SUSPENSION TRAIL BRIDGE USING SUSTAINABLE MATERIALS

Rattlesnake Creek, Missoula, Montana, USA

Brad Miller PE *brad.miller@hdrinc.com*

BACKGROUND

- Initial Concept - Cable Stayed Bridge Using Smallwood

(Smallwood, or Roundwood, is 6 to 8 Inch Diameter Wood Made From Dead Lodge Pole Pine)

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- Many Agencies were involved in the Project

SMALLWOOD

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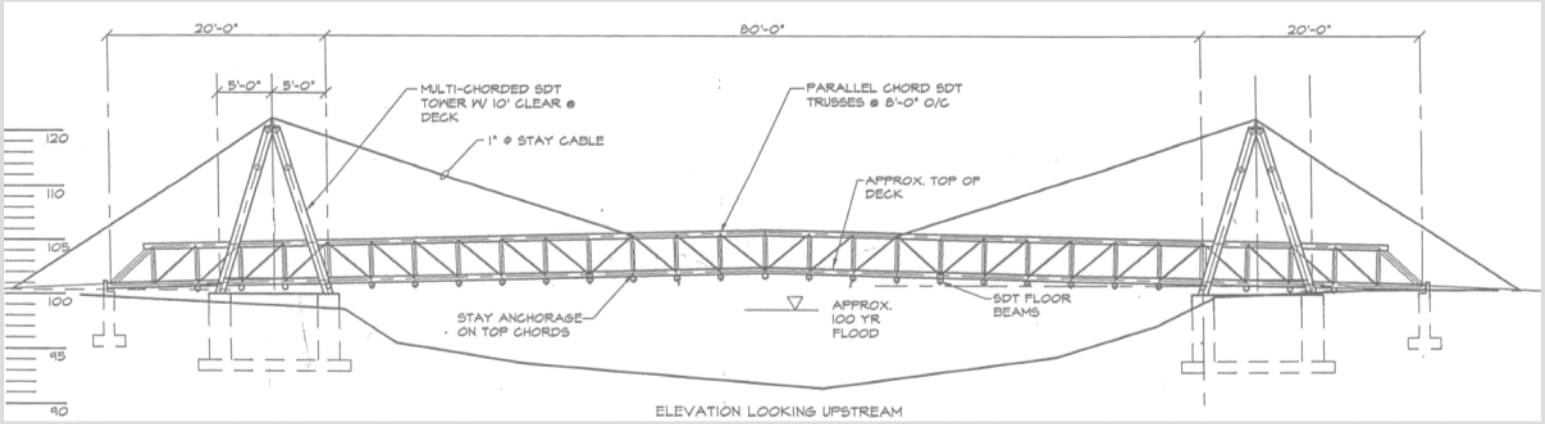
- Use This Sustainable Design Resource to Qualify for the Grant, and Help Minimize Fire Hazard

DESIGN STRATEGY



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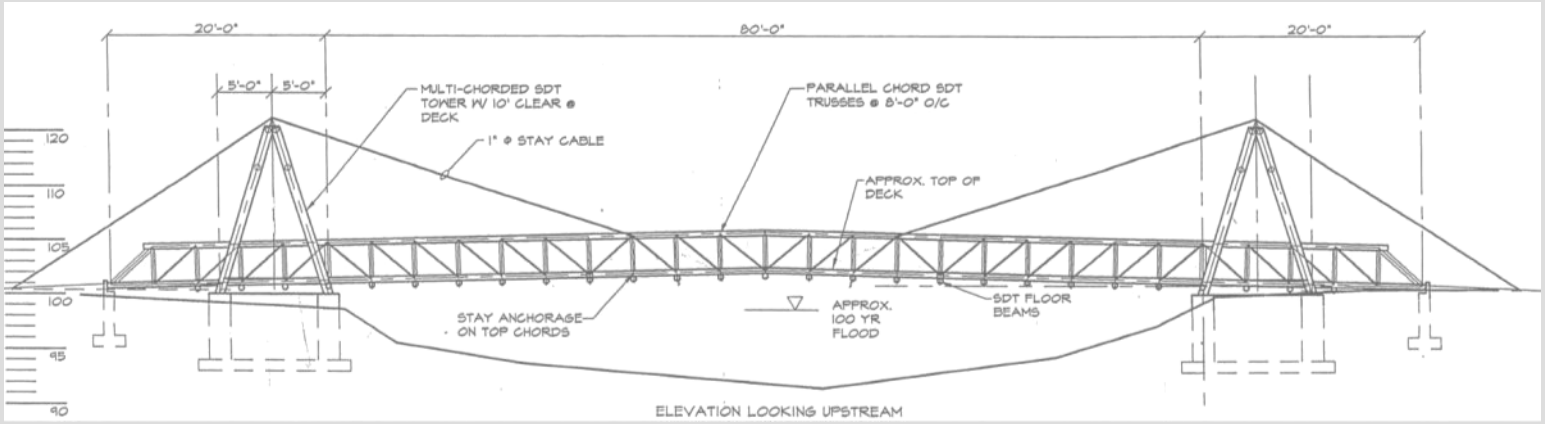

