

# Structure Point

CONCRETE SOFTWARE SOLUTIONS

sp slab

sp column

sp mats

sp beam

sp frame

sp wall

Work quickly.  
Work simply.  
Work accurately.

## StructurePoint's Productivity Suite of powerful software tools for reinforced concrete analysis & design

**sp wall**

Finite element analysis & design of reinforced, precast ICF & tilt-up concrete walls

**sp column**

Design & investigation of rectangular, round & irregularly shaped concrete column sections

**sp mats**

Finite element analysis & design of reinforced concrete foundations, combined footings or slabs on grade

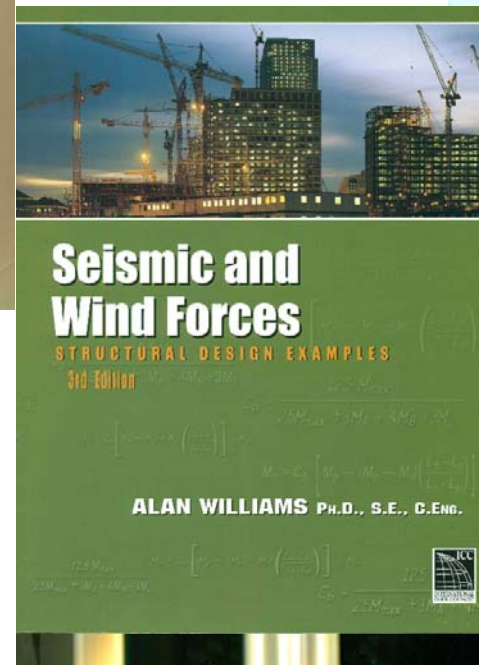
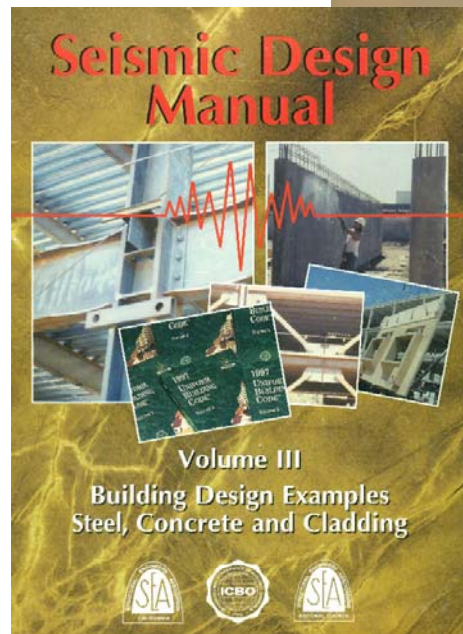
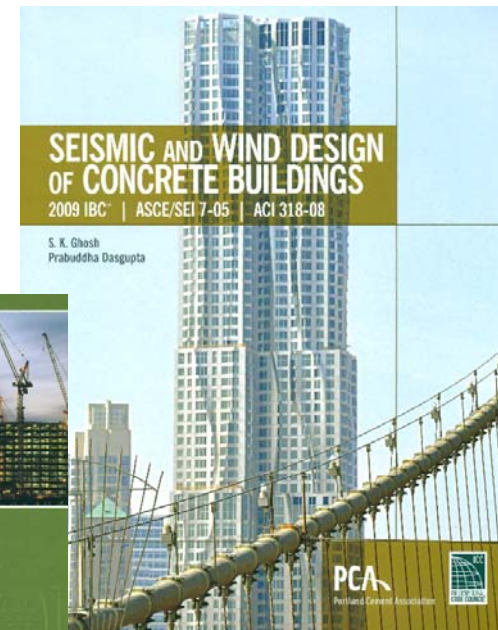
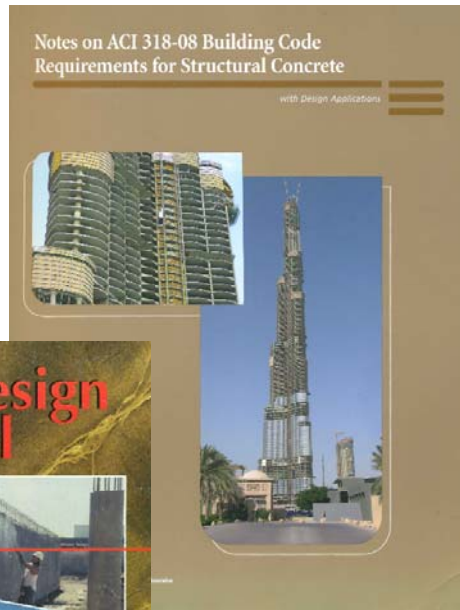
**sp beam**

Analysis, design & investigation of reinforced concrete beams & one-way slab systems

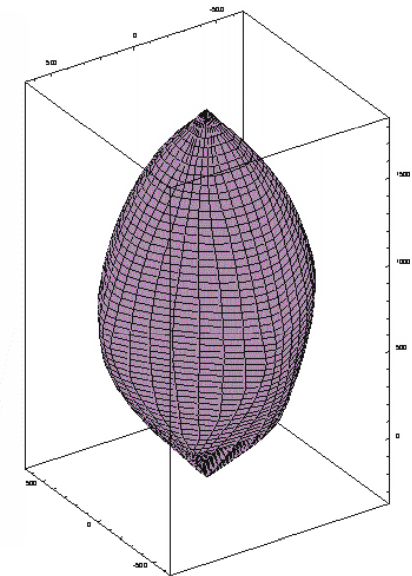
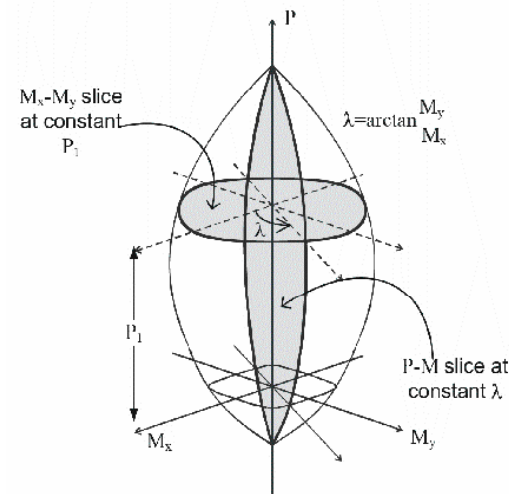
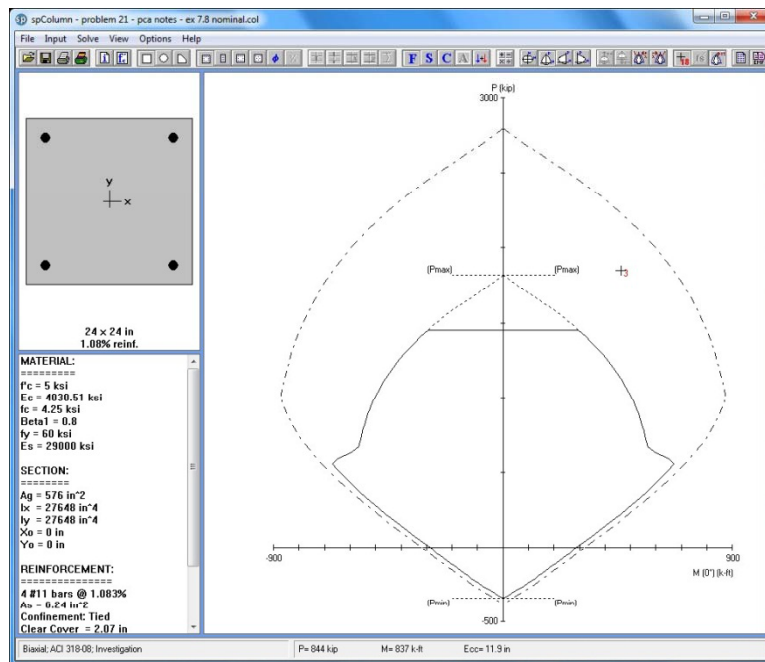
**sp slab**

Analysis, design & investigation of reinforced concrete beams & slab systems

# The Industry Standard



- Design and investigation of rectangular, round, or irregular concrete sections including slenderness effects





# Options



- **Codes:** ACI 318-11/08/05/02  
CSA A23.3-04/94
- **Units:** English or Metric
- **Run Axis:** X, Y or Biaxial
- **Run Options:** Design or Investigation
- **Slenderness:** Yes or No

General Information

Labels  
Project:  
Column: Engineer:

Units  
 English  
 Metric

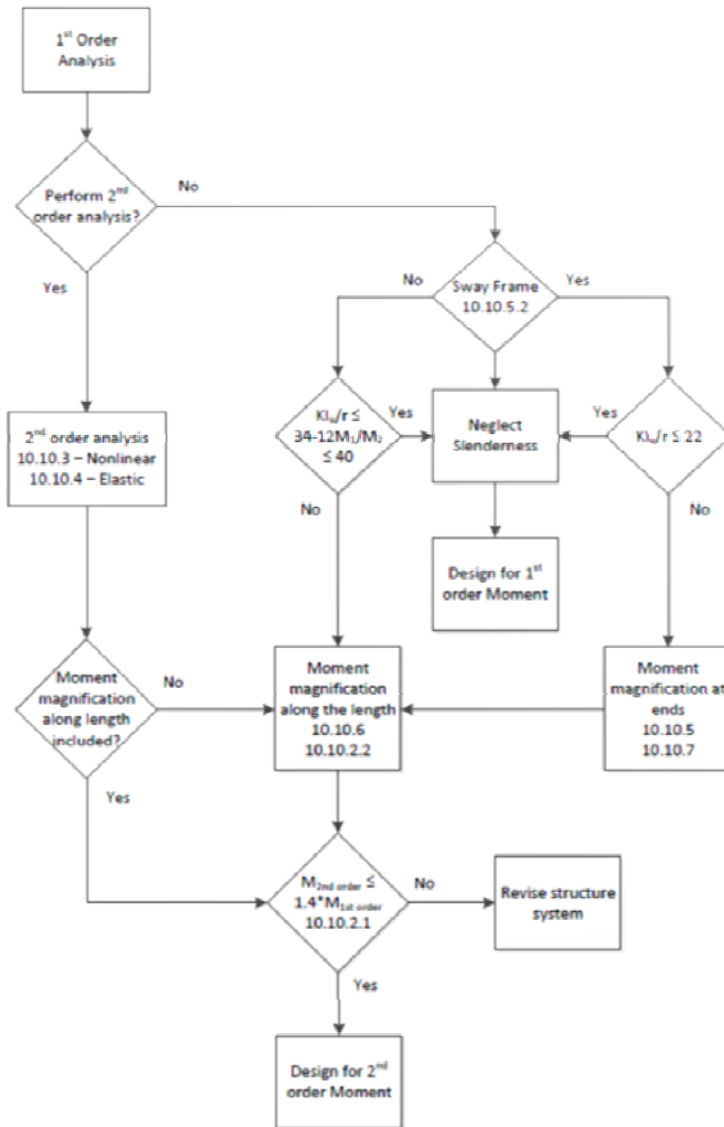
Run Option  
 Investigation  
 Design

Run Axis  
 About X-Axis  
 About Y-Axis  
 Biaxial

Design Code  
 ACI 318-11  
 ACI 318-08  
 ACI 318-05  
 ACI 318-02  
 CSA A23.3-04  
 CSA A23.3-94

Consider slenderness?  Yes  No

OK Cancel



# Slenderness

## Design Column

Slenderness related to the column being considered

The 'Design Column' dialog box is split into two panes for X-Axis and Y-Axis. Each pane includes fields for 'Clear height' (16 ft), 'Sway criteria' (Sum Pc/(Pc) and Sum Pu/(Pu)), and 'Effective length factors' (Compute 'k' factors or Input 'k' factors). The X-Axis 'Compute k' factors are 0.825 and 1.406, while the Y-Axis are 0.8 and 1.37. There are 'Copy to Y-Axis' and 'Copy to X-Axis' buttons at the bottom of each pane.

## Beams

Slenderness related to beams

The 'X-Beams (perpendicular to X)' dialog box shows 'Beam Location' options (Above Left, Above Right, Below Left, Below Right). Under 'Beam Above Left', there are options for 'No beam specified' and 'Copy From Beam Right'. It also includes fields for 'Span (c/c)' (20 ft), 'Width' (22.52 in), 'Depth' (22.52 in), 'f'c' (5 ksi), 'Ec' (4030.51 ksi), and 'Inertia' (21433.5 in^4).

## Columns Above and Below

Slenderness related to columns above and below the design column

The 'Columns Above and Below' dialog box has two panes: 'Column Above' and 'Column Below'. Each pane includes fields for 'Height (c/c)', 'Width (along X)', 'Depth (along Y)', 'Concrete, f'c', and 'Ec'. The values for both panes are: Height (11 ft), Width (18 in), Depth (18 in), f'c (5 ksi), and Ec (4030.51 ksi). There are 'Copy to Column Below' and 'Copy to Column Above' buttons.

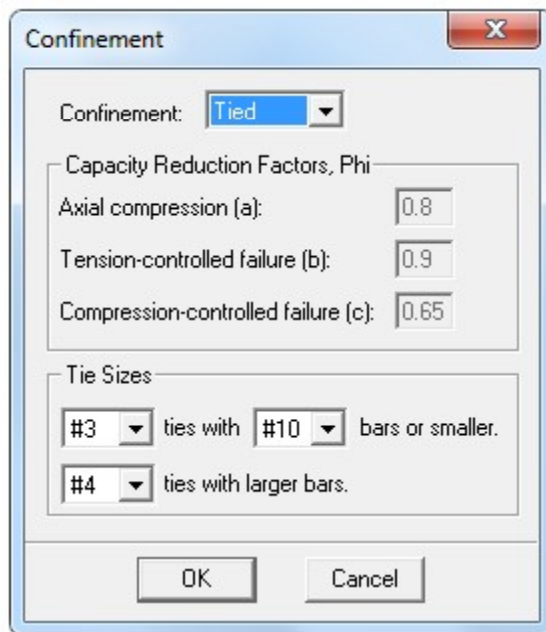
## Factors

Factors that affect slenderness calculations

The 'Slenderness Factors' dialog box has radio buttons for 'Code defaults' (selected) and 'User-defined'. It includes a 'Stiffness reduction factor' field (0.75) and a 'Cracked-section coefficients' section with 'Beams (clb)' (0.35) and 'Columns (clc)' (0.7) fields.

# Reinforcement Options

## ■ Confinement



Confinement dialog box showing settings for confinement type and capacity reduction factors.

Confinement: **Tied**

Capacity Reduction Factors, Phi

Axial compression (a):

Tension-controlled failure (b):

Compression-controlled failure (c):

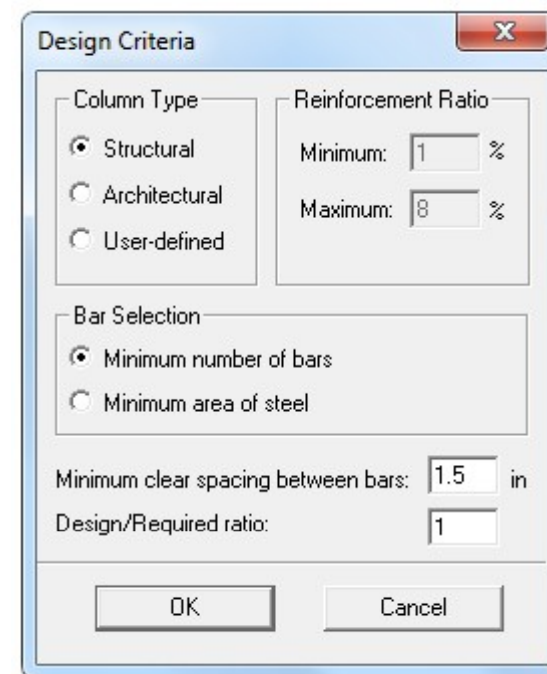
Tie Sizes

ties with  bars or smaller.

ties with larger bars.

OK Cancel

## ■ Design Criteria



Design Criteria dialog box showing settings for column type, reinforcement ratio, and bar selection.

Column Type

Structural

Architectural

User-defined

Reinforcement Ratio

Minimum:  %

Maximum:  %

Bar Selection

Minimum number of bars

Minimum area of steel

Minimum clear spacing between bars:  in

Design/Required ratio:

OK Cancel



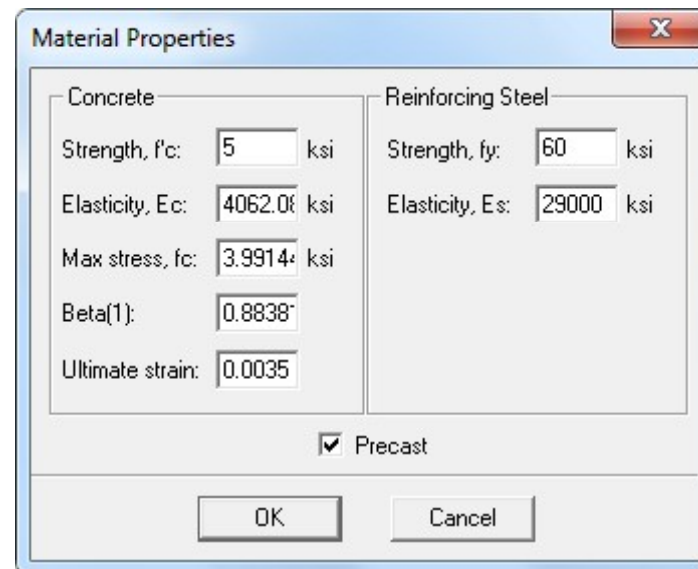
# Material Properties

## ■ Concrete:

$f'_c$ ,  $E_c$ ,  $f_c$ ,  $\beta_1$ , and  $\epsilon_c$

## ■ Steel:

$f_y$  and  $E_s$



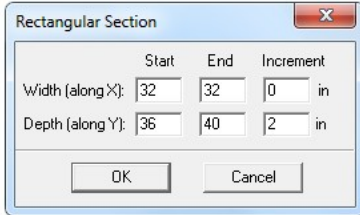
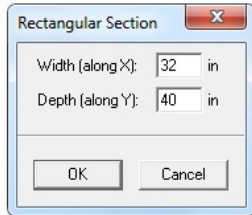
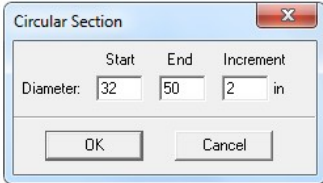
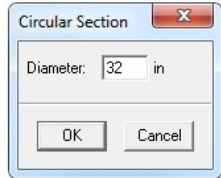
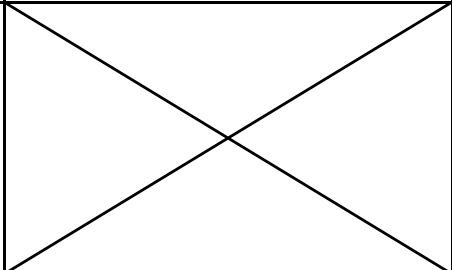
The image shows a software dialog box titled "Material Properties". It is divided into two columns: "Concrete" and "Reinforcing Steel".

