



# AISC Steel Bridge

CENE-476 Final Proposal Presentation

*Image via pnsastech.com*

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# Purpose and Client

- Purpose
  - Design and construct a 1:10 scale steel bridge
  - Compete against other schools in the AISC Student Steel Bridge Competition
    - Virtual Pacific Southwest Regional Event hosted by UCLA in Spring 2021.
- Client
  - Mark Lamer



Image courtesy of AISC.org



# Location and Background

- Location
  - Katy Trail State Park
    - Between Clinton and Machens Missouri
    - Along Missouri River
    - Hypothetical site location for use in competition
- Background
  - SSBC Competition
    - 8 categories of judgement encompassing design, performance and economy of bridge.



Image courtesy of railstotrails.org

# Project Scope

## Task 1: Due Diligence

- 1.1 Analysis Methods
- 1.2 Existing Bridge Designs
- 1.3 Steel Design Principles



Image courtesy of AISC.org

# Project Scope

## Task 2: Design Development

### 2.1 Selection of Design Features

- 2.1.1 Truss Style Selection
- 2.1.2 Material Selection
- 2.1.3 Member Design
- 2.1.4 Connection Design

### 2.2 Design Progression

- 2.2.1 Proof Of Concept
- 2.2.2 Proof Of Design



### 2.3 Design Calculations and Predictions

- 2.3.1 Material Strength
- 2.3.2 Member Strength
- 2.3.3 Connection Strength
- 2.3.4 Sectional Strength
- 2.3.5 Overall Strength



