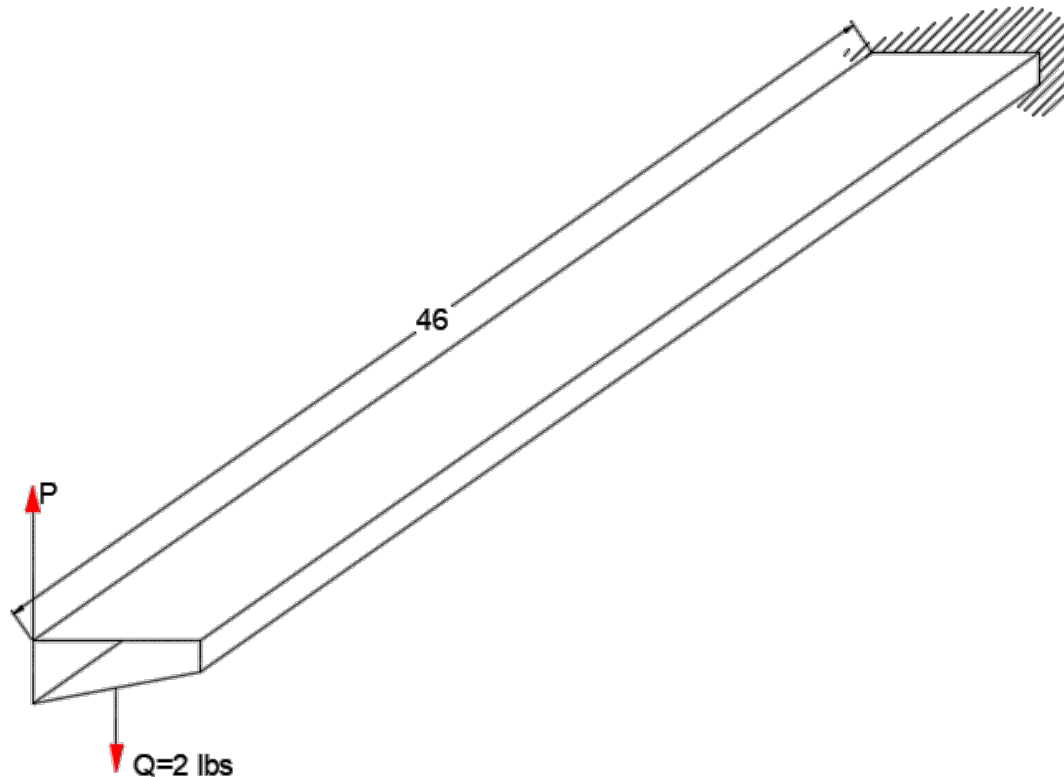


AirBus-AE525 Wingbox contest (Fall 2019)

- Design and Build the **lightest semi-monocoque wingbox** to withstand the bending and twisting loads. The cantilevered wingbox weighing **no more than 0.7 lbs** must carry a dead load 'Q' of 2 lbs and minimum end load 'P' of **15 lbf** to qualify. The wingbox will be tested to failure and the team achieving the highest score based on a weighted rubric will be the winner. The score will be based on the wing design documentation, construction quality, and performance.



Eligibility:

Open to student groups (≤ 4) enrolled in the Fall 2019 AE 525 course

Deadlines:

Entry : Enrolled in AE 525

Submission : **12/06/2019**

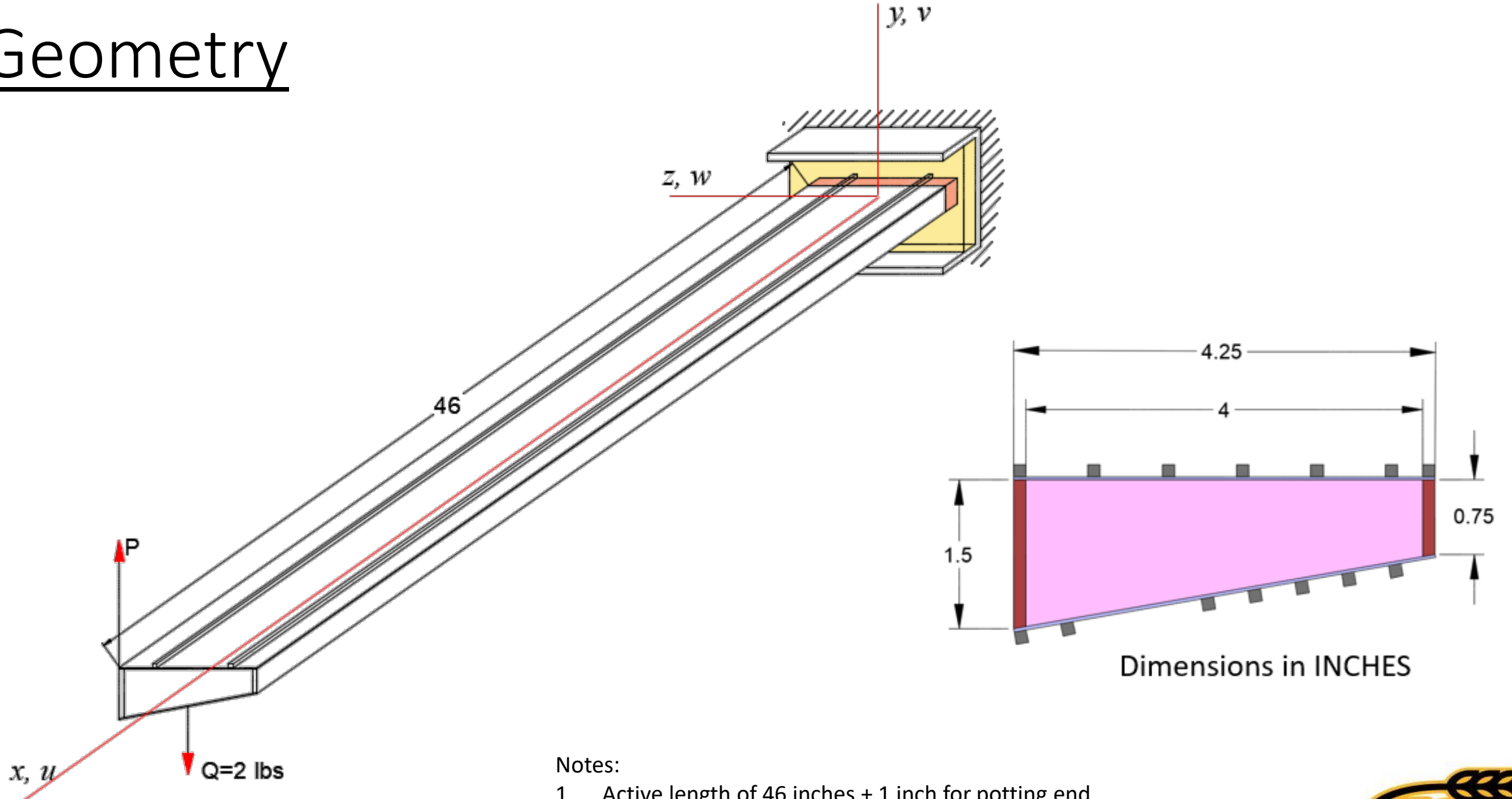
Awards:

1st Place : \$1000

2nd Place : \$500

3rd Place : \$250

Geometry

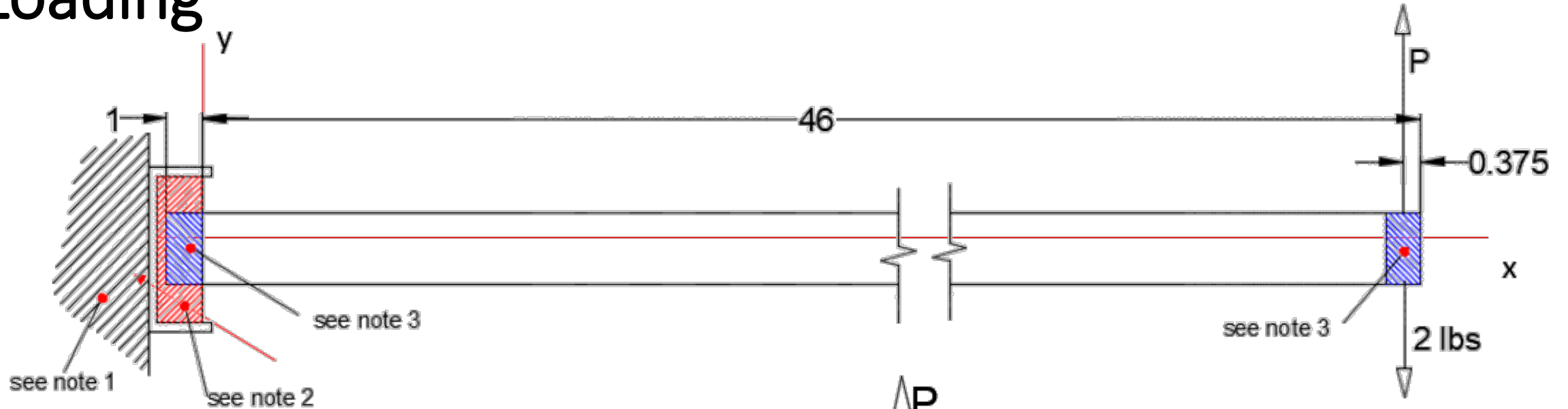


Dimensions in INCHES

Notes:

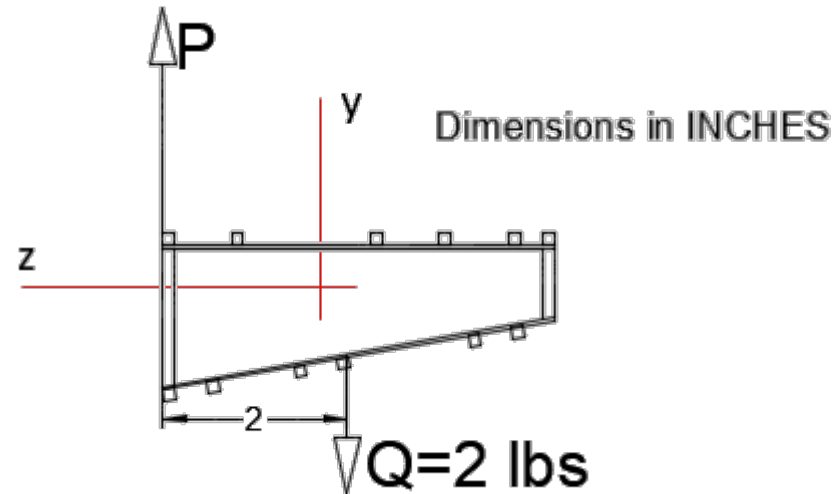
1. Active length of 46 inches + 1 inch for potting end
2. The stringers must be placed on the outside.
3. End will be potted by Flight Structures Lab

Loading



NOTES

1. Rigid support
2. End potted in epoxy resin
3. Ends to be reinforced with 1.00 in thick foam rib



NOTE: The teams will be provided with end foam ribs (1.00in thick) to be inserted at the free and fixed ends. The stringers, spars and skin must extend the entire length (47 inches)

Scoring rubric

The designs were scored based on the following formula

$$Score = S_{performance} + S_{analysis} + S_{report}$$

$$S_{performance} = 0.5 \frac{P_{max}}{W_{Wing}} + 0.5 \frac{Q}{\delta_Q} + 0.05 \left[\frac{P_{max}}{\delta_{max}} + \frac{P_{max}}{\theta_{max}} \right] - 10 \frac{W_{Wing}}{0.5} - 5 \frac{W_{adhesive}}{W_{Wing}}$$

$$S_{analysis} = 10 \left(1 - f \left(P_{max}, P_{pred}, 0.1 \right) \right) + 20 \left(1 - f \left(\delta_Q, \delta_{Q_pred}, 0.1 \right) \right) + 20 \left(1 - f \left(\delta_{15}, \delta_{15_pred}, 0.1 \right) \right)$$

$$f(A, A_{pred}, \beta) = \begin{cases} 0 & \frac{|A - A_{pred}|}{A_{pred}} \leq \beta \\ \frac{|A - A_{pred}|}{A_{pred}} - \beta & otherwise \end{cases}$$

Note : The tolerances for strength and stiffness are based on variability in material properties.

W_{Parts} ~ Total weight of parts before assembly

W_{WING} ~ weight of wingbox after assembly (lbs)
(should not exceed 0.7 lbs)

$W_{adhesive} = (W_{WING} - W_{Parts})$ ~ Weight of adhesive

P_{max} ~ Measured failure load

P_{pred} ~ predicted failure load (lbs)

δ_{15} ~ Measured end deflection (along load) at P=15 lbs (+Q=2lbs)

δ_{15_pred} ~ Predicted end deflection (along load) at P=15 lbs (+Q=2lbs)

δ_Q ~ Measured end deflection (along load) at Q=2 lbs

δ_{Q_pred} ~ Predicted end deflection (along load) at Q=2 lbs

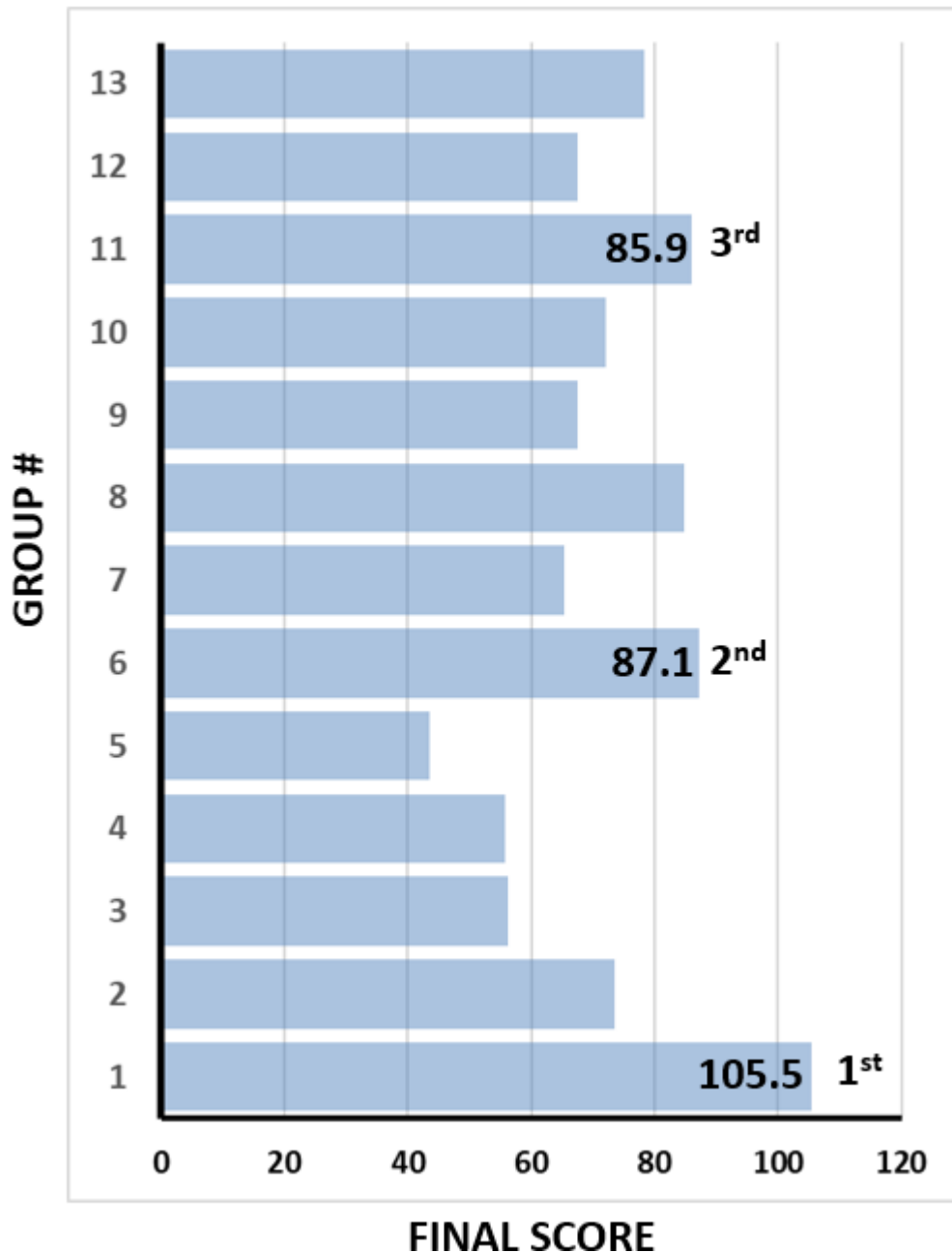
δ_{max} ~ Measured end deflection at failure