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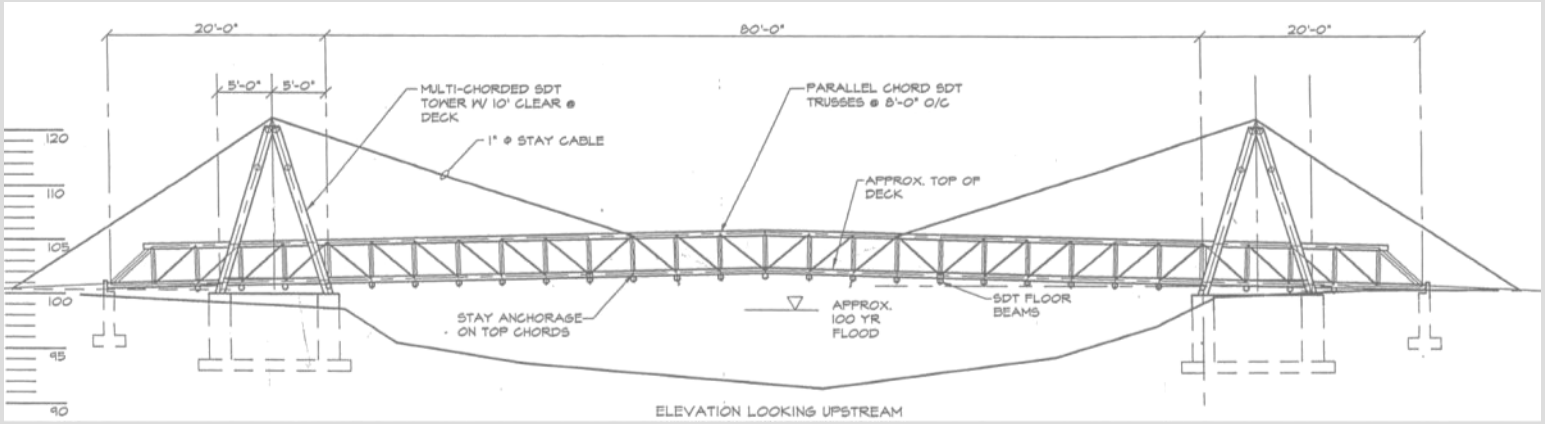

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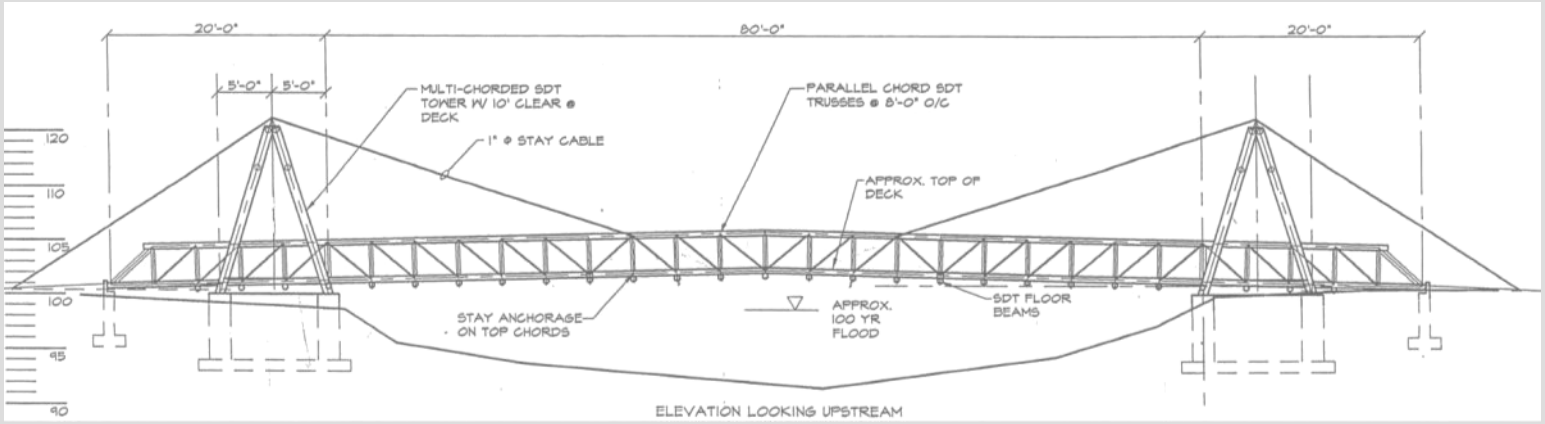

- Cable Stayed Bridge Concept From Study by Others
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- Use 6 inch Diameter Smallwood

