


Portable Timber Bridge Systems for Temporary Stream Crossings

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STREAM CROSSING CHALLENGE

- Forest road stream crossings are focal points for introducing sediment into streams.
  - Construction, use, and removal activities can introduce significant sediment loads.
  - Road approaches bring sediment to the stream.
  - Low-impact and cost-effective stream crossing methods are needed.
- Temporary bridges are also needed by construction activities.

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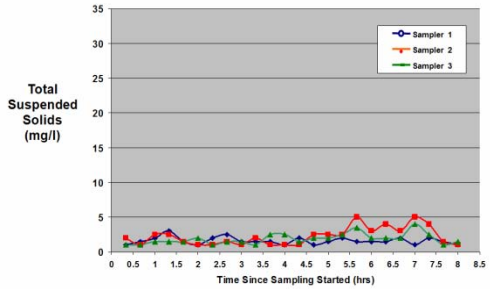
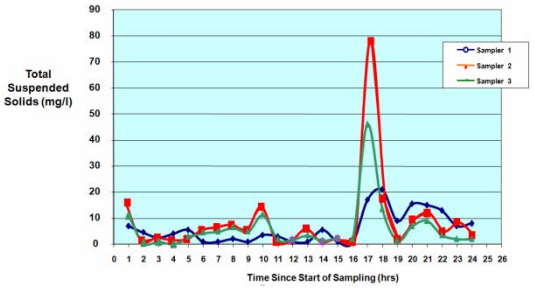
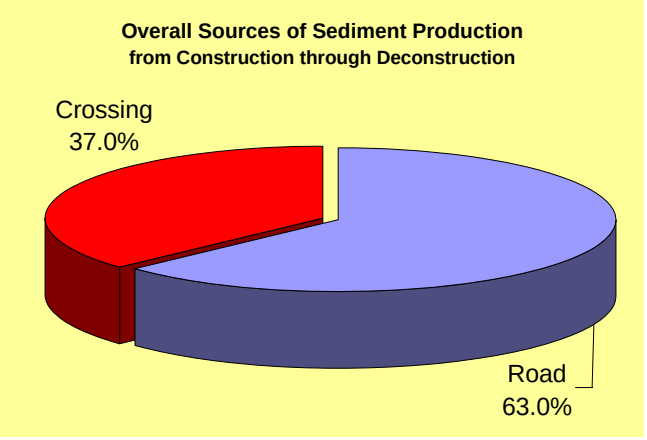
STREAM CROSSING WATER QUALITY IMPACTS

- **Portable bridges can be installed and removed with negligible sediment loads to forest streams.**



- **Sediment introduction during use of portable bridges can be minimal – even during use of off-highway vehicle bridges by log skidders.**
  - *Majority of sediment introduced during storm events*
  - *Majority of sediment is generated from road approaches*





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PORTABLE BRIDGE DESIGN CONSIDERATIONS

- **Safety**
  - Structural adequacy / design vehi
  - Appropriate management of risks
- **Serviceability and Performance**
  - Deflection limitations
  - Ease of installation
  - Durability
- **Cost**
  - Initial
  - Life-cycle

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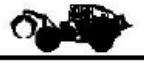
BRIDGE CLASS DESIGN CRITERIA

	Sub-Low Volume	Low Volume	High Volume
Design Life	5 years	10 years	25 years
Traffic Type	Off-highway vehicles	Trucks	Trucks
ADT	50	100	unlimited
Design Speed	8 kph	8 kph	40 kph
Load type	Off-highway vehicles	HS20 or greater	HS20 or greater
Load application period	6 months	24 months	36 months
Deflection limit	none	none	AASHTO or reduced

DESIGN LOADS

Standard AASHTO Equivalents of Forestry Vehicles by Span						
Vehicle	Wheeled Skidder	Wheeled Skidder	Wheeled Skidder	Wheeled Skidder	Wheeled Skidder	Wheeled Skidder
Weight (lbs)	15000 - 20000	20000 - 25000	25000 - 30000	30000 - 35000	35000 - 40000	40000 - 45000
Bridge Span (ft)						
10	H 15-44	H 15-44	H 15-44	H 20-44	H 20-44	HS 25-44
12	H 15-44	H 15-44	H 15-44	H 20-44	H 20-44	HS 25-44
14	H 15-44	H 15-44	H 15-44	H 20-44	H 20-44	HS 25-44
16	H 15-44	H 15-44	H 15-44	H 20-44	H 20-44	HS 25-44
18	H 15-44	H 15-44	H 15-44	H 20-44	H 20-44	HS 25-44
20	H 15-44	H 15-44	H 15-44	H 20-44	H 20-44	HS 25-44
22	H 15-44	H 15-44	H 15-44	H 20-44	H 20-44	HS 25-44
24	H 15-44	H 15-44	HS 15-44	H 20-44	H 20-44	HS 25-44

