STRUCTURAL CALCULATION FOR THE POST-TENSIONED SLAB-ON-GROUND

OF

SUNSHINE PROJECT
California

March 2006

Reference: *SOG USER MANUAL*, ADAPT Corp.

E-Mail support@adaptsoft.com **www.adaptsoft.com**
1733 Woodside Road, Suite 220, Redwood City, California, 94061, USA, Tel: (650) 306-2400 Fax: (650) 306 2401

ADAPT

SUMMARY

This is the structural calculation of the post-tensioned ground supported foundation Slab of Sunshine Building. The soil below the foundation is expansive clay with properties determined by the soil engineer. The design follows the PTI (IBC, UBC) recommendations, with enhancements where necessary (E-PTI).

1 – GEOMETRY

The geometry of the Slab is as follows: (**Fig, 1-1**).

Slab thickness:	5 inch
Perimeter Beam:	12x18 inch
Interior Beams:	12x12 inch

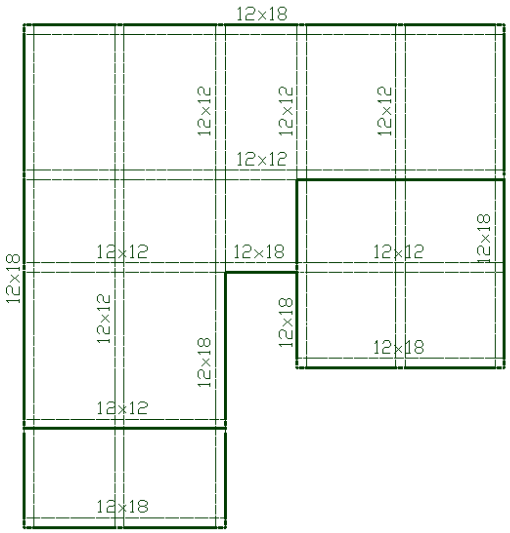
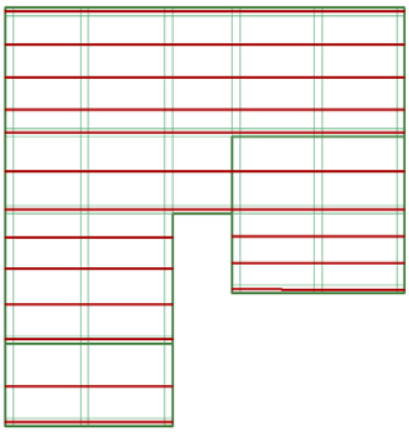


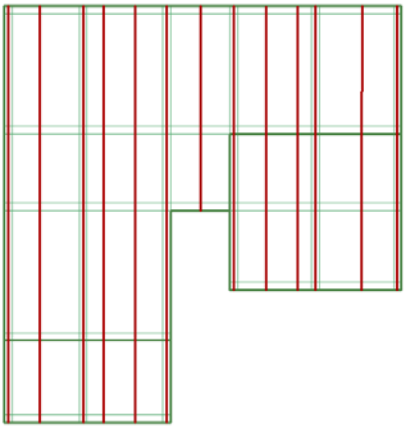
FIGURE 1-1 POSITION AND DIMENSIONS OF THE STIFFENING BEAMS

2 – POST-TENSIONING

Strand Diameter	= ½ inch
Strand Area	= 0.153 in^2
Modulus of Elasticity	= 29000 ksi
f_{pu}	= 270 ksi
f_{se}	= 175 ksi
Effective Force	= 26.7 kips



TENDONS IN THE X-DIRECTION
13 IN TOTAL ON LEFT
10 IN TOTAL ON RIGHT



TENDONS IN THE Y-DIRECTION
13 IN TOTAL

FIGURE 2-1 ALL TENDONS ARE STRAIGHT AND PLACED AT MID-DEPTH OF SLAB

3 - MATERIALS

3.1- Concrete

- Weight = 150 pcf
- Strength at 28 days = 2500 psi
- Modulus of elasticity = 1500 ksi
- Poisson's ratio = 0.20

3.2- Soil

- Bulk modulus = 100 pci

4 - LOADING

4.1 - Dead Load

- Selfweight = 150 pcf
- Perimeter line load = 1100 plf

4.2 - Live Load

- Uniform superimposed = 40 psf

5 - DESIGN

5.1 Design Requirements

- Soil parameters
  - Center lift
    - y_m = 1.50 inch
    - e_m = 5.30 ft
  - Edge lift
    - y_m = 0.50 inch
    - e_m = 2.60 ft

