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ARCH 324 - Structures 2, Winter 2009

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LOAD

\[ \uparrow 30k \]
\[ 16' \]
\[ + \]
\[ 8' \]
\[ \uparrow 80k \]

SHEAR

\[ 30^\circ \]
\[ 15^\circ \]
\[ (240) \]
\[ (240) \]
\[ -30 \]
\[ -80k \]

MOMENT

\[ 2560 \]
\[ 960 \]

TRIAL SLOPE

\[ \frac{2560}{EI} \]

\[ 16' \]

\[ 6120 \]

\[ B \]

\[ \frac{960}{EI} \]

\[ \frac{25600 - 5120}{24} \]

\[ D = 853.3^k \]

CORRECTED SLOPE

\[ \frac{13387}{EI} \]

\[ 1706.7 \]

\[ 13387 \]

\[ \frac{1813.3}{EI} \]

\[ x \]

\[ 13387 \]

Find \( x \) by trial and error so that area \( A = B \)

(cont)
To solve for $x$, guess a trial $x$ and then calculate the areas. Adjust $x$ so that area 'A' below equals area 'B' above the base line. Approximately triangular areas near the center can be $\frac{1}{2}bh$.

**Trial 1 - $x = 12$**

Area A $= \frac{1706.7 \times 1067x}{2} = 17804$

Area B $= \frac{5120 + 6827 + \left(\frac{1}{2} \times 853.4 \times (16-12)\right)}{2} = 13654$

 trial error $= 6.4\%$

**Trial 2 - $x = 13$**

Area A $= 1067 \times 13 = 13871$

Area B $= 11947 + \left[\frac{1}{2} \times 853.4 \times (16-13)\right] = 13227$

 trial error $= 4.4\%$

**Trial 3 - $x = 12.6$**

Area A $= 1067 \times 12.6 = 13444$

Area B $= 11947 + \left[\frac{1}{2} \times 853.4 \times (16-12.6)\right] = 13398$

 trial error $= 0.3\%$

Average area $= 13421$

Deflection $= \frac{\text{Area}(1728)}{EI} = \frac{13421(1728)}{29000(1330)} = 0.6"$