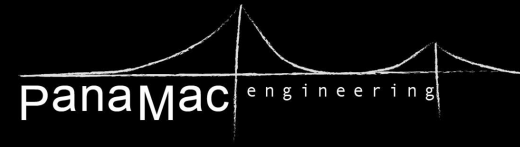




Michigan
Technological
University



Rio Tabasara Pedestrian Bridge

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December 13, 2018

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Outline

- Site Visit
- Community Background
- Data Collection
- Design
 - Assumptions
 - Details
 - Alternate Considerations
- Cost Estimate
- Construction Schedule
- Looking Forward

Site Visit

- Traveled to Vigui
 - 7 hour duration
- Took a Chiva to Llano Nopo
 - 1 hour duration
- Hiked to Llano Miranda
 - 1.5 hour duration
- Hosted by Peace Corps Volunteer



Site Visit



Site Visit

- Scoped out potential locations for the bridge
 - Accessibility
 - Flood Areas
- Community Meeting
 - Needs
 - Ideas
- Tour from Ubaldo



Community Background

- Very few jobs within the Comarca
- Many men live in a bigger city during the week
- Problems with HIV and Dysentery



- No electricity, running water, or latrines
- First Peace Corps Volunteer on-site

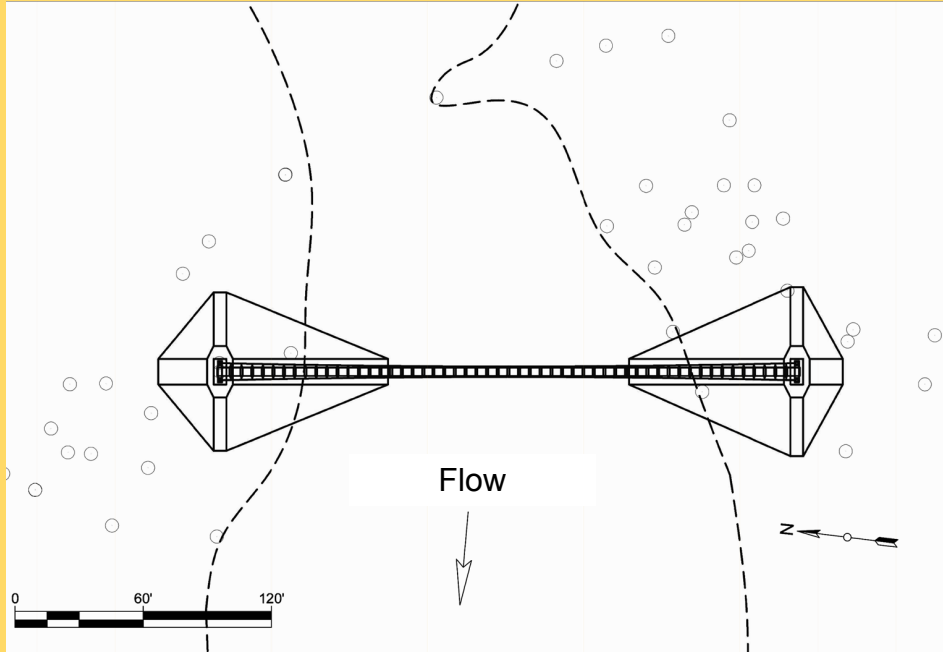


Data Collection

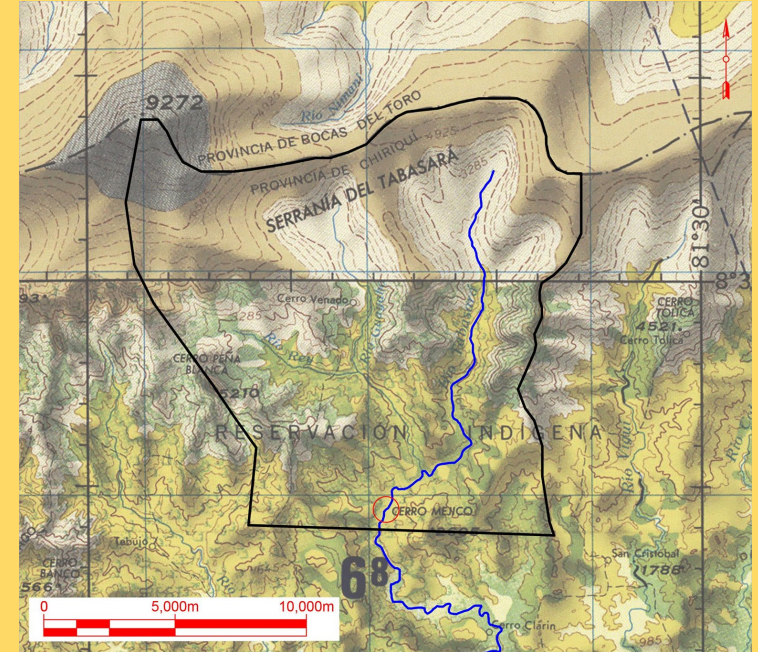
