



## THE NEWCOMB BRIDGE

*Stephen Gibbons*

*Michael Rugnetta*

*Brandon Exner*

*Emanuel Cho*

*Joey DeSocio*



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## Project Manager Overview

*Stephen J. Gibbons*

**Owner / Client:** Paul Hai

**Purpose:** The purpose of the Newcomb Bridge is to provide a means of transportation across a 20 foot span. This span of lower elevation includes a small river, and approximately a 10 foot drop off that does not allow any vehicles to cross. We must create a reliable structure that will provide us with the strength to support numerous types of vehicles, with the largest being a massive 2500lb gator that is almost 6 feet wide.

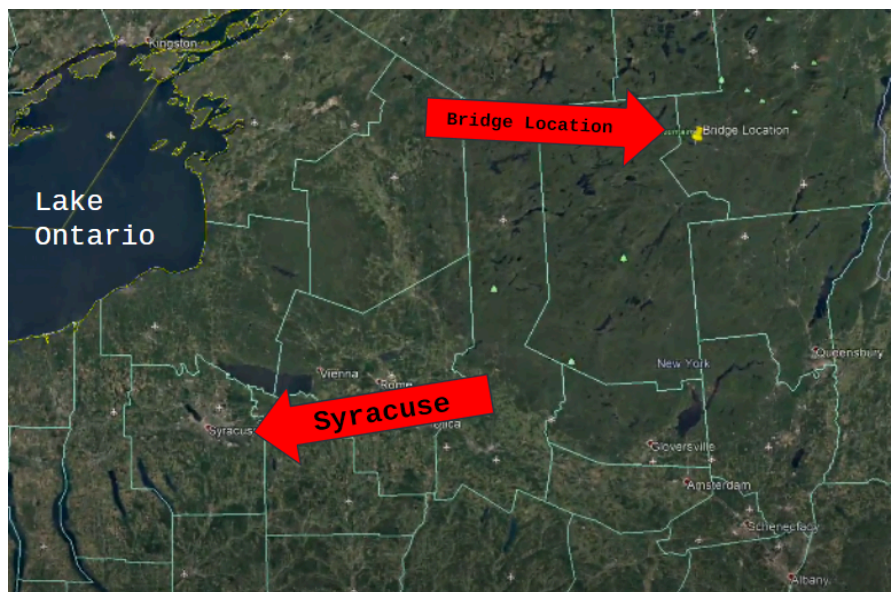
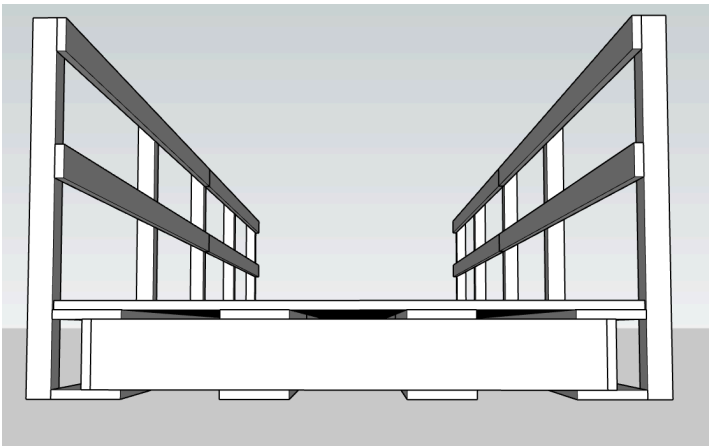
**Location:** State University of Environmental Science and Forestry - Newcomb Campus

**Owner's Project Requirements:** Length - *24 feet*

Width - *8 feet*

Support - *2500 lbs*

Uses - *Transportation for offroad vehicles*



## Scheduling Overview

*Brandon Exner*

### Main Scheduling Obstacles:

1. Getting desired width of the bridge from the owner → **+7 days**
2. Redesign Primary members of the bridge → **+6 days**
3. Developing Drawings of the bridge → **+6 days**

