UNIVERSITY OF WOLLONGONG IN DUBAI

Truss Description & sketch: 2/3 Pictures: 3/3
Results: 4/4 Total Report Grade: 9/10

Laboratory Session 11:

TRUSS COMPETITION

Family Name:	[redacted]
First Name:	
Student Number:	
Student Submitting	

Subject number and name:	ENGG102 – Fundamentals of Engineering Mechanics
Subject coordinator:	Dr. Umar Asghar
Title of Assignment:	Project 3 – Truss Competition
Date and time due:	22-03-2024, 23:59:59
Lab Number:	1.53
Tutor Name:	Mr. Ahmed Mohamed
Total number of pages:	5

Truss Description

After conducting research, the team decided to construct the *"Howe truss"* for several reasons.

The Howe truss is a structural system that is characterized by inclined diagonals with same angles in compression and vertical members in tension, resulting in an equal distribution of loads across the truss.

The verticals also play a role in reducing any dead load (a constant load in a bridge that is due to the weight of the members) which gives more stability and durability to the whole structure. Moreover, it is a lightweight solution and relatively easy to fabricate and repair, which is the reason why it is still extensively used today.

While constructing, the team also made some additional modifications to the design, adding some members and altering orientations to find solutions for suspected weak joints and to maximize the usage of materials. The modifications include stacking sheets together and glueing them to achieve a fiber matrix that will be stronger than a single beam when confronted by the compressive force of the experiment and by adding diagonals at the cross section of the truss to create a rigid structure.

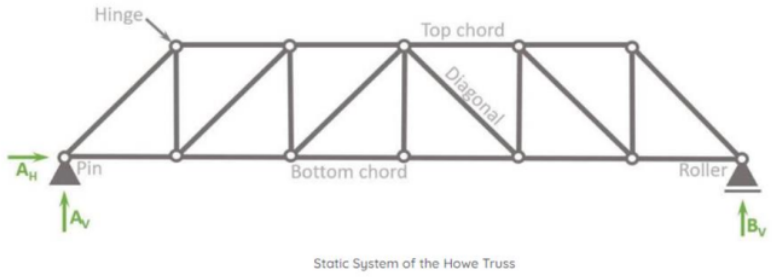

Figure 1: Standard design of a Howe truss

The total height of the truss is 133 mm, and the total width of the truss is 143 mm. The vertical supports of the truss are all 100 mm in height. Their cross-sectional areas (from left to right) are:

10 × 10 mm, 20 × 10 mm, 8 × 8 mm, 20 × 10 mm, 10 × 10 mm

The diagonals have a cross section of 8 × 8 mm but vary in length from 11 mm to 12.5 mm due to the angled cuts and the uneven spacing between the vertical members of the truss.

The top and bottom chords of the truss are both made from wood with a cross-section of 10 × 10 mm. The bottom chord has a length of 450 mm whereas the top chord has a length of 320 mm.

The members connecting the two halves of the truss are made of 10 × 10 mm wood. The top members' length is 132 mm, whereas the members at the bottom have a length of 122 mm.

To give additional support to the truss, there are two diagonal members connecting the two halves. Their cross-sections are 5 × 10 mm, and their length is approximately 160 mm.

