UTM UNIVERSITI TEKNOLOGI MALAYSIA

UTM Razak School of
Engineering and
Advanced Technology

R E S E A R C H   U N I V E R S I T Y

CIVIL ENGINEERING DEPARTMENT

SHEAR FORCE

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1.		
2.		
3.		
Section / Group		
Lecturer's Name		

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SHEAR FORCE (1)

1.0   OBJECTIVE

To show that the shear force at a cut section of a beam is equal to the algebraic sum of the forces acting to the left or right of the section.

2.0   THEORY
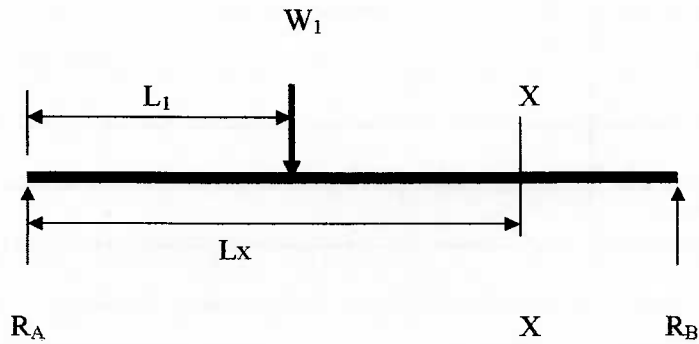
Shear force at section x-x is :

$$S.F \; x\text{-}x = W_1 - R_A$$

OR $\qquad S.F \; x\text{-}x = R_B$

When the load is to the right of x-x :

$$S.F \; x\text{-}x = R_A$$

3.0   APPARATUS

1.   A pair of simple supports.
2.   Special beam with a cut section.
3.   A set of weights with several load hangers.

4.0   PROCEDURE

1. Connect the load cell to the digital indicator.

2. Switch on the indicator. For stability of the reading the indicator must be switch on for 10 minutes before taking readings.

3. Fixed the two simple supports to the aluminum base at a distance equal to the span of the beam tested. Screw the supports tightly to the base.

4. Hang the load hanger to the beam.

5. Place the beam on the supports.

6. Place the load hanger at the desired location.

7. Note the indicator reading. If it is not zero, press the tare button on the indicator.

8. Place a load on each load hanger.

9. Record the indicator reading. This represents the shear force at the cut section.

10. Add load to the load hanger and record the indicator reading.

11. Repeat step 10 for another 5 sets of readings.

5.0   RESULTS

Beam span   = ...mm

Distance of the shear section from the left support, L_x = ...mm

Distance of the load from the left support, L_1 = ...mm

Table 1

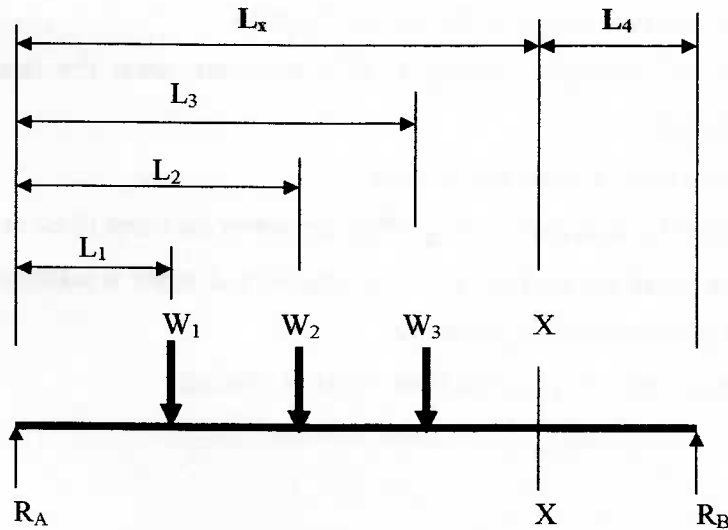| Load (N)	Shear force at x-x	
	Experimental (N)	Theory (N)

6.0   QUESTIONS

1. Using the data in Table 1, plot the bar chart for the shear force versus load.

2. Determine the slope of the graph.

3. Calculate the theoretical slope.

4. From the slope, calculate the average percentage error for the experiment.

   Percentage error $= [(\text{Slope theory} - \text{Slope exp.}) / (\text{Slope theory})] \times 100\%$

5. Comment on the accuracy of the experiment

1.0 OBJECTIVE

To show that shear force at a cut section of a beam is equal to the algebraic sum of the forces acting to the left or right of the section.

2.0 THEORY

Shear force at section X – X is :

$$S.F \ x\text{-}x = W_1 + W_2 + W_3 - R_A$$

OR $\qquad S.F \ x\text{-}x = R_B$

3.0 APPARATUS

1. A pair of simple supports
2. Special beam with a cut section
3. A set of weights with several load hangers

4.0   PROCEDURE

1. Connect the load cell to the digital indicator.

2. Switch on the indicator. For stability of the reading, the indicator must be switch on for 10 minutes before taking readings.

3. Fixed the two simple supports to the aluminum base at a distance equal to the span of the beam tested. Screw the support tightly to the base.

4. Hang the load hanger to the beam.

5. Place the beam on the supports.

6. Place the load hanger at the desired location.

7. Note the indicator reading. If it is not zero, press the tare button on the indicator.

8. Place a load on each load hanger.

9. Record the indicator reading. This represents the shear force at the cut section.

10. Remove all loads from the load hangers and apply a different set of loading and at different set of locations.

11. Repeat step 6 to 11 for another 5 sets of readings.

5.0   RESULTS

Beam span   = ...mm

Distance of the shear section from the left support   = ... mm

Table 2

Load case	Load and its distance from the left support						Shear force theory (N)	Shear force experiment (N)	% error
	W1 (N)	L1(mm)	W2 (N)	L2(mm)	W3 (N)	L3(mm)			
Case 1									
Case 2									
Case 3									
Case 4									
Case 5									

6.0 QUESTIONS

1. Using the data in Table 2, plot the bar chart for the shear force for the theoretical and experimental case for each load case.

2. Calculate the percentage error for each load case and hence determine the overall percentage error.

3. Comment on the accuracy of the experiment.

4. State the probable factors that affect the accuracy of the experiment.

5. What is the importance of shear force in civil engineering area?