BRIDGE OVER THE BLACKFOOT RIVER
TRUSS SPAN LENGTHENING

Location: Near Missoula, Montana
Owner: Missoula County
Design: HDR Engineering
Contractor: Frontier West LLC
Completed: November, 2008

Presenters:
Brad Miller P.E. HDR Engineering
Dustin Hirose P.E. HDR Engineering

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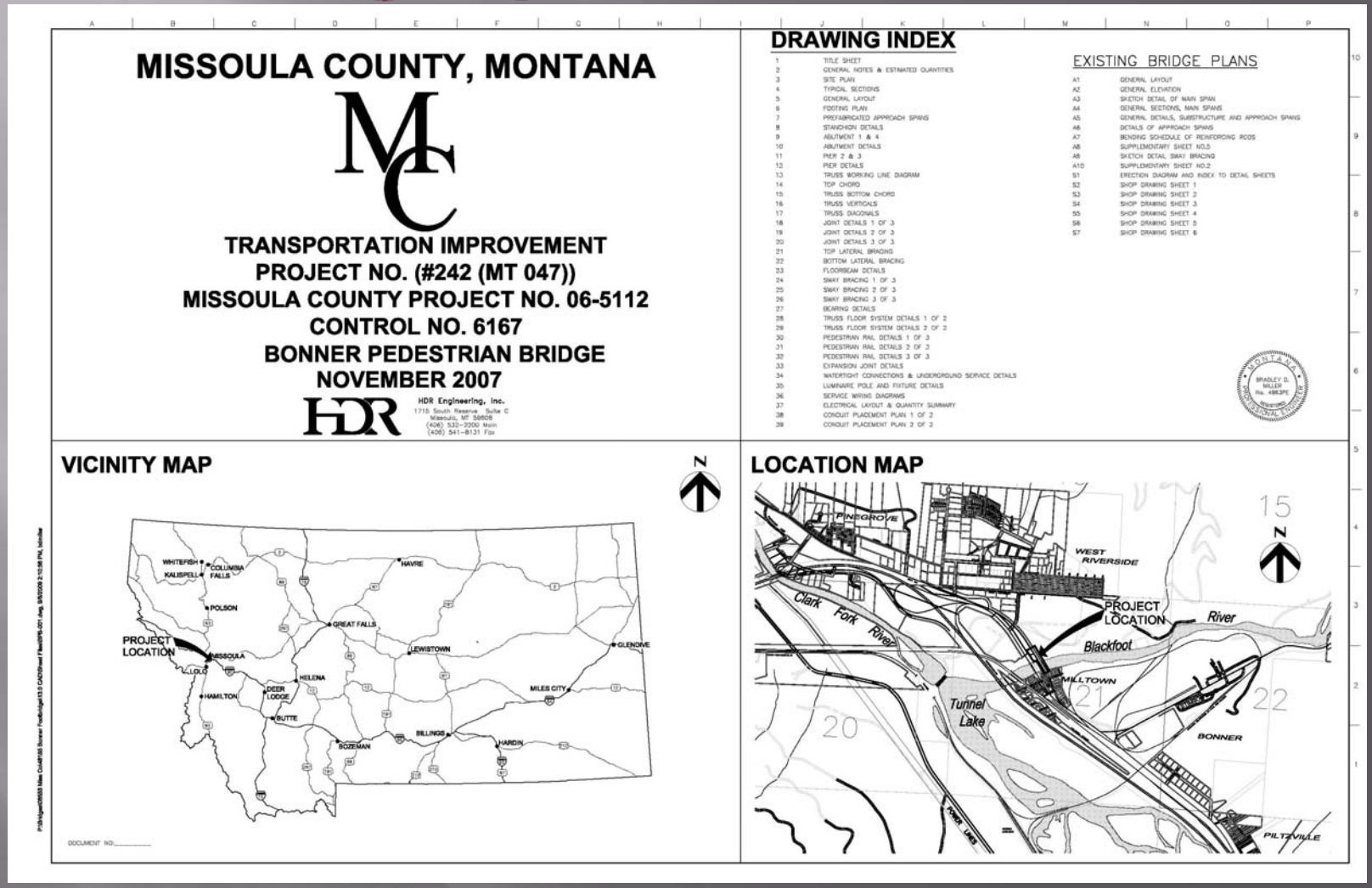
Geographical Location



MISSOULA COUNTY, MONTANA

TRANSPORTATION IMPROVEMENT
PROJECT NO. (#242 (MT 047))
MISSOULA COUNTY PROJECT NO. 06-5112
CONTROL NO. 6167
BONNER PEDESTRIAN BRIDGE
NOVEMBER 2007

HDR Engineering, Inc.
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EXISTING BRIDGE PLANS

A1	GENERAL LAYOUT
A2	GENERAL ELEVATION
A3	SKETCH DETAIL OF MAIN SPAN
A4	GENERAL SECTIONS, MAIN SPANS
A5	GENERAL DETAILS, SUBSTRUCTURE AND APPROACH SPANS
A6	DETAILS OF APPROACH SPANS
A7	BENDING SCHEDULE OF REINFORCING RODS
A8	SUPPLEMENTARY SHEET NO.5
A9	SKETCH DETAIL SWAY BRACING
A10	SUPPLEMENTARY SHEET NO.2
S1	ERECTION DIAGRAM AND INDEX TO DETAIL SHEETS
S2	SHOP DRAWING SHEET 1
S3	SHOP DRAWING SHEET 2
S4	SHOP DRAWING SHEET 3
S5	SHOP DRAWING SHEET 4
S6	SHOP DRAWING SHEET 5
S7	SHOP DRAWING SHEET 6

BRADLEY D. MILLER No. 4963PE REGISTERED PROFESSIONAL ENGINEER

VICINITY MAP

DOCUMENT NO:_____

LOCATION MAP

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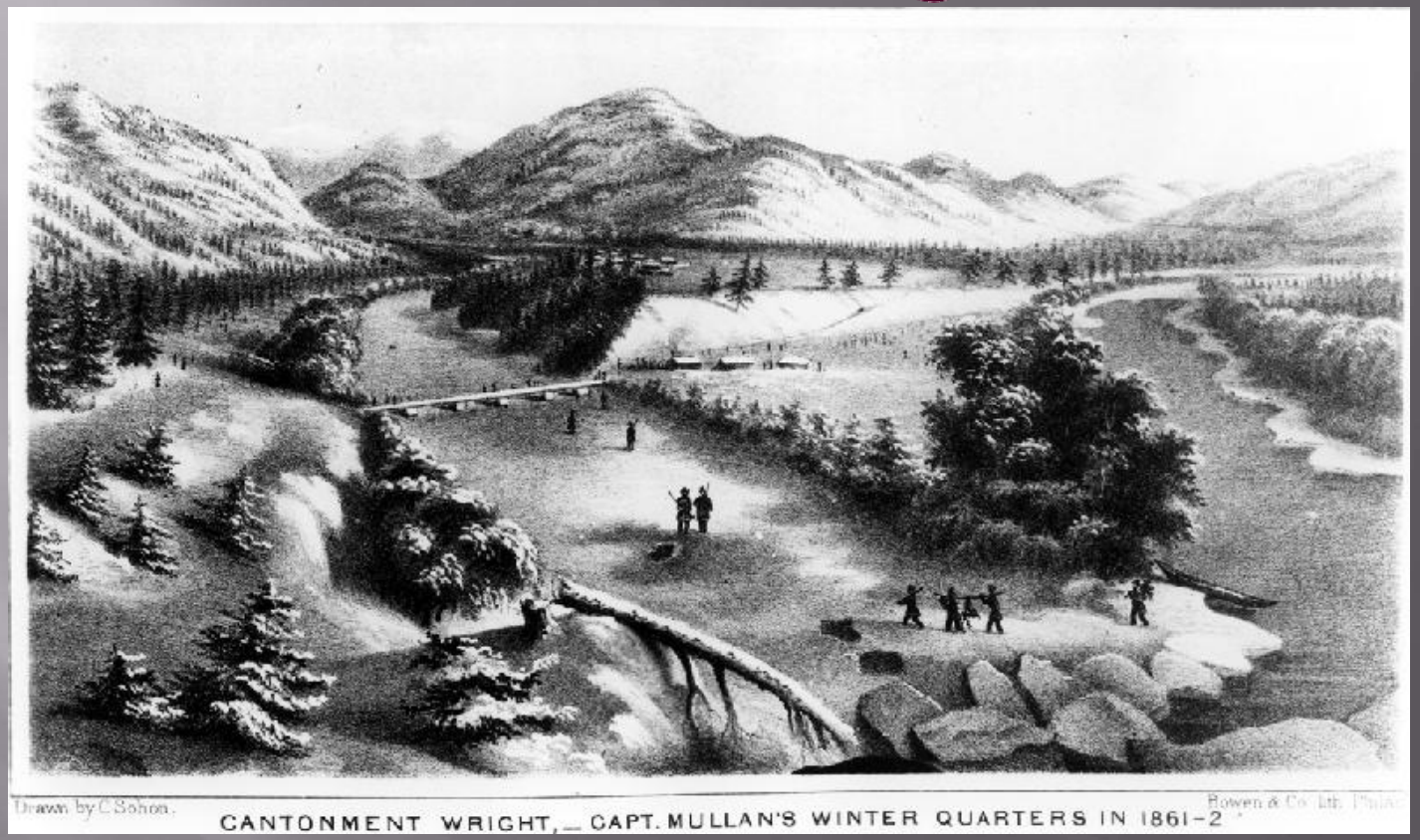
Historical Background



