A Bridge to the Comarca: Chucunaque River Footbridge

iDesign 2013

Del Puente Engineering

Corrinne Beyer, Jillian Broadbent (PM), Wes Karras, Carissa Maes, Tom Stroup

Mission Statement

"As a global firm in consulting and design, Del Puente Engineering has the human and technical resources design safe, economical river crossings with minimal environmental impact, along with the depth of knowledge and experience to help clients achieve successful projects in the complex social and political climate of the Embera-Wounaan Comarca of Panama."

Outline

- Our Experiences
- Community Background
- Design Requirements
- Data Collection
- Final Design
- Cost Estimate
- Schedule
- Summary
- Questions

Destination: Panama

Travel to Comarca

Community Background

Community Background

Community Background

http://panamatourismtravel.blogspot.com/2012/01/embera-baskets.html

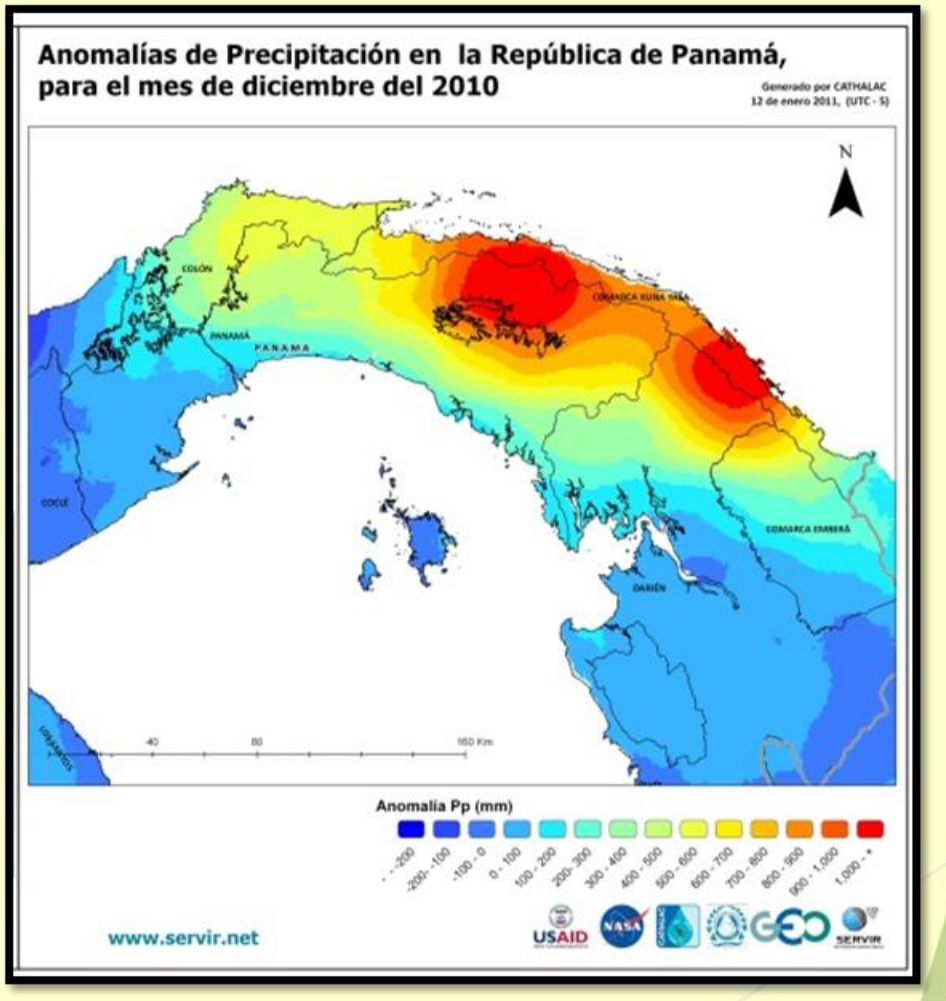
Festival

Festival

Reasons for a Bridge

Chucunaque Watershed

- River Length: 134 miles
- Watershed Area: 4118 square miles
- 100-year Flood Line



https://servirglobal.net/Mesoamerica/Articles/tabid/241/Article/1001/heavy-rains-and-flooding-in-panama-dec-2010.aspx