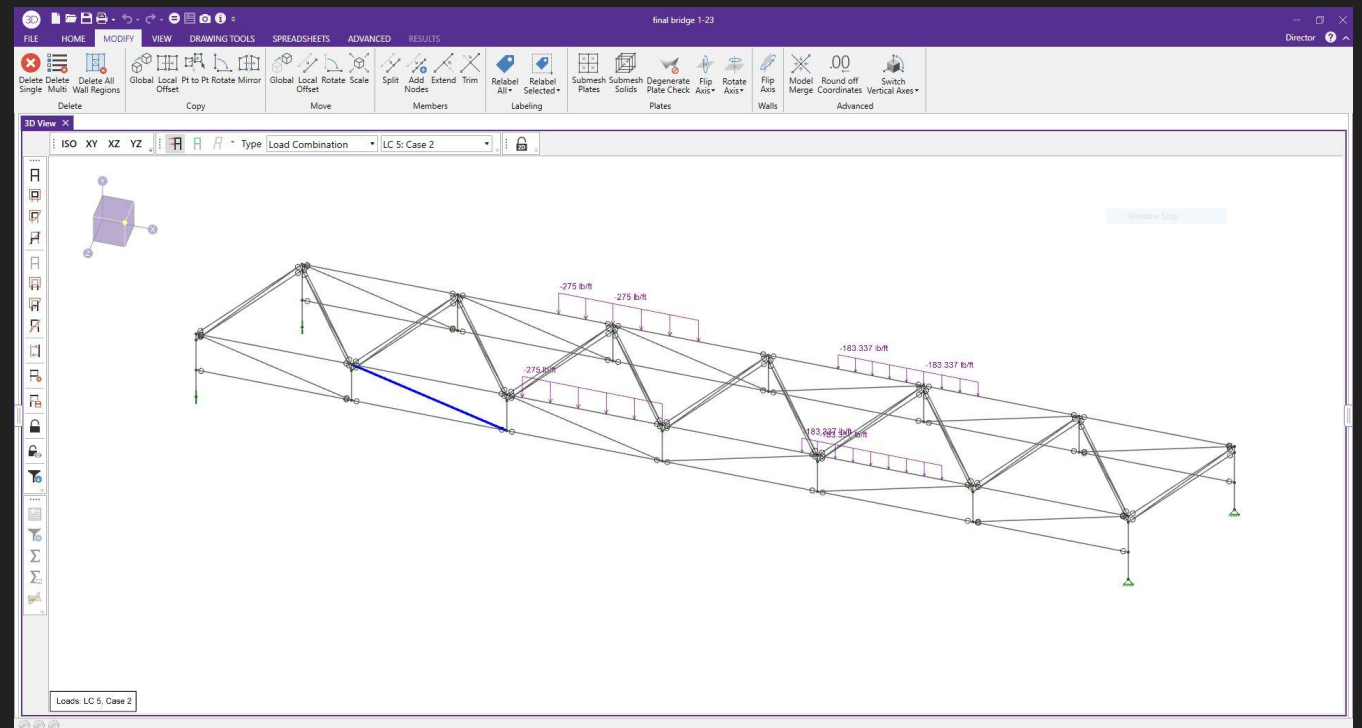
# Project Scope

## Task 3: Structural Analysis

3.1 Truss Analysis

3.2 Analysis of Connections

3.4 Material Analysis



# Project Scope

## Task 4: Plan Sets

### 4.1 Shop Drawings

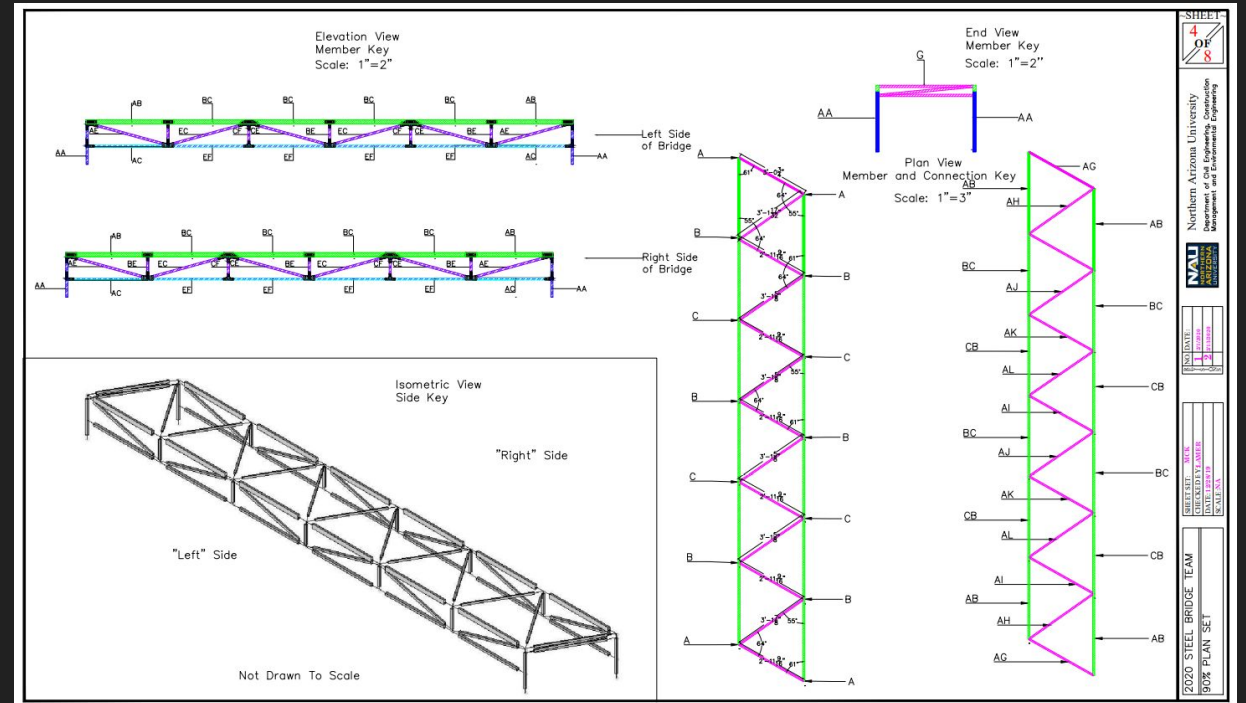
4.1.1 Steel Schedule For Material Sourcing