5.2 Center Lift Design

5.2.1 Deflection check

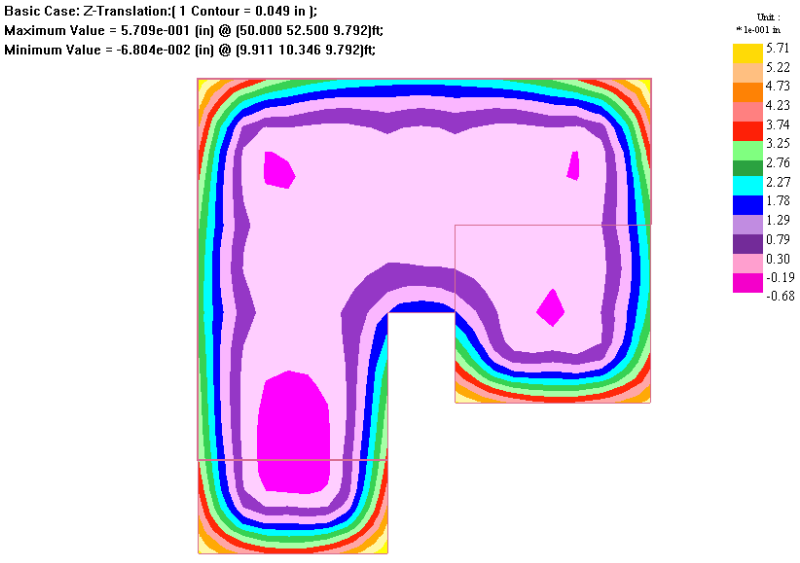


FIGURE 5.2.1-1 COLOR CONTOUR OF DEFLECTION FOR CENTER LIFT

The maximum relative deflection (d) occurs between a point at the lower left corner of the Slab and a point in the interior about 16 ft from the corner.