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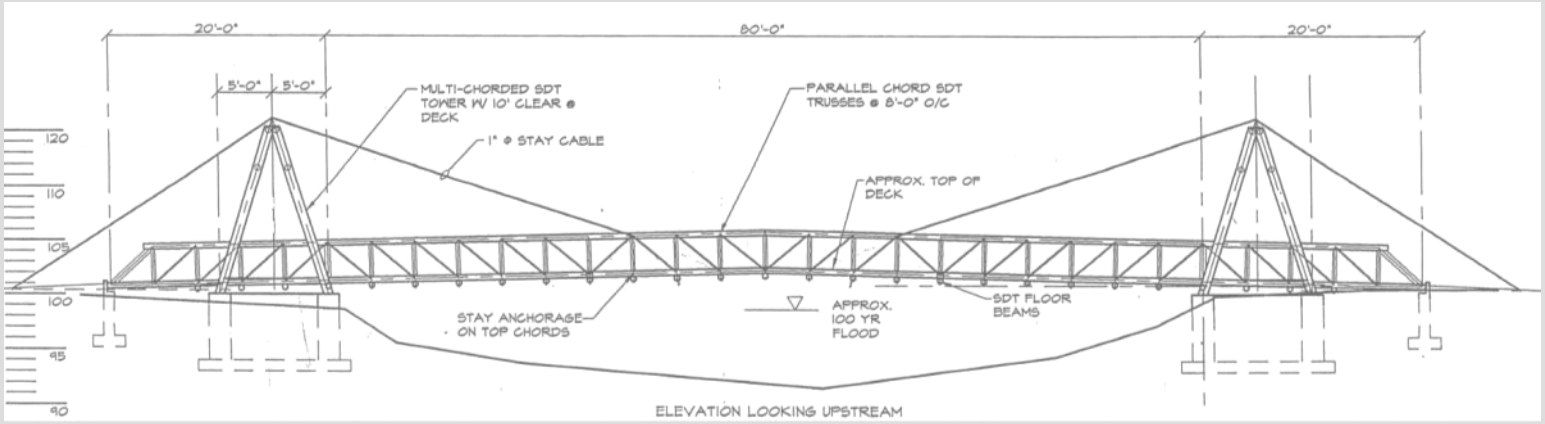

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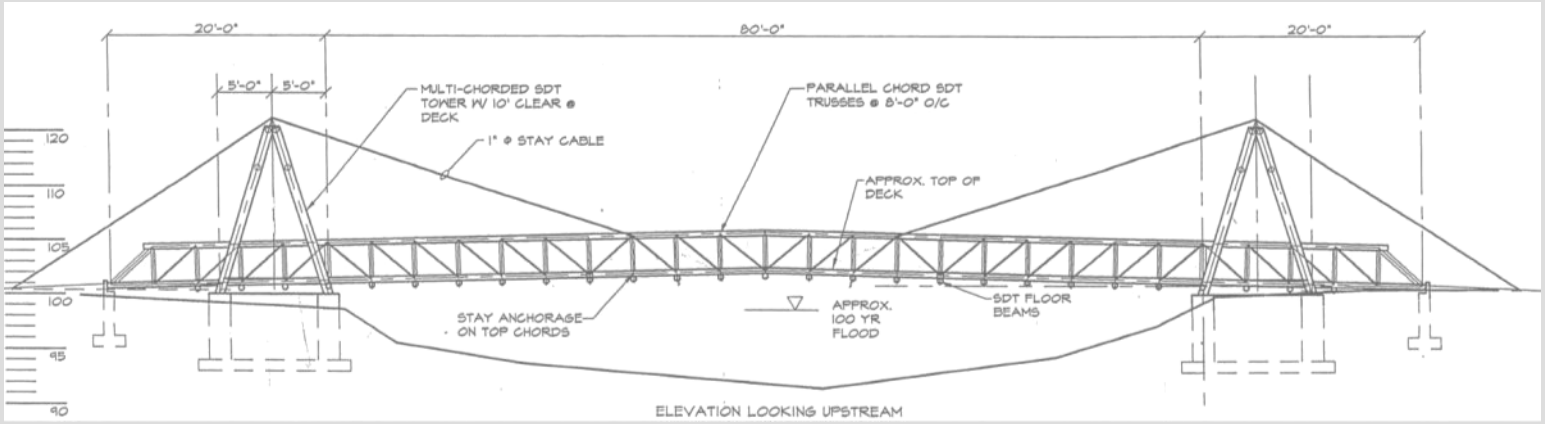

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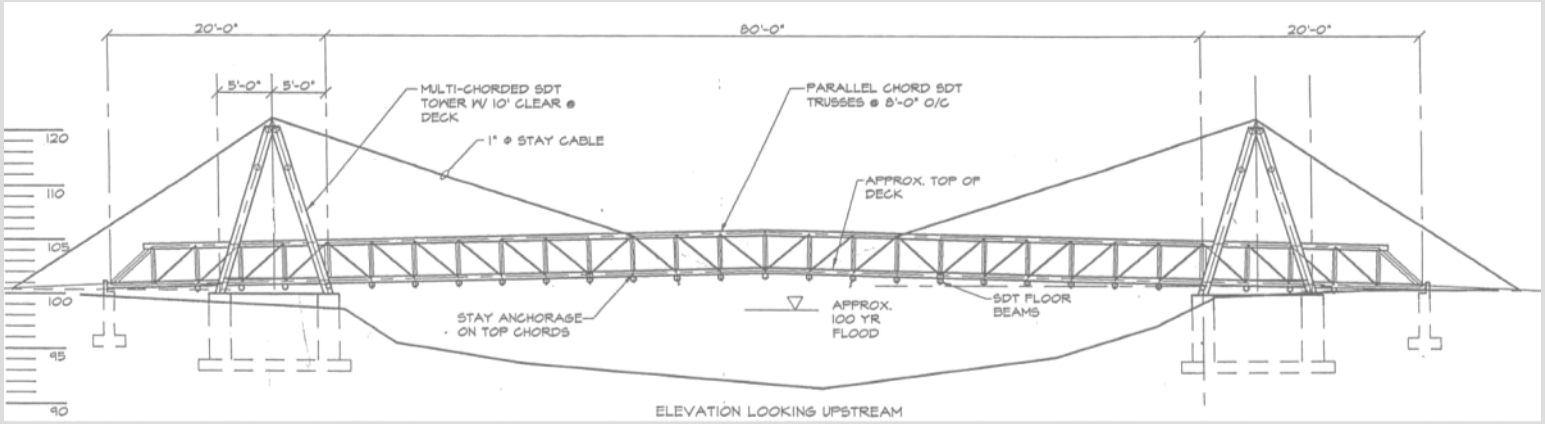