Design Challenges

Design Challenges

Surveying

Surveying

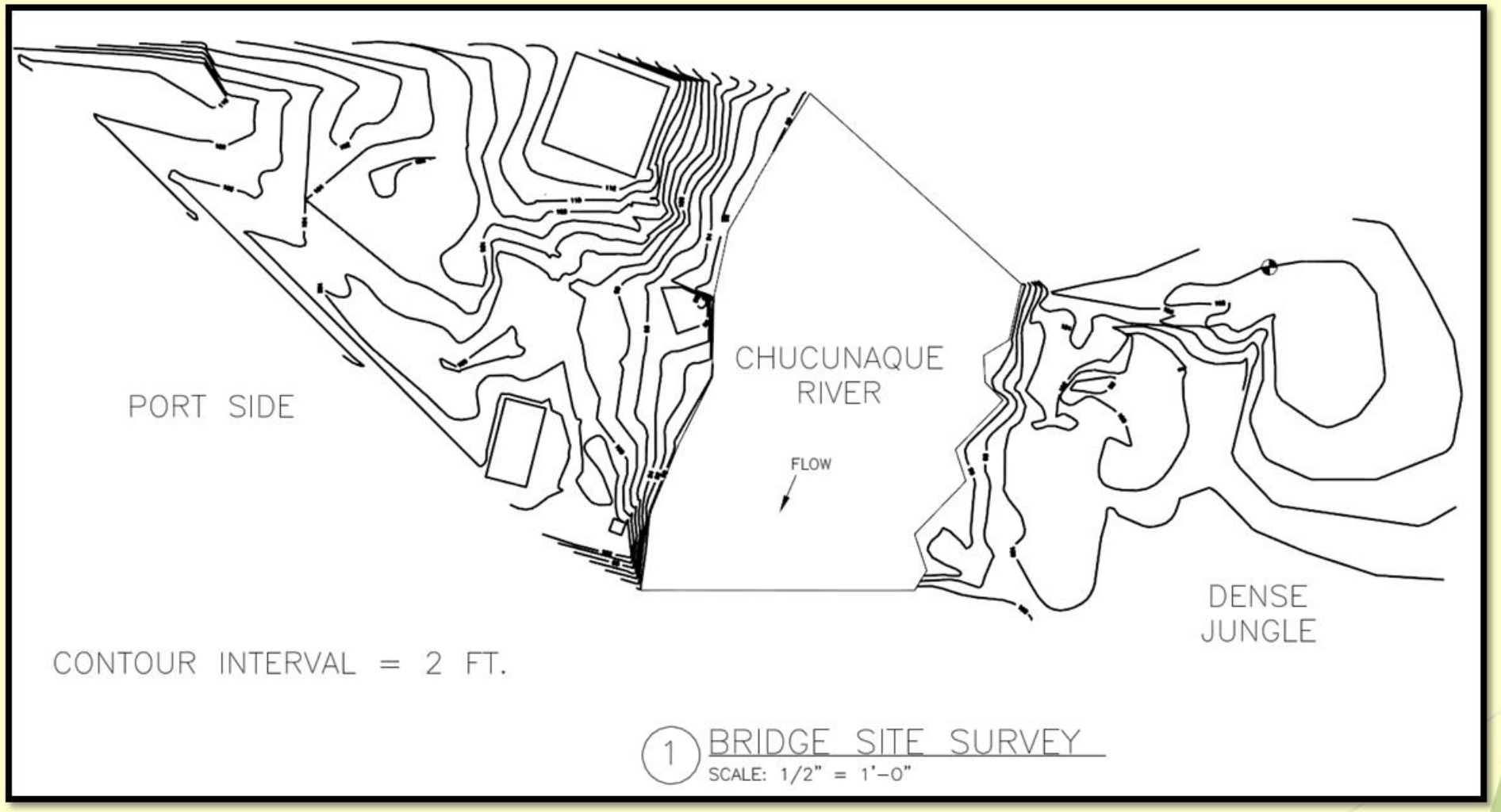
Alternatives

- Vehicular Bridge
- Removable Deck
- Cable Running Barge
- Suspension Bridge

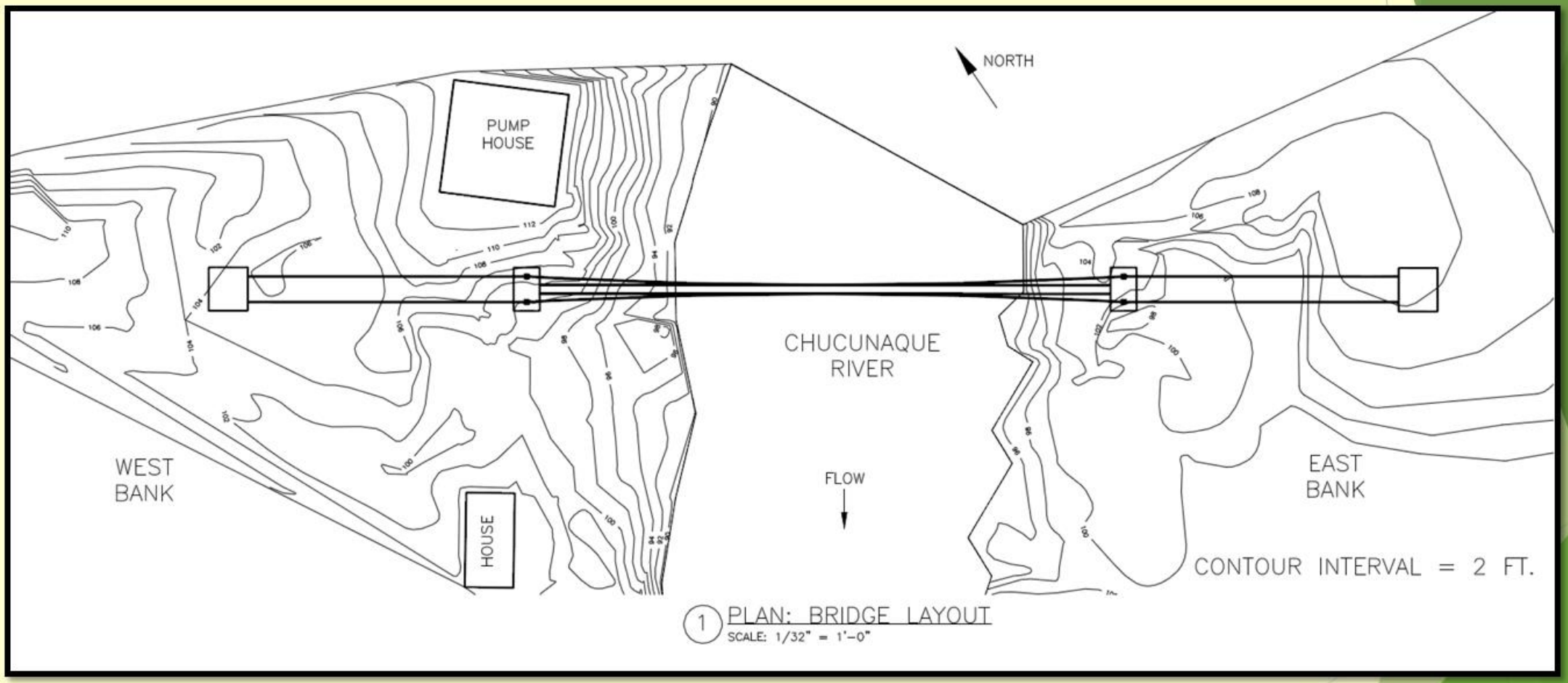
Design Loads

- People
- Horse
- Motorcycle
- Wind
- Earthquake

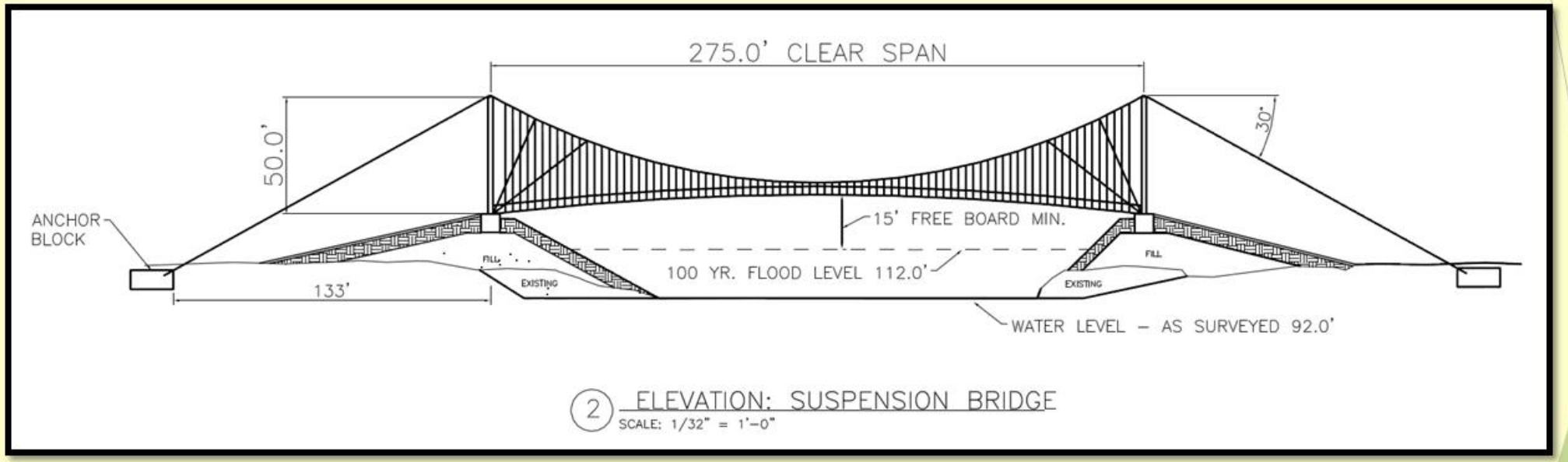