θ_{max} ~ Measured end twist at failure (degrees)

AIRBUS



AirBus-AE525 Wingbox contest (2019 Fall) :Winners



- 1ST PLACE

- Yie Jian Chee, Christopher Mueller, Nelson Ghee, Sivaganeshwar Subramaniam

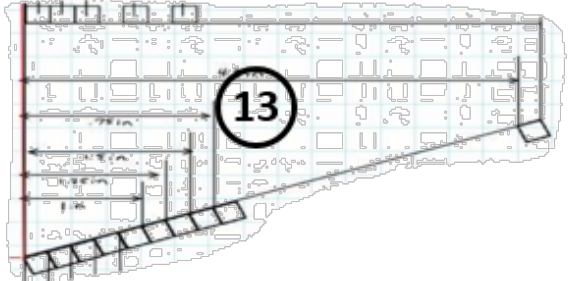
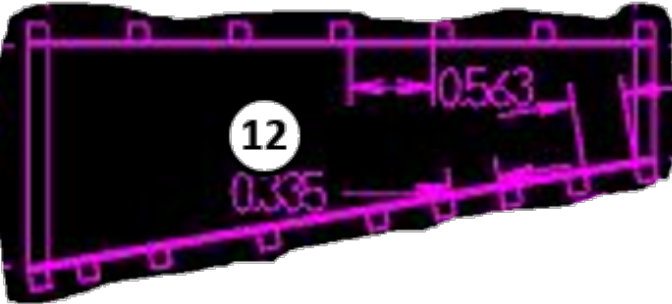
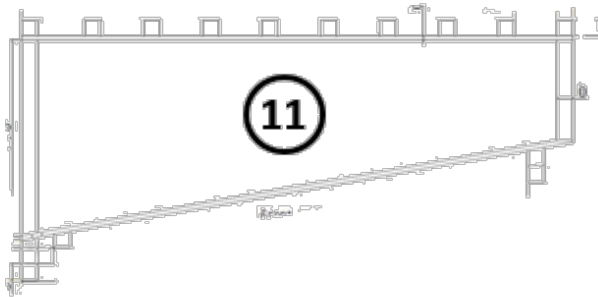
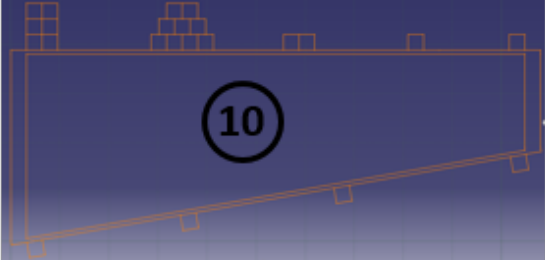
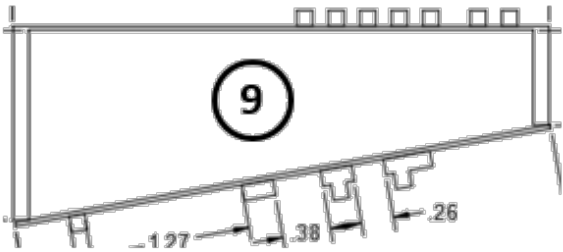
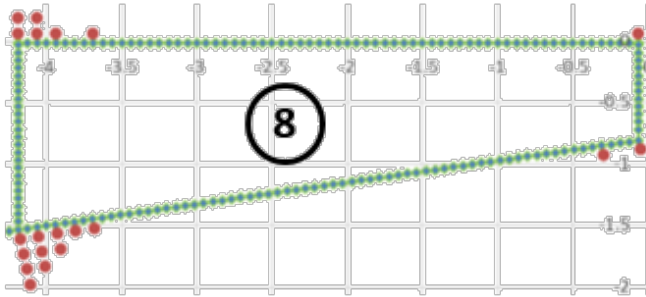
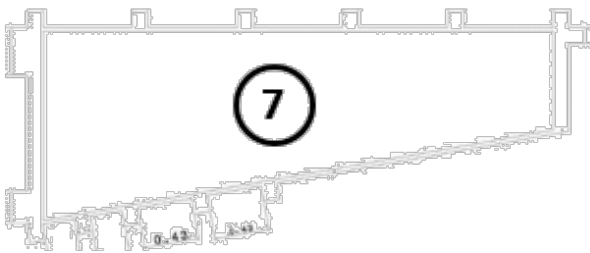
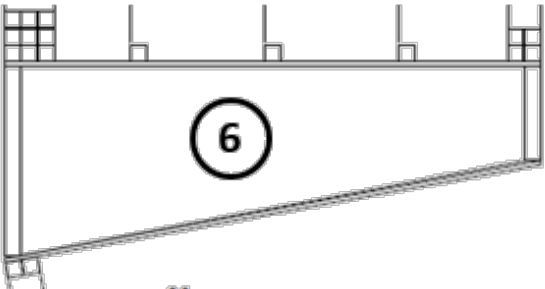
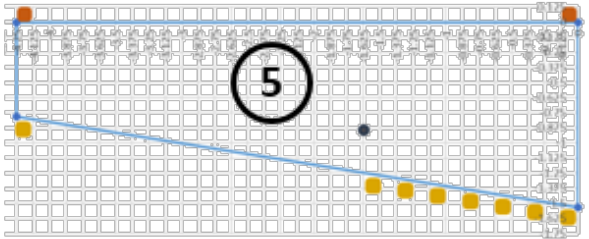
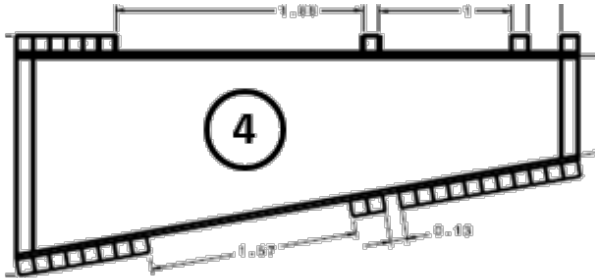
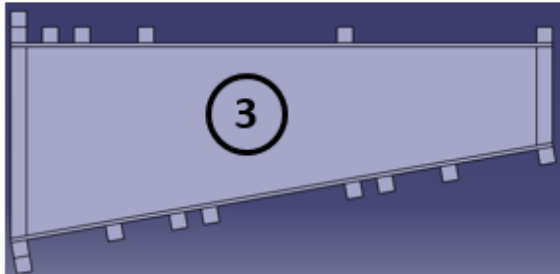
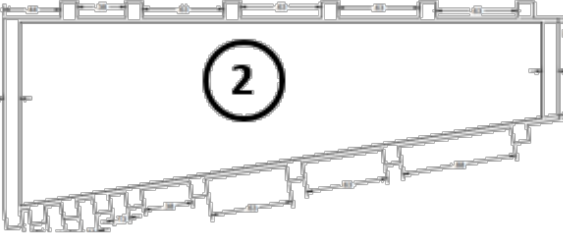
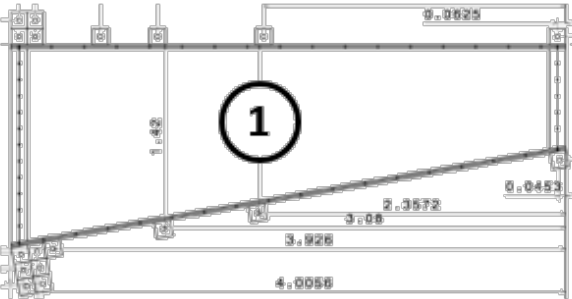
- 2ND PLACE