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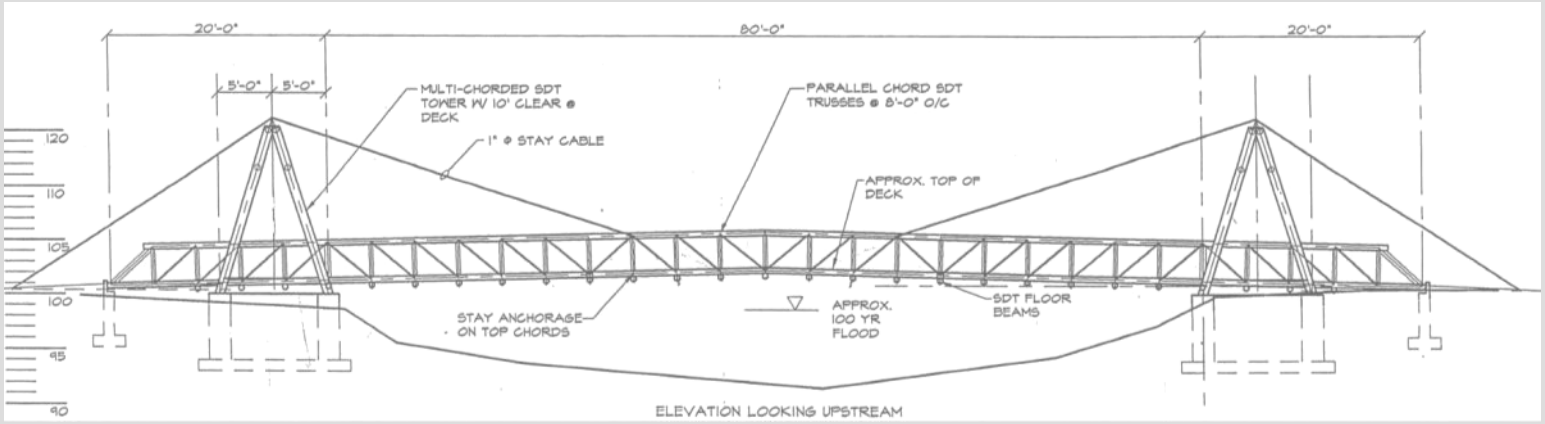

- Simplify Concept - Ease of Construction & Maintenance
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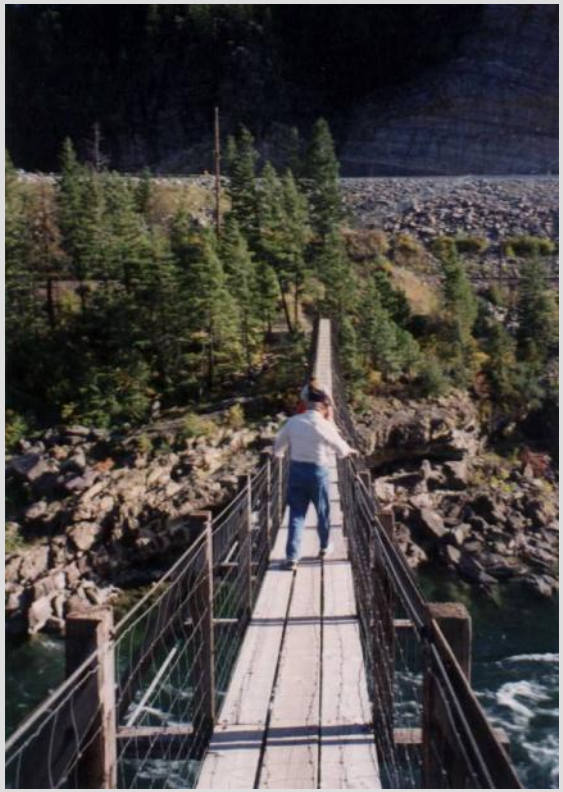
- Consider Aesthetics & Context Sensitive Design