Concrete	Reinforcing Steel
Strength, $f'_c$ : 5 ksi	Strength, $f_y$ : 60 ksi
Elasticity, $E_c$ : 4062.08 ksi	Elasticity, $E_s$ : 29000 ksi
Max stress, $f_c$ : 3.9914 ksi	
Beta(1): 0.8838	
Ultimate strain: 0.0035	

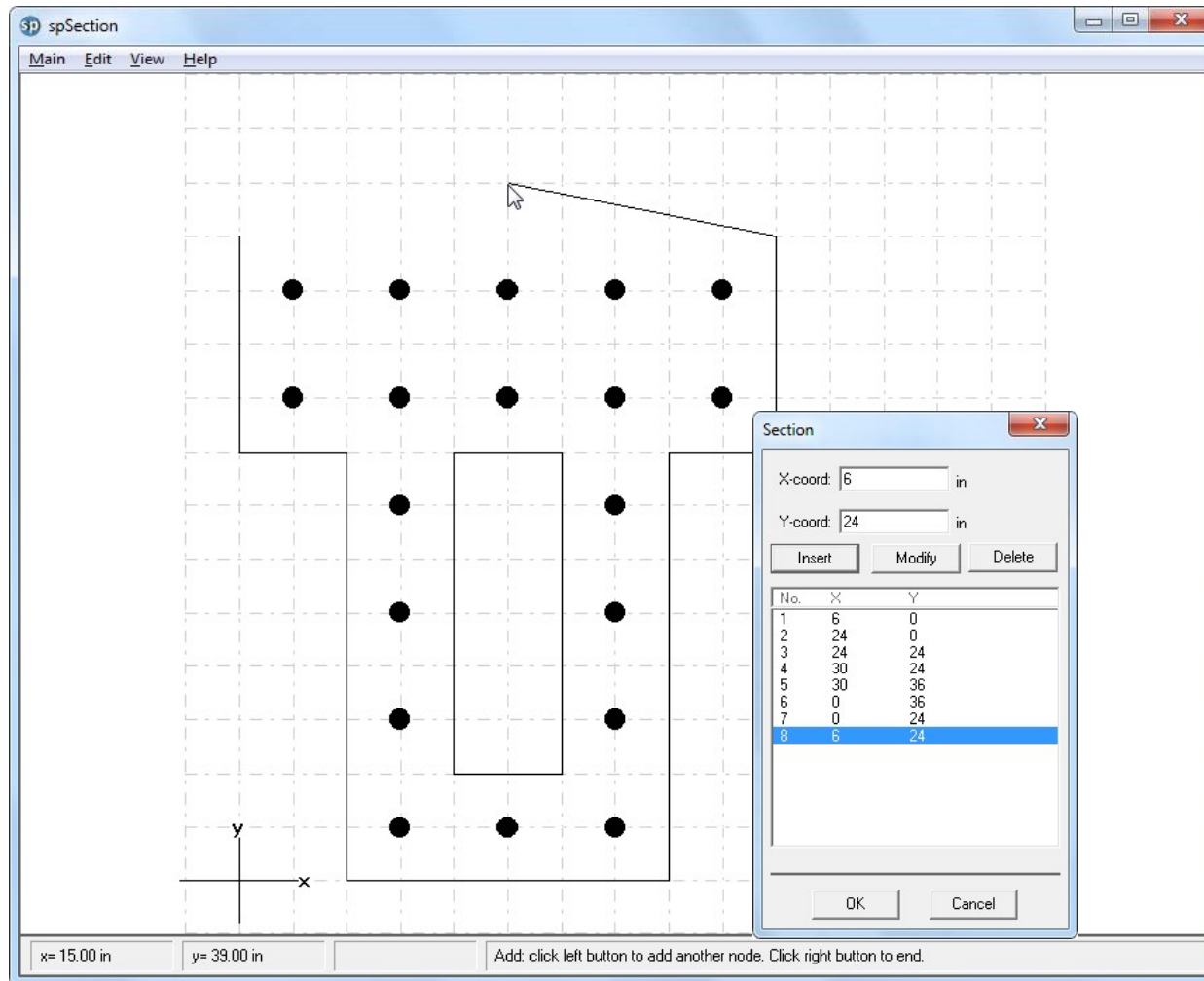
At the bottom of the dialog, there is a checked checkbox labeled "Precast" and two buttons: "OK" and "Cancel".

Precast (CSA only)

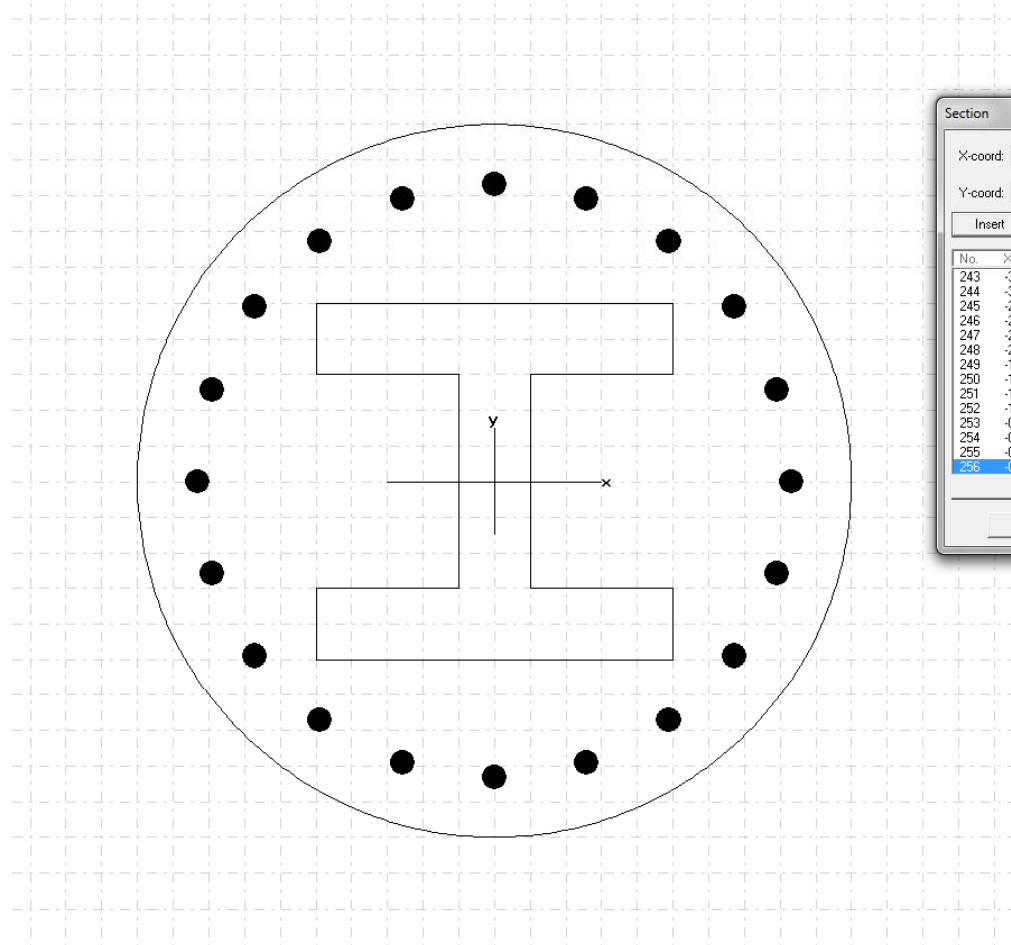
# Section

	Design	Investigation
<input type="checkbox"/> <b>Rectangular:</b>	 <p>Rectangular Section dialog box for Design mode. Fields: Width (along X): Start 32, End 32, Increment 0 in; Depth (along Y): Start 36, End 40, Increment 2 in.</p>	 <p>Rectangular Section dialog box for Investigation mode. Fields: Width (along X): 32 in; Depth (along Y): 40 in.</p>
<input checked="" type="checkbox"/> <b>Circular:</b>	 <p>Circular Section dialog box for Design mode. Fields: Diameter: Start 32, End 50, Increment 2 in.</p>	 <p>Circular Section dialog box for Investigation mode. Field: Diameter: 32 in.</p>
<input type="checkbox"/> <b>Irregular:</b>	 <p>Irregular Section dialog box for Design mode. The dialog box is crossed out with a large X.</p>	<ul style="list-style-type: none"><li>• Irregular Section Editor</li><li>• Import Geometry</li></ul>

# Irregular Sections



# Irregular Sections



Section

X-coord: 0.245413 in  
Y-coord: 9.99699 in

Insert Modify Delete

No.	X	Y
243	-3.3689	9.41544
244	-3.13682	9.49528
245	-2.90285	9.5694
246	-2.66713	9.63776
247	-2.4298	9.70031
248	-2.19101	9.75702
249	-1.9509	9.80785
250	-1.70962	9.85278
251	-1.46731	9.89176
252	-1.22411	9.9248
253	-0.980172	9.95185
254	-0.735646	9.9729
255	-0.490677	9.98795
256	0.245413	9.99699

OK Cancel



# Irregular Sections

Import Data (from text file)

Geometry  
 Reinforcement  
 Service loads  
 Factored loads

OK Cancel

## Geometry Data:

```

No_Of_Section_Nodes
Xs1 Ys1
Xs2 Ys2
.
.
.
Xsn Ysn
No_Of_Opening_Nodes
Xo1 Yo1
Xo2 Yo2
.
.
.
Xon Yon
    
```

Templates.xls [Read-Only] [Compatibility Mode] - Microsoft Excel

Home Insert Page Layout Formulas Data Review View Add-Ins Acrobat

D5 fx 30

1 Input Output

2 Notes: 1. No units are used. It is the user's responsibility to maintain the consistency of units 2. Diagram scales are fixed. They may be changed if ne  
3. Do not delete or move output data cells. Otherwise the exported data might be incorrect.

3

4

5	Center-to-Center Width in X:	30			
6	Height in Y:	38			
7	Reinforcement Ring Diameter:	33			
8	Left Reinforcement Area per bar:	0.5			
9	Right Reinforcement Area per bar:	0.5			

Export Geometry

Export Reinforcement

Geometry					
Degree	Radian	x-base	y-base	X	Y
0.000	0.000	19.000	0.000	34.000	0.000
10.000	0.175	18.711	3.299	33.711	3.299
20.000	0.349	17.854	6.498	32.854	6.498
30.000	0.524	16.454	9.500	31.454	9.500
40.000	0.698	14.555	12.213	29.555	12.213
50.000	0.873	12.213	14.555	27.213	14.555
60.000	1.047	9.500	16.454	24.500	16.454
70.000	1.222	6.498	17.854	21.498	17.854
80.000	1.396	3.299	18.711	18.299	18.711
90.000	1.571	0.000	19.000	15.000	19.000
90.000	1.571	0.000	19.000	-15.000	19.000
100.000	1.745	-3.299	18.711	-18.299	18.711
110.000	1.920	-6.498	17.854	-21.498	17.854
120.000	2.094	-9.500	16.454	-24.500	16.454
130.000	2.269	-12.213	14.555	-27.213	14.555
140.000	2.443	-14.555	12.213	-29.555	12.213
150.000	2.618	-16.454	9.500	-31.454	9.500
160.000	2.793	-17.854	6.498	-32.854	6.498
170.000	2.967	-18.711	3.299	-33.711	3.299
180.000	3.142	-19.000	0.000	-34.000	0.000
190.000	3.316	-18.711	-3.299	-33.711	-3.299
200.000	3.491	-17.854	-6.498	-32.854	-6.498
210.000	3.665	-16.455	-9.500	-31.455	-9.500
220.000	3.840	-14.555	-12.213	-29.555	-12.213
230.000	4.014	-12.213	-14.555	-27.213	-14.555
240.000	4.189	-9.500	-16.454	-24.500	-16.454
250.000	4.363	-6.498	-17.854	-21.498	-17.854
260.000	4.538	-3.299	-18.711	-18.299	-18.711
270.000	4.712	0.000	-19.000	-15.000	-19.000

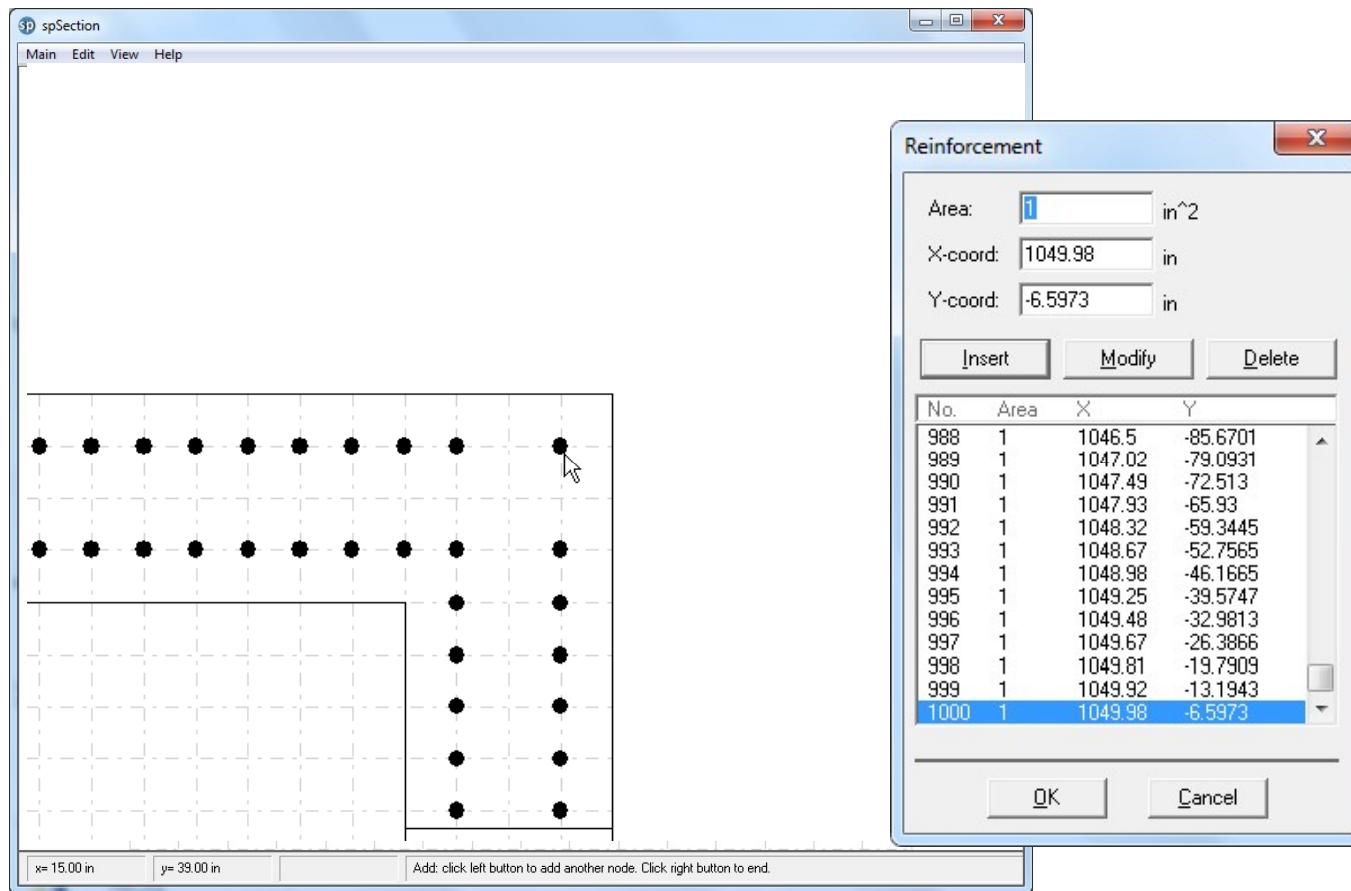
Read Me Example4 Example8 Example9 Example10 Example12 Exarj

Ready 100%

# Reinforcement

	Design	Investigation
<p>All Sides Equal:</p>		
<p>Equal Spacing:</p>		
<p>Sides Different:</p>		
<p>Irregular:</p>		

# Irregular Reinforcement



The screenshot displays the spSection software interface. The main window shows a grid with an irregular reinforcement layout. A dialog box titled "Reinforcement" is open, showing the properties for a selected node (No. 1000).

Reinforcement Dialog Box Fields:

- Area: 1 in<sup>2</sup>
- X-coord: 1049.98 in
- Y-coord: -6.5973 in

Buttons: Insert, Modify, Delete, OK, Cancel

No.	Area	X	Y
988	1	1046.5	-85.6701
989	1	1047.02	-79.0931
990	1	1047.49	-72.513
991	1	1047.93	-65.93
992	1	1048.32	-59.3445
993	1	1048.67	-52.7565
994	1	1048.98	-46.1665
995	1	1049.25	-39.5747
996	1	1049.48	-32.9813
997	1	1049.67	-26.3866
998	1	1049.81	-19.7909
999	1	1049.92	-13.1943
1000	1	1049.98	-6.5973

Status Bar: x= 15.00 in y= 39.00 in Add: click left button to add another node. Click right button to end.

# Irregular Reinforcement

Import Data (from text file)

Geometry  
 Reinforcement  
 Service loads  
 Factored loads

OK Cancel

## Reinforcement Data:

```

No_Of_Bars
A1 X1 Y1
.
.
An Xn Yn
    
```

Templates.xls [Read-Only] [Compatibility Mode] - Microsoft Excel

Home Insert Page Layout Formulas Data Review View Add-Ins Acrobat

L28    fx    =J28-\$D\$6/2

Notes: 1. No units are used. It is the user's responsibility to maintain the consistency of units. 2. Diagram scales are fixed. They may be c  
3. Do not delete or move output data cells. Otherwise the exported data might be incorrect.

