Summary:

<table>
<thead>
<tr>
<th></th>
<th>Long Direction</th>
<th>Short Direction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cross Sectional Area $A$(in.$^2$)</td>
<td>1.530</td>
<td>2.646</td>
</tr>
<tr>
<td>Centroid of Tensions (in. From Top)</td>
<td>-2.00</td>
<td>-2.00</td>
</tr>
<tr>
<td>Top Depth to Section Centroid, $y_t$ (in.)</td>
<td>-3.79</td>
<td>-3.75</td>
</tr>
<tr>
<td>Prestress Eccentricity, $\theta$ (in.)</td>
<td>1.79</td>
<td>1.73</td>
</tr>
<tr>
<td>Allowable concrete tensile stress: $f_t = 6.\sqrt{f_c'} = 6.\sqrt{3000} = 329$ psi</td>
<td>0.329</td>
<td>0.329</td>
</tr>
<tr>
<td>Allowable concrete compressive stress: $f_c = 0.45f'_c = 0.45 (3000) = 1,350$ psi</td>
<td>1.35</td>
<td>1.35</td>
</tr>
</tbody>
</table>

A.3.2.2 CENTER LIFT DESIGN ($e_m = 9.0$ ft, $y_m = 0.07$ in.)

A) Design Moments

1. Long Direction

$M_L = A_o \left[ B \left( e_m \right)^{1.238} + C \right]$

Where

$A_o = \frac{\left( L \right)^{0.013} \left( S \right)^{0.306} \left( h \right)^{0.688} \left( P \right)^{0.534} \left( y_m \right)^{0.193}}{727}$

and for: $0 \leq e_m \leq 5 \quad B = 1, C = 0$

$5 < e_m \quad B = \frac{\left( y_m - 1 \right)}{3} \leq 1.0$

$C = \frac{8 - \left( P - 613 \right)}{255} \left( 4 - y_m \right) \geq 0$

$A_o = \frac{\left( 42 \right)^{0.013} \left( 12 \right)^{0.306} \left( 14.5 \right)^{0.688} \left( 695 \right)^{0.534} \left( 0.07 \right)^{0.193}}{727}$

$A_o = 0.383$

$B = \frac{y_m - 1}{3} = \frac{0.07 - 1}{3} = -0.31 < 1.0$

$C = \frac{8 - \left( 695 - 613 \right)}{255} \left( 4 - 0.07 \right) \geq 0$

$C = 10.06 > 0$

$M_L = 0.383 \left[ -0.31(9.0)^{1.238} + 10.06 \right]$

$M_L = 2.05$ ft-kips / ft

at $e_m = 5$ ft, $M_L = 2.81$ ft-kips/ft (see Section 4.3.2)

Use $M_L = 2.81$ ft-kips/ft

2. Short Direction

For $LL / LS > 1.1$:

$M_s = \frac{(58 + e_m)M_L}{60}$

$M_s = \frac{(58 + 9.0)(2.05)}{60}$

$M_s = 2.29$ ft-kips/ft

at $e_m = 5$ ft, $M_s = 2.95$ ft-kips/ft (see Section 4.3.2)

Use $M_s = 2.95$ ft-kips/ft

B) Compare actual and allowable service load stresses

1. Long Direction

a. Tension in top fiber (Tension negative, compression positive):

$f = \frac{P}{A} - \frac{M_L}{S_t} + \frac{P e_p}{S_t}$

$f = \frac{102.7}{1,530} - \frac{(2.81)(24)(12)}{5,274} + \frac{(102.7)(1.79)}{5,274}$

$f = -0.051$ ksi $<-0.329$ ksi OK

b. Compression in bottom fiber:

$f = \frac{P}{A} + \frac{M_L}{S_b} - \frac{P e_p}{S_b}$

$f = \frac{102.7}{1,530} + \frac{(2.81)(24)(12)}{1,866} - \frac{(102.7)(1.79)}{1,866}$

$f = 0.402$ ksi $< 1.35$ ksi OK

2. Short Direction

a. Tension in Top Fiber:

$f = \frac{P}{A} - \frac{M_s}{S_t} + \frac{P e_p}{S_t}$

$f = \frac{209.1}{2,646} - \frac{(2.95)(42)(12)}{9,017} + \frac{(209.1)(1.73)}{9,017}$

$f = -0.046$ ksi $<-0.329$ ksi OK

b. Compression in Bottom Fiber

$f = \frac{209.1}{2,646} + \frac{(2.95)(42)(12)}{3,123} - \frac{(209.1)(1.73)}{3,123}$

$f = 0.439$ ksi $< 1.35$ ksi OK
C) Minimum Foundation Stiffness (6.10 - CΔ = 360 from Table 6.2)

1. Long Direction

\[ \beta = \frac{1}{12} \sqrt{\frac{E_c I_c}{E_{s, i}}} = \frac{1}{12} \sqrt{\frac{(1,500,000)(19,987)}{1,000}} = 6.17 \text{ ft} \]

\[ 6\beta = 37.02 \text{ ft} < 42 \therefore z_L = 37.02 \text{ ft} \]

\[ E_c I_c \geq 18,000 M_s L_s C_A z_L \]

\[ I_c \geq \frac{18,000(2.81)(24)(360)(37.02)}{1,500,000} = 10,785 \text{ in}^4 \]

19,987 >> 10,785 \[ \text{OK} \]

Stiffness is OK in long direction

2. Short Direction

\[ \beta = \frac{1}{12} \sqrt{\frac{(1,500,000)(33,635)}{1,000}} = 7.02 \text{ ft} \]

\[ 6\beta = 42.12 \text{ ft} > 24 \therefore z_S = 24 \text{ ft} \]

\[ E_c I_S \geq 18,000 M_s L_s C_A z_S \]

\[ I_S \geq \frac{18,000(2.95)(42)(360)(24)}{1,500,000} = 12,846 \]

33,635 >> 12,846 \[ \text{OK} \]

Stiffness is OK in short direction

D) Shear Calculations

1. Long Direction

a. Expected Service Shear:

\[ V_L = \frac{(L)^{0.09}(S)^{0.71}(h)^{0.43}(P)^{0.44}(y_m)^{0.16}(e_m)^{0.93}}{1,940} \]

\[ V_L = \frac{(42)^{0.09}(12)^{0.71}(14.5)^{0.43}(695)^{0.44}(0.07)^{0.16}(9.0)^{0.93}}{1,940} \]

\[ V_L = 1.194 \text{ kips/ft} \]

b. Permissible Shear Stress

\[ f_p = \frac{P_c}{A} = \frac{102.7}{1,530} = 0.067 \text{ ksi} \]

\[ V_c = 1.7 \sqrt{f_c} + 0.2 f_p = 93 + 13 = 106 \text{ psi} \]

c. Applied Service Load Shear Stress

\[ v = \frac{VW}{nbh} \]

\[ V = \frac{(1.194)(24)(1,000)}{(3)(12)(14.5)} = 55 \text{ psi} < 106 \text{ psi} \]

Shear Stress OK in the long direction

2. Short Direction

a. \[ V_s = \frac{(L)^{0.19}(S)^{0.45}(h)^{0.20}(P)^{0.54}(y_m)^{0.04}(e_m)^{0.97}}{1,350} \]

\[ V_s = \frac{(24)^{0.19}(11.9)^{0.45}(14.5)^{0.20}(695)^{0.54}(0.07)^{0.04}(9.0)^{0.97}}{1,350} \]

\[ V_s = 1.829 \text{ kips/ft} \]

b. Permissible Shear Stress:

\[ f_p = \frac{P_c}{A} = \frac{209.1}{2,646} = 0.079 \text{ ksi} \]

\[ V_c = 1.7 \sqrt{3000} + 0.2(0.079)(1000) \]

\[ V_c = 93 + 16 = 109 \text{ ksi} \]

c. Applied Service Load Stress

\[ v = \frac{VW}{nbh} \]

\[ V = \frac{1.829(42)(1,000)}{(5)(12)(14.5)} = 88 \text{ psi} < 109 \text{ psi} \]

Shear Stress is OK in the Short Direction

A.3.2.3 EDGE LIFT DESIGN (e_m = 5.2 ft, y_m = 0.46 in.)

