May 11th Fri 12:30

Urban Plan Software
Traffic Sign & Median

Deep Foundations

Alum. Sheet Pile
Building Design

Senior Design 2 + 2 1 + 3 3 + 1

Advising L16 - H12
\[ R_n = \frac{\phi \cdot b \cdot d^2}{W_n} \]

\[ \phi = 0.90 \]

\[ \phi \cdot W_n \geq M_n \]

\[ M_n = A_{fy} (d - a/2) \]

Analysis of Reinforced Concrete Beams

Senior Design Final Presentation
April 23rd 6:00 PM
Tension controlled beam

Ductile failure

\[ E_s > E_y \text{ when } E_c = 0.003 \]

in compression crushing

Eventually yield yields before concrete

\[ f_y > 400 \text{ psi} \]

When concrete cracks

Instananeous

Steel yield + Traditional

\[ \frac{P}{A_s} = \frac{60}{4} \]

\[ f_y \cdot A_y \cdot P = 0.4 \cdot L \]
\[
\frac{8}{x} = \left[ \frac{9000 + 8\sqrt{y}}{8000} \right] = \frac{\text{psi}}{\text{in}^2}
\]

\[
E_y = \frac{\text{psi}}{\text{in}^2}
\]

\[
\frac{0.003}{P} = \frac{x_{0.03}}{P} = 0.003
\]

That the steel (uniaxial) yields (\(E_s = 0.0020\)) crush (\(E_c = 0.003\)) at the same time.

% steel that will cause the concrete to fail.

Balanced Condition.
\[ T \leq \dfrac{2 \gamma_{0.85}}{\gamma_{0.85}} + T \]

\[ P_{99} = 0.85 \frac{87,000 + T}{87,000} \]

\[ x = \gamma / \gamma_{0.85} \]

\[ \dfrac{\gamma_{0.85}}{\gamma_{90}} = 12.9 \]

\[ \dfrac{p}{p} = 0.85 \frac{\gamma_{0.85}}{\gamma_{90}} = 0.99 \]

\[ \gamma_{90} = 1.5p \]

\[ b = \gamma_{90} \]

\[ c = f \]
\[ x = 0.0214 \quad \therefore 75b = 6.696 \]

Let \( 6g = 0.0214 \)

\[ 5.9 \text{ bars} (3.0) \]

\[ A_{5b} = 6.28 \text{ in}^2 \]

\[ 0.85(3) = A_{5b} (0.85)(12.426) = A_{5b} (60) \]

\[ A_{5b} = 6.28 \text{ in}^2 \]

\[ a = 8.4 \]

\[ c = 1 \]

\[ \frac{x_9 = 12.926 \text{ in}}{} \]

\[ \frac{0.03 + 0.0207}{0.21} = \frac{x}{x} \]

\[ f_y = 60 \text{ ksi} \]

\[ f_c = 3 \text{ ksi} \]

Calculate \( A_{5b} \)
\[ j = 1 \pm 0.05 \]

<table>
<thead>
<tr>
<th>y_j</th>
<th>y_j \pm \delta y_j</th>
<th>y_j \pm 2 \delta y_j</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.33</td>
<td>0.21 \pm 0.16</td>
<td>0.16 \pm 0.16</td>
</tr>
<tr>
<td>0.43</td>
<td>0.21 \pm 0.16</td>
<td>0.16 \pm 0.16</td>
</tr>
</tbody>
</table>

\[ B_1 = 0.65 \]

\[ B_1' = 0.85 \]
\[ f_y = 85 \text{ ksi} \]

\[ f_c = 3 \text{ ksi} \]

\[ d_y = 8 \text{ ft} \]

\[ f_y = \frac{(8)^{(3/8)}}{8^{(1/3)}} \]

\[ g = \frac{0.001}{(8^{(1/3)})} \]

\[ v = 200 \text{ ksi} \]

\[ a = 0.002 \]

\[ A_{sb} = 6.28 \]

\[ A_{pl} = 0.0214 \]

\[ x = 5.93 \]

\[ C = 7 - 4 = 5.07 \]

Check the Beam.
\[ p \rightarrow 2010 = \frac{1}{3} \times 2 \]

\[ \text{Fac+} = 0.009 \]

\[ 0.18 + \frac{1}{3} = 0.009 \]

\[ 0 \rightarrow 0.009 \]
- Product 
  Spacing Requirements
- Design a beam
  Next Class