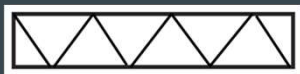


# 2016-2017 Steel Bridge Team



Sabrina Ballard  
Sean Hopper  
Ryan Morofsky  
Meg Stevens

CENE 476 – Fall 2016

## Project Understanding

- Project Purpose
  - American Institute of Steel Construction (AISC) and American Society of Civil Engineers (ASCE) Student Steel Bridge Competition
  - 1:10 scale model steel bridge
- Project Background
  - Luckiamute subdivision proposed bridge
  - Water and sewer lines running parallel to river

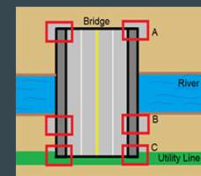


Figure 1. Location of Bridge

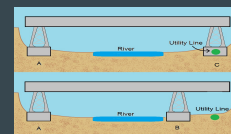


Figure 2. Footing Options

2 Morofsky

## Project Understanding

- Technical Considerations
  - 50 pounds lateral load
  - 2500 pounds vertical load
  - Positive and negative bending moment
- Potential Challenges
  - Member sizes under 36"x4"x6"
  - Minimizing deflection and weight



Figure 3. Bending Moments [1]

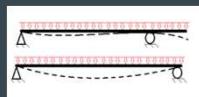


Figure 4. Beam Diagrams

3 Ballard

## Project Understanding

|  |  |
|--|--|
| Client   | Technical Advisor  |
|  |  |
| Mark Lamer, PE   | Thomas Nelson, MS, PE, SE  |

### Stakeholders

- Future owners of homes in Beaver Lodge Estates
- Northern Arizona University (NAU) ASCE Student Chapter

4 Ballard

## Scope Of Services

- 1.0 Research
- 2.0 Fundraising
- 3.0 Structural Analysis and Design
- 4.0 Fabrication
- 5.0 Construction
- 6.0 PSWC
- 7.0 Project Management



Figure 5. Steel Bridge Loading

5 Ballard

## Schedule

### Fall 2016

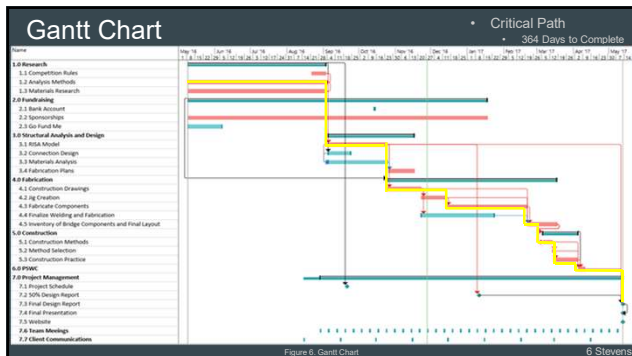
- 1.0 Research
- 2.0 Fundraising
- 3.0 Structural Analysis and Design
  - 3.1 RISA Model
  - 3.2 Connection Design
  - 3.3 Materials Analysis
  - 3.4 Fabrication Plans
- 4.0 Fabrication
  - 4.1 Construction Plans
  - 4.2 Jig Creation

### Spring 2017

- 4.0 Fabrication (cont'd)
  - 4.3 Fabricate Components
  - 4.4 Welding
- 5.0 Construction
  - 5.1 Construction Methods
  - 5.2 Method Selection
  - 5.3 Construction Practice
- 6.0 PSWC
- 7.0 Project Management



6 Stevens



### Staffing

Design Team

- Project Manager (PM)
- Drafter (DRF)
- Design Engineer (DSNENG)
- Fabricator (FAB)
- Engineering Interns (6) (INT)

Table 1. Estimated Hours

| Task                                      | PM  | DRF | DSNENG | FAB | INT | Total |
|---|-----|-----|--------|-----|-----|-------|
| <b>1.0 Research</b>                       | 10  | 10  | 10     | 10  | 10  | 50    |
| <b>2.0 Fundraising</b>                    | 0   | 0   | 20     | 0   | 20  | 40    |
| <b>3.0 Structural Analysis and Design</b> |     |     |        |     |     |       |
| 3.1 RISA Model                            | 10  | 5   | 100    | 0   | 25  | 140   |
| 3.2 Connection Design                     | 10  | 30  | 10     | 5   | 10  | 65    |
| 3.3 Materials Analysis                    | 10  | 0   | 20     | 10  | 5   | 45    |
| 3.4 Fabrication Plans                     | 5   | 60  | 10     | 5   | 10  | 90    |
| <b>4.0 Fabrication</b>                    | 5   | 5   | 25     | 75  | 25  | 135   |
| <b>5.0 Construction Practice</b>          | 10  | 10  | 15     | 45  | 45  | 125   |
| <b>6.0 PSWC</b>                           | 25  | 25  | 30     | 40  | 40  | 160   |
| <b>7.0 Project Management</b>             | 50  | 30  | 30     | 30  | 30  | 170   |
| <b>Total</b>                              | 100 | 80  | 130    | 200 | 170 | 680   |

8 Hopper

### Cost of Engineering Services

Table 2. Total Cost of Services

| Service               | Rate              | Unit        | Total Cost       |
|-----------------------|-------------------|-------------|------------------|
| <b>Personnel</b>      |                   |             |                  |
| PM                    | \$117 per hour    | 135 hours   | \$ 15,795        |
| DRF                   | \$54 per hour     | 175 hours   | \$ 9,450         |
| DSNENG                | \$78 per hour     | 270 hours   | \$ 21,060        |
| FAB                   | \$45 per hour     | 220 hours   | \$ 9,900         |
| INT                   | \$17 per hour     | 220 hours   | \$ 3,740         |
| <b>Transportation</b> |                   |             |                  |
| Lodging               | 4 nights, 2 rooms | \$140/night | \$ 1,120         |
| Car Rental            | 5 days            | \$150/day   | \$ 750           |
| Testing               | \$100 per hour    | 20 hours    | \$ 2,000         |
| Materials             | Lump Sum          | \$4,000     | \$ 4,000         |
| <b>Total</b>          |                   |             | <b>\$ 67,742</b> |

9 Hopper

### References

[1] "Section Method: Fundamentals: Knowledgebase: SAFAS", Setareh.arch.vt.edu, 2016. [Online]. Available: [http://www.setareh.arch.vt.edu/safas/007\\_fdm1\\_12\\_section\\_method.html](http://www.setareh.arch.vt.edu/safas/007_fdm1_12_section_method.html).

[2] "ASCE - AISC Student Steel Bridge Competitions", Aisc.org, 2016. [Online]. Available: <http://www.aisc.org/content.aspx?id=780>.