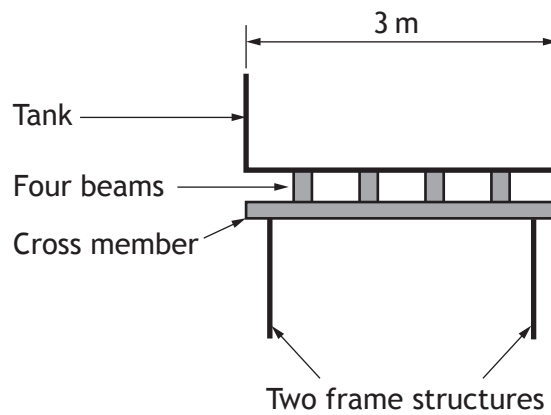


8. The water storage system below shows a water tank which is filled by an electrical pump. The tank with dimensions 3 m × 3 m sits on four timber beams. The beams are secured to a cross member at one end and fixed into the wall at the other. Each beam carries an equal share of the water tank's weight.

The cross member is supported by two frame structures.



Front View

- (a) Calculate the maximum uniformly distributed load exerted on each beam if the water level in the storage tank does not exceed 1.5 metres. Ignore the weight of the tank.

(1 m³ of water has a mass of 1000 kg.)

4

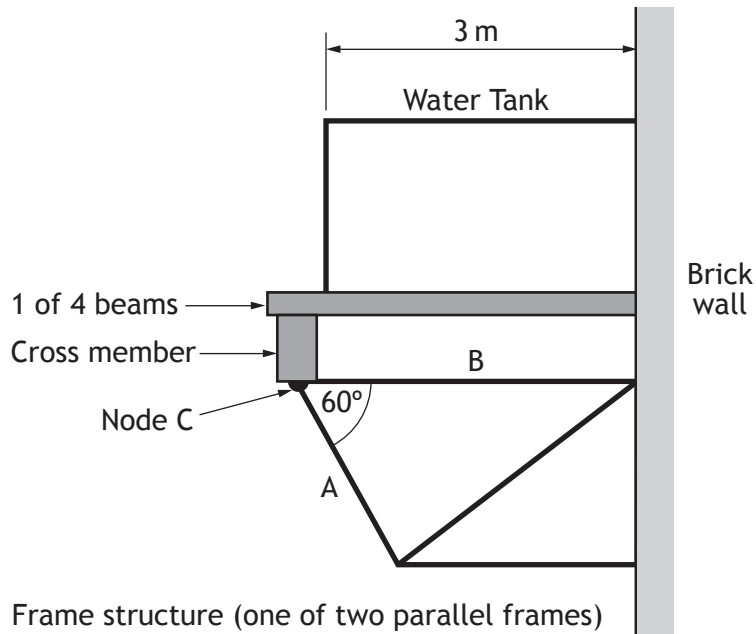
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* X 7 2 3 7 6 0 1 1 1 *

8. (continued)

MARKS
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MARGIN



Side View

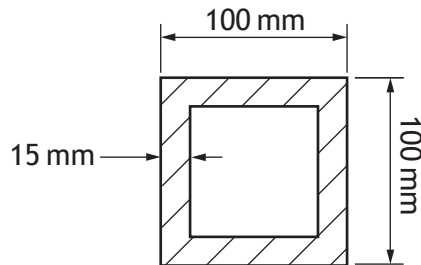
- (b) The figure above shows one of the frame structures which support the tank. The force exerted by the water in the tank at node C is 58.8 kN.
- (i) Calculate the **magnitude** and determine the **nature** of the forces in members labelled **A** and **B**.

3



8. (b) (continued)

Member A is a 100 mm × 100 mm square tubular section with a uniform wall thickness of 15 mm as shown below.



(ii) Calculate the stress present in member A.

3

[Turn over

8. (continued)

- (c) The water tank is filled using an electrical pump, rated at 230 V and 15 A, which is located at ground level. The pump is 75% efficient and the filling pipe is located 6 metres above ground level.

Calculate the time it will take to fill an empty tank to a level of 1.5 metres.

5