A) Design Moments

1. Long Direction

\[ M_L = \frac{(S)^{0.1}(h e_m)^{0.78}(y_m)^{0.66}}{7.2(L)^{0.0065}(P)^{0.04}} \]

\[ M_L = \frac{(12)^{0.1}(14.5)(5.2)^{0.78}(0.46)^{0.66}}{7.2 (42)^{0.0065}(659)^{0.04}} \]

\[ M_L = 2.33 \text{ kips/ft} \]

2. Short Direction

For \( L_s / L_s > 1.1 \)

\[ M_s = h^{0.35} \left[ \frac{(19 + e_m)}{57.75} \right] M_L \]

\[ M_s = (14.5)^{0.35} \left[ \frac{(19 + 5.2)}{57.75} \right] 2.33 \]

\[ M_s = 2.49 \text{ kips/ft} \]
B) Compare actual and allowable service load stresses

1. Long Direction

a. Tension in Bottom Fiber:
\[ f = \frac{P_r}{A} - \frac{M_t}{S_b} - \frac{P_{e_r}}{S_o} \]
\[ f = \frac{102.7}{1,530} - \frac{2.33(24)(12)}{1,866} - \frac{(102.7)(1.79)}{1,866} \]
\[ f = -0.391 \text{ ksi} > -0.329 \text{ ksi} \]
N.G.

Add one tendon to each rib at 3 in. from bottom
\[ P_r = 8(26.6) - 0.75(80,719) = 182.5 \text{ kips} \]

Force/tendon = \( 182.5 / 8 = 22.81 \text{ kips} \)
\[ f = \frac{182.5}{1,530} - \frac{2.33(24)(12)}{1,866} - \frac{(114.05)(1.79)}{1,866} + \frac{(68.43)(7.71)}{1,866} \]
\[ f = -0.067 \text{ ksi} < -0.329 \text{ ksi} \]
OK

b. Compression in Top Fiber
\[ f = \frac{P_r}{A} - \frac{M_t}{S_t} - \frac{P_{e_r}}{S_t} \]
\[ f = \frac{182.5}{1,530} - \frac{2.33(24)(12)}{1,866} - \frac{(114.05)(1.79)}{1,866} + \frac{(68.43)(7.71)}{1,866} \]
\[ f = 0.185 \text{ ksi} < 1.35 \text{ ksi} \]
OK

2. Short Direction

a. Tension in Bottom Fiber
\[ f = \frac{P_r}{A} - \frac{M_t}{S_b} - \frac{P_{e_r}}{S_o} \]
\[ f = \frac{209.1}{2,646} - \frac{2.49(42)(12)}{3,123} - \frac{(209.1)(1.73)}{3,123} \]
\[ f = -0.439 \text{ ksi} > -0.329 \text{ ksi} \]
N.G.

Add one tendon to each rib, 3 in. from bottom (5 total added tendons in ribs)
\[ P_r = 14(26.6) - 0.75(80,719) = 342.1 \text{ kips} \]

Force per tendon = \( 342.1 / 14 = 24.4 \text{ kips} \)
\[ f = \frac{342.1}{2,646} - \frac{2.49(42)(12)}{3,123} - \frac{(219.6)(1.73)}{3,123} + \frac{(122.0)(7.77)}{3,123} \]
\[ f = -0.091 < -0.329 \text{ ksi} \]
OK

b. Compression in top fiber
\[ f = \frac{342.1}{2,646} + \frac{(2.49)(42)(12)}{9,017} + \frac{(219.6)(1.73)}{9,017} + \frac{(122.0)(7.77)}{9,017} \]
\[ f = +0.205 \text{ ksi} < 1.35 \text{ ksi} \]
OK

C) Minimum Foundation Stiffness (6.10 - \( C_\Delta = 720 \)
from Table 6.2)