- **Lewis and Clark Explored Area in 1805-1806**
- **Captain John Mullan Built a Bridge Here in 1861-1862**
- **Sketch of Confluence by Gustav Sohon in Mullan's Party**

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Historical Background

- **Milltown Dam Completed in 1908 – Flood Occurred Same Year**
- **Heavy Metals from Mine Waste Deposited above the Dam**
- **Dam was Removed in 2008 after a Decade of Controversy**

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Project Background

- **Bridge Constructed in 1921 near Milltown / Bonner, MT**
- **Converted to Pedestrian Bridge around 1948**
- **Scheduled for Replacement as Part of Superfund Clean-up with the Milltown Dam Removal in 2008**

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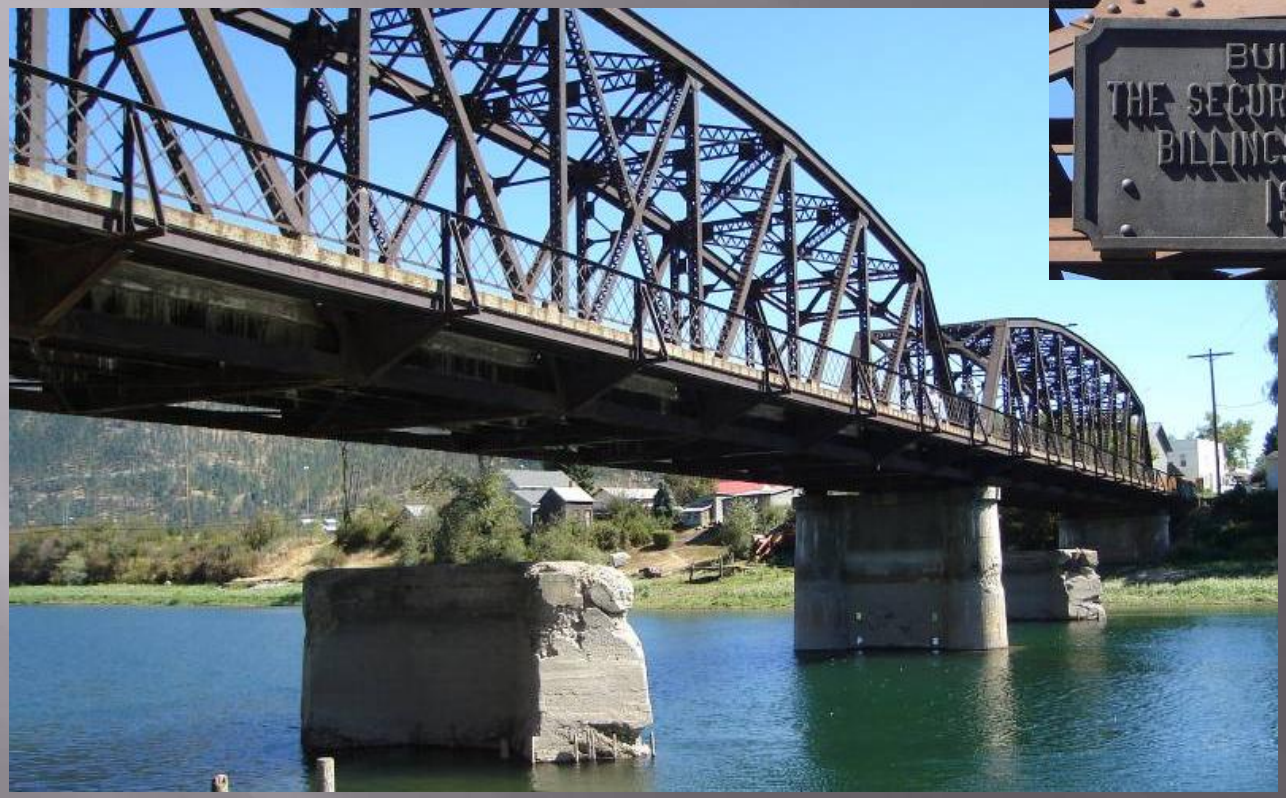
Project Background



- **1921 Pratt Truss Bridge Built by the Security Bridge Co.**
- **Preliminary Design Indicated a New Bridge was Required**
- **Strong Community Involvement Begins 'Save Our Bridge!' (SOB) Movement**

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Project Background

“SAVE OUR BRIDGE”

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Project Background

- **Blackfoot River – Part of Milltown Reservoir, Before Construction**
- **Slow Velocity – Very Little Scour**

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Project Background

- **Blackfoot River After Dam Removal and Bridge Construction**
- **Faster Velocity – Much More Scour (Approximately 12’ Initially)**

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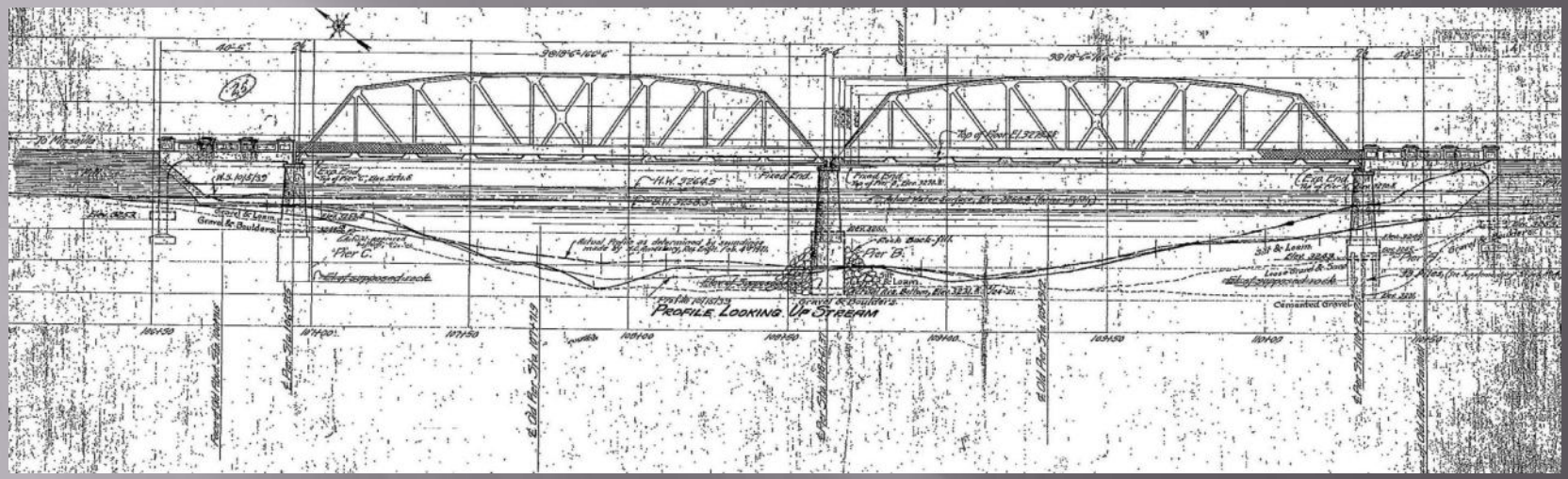
Replacement Options



- River Expected to Scour Below Footings at Center Pier
- Old Four Span Bridge, 40’-166.5’-166.5’- 40’ = 413’
- To be Replaced with New Three Span Bridge, 92’-230-’92’ = 414’
- 230’ Main-span Required by Environmental Agencies to Eliminate Piers From the 100-year Floodplain