Center-to-Center Width in X:	40	Export Geometry
Height in Y:	30	Export Reinforcement
Reinforcement Ring Diameter:	25	
Reinforcement Area per Bar:	0.5	

Geometry					
Degree	Radian	x-base	y-base	X	Y
0.000	0.000	15.000	0.000	35.000	0.000
10.000	0.175	14.772	2.605	34.772	2.605
20.000	0.349	14.095	5.130	34.095	5.130
30.000	0.524	12.990	7.500	32.990	7.500
40.000	0.698	11.491	9.642	31.491	9.642
50.000	0.873	9.642	11.491	29.642	11.491
60.000	1.047	7.500	12.990	27.500	12.990
70.000	1.222	5.130	14.095	25.130	14.095
80.000	1.396	2.605	14.772	22.605	14.772
90.000	1.571	0.000	15.000	20.000	15.000
90.000	1.571	0.000	15.000	-20.000	15.000
100.000	1.745	-2.605	14.772	-22.605	14.772
110.000	1.920	-5.130	14.095	-25.130	14.095
120.000	2.094	-7.500	12.990	-27.500	12.990
130.000	2.269	-9.642	11.491	-29.642	11.491
140.000	2.443	-11.491	9.642	-31.491	9.642
150.000	2.618	-12.990	7.500	-32.990	7.500
160.000	2.793	-14.095	5.130	-34.095	5.130
170.000	2.967	-14.772	2.605	-34.772	2.605
180.000	3.142	-15.000	0.000	-35.000	0.000
190.000	3.316	-14.772	-2.605	-34.772	-2.605
200.000	3.491	-14.095	-5.130	-34.095	-5.130
210.000	3.665	-12.990	-7.500	-32.990	-7.500
220.000	3.840	-11.491	-9.642	-31.491	-9.642
230.000	4.014	-9.642	-11.491	-29.642	-11.491
240.000	4.189	-7.500	-12.990	-27.500	-12.990
250.000	4.363	-5.130	-14.095	-25.130	-14.095

Ready



# Loads



**F**

## Factored Loads

Import Data (from text file)

- Geometry
- Reinforcement
- Service loads
- Factored loads

OK Cancel

Factored Loads

Load	X-Moment (kip)	Y-Moment (kip-ft)
120	582	0

Insert Modify Delete

No.	P	Mx	My
18	-780	1048.8	0
19	790	885	0
20	790	-1656	0
21	480	458	0
22	480	-942	0
23	190	129	0
24	190	-132	0
25	-120	-288	0
26	-120	582	0

OK Cancel

**S**

## Service Loads

Mandatory for slenderness

Import Data (from text file)

- Geometry
- Reinforcement
- Service loads
- Factored loads

OK Cancel

Service Loads

	Axial Load (kip)		X-Moments (k-ft)		Y-Moments (k-ft)		Sustained Load (%)
	@ Top	@ Bot	@ Top	@ Bot	@ Top	@ Bot	
Dead	200	100	200				
Live	250	287	654				
Wind	600	873	768				
EQ	300	378	762				
Snow	0	0	0				

Insert Modify Delete

No IP, Mat, Mob, Myt, Myb for each case

OK Cancel

**A**

## Axial Loads

Uniaxial, short column investigation only

Axial Loads

Initial load (kip)	Final load (kip)	Increment (kip)
-120	582	0

Insert Modify Delete

No.	Initial	Final	Inc
18	-780	1048.8	0
19	790	885	0
20	790	-1656	0
21	480	458	0
22	480	-942	0
23	190	129	0
24	190	-132	0
25	-120	-288	0
26	-120	582	0

OK Cancel

**+/-**

## Load Factors

For service loads only

Load Combinations

Dead	Live	Wind	EQ	Snow
0.8	0	0	-1	0

Insert Modify Delete Defaults

Combo	Dead	Live	Wind	EQ	Snow
U1	1.4	0	0	0	0
U2	1.2	1.6	0	0	0
U3	1.2	1	0	0	0
U4	1.2	0	0.8	0	0
U5	1.2	1	1.6	0	0
U6	0.9	0	1.6	0	0
U7	1.2	0	-0.8	0	0
U8	1.2	1	-1.6	0	0
U9	0.9	0	-1.6	0	0
U10	1.2	1	0	1	0
U11	0.9	0	0	1	0
U12	1.2	1	0	-1	0
U13	0.9	0	0	-1	0

**C**

## Control Point

Investigation Only

$$\phi P_{n,max} / 0.85$$

$$\phi P_{n,max} / x$$

$$f_s = 0.0$$

$$f_s = f_y / 2$$

$$\epsilon_s = f_y / E_s$$

$$\epsilon_s = 0.005$$

$$P = 0$$

$$\phi P_{n,min}$$

# Factored Loads

Import Data (from text file)

Geometry  
 Reinforcement  
 Service loads  
 Factored loads

OK Cancel

Factored Loads

Load	X-Moment	Y-Moment
-120	582	0
(kip)	(k-ft)	(k-ft)

Insert Modify Delete

No.	P	Mx	My
18	-780	1048.8	0
19	790	885	0
20	790	-1656	0
21	480	468	0
22	480	-942	0
23	190	129	0
24	190	-132	0
25	-120	-288	0
26	-120	582	0

OK Cancel

# Service Loads

Service Loads

	Axial Load (kip)	X-Moments (k-ft)		Y-Moments (k-ft)		Sustained Load (%)
		@ Top	@ Bot	@ Top	@ Bot	
Dead:	200	100	200	0	0	
Live:	250	387	654	0	0	
Wind:	600	873	768	0	0	
EQ:	300	378	762	0	0	
Snow:	0	0	0	0	0	

Buttons: Insert, Modify, Delete

No. [P, Mx, My, Myb] for each case

1. D | 200, 100, 200, 0, 0 | L | 250, 387, 654, 0, 0 | W | 600, 873, 768, 0, 0 | E | 300

Buttons: OK, Cancel

Import Data (from text file)

- Geometry
- Reinforcement
- Service loads
- Factored loads

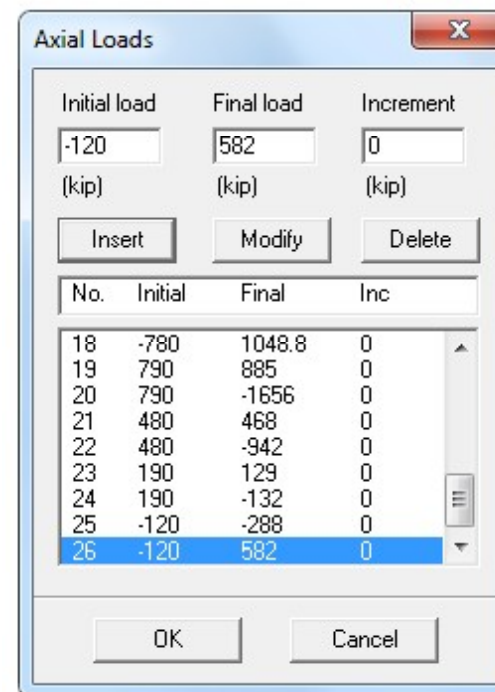
Buttons: OK, Cancel

Load Combinations

	Dead	Live	Wind	EQ	Snow
	0.9	0	0	-1	0
	Insert	Modify	Delete	Defaults	
Combo	Dead	Live	Wind	EQ	Snow
U1	1.4	0	0	0	0
U2	1.2	1.6	0	0	0
U3	1.2	1	0	0	0
U4	1.2	0	0.8	0	0
U5	1.2	1	1.6	0	0
U6	0.9	0	1.6	0	0
U7	1.2	0	-0.8	0	0
U8	1.2	1	-1.6	0	0
U9	0.9	0	-1.6	0	0
U10	1.2	1	0	1	0
U11	0.9	0	0	1	0
U12	1.2	1	0	-1	0
U13	0.9	0	0	-1	0

# Axial Loads

- For non-slender uniaxial loading only



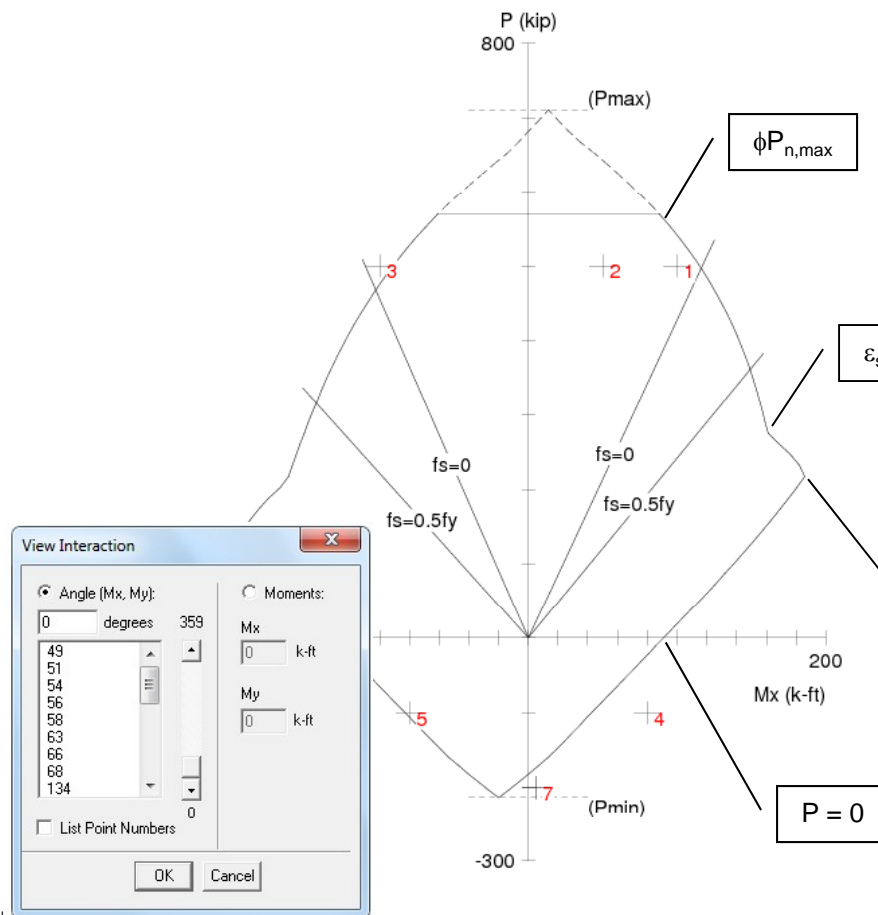
The dialog box titled "Axial Loads" contains three input fields for "Initial load", "Final load", and "Increment", each with a unit of "(kip)". Below these fields are "Insert", "Modify", and "Delete" buttons. A table lists axial load data for various elements, with the last row (No. 26) highlighted in blue. The table has columns for "No.", "Initial", "Final", and "Inc".

No.	Initial	Final	Inc
18	-780	1048.8	0
19	790	885	0
20	790	-1656	0
21	480	468	0
22	480	-942	0
23	190	129	0
24	190	-132	0
25	-120	-288	0
26	-120	582	0

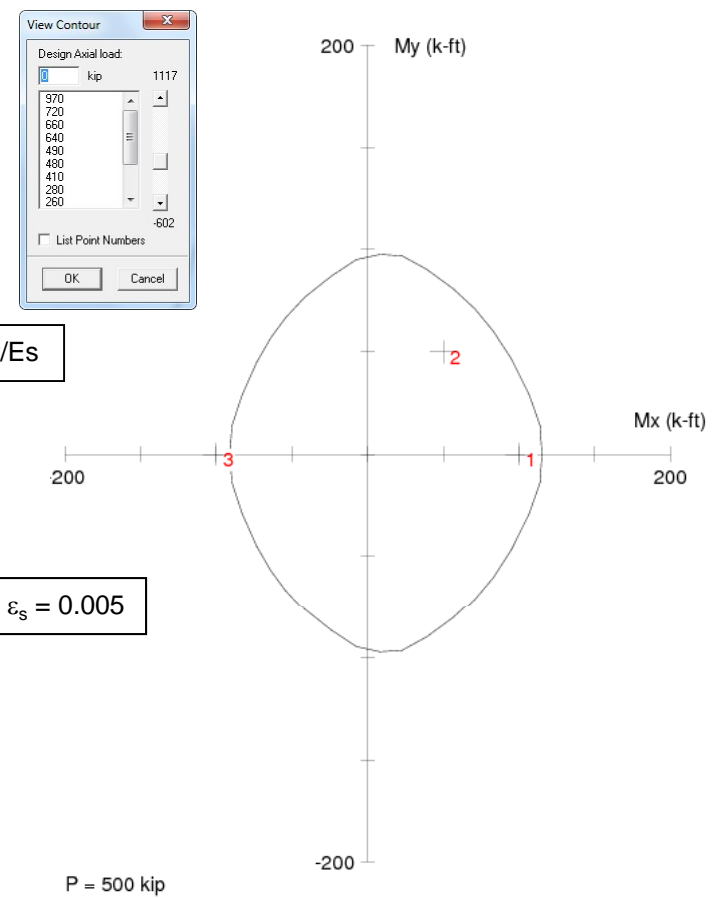


# Graphical Results

P-M Diagram



Mx-My Diagram



View Interaction

Angle (Mx, My):  
 0 degrees 359  
 49 51 54 56 58 63 66 68 134  
 List Point Numbers  
 OK Cancel

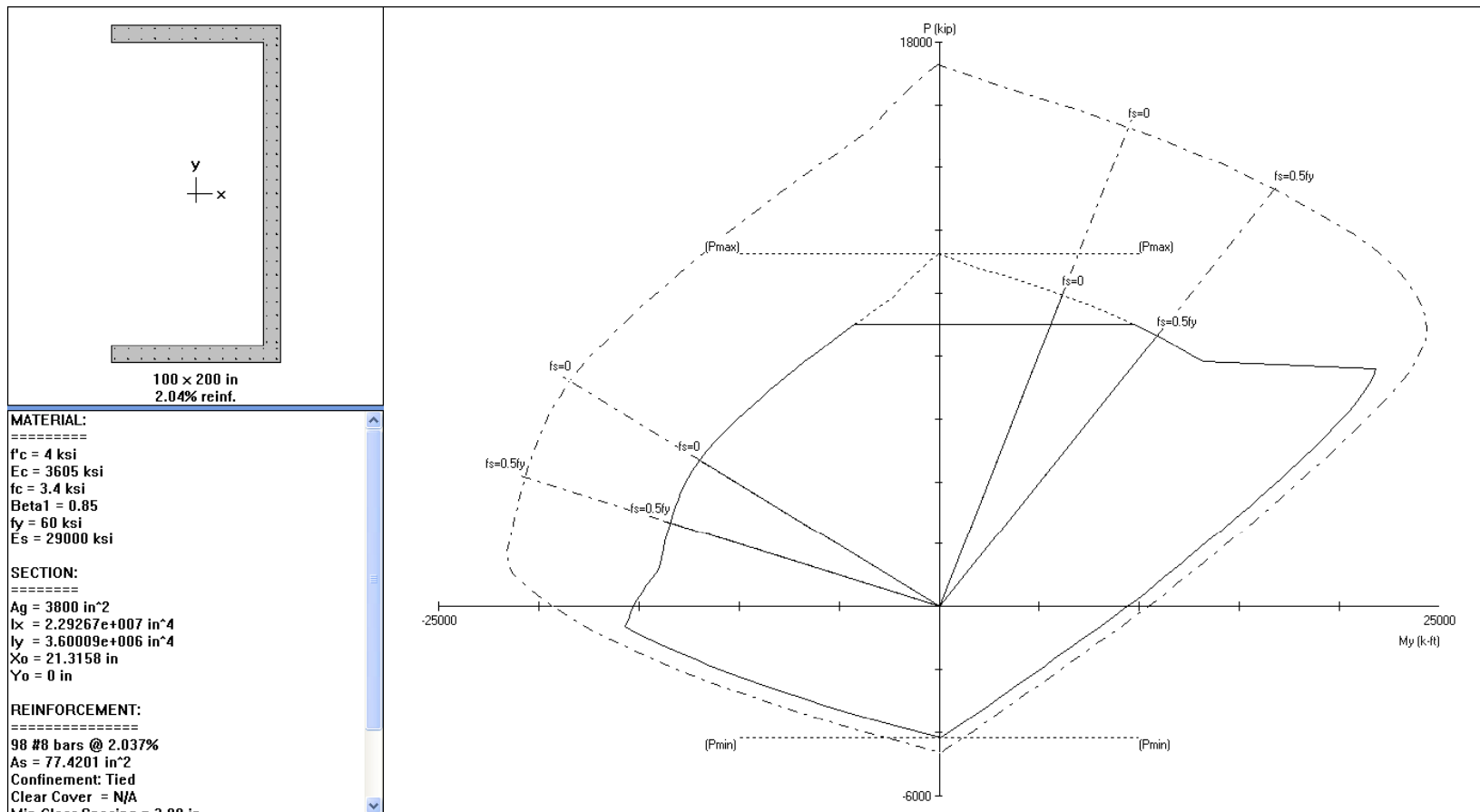
Moments:  
 Mx 0 k-ft  
 My 0 k-ft  
 0  
 OK Cancel

View Contour

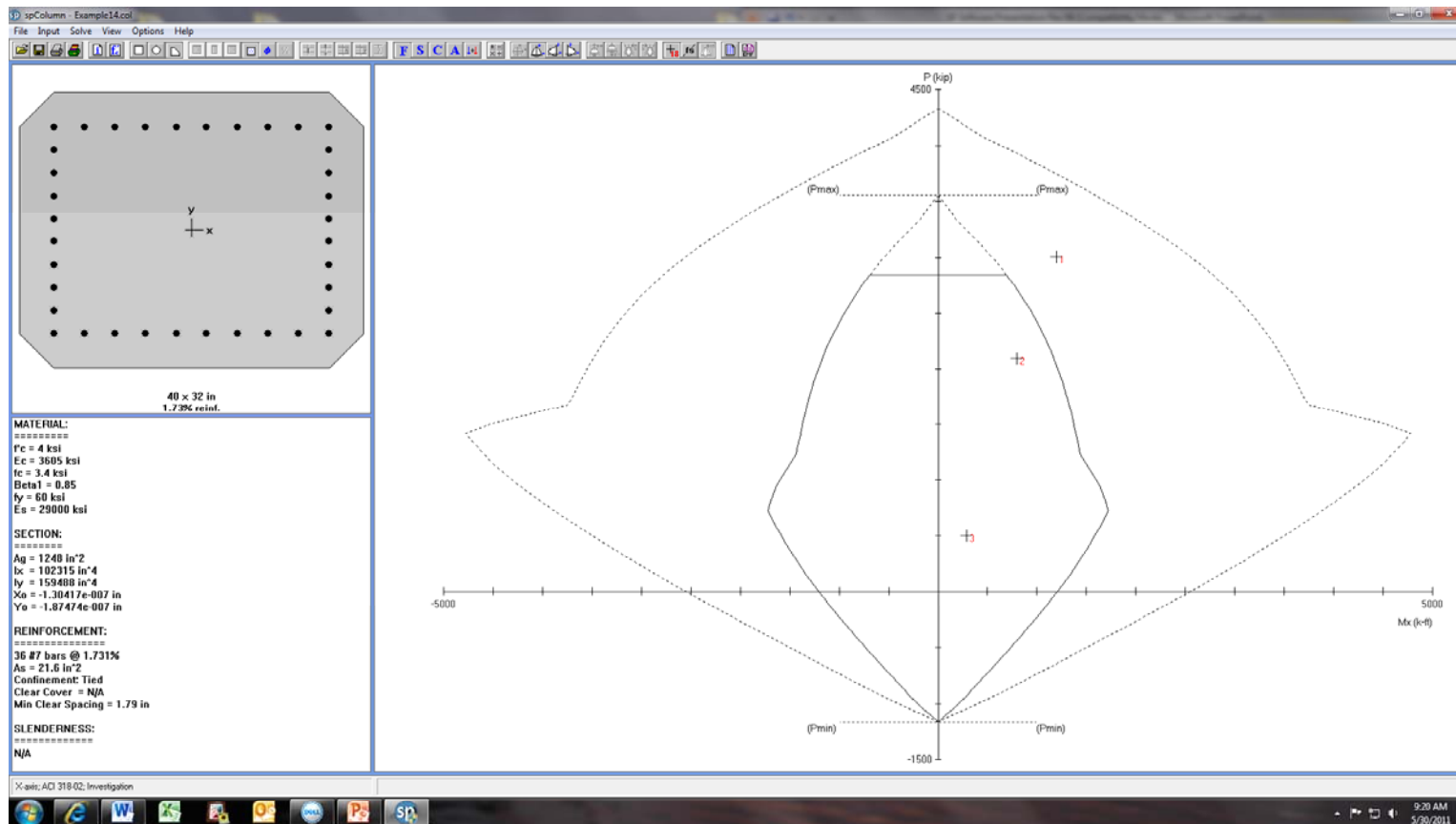
Design Axial load:  
 0 kip 1117  
 970 720 660 640 490 480 410 280 260 -602  
 List Point Numbers  
 OK Cancel