1. Long Direction
\[ E_c I_L \geq 18,000 M_c L_s C_\Delta z_L \]
Eqn. (6-22)
\[ I_L \geq \frac{(18,000)(2.33)(24)(720)(37.02)}{1,500,000} = 17,886 \text{ in}^4 \]
19,987 > 17,886
OK

Stiffness is OK in long direction

2. Short Direction
\[ E_c I_S \geq 18,000 M_s L_c C_\Delta z_S \]
Eqn. (6-22)
\[ I_S \geq \frac{(18,000)(2.49)(42)(720)(24)}{1,500,000} = 21,686 \text{ in}^4 \]
33,635 > 21,686
OK

Stiffness is OK in short direction

D) Shear Calculations

1. Long Direction
a. Expected Service Shear:
\[ V_L = \frac{L^{0.07}(h)^{0.4}(P)^{0.03} E_m^{0.16} V_m^{0.67}}{3(S)^{0.015}} \]
\[ V_L = \frac{(42)^{0.07}(14.5)^{0.4}(695)^{0.03}(5.2)^{0.16}(0.46)^{0.67}}{3(12)^{0.015}} = 1.14 \text{ kips/ft} \]
b. Permissible Shear Stress
\[ V_c = 1.7 \sqrt{f_c} + 0.2 f_c = 93 + 24 = 117 \text{ psi} \]
c. Design (Actual) Shear Stress:
\[ V = \frac{V_L W}{n b h} = \frac{(1.14)(24)(1,000)}{(3)(12)(14.5)} = 52 \text{ psi} < 117 \text{ psi} \]
OK
2. Short Direction

a. Expected service shear:
\[
\nu_s = \frac{(24)^{0.07} \cdot (14.5)^{0.4} \cdot (695)^{0.03} \cdot (5.2)^{0.16} \cdot (0.46)^{0.67}}{3(11.9)^{0.015}}
\]
\[= 1.10 \text{ kips/ft}
\]

b. Permissible shear stress
\[
\nu_c = 1.7\sqrt{F_{ct}^{1.0}} + 0.2 f_p
\]
\[
= 1.7\sqrt{3000} + 0.2 \times 0.129 \times 1,000
\]
\[= 93 + 26 = 119 \text{ psi}
\]

c. Design (actual) shear stress:
\[
\nu = \frac{\nu_s W}{nbh} = \frac{(1.1)(42)(1,000)}{(5)(12)(14.5)}
\]
\[= 53\text{ psi} < 119\text{ psi} \quad \text{OK}
\]

Shear is OK in both directions.

A. Center Lift

1. Long Direction

Total long direction moment:
\[
M_L = 2.81 \times 24 = 67.4 \text{ ft-kips}
\]

To be developed with cracked section:
\[
0.9M_L = 0.9 \times 67.4 = 60.7 \text{ ft-kips}
\]

Slab tendon force = 5 x 26.6 = 133.0 kips

Capacity with tendons alone:

Depth of compression block
\[
a = \frac{79.8}{0.85(3.0)(24)(12)} = 0.11 \text{ in.}
\]

Cracked section capacity
\[
M_{cr} = \frac{133}{12} \left(14.5 - 3 - \frac{0.11}{2}\right)
\]
\[M_{cr} = 76.1 \text{ ft-kips} > 50.3 \text{ ft-kips}
\]

B. Edge Lift

1. Long Direction

Total long direction moment:
\[
M_L = 2.33 \times 24 = 55.9 \text{ ft-kips}
\]

To be developed with cracked section:
\[
0.9M_L = 0.9 \times 55.9 = 50.3 \text{ ft-kips}
\]

Rib tendon force = 3 x 26.6 = 79.8 kips

Capacity with tendons alone:

Depth of compression block
\[
a = \frac{133}{0.85(3.0)(12)(3)} = 1.45 \text{ in.}
\]

Cracked section capacity
\[
M_{cr} = \frac{133}{12} \left(14.5 - 3 - \frac{1.45}{2}\right)
\]
\[M_{cr} = 130.5 \text{ ft-kips} >> 60.7 \text{ ft-kips}
\]
2. Short Direction

Total short direction moment

\[ M_S = 2.49 \times 42 = 104.6 \text{ ft-kips} \]