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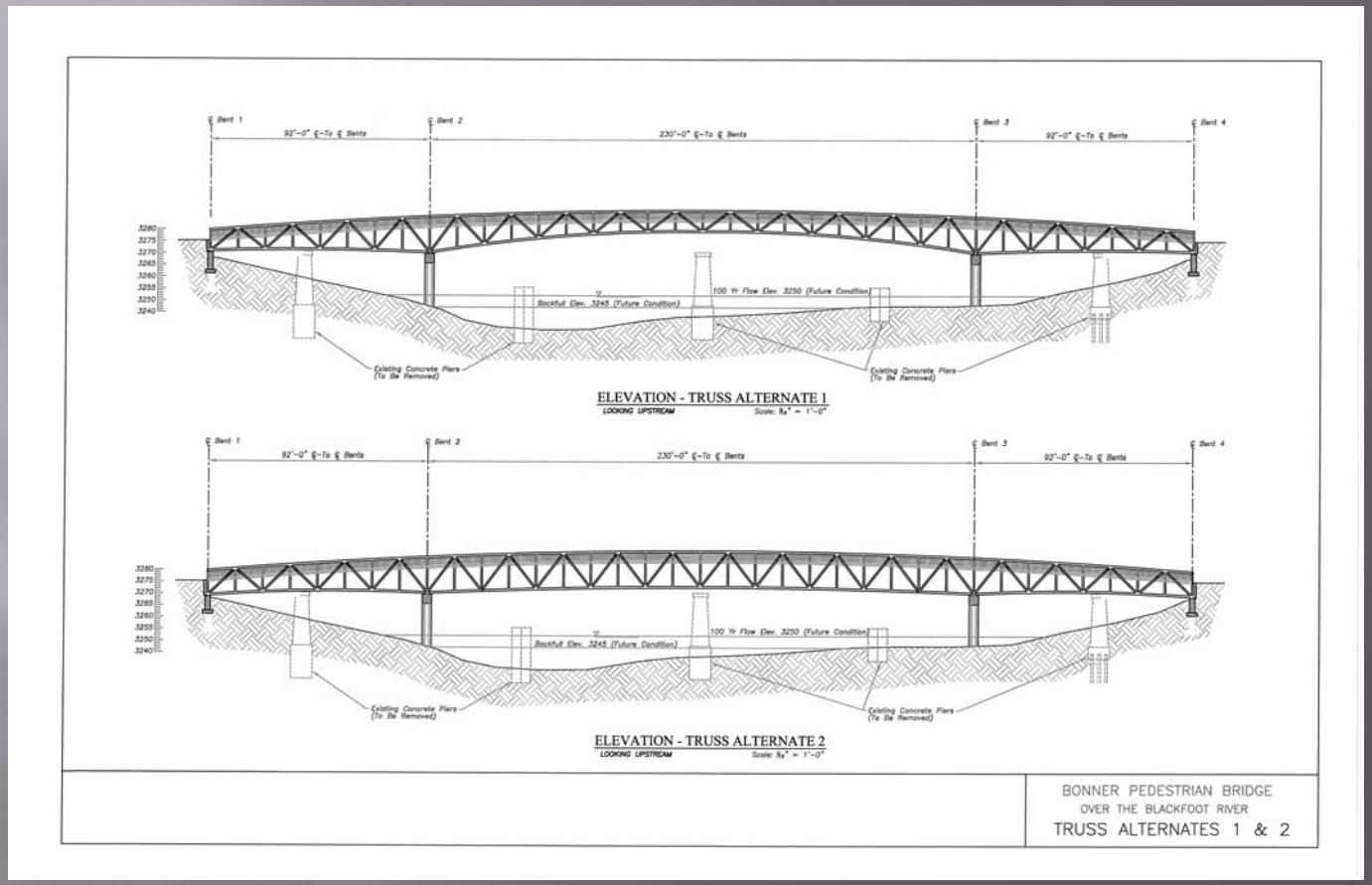
Replacement Alternates1&2



- **230' Main-span Required by Environmental Agencies**
- **New Span Configuration 92'-230'-92' = 414'**

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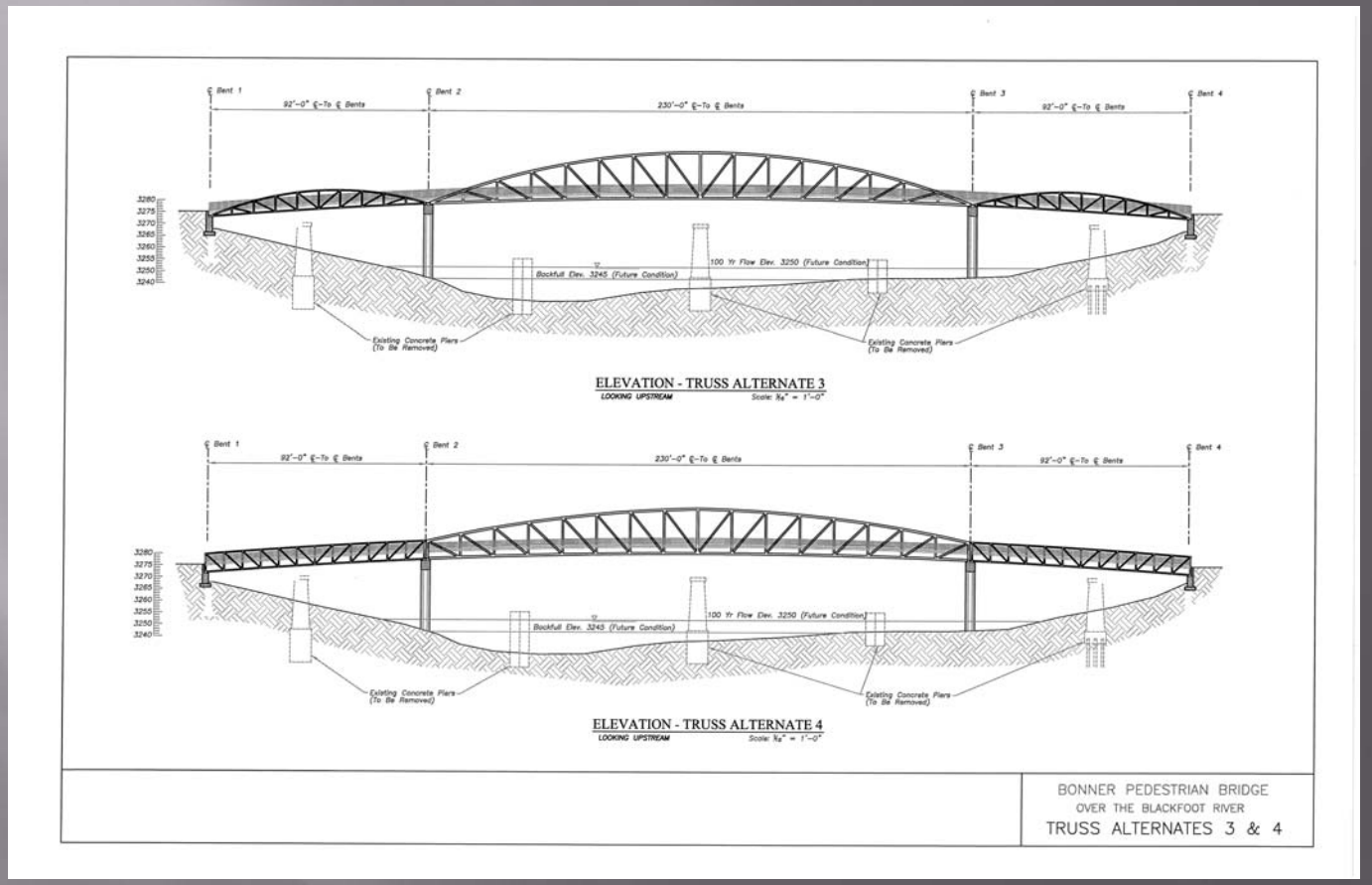
Replacement Alternates 3&4



- **230' Main-span Required by Environmental Agencies**
- **New Span Configuration 92'-230'-92' = 414'**

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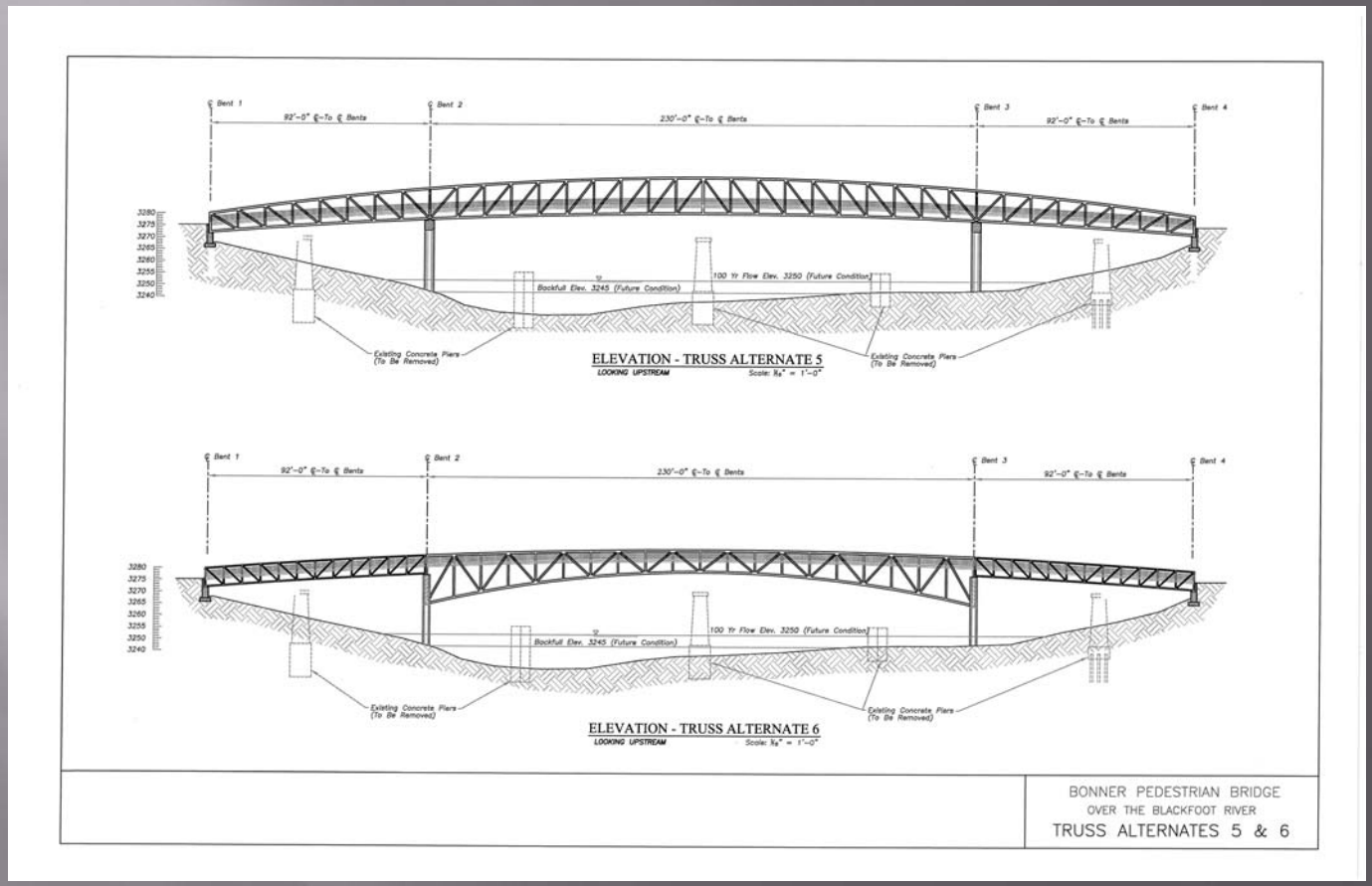
Replacement Alternates 5&6



