

ILLINOIS INSTITUTE OF TECHNOLOGY 2007 AISC/ASCE STEEL BRIDGE COMPETITION



We selected this bridge configuration because we decided that it would be the most economical choice as based on the design loads, the weight of the bridge, the building time and the ease of building. To make this our final selection we used a scoring sheet which was based on the given requirements by AISC. We also took into consideration the site the bridge would be built in and how construction would affect our cost. To make the bridge more economical we made sure to use steel sections that are widely available in the current market. This reduces material cost and therefore the overall cost of the bridge.

Score Sheet:

onstruction Time and Speed	Raw Value			12	ectored
1 Construction Time		4	01	01	-
2 Clothes Tourb River	4	- 4	0	0	-
3 Member Touches River	- i				
4 Repar Time	1				1.
5 Damage Repars	0				
6 Lateral Test	01	0		-	-
7 Vertical Test	0.2	0			_
8	01	6		-	
Construction Time					
Construction Economy	Raw Value			17	ectored
	1 1000 10000 1		1.1.1.1		-
9 Number of Builders	4				
10 Total Time	6.5				- 27
11 Temporary Pier Moves Construction Cost	0			_	
Construction Cost				_	- 11
Atress and Weight Penalties	Baw Value	_	_	12	sciored
12 Bindge Weight	105			-	18
t3 Display	0				
14 Dimension	0	0	0	0	
15 Center Line	ő				
tid ***Material Perustes***				-	
17 Lateral Test	01	ð Ø		_	
ta Vertical Test	0.2	0		-	
19	0.1	0			
Total Weight					14
Stiffness	D1A	018	02	_	Total
20 Aggregate Deflection	0.05	0.06	0.12	-	
and the second	CU US	0.061	4.12	_	
Structural Efficiency					_
Total Weight	185	1		-	92
Aggregate Deflection Structural Cest	0.23				
Structural Cost					
Overall Performance					- 0
Construction Cost Structural Cost	-			_	-27
Total Cost				-	104

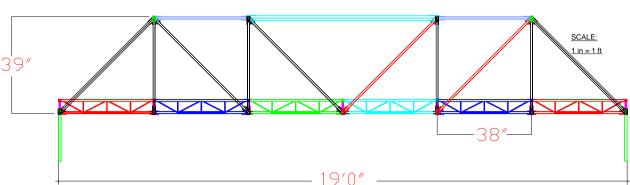
History

The Student Steel Bridge Competition is sponsored by the American Institute of Steel Construction (AISC) and the American Society of Civil Engineers (ASCF)

Safety is of primary importance. AISC and ASCE request that competitors, advisers, hosts, and judges take all necessary precautions to prevent injury.

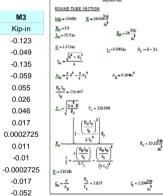
Students design a steel bridge by themselves but may seek advise from faculty and other consultant. Students may fabricate the entire bridge themselves, however the services of a commercial fabricator may be used, provided that students develop the work orders and observe the operations. Student involvement in bridge fabrication is encouraged.

The rules are changed every year to improve the contest and assure that competitors design and build new bridges. These rules govern both Regional and National competitions.





Team Member Major Year Gbadebo Atewologun CE Junior Christina Barret CS Junior ARCH John Brilla Junior David Fahs CE Senior Patrick Fong ARCH Junior CE Bernard Froehlich Senior CE Emiliano Giana Senior Naomi Heler CE Senior CE Daniel Hernandez Senior CE Ei Sheng Hong Senior Thomas Huang ARCH Junior Mohamad Khudeira CE Junior Yong-Wan Kim CE Junior Linda Lee ARCH Senior Man Leung CE Junior CE Heather Mahonev Senior Jinit Patel CE Senior Robert Pershey POL.SCI Senior Sotiel Polena CE Senior Fuzel Shethwala ARCH Junior Lucas Shorette CE Senior ARCH YCentroidFZ Milena Stopic Junior CF Melissa B. Swiderski Senior 21.237 Chintan B. Thakkar ME Senior 21 Lee Welsh CE Senior