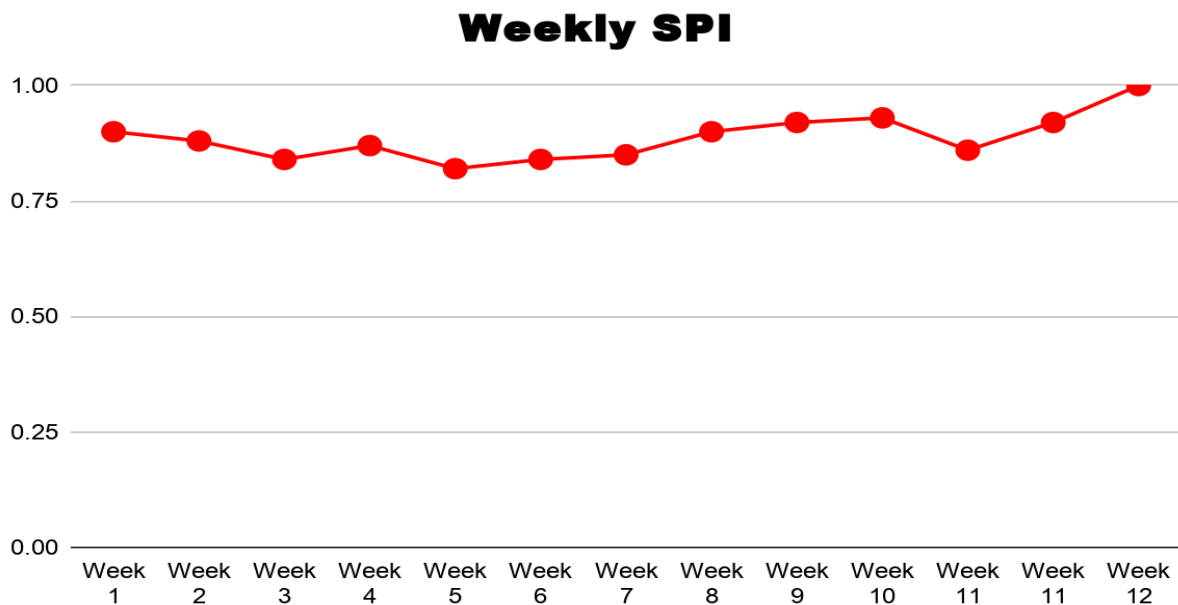
### Main Scheduling Strengths

1. Deflection Criteria → **-2 days**
2. Construction → **-5 days**

The delays and obstacles we faced throughout the project were primarily due to the coordination with the owner, and the large scale of this bridge. Prior to developing the original schedule we did not know the massive amount of weight this bridge needed to support across this long length. After coming to this realization, we had to determine the type of primary members for the bridge because the 2x12 lumber would not support the weight.

**Average SPI → 0.88 (Actual progress / Scheduled progress)**

Our original schedule was created prior to our knowledge on the strength of materials, and bridge construction. As the course continued we learned all of the methods and requirements of the project and updated our schedule accordingly.