- **230' Main-span Required by Environmental Agencies**
- **New Span Configuration 92'-230'-92' = 414'**

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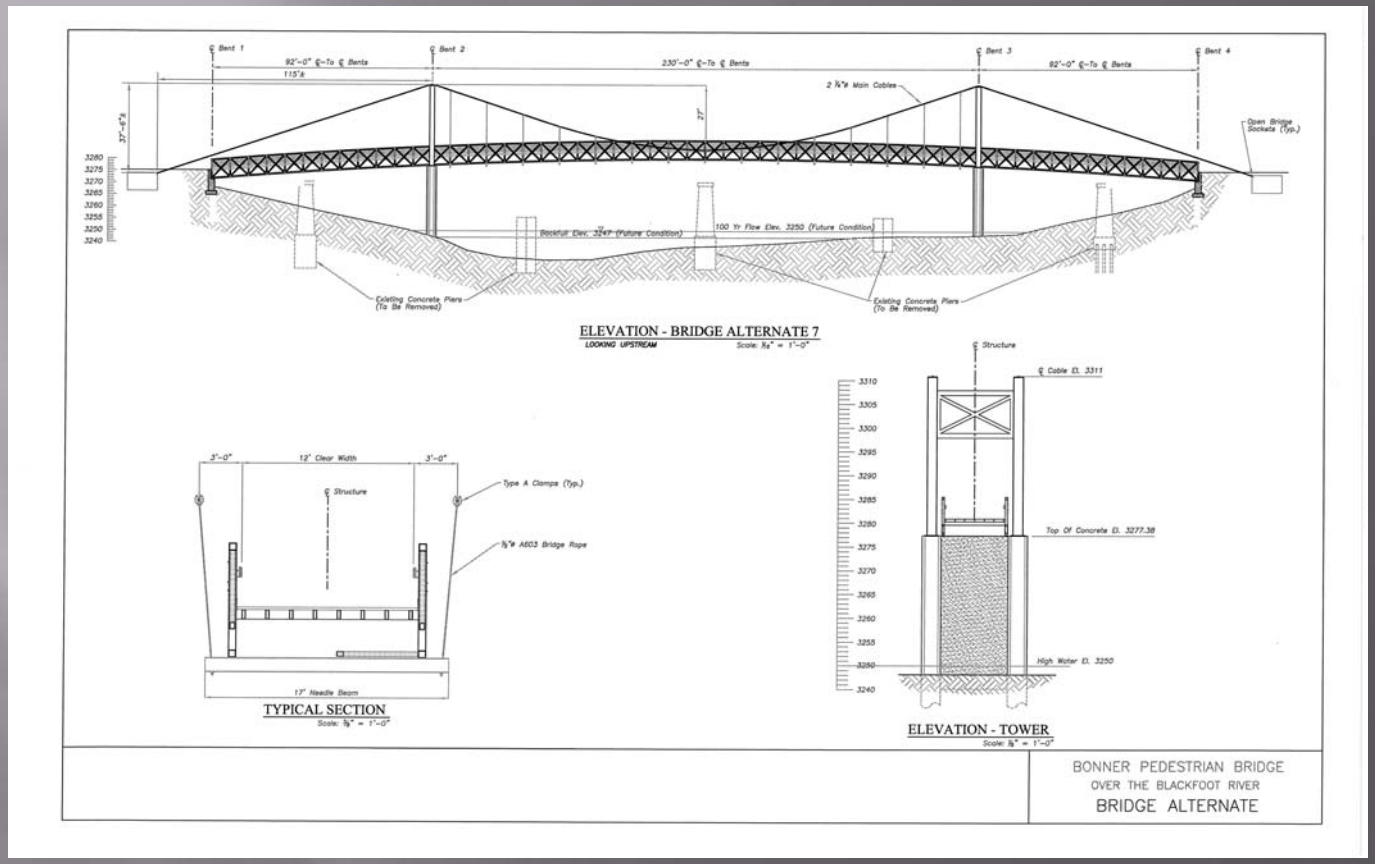
Replacement Suspension Bridge Alternative



- **230’ Main-span Required by Environmental Agencies**
- **New Span Configuration 92’-230’-92’ = 414’**

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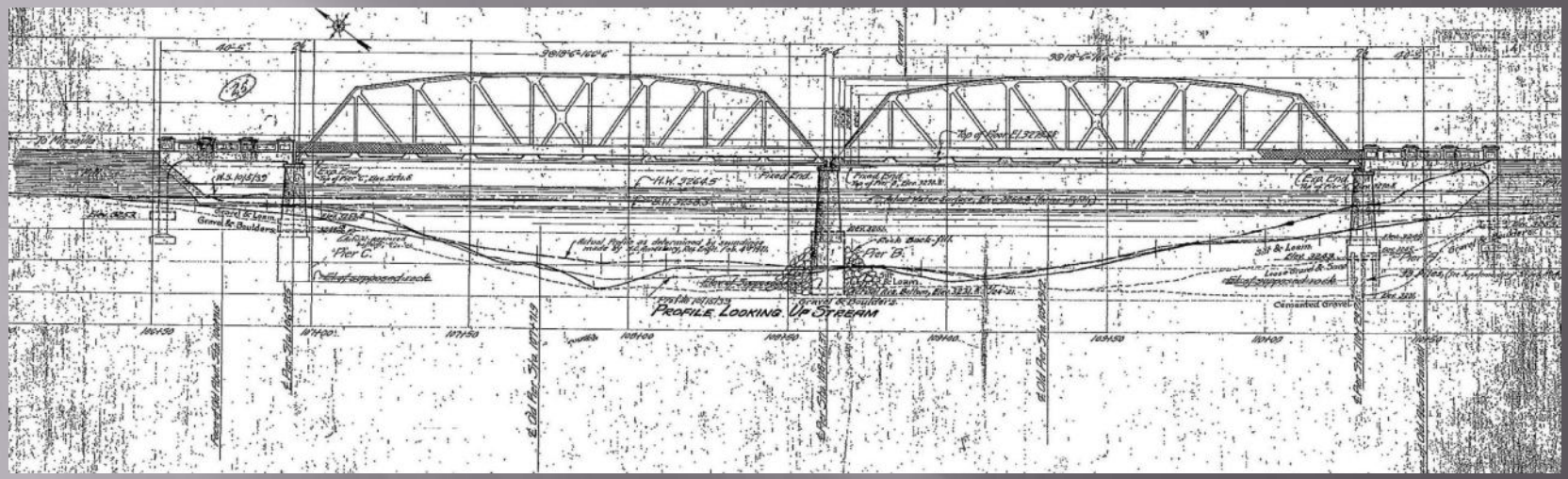
Reconstruction Option



- **Save Our Bridge Committee Continued to Gather Support**
- **Missoula County (Tim Elsea) Looked for Another Option**
- **Tim Worked With HDR to Save the Bridge (at Least Part of Bridge)**
- **Lengthening One Truss to Fit the 230’ Main Span Requirement was Explored**

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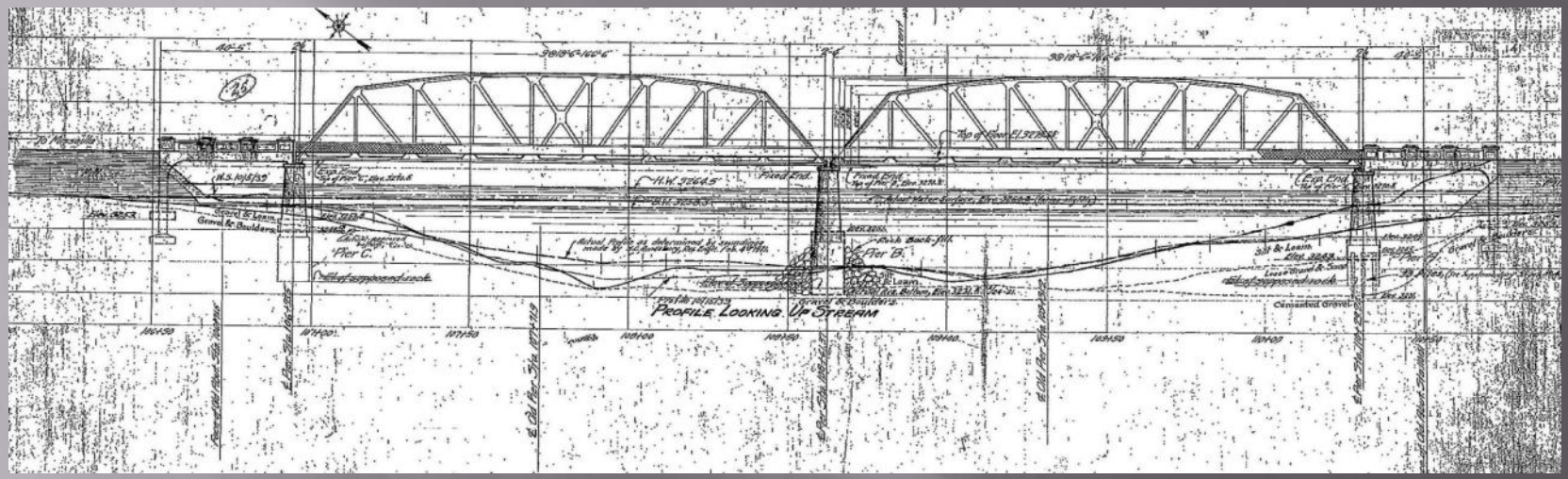
Reconstruction Option