XCentroidFX

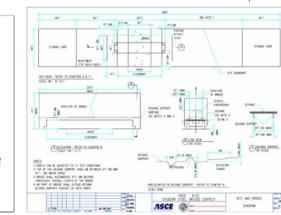
in

-1.111E+14

YCentroidFX

in

24.12



YCentroidFY

in

2.984E+14

XCentroidFZ

in

128.026

111.68

in

-1.186 TABLE: Base Reactions

SAP2000 ANALYSIS

Text

1

4

1

4

4

6

6

6

10

6

10

10

11

Frame Joint

Text

4

Λ

4

4

12

12

12 4

12

13

13

13

13

14

14

TABLE: Element Joint Forces - Frames

F1

Kip

0.686

-0.6

0.6

-0.686

1.408

-1.184

1.184

-1.408

1.738

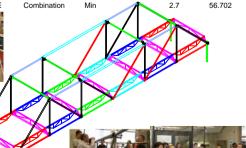
-1.233

1.233

-1.738

1 408

OutputCase	CaseType	StepType
Text	Text	Text
ENVELOPE	Combination	Max
ENVELOPE	Combination	Min



F3

Kip

0.688

-0.598

0.602

-0.684

0.001304

0.001304

0.001304

0.001304

0.003236

0.003236

0.003236

0.003236

0.001304

0.001304

F2

Kip

-0.004522

0.005116

-0.005116

0.004522

0.002091

-0.001734

0.001734

-0.002091

0.0001141

0.00002603

-0.00002603

-0.0001141

-0.001907

0.002258

M1

Kip-in

0.155

0.039

0 14

0.032

-0.011

0.016

-0.016

0.011

0.00001786

0.001916

-0.001916

-0.00001786

0.016

-0.011

GlobalFZ

Kip

2.808

M3

Kip-in

-0.123

-0.049

-0 135

-0.059

0.055

0.026

0.046

0.017

0.011

-0.01

-0.017

-0.052

GlobalMX

Kip-in

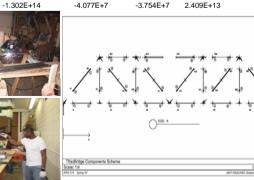
59.636

GlobalMY

Kip-in

-301.547

-354.899



XCentroidFY

in

30.535





Bridge Configuration:

We selected this bridge configuration because we decided that it would be the most economical choice as based on the design loads, the weight of the bridge, the building time and the ease of building. To make this our final selection we used a scoring sheet which was based on the given requirements by AISC. We also took into consideration the site the bridge would be built in and how construction would affect our cost. To make the bridge more economical we made sure to use steel sections that are widely available in the current market. This reduces material cost and therefore the overall cost of the bridge.

Score Sheet:

nstruction Time and Speed	Raw Value	_		1	ctore
1 Construction Time	1	4	01	0	-
2 Clothers Touch Rover	0				
3 Member Touches River	Ó			_	
4 Repar Time					
5 Damage Repairs	0			_	
6 Lateral Test 7 Vertical Test	0.1	0		-	
7 Vertical Test	0.2	0		_	_
Construction Time		(V)	- 1		
Construction Economy	Raw Value			17.0	ctor
9 Number of Builders	4	- 1	-		-
10 Total Time	6.6				- 4
11 Temporary Pier Moves Construction Cost	a			-	÷
tress and Weight Penalties	Baw Value	_		17.	ctor
12 Bindge Weight	105			-	
t3 Dapiay					_
14 Dimension	0	0	0	0	-
15 Center Line	ă	- 6		-	-
16 ***Material Perustes***				-	
17 Lateral Test	01				
18 Vertical Test	0.2	<i>a</i>		-	
19 Total Weight	0.1	0		_	_
				-	-
Soffress	21A	018	02		963
20 Aggregate Deflection	0.05	0.06	0.12		
Structural Efficiency					_
Total Weight	185			-	1
Aggregate Deflection Structural Cest	0.23				
Structural Cost					
Overall Performance					_
Construction Cost			1		-
Structural Cost					5
Total Cost					

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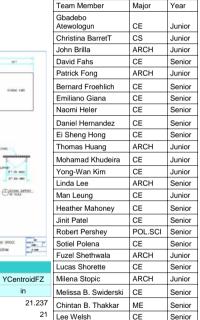
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ILLINOIS INSTITUTE OF TECHNOLOGY