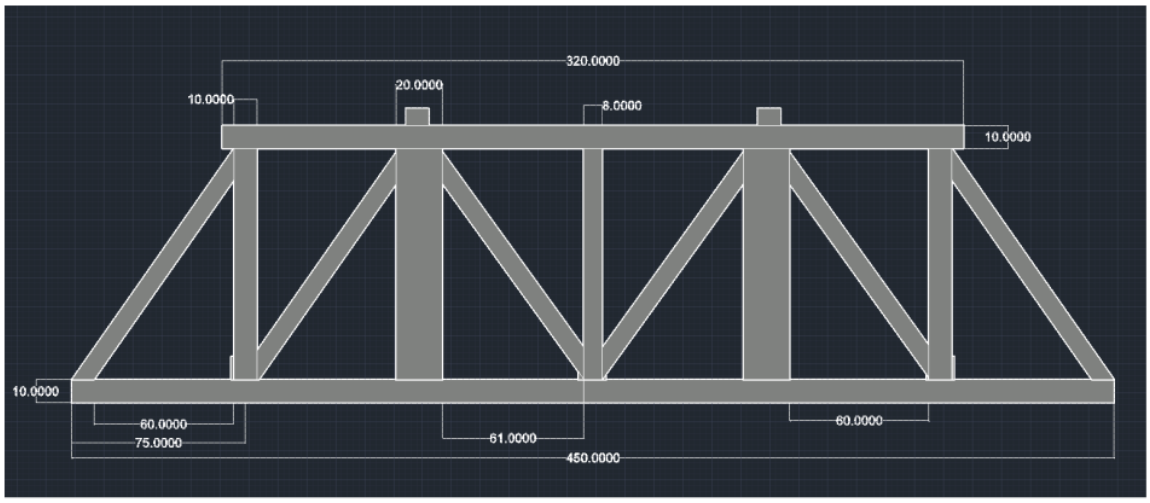

Figure 2: Sketch of designed truss – Front view

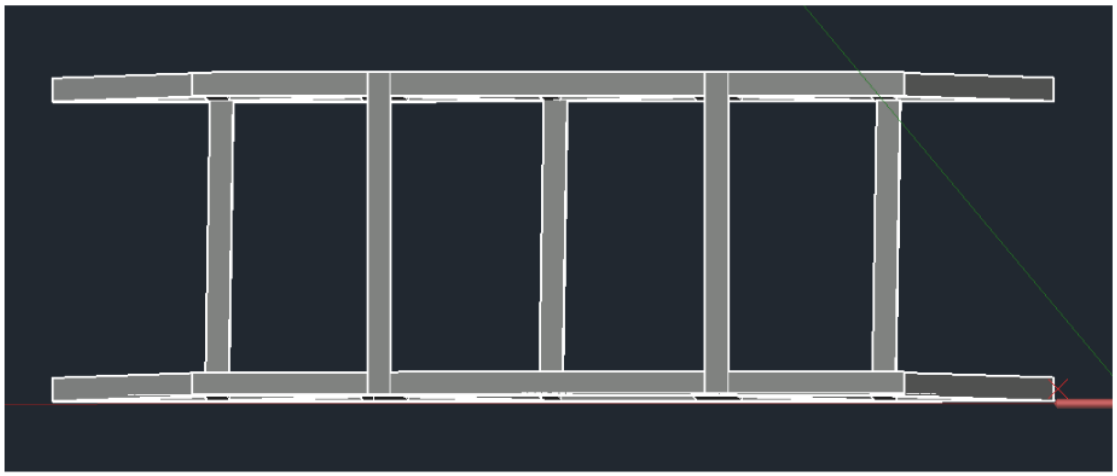

Figure 3: Sketch of designed truss – Top view

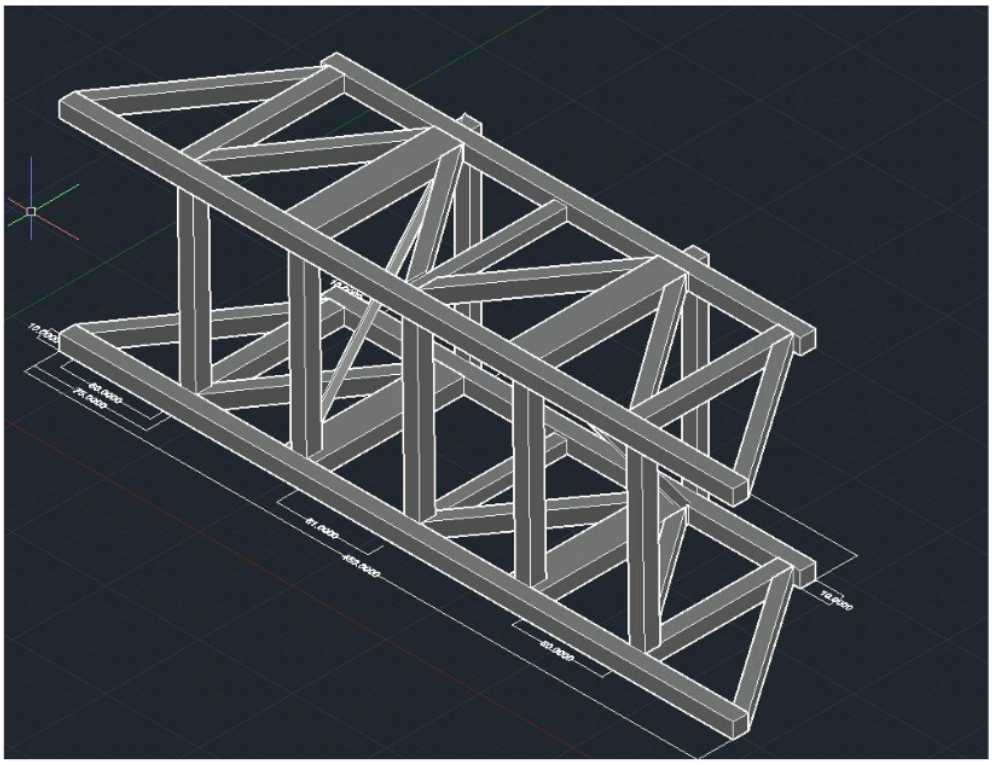

Figure 4: Three-dimensional view of the truss

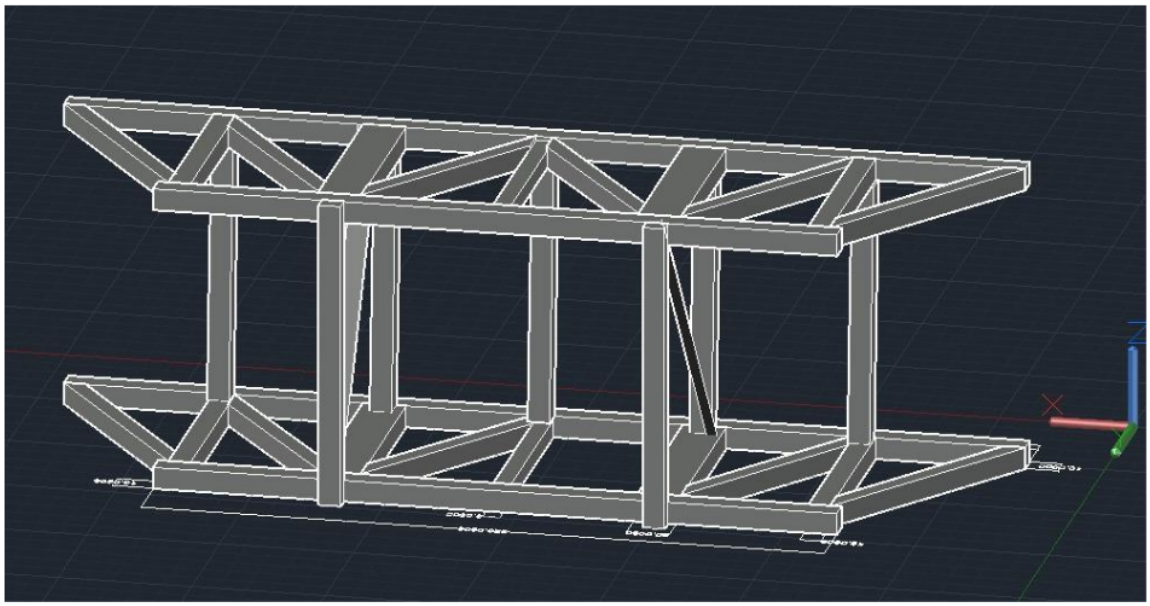

Figure 5: Three-dimensional view of the truss

Pictures