Site Survey


PORT SIDE
CHUCUNAQUE
RIVER
FLOW
DENSE
JUNGLE
CONTOUR INTERVAL = 2 FT.
1 BRIDGE SITE SURVEY
SCALE: 1/2" = 1'-0"

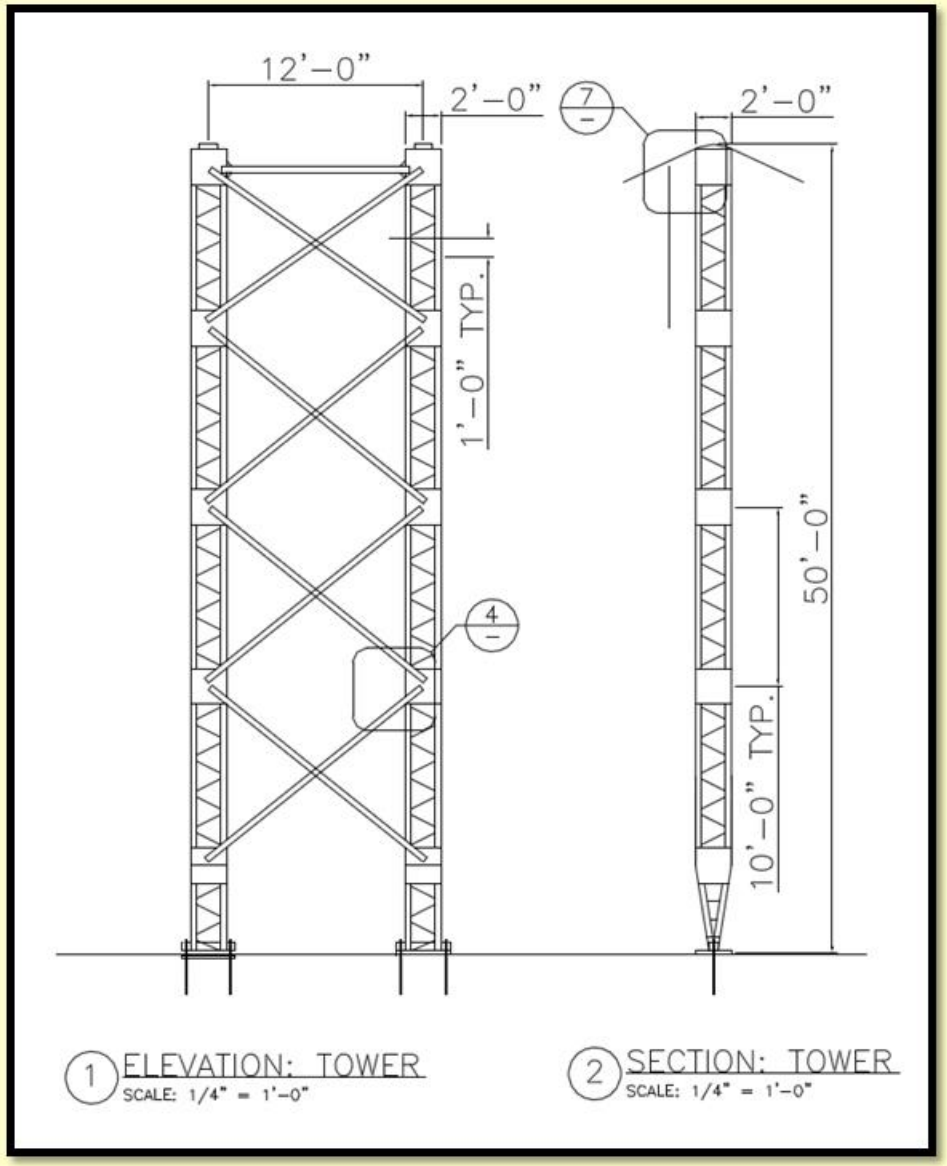
Plan

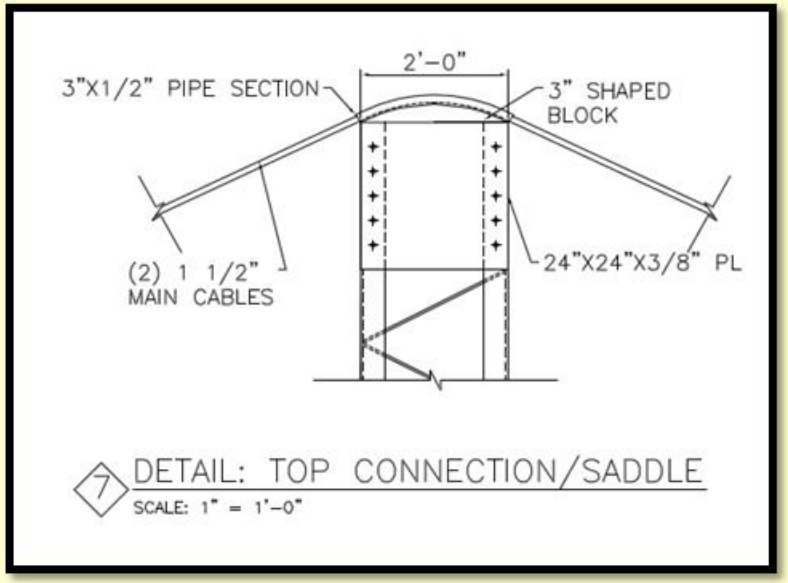

NORTH
PUMP HOUSE
CHUCUNAQUE RIVER
WEST BANK
EAST BANK
FLOW
HOUSE
CONTOUR INTERVAL = 2 FT.
1 PLAN: BRIDGE LAYOUT
SCALE: 1/32" = 1'-0"

