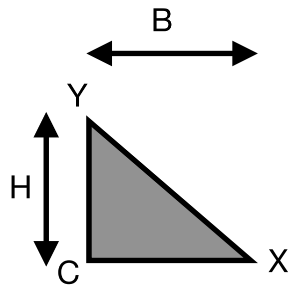
Test Case 5: Triangular (Right-Angled) Cross-Section FAIL!



Cross-Section

Note: The axes are taken along the sides making the right angle.

For the given cross-section:

$$F(x,y) = (x)(y)(By + Hx - HB)$$
$$\Rightarrow F(x,y) = Bxy^2 + Hx^2y - HBxy$$

Therefore,

$$\phi_p = B'F(x,y) = B'(Bxy^2 + Hx^2y - HBxy)$$
$$Note\ that\ B' \neq B!\ B \equiv base,\ B' \equiv constant$$

Solving the Laplacian for above Prandtl stress function:

$$\frac{\partial^2\phi_p}{\partial y^2} + \frac{\partial^2\phi_p}{\partial x^2} = -2G\theta$$

We get,

$$2B'(Bx + Hy) = -2G\theta$$

Hence,

$$B' = \frac{-G\theta}{Bx + Hy}$$

Here also, B' which should have been a constant depends on the coordinates of the cross-section and hence, this case is **also a fail case in theory as well as in the app**.

Remarks: The right angled triangle has a rather simpler formulation than the equilateral triangle due to two of its sides being perpendicular and providing us an easy choice for the reference axes. Even though simpler in formulation, the Prandtl stress function could not be defined for the given cross-section again due to the dependency of the constant B' that is multiplied to $F(x,y)$ and this leads to another discussion similar to that in the rectangular cross-sectional case that was analysed earlier, where there might be a solution possible with a higher-level mathematics involved. However, given the method we're generalising in the app and worked out in this manual, the above case is a definite fail case for the app and the method of solving.