# Graphical Results

## Nominal Interaction Diagram



# Superimposing Diagrams



# Text Results



## Factored Loads and Moments with Corresponding Capacities:

NOTE. Each loading combination includes the following cases.  
 First line - at column top  
 Second line - at column bottom

No.	Combo	Load kip	Pu kip	Mux k-ft	Muy k-ft	PhiMnx k-ft	PhiMny k-ft	PhiMn/Mu	NA depth in	Dt depth in	eps_t	Phi
1	1 U1	280.00	280.00	49.00	61.60	244.58	307.47	4.991	11.75	24.43	0.00325	0.751
2			280.00	-218.40	-47.60	-301.43	-65.70	1.380	14.59	27.22	0.00260	0.695
3	1 U2	640.00	640.00	78.80	124.80	136.96	216.90	1.738	19.64	25.51	0.00090	0.650
4			640.00	-254.40	-60.00	-236.04	-55.67	0.928	19.64	27.25	0.00116	0.650 #
5	1 U3	490.00	490.00	65.00	97.80	162.03	243.79	2.493	16.99	26.14	0.00161	0.650
6			490.00	-229.20	-52.80	-264.31	-60.89	1.153	17.41	27.21	0.00169	0.650
7	1 U4	480.00	480.00	62.80	122.40	130.13	253.63	2.072	17.13	26.88	0.00171	0.650
8			480.00	-223.20	-85.60	-260.09	-99.75	1.165	17.25	27.13	0.00172	0.650
9	1 U5	970.00	970.00	106.60	237.00	-----Pu > Pmax-----#	-----Pu > Pmax-----#					
10			970.00	-301.20	-142.40	-----Pu > Pmax-----#	-----Pu > Pmax-----#					
11	1 U6	660.00	660.00	73.10	178.80	91.75	224.43	1.255	20.32	26.80	0.00096	0.650
12			660.00	-212.40	-120.20	-215.58	-122.00	1.015	20.12	25.80	0.00085	0.650
13	1 U7	0.00	0.00	21.20	-16.80	306.46	-242.85	14.456	7.18	23.47	0.00683	0.900
14			0.00	-151.20	4.00	-356.79	9.44	2.360	10.56	27.05	0.00468	0.873
15	1 U8	10.00	10.00	23.40	-41.40	192.49	-340.56	8.226	8.82	25.44	0.00565	0.900
16			10.00	-157.20	36.80	-356.94	83.56	2.271	10.43	27.09	0.00480	0.883

STRUCTUREPOINT - spColumn v4.60 (TM)  
 Licensed to: StructurePoint. License ID: 00000-0000000-4-28191-28191  
 C:\Program Files (x86)\StructurePoint\spColumn\Examples\Example11.col

Page 6  
 05/30/11  
 09:33 AM

17	1 U9	-300.00	-300.00	-10.10	-99.60	-26.22	-258.59	2.596	6.14	26.94	0.01018	0.900
18			-300.00	-68.40	59.00	-173.75	149.87	2.540	4.21	23.25	0.01358	0.900
19	1 U10	720.00	720.00	99.00	134.80	136.31	185.60	1.377	20.61	24.06	0.00050	0.650
20			720.00	-285.20	-117.80	-206.40	-85.25	0.724	21.63	26.38	0.00066	0.650 #
21	1 U11	410.00	410.00	65.50	76.60	211.57	247.42	3.230	14.49	24.28	0.00203	0.650
22			410.00	-196.40	-95.60	-263.84	-128.43	1.343	16.20	26.93	0.00199	0.650
23	1 U12	260.00	260.00	31.00	60.80	158.09	310.06	5.100	13.33	26.59	0.00299	0.729
24			260.00	-173.20	12.20	-306.78	21.61	1.771	14.31	27.07	0.00267	0.702
25	1 U13	-50.00	-50.00	-2.50	2.60	-253.86	264.02	101.545	6.48	23.25	0.00777	0.900
26			-50.00	-84.40	34.40	-337.08	137.39	3.994	8.80	26.19	0.00595	0.900

# Section capacity exceeded. Revise column!  
 Pmax = 893.93 kip

\*\*\* End of output \*\*\*

# Batch Mode



```
C:\Windows\system32\cmd.exe

C:\Program Files\StructurePoint\spColumn>spColumn.exe /i:"Examples\example01.col"
/dxf /emf:all /iad /cti /csv

C:\Program Files\StructurePoint\spColumn>spColumn.exe /i:"Examples\example02.col"
/dxf /emf:all /iad /cti /csv

C:\Program Files\StructurePoint\spColumn>spColumn.exe /i:"Examples\example03.col"
/dxf /emf:all /iad /cti /csv

C:\Program Files\StructurePoint\spColumn>spColumn.exe /i:"Examples\example04.col"
/dxf /emf:all /iad /cti /csv /stru

C:\Program Files\StructurePoint\spColumn>spColumn.exe /i:"Examples\example05.col"
/dxf /emf:all /iad /cti /csv /stru

C:\Program Files\StructurePoint\spColumn>spColumn.exe /i:"Examples\example06.col"
/dxf /emf:all /iad /cti /csv

C:\Program Files\StructurePoint\spColumn>spColumn.exe /i:"Examples\example08.col"
/dxf /emf:all /iad /cti /csv

C:\Program Files\StructurePoint\spColumn>spColumn.exe /i:"Examples\example09.col"
/dxf /emf:all /iad /cti /csv

C:\Program Files\StructurePoint\spColumn>spColumn.exe /i:"Examples\example10.col"
/dxf /emf:all /iad /cti /csv

C:\Program Files\StructurePoint\spColumn>spColumn.exe /i:"Examples\example11.col"
/dxf /emf:all /iad /cti /csv

C:\Program Files\StructurePoint\spColumn>spColumn.exe /i:"Examples\example12.col"
/dxf /emf:all /iad /cti /csv

C:\Program Files\StructurePoint\spColumn>spColumn.exe /i:"Examples\example13.col"
/dxf /emf:all /iad /cti /csv

C:\Program Files\StructurePoint\spColumn>spColumn.exe /i:"Examples\example14.col"
/dxf /emf:all /iad /cti /csv

C:\Program Files\StructurePoint\spColumn>spColumn.exe /i:"Examples\example15.col"
/dxf /emf:all /iad /cti /csv

C:\Program Files\StructurePoint\spColumn>spColumn.exe /i:"Examples\example16.col"
/dxf /emf:all /iad /cti /csv

C:\Program Files\StructurePoint\spColumn>spColumn.exe /i:"Examples\example17.col"
/dxf /emf:all /iad /cti /csv

C:\Program Files\StructurePoint\spColumn>spColumn.exe /i:"Examples\example18.col"
/dxf /emf:all /iad /cti /csv

C:\Program Files\StructurePoint\spColumn>spColumn.exe /i:"Examples\example19.col"
/dxf /emf:all /iad /cti /csv

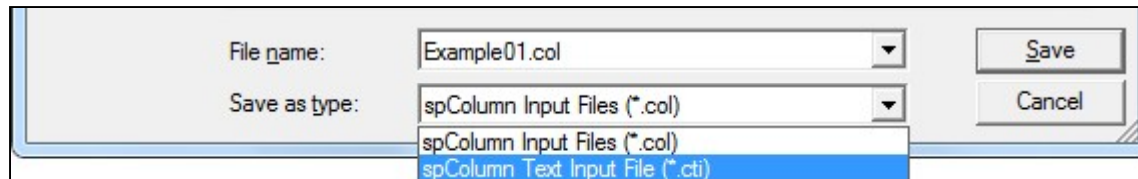
C:\Program Files\StructurePoint\spColumn>spColumn.exe /i:"Examples\example20.col"
/dxf /emf:all /iad /cti /csv /stru
```

```
Examples.bat - Notepad

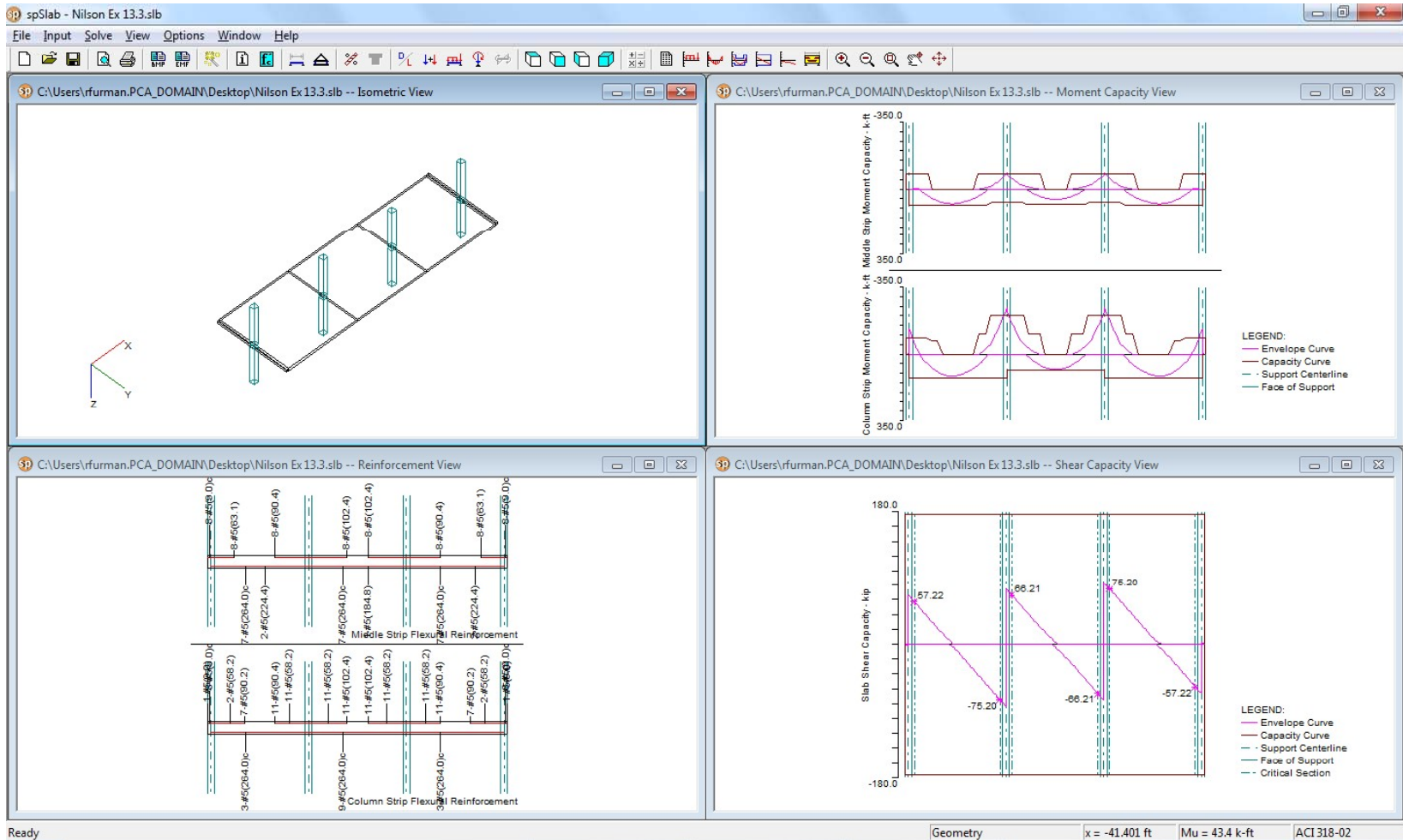
File Edit Format View Help

spColumn.exe /i:"Examples\example01.col" /dxf /emf:all /iad /cti /csv
spColumn.exe /i:"Examples\example02.col" /dxf /emf:all /iad /cti /csv
spColumn.exe /i:"Examples\example03.col" /dxf /emf:all /iad /cti /csv
spColumn.exe /i:"Examples\example04.col" /dxf /emf:all /iad /cti /csv /stru
spColumn.exe /i:"Examples\example05.col" /dxf /emf:all /iad /cti /csv /stru
spColumn.exe /i:"Examples\example06.col" /dxf /emf:all /iad /cti /csv
spColumn.exe /i:"Examples\example07.col" /dxf /emf:all /iad /cti /csv
spColumn.exe /i:"Examples\example08.col" /dxf /emf:all /iad /cti /csv
spColumn.exe /i:"Examples\example09.col" /dxf /emf:all /iad /cti /csv
spColumn.exe /i:"Examples\example10.col" /dxf /emf:all /iad /cti /csv
spColumn.exe /i:"Examples\example11.col" /dxf /emf:all /iad /cti /csv
spColumn.exe /i:"Examples\example12.col" /dxf /emf:all /iad /cti /csv
spColumn.exe /i:"Examples\example13.col" /dxf /emf:all /iad /cti /csv
spColumn.exe /i:"Examples\example14.col" /dxf /emf:all /iad /cti /csv
spColumn.exe /i:"Examples\example15.col" /dxf /emf:all /iad /cti /csv
spColumn.exe /i:"Examples\example16.col" /dxf /emf:all /iad /cti /csv
spColumn.exe /i:"Examples\example17.col" /dxf /emf:all /iad /cti /csv
spColumn.exe /i:"Examples\example18.col" /dxf /emf:all /iad /cti /csv
spColumn.exe /i:"Examples\example19.col" /dxf /emf:all /iad /cti /csv
spColumn.exe /i:"Examples\example20.col" /dxf /emf:all /iad /cti /csv /stru
```

# CTI Files



```
example01.cti - Notepad
File Edit Format View Help
#spColumn Text Input (CTI) File
[spColumn Version]
4.600
[Project]
spColumn Manual Example 1
[Column ID]
PCANotes 6.4
[Engineer]
SP
[Investigation Run Flag]
15
[Design Run Flag]
9
[Slenderness Flag]
0
[User options]
0,0,4,0,0,0,0,0,0,0,0,0,2,-1,0,-1,4,2,0,5,0,0,0.000000,0,0,13
[Irregular options]
-2,0,0,1,0.790000,50.000000,50.000000,-50.000000,-50.000000,0.000000,0.000000,5.000000,5.000000
[Ties]
0,1,7
[Investigation Reinforcement]
4,2,0,0,5,5,5,5,1.500000,1.500000,1.500000,1.500000
[Design Reinforcement]
0,0,0,0,0,0,0,0,0.000000,0.000000,0.000000,0.000000
```





# Options



General Information

General Information | Span Control | Solve Options

Labels

Project:

Frame:

Engineer:

Options

Design code:

Reinforcement:

Run mode

Design

Investigation

Frame

No. of Supports:

Left cantilever  Right cantilever

Other

Distance location as ratio of span

Floor System

Two-Way

One-Way/Beam

OK Cancel Help

## Two-way systems

General Information

General Information | Span Control | Solve Options

Design Options

Live load pattern ratio:  %

Compression Reinforcement

User Slab Strip Widths

Decremental Reinf. Design

User Distribution Factors

Beam T-Section Design

One-way Shear In Drop Panels

Long. Bm. Supt. Design

Distribute Shear to Slab Strips

Trans. Bm. Supt. Design

Critical section for punching shear

Ignore side on a free edge if within  times the slab thickness from the face of the support.

