Correction: And finally… (September 2019)

Following publication of September's 'And finally…' question, we were alerted to a production error in the solutions and issued corrected versions in October (page 41).

However, the solutions given were also challenged by a reader and, regrettably, we have to issue a further correction now.

The lateral force on the wall at any given depth *h* is density × *h*. The total lateral force is then 0.5 × density × *h* × *h*, so a function of h^2. Many readers will be used to seeing a triangular wall distribution on retaining walls and so forth, but that is pressure not force (Figure 1). The shape of the shear force diagram itself is parabolic, while the shape of the bending moment diagram down the wall is cubic.

Corrected solutions are presented in Figure 2 with a discussion below.

Situation A

The shape of the shear force diagram given in the previous solution should have been parabolic, and the shear force applied at the junction of the wall and base is 11.25kN.

The shape of the bending moment diagram given was correct, but the diagram was incorrectly labelled. The bending moment applied from the wall at its junction with the base is 5.6kNm. But this is not the bending moment on the centroid of the base, which is larger at 8.33kNm.

The difference arises here because the base is 'thick', so there is lateral hydrostatic force which is eccentric to the centroid. Enthusiasts can calculate that either by taking moments about the centre line directly or by splitting the lateral forces up into those on the wall above the base and those on the base itself.

Because the object is floating (and there is implicitly no significant shape change) there is no net vertical force on the base to create bending from vertical forces.

Situation B

The shape of the shear force diagram given in the previous solution should have been parabolic. The bending moment diagram was correct.

Learning outcomes

1) Beware of the difference between pressure and force when preparing diagrams.

2) Be alert to the possibility of axial thrust having an influence on bending. This can be easily overlooked when the structure and bending moment diagram are idealised to single-line diagrams. The bending moment diagram applies at the centroid of the element being considered. A special problem exists in non-uniform members.

3) Dealing with the forces and stability of floating objects can be quite tricky.

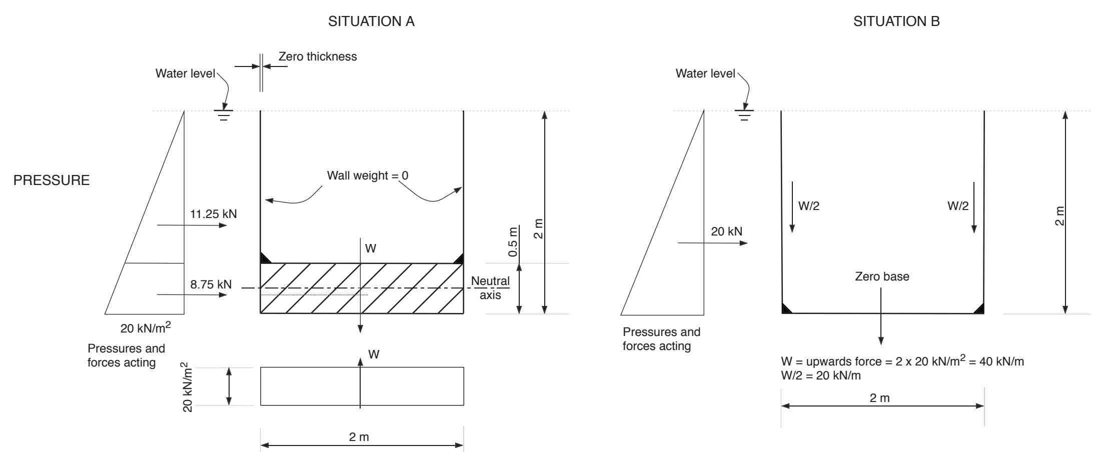

FIGURE 1: Pressure diagrams

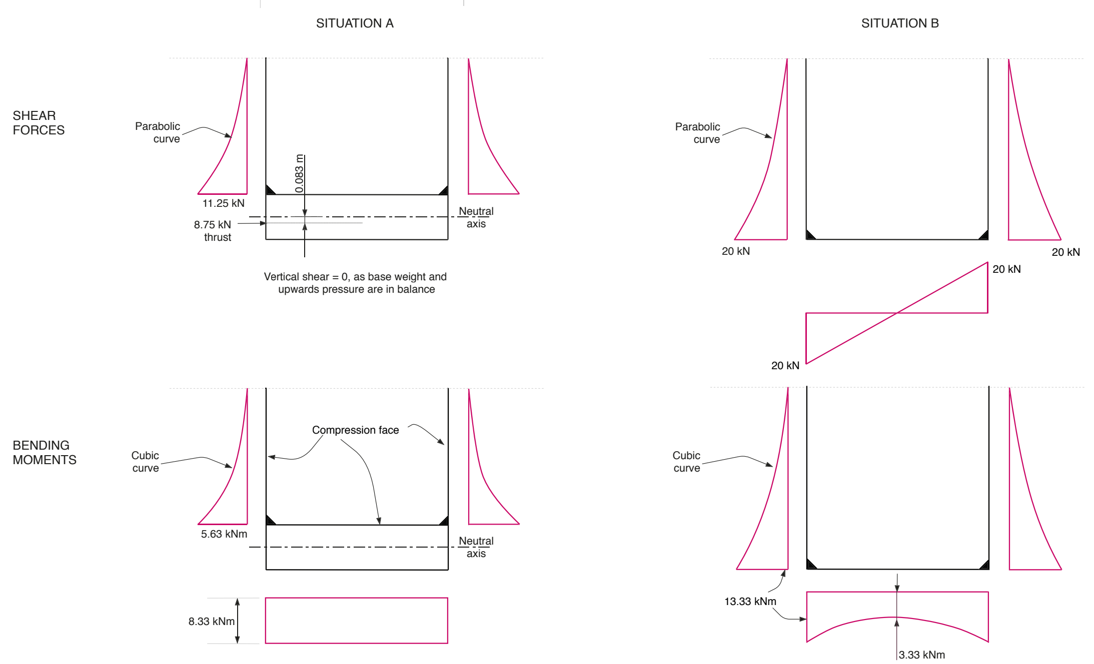

FIGURE 2: Shear force and bending moment diagrams