2.3.2 Experiment 2: End Reactions of a Loaded Beam

Principle

The end reactions, that is the forces that develop at the supports of the structure when the structure is subjected to external loads, are influenced by the applied forces and the position of these forces.

Objective

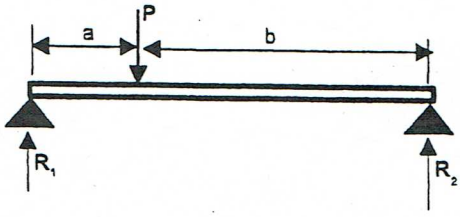
This experiment demonstrates the effect of the location of the forces applied on a beam.

Background

Constraints or supports generate reactive forces which tend to prevent motion caused by applied loads. If a *point load P* is not centrally placed on a beam of length $L = (a + b)$ that is being supported at both ends, then the reaction forces R_1 and R_2 at the supports depends on the location of the applied load. Neglecting the weight of the beam itself, the reaction forces at left and right end are respectively given by $R_1 = \frac{P \cdot b}{(a+b)}$ and $R_2 = \frac{P \cdot a}{(a+b)}$.

Apparatus

- Two platform scales
- Beam
- Test weights



Procedure

- Place a beam across the two platform scales. Reset each scale to read zero.
- Apply a 4-lb load at the middle of the beam and note that the two scales read the same value, which is half of the applied weight.
- Now move the weight to the left by a certain distance. Measure the distance between the load and the left scale. Denote this value as the variable a.
- Also, measure the distance between the load and the right scale. This distance will be denoted by b.
- Record the reading on each of the scale. The readings should give the magnitudes of the reactions at each end of the beam.
- Repeat this process three different times for three different positions of the load.

Presentation of Results

Draw a table showing the values of a and b with their corresponding readings on the left scale and on the right scale.

Analysis of Results

Verify that for every load position recorded, the reading on the left scale is equal to $Pb/(a+b)$ and on the right scale is $Pa/(a+b)$. Notice that the sum of the readings will always add up to the magnitude of the applied load.