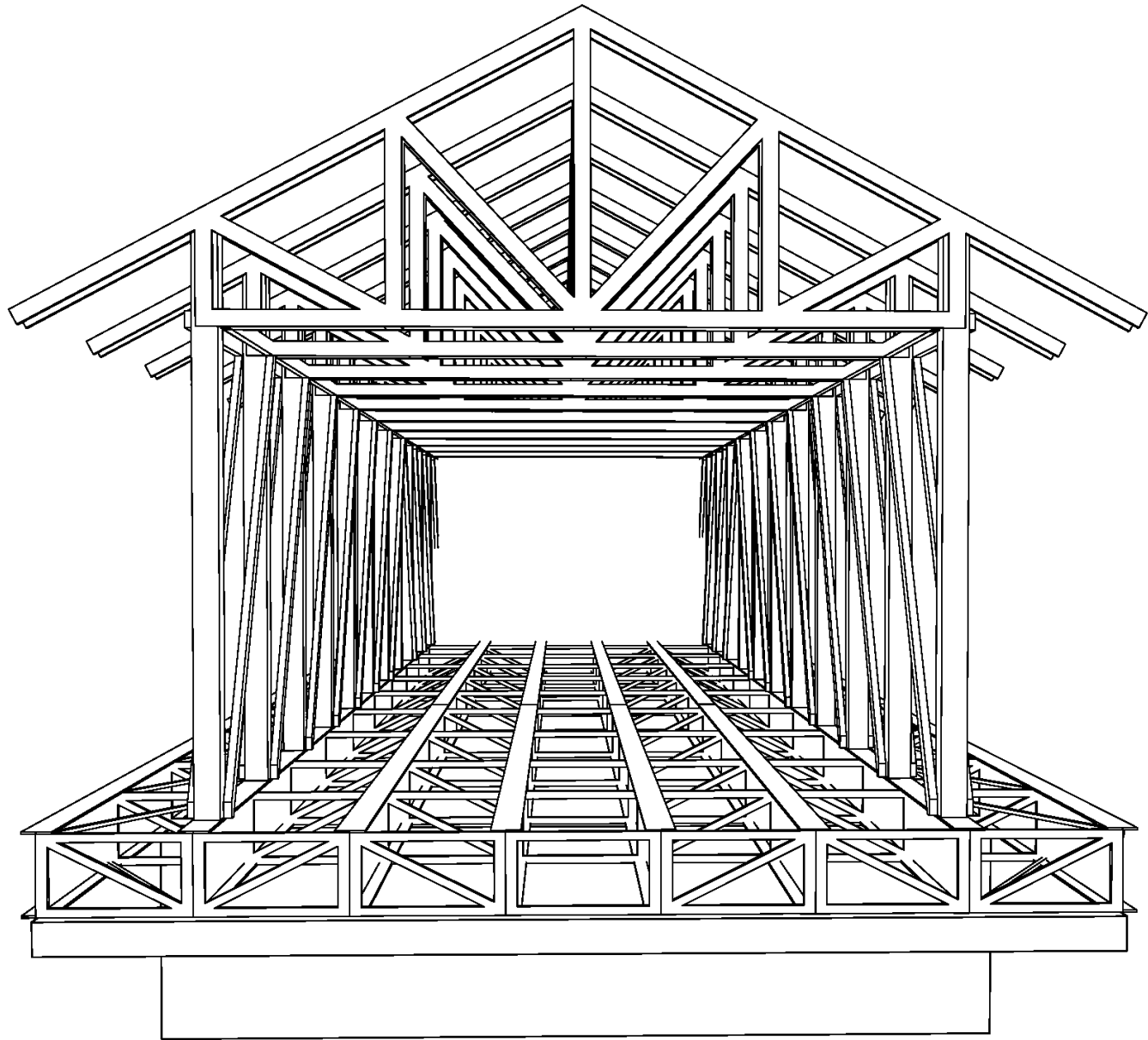












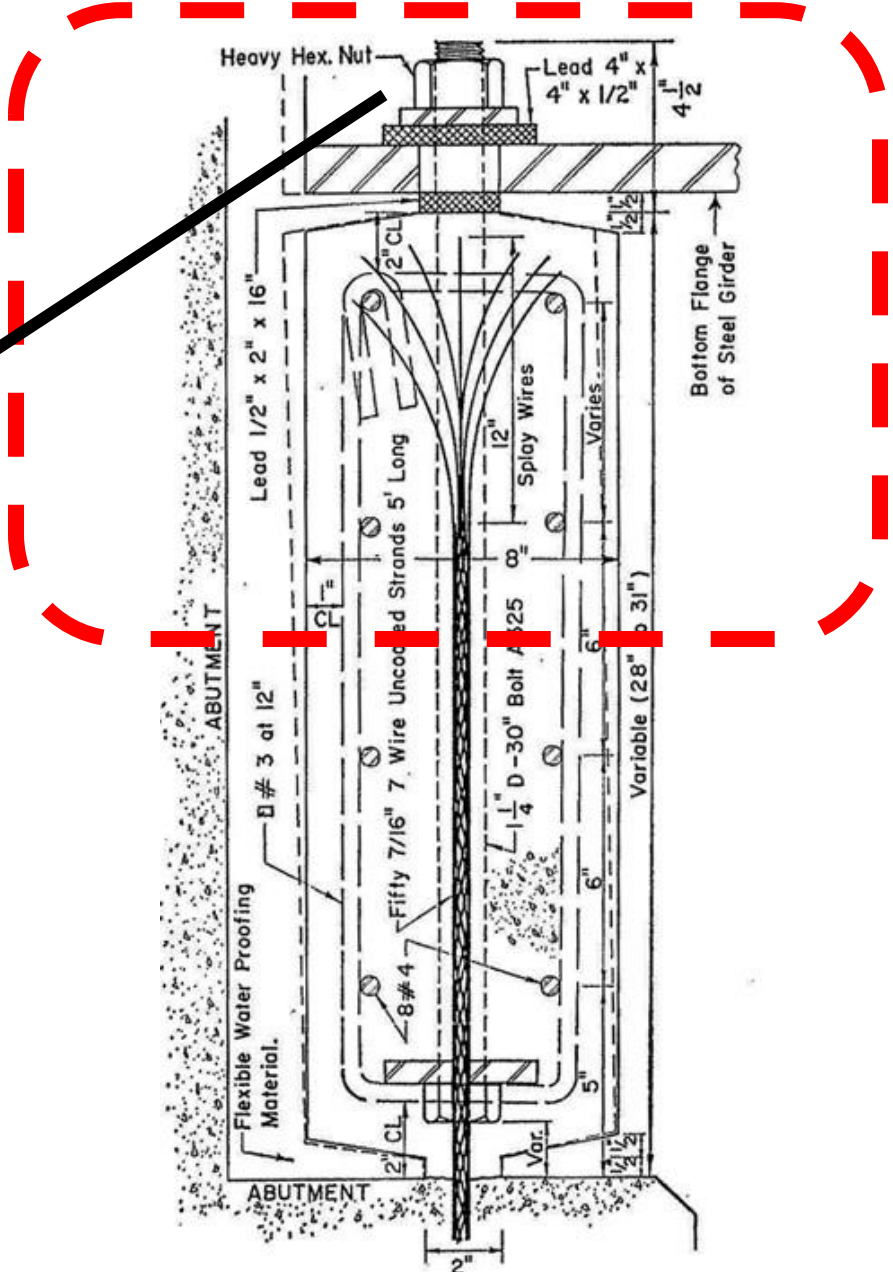