Deflection calculation options

Sections to use in deflection calculations are

Gross (uncracked)  Effective (cracked)

In negative moment regions, to calculate  $I_g$  and  $M_{cr}$  use

Rectangular Section  T-Section

Calculate long-term deflections

Duration of load  months

Sustained part of live load  %

OK Cancel Help

## One-way systems

General Information

General Information | Span Control | Solve Options

Design Options

Live load pattern ratio:  %

Compression Reinforcement

User Slab Strip Widths

Decremental Reinf. Design

User Distribution Factors

Effective flange width

Rigid beam-column joint

Moment Redistribution

Torsion Analysis and Design

Torsion type

Equilibrium  No

Compatibility  Yes

Stirrups in flanges

No  Yes

Deflection calculation options

Sections to use in deflection calculations are

Gross (uncracked)  Effective (cracked)

In negative moment regions, to calculate  $I_g$  and  $M_{cr}$  use

Rectangular Section  T-Section

Calculate long-term deflections

Duration of load  months

Sustained part of live load  %

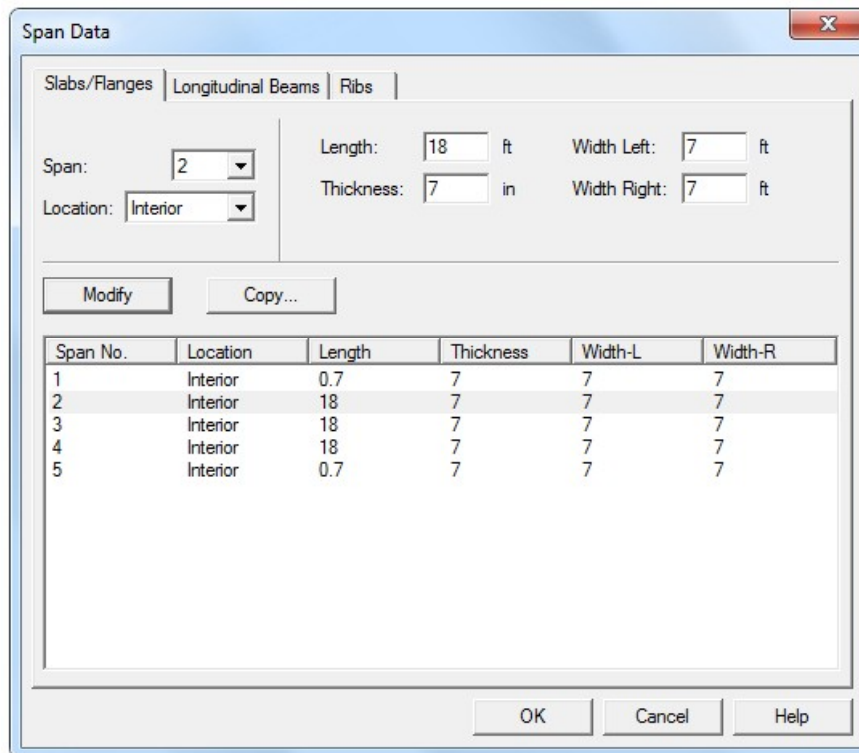
OK Cancel Help



# Span Data



## ■ Defining Spans

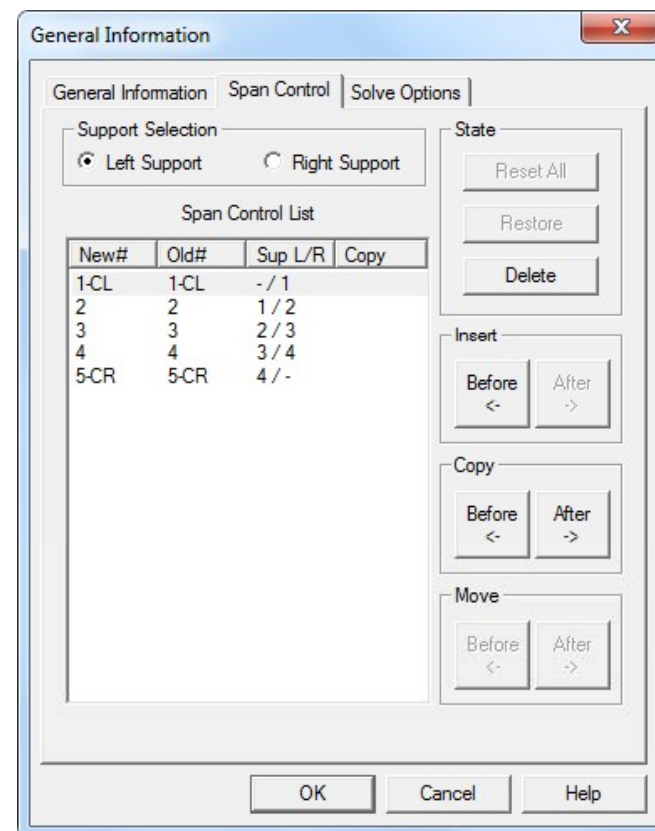


Span Data dialog box showing configuration for Slabs/Flanges, Longitudinal Beams, and Ribs. The current span is 2, located in the Interior, with a length of 18 ft, thickness of 7 in, and width of 7 ft on both sides.

Span: 2 | Length: 18 ft | Width Left: 7 ft  
Location: Interior | Thickness: 7 in | Width Right: 7 ft

Span No.	Location	Length	Thickness	Width-L	Width-R
1	Interior	0.7	7	7	7
2	Interior	18	7	7	7
3	Interior	18	7	7	7
4	Interior	18	7	7	7
5	Interior	0.7	7	7	7

## ■ Span Manipulation



General Information dialog box showing support selection and span control options. The 'Left Support' radio button is selected.

Support Selection:  Left Support  Right Support

New#	Old#	Sup L/R	Copy
1-CL	1-CL	- / 1	
2	2	1 / 2	
3	3	2 / 3	
4	4	3 / 4	
5-CR	5-CR	4 / -	

# Support Data



## ■ Defining Supports

Support Data

Columns | Drop Panels | Column Capitals | Transverse Beams | Boundary Conditions

Support: 1

Stiffness share %: 100

Height (ft): Above: 9, Below: 9

c1 (in): 16

c2 (in): 16

Check punching shear around column  Increase GammaF

Modify Copy...

Sup. No.	Stiff%	HtA	c1A	c2A	HtB	c1B	c2B	Shear	Gamma
1	100	9	16	16	9	16	16	Yes	No
2	100	9	16	16	9	16	16	Yes	No
3	100	9	16	16	9	16	16	Yes	No
4	100	9	16	16	9	16	16	Yes	No

OK Cancel Help

## ■ Boundary Conditions

Support Data

Columns | Drop Panels | Column Capitals | Transverse Beams | Boundary Conditions

Support: 1

Support Springs

Vertical Kz: 0 kip/in

Rotation Kry: 0 kip-in/rad

Far End

Column Above: Fixed

Column Below: Fixed

Modify Copy...

Sup. No	Kz	Kry	Far End - Above	Far End - Below
1	0	0	Fixed	Fixed
2	0	0	Fixed	Fixed
3	0	0	Fixed	Fixed
4	0	0	Fixed	Fixed

OK Cancel Help

# Reinforcement



## ■ Design

Reinforcement Criteria

Slabs and Ribs | Beams

	Top bars	Bottom bars
Cover (in)		
Clear:	1.5	1.5
Bar size		
Min:	#4	#4
Max:	#4	#4
Spacing (in)		
Min:	1	1
Max:	10	10
Reinf. ratio (%)		
Min:	0.18	0.18
Max:	2	2

There is more than 12 in of concrete below top bars.

OK Cancel Help

## ■ Investigation

Reinforcing Bars

Column Strip Bars | Middle Strip Bars | Beam Bars | Beam Stirrups

Span 1  
Span 2  
Span 3  
Span 4  
Span 5

Bar size: #5 No. of bars: 11 Length (ft): 7.5311

Top left Cover (in): 1.125

Span = 22 ft

Span Copy... Add Modify Delete

Size	Type	Count	Cover	Length	Start
#5	TopL	11	1.125	7.53112	--
#5	TopL	11	1.125	4.8506	--
#5	TopR	7	1.125	7.51534	--
#5	TopR	2	1.125	4.8506	--
#5	BotC	13	1.125	--	--

OK Cancel Help

# Loads



**Load Combinations**

SELF: 1.4    Dead: 1.4    Live: 0    Snow: 0    Wind: 0    EQ: 0

Add    Modify    Delete

Comb	SELF	Dead	Live	Snow	Wind	EQ
U1	1.4	1.4	0	0	0	0
U2	1.2	1.2	1.6	0.5	0	0
U3	1.2	1.2	1	1.6	0	0
U4	1.2	1.2	0	1.6	0.8	0
U5	1.2	1.2	0	1.6	-0.8	0
U6	1.2	1.2	1	0.5	1.6	0
U7	1.2	1.2	1	0.5	-1.6	0
U8	0.9	0.9	0	0	1.6	0
U9	0.9	0.9	0	0	-1.6	0
U10	1.2	1.2	1	0.2	0	1
U11	1.2	1.2	1	0.2	0	-1
U12	0.9	0.9	0	0	0	1
U13	0.9	0.9	0	0	0	-1

**Support Loads and Displacements**

Current Case: Dead    Support: 1    Displacement/Rotation: Dz: 1.5 in    Force/Moment: Fz: 0 kip

Live    Ry: 0 rad    My: 0 k-ft

Modify    Copy...

Supp No.	Dz	Ry	Fz	My
1	0	0	0	0
2	0	0	0	0
3	0	0	0	0

**Load Cases**

Label: SELF    Type: DEAD

Selfweight    Add    Modify    Delete

Label	Type
SELF	DEAD
Dead	DEAD
Live	LIVE
Snow	DEAD
Wind	LATERAL
EQ	LATERAL

OK    Cancel    Help

**Span Loads**

Current Case: Dead    Span: 1    Magnitude: 20    lb/ft<sup>2</sup>

Live    Type: Area Load

Span = 0.7 ft

Case Copy...    Add    Modify    Delete

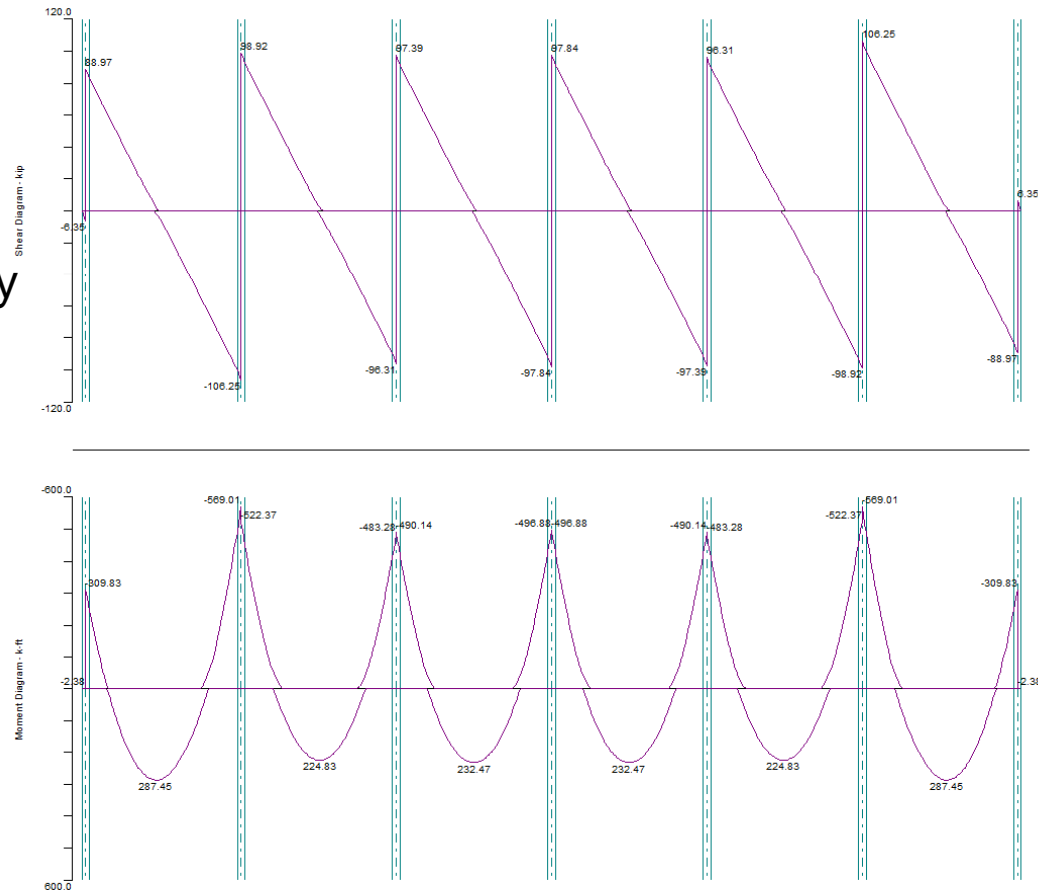
Span No.	Type	Wa	La	Wb	Lb
1	Area Load	20	-	-	-
2	Area Load	20	-	-	-
3	Area Load	20	-	-	-
4	Area Load	20	-	-	-
5	Area Load	20	-	-	-

OK    Cancel    Help

# Graphical Output



- Loads
- Internal Forces
- Moment Capacity
- Shear Capacity
- Deflections
- Reinforcement

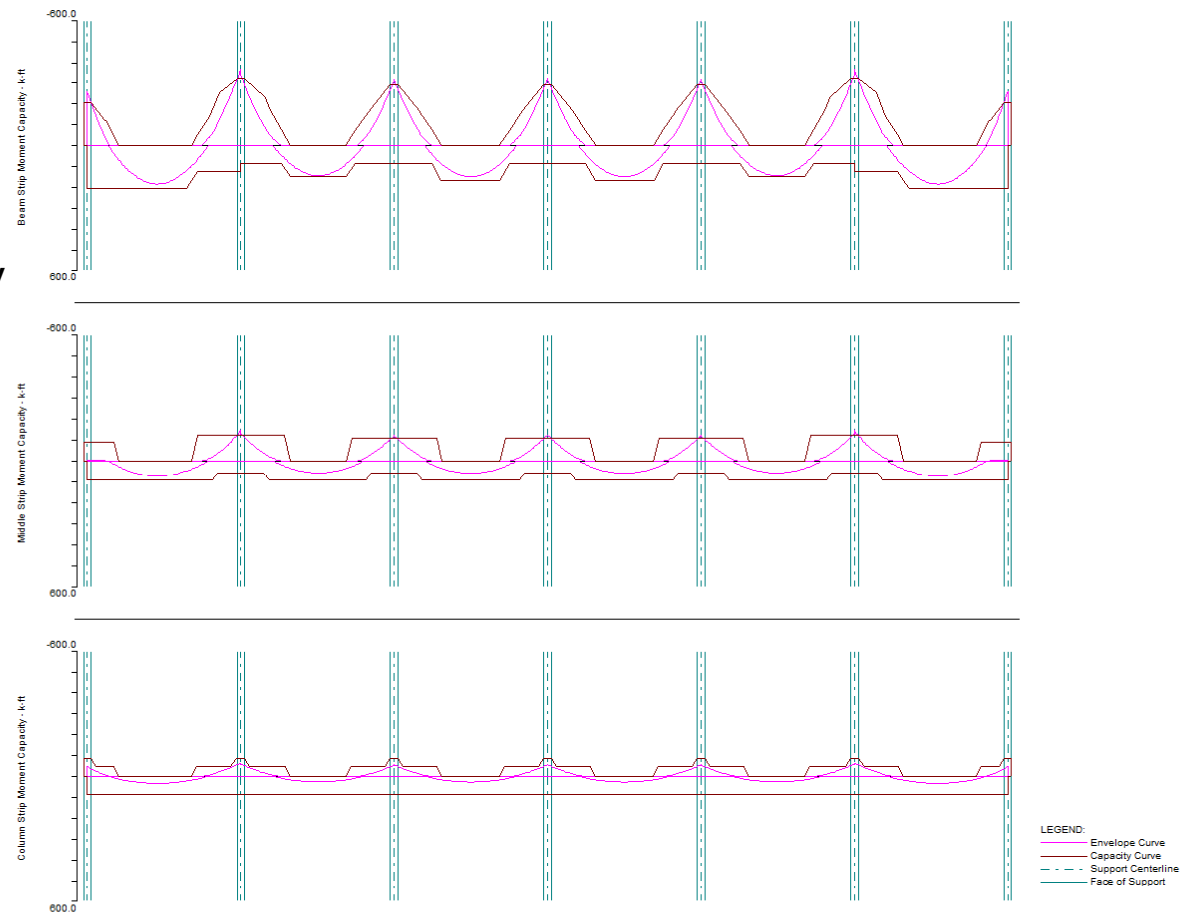


Internal Force Diagrams

# Graphical Output



- Loads
- Internal Forces
- Moment Capacity
- Shear Capacity
- Deflections
- Reinforcement

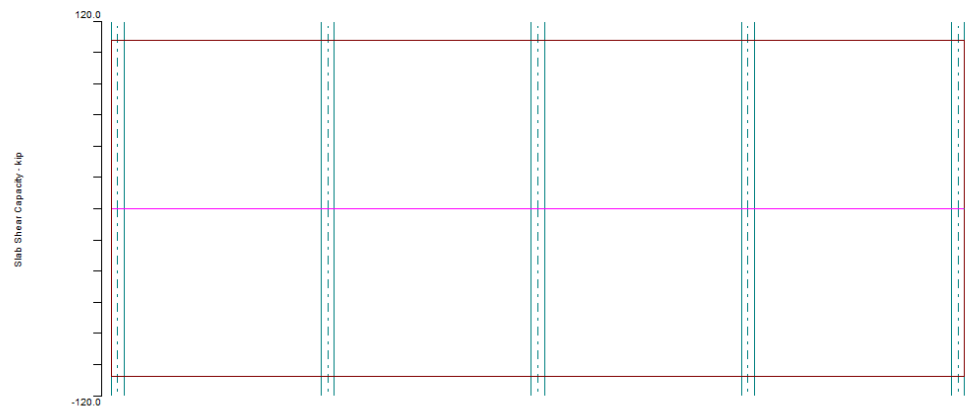
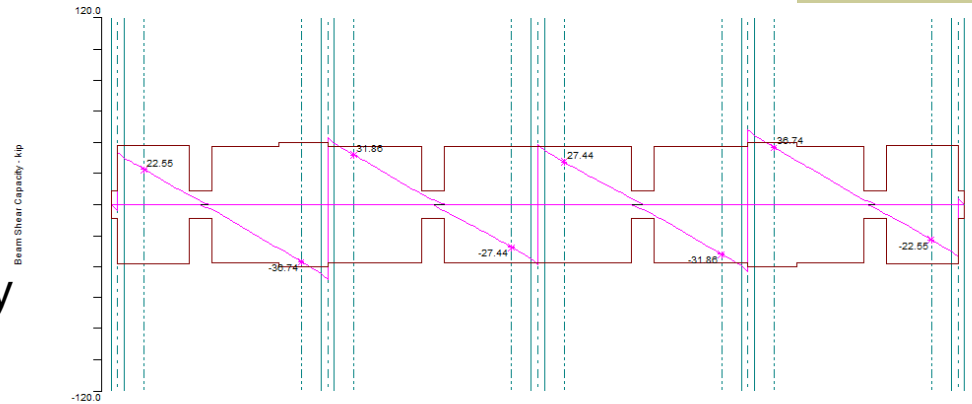


Moment Capacity Diagrams

# Graphical Output



- Loads
- Internal Forces
- Moment Capacity
- Shear Capacity
- Deflections
- Reinforcement