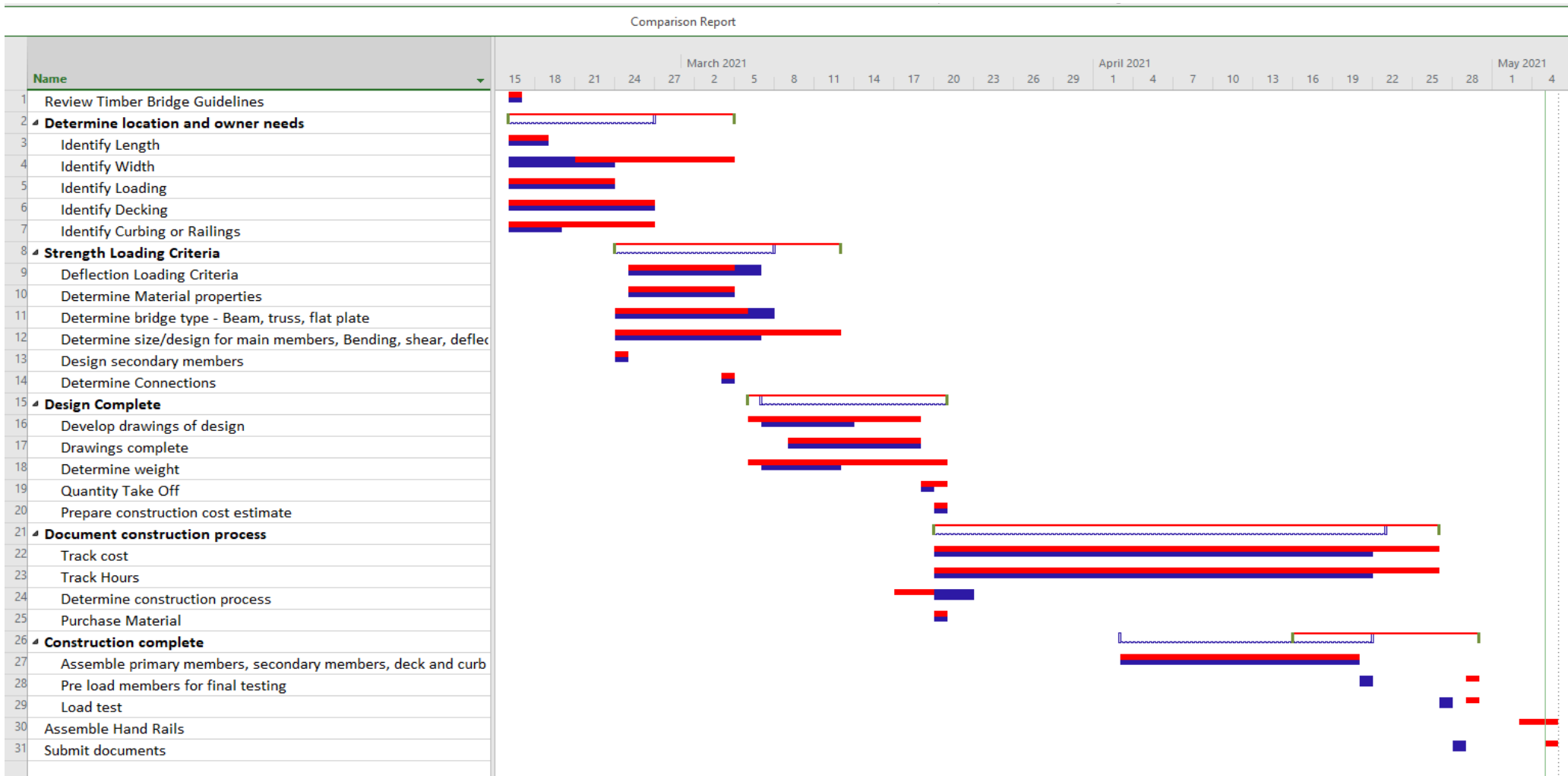




## Gantt Chart

Blue Task Bars - Originally Scheduled Time

Red Task Bars - Actual Time Spent



$$\text{Hours per Square Foot} = \text{Square Footage} / \text{Total hours worked}$$

$$192 \text{ ft}^2 / 270 \text{ hours} = 0.71 \text{ Hours per Square Foot of Bridge}$$

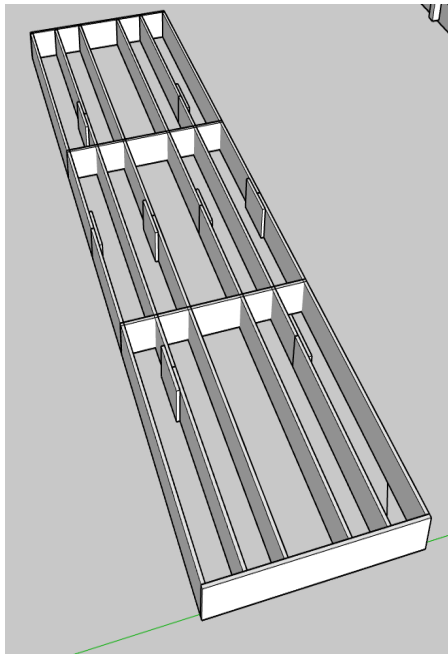
## Engineering Overview

*Michael Rugnetta*

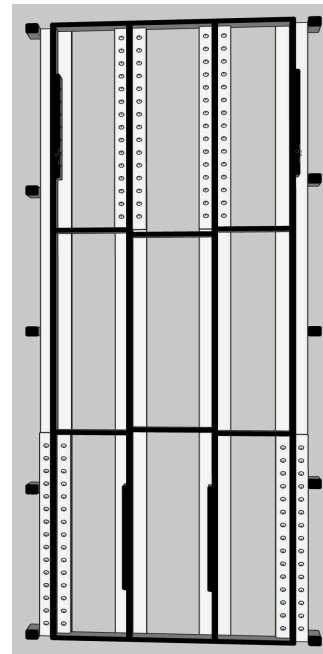
### Engineering Obstacles:

1. The original design of 2x12 primary support beams would not meet shear criteria for the bridge. This required us to redesign using I-beams.
2. Designing the bridge to a massive span and strength to comply with the owners requirements, as well as the **guidelines for the National Timber Bridge Design Competition according to the ASCE (American Society of Civil Engineers).**

### Original Design



### Final Design



### Engineering Strengths:

1. The new maximum load capacity of this bridge is much higher than the required load capacity due to the I-beams that we have constructed. This bridge is a BEAST!
2. We were able to decrease the number of primary support members down to 4 from 5 because of the I-beam strength.

