SUSPENSION TRAIL BRIDGE USING SUSTAINABLE MATERIALS

Rattlesnake Creek, Missoula, Montana, USA

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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

- Large Stands of Lodge-Pole Pine Killed by Beetles
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- Largely Going to Waste and Creating a Fire Hazard
- 6 to 8 Inch Diameter, Suitable for Intermediate Members
- 6 Inch Diameter Logs Stockpiled, From the Nez Perce NF
- Use This Sustainable Design Resource to Qualify for the Grant, and Help Minimize Fire Hazard
DESIGN STRATEGY

- Cable Stayed Bridge Concept From Study by Others
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- Second Bridge With Same Concept Well Over Budget
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- Reduce Cost of Cable Stayed Concept or Revise Concept
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- Cable Stayed Bridge Concept From Study by Others
- Second Bridge With Same Concept Well Over Budget
- Reduce Cost of Cable Stayed Concept or Revise Concept
- Use 6 inch Diameter Smallwood
DESIGN STRATEGY

- Simplify Concept - Ease of Construction & Maintenance
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- Improve What Works, Avoid What Doesn’t Work
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- Look at Other Trail Bridge Designs, US Forest Service
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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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- Use Structural-Tees Top and Bottom as Connectors
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*Changed to Composite Decking During Design
DESIGN STRATEGY

Use 90-ft Suspension Bridge, Lattice Stiffening Truss

Instead of Cable Stayed, Round Log Truss
CONSTRUCTION SEQUENCE

Anchor Block

Concrete Pier

RATTLESNAKE CREEK
CONSTRUCTION SEQUENCE

Anchor Block
Concrete Pier
Cable Attachment
Towers, Cables, and Hangers
CONSTRUCTION SEQUENCE

Transverse Floor Beams
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Transverse Floor Beams

Lattice Stiffening Truss
CONSTRUCTION SEQUENCE

Transverse Floor Beams
Timber Shear Plates and Split Ring Connectors
Lattice Stiffening Truss
CONSTRUCTION SEQUENCE

Lattice Truss Diagonals
Top/Bottom Chords
CONSTRUCTION SEQUENCE

Lattice Truss Diagonals
Treated With Copper Quinolinolate – K8

Top/Bottom Chords
CONSTRUCTION SEQUENCE

4 x 12 Inch Composite Decking
From Sawdust and Recycled Plastic

Plastic Fastening Clips
CONSTRUCTION SEQUENCE

4 x 12 Inch Composite Decking
From Sawdust and Recycled Plastic

Material Samples Available to Look at

Plastic Fastening Clips
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?