DETAILS



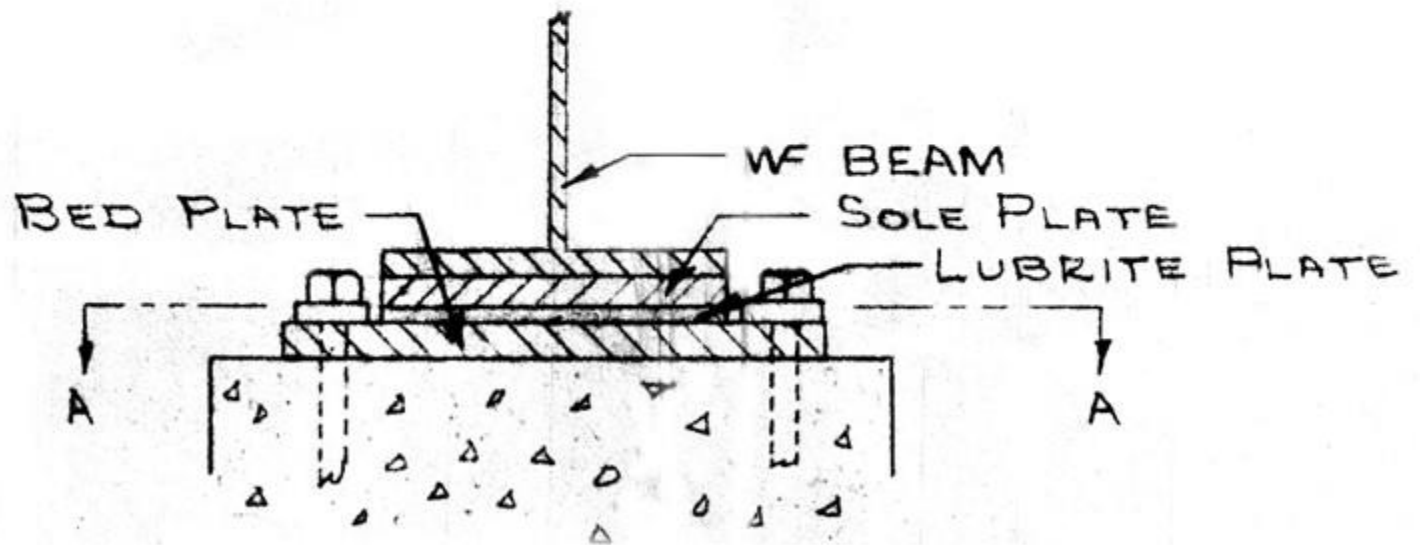
FIXED END OF A TYPICAL GIRDER