- **Lengthening Span Might be Possible by Reducing Dead Load By:**
  - **Replacing Concrete Deck with Timber Deck,**
  - **Removing Sidewalk Overhang, and**
  - **Narrowing the Deck Within the Truss**

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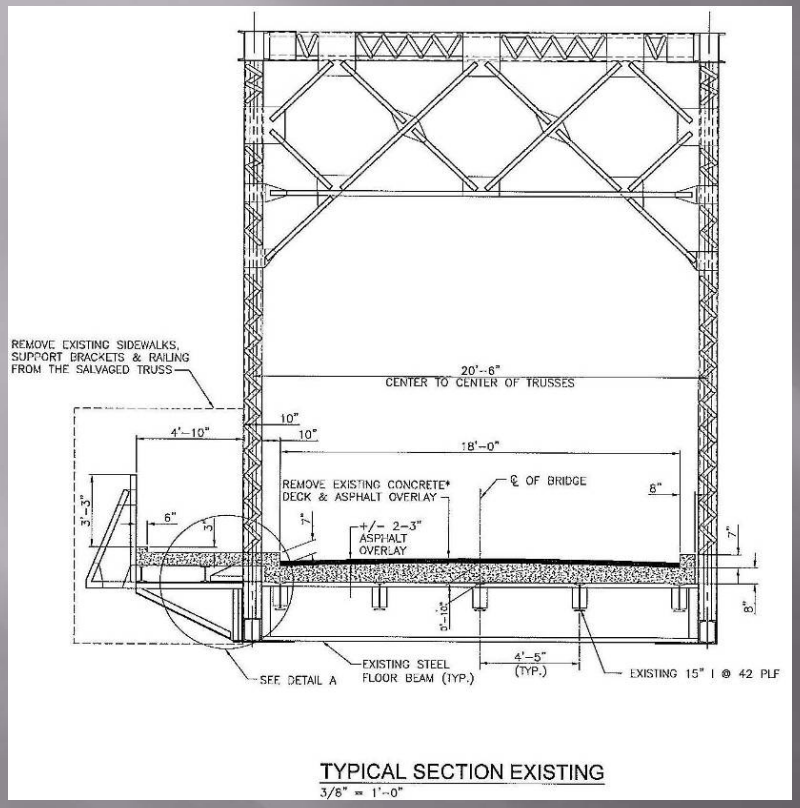
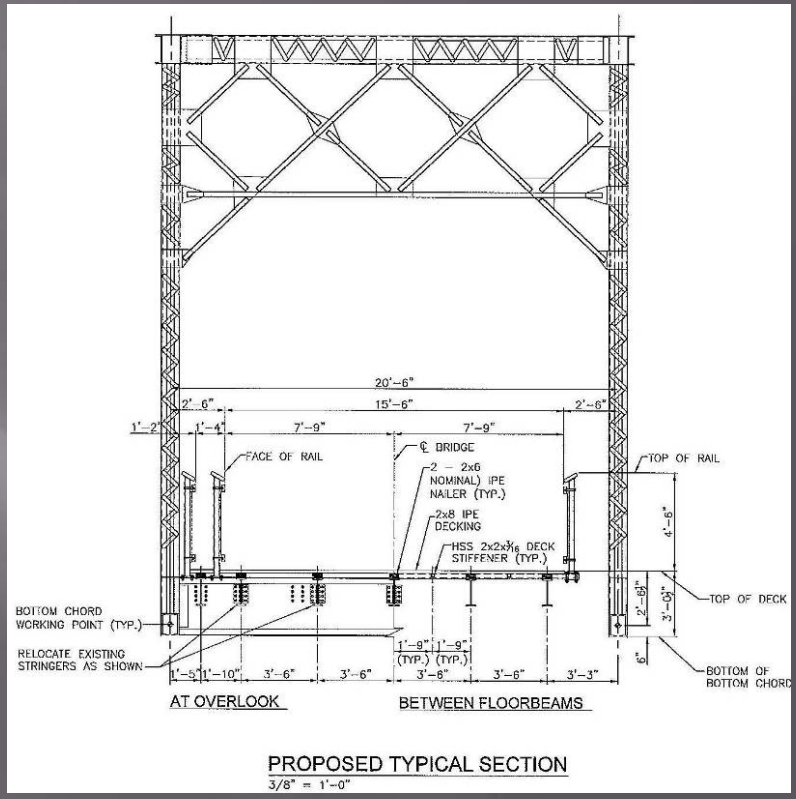
Reconstruction Option



TYPICAL SECTION EXISTING
3/8" = 1'-0"



PROPOSED TYPICAL SECTION
3/8" = 1'-0"

- **Old Bridge had Concrete Sidewalks and Overhang**
- **New Bridge is Narrower and with Lightweight Timber Deck**
- **Lighter by about 2,500 Pounds Per Foot of Bridge**

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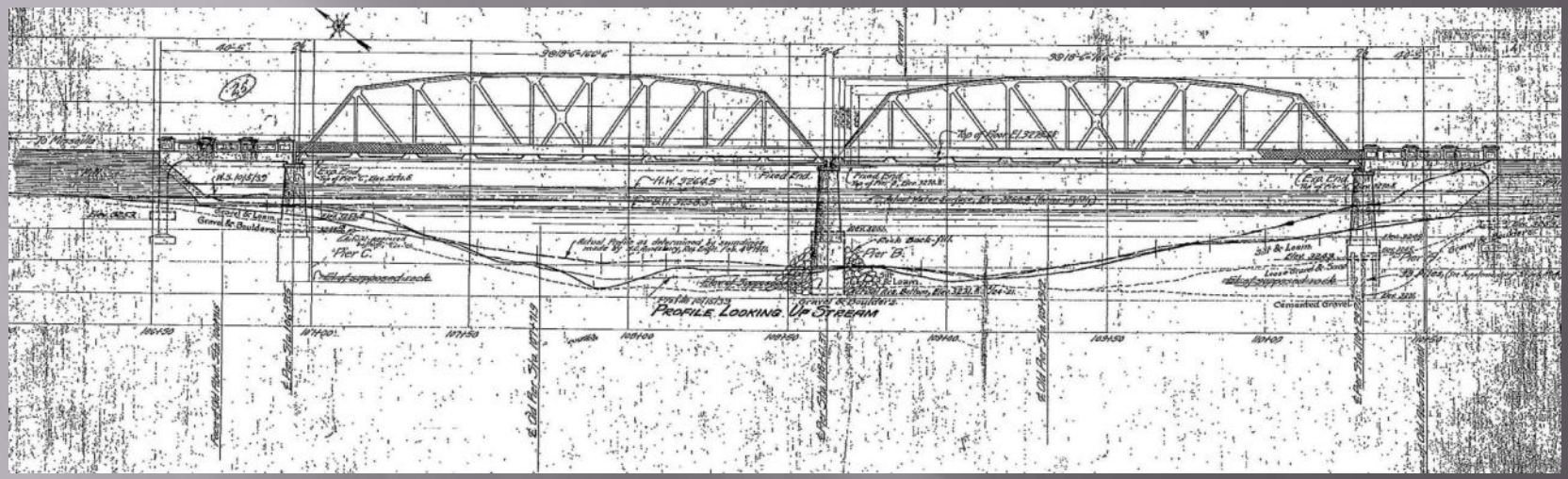
Truss Span Lengthening



- **What would This Truss Span Lengthening Look Like?**
  - **Old Bridge Span Configuration was 40’-166.5’-166.5’-40’**
  - **Old Trusses had Nine 18.5’ Bays**
  - **New Bridge Span Configuration-230’ Main Span Required**
  - **Twelve 18.5’ Bays would make Truss Span 222’ Long**
  - **222’ Span would be Long Enough, but would this Work?**