Deflection ratio = (vertical/horizontal) = 0.571/(16*12) = 1/336<1/300

5.2.2 Stress check due to bending

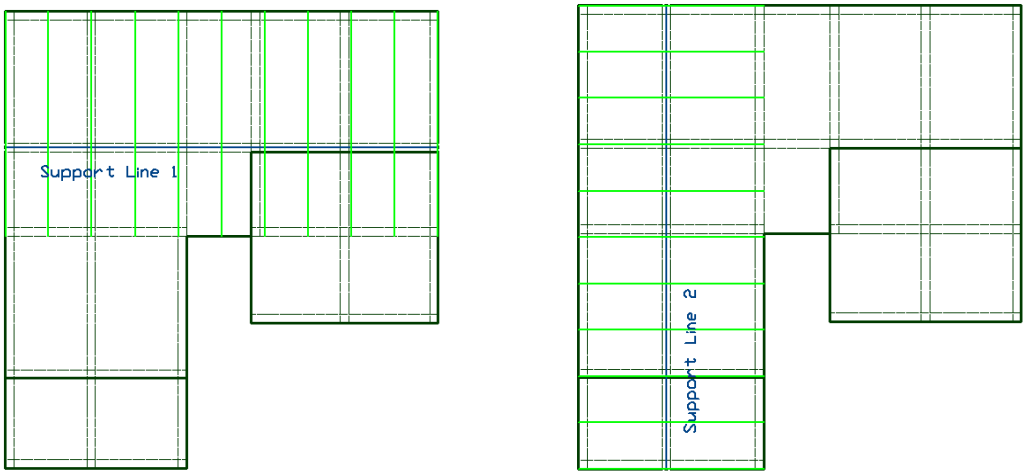
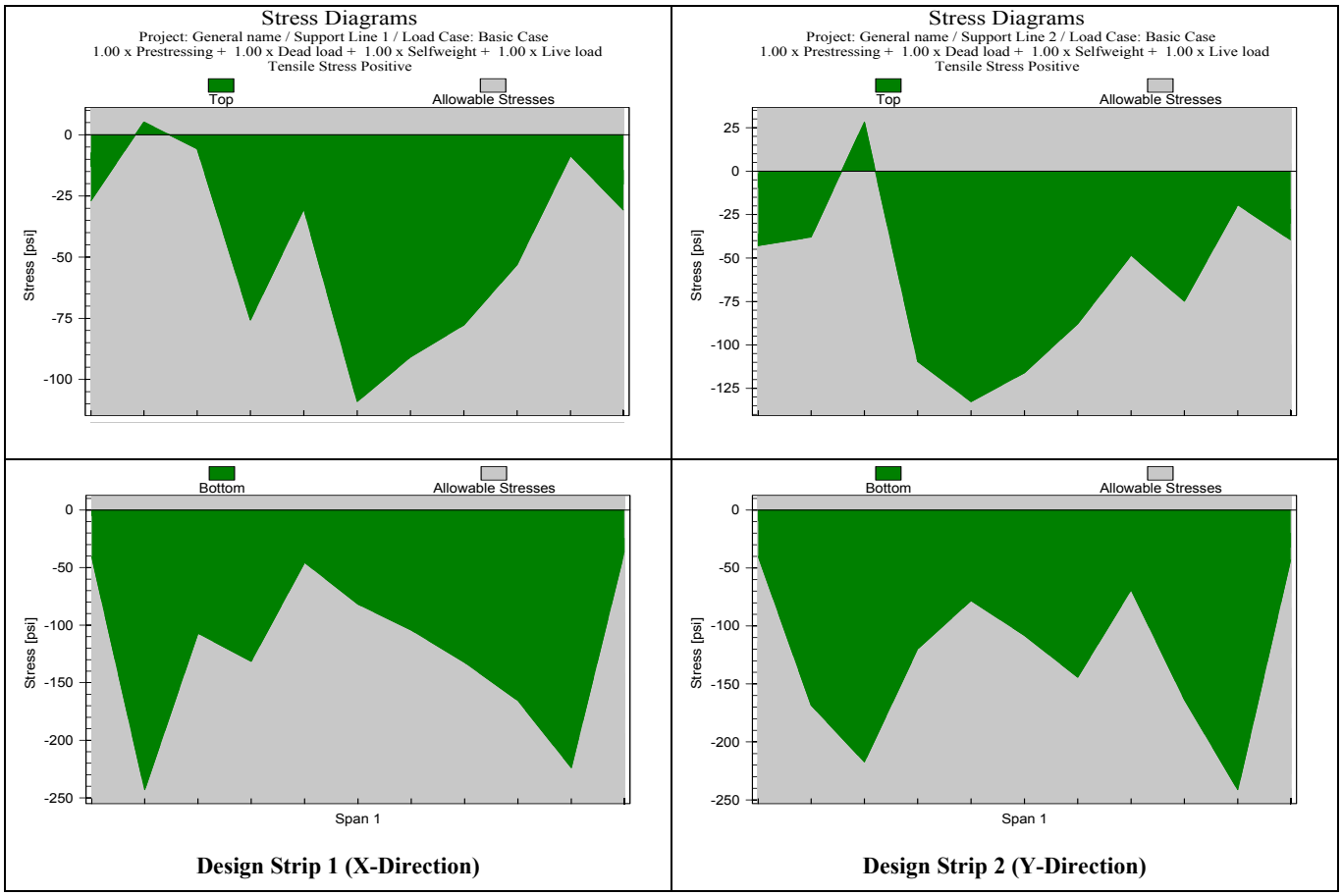