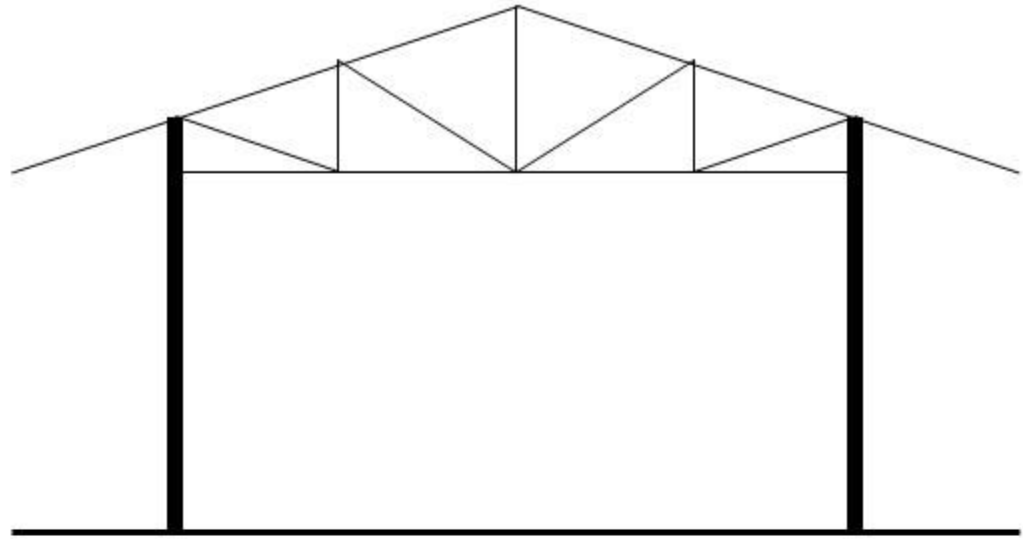
STEEL GIRDER END SUPPORTED BY CONCRETE ROCKER