- John Randall, Connor Devlin, Cameron Hoover, Daniel Pine

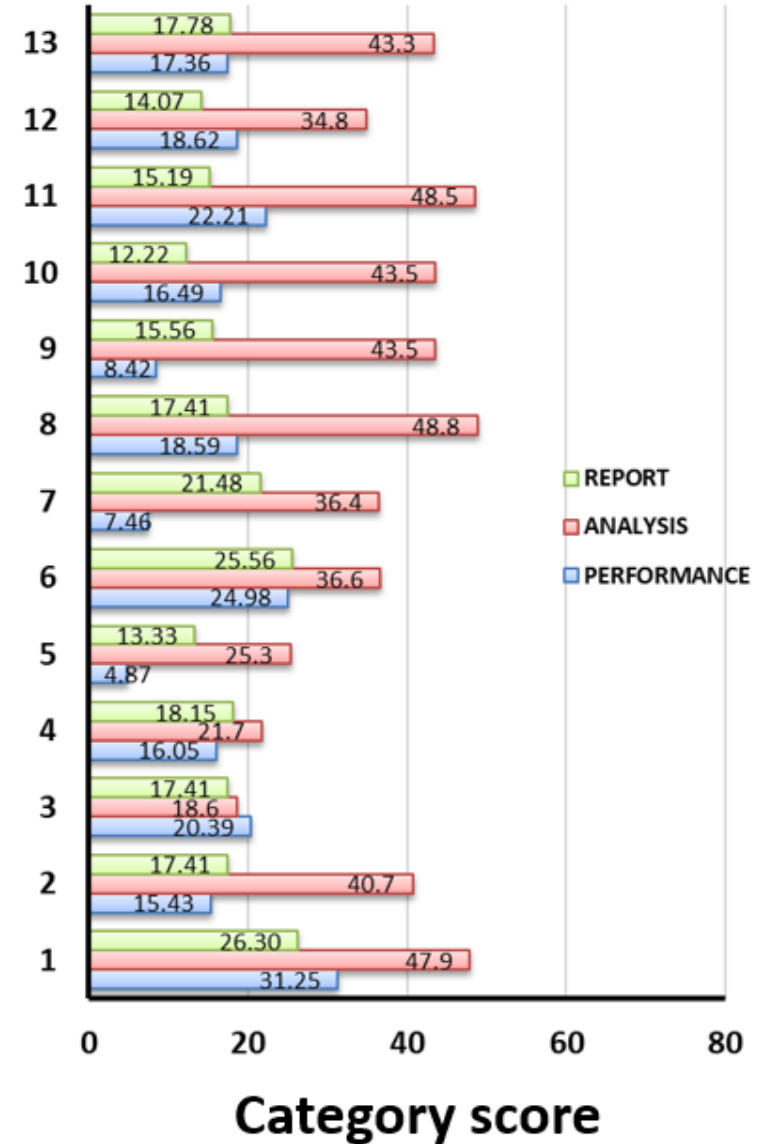