To be developed with cracked section

\[ 0.9M_S = 0.9 \times 104.6 = 94.1 \text{ ft-kips} \]

Rib tendon force = 5 \times 26.6 = 133.0 kips

Capacity with tendons alone

Depth of compression block

\[ a = \frac{133.0}{0.85(3.0)(42)(12)} = 0.10 \text{ in.} \]

\[ M_o = \frac{133.0}{12} \left( 14.5 - 3 \cdot \frac{0.10}{2} \right) \]

\[ M_o = 126.9 \text{ ft-kips} > 94.1 \text{ ft-kips} \]

A325 UNIFORM THICKNESS FOUNDATION CONVERSION

A. Long Direction

\[ H = \sqrt{\frac{I}{W}} = \sqrt{\frac{19,987}{24}} = 9.4 \text{ in.} \]

B. Short Direction

\[ H = \sqrt{\frac{I}{W}} = \sqrt{\frac{33,635}{42}} = 9.3 \text{ in.} \]

Use 9.5-in. uniform thickness foundation.

C. Prestress Force and Eccentricity

1. Long Direction

\[ P_L = \frac{182.5}{1,530} \times 24 \times 12 \times 9.5 = 326.4 \text{ kips} \]

\[ SG = \frac{(24)(42)(9.5)(150)(0.75)}{2,000} = 44.9 \text{ kips} \]

\[ P_e = 326.4 + 44.9 = 371.3 \text{ kips} \]

\[ N_r = \frac{371.3}{26.6} = 13.96 \quad \text{Use 14} \]

Original

\[ e_p = \frac{[(114.05)(1.79)] + ([68.43)(-7.71)]}{182.5} \]

\[ e_p = 1.77 \text{ in.} \]

Eccentricity in UTF:

\[ e_p = \frac{(8/14)}{x} = 1.77 = 1.01 \text{ in.} \]

Locate CGS of tendons in uniform thickness foundation 5.75 in. below top of foundation.

2. Short Direction

\[ P_r = \frac{342.1}{2,646} x 42 \times 12 \times 9.5 = 619.0 \text{ kips} \]

SG = 44.9 kips

\[ P_e = 619.0 + 44.9 = 663.9 \text{ kips} \]

\[ N_r = \frac{663.9}{26.6} = 24.96 \quad \text{Use 25} \]

Original

\[ e_p = \frac{[(219.6)(1.73)] + ([122.0)(-7.77)]}{342.1} \]

\[ e_p = 1.66 \text{ in.} \]

Eccentricity in UTF:

\[ e_p = \frac{(14/25)}{x} = 1.66 = 0.93 \text{ in.} \]

Locate CGS of tendons in uniform thickness foundation 5.75 in. below top of foundation.

D. Check UTF Flexural Capacity:

\[ A_{(Long)} = (24)(12)(9.5) = 2,736 \text{ in}^2 \]

\[ A_{(Short)} = (42)(12)(9.5) = 4,788 \text{ in}^2 \]

\[ S_{tor,s}(long) = \frac{(24)(12)(9.5)^2}{6} = 4,332 \text{ in}^3 \]

\[ S_{tor,s}(short) = \frac{(42)(12)(9.5)^2}{6} = 7,581 \text{ in}^3 \]

Note: in a uniform thickness foundation, \( S_t = S_b \)

1. Center Lift

a. Long Direction

\[ P_r = 14(26.6) - 44.9 = 327.5 \text{ kips} \]

Tension in Top Fiber

\[ f = \frac{P_o}{A} - \frac{M_0}{S_t} + \frac{P_e \cdot e_p}{S_t} \]

\[ f = \frac{327.5}{2,736} - \frac{(2.81)(24)(12)}{4,332} + \frac{(327.5)(-1)}{4,332} \]

\[ f = -0.143 \text{ ksi} < -0.329 \text{ ksi} \quad \text{OK} \]
Compression in Bottom Fiber
\[ f = \frac{P_r}{A} + \frac{M_s}{S_s} - \frac{P_r e_p}{S_p} \]
\[ f = \frac{327.5}{2,736} + \frac{(2.81)(24)(12)}{4,332} - \frac{(327.5)(-1)}{4,332} \]
\[ f = 0.382 \text{ ksi} < 1.35 \text{ ksi} \quad \text{OK} \]

b. Short Direction
\[ P_r = 25(26.6) - 44.9 = 620.1 \text{ kips} \]