ROCKER ALLOWS LONGITUDINAL MOTION WHILE PREVENTING UPLIFT



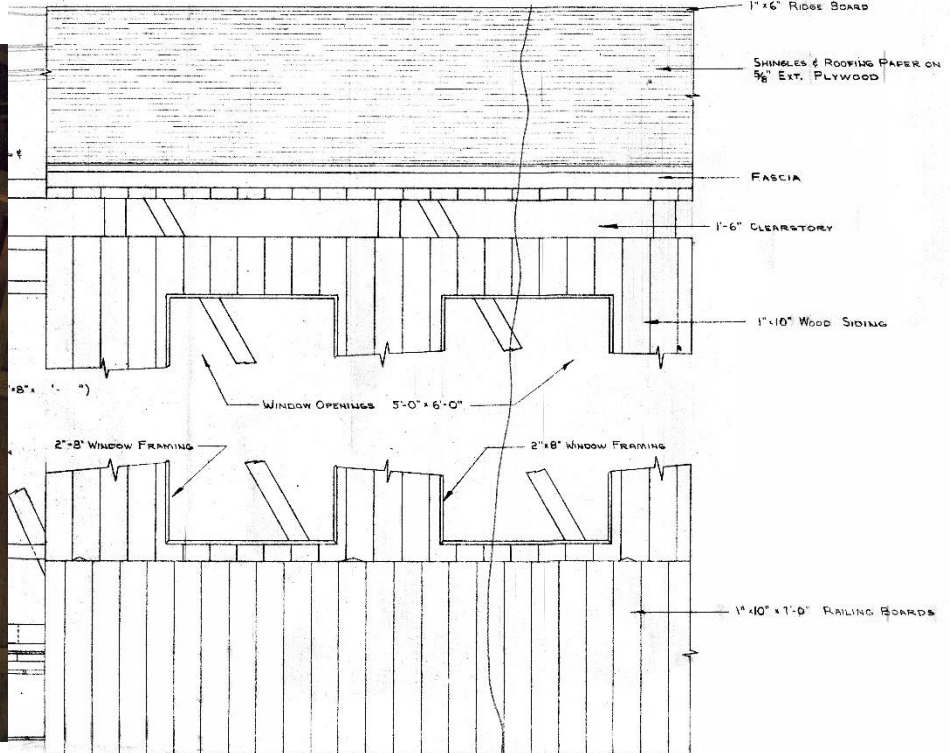
BEAM EXPANSION PLATE ASSEMBLY



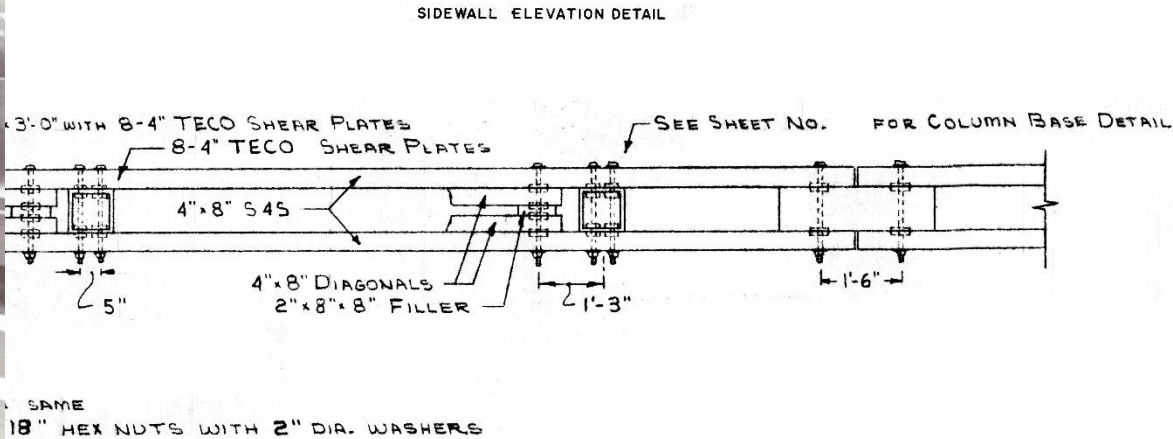
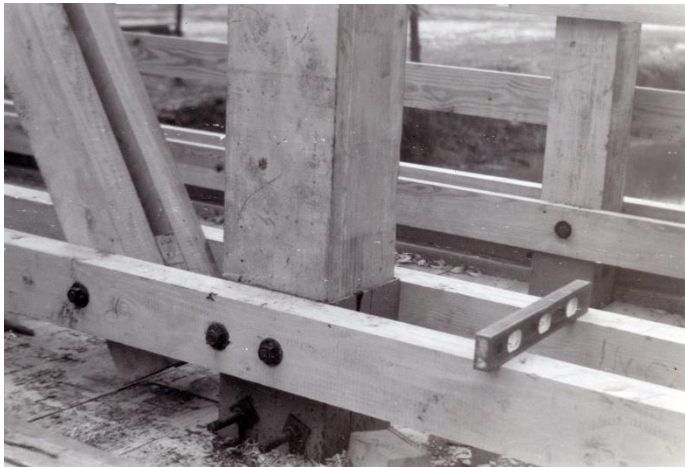