US FOREST SERVICE TRAIL SUSPENSION BRIDGES



Typical USFS Suspension Foot Bridge, Libby, Montana

US FOREST SERVICE TRAIL SUSPENSION BRIDGES

Typical USFS Suspension Pack Bridge, Lochsa, Montana

US FOREST SERVICE TRAIL SUSPENSION BRIDGES

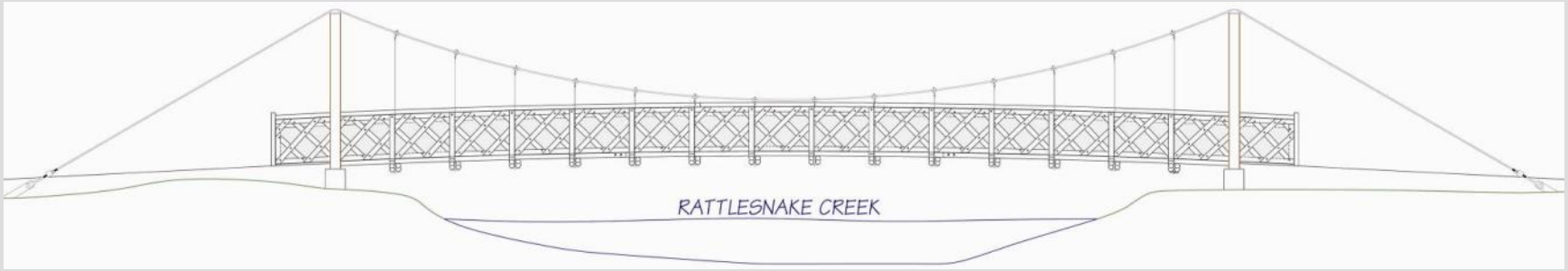
-Lattice Stiffening Trusses Using 6 Inch Boards

- Problems With Splices and Connections

- Towers Hard to Rehabilitate

- Many Have Lasted 75 Years!

DESIGN STRATEGY



- Use Lattice Stiffening Trusses From Half Rounds, Flat Sides Toward Each Other

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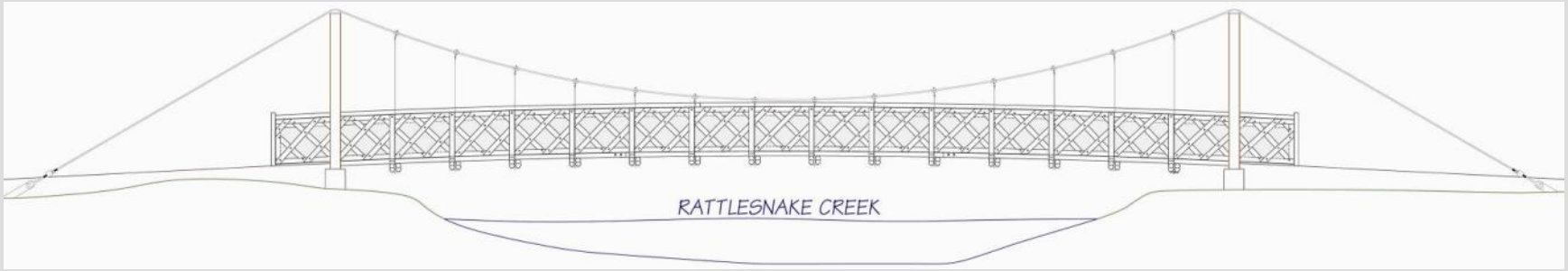

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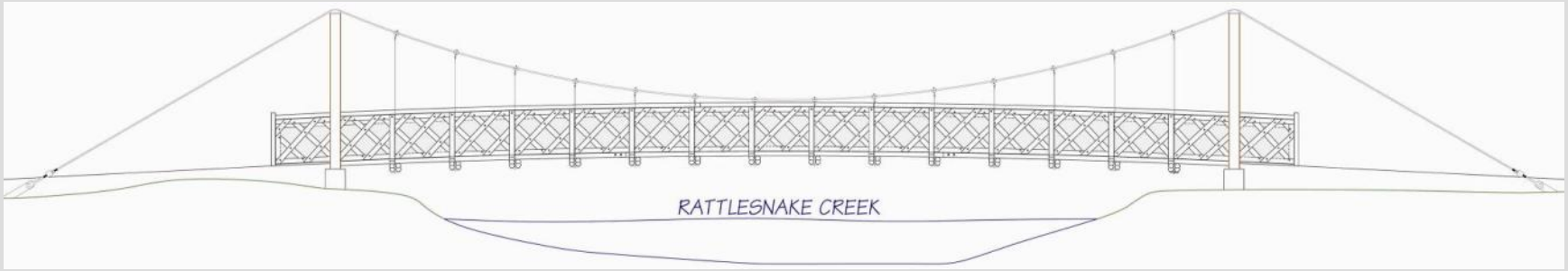

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- Eliminate Stringers For Simplicity and Savings, Use *Glued-Laminated Deck Over Floor-beams

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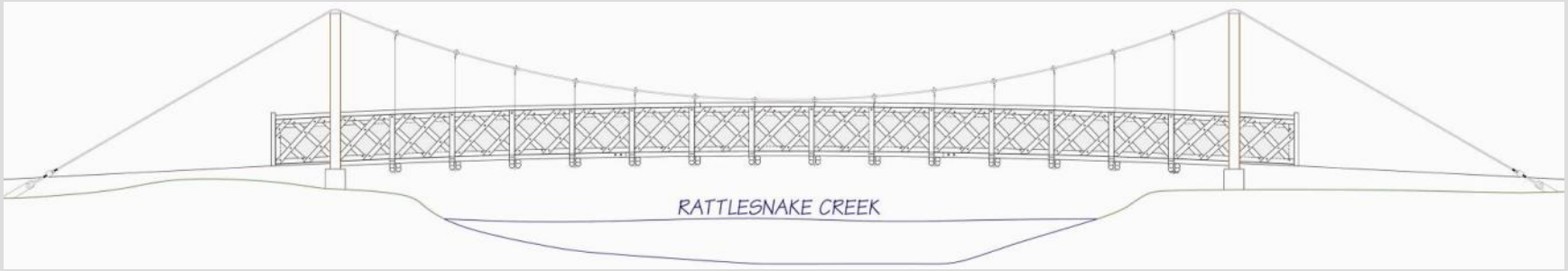