Figure 6: Front view of the truss

Figure 7: Top view of the truss

Figure 8a and 8b: Side view of the truss

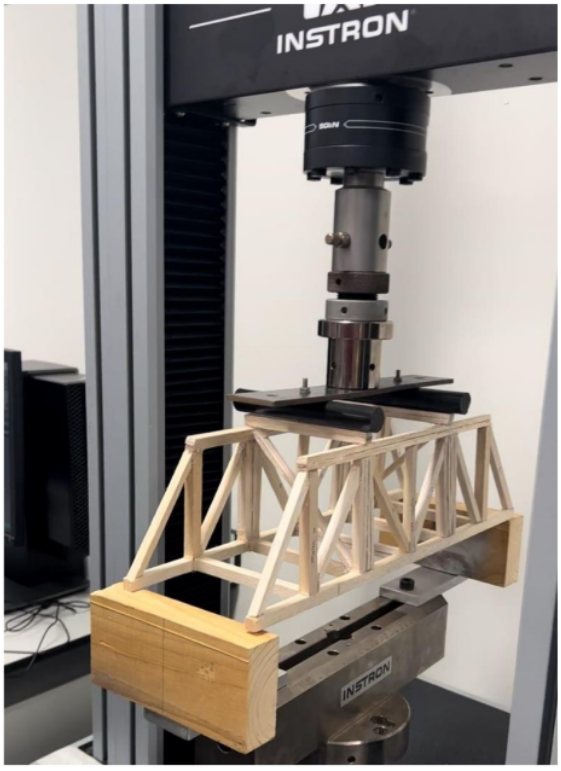

Figure 9a and 9b: Truss test set-up

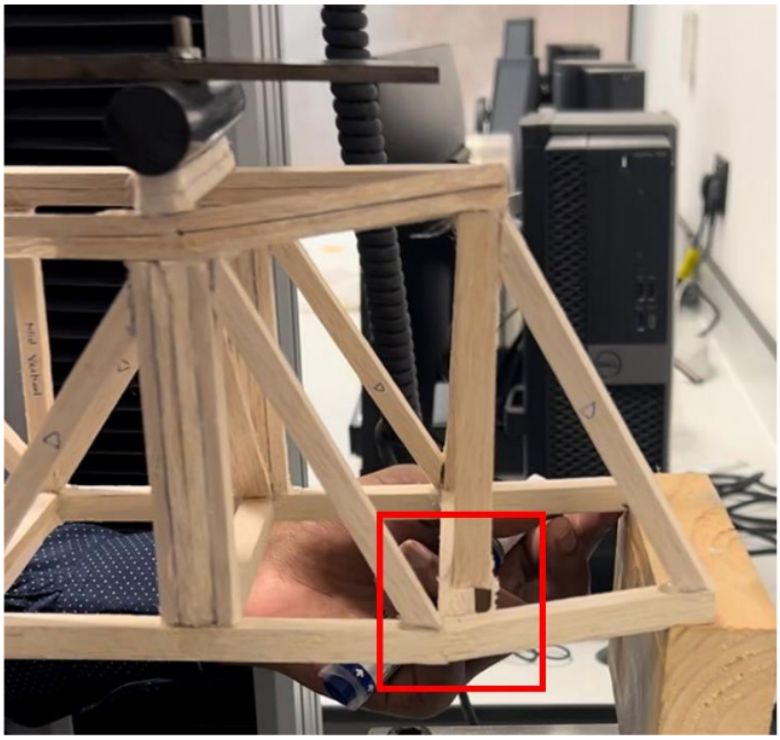

Figure 10: Point of failure of truss

Results

Ultimate Load of Truss 471.38 N
Weight of Truss 102.80 g = 0.1028 kg