**SCHEMATIC DIAGRAM OF
MOMENT CONNECTION
CREATED BY EXTENDING
THE COLUMN TO THE
RAFTER**



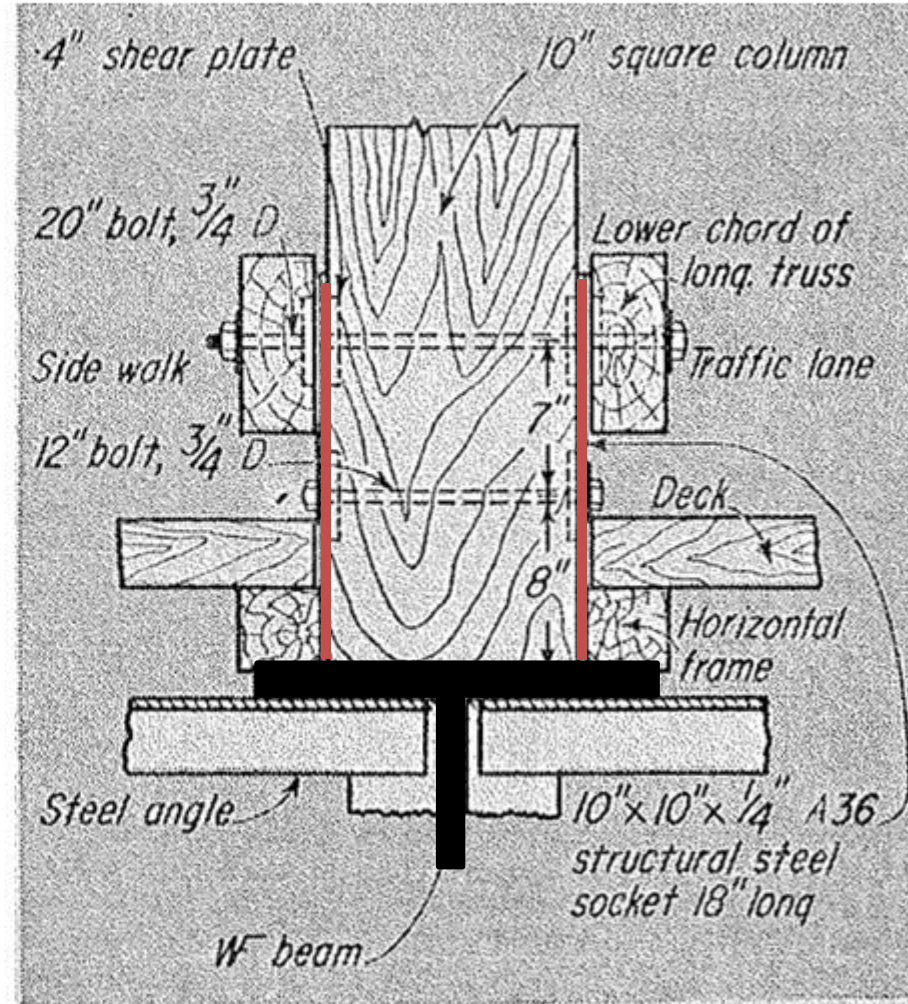
18 in. long HSS STEEL SOCKET 10 x 10 x ¼ in. cross-section