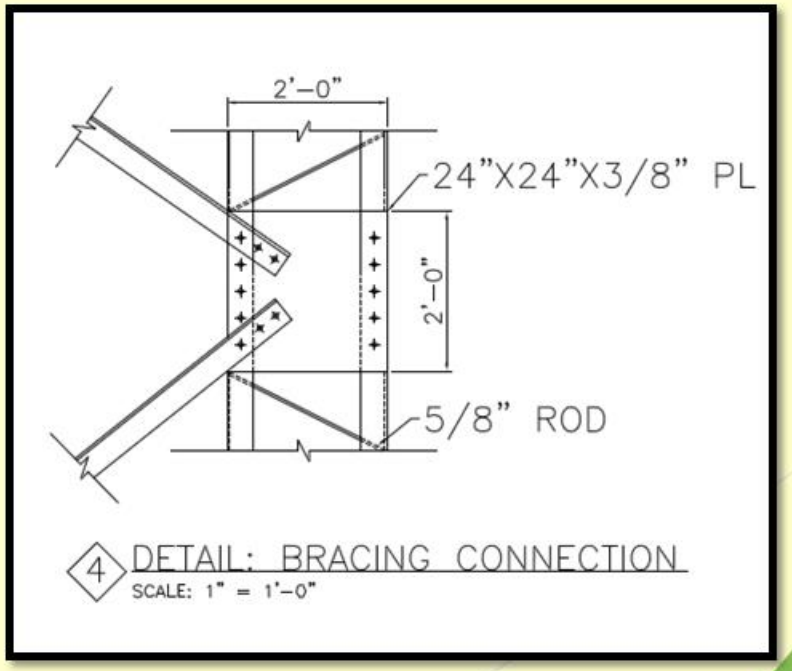
Profile


275.0' CLEAR SPAN
50.0'
30°
ANCHOR BLOCK
15' FREE BOARD MIN.
100 YR. FLOOD LEVEL 112.0'
FILL
EXISTING
133'
FILL
EXISTING
WATER LEVEL – AS SURVEYED 92.0'
2 ELEVATION: SUSPENSION BRIDGE
SCALE: 1/32" = 1'-0"