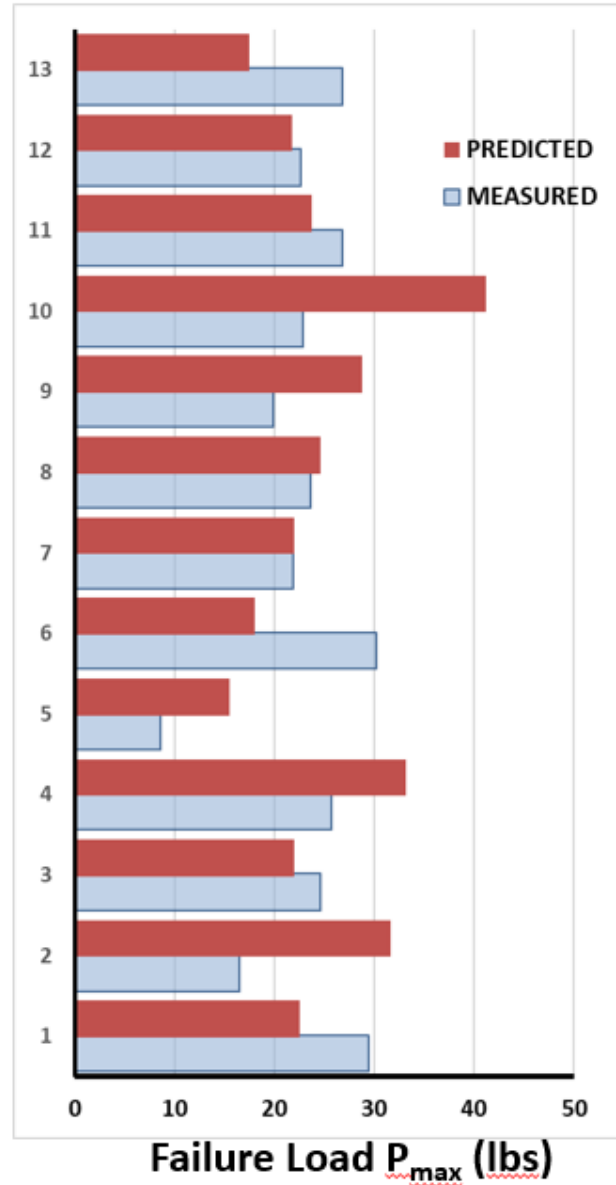
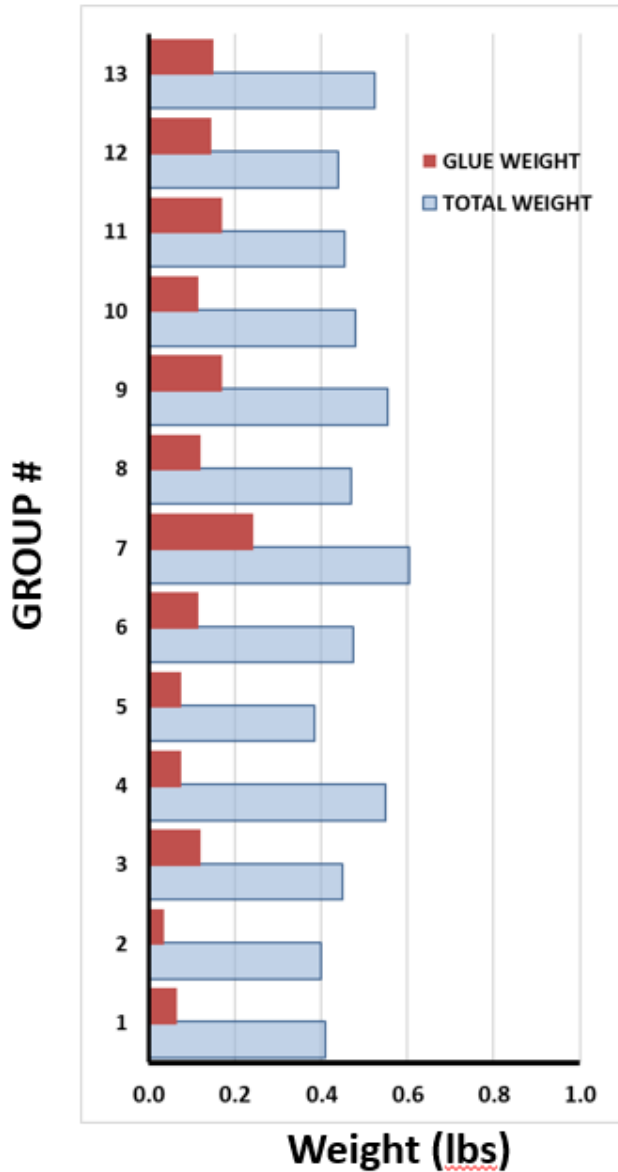
- 3RD PLACE