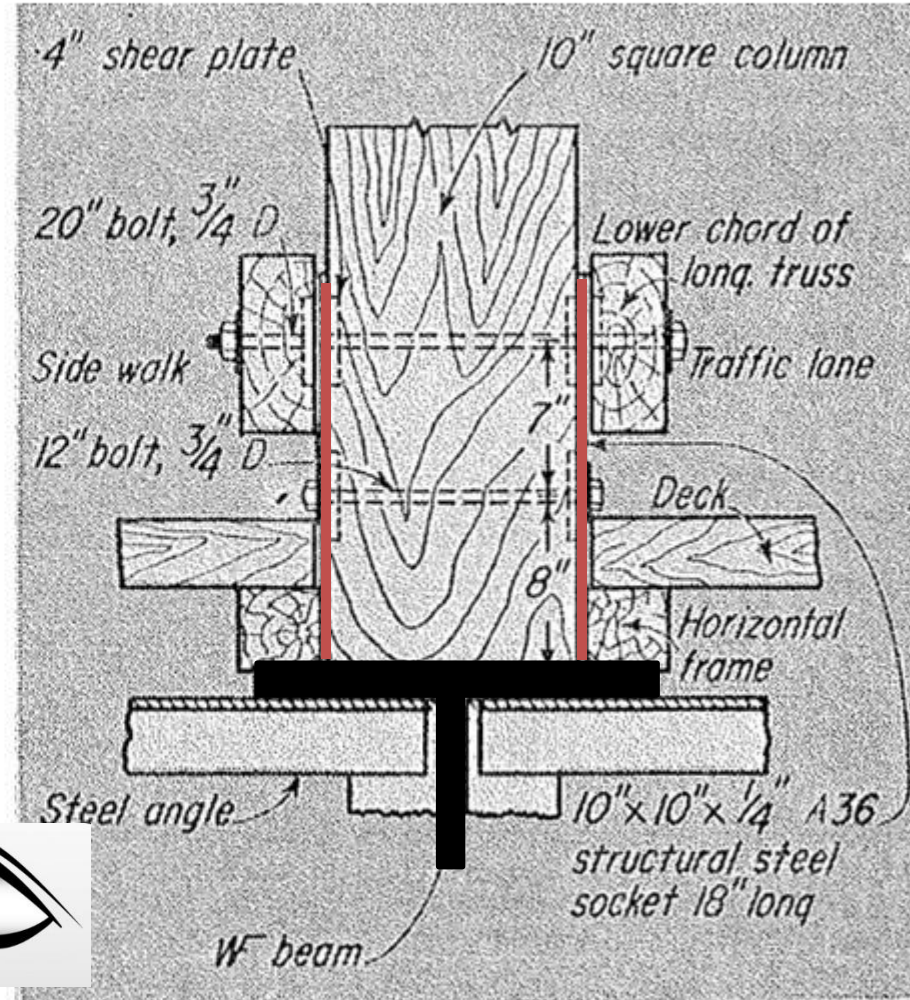