### Allowable Deflection vs. Actual Deflection

**Allowed Deflection:** 0.49 Inches

**Actual Deflection w/ 4000lb of force:** 0.23 Inches

#### Deflection Calculations:

$$\begin{aligned} \triangle &= PL^3 / 48 EL \\ \triangle &= 4,000 * 240^3 / 48 * 1,500,000 * .928 \\ \triangle &= 0.493 \text{ in} \end{aligned}$$

Actual Deflection: .232 in



## Engineering Calculations

*Michael Rugnetta*

### Important Calculations/Numbers:

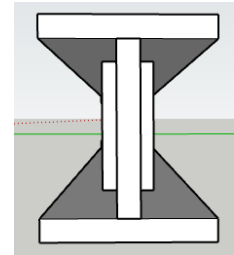
1. ASCE Load Requirement: **240 PLF (pounds per linear foot)**
2. Moment of Inertia for 2x12 I-beam: **1600 in<sup>4</sup>**
3. **Allowable** Bending Stress Vs. **Actual** Bending Stress

In order for the beams to be sufficient enough to meet our determined maximum load capacity, **the actual bending stress must be greater than the allowable bending stress.**

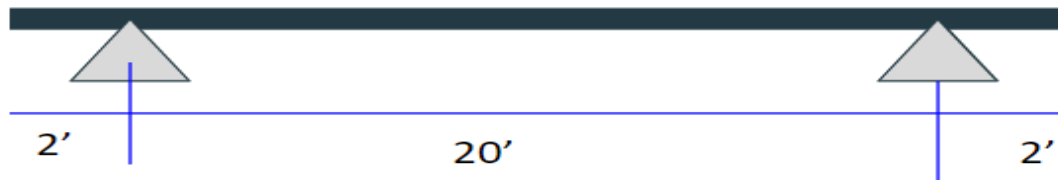


Allowable = **650 PSI**

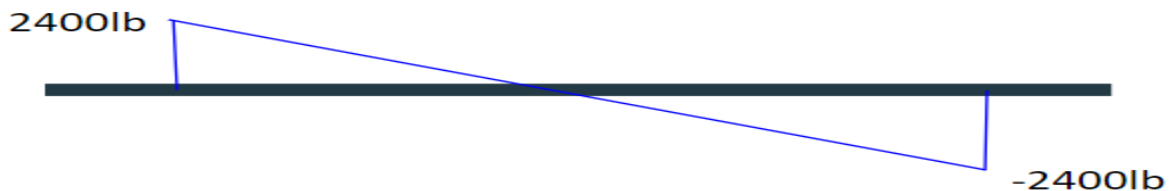
Actual = **819 PSI**



### Bridge Support/Span:



**Maximum Shear: 2400lb**



### Moment Diagram:

**Maximum moment: 12,000 lb \* ft**



## Estimation Overview

*Joey DeSocio*

### Estimating Obstacles:

1. The bridge dimensions of the deck were requested to be 24' by 8', and the original design did not meet the required support for the load of the deck. The redesign using I-beams needed a new estimate.
2. The final order was overestimated, and we received more lumber than needed to construct the bridge.
3. Bracing was needed for each I-beam on the top and bottom flanges as well as the web.

### Estimating Strengths:

1. Tully Building supply gave a full refund for any of the lumber that was not used. The total refund added up to be \$440.81


**Original Estimation:**

- The first estimation: \$1,724.68
- The first quote from Tully Building Supply: \$2,493.40
- The cost of the lumber ordered and used: \$3,521.93
  - Original cost of \$3,962.74 minus the refund of \$440.81