Tension in Top Fiber
\[ f = \frac{P_r}{A} - \frac{M_s}{S_t} + \frac{P_r e_p}{S_t} \]
\[ f = \frac{620.1}{4,788} + \frac{(2.95)(42)(12)}{7,581} + \frac{(620.1)(-1)}{7,581} \]
\[ f = -0.148 \text{ ksi} < -0.329 \text{ ksi} \quad \text{OK} \]

Compression in Bottom Fiber
\[ f = \frac{P_r}{A} + \frac{M_s}{S_s} - \frac{P_r e_p}{S_p} \]
\[ f = \frac{620.1}{4,788} + \frac{(2.95)(42)(12)}{7,581} - \frac{(620.1)(-1)}{7,581} \]
\[ f = 0.407 \text{ ksi} < 1.35 \text{ ksi} \quad \text{OK} \]

2. Edge Lift

a. Long Direction

Tension in Bottom Fiber
\[ f = \frac{P_r}{A} - \frac{M_s}{S_s} + \frac{P_r e_p}{S_p} \]
\[ f = \frac{327.5}{2,736} - \frac{(2.33)(24)(12)}{4,332} - \frac{(327.5)(-1)}{4,332} \]
\[ f = 0.040 \text{ ksi (compression)} < -0.329 \text{ ksi} \quad \text{OK} \]

Compression in Top Fiber
\[ f = \frac{P_r}{A} + \frac{M_s}{S_t} + \frac{P_r e_p}{S_t} \]
\[ f = \frac{327.5}{2,736} + \frac{(2.33)(24)(12)}{4,332} + \frac{(327.5)(-1)}{4,332} \]
\[ f = 0.199 \text{ ksi} < 1.35 \text{ ksi} \quad \text{OK} \]

b. Short Direction

Tension in Bottom Fiber

\[ f = \frac{P_r}{A} + \frac{M_s}{S_s} - \frac{P_r e_p}{S_p} \]
\[ f = \frac{620.1}{4,788} - \frac{(2.49)(42)(12)}{7,581} - \frac{(620.1)(-1)}{7,581} \]
\[ f = 0.046 \text{ ksi (compression)} < -0.329 \text{ ksi} \quad \text{OK} \]

Compression in Top Fiber
\[ f = \frac{P_r}{A} + \frac{M_s}{S_t} + \frac{P_r e_p}{S_t} \]
\[ f = \frac{620.1}{4,788} + \frac{(2.49)(42)(12)}{7,581} + \frac{(620.1)(-1)}{7,581} \]
\[ f = 0.213 \text{ ksi} < 1.35 \text{ ksi} \quad \text{OK} \]

E. Check UTF Shear Capacity

1. Center Lift

a. Long Direction

Allowable Shear Stress:
\[ \nu = 1.7\sqrt{\frac{f}{f_c}} + 0.2f_p \]
\[ \nu = 1.7\sqrt{\frac{3,000}{(9.5)(12)}} + 0.2 \left( \frac{327.5(1,000)}{2,736} \right) \]
\[ \nu = 117 \text{ psi} \]

Applied Shear Stress
\[ \nu = \frac{(1.194)(1,000)}{(9.5)(12)} = 10 \text{ psi} < 117 \text{ psi} \quad \text{OK} \]

b. Short Direction

Allowable Shear Stress:
\[ \nu = 1.7\sqrt{\frac{3,000}{(9.5)(12)}} + 0.2 \left( \frac{620.1(1,000)}{4,788} \right) \]
\[ \nu = 119 \text{ psi} \]

Applied Shear Stress
\[ \nu = \frac{(1.829)(1,000)}{(9.5)(12)} = 16 \text{ psi} < 119 \text{ psi} \quad \text{OK} \]