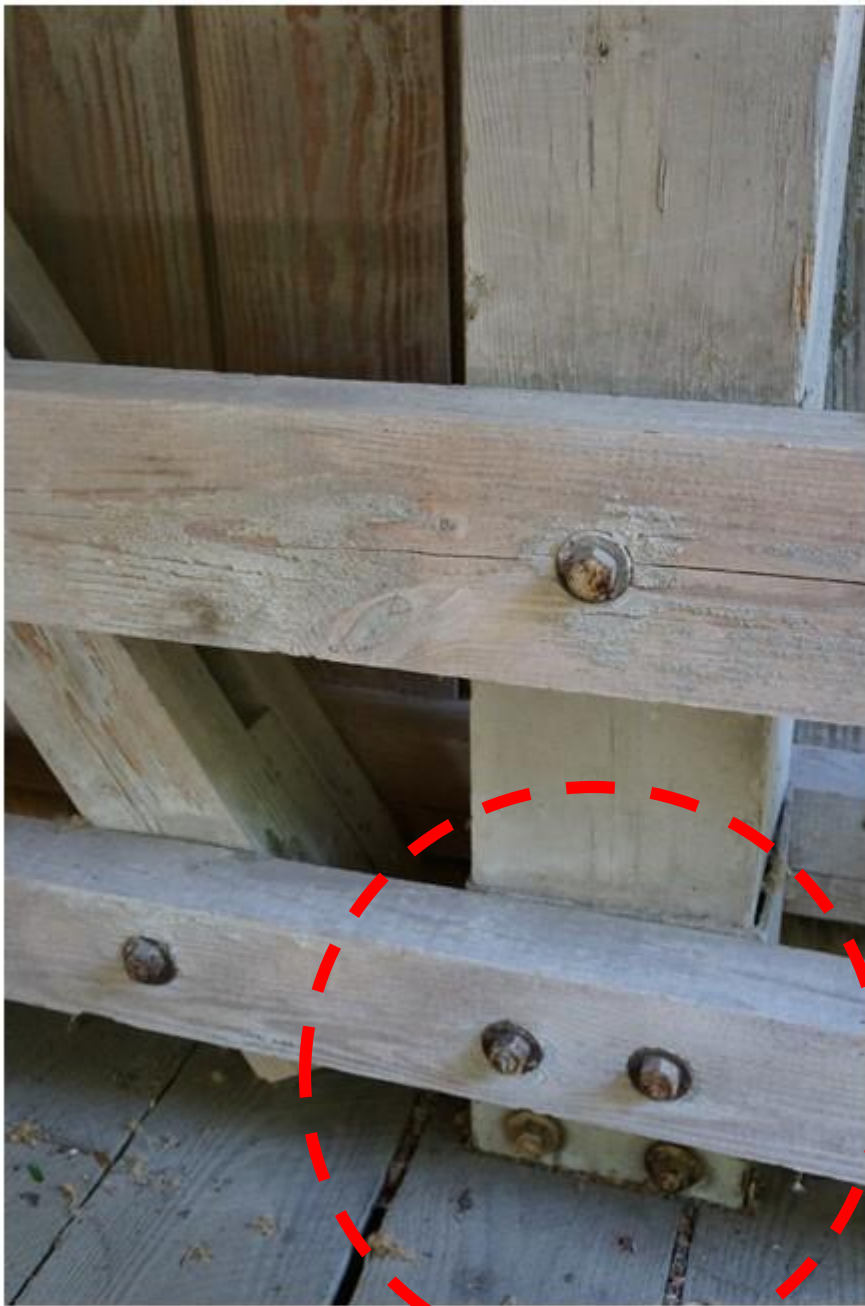
FRAMING AND SIDE WALL ELEVATION