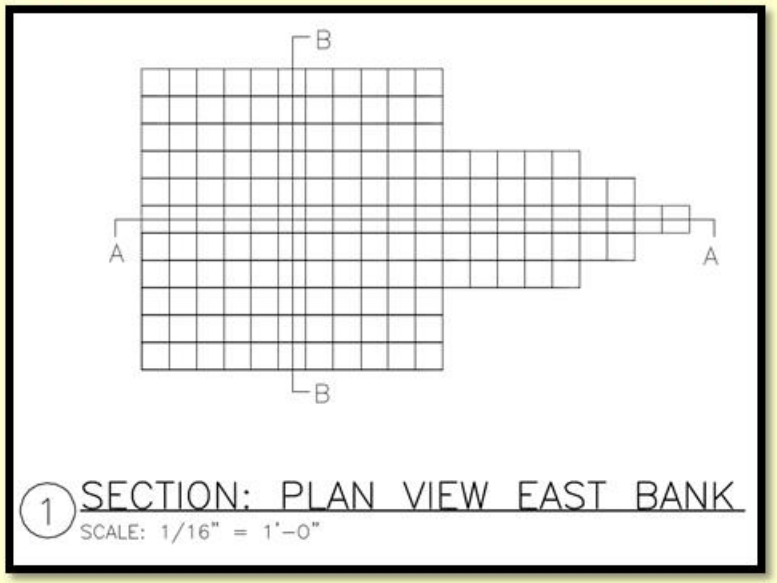
Tower Details

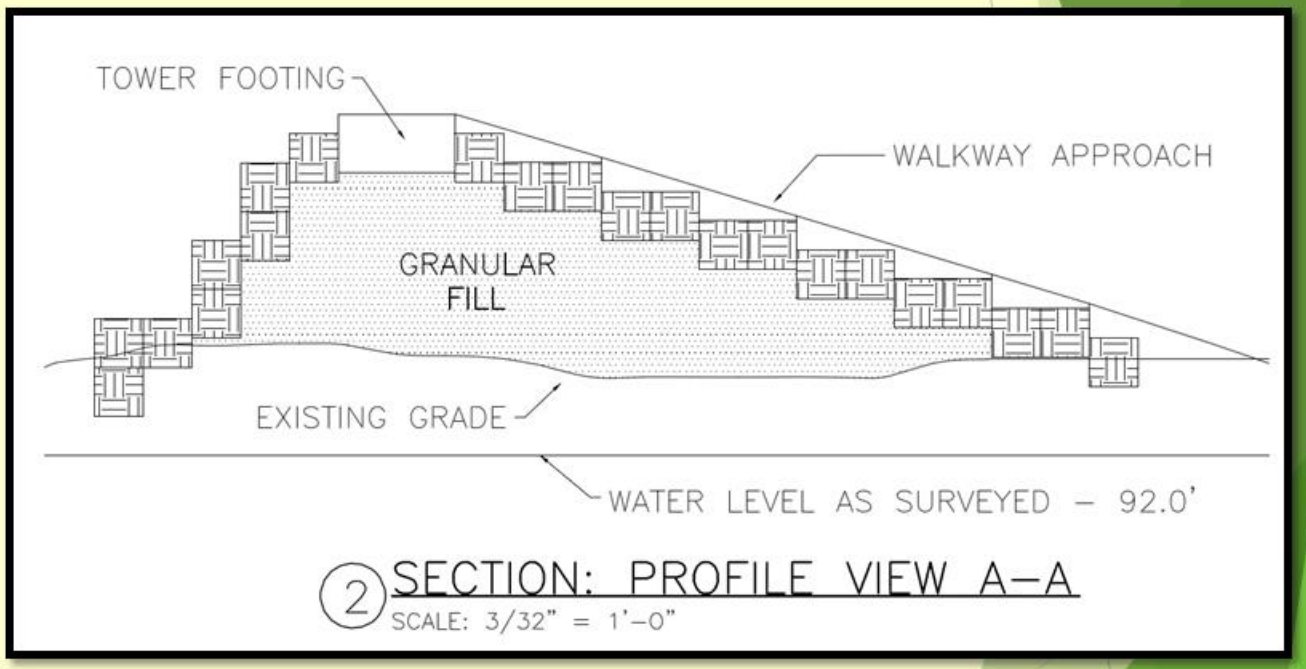


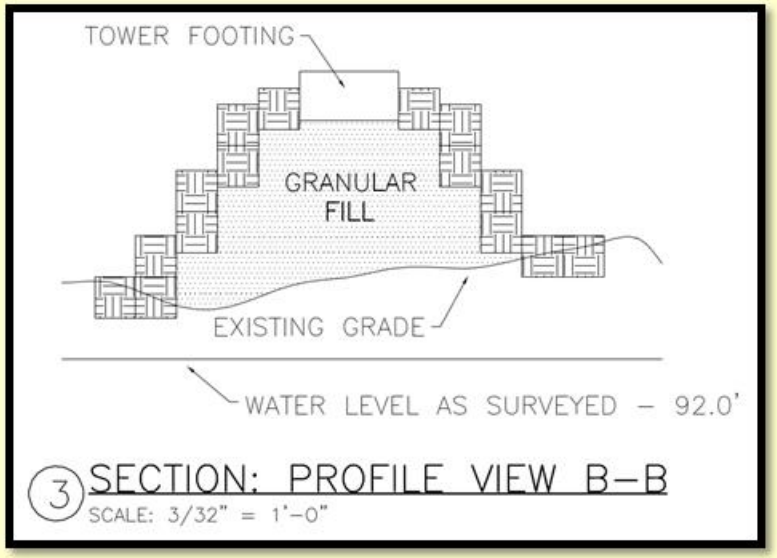




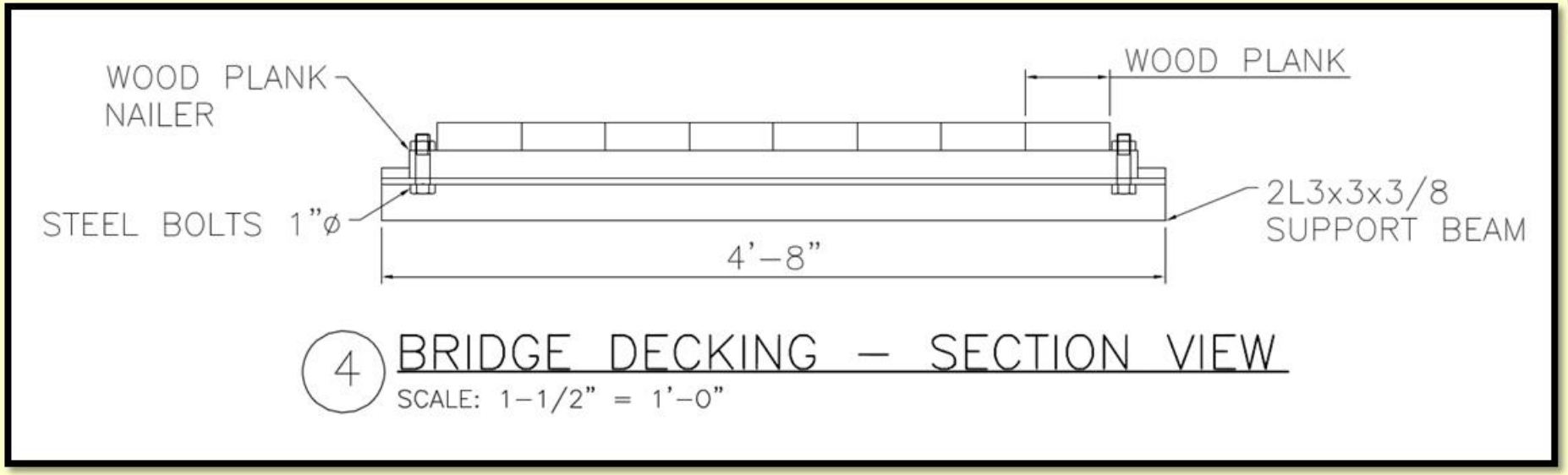