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*Changed to Composite Decking During Design

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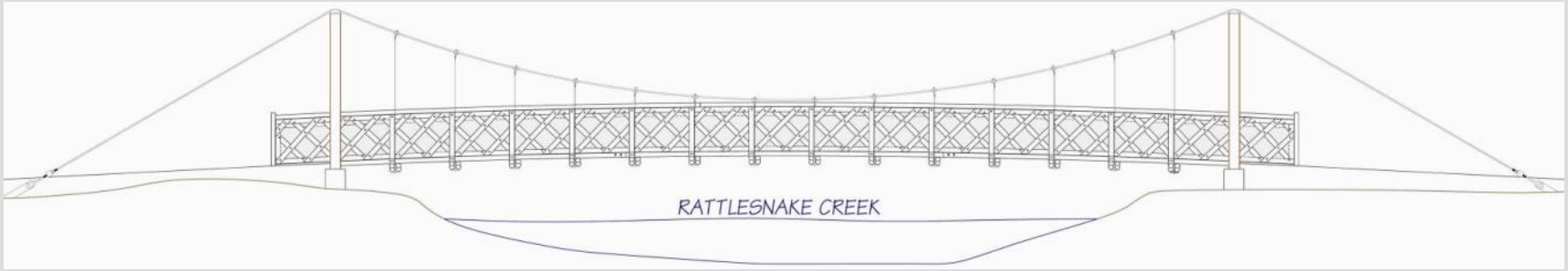
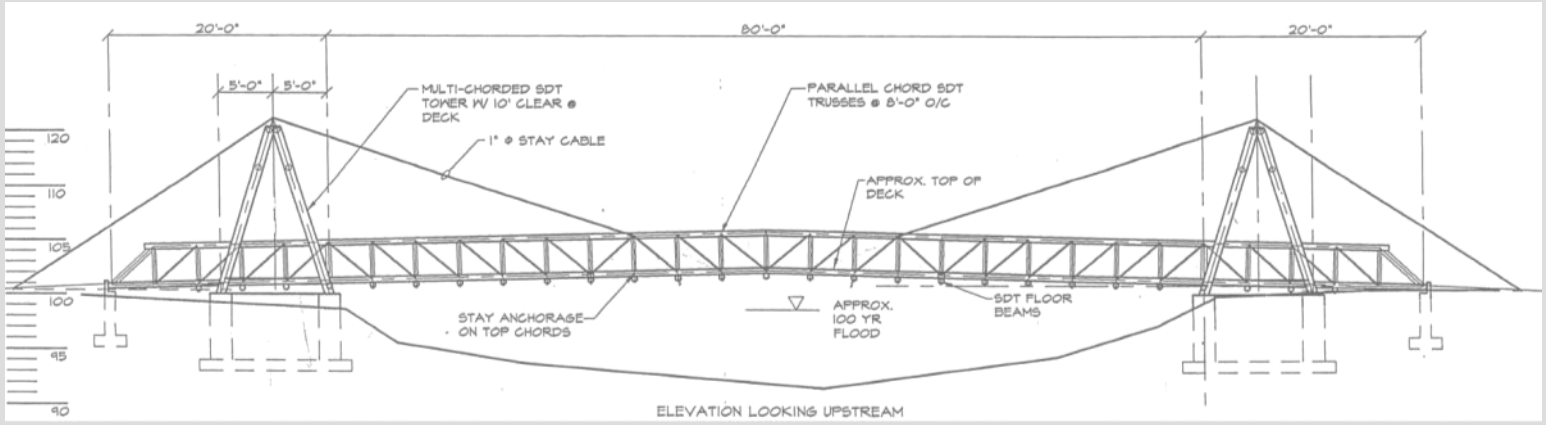
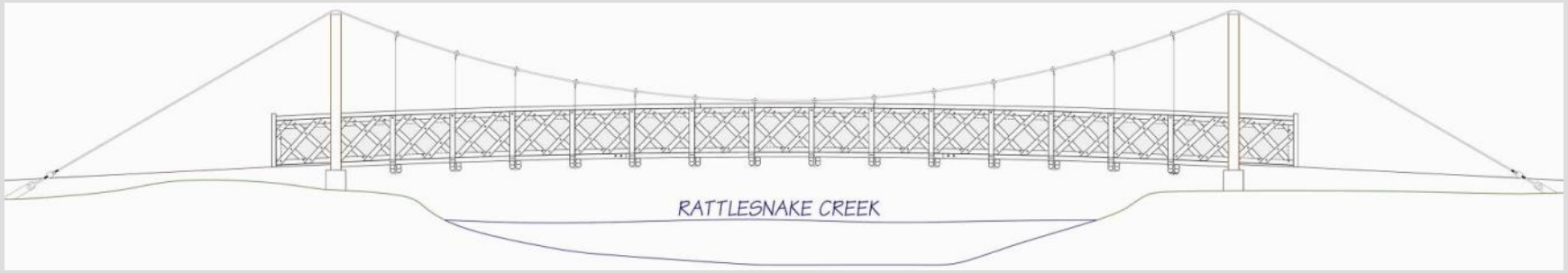