- Surveying
- Soil Analysis
- Flow Rate
- Preliminary Calculations
- Design Decisions



Data Collection



Surveyed Points: Plan View



Approximate Watershed Drainage Area:
24,840 hectares

Llano Ñopo

- Developed City 2 hours away
- Hospital
- School
- Markets
- Electricity
- Bridge



Llano Ñopo

Llano Ñopo Suspension Bridge

Attribute	Measurement
Length	277.5 ft.
Width	6.0 ft.
Deck to Water Level	37.3 ft.
Bottom of Cable Sag to Water Level	40.8 ft.
Cable Sag	15 ft.
Cable Diameter	1.25 in.



Preliminary Design

- Needs

- Carry children to school
- May carry animals
- Minimum span ~270 ft
- Survive river flooding



- Design Choices

- Suspension bridge
- Ramps to raise bridge above floodplain
- 4 feet wide to allow people to pass
- Design for animal hoof-loads
- Consider 100 mph wind load



Suspended bridge example - Bridges to Prosperity Manual

Alternate Designs

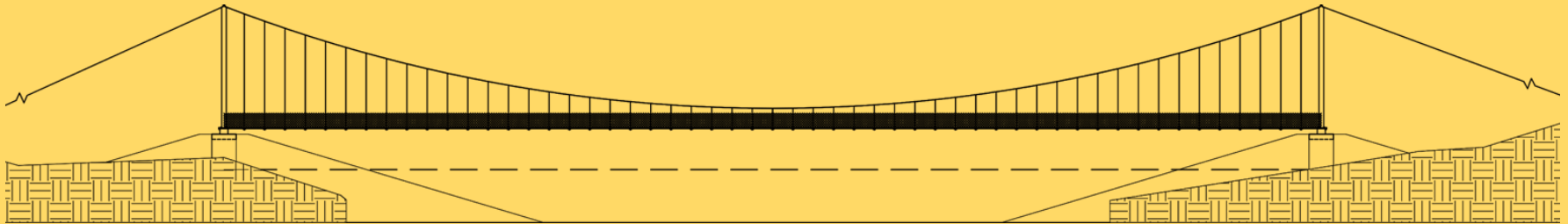
- Three-cable bridge considered
- Still must stay above the water
- Dangerous for children
- Ramps would be too large
- Considering safety and cost, better to build suspension bridge