- Christopher Trevino, Lan Nguyen, Yasaman Teherirozbahani, Kristopher Stewart

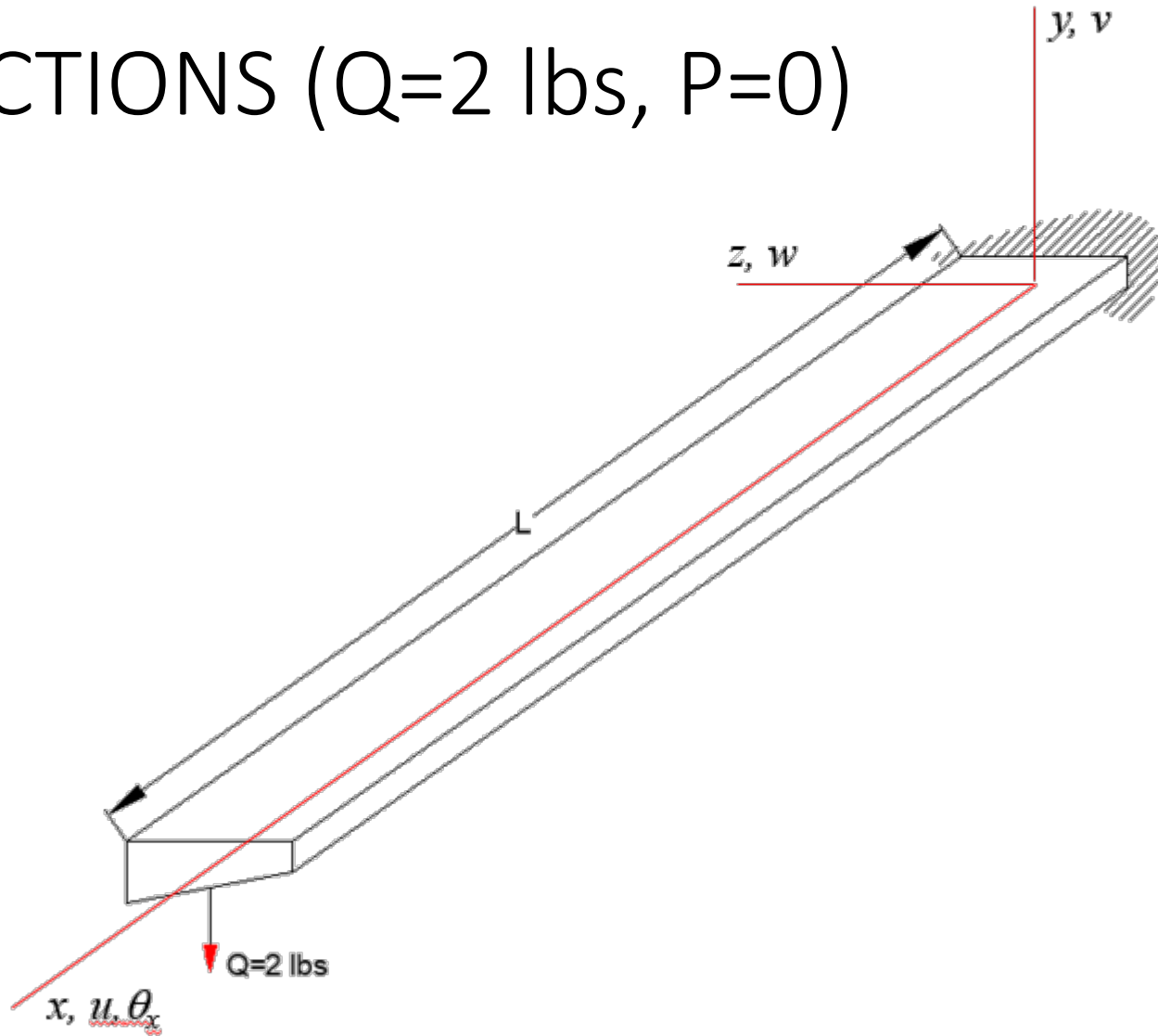
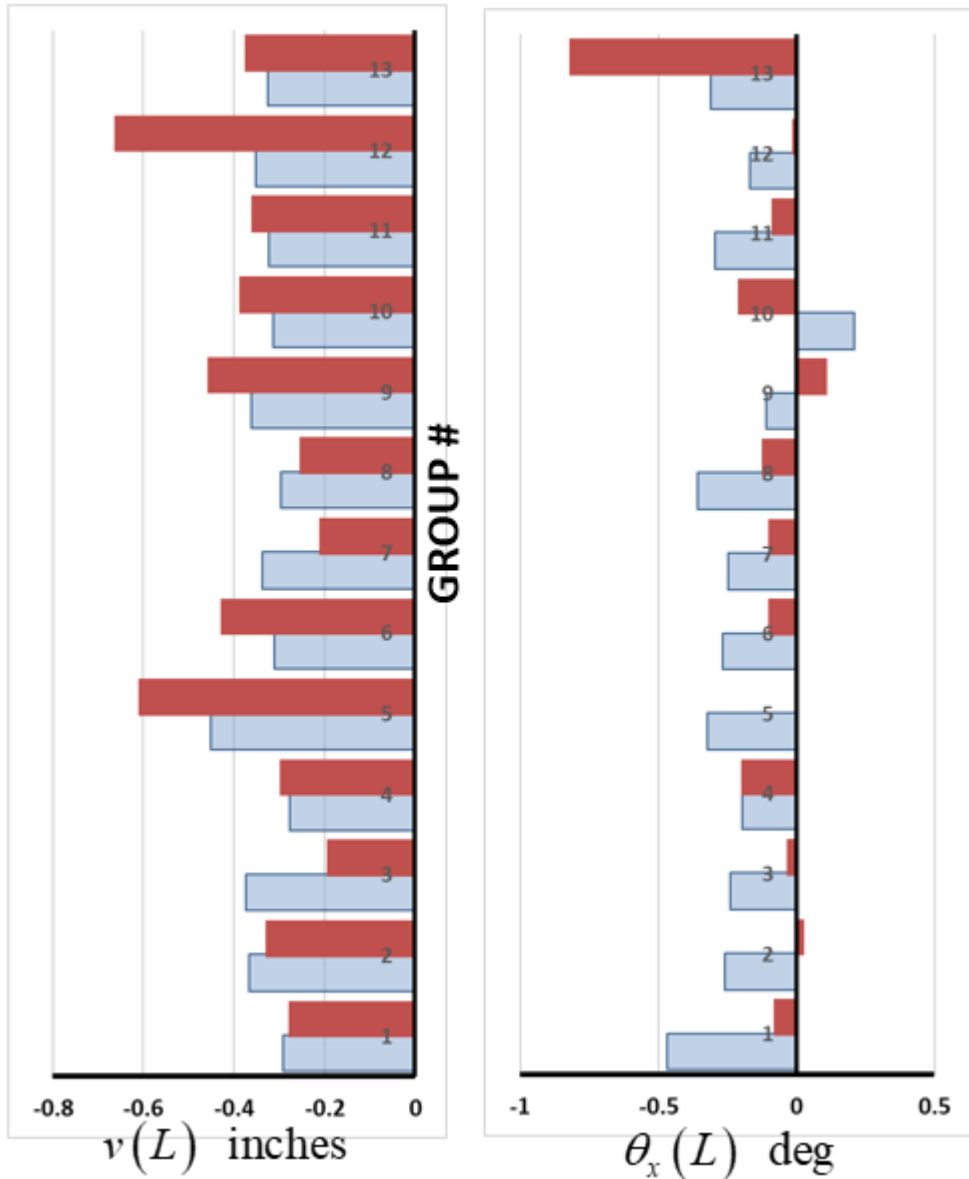
Cross-section geometries..



BREAKDOWN OF SCORES



MEASUREMENTS & PREDICTIONS (Q=2 lbs, P=0)



MEASUREMENTS & PREDICTIONS (Q=2 lbs, P=15 lbs)