2. Edge Lift

a. Long Direction

Applied Shear Stress
\[ \nu = \frac{(1.14)(1,000)}{(9.5)(12)} = 10 \text{ psi} < 117 \text{ psi} \quad \text{OK} \]
b. Short Direction

Applied Shear Stress

\[ \nu = \frac{(1.10)(1,000)}{(9.5)(12)} = 10 \text{ psi} < 119 \text{ psi} \quad \text{OK} \]

F. Equivalent Cracked Sections

1. Center Lift

a. Long Direction

To be developed with cracked section:

0.9 \( M_L = 60.7 \text{ ft-kips} \)

Slab tendon force = 14 x 26.6 = 372.4 kips

Capacity with tendons alone:

Depth of compression block:

\[ a = \frac{372.4}{(0.85)(3.0)(24)(12)} = 0.51 \text{ in.} \]

Cracked section capacity:

\[ M_{cr} = \frac{372.4}{12} \left(9.5 - 3.75 - \frac{0.51}{2}\right) \]

\[ M_{cr} = 108.5 \text{ ft-kips} > 60.7 \text{ ft-kips} \]

b. Short Direction

To be developed with cracked section:

0.9 \( M_S = 94.1 \text{ ft-kips} \)

Slab tendon force = 25 x 26.6 = 665.0 kips

Capacity with tendons alone:

Depth of compression block:

\[ a = \frac{665}{(0.85)(3.0)(42)(12)} = 0.52 \text{ in.} \]

Cracked section capacity:

\[ M_{cr} = \frac{665}{12} \left(9.5 - 3.75 - \frac{0.52}{2}\right) \]

\[ M_{cr} = 193.4 \text{ ft-kips} > 111.5 \text{ ft-kips} \]

2. Edge Lift

a. Long Direction

To be developed with cracked section:

0.9 \( M_L = 50.3 \text{ ft-kips} \)

Slab tendon force = 14 x 26.6 = 372.4 kips

Capacity with tendons alone:

Depth of compression block:

\[ a = \frac{372.4}{(0.85)(3.0)(24)(12)} = 0.51 \text{ in.} \]

Cracked section capacity:

\[ M_{cr} = \frac{372.4}{12} \left(9.5 - 3.75 - \frac{0.51}{2}\right) \]

\[ M_{cr} = 170.5 \text{ ft-kips} > 50.3 \text{ ft-kips} \]

b. Short Direction

To be developed with cracked section:

0.9 \( M_S = 94.1 \text{ ft-kips} \)

Slab tendon force = 25 x 26.6 = 665.0 kips

Capacity with tendons alone:

Depth of compression block:

\[ a = \frac{665}{(0.85)(3.0)(42)(12)} = 0.52 \text{ in.} \]

Cracked section capacity:

\[ M_{cr} = \frac{665}{12} \left(9.5 - 3.75 - \frac{0.52}{2}\right) \]

\[ M_{cr} = 304.2 \text{ ft-kips} > 94.1 \text{ ft-kips} \]

A.3.2.6 DESIGN SUMMARY

A. Long Direction

Use 14.5 in. deep ribs, 12 in. wide, spaced 12 ft -0 in. on center, (5) ½-in \( \phi \) 270 ksi low-relaxation tendons in the slab with centroids 2 in. below the top of slab and at 5 ft -0 in. on center, beginning 2 ft-0 in. from each edge and one tendon in the bottom of each rib with centroid 3 in. above the rib soffit (total of 3 ribs, 5 slab tendons and 3 rib tendons)

B. Short Direction

Use 14.5 in. deep ribs, 12 in. wide, spaced at an average of 10.5 ft on center (14 ft maximum, 8 ft minimum), (9) ½-in \( \phi \) 270 ksi low relaxation tendons in the slab with centroids 2 in. below the top of slab and at 4 ft-9 in. on center, beginning 2 ft-0 in. from each edge and one tendon in the bottom of each interior and exterior rib with centroid 3 in. above the rib soffit (total of 5 ribs, 9 slab tendons and 5 rib tendons).