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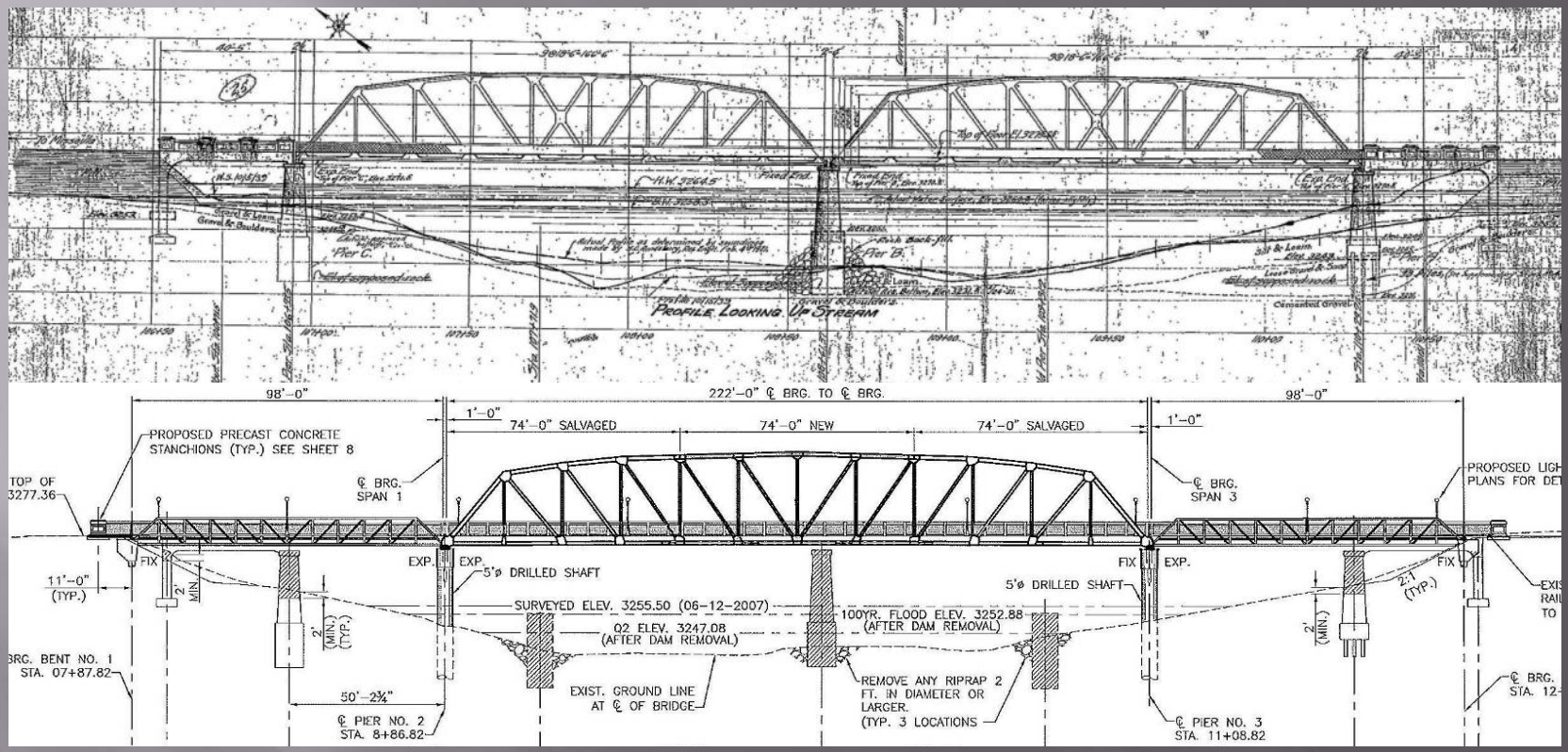
Truss Span Lengthening



- **Lengthened Main Truss Span – From 12 to 9 Bays = 222’**
- **New Prefabricated Steel Approach Spans, Each 98’ Long**

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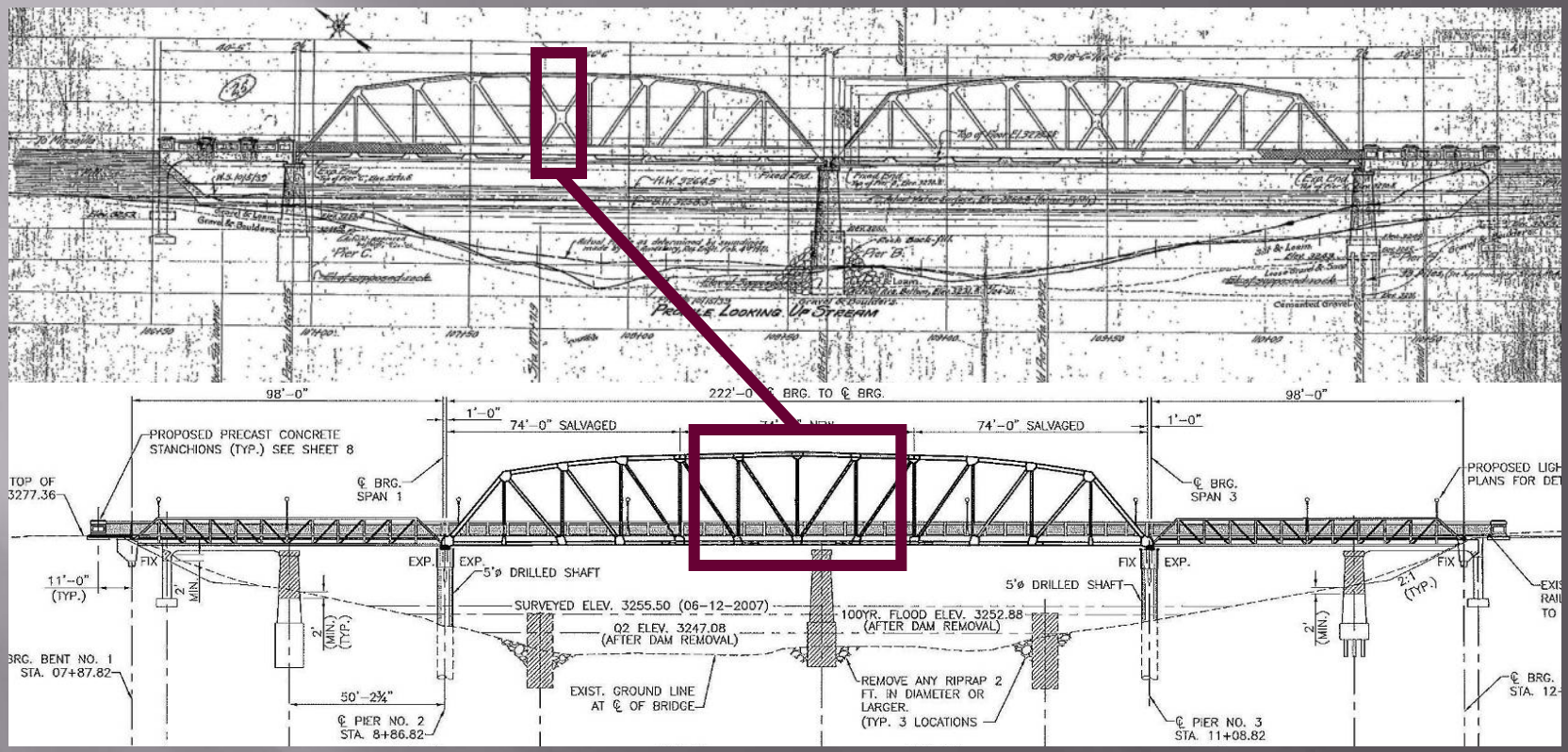
Truss Span Lengthening



- **Lengthened Main Truss Span – From 12 to 9 Bays = 222’**
- **New Prefabricated Steel Approach Spans, Each 98’ Long**
- **Remove Center Truss Bay and Add 4 New Truss Bays**

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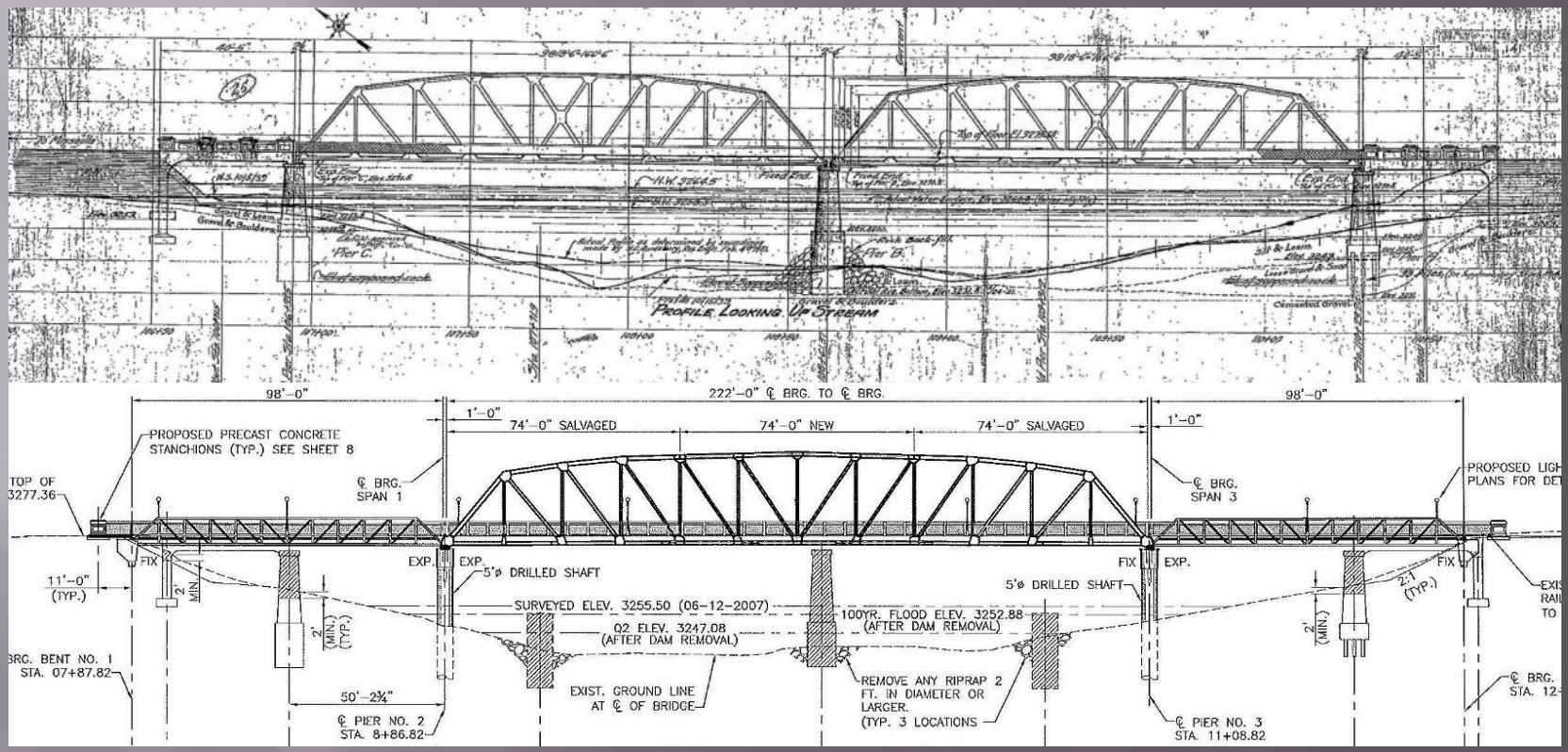
Truss Span Lengthening