Approach and Slope Details

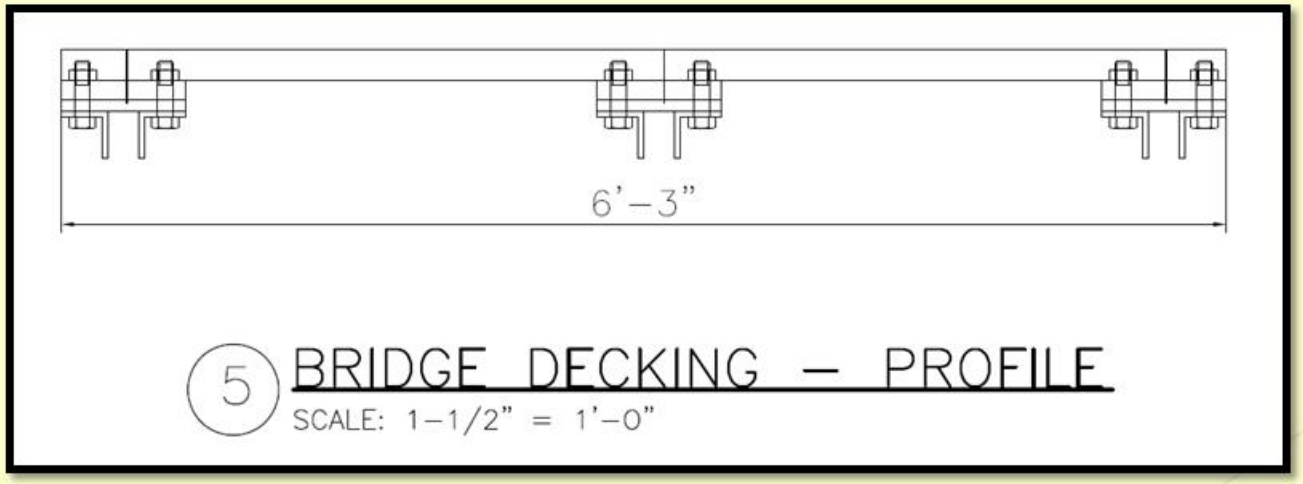




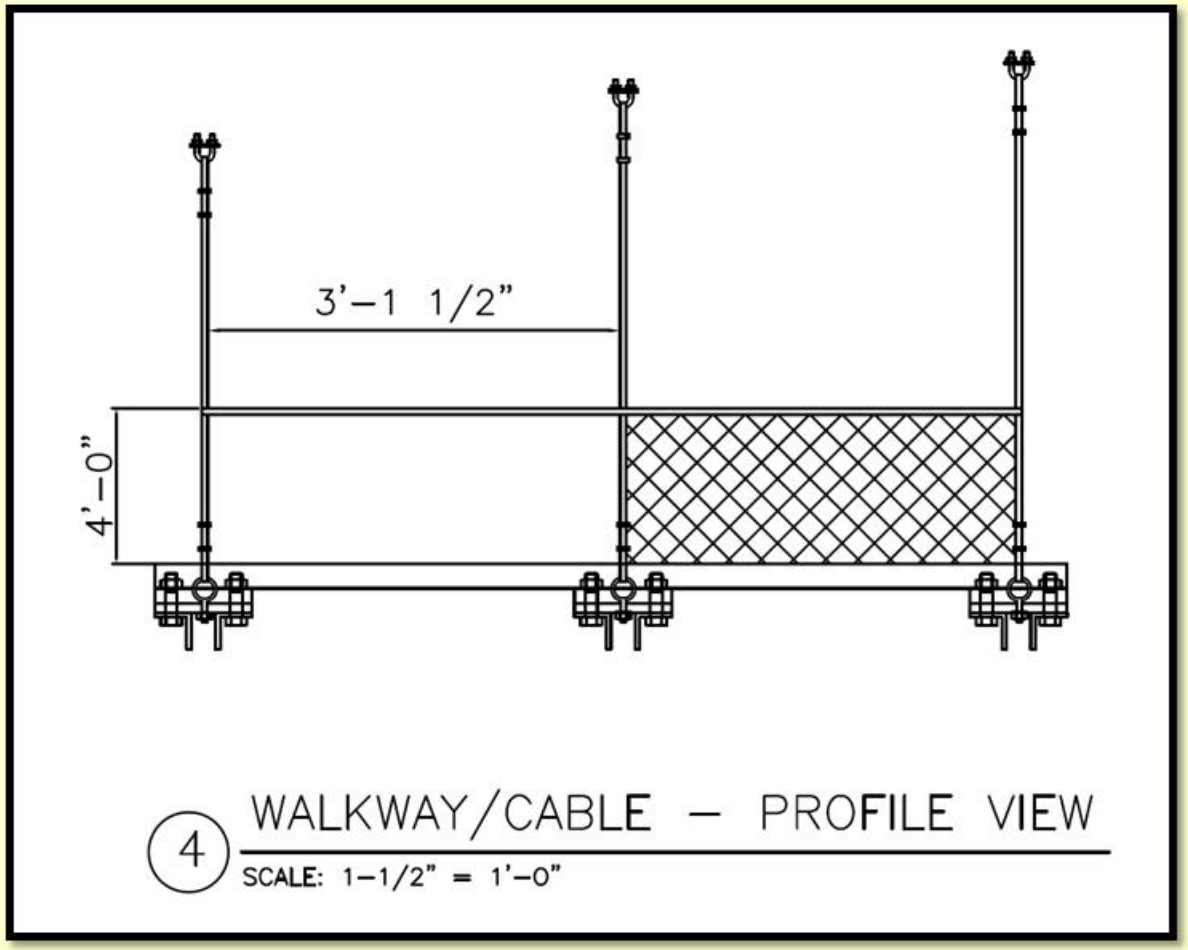


Decking Details

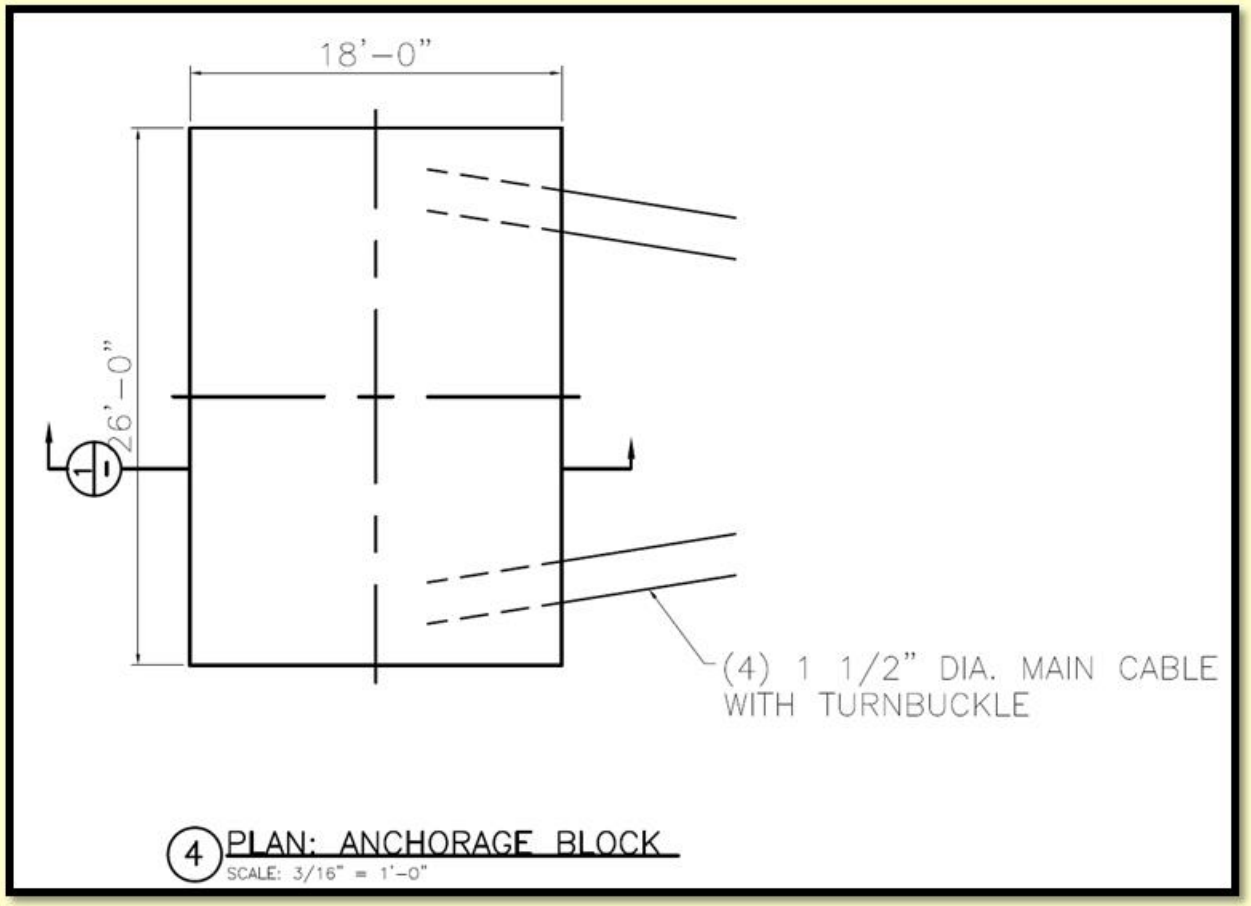