FIGURE 5.2.2-1 SOLID LINES (GREEN) INDICATE STRESSES BELOW ALLOWABLE VALUES FOR ALL DESIGN SECTIONS



Design Strip 1 (X-Direction) **Design Strip 2 (Y-Direction)**

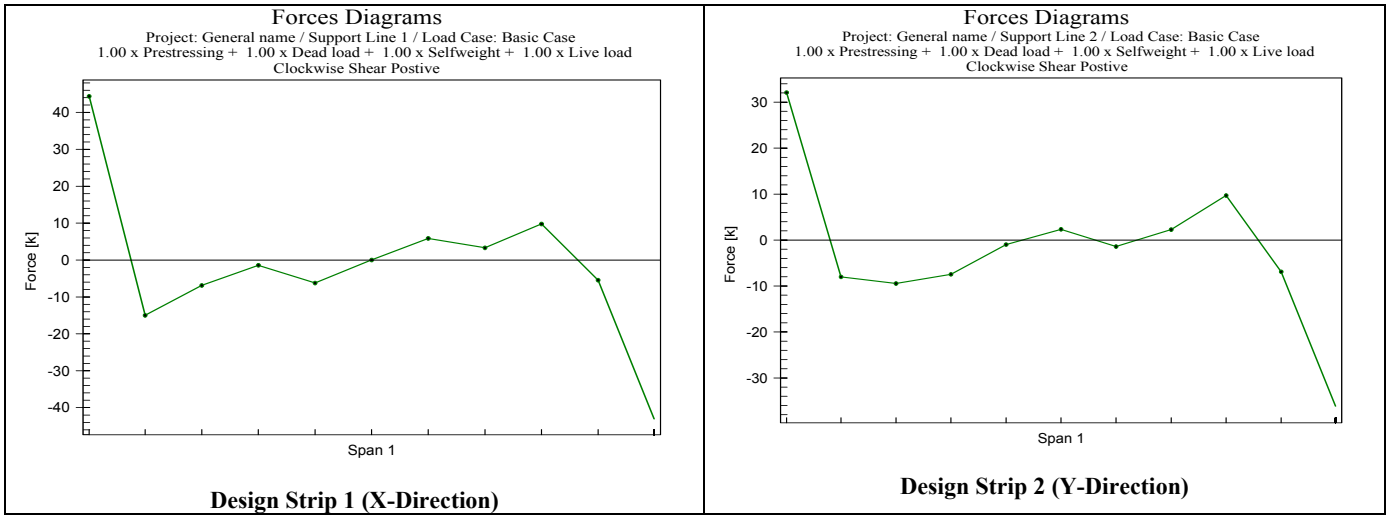
FIGURE 5.2.2-2 DISTRIBUTION OF CALCULATED AND ALLOWABLE STRESSES FOR DESIGN STRIPS IN X- AND Y-DIRECTION

(Allowable stress in tension $6(f'c)^{1/2}$ = 300 psi OK)
(Allowable stress in compression 0.45f'c = 1125 psi, OK)

5.2.3 Stress check for shear

	Governing Force (k)	$\sum$Area $_{web}$ (in ^{2})	Shear Demand (psi)	Allowable Shear (psi)	
X-direction	44.4	648	68.5	104	Okay
Y-direction	32.1	564	56.9	104	Okay

TABLE 5.2.3-1 CALCULATED AND ALLOWABLE SHEAR STRESSES



Design Strip 1 (X-Direction) **Design Strip 2 (Y-Direction)**

FIGURE 5.2.3-1 DISTRIBUTION OF SHEAR FOR DESIGN STRIPS

5.3 Edge Lift Design

Edge Lift was designed for an applied edge displacement of 0.18 inch (See Reference).

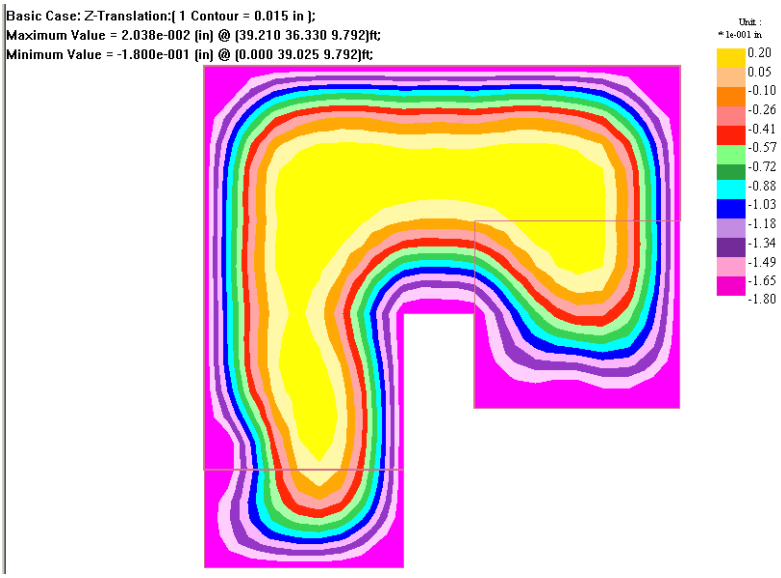


FIGURE 5.3-1 COLOR CONTOUR OF DEFLECTION FOR EDGE LIFT

(Maximum deflection 0.18 inch)

