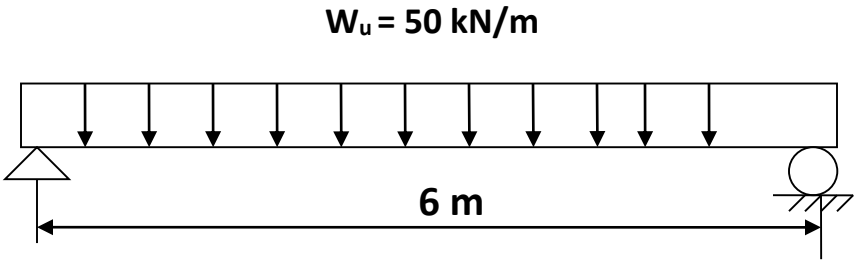
Shear Design Example 2

The beam shown in the Figure below carries a total factored load (including self-weight) of 50 kN/m. The beam is reinforced through its length with φ8 vertical stirrups at spacing of 200 mm. The beam width is 300 mm and effective depth, d is 540 mm. Use f''_c = 25 MPa, and f_y = 420 MPa, f_{ys}= 300 MPa.



Assume the Span 6m is the clear span (between support face)

a. Calculate V_c? **Ans:** $V_c = \frac{\sqrt{f'_c}}{6} b_w d$ ***= 135 kN***

b. Calculate V_s? **Ans:** **Av= 100.53 mm²** , $V_S = \frac{A_v f_y d}{s}$ ***= 81.43 kN***

c. Calculate V_n? **Ans:** **V_n = V_c + V_s = 216.43 kn**

d. Calculate the minimum area of shear reinforcement required according to SBC 304 provisions?

$$A_{v,\min} = \max\{\frac{b_w s}{3 f_y} , \frac{\sqrt{f'_c} b_w s}{16 f_y}\}$$

Av, min = 66.7 mm² **Av= 100.53 mm² > *Av, min* *O.K***

e. Prove that the shear reinforcement provided is sufficient according to SBC 304 provisions?

V_u at face of the support = 50*6/2 = 150 kN

$V_{u@d}$ at d from face of the support = 150 – 60*0.54 = 123 kN

ϕV_n = 162.3 > $V_{u@d}$ Ok , yes the shear reinforcement provided is sufficient