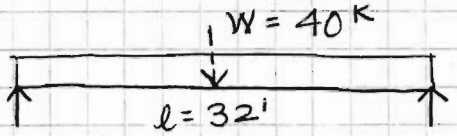
open.michigan

#14-1(3)a

DESIGNING A STEEL SECTION

GIVEN: $f_b = 30$ ksi



FOR A SIMPLY SUPPORTED UNIFORMLY LOADED BEAM,

MAXIMUM MOMENT $M = \frac{W\ell}{8}$

$\therefore M = \frac{40^K \times 32'}{8}$

$\therefore M = 160^{K-1}$

NOW,

$f_b = \frac{Mc}{I} = \frac{M}{S}$

$\therefore S = \frac{M}{f_b} = \frac{160^{K-1} \times 12''}{30^{ksi}}$

$\therefore S = 64\ in^3$

FOR $S_x = 64\ in^3$, in Table D-36,

SECTIONS APPROPRIATE ARE:

- 'W 16 X 40'
- W 18 X 40
- W 14 X 48 → HEAVIER
- W 21 X 44 → ALSO HEAVIER BUT STIFFER $S_x = 81.6\ in^3$

∴ THE MOST ECONOMICAL SECTION IS 'W 16 X 40'.