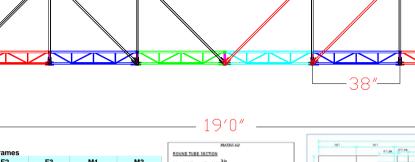


TABLE: Element Joint Forces - Frames						
Frame	Joint	F1	F2	F3	M1	M3
Text	Text	Kip	Kip	Kip	Kip-in	Kip-in
4	1	0.686	-0.004522	0.688	0.155	-0.123
4	4	-0.6	0.005116	-0.598	0.039	-0.049
4	1	0.6	-0.005116	0.602	0.14	-0.135
4	4	-0.686	0.004522	-0.684	0.032	-0.059
12	4	1.408	0.002091	0.001304	-0.011	0.055
12	6	-1.184	-0.001734	0.001304	0.016	0.026
12	4	1.184	0.001734	0.001304	-0.016	0.046
12	6	-1.408	-0.002091	0.001304	0.011	0.017
13	6	1.738	0.0001141	0.003236	0.00001786	0.0002725
13	10	-1.233	0.00002603	0.003236	0.001916	0.011
13	6	1.233	-0.00002603	0.003236	-0.001916	-0.01
13	10	-1.738	-0.0001141	0.003236	-0.00001786	-0.0002725
14	10	1.408	-0.001907	0.001304	0.016	-0.017
14	11	-1.186	0.002258	0.001304	-0.011	-0.052
TADI	E. Bee	Beestiene				

	MATHCAD	
	ROUND TUBE SECTION	
)(数-10005 页-2000 ²⁴ 2 約 ²	
		-36 hip
		in a
	<u>d</u> :=1373m t_:=0.049	in. d₁:=d=3t
	$\overline{f}_{M} := \frac{\sqrt{d^2 + d_1^2}}{4}$	
	$ A_{\mathbf{g}} = \frac{\mathbf{x}}{4} \mathbf{d}^2 - \frac{\mathbf{x}}{4} \mathbf{d}_1^2 \qquad A_{\mathbf{g}} = 0 $	1.20 th
	$\frac{N_{\rm H}/L_{\rm H}}{r_{\rm H}} = 314.667$	
	$\underline{C}_{x,z} \approx \sqrt{\frac{2 \cdot \mathbf{x} \cdot \mathbf{E}}{\mathbf{F}_{y}}} \qquad C_{x} = 126.099$	
25	$\boldsymbol{\Sigma}_{n} := \underbrace{ \begin{bmatrix} 1 - \frac{\left(\frac{\boldsymbol{\Sigma}_{n} \boldsymbol{\Sigma}_{n}}{\boldsymbol{\Sigma}_{n}}\right)^{2}}{\boldsymbol{\Sigma}_{n}} \\ - \frac{1}{2\boldsymbol{\Sigma}_{n}^{2}} \end{bmatrix} \boldsymbol{\Sigma}_{n}}_{\boldsymbol{\Sigma}_{n}}$	$F_{n} = 10.55 \frac{hlp}{r^2}$
	$\frac{\delta \mathbf{x} - \frac{\delta \mathbf{x}}{\mathbf{x}_{z}}}{\frac{\delta}{5} + \frac{\delta \left(\frac{\mathbf{x}_{y} \mathbf{I}_{y}}{\mathbf{x}_{z}}\right)}{\theta \cdot \mathbf{c}_{y}} - \frac{\left(\frac{\mathbf{x}_{y} \mathbf{I}_{y}}{\mathbf{x}_{z}}\right)^{2}}{\left(\theta \cdot \mathbf{c}_{y}\right)^{2}}$	· "
25	E=1101B	
	$f_{ab} = \frac{p}{A_{g}}$ $\frac{F_{a}}{f_{g}} = 1957$	ζ = 5394 ^{3/2} b ¹

XCentroidFX

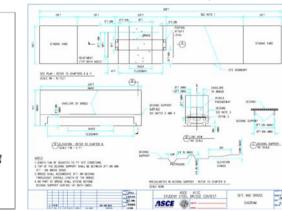
in

-1.111E+14

YCentroidFX

in

24.12



YCentroidFY

in

2.984E+14

XCentroidFZ

in

128.026

in

SCALE:

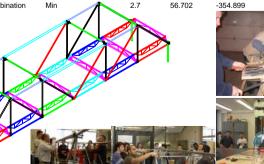
1 in = 1 ft

OutputCase StepType CaseType Text Text Text ENVELOPE Combination Max



39″

SAP2000 ANALYSIS



GlobalFZ

Kip

2.808

GlobalMX

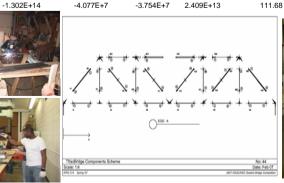
Kip-in

59.636

GlobalMY

Kip-in

-301.547



XCentroidFY

in

30.535