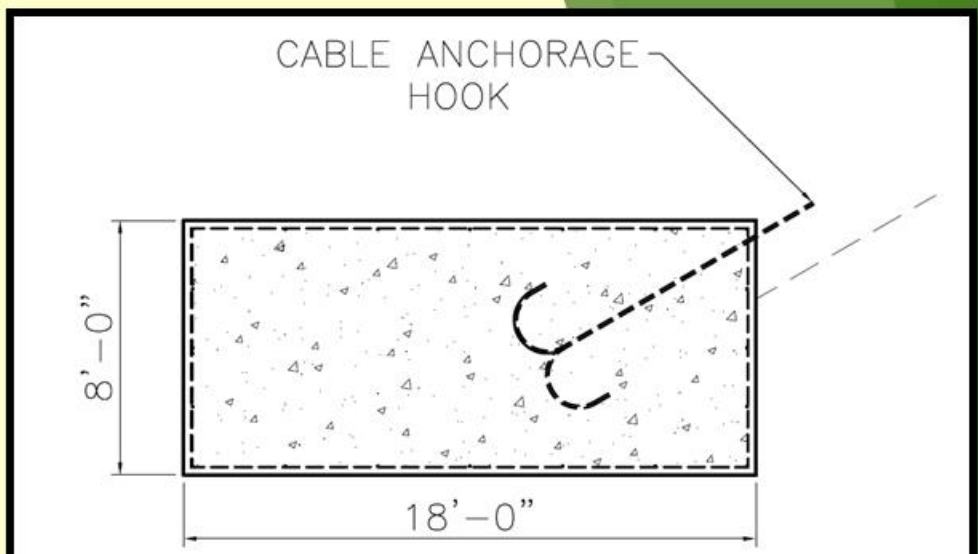
Cable Walkway Assembly



Anchor Block Details



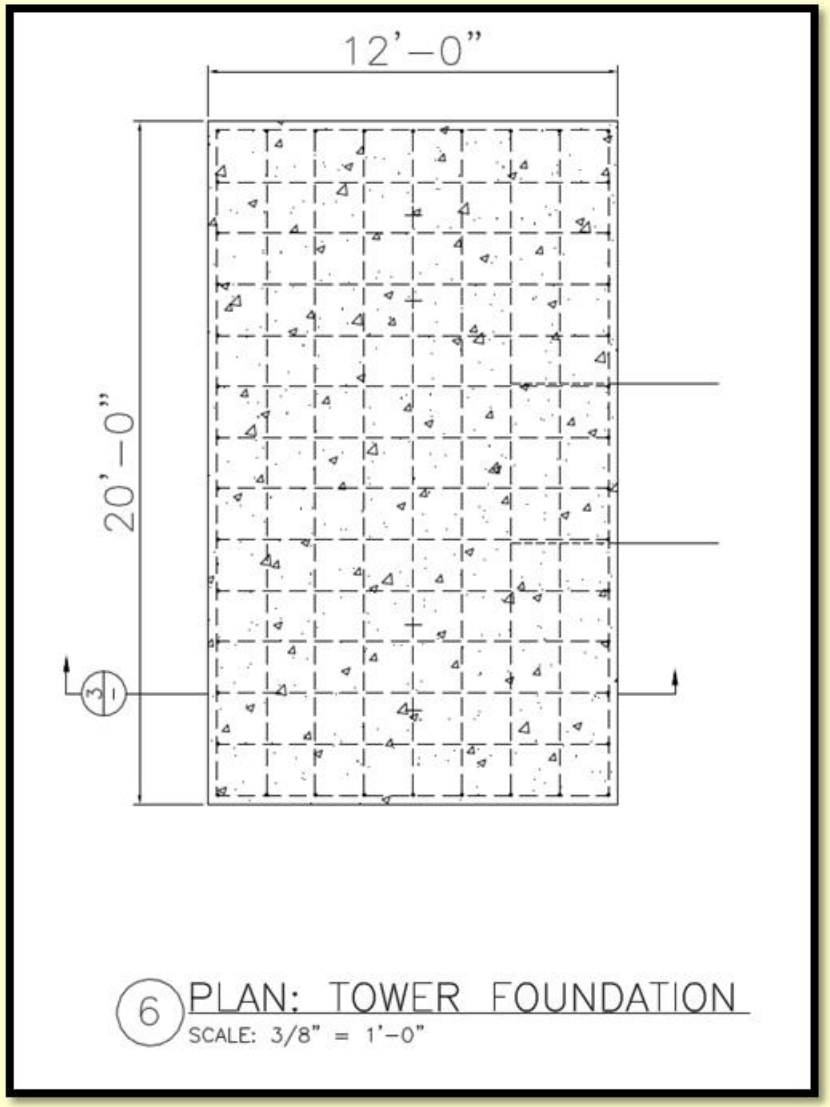
4 PLAN: ANCHORAGE BLOCK
SCALE: 3/16" = 1'–0"