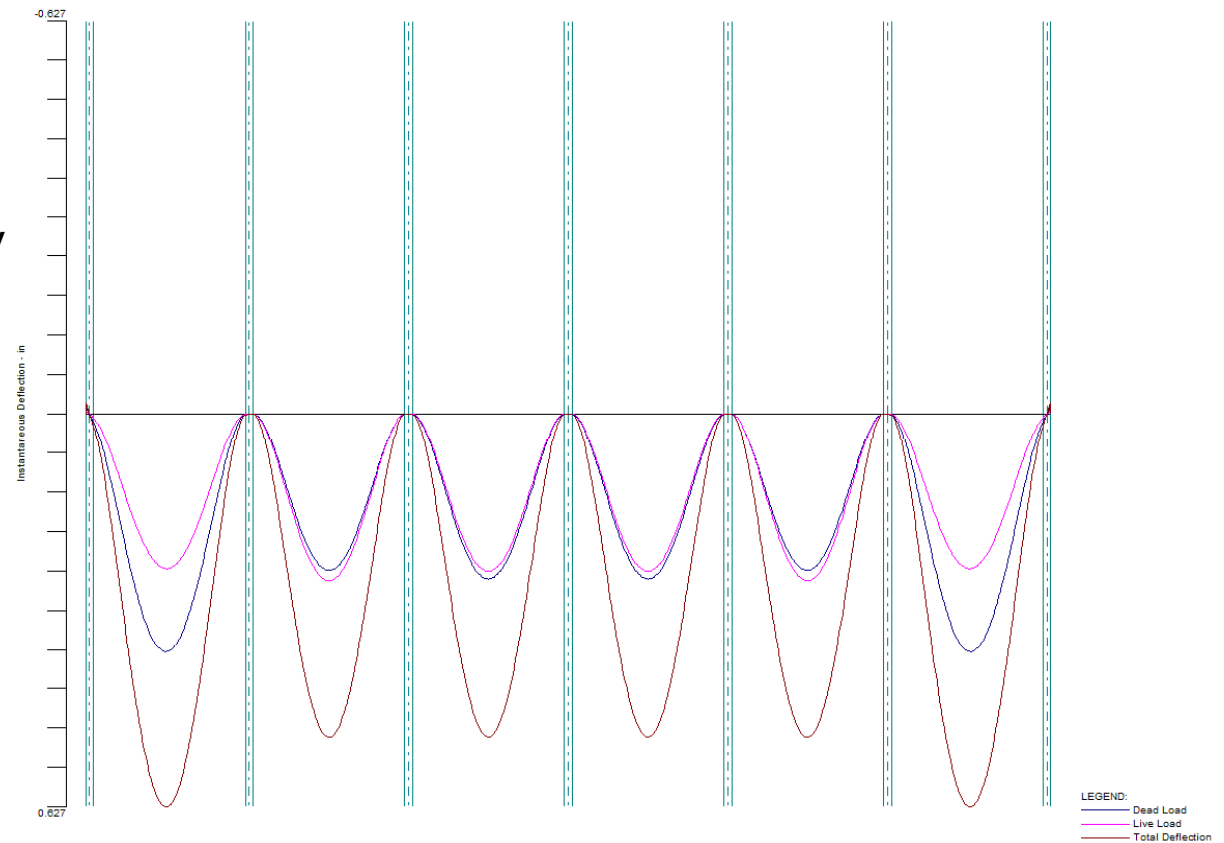
LEGEND:  
— Envelope Curve  
— Capacity Curve  
- - - Support Centerline  
- - - Face of Support  
- - - Critical Section

Shear Capacity Diagrams

# Graphical Output



- Loads
- Internal Forces
- Moment Capacity
- Shear Capacity
- Deflections
- Reinforcemet



Deflection Diagram



# Text Output



- Input Echo
- Design Results
- Column Forces
- Internal Forces
- Deflections

Results Report

Close Select All Copy Print... [2] Design Results 551 lines

Deflections

Section properties

Units: Ig, Icr, Ie (in<sup>4</sup>), Mcr, Mmax (k

Span	Dead			Dead+Live			Load Level			
	Ie,avg	Mmax	Zone	Ie,avg	Mmax	Zone	Mmax	Ie	Mmax	Ie
1	9333	9333	Right	9333	8345	36.89	-0.52	9333	-1.14	9333
2	20489	20338	Left	9333	8345	36.89	-30.61	9333	-66.92	8511
			Middle	25395	2625	63.14	27.19	25395	59.43	25395
3	20421	20348	Left	9333	8547	36.89	-58.35	8746	-127.56	8566
			Middle	9333	8547	36.89	-52.93	8913	-115.73	8573
4	20489	20338	Left	9333	8547	36.89	-58.35	8746	-127.56	8566
			Middle	25395	2625	63.14	27.19	25395	59.43	25395
5	9333	9333	Right	9333	8345	36.89	-30.61	9333	-66.92	8511
			Left	9333	8345	36.89	-0.52	9333	-1.14	9333

Maximum Instantaneous Deflections - Direction of Analysis

Units: D (in), Ig (in<sup>4</sup>)

Span	Frame			Strip	Ig	Strips				
	Ddead	Dlive	Dtotal			LDF	Ratio	Ddead	Dlive	Dtotal
1	-0.001	-0.001	-0.003	Column	20040.5	0.781	0.990	-0.001	-0.001	-0.003
				Middle	2862	0.219	1.943	-0.002	-0.003	-0.005
2	0.012	0.014	0.026	Column	20040.5	0.693	0.878	0.010	0.012	0.023
				Middle	2862	0.307	2.723	0.032	0.039	0.071
3	0.006	0.007	0.013	Column	20040.5	0.673	0.853	0.005	0.006	0.011
				Middle	2862	0.327	2.903	0.017	0.020	0.037
4	0.012	0.014	0.026	Column	20040.5	0.693	0.878	0.010	0.012	0.023
				Middle	2862	0.307	2.723	0.032	0.039	0.071
5	-0.001	-0.001	-0.003	Column	20040.5	0.781	0.990	-0.001	-0.001	-0.003
				Middle	2862	0.219	1.943	-0.002	-0.003	-0.005

Maximum Long-term Deflections - Direction of Analysis

Time dependant factor for sustained loads = 2.000

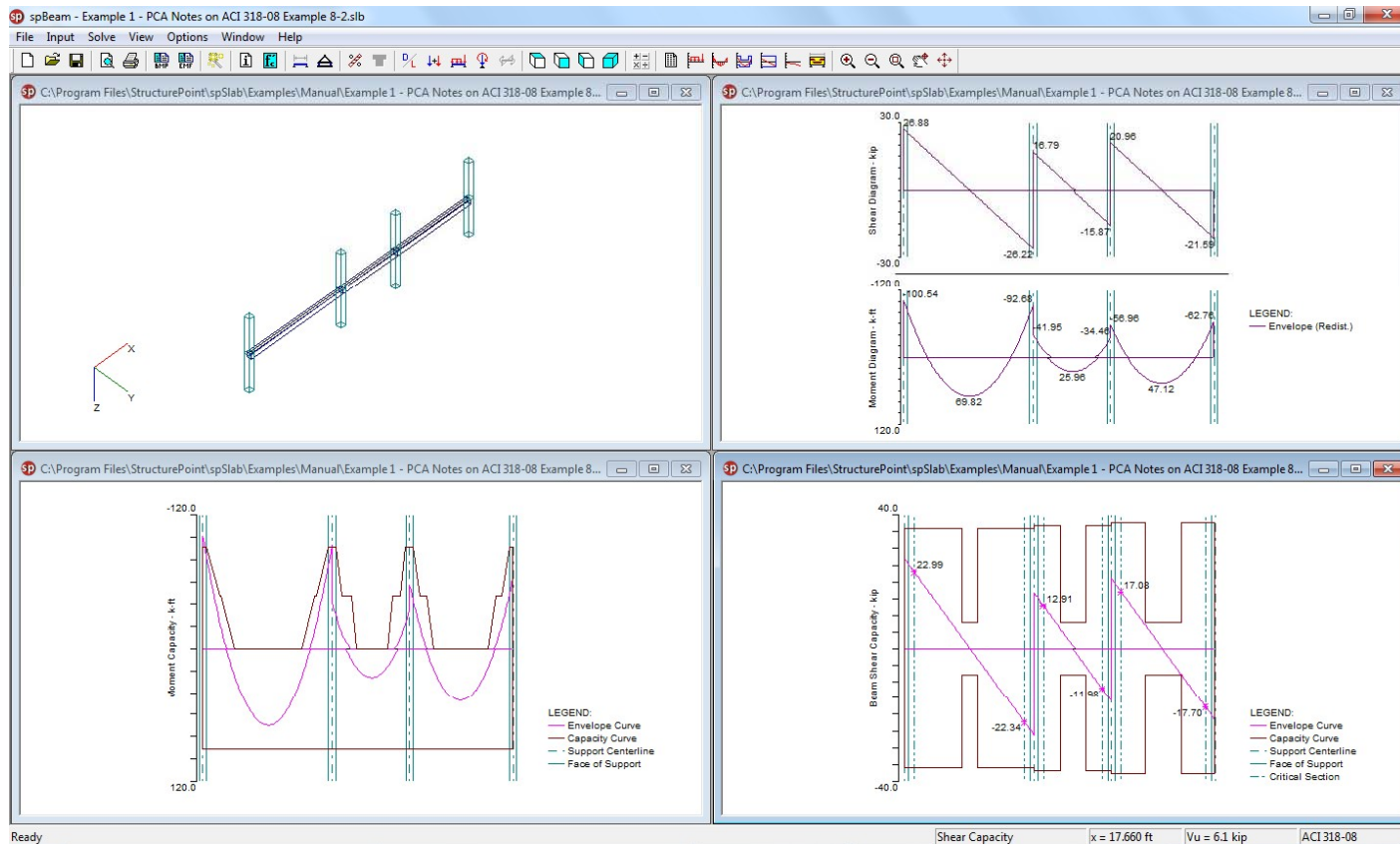
Units: D (in)

Span	Column Strip					Middle Strip						
	Dsust	Lambda	Dcs	Dcs+lu	Dcs+1	Dtotal	Dsust	Lambda	Dcs	Dcs+lu	Dcs+1	Dtotal
1	-0.001	2.000	-0.002	-0.004	-0.004	-0.005	-0.002	2.000	-0.005	-0.007	-0.007	-0.010
2	0.010	2.000	0.021	0.033	0.033	0.044	0.032	2.000	0.065	0.103	0.103	0.136
3	0.005	2.000	0.010	0.016	0.016	0.021	0.017	2.000	0.034	0.054	0.054	0.071
4	0.010	2.000	0.021	0.033	0.033	0.044	0.032	2.000	0.065	0.103	0.103	0.136
5	-0.001	2.000	-0.002	-0.004	-0.004	-0.005	-0.002	2.000	-0.005	-0.007	-0.007	-0.010

Material Takeoff

Reinforcement in the Direction of Analysis

- Analysis, design, and investigation of R/C beams and one-way slab systems



# Options



General Information

General Information | Span Control | Solve Options

Labels

Project: spSlab/spBeam Manual, Example 1

Frame: PCA Notes on ACI 318-08, Example 8-2

Engineer: StructurePoint

Options

Design code: ACI 318-08

Reinforcement: ASTM A615

Run mode

Design

Investigation

Frame

No. of Supports: 4

Left cantilever  Right cantilever

Floor System

One-Way/Beam

Other

Distance location as ratio of span

OK Cancel Help

General Information

General Information | Span Control | Solve Options

Design Options

Live load pattern ratio: 100 %

Compression Reinforcement

Decremental Reinf. Design

Effective flange width

Rigid beam-column joint

Moment Redistribution

Torsion Analysis and Design

Torsion type

Equilibrium

Compatibility

Stirrups in flanges

No

Yes

Deflection calculation options

Sections to use in deflection calculations are

Gross (uncracked)

Effective (cracked)

In negative moment regions, to calculate  $I_g$  and  $M_{cr}$  use

Rectangular Section

T-Section

Calculate long-term deflections

Duration of load

60 months

Sustained part of live load

0 %

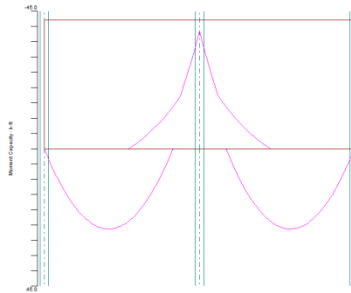
OK Cancel Help

# Moment Redistribution



For ACI 318-08, 05,  
and 02

$$\delta = \begin{cases} 0, & \text{if } s_t < 0.0075 \\ 1000s_t, & \text{if } s_t \geq 0.0075 \end{cases} \text{ or}$$

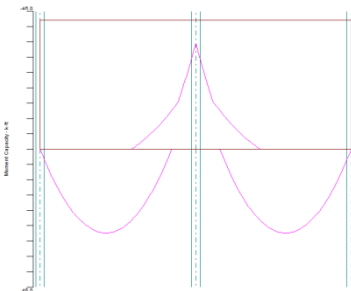


Top Reinforcement										
Units: Width (ft), Mmax (k-ft), Xmax (ft), As (in <sup>2</sup> ), Sp (in)										
Span Zone	Width	Mmax	Xmax	AsPrime	AsMin	AsMax	SpReq	AsReq	Bars	
1 Left	2.08	0.00	0.667	0.000	0.000	1.056	9.792	0.000	3-#5	*5
Middle	2.08	3.70	15.400	0.000	0.094	1.056	9.792	0.071	3-#5	*3 *5
Right	2.08	33.18	23.333	0.000	0.195	1.056	9.792	0.706	3-#5	
2 Left	2.08	33.18	0.667	0.000	0.195	1.056	9.792	0.706	3-#5	
Middle	2.08	3.70	8.600	0.000	0.094	1.056	9.792	0.071	3-#5	*3 *5
Right	2.08	0.00	23.333	0.000	0.000	1.056	9.792	0.000	3-#5	*5

NOTES:  
\*3 - Design governed by minimum reinforcement.  
\*5 - Number of bars governed by maximum allowable spacing.

For ACI 318-99

$$\delta = \begin{cases} 0, & \text{if } (\rho - \rho') > 0.5\rho_b \\ 20\left(\frac{\rho - \rho'}{\rho_b}\right), & \text{if } (\rho - \rho') \leq 0.5\rho_b \end{cases} \text{ or}$$



Moment Redistribution Factors							
Units: Org.Mu (k-ft)							
Supp	Side	Org.Mu	Iter.#	EpsilonT	Factor[%]	User Limit[%]	Applied Factor[%]
1	Right	0.00	0	0.00000	0.00	0.00	0.00
2	Left	33.18	5	0.00998	9.98	10.00	9.98
2	Right	33.18	5	0.00998	9.98	10.00	9.98
3	Left	0.00	0	0.00000	0.00	0.00	0.00

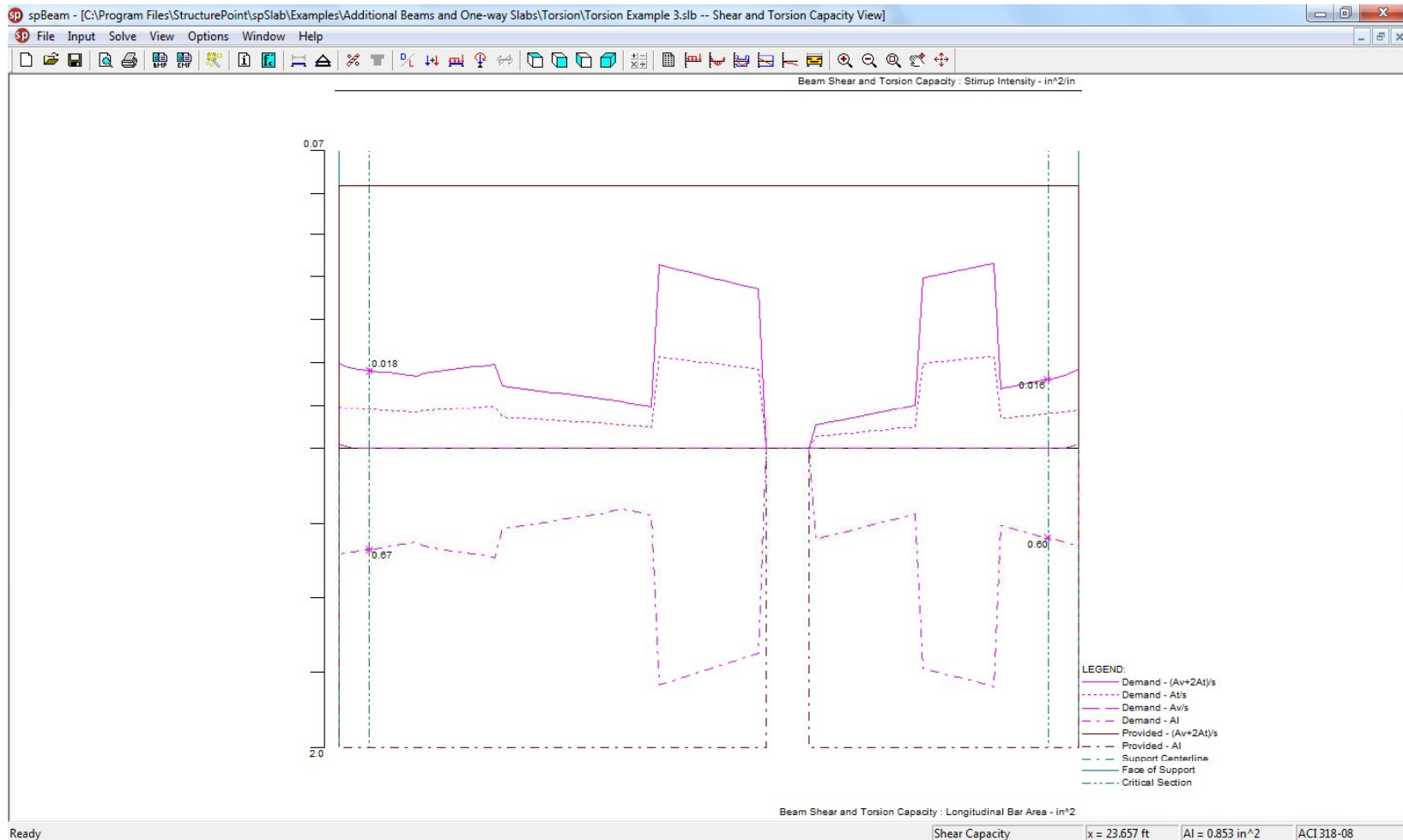
Top Reinforcement										
Units: Width (ft), Mmax (k-ft), Xmax (ft), As (in <sup>2</sup> ), Sp (in)										
Span Zone	Width	Mmax	Xmax	AsPrime	AsMin	AsMax	SpReq	AsReq	Bars	
1 Left	2.08	0.00	0.667	0.000	0.000	1.056	9.792	0.000	3-#5	*5
Middle	2.08	2.01	15.400	0.000	0.082	1.056	9.792	0.038	3-#5	*3 *5
Right	2.08	29.46	23.333	0.000	0.195	1.056	9.792	0.618	3-#5	*5
2 Left	2.08	29.46	0.667	0.000	0.195	1.056	9.792	0.618	3-#5	*5
Middle	2.08	2.01	8.600	0.000	0.082	1.056	9.792	0.038	3-#5	*3 *5
Right	2.08	0.00	23.333	0.000	0.000	1.056	9.792	0.000	3-#5	*5

NOTES:  
\*3 - Design governed by minimum reinforcement.  
\*5 - Number of bars governed by maximum allowable spacing.