**Final Cost: \$3,521.93**

**CPI: 1.02 (Budget / Actual cost)**

**Cost per Square Foot: \$18.34**

<p><b>Tully Building Supply, Inc.</b>  <b>ALPINE BUILDING SUPPLY</b>          SERVING CENTRAL NEW YORK SINCE 1921</p>		<p><b>Tully Building Supply, Inc.</b>          24 Osawadaga St          PO Box 677          Tully, NY 13159          315-696-8984          Fax: 315-696-5239</p>																									
		<p><b>QUOTE</b></p> <p><b>2184-209456    R2    PAGE 1 OF 1</b></p>																									
<p><b>SOLD TO</b></p> <p>*CASH CONTRACTOR *</p>		<p><b>JOB ADDRESS</b></p> <p>STEVE ESF BRIDGE          124 FORESTY DR          SYRACUSE</p>		<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">ACCOUNT</td> <td style="width: 50%;">JOB</td> </tr> <tr> <td>999901</td> <td>0</td> </tr> <tr> <td>CREATED ON</td> <td>04/09/2021</td> </tr> <tr> <td>EXPIRES ON</td> <td>04/27/2021</td> </tr> <tr> <td>BRANCH</td> <td>1000</td> </tr> <tr> <td>CUSTOMER PO#</td> <td></td> </tr> <tr> <td>STATION</td> <td>T10</td> </tr> <tr> <td>CASHIER</td> <td>DAL</td> </tr> <tr> <td>SALESPERSON</td> <td>MAN</td> </tr> <tr> <td>ORDER ENTRY</td> <td>DAL</td> </tr> <tr> <td>MODIFIED BY</td> <td>DAL</td> </tr> </table>		ACCOUNT	JOB	999901	0	CREATED ON	04/09/2021	EXPIRES ON	04/27/2021	BRANCH	1000	CUSTOMER PO#		STATION	T10	CASHIER	DAL	SALESPERSON	MAN	ORDER ENTRY	DAL	MODIFIED BY	DAL
ACCOUNT	JOB																										
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SALESPERSON	MAN																										
ORDER ENTRY	DAL																										
MODIFIED BY	DAL																										
<p>"It's What We Do"</p>																											
COPY																											
Item	Description	D	Quantity	U/M	Price	Per	Amount																				
268PT	2X6-8" SYP PRES TREAT #1 PRIME		74	EA	14.6000	EA	1080.40																				
2612PT	2X6-12 SYP PRES TREATED PRIME		4	EA	20.4000	EA	81.60																				
4616PT	4X6-16 SYP P/T		5	EA	59.2600	EA	296.40																				
21220PT	2X12-20 PRES. TREATED		15	EA	126.6200	EA	1899.30																				
2128PT	2X12-8 TREATED		6	EA	34.4100	EA	206.46																				
N347209	4" x 1/4" Structural Screw 250p		4	EA	81.0000	EA	324.00																				
N341174	3"X9/8 CAMO BGL DECK SCREW 350C		2	EA	29.7900	EA	59.58																				
Adjustment	Fuel						15.00																				
						Subtotal	3,962.74																				
Quote is good for 15 days						Sales Tax @ 6.00%	317.02																				
						Total	4,279.76																				
<p><b>Buyer:</b> _____</p>																											

## Construction Overview

*Emanuel Cho*

### Construction Obstacles:

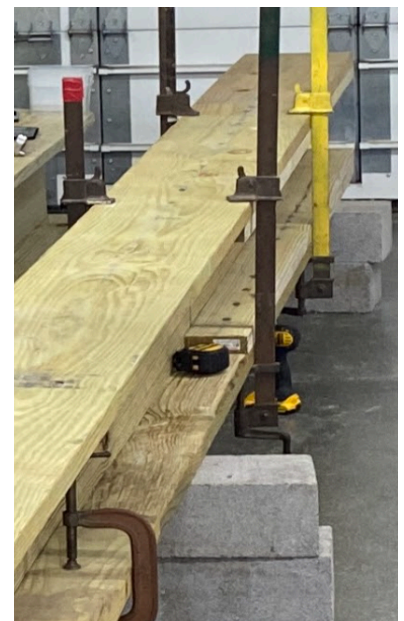
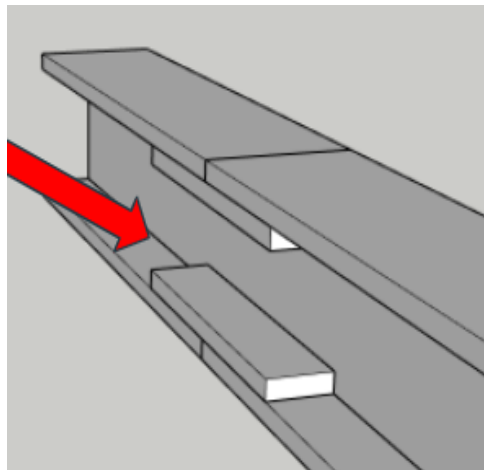
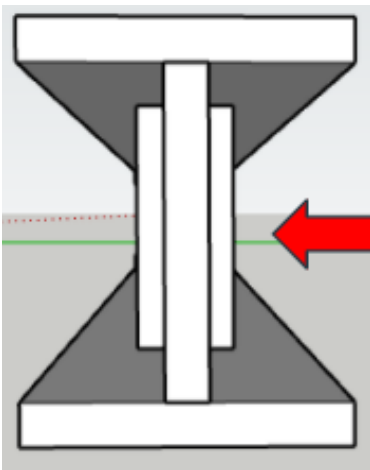
1. The most challenging part of constructing this bridge was creating the I-beams. Securing the web of the I-beam directly in the middle of each flange required us to configure a “track” to slide the web into prior to screwing it in with 4 inch screws.
2. The other obstacle we were required to overcome was moving the I-beams to the needed spacing before attaching the bridging members. This was due to the very heavy weight of the I-beam and required us to use a pallet-jack.

### Construction Strength

1. One of our main strengths in construction of the Newcomb bridge was **Teamwork**. We had all members work together on numerous days to complete the bridge, and this allowed us to **complete construction in a shorter time than we originally scheduled**.
2. Another strength would be the knowledge/experience of construction brought to the team from our Project Manager which helped the overall construction process bringing ideas.