PLAN OF BOTTOM CHORD

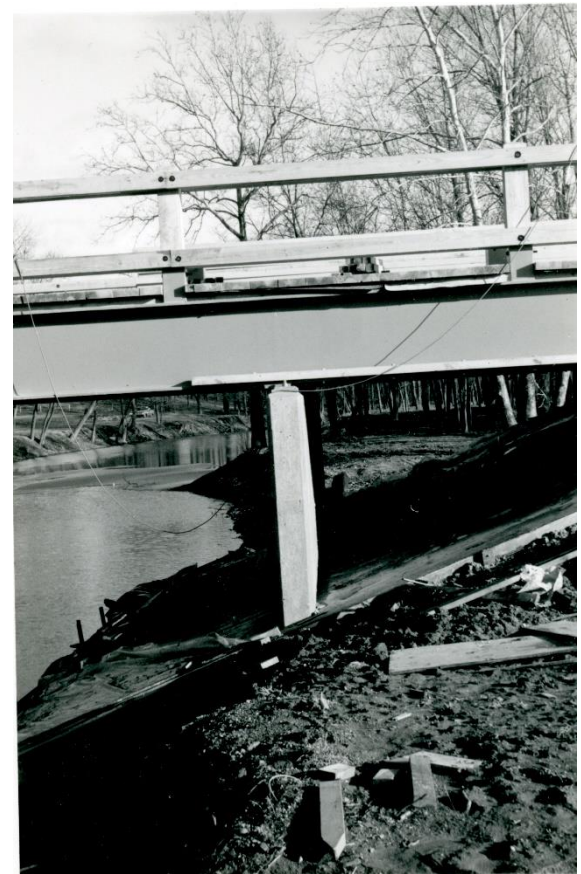


SOCKET connects steel and timber.



SOCKET connects steel and timber.

CONSTRUCTION

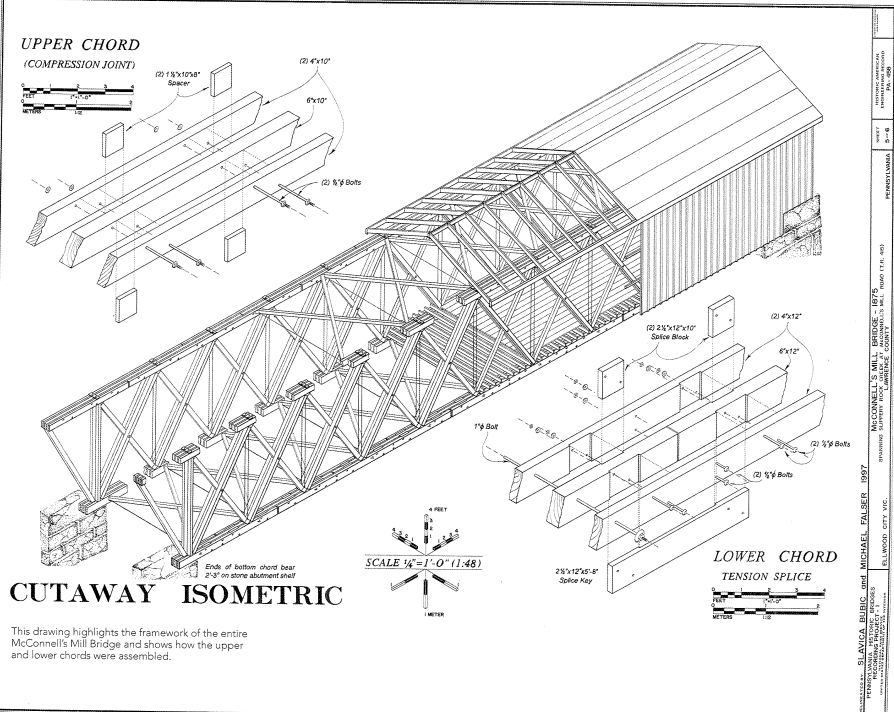








CONCLUDING REMARKS



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