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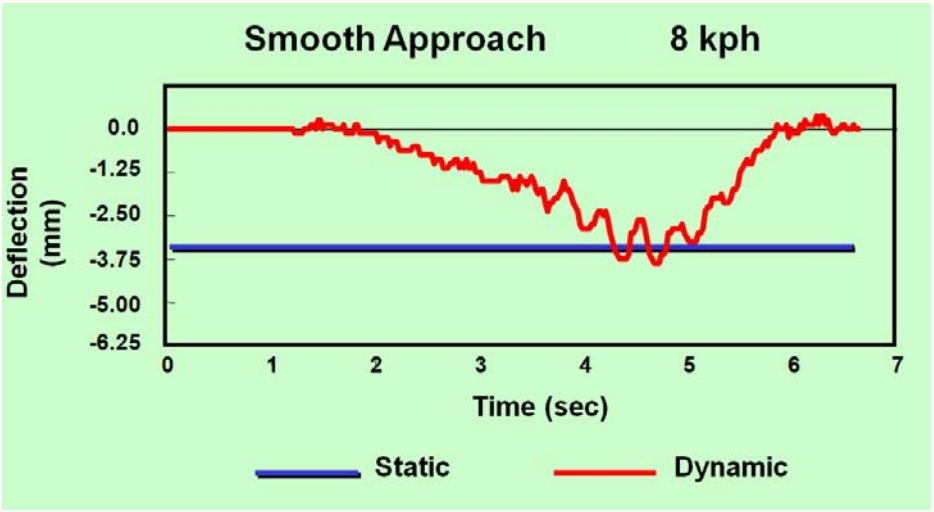
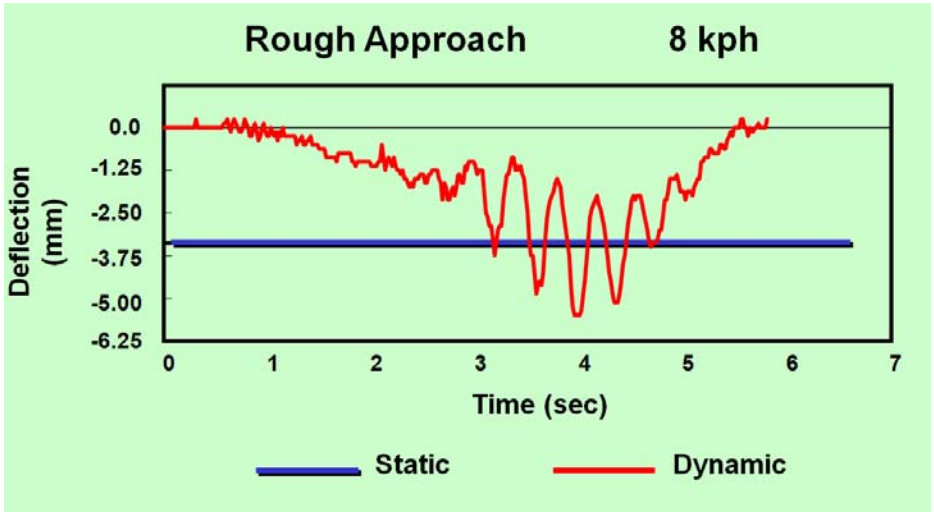
DESIGN LOADS – DYNAMIC EFFECTS

	Dynamic Amplification Factor
Mean	1.17
90th Percentile	1.50
95th Percentile	1.64





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PORTABLE BRIDGE EXAMPLES

Longitudinal deck superstructures

- Traditional glued-laminated timber deck

- Off-highway vehicle glued-laminated timber panels

- T-section glued-laminated timber deck

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TRADITIONAL GLULAM DECK

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TRADITIONAL GLULAM DECK COST

+ initial bridge cost = $ 15,500
+ installation cost per site = $ 1,
+ total cost for 10 sites = $ 25,500
+ <u>average cost per site = $ 2,550</u>

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GLULAM DECK FOR OFF-HIGHWAY VEHICLES

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OFF-HIGHWAY VEHICLE BRIDGE COST

+ initial bridge cost = $ 8,0
+ installation cost per site = $ 1
+ total cost for 50 sites = $ 16,250
+ average cost per site = $ 325

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T-SECTION GLULAM DECK

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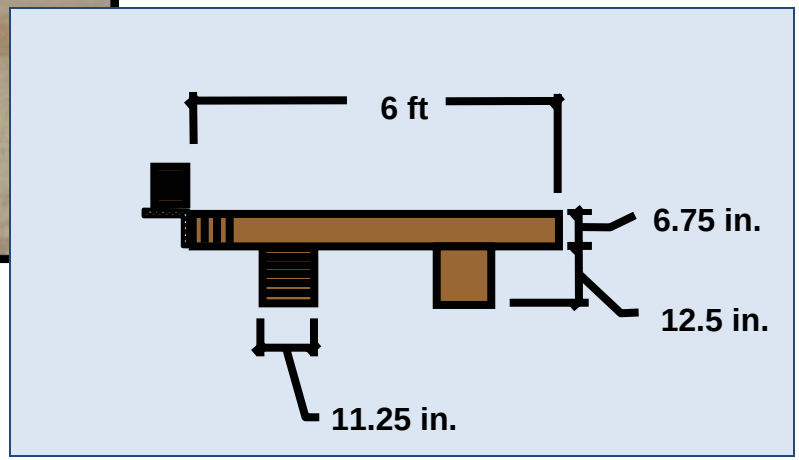

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T-SECTION BRIDGE COST

- initial bridge cost ..... $ 17,000
- spread footer cost ..... $ 600
- installation and removal cost . $ 1,000
- Total Cost for 10 sites..... $ 27,600
- Cost per site $

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DISCUSSION

- Bridges performed well overall.
  - Bridges successfully carried design loads and overloads.
  - Repeated installation/removal brings additional wear on components.
  - High initial cost limits acceptance for engineered bridges.
- Bolt-laminated and stress-laminated deck designs available.
  - Repeated handling may be problematic for hardware.

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SUMMARY

- Portable timber bridges are excellent options for temporary stream crossings.
  - Portable bridge systems can reduce water quality impacts at the road stream crossing.
  - Longitudinal deck designs are most appropriate for portable applications.
  - Glulam decks have performed well in service. Repeated use results in considerable wear.
  - While glulam decks have high initial costs, the average cost per site is competitive with other stream crossing options.

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