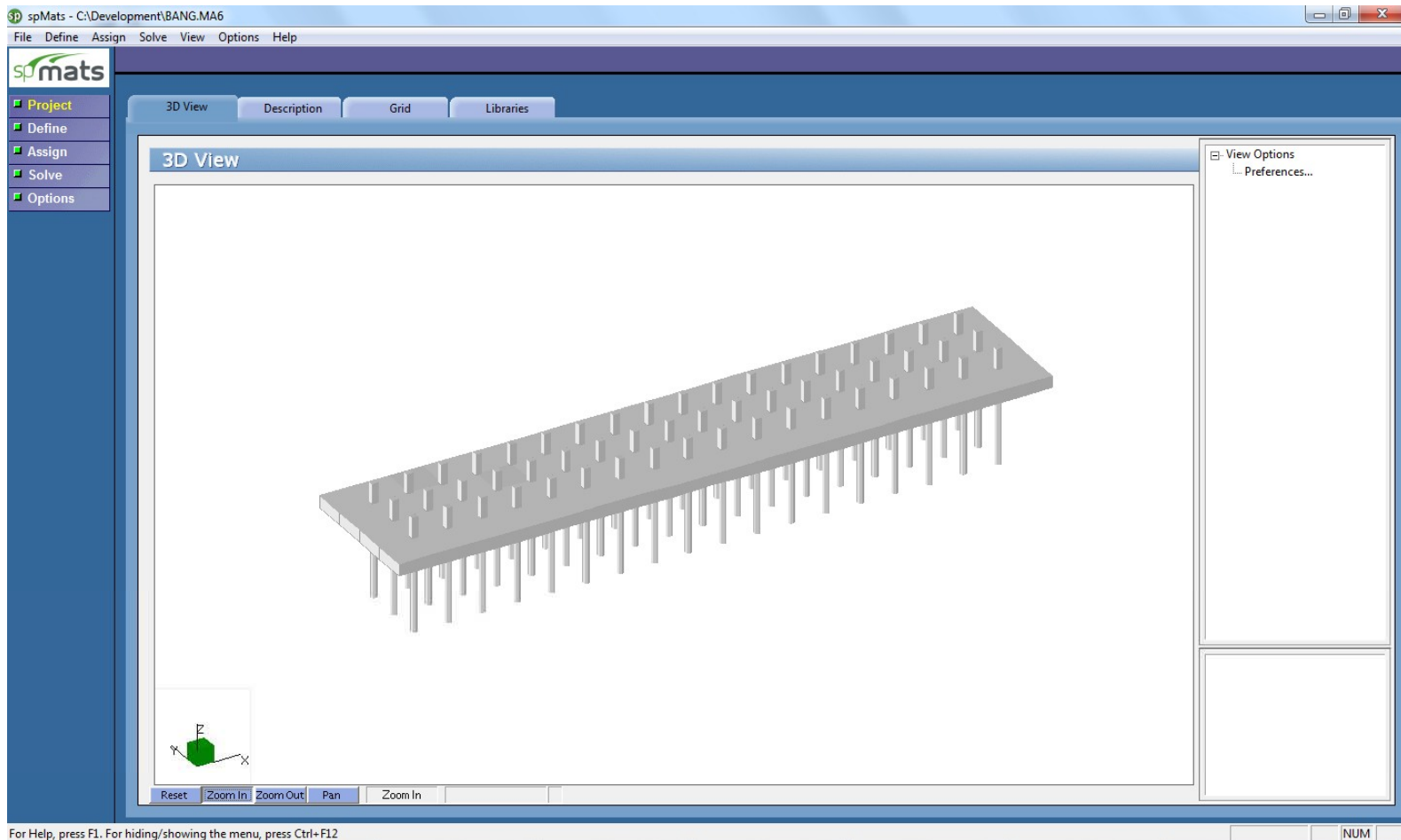
For CSA A23.3

$$\delta = 30 - 50\frac{c}{d}$$

# Shear and Torsion



# sp mats



# Meshing



sp Mats - c:\program files\structurepoint\sp mats\examples\example2.ma7, (Modified)

File Define Assign Solve View Options Help

Project  
Define  
Assign  
Solve  
Options

3D View Description Grid Libraries

### Grid

Define...  
Description...  
Set Up...  
Generate...  
Reset...  
Preferences  
X Grid  
Y Grid

Grid Setup

Grid Direction  
 X Direction  Y Direction

Edit Gridlines  
Coordinate (ft)  Add

Number	Coordinate
[1]	0.000 ft
[2]	2.000 ft
[3]	4.000 ft
[4]	6.000 ft
[5]	8.000 ft
[6]	10.000 ft
[7]	12.000 ft
[8]	14.000 ft
[9]	16.000 ft

Delete  
Modify  
Copy  
Reset

OK Cancel

DoubleClick for Setup

Reset Zoom In Zoom Out Pan Normal View X = 92.86, Y = 29.91 ft

Modified NUM



# Define Properties



Project Define Assign Solve Options

Properties Restraints Loads Load Combinations

### Soil

Label Subgrade modulus (ksf) Allowable pres.(ksf)

Soil1 50 6

Label	Subgrade Modulus - ks	Allowable Pressure -
Soil1	50.0000	6.00
Soil2	75.0000	8.00

Add Delete Modify

- Thickness
  - Thick1
  - Thick2
- Soil
  - Soil1
  - Soil2
- Concrete
  - Conc1
- Reinforcement
  - Steel1
- Design Parameters
  - DC\_1
- Column Dimensions
  - Column1

File Define Assign Solve View Options Help

sp mats

Project Define Assign Solve Options

Properties Restraints Loads Load Combinations

### Design Parameters

Label Min. Reinf. Ratio (% of Ag) X-Dir Y-Dir

DC\_1 0.18 Top Cover 3.25 3.5 in

Bottom Cover 3.25 3.5 in

Label	Ratio	Top Cover X	Top Cover Y	Bottom Cover X	Bottom Cover Y
DC_1	0.18..	3.2500	3.5000	3.2500	3.5000

Add Delete Modify

- Thickness
  - Thick1
  - Thick2
- Soil
  - Soil1
  - Soil2
- Concrete
  - Conc1
- Reinforcement
  - Steel1
- Design Parameters
  - DC\_1
- Column Dimensions
  - COL1

# Restraints



File Define Assign Solve View Options Help

sp mats

Project Define Assign Solve Options

Properties Restraints Loads Load Combinations

### Piles

Label: Pile 1 Spring Constant (k/ft): 776.177

Label	Type	Dim a	Dim b	Dim c	Dim d	Length	Spring Constant
Pile 1	Round	20.0000	0.0000	0.0000	0.0000	15.0000	776.1774


Buttons: Add, Edit

Add/Edit Pile

Label: Pile 1

Pile Type: Round

Pile Dimensions: Diameter d (in): 20, Length (ft): 15



Pile Material: Concrete, Mod. Elasticity (k/si): 3156, Select Soil: Soil1

Buttons: OK, Cancel

Nodal Springs  
Slaved Nodes  
WallRx1  
Piles  
Pile 1

Modified NUM

For Help, press F1. For hiding/showing the menu, press Ctrl+F12

# Defining Loads



Project | Define | Assign | Solve | Options

Properties | Restraints | Loads | Load Combinations

### Loads - Concentrated

Label: PD1    Pz (kips): -50    Mx (k-ft): 0    My (k-ft): 0    Load Case: A

Label	Pz	Mx	My	Case
PD1	-50.0000	0.0000	0.0000	A
PD2	-47.0000	0.0000	0.0000	A
PD3	-94.0000	0.0000	0.0000	A

Concentrated

- PD1
- PD2
- PD3
- PL1
- PL2
- PL3
- PW1
- PW2
- PW3
- PW4
- Surface

Add | Delete | Modify

Project | Define | Assign | Solve | Options

Properties | Restraints | Loads | Load Combinations

### Load Combinations

Label: S1    Save Results:     Level: Service

Case A: 1    Case B: 1    Case C: 0    Case D: 0    Case E: 0    Case F: 0

Label	A	B	C	D	E	F	Level	Save
S1	1.00	1.00	0.00	0.00	0.00	0.00	Service	Yes
S2	1.00	1.00	1.00	0.00	0.00	0.00	Service	Yes
S3	1.00	0.00	1.00	0.00	0.00	0.00	Service	Yes

Service

- S1
- S2
- S3
- Ultimate

Add | Delete | Modify | Options...

# Assign



spMats - c:\program files\structurepoint\spmats\examples\additional\slab with opening.ma7, (Modified)

File Define Assign Solve View Options Help

Project  
Define  
Assign  
Solve  
Options

Properties Restraints Loads

Grid

Thickness  
T1  
T2  
T3  
T4

Soil  
S1

Concrete  
C1

Reinforcement  
R1

Design Parameters  
DC\_1  
Column Dimensions

Label T1  
Value 12.0000 in

Reset Zoom In Zoom Out Pan Normal View X = 29.00, Y = -4.47 ft

For Help, press F1. For hiding/showing the menu, press Ctrl+F12

Modified NUM

# Solution



Run Solver View Results View Contours Reports

### Solver

Maximum number of iterations:

Maximum allowed displacement (in):

Minimum contact area (%):

Mat uplift occurs for positive nodal displacement exceeding (in):

Compute required reinforcement based on:
   
 Maximum moment within an element
   
 Average moment within an element

Run Solver View Results View Contours Reports

### Reports

Print to:

Input Echo:
   
 Title Page  Nodes  Definitions  Elements

Nodes:
   
 All From:  To:

Elements:
   
 All From:  To:

Combinations:
   
 All

Results:
   
 Force Vector
   
 Displacement Vector
   
 Punching Shear

Ultimate:
   
 Element Nodal Moments

Service:
   
 Spring/Pile Disp & Reaction
   
 Element Disp & Pressure

Envelopes:
   
 Nodal Displacements
   
 Spring/Pile Disp & Reaction
   
 Element Disp & Pressure
   
 Element Top Moment

Element Bot Moment
   
 Design Moment & Steel-Top
   
 Design Moment & Steel-Bot

Run Solver View Results View Contours Reports

### View Results

Data range:
   
 Display all results  Only from  to:

Envelope - Design Moment & Steel - Bot

C5b - ELEMENT BOTTOM DESIGN MOMENT AND REINFORCEMENT:

Units --> Moment (kip-ft/ft), As (in<sup>2</sup>/ft)

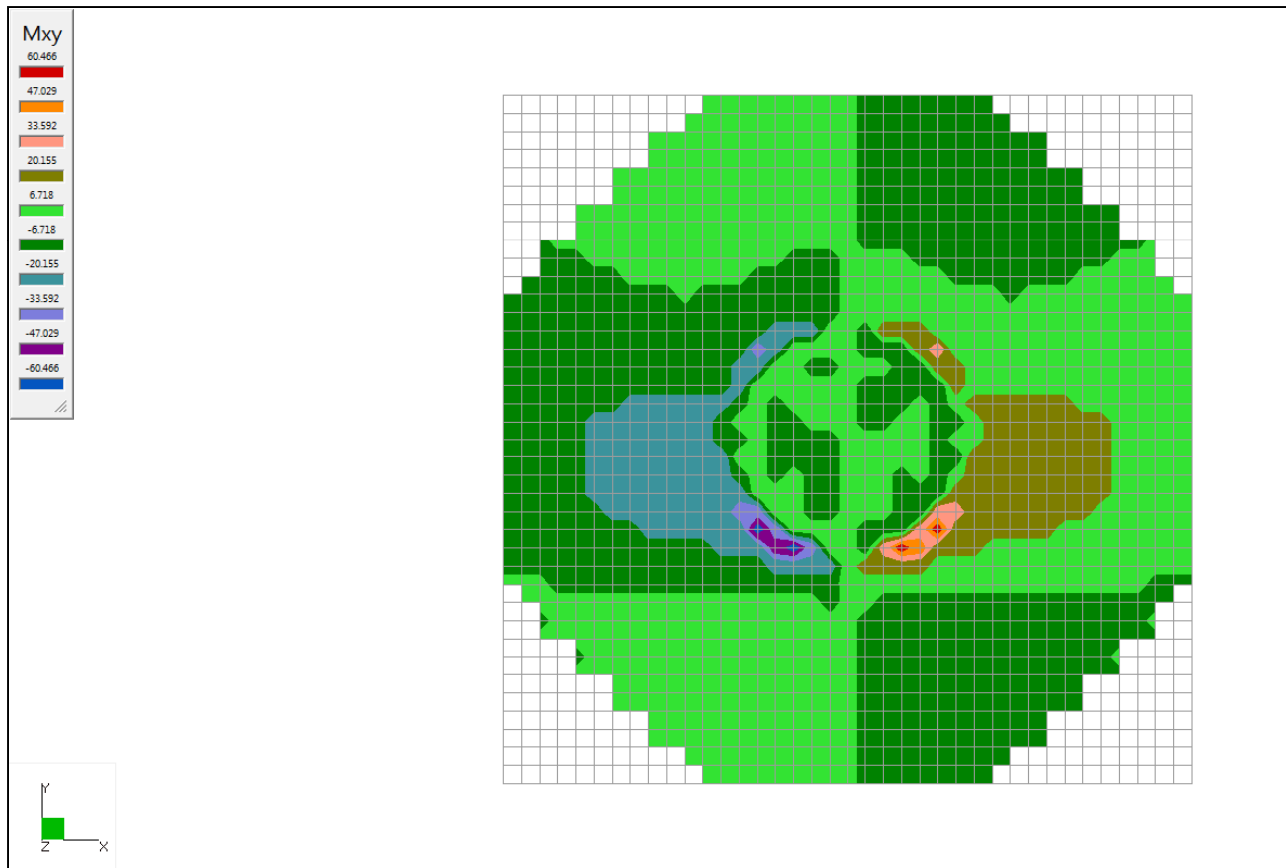
Flags --> [m] Minimum controls. [x] Exceeds maximum. [\*] Cannot...

Elem	Node	Ld	Comb.	Max. M(ux)	As(xx)	Node	Ld	Comb.	Max. M(uy)
1	26		U2	-33.59	0.518m	26	U2	-35.39...	
2	26		U5	-38.21	0.518m	26	U5	-41.09...	
3	3		U5	-13.51	0.518m	27	U2	-21.81...	
4	4		U5	-1.70	0.518m	28	U5	-16.88...	
5	6		-	0.00	0.518m	5	U5	-12.33...	
6	6		-	0.00	0.518m	6	U5	-9.84...	
7	7		-	0.00	0.518m	7	U5	-8.61...	

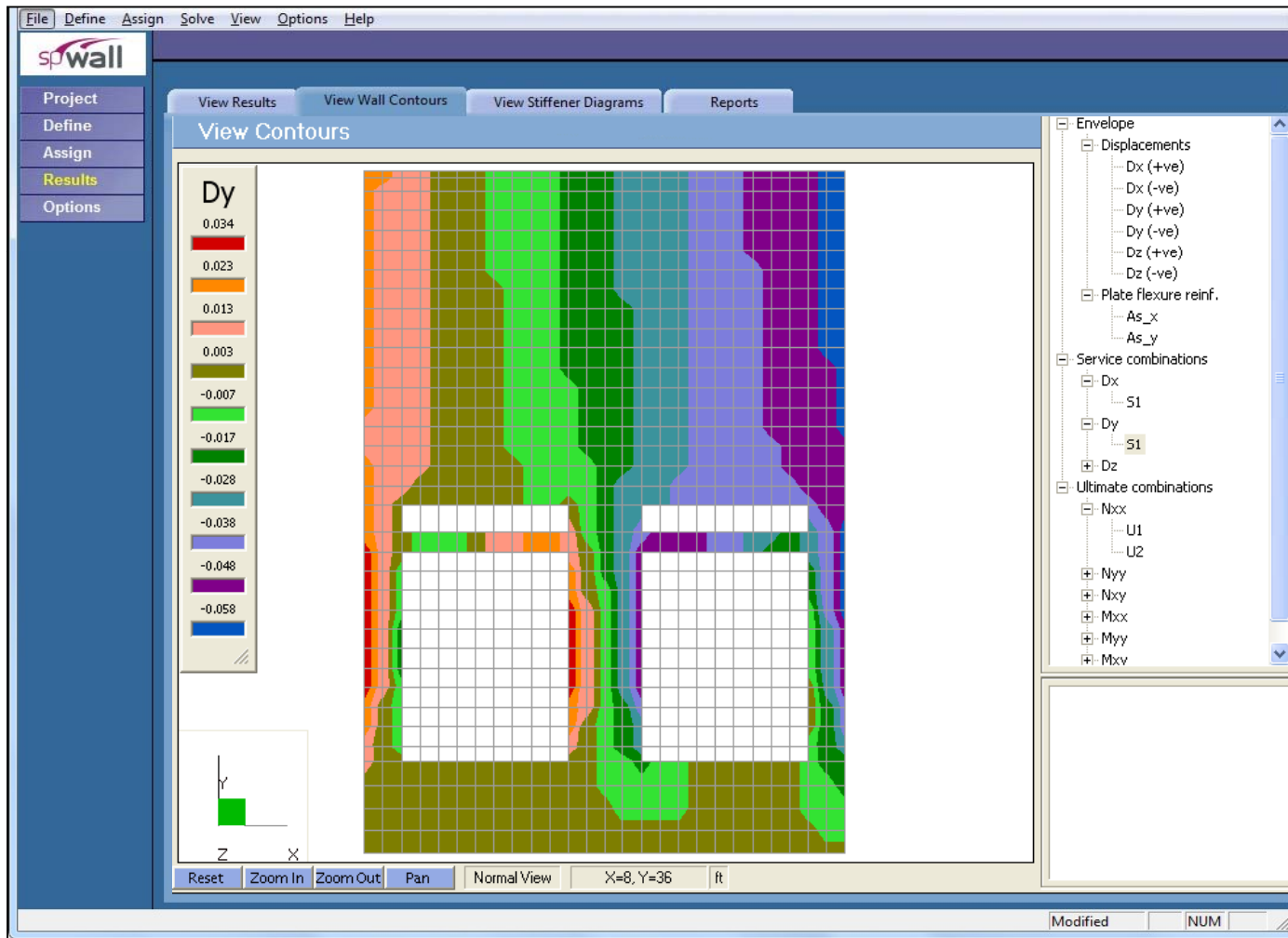
Envelope

- Nodal Displacements
- Spring/Pile Disp & Reaction
- Element Disp & Pressure
- Element Top Moment
- Element Bot Moment
- Design Moment & Steel - Top
- Design Moment & Steel - Bot
- Solver Messages
- Service
  - Force Vector
  - Displacement Vector
  - Spring/Pile Disp & Reaction
  - Element Disp & Pressure
  - Punching Shear
- Ultimate
  - Force Vector
  - Displacement Vector
  - Element Nodal Moments
  - Punching Shear

# Contours



# sp wall





# Define



Project | Define | Assign | Results | Options

Properties | Supports | Loads | Load Combinations

### Stiffener Section

Label: beam

Section (in):  
 Type: Rectangular  
 Width (in plane): 24  
 Height (out of plane): 30

Flange (in):  
 Projection: At the middle  
 Left: 0, Right: 0  
 Width: 0, 0  
 Thickness: 0, 0

Label	Type	Projection	Width/Dia.	Height	Flange W-L	Flange T-L	Flang
beam	Rectangular	At the middle	24.00	30.00	0.00	0.00	

Add | Delete | Modify

- Plate Thickness
- Stiffener Section
- Plate Cracking Coefficient
- Stiffener Cracking Coeff.
- Concrete
- Reinforcement
- Plate Design Criteria
- Stiffener Design Criteria

