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DESIGNING A STEEL SECTION

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

\[ W = 40 \text{k} \]

\[ l = 32' \]

For a simply supported uniformly loaded beam,

**Maximum Moment** \( M = \frac{Wl}{8} \)

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

\[ M = 160 \text{k}\cdot\text{in} \]

Now,

\[ f_b = \frac{M_c}{W} = \frac{M}{S} \]

\[ s = \frac{M}{f_b} = \frac{160 \text{k}\cdot\text{in}}{30 \text{ ksi}} \]

\[ s = 5.33 \text{ in}^2 \]

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

\[ S_x = 81.6 \text{ in}^3 \]

The most economical section is 'W 16 x 40'.