Photo Credit: Cameron Speirs

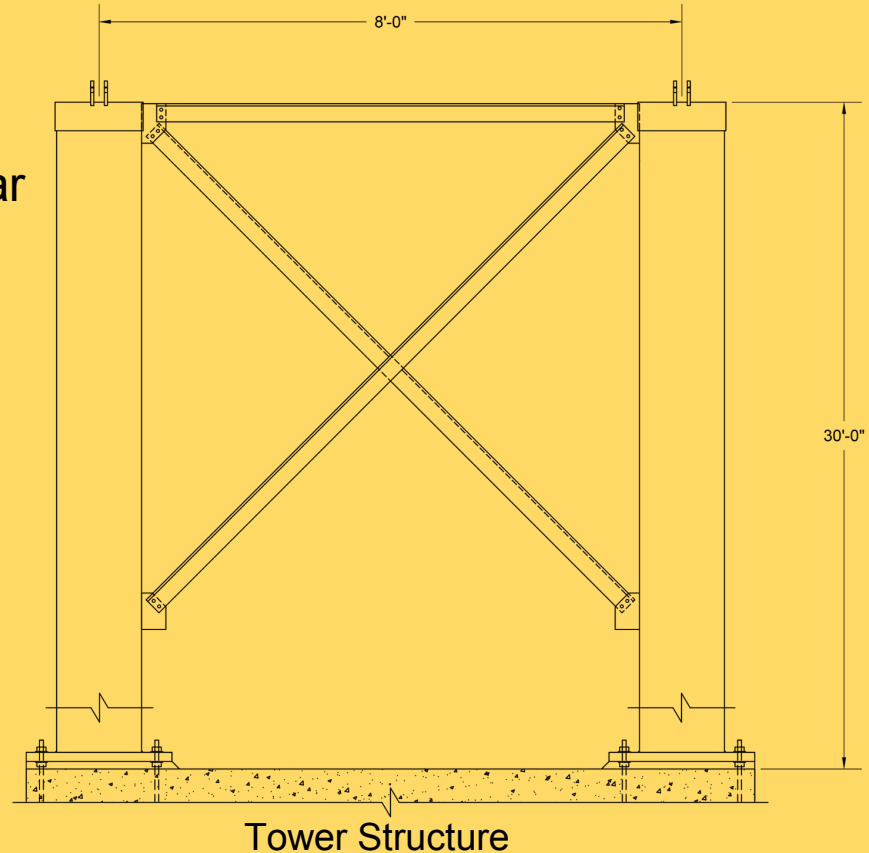
Overall Design

- 270 foot span
- 25 foot cable sag
- 5 foot hanger spacing
- 10 foot freeboard (height above water)



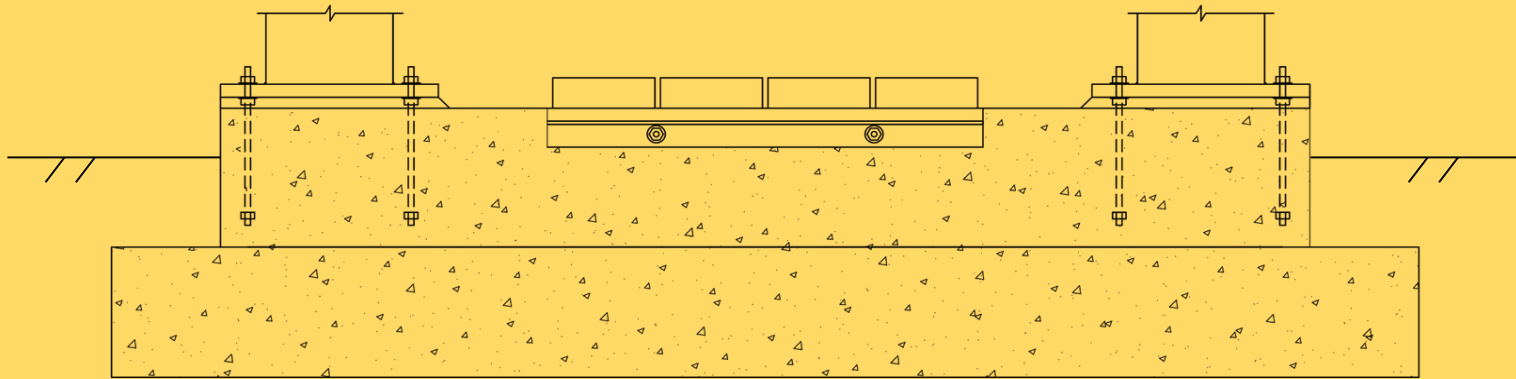
Superstructure Design

- Designed for 65 lb/ft² or 500lb at any point
- Minimum of $\frac{3}{8}$ " steel for corrosion and wear
- Decking: 4x12 native wood planks
- Cables: 1 $\frac{5}{8}$ " 6x25 Galvanized Wire Rope
- Towers: 30' Tall 14x0.375 Round HSS
- Cables and hangers designed with large factor of safety, preventing progressive failure



