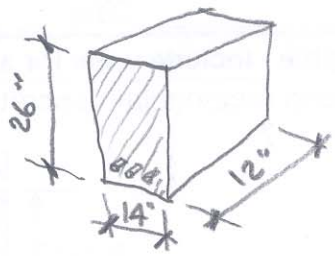
1. Service Dead Load of Beam:

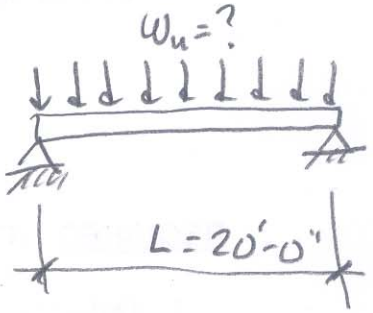


$$\text{VOL.} = \frac{26" \times 14" \times 12"}{1728\ in^3/ft^3} = 2.53\ ft^3$$

$$WT = (\text{UNIT WT})(\text{VOL.}) = \left(150\ \tfrac{lb}{ft^3}\right)(2.53\ ft^3)$$

WT. = 379.5 lb PER 1 LIN. FT.

2. Factored Uniform Load, "w_u":



$$w_u = 1.2D + 1.6L$$
$$= 1.2(\text{BEAM WT}) + 1.6(800\ PLF)$$
$$= 1.2(379.5\ PLF) + 1.6(800\ PLF)$$

w_u = 1735 PLF

3. Maximum Applied Factored Moment, "M_{max}":

$$M_{max} = \frac{w_u L^2}{8} = \frac{\left(1.735\ \tfrac{k}{ft}\right)(20\ ft)^2}{8} = 86.75\ k\text{-}ft$$

4. Usable Moment Capacity, "M_u":

$$M_u = 0.9 A_s f_y d\left[1 - \left[0.59\left(\frac{\rho f_y}{f'_c}\right)\right]\right]$$

$$A_s = 3\ Bars\left(0.79\ in^2/Bar\right) = 2.37\ in^2$$

$$\rho = \frac{A_s}{bd} = \frac{2.37\ in^2}{(14")(24.5")} = 0.0069$$

$$= 0.9\left(3\ bars\left(\tfrac{0.79\ in^2}{Bar}\right)\right)(60\ ksi)(24.5")\left[1 - \left[0.59\left(\frac{(0.0069)(60\ ksi)}{4\ ksi}\right)\right]\right]$$

$$= 0.9\left(2.37\ in^2\right)(60\ ksi)(24.5")[0.9389]$$

$$= 2944\ kip\text{-}in$$

M_u = 245.3 kip-ft

5. Is Beam Acceptable: → Yes, beam is acceptable since $M_u = 245.3\ k\text{-}ft > 86.75\ k\text{-}ft$