Calculation of yielding penetration zone of 8 wf 40, October 1951

C. H. Yang

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Calculation of Yielding penetration zone

\( P_0 = 41.05 \text{ in}^3 \)

\( t_{sw} = 0.371 \text{ in} \)

\( T_{0-gage} = 37.6 \text{ kip/ft} \)

\( T_{0-web} = 38.7 \text{ kip/ft} \)

\[ M_{ABC} = \frac{(6.5)^2}{2} \times 37.1 = 3.91 \]

\[ M_0 = (41.05 - 3.91) \times 37.6 + \frac{2}{3} \left( \frac{(6.5)^2}{2} \right) \times 0.371 \times 38.7 \]

\[ M_0 = 37.14 \times 37.6 + \frac{2}{3} (3.25)^2 \times 0.371 \times 38.7 \]

\[ M_0 = 1395 + 101 = 1495 \text{ kip-ft} \]

\[ W = 211.6 \text{ (knot load)} \text{ kip} \]

\[ L = \frac{1495}{211.6} = 6.93 \text{ in} \]

\[ M = 1395 + \frac{\alpha}{3} \left( \frac{g^2}{2} \right) \times 0.371 \times 38.7 \Phi \]

\[ + \frac{(3.25 \cdot y)(3.25 + y)}{2} \times 38.7 \]

\[ = 1395 + \frac{\alpha}{3} \left( \frac{g^2}{2} \right) \times 0.371 \times 38.7 \]

\[ + \frac{(3.25 \cdot y - y^2)}{2} \times 37.1 \times 38.7 \]

\[ = 1395 + \frac{1}{8} \left( 0.371 \times 38.7 \right) + \frac{1}{2} \]
\[ = 1395 - \frac{1}{3} \cdot 0.371 \cdot 38.7 \cdot y^2 + (3.25)^2 \cdot [0.371 \cdot 38.7] \]

\[ = 1395 - \frac{1}{3} \cdot 14.35 \cdot y^2 + 3.25 \cdot 14.35 \cdot y \\
= 1395 + 151 - 4.78 y^2 \]

\[ = 1546 - 4.78 y^2 \quad \text{previous calculation = 1540} \]

\[ y = 0 \quad x = \frac{1546}{21.6} = 71.6'' \]

\[ y = 35'' \quad x = 69.3'' \quad 71.6 - 69.3 = 2.3'' \]

The Curve

\[ 21.6 \cdot x = 1546 - 4.78 \cdot y^2 \quad \text{between} \quad x = 71.6'' \]

\[ \& \quad x = 69.3'' \]

Calculation of yields & zones \# 4W-31 to be continued.
1. Simple tension test with white
   work to see the yield point
   development as a companion
   of measured strain

2. More strain gages on cantilever
   to study spirit of mechanism
   in bend