4.1.2 Shop Drawings For Connection  
Fabrication

4.1.3 Shop Drawings For Member  
Fabrication

4.1.4 Hardware Schedule For Nuts and Bolts

### 4.2 Construction Plans



# Project Scope

## Task 5: Fabrication

### 5.1 Sourcing Materials

5.1.1 Steel

5.1.2 Misc Fittings

5.1.3 Nuts and Bolts

### 5.2 Subcontracted Fabrication

5.2.1 Welding Preparation

5.2.2 Machining Preparation



Image courtesy of millerwelds.com [3]



# Project Scope

## Task 6: Competition Preparation

6.1 Construction Practice

6.2 Visual Elements

6.2.1 Poster

6.2.2 Bridge Aesthetics

6.3 Construction Estimate

## Task 7: AISC Competition



Image courtesy of engineering.case.edu



Image courtesy of www.ce.washington.edu

# Project Scope

## Task 8: Project Management

8.1 Budget and Fundraising

8.2 Fabrication Management

8.3 Project Meetings

8.3.1 Team Meetings

8.3.2 Stakeholder Meetings

8.3.2.1 GI Meetings

8.3.2.2 TA Meetings

8.4 Report

8.4.1 30% Report and Presentation

8.4.2 60% Report and Presentation

8.4.3 90% Report and Presentation

8.4.4 Final Report and Presentation

8.5 Website

8.6 Undergraduate Research Symposium Presentation



Image courtesy of [www.lancastercivil.com](http://www.lancastercivil.com)



# Project Scope

## Exclusions:

- Foundation design
- Geotechnical analysis
- Hydrology considerations
- Surveying
- All other elements that exceed design scope

## Impacts:

- Environmental
- Economic
- Social

\* Critical Path Items Highlighted in Yellow

# Project Schedule



Project: CENE-476 Steel Bridge  
Date: 11/13/2020

Task		Manual Task		Manual Summary		Deadline		Manual Progress	
Summary		Manual Milestone		Rolled Up Manual Task		Critical			



# Staffing Plan

## Required Positions

Senior Engineer - SENG

Engineer - ENG

Engineer in Training - EIT

Lab Technician - LAB

Administrative Assistant - AA

Hours per Position	SENG	ENG	EIT	LAB	AA
Task 1	0	6	17	0	88
Task 2	23	115	92	0	0
Task 3	11	32	11	0	0
Task 4	2	2	0	35	0
Task 5	0	30	10	148	10
Task 6	0	0	26	21	5
Task 7	10	10	2	2	0
Task 8	36	72	126	28	108
<b>Total Hrs</b>	<b>81</b>	<b>265</b>	<b>284</b>	<b>234</b>	<b>211</b>

# Cost Of Engineering Services

Cost of Engineering Services				
1.0 Personnel	Classification	Hours	Rate, \$/hr	Cost
	SENG	81	210	\$17,010
	ENG	265	150	\$39,750
	EIT	284	80	\$22,720
	LAB	234	100	\$23,400
	AA	211	55	\$11,605
	Personnel Total	1076		\$114,485
2.0 Materials	Steel members, connections and hardware			\$2,000
3.0 Equipment	Tools required for construction and assembly			\$500
4.0 Subcontract	Machining and Welding			\$240
5.0 Travel  *Pending Covid Restrictions	Van Rental	4 days	\$65/day	\$260
	Fuel	600 miles	\$0.36/mile	\$216
	Food	4 days	\$56/person/day	\$1,120
	Lodging	3 nights	\$180/room/night	\$2,700
<b>6.0 Total</b>				<b>\$121,521</b>



# References

[1] *Steel Construction Manual*, 14th ed. American Institute of Steel Construction, 2011.

[2] "Student Steel Bridge Competition", Aisc.org, 2020. [Online]. Available: <https://www.aisc.org/education/university-programs/student-steel-bridge-competition/about/>. [Accessed: 06- Sep- 2020].

[3] "Miller - Welding Equipment - MIG/TIG/Stick Welders & Plasma Cutting," *Miller Electric*. [Online]. Available: <https://www.millerwelds.com/>. [Accessed: 20-Sep-2020].