- **Preliminary Analysis Indicated Truss Lengthening Was Feasible**
- **Missoula County Agreed to Go With This Option at Higher Cost**
- **SOB's Changed Sign to 'SAVE*D* OUR BRIDGE'**

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Removing Old Truss Spans

Work Bridge Placed Upstream

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Lengthening the Truss

One Truss Span Separated for Lengthening

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Lengthening the Truss

New Steel Added – Truss Span Lengthened

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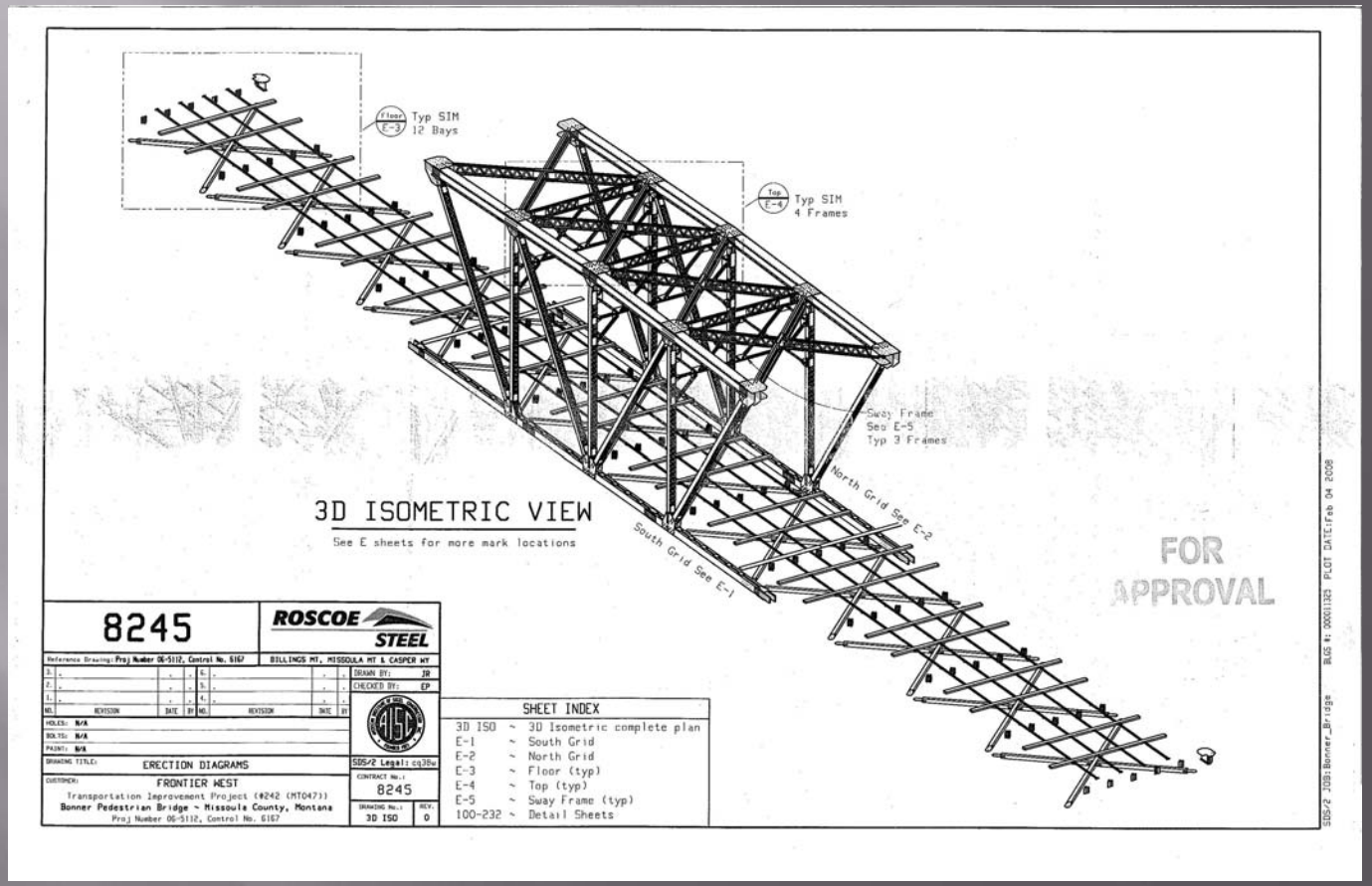
Lengthening the Truss



- **3-D Model Created by Steel Supplier, Roscoe Steel**
- **Helped to Ensure Correct Dimensions and Fit for New Members**

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Lengthening the Truss

- **Rivets Replaced with Bolts**
- **Members From Discarded Truss Replaced Damaged Members**
- **Stringers From Discarded Truss Used in New Bays**

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Lengthening the Truss

- **New Lateral Bracing Required for Wind and Seismic Loading**
- **Structural Steel Tubes Replaced Round Bars**

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Painting the Bridge

- **Old Steel Water-Jetted with 5,000 psi Using Roto-Tip Nozzle**
- **Old and New Steel Painted With Moisture Cure Urethane Paint**
- **3-Coat Semi-Gloss System by Wasser (2nd and 3rd Coats Shown)**
- **New Paint Encapsulated Old Lead-Based Paint**

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Painting the Bridge

- **Bridge Span Ready for Nailers, Decking and Rail Mesh**
- **Note Decking Supports for 2x8 IPE Hardwood Deck**
- **Also Note Rail Post Supports Independent of Deck**

Lighting

- **Cast Iron Light Posts From Anaconda, MT Using 1930's Mold**
- **Modern Energy Efficient Fixtures and Polycarbonate Globes**
- **Mounted Outside of Railing**

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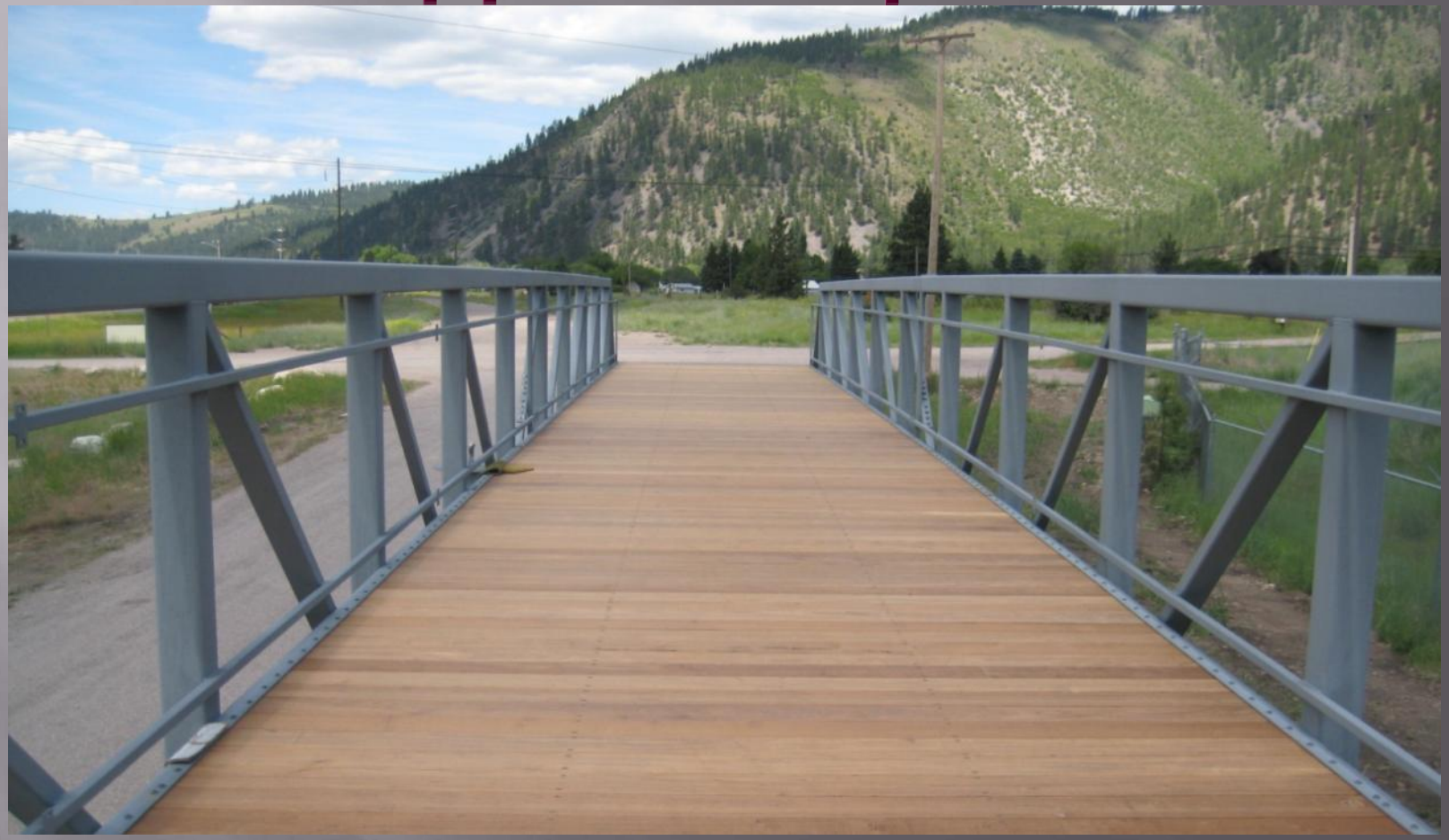
Approach Spans