Deflection ratio = (vertical/horizontal) = 0.18/(5*12) = 1/333<1/300

5.3.2 Stress check due to bending

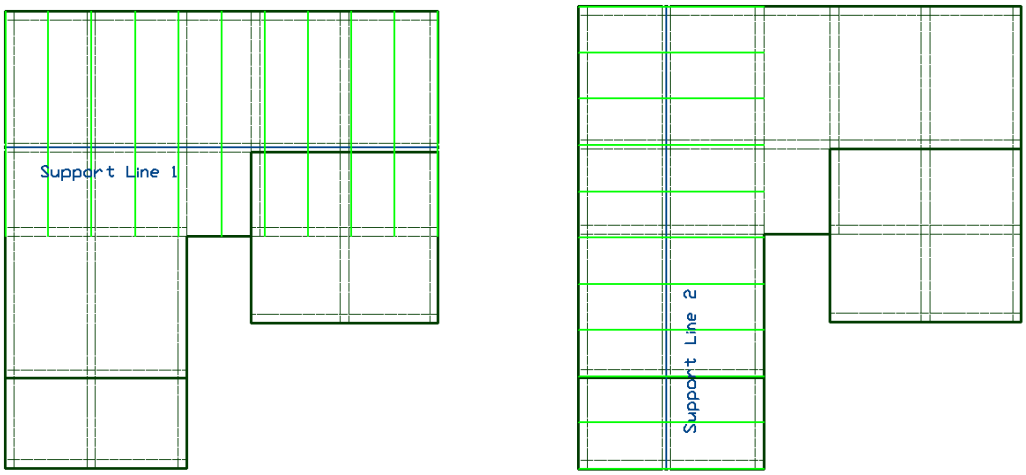
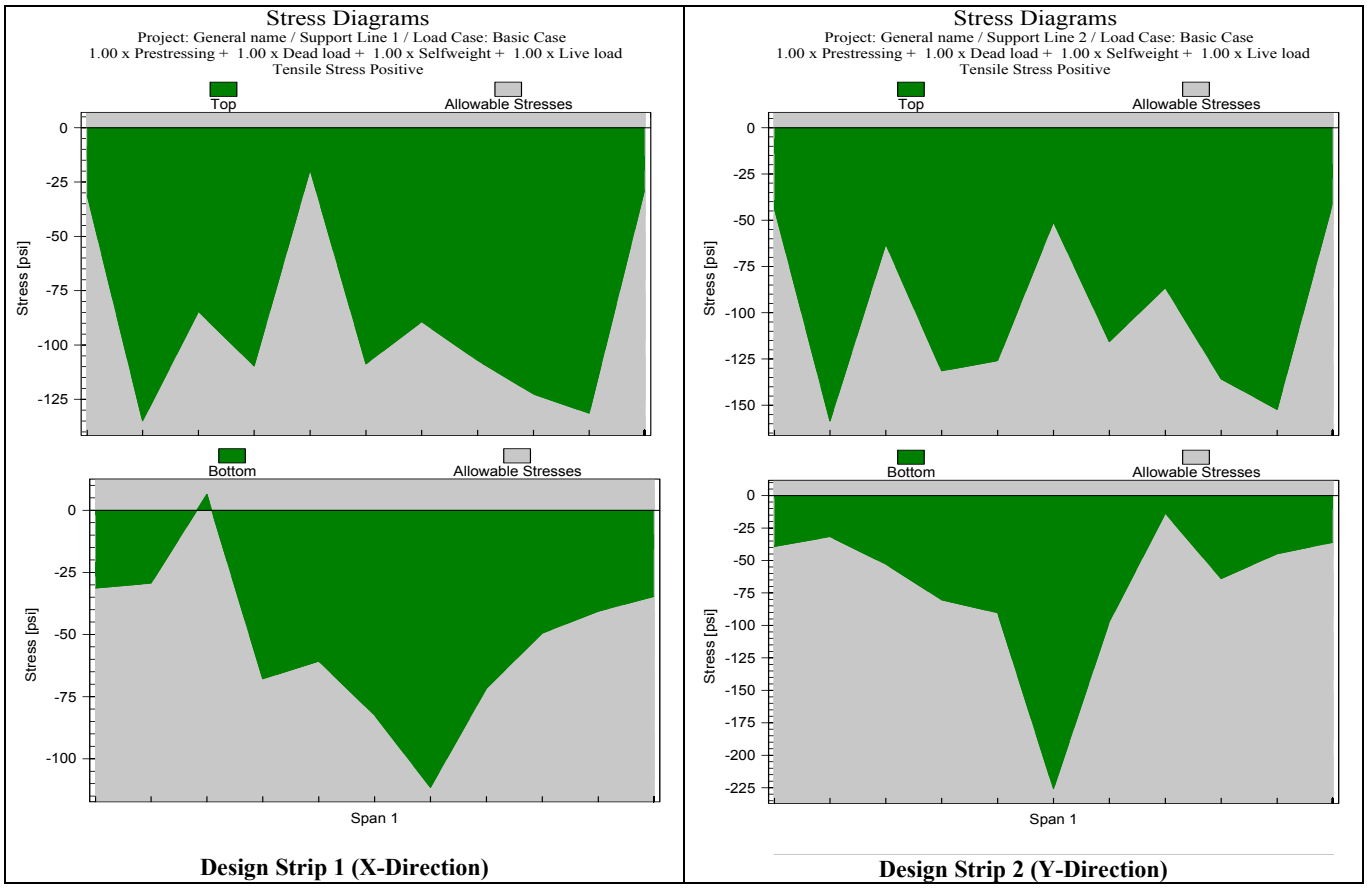


