4) Shear Reinforcement

a) For spans AB, BC and CD

Provide minimum shear reinforcement (links) at spans where shear force is minimum or zero. minimum minimum shear reinforcement here depends on area of tensile steel.

The minimum amount of tensile steel at any point in the span is 1H10, hence, $A_s = 78\ mm^2$

$$\frac{100A_s}{bd} = \frac{100 \times 78}{250 \times 456} = 0.068$$

Nominal shear stress, v_c (Table 3.8, BS8110) $= 0.34\ N/mm^2$

Since $f_{cu} = 30\ N/mm^2$ assumed here,

Actual $v_c = 0.34 * \left[\frac{30}{25}\right]^{1/3} = 0.36\ N/mm^2$

Provide minimum links with spacing $S_v \leq 0.75d = 342$

Provide H8 link with spacing = 300mm c/c

$$\frac{A_{sv}}{S_v} = \frac{0.4b}{0.87f_y}$$

b) Support A

critical section for shear can be taken at a distance 'd' from the face of the support i.e. $0.2 + 0.456 = 0.65m$ from the centre of end support A

Design shear force $V = 42 - 0.65v = 42 - 0.65 * 20 = 29\ KN$

Design shear stress, $v = \frac{V}{bd} = \frac{29 \times 10^3}{250 * 456} = 0.25\ N/mm^2$

$$\frac{100A_s}{bd} = \frac{100 * 226/2}{250 \times 456} = 0.1$$