ARCH 324 - Structures 2, Winter 2009

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Given: \( A_s = 2 \text{in}^2 \)  
\( f_y = 60 \text{ KSI} \)  
\( f'_c = 3 \text{ KSI} \)

Find \( M_u \)

**Step 1:** \( A_c = \frac{A_s f_y}{0.85 f'_c} = \frac{2(60)}{0.85(3)} = 47.06 \text{in}^2 \)

**Step 2:** Find where \( A_c \) lies on shape 
\[ 47.06 - 24 = 23.06 \text{in}^2 
\]
\[ 12 \times 23.06 = 1.44 \]

**Step 3:** Since shape is not rectangular do not use \( \frac{a}{2} \) but rather find centroid of area
\[ \bar{y} = \frac{\sum A_d d}{\sum A} \]
I'll choose top as baseline  
\( d \) is distance fr. centroid of shape to baseline
\[ \frac{24(2) + 23.04(3.72)}{24 + 23.04} = 2.84 \text{in fr. top} \]

**Step 4:** \( z = d - \bar{y} = 18 - 2.84 = 15.16 \text{in} \)

**Step 5:** 
\( M_u = \phi A_s f_y z = 0.9(2)(60)(15.16) = \frac{1037.28}{16} = 64.8 \text{ KIN} \)
\[ = 136.4 \text{ KFT} \]