Use 90-ft Suspension Bridge, Lattice Stiffening Truss



Instead of Cable Stayed, Round Log Truss

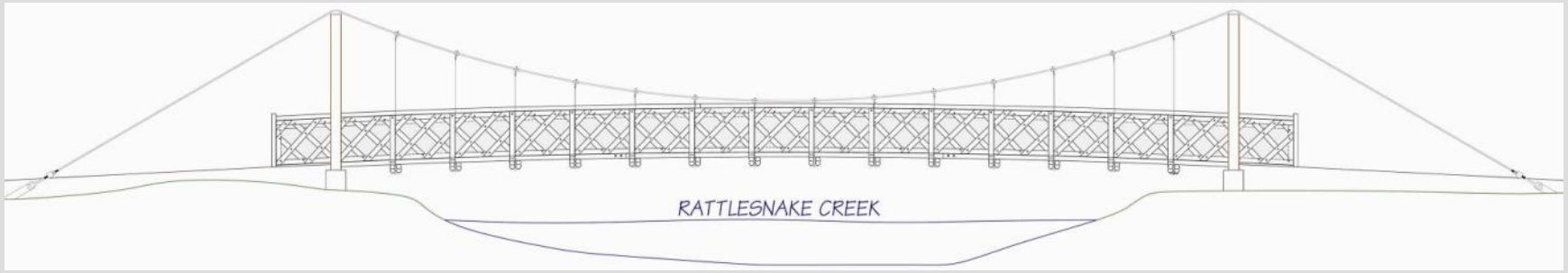
CONSTRUCTION SEQUENCE



Anchor Block

Concrete Pier

CONSTRUCTION SEQUENCE



Anchor Block

Concrete Pier

Cable Attachment

Towers, Cables, and Hangers

CONSTRUCTION SEQUENCE

Transverse Floor Beams

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Lattice Stiffening Truss

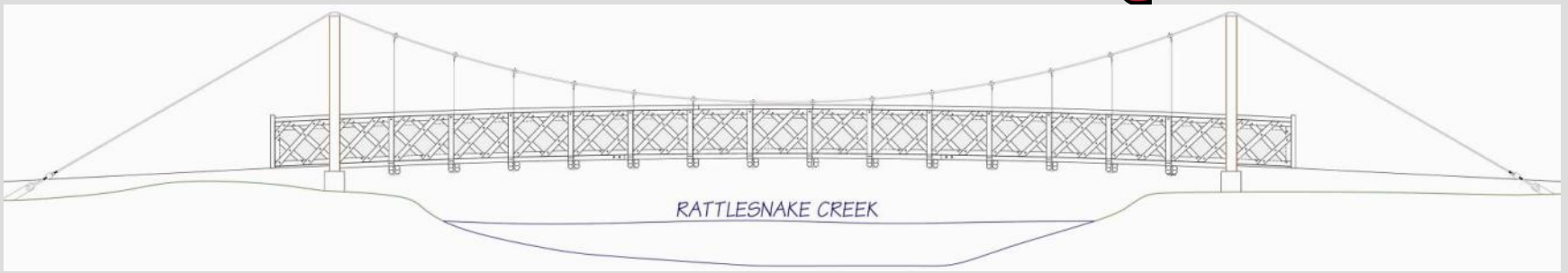
CONSTRUCTION SEQUENCE

Transverse Floor Beams

Lattice Stiffening Truss

Timber Shear Plates and Split Ring Connectors

CONSTRUCTION SEQUENCE



Lattice Truss Diagonals

Top/Bottom Chords

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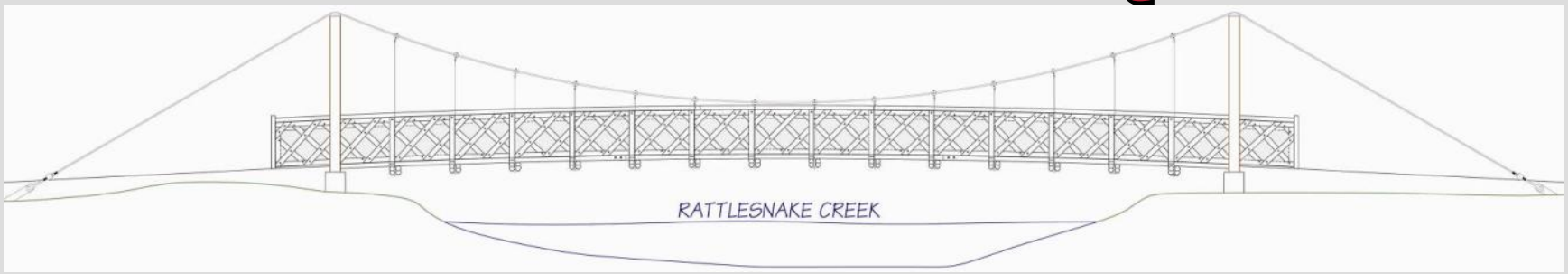
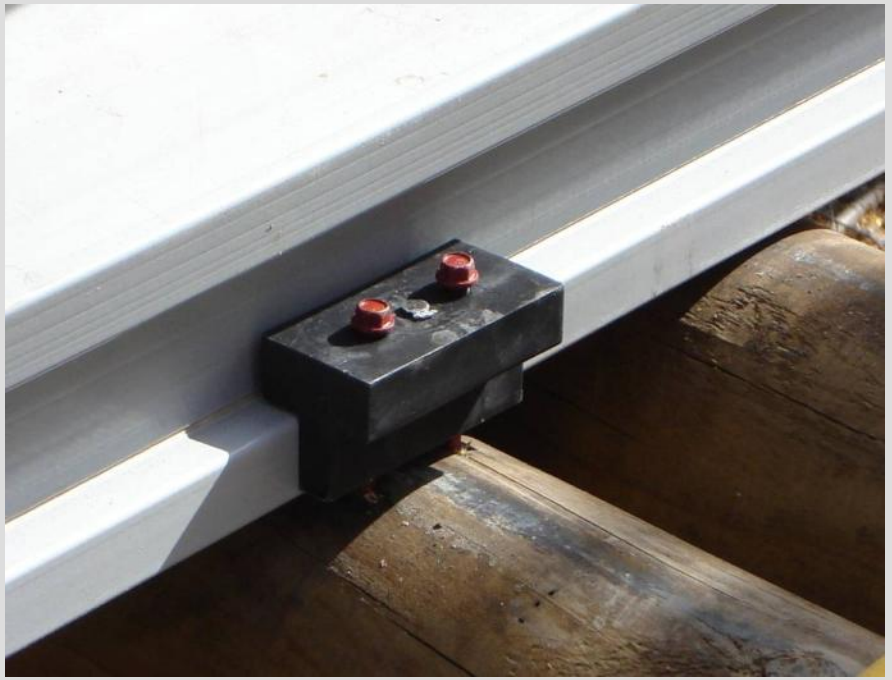