- **Prefabricated Steel Approach Spans From CONTECH**
- **12’ Wide, Primed and Decked With IPE (Ironwood) 2x8 Decking**

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All New Foundations

- **5’ Diameter Drilled Shafts For the Piers, 50’ Deep**
- **2’ Diameter Drilled Shafts For the Abutments, 45’ Deep**

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All New Foundations

Finishing a Pier

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All New Foundations

Ready for the Spans

Setting the Spans

Main Span

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Setting the Spans

Main Span (From Behind)

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Setting the Spans

Main Span Looking Downstream

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Setting the Spans

Rolling the Main Span into Place

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Setting the Spans

Approach Spans Placed

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Installing IPE Decking

- **Predrilling Holes and Screwing Down 2x8 IPE (Ironwood)**
- **Note Nailers on Stringers**

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Overlooks

- **Main Truss is Wider Than Approach Spans, 16’ vs. 12’**
- **2 Overlooks Each Side of Truss Span for Recreation Purposes**

Installing Rail Mesh

- **Fused Black Vinyl Coated Chain Link Mesh**
- **Knuckled Top and Bottom**

Bridge Approaches

- **End Blocks Match the Look of the Old Approach Span Railing**
- **Bollard Folds Down for Emergency and Maintenance Vehicles**

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Finished Bridge

Ribbon Cutting Ceremony, November 3, 2008

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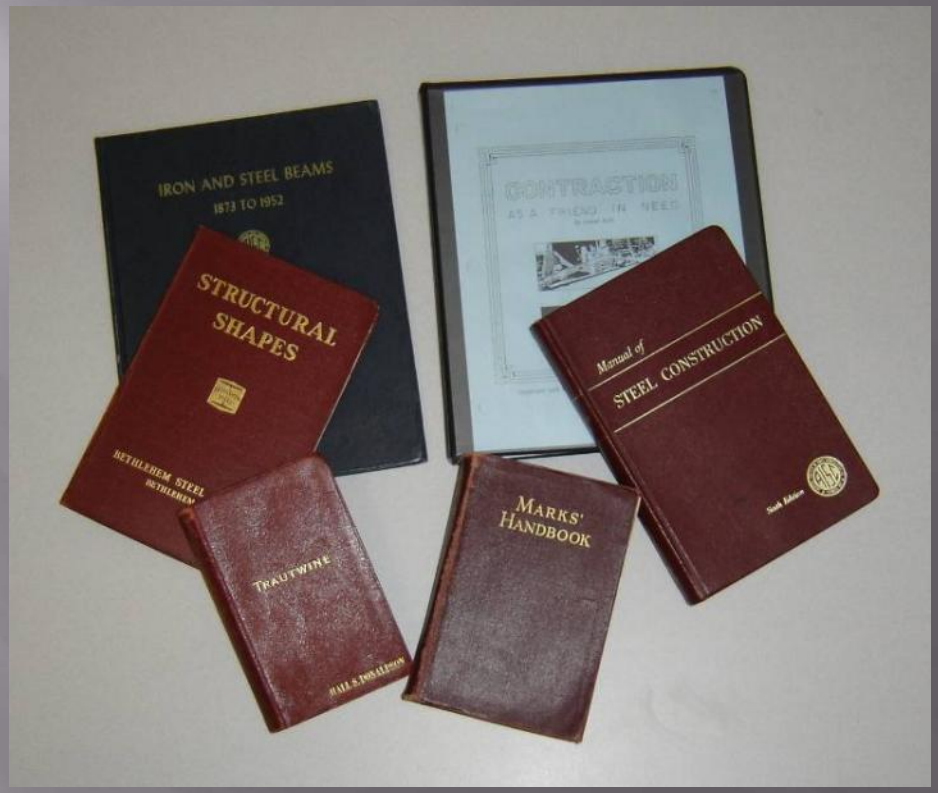
Finished Bridge

Landscaping Early 2009

Construction Costs

Total Cost $3,000,000 - $500 / Sq. Ft.

Design Resources



- **Steel Shape Section Strengths and Properties – Old Handbooks**
- **Heat Straightening – Holt Publications**
- **Heat Shortening Details and Specs – AREMA and Old DOT Stds.**

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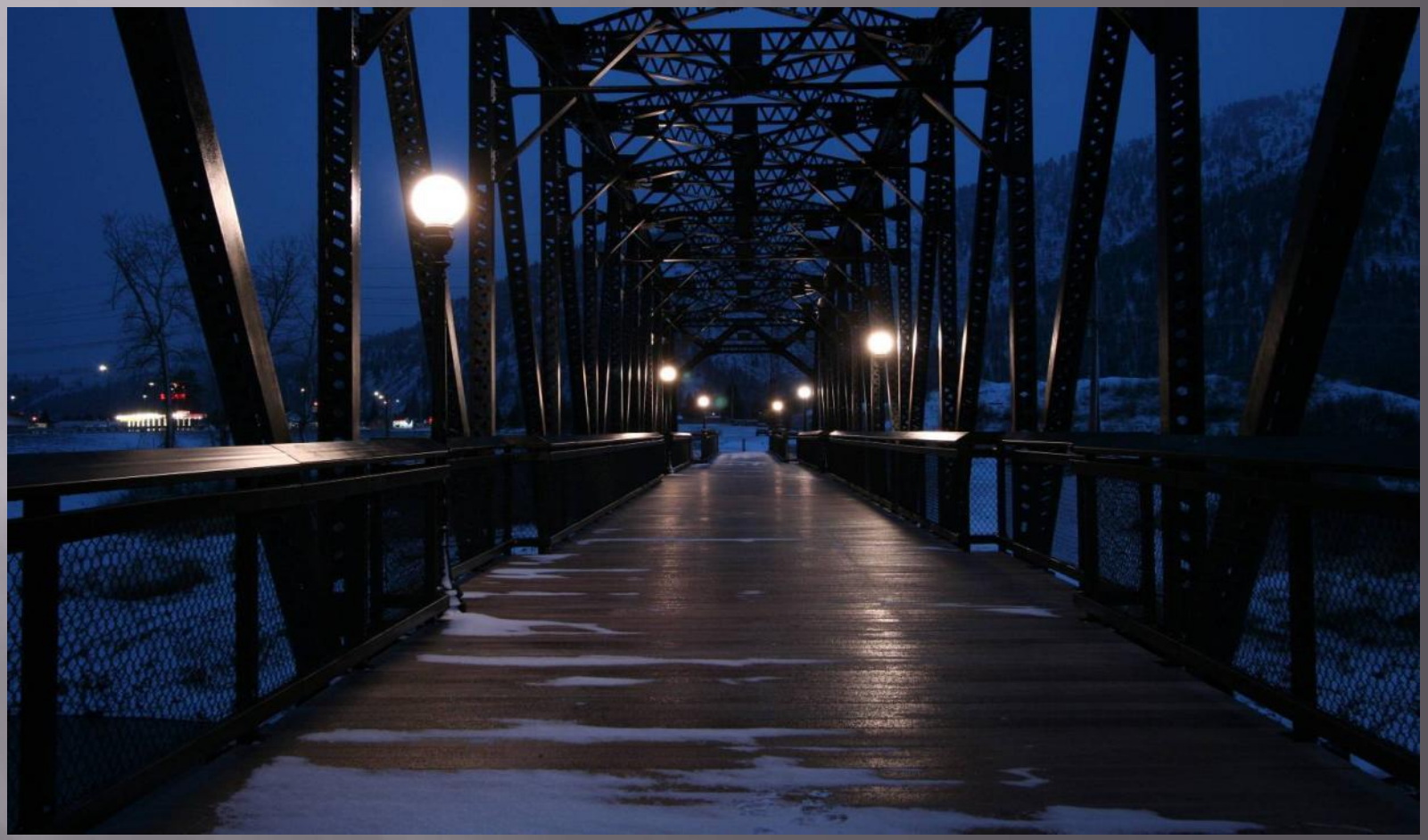
Finished Bridge at Night



QUESTIONS?

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Modern Steel Construction

September Issue

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