Las Trancas Bridge Project

Trancas Associates
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Michigan Technological University - International Senior Design
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Outline

• Community Overview
• Current Conditions of Roadway and Project Site
• Data Acquisition and Analysis
• Design Constraints and Alternatives
• Final Design Selection and Detailing
• Cost Estimate and Project Schedule
Comarca Ngäbe-Buglé
Las Trancas Location & Transportation Routes

(via Google Maps)
Poor Road Conditions
Steep Road Grades
Previous Bridge Attempts
Current Conditions
Ford Crossing
Las Trancas Center
Las Trancas Community
Site Layout
Site Surveying
Soil Conditions

Soil Classification

● Brown red fat clay
● High Plasticity
● CH on ASTM Scale
Summary of Design Constraints

- Remote Location
- Poor Road Conditions
- Steep Elevations
- Budget
- Hydrology
- Soil Conditions
Design Alternatives

Box Culvert

Steel Truss

Wood Truss
Final Design

Flexible Steel Buried Bridge

- Reduces Live Loads
- Spread footings
- Natural river bottom
- Lightweight materials
- Low maintenance


Hydrology - Watershed

- 0.33 $mi^2$ approximated watershed area
- ~ 4300’ channel length leading into the site location
- NRCS Peak Discharge Method was used:
  - Runoff Curve Number: 83
Hydrology - Stream Channel Slope

- 5% Channel Slope
Hydrology - Hydrograph

Hydrograph due to runoff through channel at project location

- 280 ft³/s Max Flow Rate
Riprap Placement

- Plan view of Riprap Placement
- Riprap to be Placed at 3:1 along River Channel

Max River Height: 30”
Max Velocity of 8.4 ft^3/s
Crown Plate and Footing on 3D model
Footing Design

6" x 2" Steel Footing
18.75 ft Length
5 ft Width

f’c = 4 ksi
Grade 60 Steel
Bridge Dimensions

- **18.75 ft Width**
- 5 Plates across End Section
- 5 Plates across Middle Section
- 5 Plates across End Section
- 9ft 3 in
- 23 ft 4 in
- Existing Road Profile
- Footings to be a Depth of 7.5 ft
- River Channel to be Excavated for Bridge Installation
Bridge Plates

Corrugated Steel Plate
(15 in x 5.5 in)

HS-20 Loading
Crown Plate Dimensions

End Section
R102.25 in

171.75 in

114.3 in

114.3 in

Middle Section
R190 in

End Section
R102.25 in
Headwall Plate on 3D Model
Gravel Placement

- 18 ft Road Width
- Minimum 2 ft of Gravel Cover
- Masonry Wall to Contain Gravel

1 in Crushed, Angular Gravel
- 6” - 8” Lifts and Compacted to 90%
- Vertical Road Grades of 16% and 20%
Masonry Wing Walls

Concrete Block Masonry Walls

Cross Section
5% Crown
Steel Headwall

Connection A rods run to opposite side Headwall. Connection B & C rods connect to Crown Plate.
Cost Estimation and Project Schedule

Overall Project Cost - $67,000

- Equipment - $18,500
- Material - $38,000
- Labor - $10,500

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Conclusion

• Las Trancas needs a reliable structure over this stream crossing to keep transportation route open year-round
• Analyzed data collected on assessment trip, formed design constraints
• Flexible buried steel bridge best meets design constraints
• Detailed final design
  • Channel Design
  • Footing Design
  • Roadbed Design
  • Steel Structure Design
• Cost Estimate Project Schedule
Thank You!