### Geometric Tolerance:

1. System used to control deviations in geometry. It defines the form and size of a tolerance zone within a feature. It allows tolerances to be applied.
2. Putting two boards at both ends of the bridge and placing one screw 2” high in the board, making it 3 ¼” high, we run a string tie from one end to the other to see what the deflections are.
3. The **deflection and tolerance in the middle decreased ⅛”**





## Labor Availability

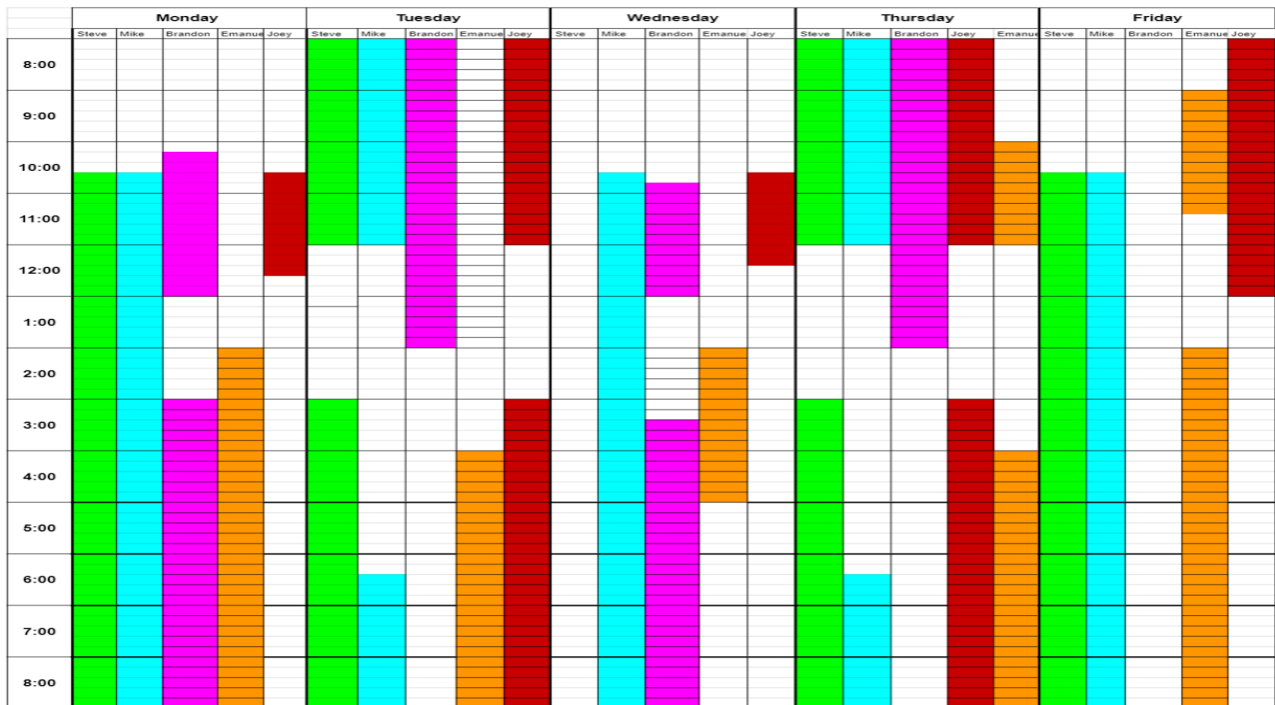
**Stephen Gibbons - Green**

**Michael Rugnetta - Blue**

**Emanuel Cho - Orange**

**Joey DeSocio - Red**

**Brandon Exner - Purple**



**Hours per Square Foot = Total hours spent / square footage of bridge**

**Total = 0.52 Hours per square foot**

## Meeting Minutes

<b>Project</b>	Newcomb Bridge Build				
<b>Topic</b>	Game Plan				
<b>Date</b>	02/18/2021	<b>Time</b>	2:30 AM		
<b>Location</b>	ESF Campus Baker	<b>Room #</b>	158	<b>Call-in #</b>	
<b>Facilitator</b>		<b>Scribe</b>	Stephen Gibbons		

### Discussion Items and Summary

ID	Discussion Item/Summary	Facilitator
1	- Job Roles and Responsibilities	Stephen Gibbons
2	- Game Plan for The Semester	Stephen Gibbons

### Issues/Risks

ID	Issue/Risk and Description	Owner	Importance <sup>1</sup>	Date Entered	Date to Review
1	None				

### Action Items

ID	Decision Description	Comments	Owner	Status
1	Team Member Roles			Closed
2	PM Role switched To Stephen			Closed
3				

### Decisions Made

Action Item	Owner	Status <sup>2</sup>	Date Entered	Planned Completion
1		Open	02/16/21	