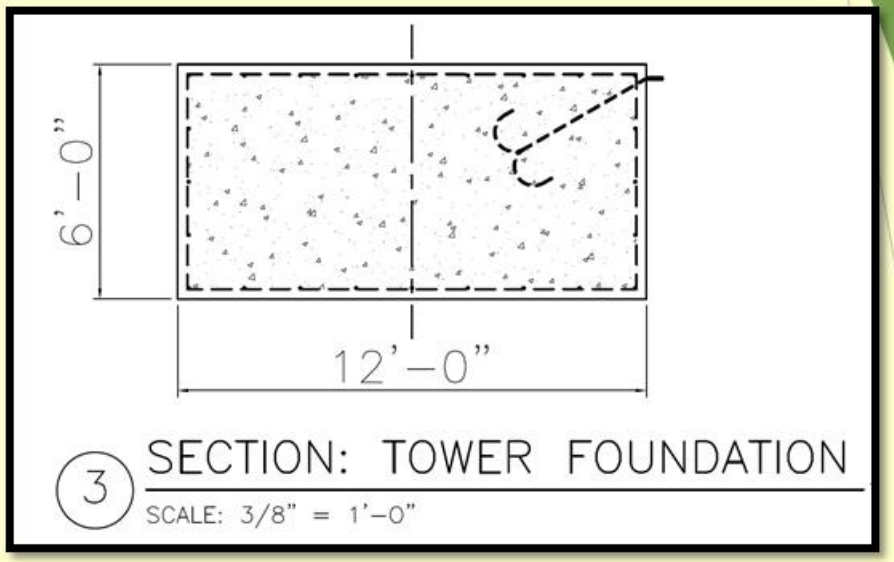
1 SECTION: CABLE ANCHORAGE
SCALE: 1/4" = 1'–0"

5 DETAIL: TURNBUCKLE ASSEMBLY
SCALE: 1" = 1'–0"

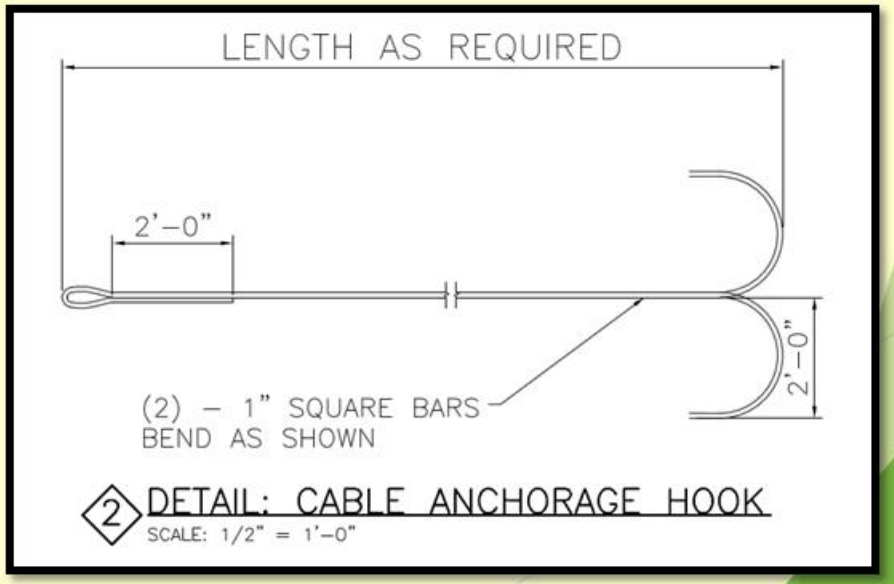
Tower Footing Details



6 PLAN: TOWER FOUNDATION
SCALE: 3/8" = 1'–0"



3 SECTION: TOWER FOUNDATION
SCALE: 3/8" = 1'–0"



2 DETAIL: CABLE ANCHORAGE HOOK
SCALE: 1/2" = 1'–0"

Cost Estimate

- Total Estimated Cost: $418,000

Bridge Item	Estimated Cost
Anchor Block	$54,800
Approach	$300
Cables	$88,100
Gabions	$170,000
Towers	$32,700
Tower Foundation	$21,500
Walkway	$50,600

http://coalcliff.com/wp-content/uploads/2012/04/Cat_970F_Front_End_Loader.jpeg

Construction Schedule

Preliminary Phase	
Task Name	**Duration**
Permitting	132 days
Order Materials	44 days
Cutting Timber	15 days
Total Duration:	**191 days**

Construction Phase I	
Task Name	**Duration**
Mobilization	5 days
Port Slope Construction	15 days
Jungle Slope Construction	15 days
Port Approach	1 day
Port Foundation	3 days
Jungle Approach	1 day
Jungle Foundation	3 days
Demobilization	5 days
Total Duration:	**45 days**

Construction Phase II	
Task Name	**Duration**
Mobilization	5 days
Port Anchor Excavation	3 days
Jungle anchor Excavation	3 days
Port Anchor Block	5 days
Jungle Anchor Block	5 days
Port Tower	19 days
Jungle Tower	19 days
Main Cable	6 days
Vertical Hangers	4 days
Decking Steel	5 days
Decking Wood	14 days
Demobilization	5 days
End Project	0 days
Total Duration:	**87 days**

Construction and Constructability

Funding

BRIDGES TO PROSPERITY

ENGINEERS WITHOUT BORDERS PANAMA

http://ewbpanama.org/

http://bridgestoprosperity.org/

Conclusion

- Alto Playón
- Suspension Bridge
- Construction Duration - 6 months
- Estimated Cost - $418,000

Acknowledgements

- International Senior Design Advisors:

  Mr. Michael T. Drewyor, P.E., P.S.

  Dr. David Watkins, PhD., P.E.

- Peace Corps Volunteers:

  Aja Kennedy, Metetí, Panama

  Amber Naylor, Alto Playón, Panama

- Others:

  Larry Belken - CH2M Hill

  Clinton Donnelly - President, Engineers Without Borders-Panama

Questions?