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DESIGNING A STEEL SECTION

**GIVEN:**  \( f_b = 30 \text{ ksi} \)

\[
m = \frac{Wl}{8}
\]

\[
\therefore M = \frac{40 \text{ kips} \times 32'}{8}
\]

\[
\therefore M = 160 \text{ kips} \cdot \text{ft}
\]

**NOW,**

\[
f_b = \frac{M_c}{A} = \frac{M}{b}
\]

\[
\therefore S = \frac{M}{f_b} = \frac{160 \text{ kips} \cdot \text{ft}}{30 \text{ ksi}}
\]

\[
\therefore S = 64 \text{ in}^3
\]

**FOR** \( S_x = 64 \text{ in}^3 \), **in Table D-36,**

**SECTIONS APPROPRIATE ARE:***

'W 16 x 40'

W 18 x 40

W 14 x 48 \( \rightarrow \) HEAVIER

W 21 x 44 \( \rightarrow \) ALSO HEAVIER BUT STIFFER

\( S_x = 81.6 \text{ in}^3 \)

'\( \therefore \) THE MOST ECONOMICAL SECTION IS \( 'W 16 x 40 \).'