Project | Define | Assign | Results | Options

Properties | Supports | Loads | Load Combinations

### Plate Cracking Coefficients

Label: 24wall  
 In plane: 0.35  
 Out of plane: 0.35

Label	In plane	Out of pl...
24wall	0.350	0.350
8wall	1.000	1.000

Add | Delete | Modify

- Plate Thickness
- Stiffener Section
- Plate Cracking Coefficient
- Stiffener Cracking Coeff.
- Concrete
- Reinforcement
- Plate Design Criteria
- Stiffener Design Criteria

# Assign



spWall - C:\Program Files\StructurePoint\spWall\Examples\Additional\Load Bearing Wall with Stiffeners.wa3

File Define Assign Solve View Options Help

spWall

Project  
Define  
Assign  
Results  
Options

Properties Supports Loads

Concrete

- Plate Thickness
- Plate Cracking Coefficient
- Plate Concrete
- Plate Reinforcement
- Plate Design Criteria
- Stiffener Section
- Stiffener Cracking Coeff.
- Stiffener Concrete
- Concrete
  - Concrete
- Stiffener Reinforcement
- Stiffener Design Criteria

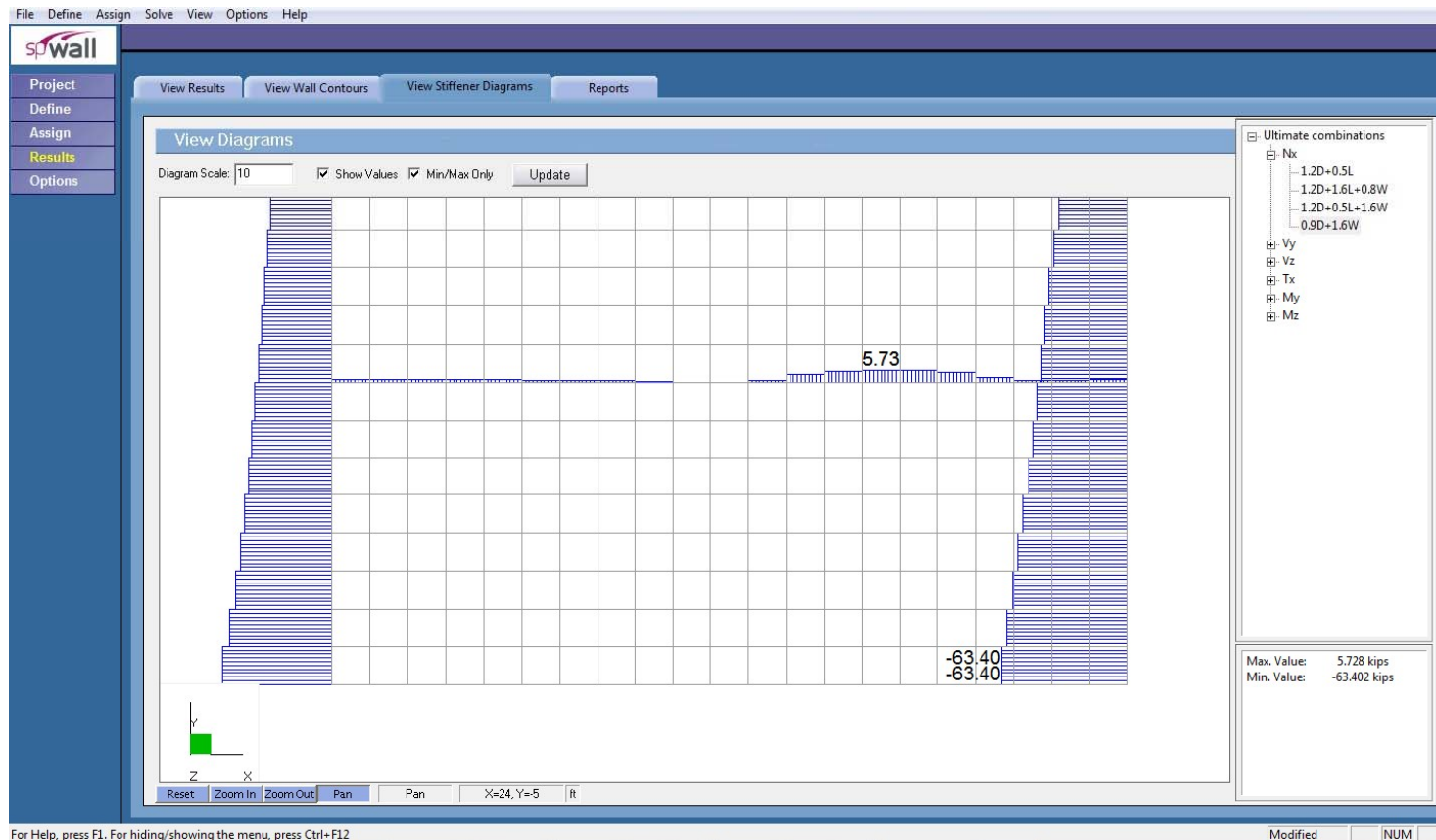
Label	Concrete
fc - Co...	4.0000 ksi
w - Unit ...	150.0000 pcf
Ec - You...	3834.2500 ksi
v - Poiss...	0.1500

Reset Zoom In Zoom Out Pan Normal View X = 57, Y = -7 ft

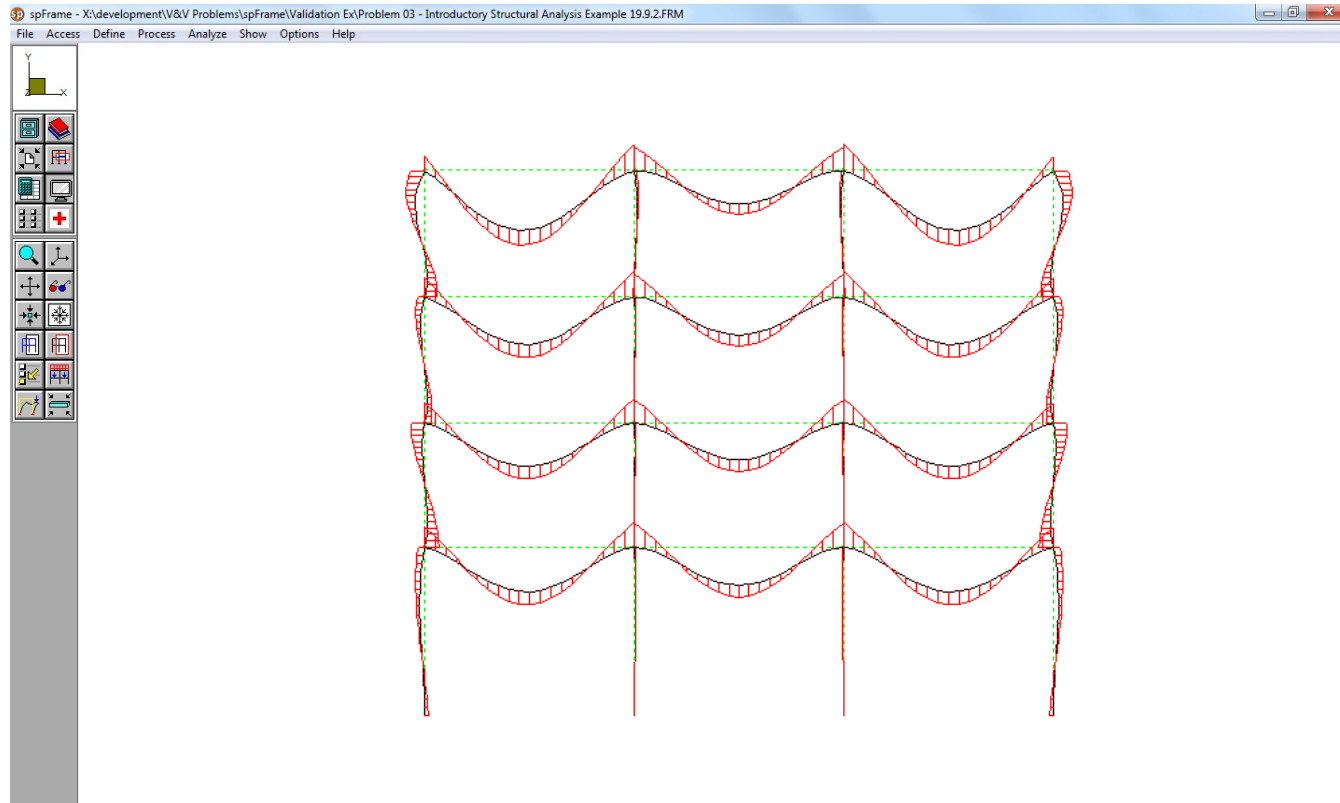
NUM

For Help, press F1. For hiding/showing the menu, press Ctrl+F12

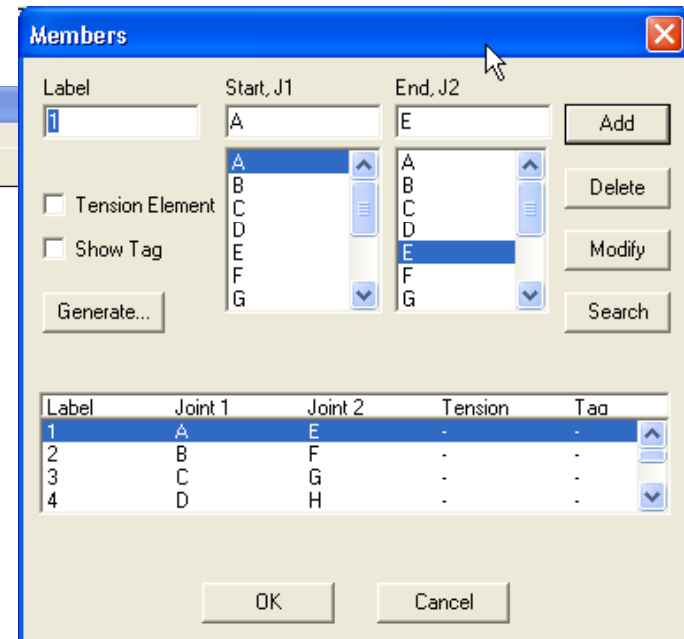
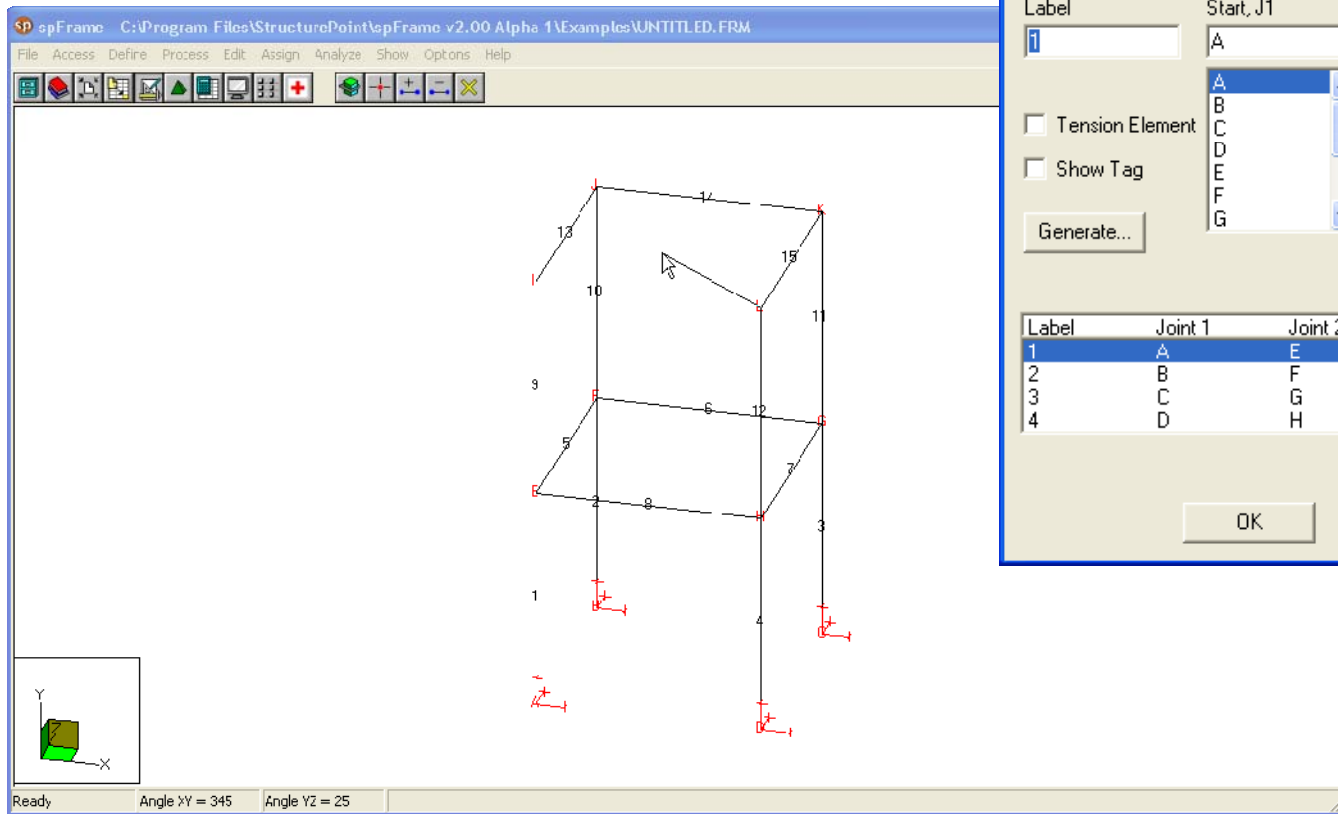
# Solution



- General purpose structural analysis of 2-D and 3-D structures subject to static loads



## ■ Creating the Model



## ■ Applying the Forces

**Member Loads**

Label:

Type:   
 Point Load   
 Distributed Load   
 Moment Load   
 Left Triangle   
 Right Triangle   
 Temperature

Intensity (W):  kN/m

Distance from J1/Length:

Load Length/Length:

Orientation:   
 Local   
 Global   
 Projection

Direction:   
 X   
 Y   
 Z

Label	O-D-T	Par1	Par2	Par3
Dist 1	L-Y-D	-5	0	1
Tria_1	L-Y-R	-10	0	0.75
P1	L-X-P	12	0	.
P2	L-X-P	20	0	.

**Known Displacements**

Load case:

Joint List: A, B, C, D, E, F

Dx:  mm Rx:  Rad

Dy:  mm Ry:  Rad

Dz:  mm Rz:  Rad

Joint	Dx	Dy	Dz	Rx	Ry	Rz
A	0	10	0	0	0	0

**Joint Loads**

Load case:

Joint List: A, B, C, D, E, F

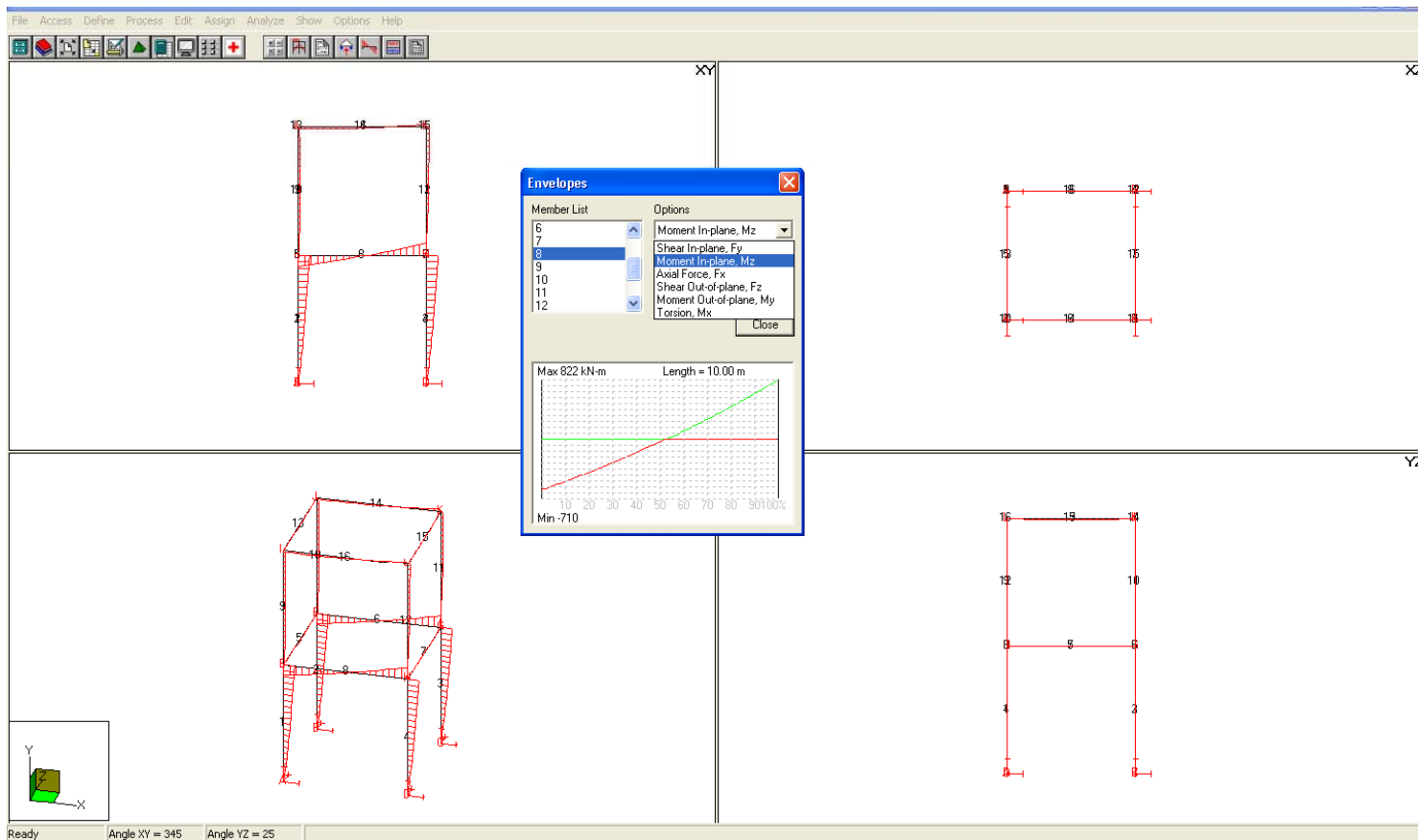
Fx:  kN Mx:  kN-m

Fy:  kN My:  kN-m

Fz:  kN Mz:  kN-m

Joint	Fx	Fy	Fz	Mx	My	Mz
F	10	0	0	0	0	0
E	10	0	0	0	0	0
I	15	0	0	0	0	0

## Viewing Results





# Structure Point

CONCRETE SOFTWARE SOLUTIONS

**Call: +1-847-966-4357**

**Email: [info@StructurePoint.org](mailto:info@StructurePoint.org)**