Lattice Truss Diagonals **Top/Bottom Chords**

Treated With Copper Quinolinolate – K8

CONSTRUCTION SEQUENCE



4 x 12 Inch Composite Decking From Sawdust and Recycled Plastic

Plastic Fastening Clips

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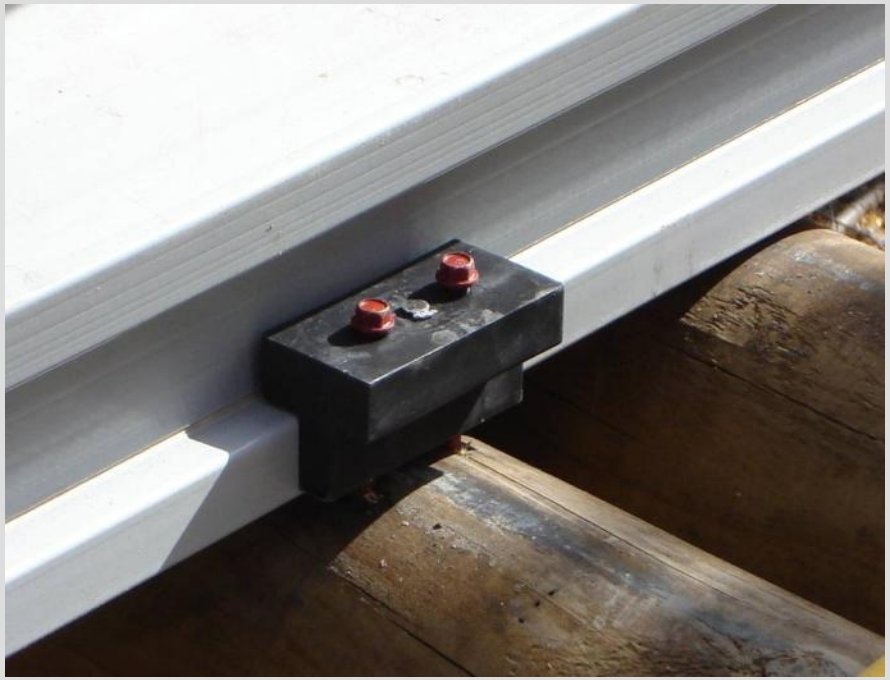

4 x 12 Inch Composite Decking From Sawdust and Recycled Plastic

Plastic Fastening Clips

Material Samples Available to Look at

CONSTRUCTION SEQUENCE

- Lateral Bracing
- Plates and Cones as Climbing Deterrent

CONSTRUCTION SEQUENCE

Approach Slab

Vinyl Coated Chain Link Mesh

CONSTRUCTION SEQUENCE

4'x8' x 5/8 Inch Thick Rubber Mats From Recycled Tires


COST
Total Cost - $250,000
$350 Per Square Foot

Dedication Ceremony

April 21, 2006

NATIONAL AWARDS

- 2007 American Council of Engineering Companies (ACEC): Engineering Excellence Awards, Honor Award

- 2007 America Road and Transportation Builders (ARTBA): Globe Award, 1st Place Bridge Category

- 2007 National Council of Structural Engineers Associations (NCSEA): Finalist Project Award, Second Place

- 2008 Association of Conservation Engineers (ACE): First Place Award of Excellence

PRESENTATIONS

- SMALLWOOD 2006 – Richmond, VA

- 2006 HDR Transportation Conference – Phoenix, AZ

- 86th Annual TRB Conference – Washington DC

- 2006 ACI Convention - Atlanta, GA

-2007 ACE Conference – Missoula, MT

- 2007 Western Bridge Engineers Seminar – Boise, ID

- 2008 17th Congress, International Association for Bridge and Structural Engineering – Chicago, Il

- SMALLWOOD 2010 – Hot Springs, AR

Rattlesnake Creek Pedestrian Bridge

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Thank You!! **Questions?**