### Invited Participants

ID	Name	Title	Department	Attend <sup>3</sup>
1	Stephen Gibbons	Project Team Member	Project Manager	X
2	Mike Rugnetta	Project Team Member	Scheduler	
3	Joey Desocio	Project Team Member	Estimator	X
4	Emmanual Cho	Project Team Member	Construction	X
5	Brandon Exner	Project Team Member	Engineer	X

<sup>1</sup> 4: critical/severe; 3: high; 2: moderate; 1: minimal/minor

<sup>2</sup> Open; closed

<sup>3</sup> X: attended meeting; N: not present; S: sent representative

## Meeting Minutes

<b>Project</b>	Newcomb Bridge Build				
<b>Topic</b>	Game Plan				
<b>Date</b>	04/8/2021	<b>Time</b>	3:30 AM		
<b>Location</b>	ESF Campus Baker	<b>Room #</b>	158	<b>Call-in #</b>	
<b>Facilitator</b>		<b>Scribe</b>	Stephen Gibbons		

### Discussion Items and Summary

ID	Discussion Item/Summary	Facilitator
1	<ul style="list-style-type: none"> <li>- Phase 2 Plan</li> <li>- Going to need all hands on deck</li> <li>- Construction Phase is now and everyones gotta actually do something</li> </ul>	Stephen Gibbons
2		

### Issues/Risks

ID	Issue/Risk and Description	Owner	Importance <sup>4</sup>	Date Entered	Date to Review
1	None				

### Action Items

ID	Decision Description	Comments	Owner	Status
1				Closed
2				Closed
3				

### Decisions Made

Action Item	Owner	Status <sup>5</sup>	Date Entered	Planned Completion
1				

### Invited Participants

ID	Name	Title	Department	Attend <sup>6</sup>
1	Stephen Gibbons	Project Team Member	Project Manager	X
2	Mike Rugnetta	Project Team Member	Scheduler	X
3	Joey Desocio	Project Team Member	Estimator	X
4	Emmanual Cho	Project Team Member	Construction	X
5	Brandon Exner	Project Team Member	Engineer	

<sup>4</sup> 4: critical/severe; 3: high; 2: moderate; 1: minimal/minor

<sup>5</sup> Open; closed

<sup>6</sup> X: attended meeting; N: not present; S: sent representative

## Project Update Meeting – Week 2/18

Project team members and responsibilities:

Project Team Leader/Modeler: Stephen Gibbons

Schedule: Mike Rugnetta

Budget: Joey Desocio

Engineering: Brandon Exner

Construction/safety/documentation/permits: Emmanuel Cho

Activities to be completed this past week, and completion status of each activity (emphasize milestones):

Provide a SPI analysis each week      n/a

Provide a CPI each week when relevant   n/a

One-week look ahead (critical path)

Begin estimate

Figure out Design

Begin Schedule

Provide Update

Two-week look ahead (critical path)

Cont. Design

Provide Update

Hours to date:

Expenses to date: \$0.00

## Project Update Meeting – Week 2/25

Project team members and responsibilities:

Project Team Leader/Engineering/Modeling: Stephen Gibbons

Schedule: Mike Rugnetta

Budget: Joey Desocio

Engineering: Brandon Exner

Construction/safety/documentation/permits: Emmanuel Cho

Activities to be completed this past week, and completion status of each activity (emphasize milestones):

Provide a SPI analysis each week      1.0

Provide a CPI each week when relevant   n/a

### **One-week look ahead (critical path)**

Begin Engineering

Finalize Bridge width

Review/Update Schedule

Provide weekly update to client

### **Two-week look ahead (critical path)**

Finalize Design

Switch from Sketchup to Autocad

Provide Weekly Update to client

Hours to date: 13

Expenses to date: \$0.00



## Project Update Meeting – Week 3/4

Project team members and responsibilities:

Project Team Leader/Modeling: Stephen Gibbons

Schedule: Mike Rugnetta

Budget: Joey Desocio

Engineering: Brandon Exner

Construction/safety/documentation/permits: Emmanuel Cho

Provide a SPI analysis each week      0.7

Provide a CPI each week when relevant   n/a

### **One-week look ahead (critical path)**

Finalize Design

Begin Engineering in Autocad

Review/Update Schedule

Provide weekly update to client

### **Two-week look ahead (critical path)**

Order Wood/ Supplies

Review/Update Schedule

Provide Weekly Update to client

Hours to date: 17

Expenses to date: \$0.00

## Project Update Meeting – Week 3/11

Project team members and responsibilities:

Project Team Leader/Modeling: Stephen Gibbons

Schedule: Mike Rugnetta

Budget: Joey Desocio

Engineering: Brandon Exner

Construction/safety/documentation/permits: Emmanuel Cho

Provide a SPI analysis: 0.7

Provide a CPI: n/a

### **One-week look ahead (critical path)**

Continue/Finish Engineering

Begin drafting in Autocad

Begin to figure out supplies needed

Provide weekly update to client

### **Two-week look ahead (critical path)**

Order Wood/ Supplies

Begin Construction Phase

Review/Update Schedule

Provide Weekly Update to client

Hours to date: 15

Expenses to date: \$0.00

## Project Update Meeting – Week 3/18

Project team members and responsibilities:

Project Team Leader/Modeling: Stephen Gibbons

Schedule: Mike Rugnetta

Budget: Joey Desocio

Engineering: Brandon Exner

Construction/safety/documentation/permits: Emmanuel Cho

Provide a SPI analysis: 0.7

Provide a CPI: n/a

### **One-week look ahead (critical path)**

Finish Engineering

Transfer Drawings to CAD

Order Wood/Supplies

Provide weekly update to client

### **Two-week look ahead (critical path)**

Begin Construction Phase

Review/Update Schedule

Provide Weekly Update to client

Hours to date: 18

Expenses to date: \$0.00

## Project Update Meeting – Week 3/25

Project team members and responsibilities:

Project Team Leader/Modeling: Stephen Gibbons

Schedule: Mike Rugnetta

Budget: Joey Desocio

Engineering: Brandon Exner

Construction/safety/documentation/permits: Emmanuel Cho

Provide a SPI analysis: 0.8

Provide a CPI: n/a

### **Current Week**

Finishing up Engineering

Possibly change design

Get Approval of Engineering

Transfer Drawings to AutoCad

### **One-week look ahead (critical path)**

Order Wood/Supplies

Begin Construction Phase

Review/Update Schedule

Provide weekly update to client

### **Two-week look ahead (critical path)**

Continue Construction Phase

Review/Update Schedule

Provide Weekly Update to client

Hours to date: 19

Expenses to date: \$0.00

## Project Update Meeting – Week 4/1

### Project team members and responsibilities:

Project Team Leader/Modeling: Stephen Gibbons

Schedule: Mike Rugnetta

Budget: Joey Desocio

Engineering: Brandon Exner

Construction/safety/documentation/permits: Emmanuel Cho

SPI analysis: 0.8

CPI: n/a

### **Current Week**

Finishing up Engineering

Possibly change design

Get Approval of Engineering

### **One-week look ahead (critical path)**

Order Wood/Supplies

Begin Construction Phase

Review/Update Schedule

Provide weekly update to client

### **Two-week look ahead (critical path)**

Continue Construction Phase

Review/Update Schedule

Provide Weekly Update to client

Hours to date: 36

Expenses to date: \$0.00



## Project Update Meeting – Week 4/8

Project team members and responsibilities:

Project Team Leader/Modeling: Stephen Gibbons

Schedule: Brandon Exner

Budget: Joey Desocio

Engineering: Mike Rugnetta

Construction/safety/documentation/permits: Emmanuel Cho

SPI analysis: 0.8

CPI analysis: n/a

### **Current Week**

Engineering Finished

Wood Delivered

### **One-week look ahead (critical path)**

Begin Construction Phase

Build I-Beam

Review/Update Schedule

Provide weekly update to client

### **Two-week look ahead (critical path)**

Continue Construction Phase

Review/Update Schedule

Provide Weekly Update to client

Hours to date: 20

Expenses to date: \$0.00

## Project Update Meeting – Week 4/15

Project team members and responsibilities:

Project Team Leader/Modeling: Stephen Gibbons

Schedule: Brandon Exner

Budget: Joey Desocio

Engineering: Mike Rugnetta

Construction/safety/documentation/permits: Emmanuel Cho

Provide a SPI analysis: 0.8

Provide a CPI: 0.83

### **Current Week**

Order wood

Cut 2x6x8', 2x12x8'

### **One-week look ahead (critical path)**

Build I-Beam

Review/Update Schedule

Provide weekly update to client

### **Two-week look ahead (critical path)**

Continue Construction Phase

Review/Update Schedule

Provide Weekly Update to client

Hours to date: 50

Expenses to date: \$4,319.41

## Project Update Meeting – Week 4/22

Project Team Leader/Modeling: Stephen Gibbons

Schedule: Mike Rugnetta

Budget: Joey Desocio

Engineering: Brandon Exner

Construction/safety/documentation/permits: Emmanuel Cho

Provide a SPI analysis: 0.89

Provide a CPI: 0.83

### **One-week look ahead (critical path)**

Continue Construction Phase

Review/Update Schedule

Provide Weekly Update to client

### **Two-week look ahead (critical path)**

Continue Construction Phase

Review/Update Schedule

Provide Weekly Update to client

Design Hours to date: 20

Construction Hours to Date: 35

Expenses to date: \$4,319.41