$$\textbf{Strength Factor} = \frac{\text{Ultimate Load (N)}}{\text{Weight of Truss (N)}} = \frac{471.38\ \text{N}}{0.1028 \times 9.81\ \text{N}} = 467.422$$

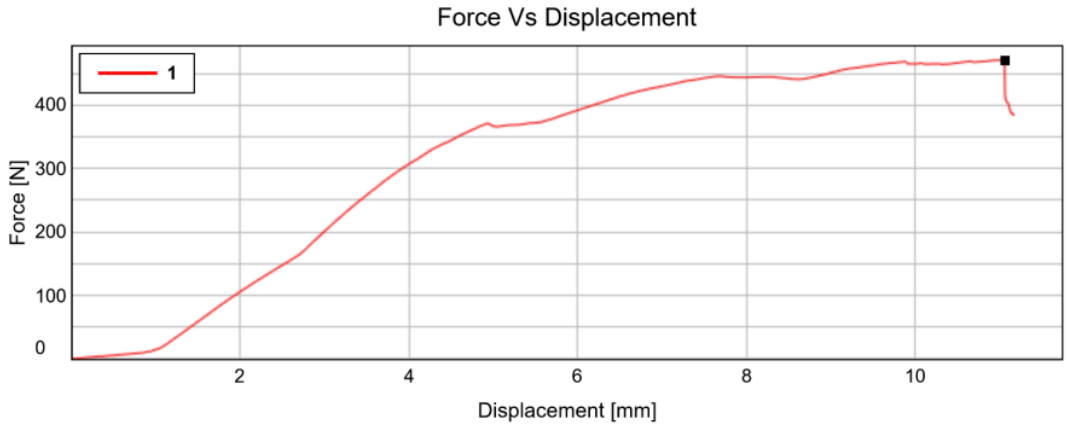

Figure 11: Force vs Displacement graph for truss during testing

ENGG102 Report 3

GRADEMARK REPORT

FINAL GRADE

GENERAL COMMENTS

90 /100

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