FIGURE 5.3.2-1 SOLID LINES (GREEN) INDICATE STRESSES BELOW ALLOWABLE VALUES FOR ALL DESIGN SECTIONS



Design Strip 1 (X-Direction) **Design Strip 2 (Y-Direction)**

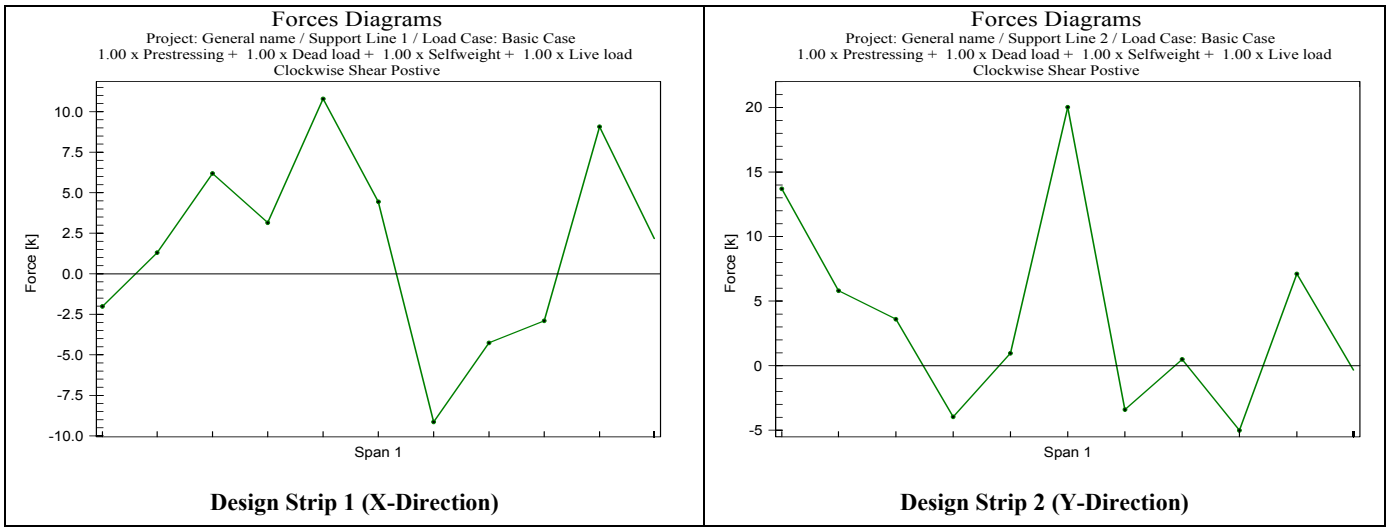
FIGURE 5.3.2- DISTRIBUTION OF CALCULATED AND ALLOWABLE STRESSES FOR DESIGN STRIPS IN X- AND Y-DIRECTION

(Allowable stress in tension $6(f'c)^{1/2}$ = 300 psi OK)
(Allowable stress in compression 0.45f'c = 1125 psi, OK)

5.3.3 Stress check for shear

	Governing Force (k)	$\sum$Area$_{web}$ (in^2)	Shear Demand (psi)	Allowable Shear (psi)	
X-direction	10.8	648	16.7	104	Okay
Y-direction	20	564	35.5	104	Okay

TABLE 5.3.3-1 CALCULATED AND ALLOWABLE SHEAR STRESSES



Design Strip 1 (X-Direction) **Design Strip 2 (Y-Direction)**

FIGURE 5.3.3-1 DISTRIBUTION OF SHEAR FOR DESIGN STRIPS