Tower Foundation Design

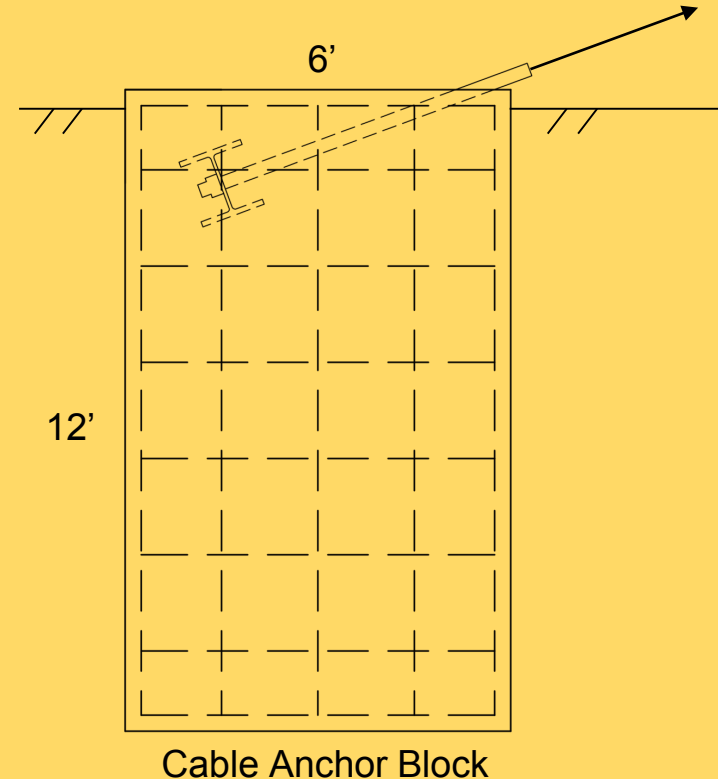
- Uncertainty in exact soil properties
 - Not able to conduct detailed soil tests
- Designed for approximate worst-case clay
- Large factors of safety used
- Large mat foundations for towers: 6x12 feet
- 14" Thick Reinforced Concrete



Tower Foundation

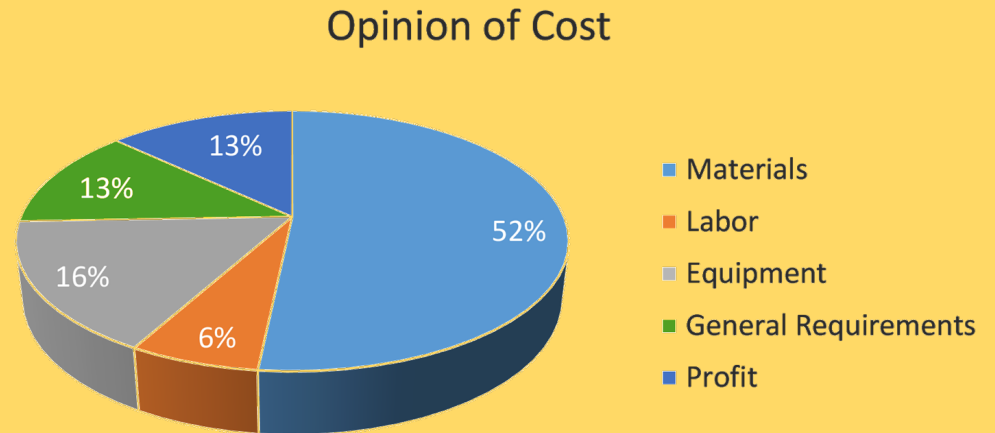
Anchor Block Design

- Deep concrete anchor blocks for cables
 - 6x10x12 feet, deep to resist sliding
 - Embedded steel beam to connect to cable
 - Skin reinforcement to control cracking
 - Entirely embedded in the ground



Cost Estimation

	Cost (USD)
Materials	115,929
Labor	14,480
Equipment	36,668
General Requirements	28,101
Profit	29,277
TOTAL	225,000



Construction Schedule

- Construction window
 - January-April (Dry Season)
- Three month expected duration
- 8 hour work days
- 5 day work weeks



Looking Forward

- Documents to Peace Corps. Volunteer
- Ministry of Public Works
- Other forms of Funding
- Construction



Thank You!

