

COMPANY NAME AND ADDRESS	Project: VERIFICATION COMPARISON WITH PCACOL	Engineer: YP Date: 2/13/07	Project #
	Subject: CIRCULAR COLUMN	Checker: Date:	Page:
ShortCol Copyright © 2007			

Reinforced concrete column capacity

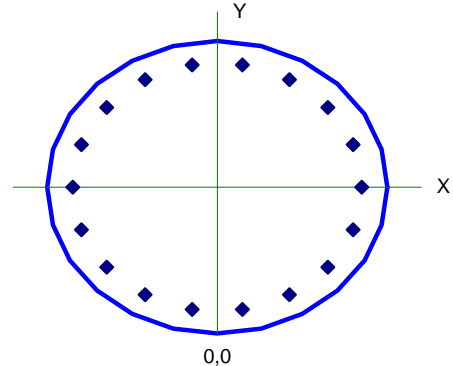
Materials:

Concrete $f'_c = 4$ ksi $E_c = 3,640$ ksi
 Steel $f_y = 60$ ksi $E_s = 29,000$ ksi
 Ultimate conc. strain $\epsilon_c = -0.003$

Design Code: ACI 318-05
 Resistance Factors $\phi_b = 0.9$ $\phi_c = 0.65$
 Confinement: Other

Section Properties:

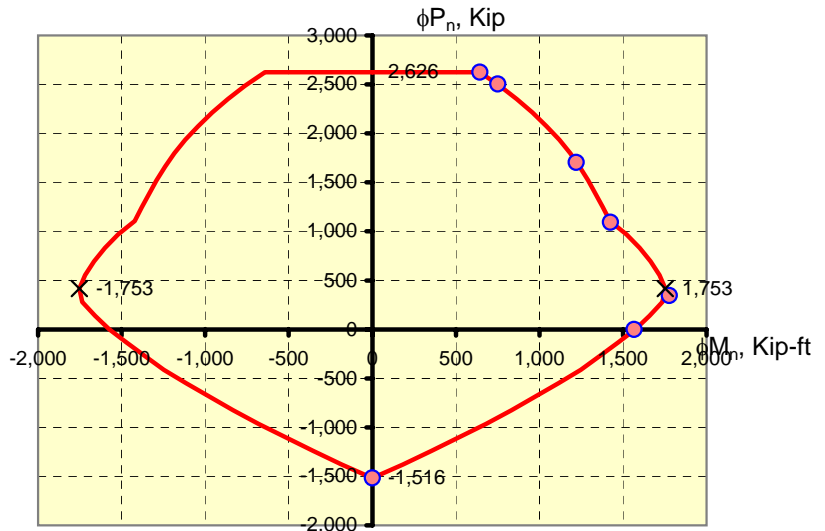
Diameter = 36 in
 $A_c = 1017.88$ in² $A_T = 1213.5$ in²
 $I_c = 82448$ in⁴ $I_T = 105316.1$ in⁴
 $Y_{bc} = 18$ in $Y_{bT} = 18.00$ in



Reinforcing bars:

Bar Area = 1.56 in²
 No. bars = 18 (< 100)
 $\Sigma(A_s) = 28.08$ in²
 $A_s/A_c = 2.76\%$
 Edge dist. = 2.71 in

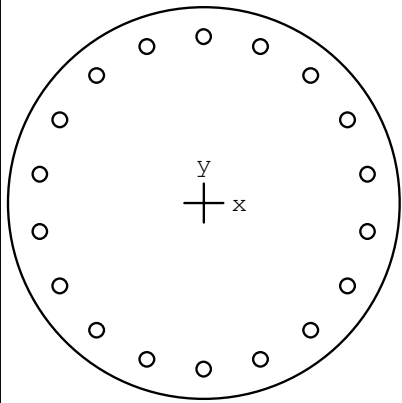
Axial Force/Bending Moment Interaction Diagram



Positive moment corresponds to tension in bottom fibers of the section
 Positive axial force is compressive force

Reinforcing Bar No.	Area A_s in ²	Coordinates, in	
		X (from ctr.)	Y (from bot.)
1	1.56	15.29	18.00
2	1.56	14.37	23.23
3	1.56	11.71	27.83
4	1.56	7.65	31.24
5	1.56	2.66	33.06
6	1.56	-2.66	33.06
7	1.56	-7.65	31.24
8	1.56	-11.71	27.83
9	1.56	-14.37	23.23
10	1.56	-15.29	18.00
11	1.56	-14.37	12.77
12	1.56	-11.71	8.17
13	1.56	-7.65	4.76
14	1.56	-2.66	2.94
15	1.56	2.66	2.94
16	1.56	7.65	4.76
17	1.56	11.71	8.17
18	1.56	14.37	12.77

Description	Factored Loads		Capacity	Demand/Capacity Ratio
	P_u kip	M_u kip-ft	ϕM_n kip-ft	
1	2626	645	643	100%
2	2504.5	751	746	101%
3	1704.7	1220	1221	100%
4	1094.2	1425	1431	100%
5	344	1777	1743	102%
6	0	1567	1572	100%
7	-1516	0	0	0%
8				
9				
10				



36 in diam.

Code: ACI 318-02

Units: English

Run axis: About X-axis

Run option: Investigation

Slenderness: Not considered

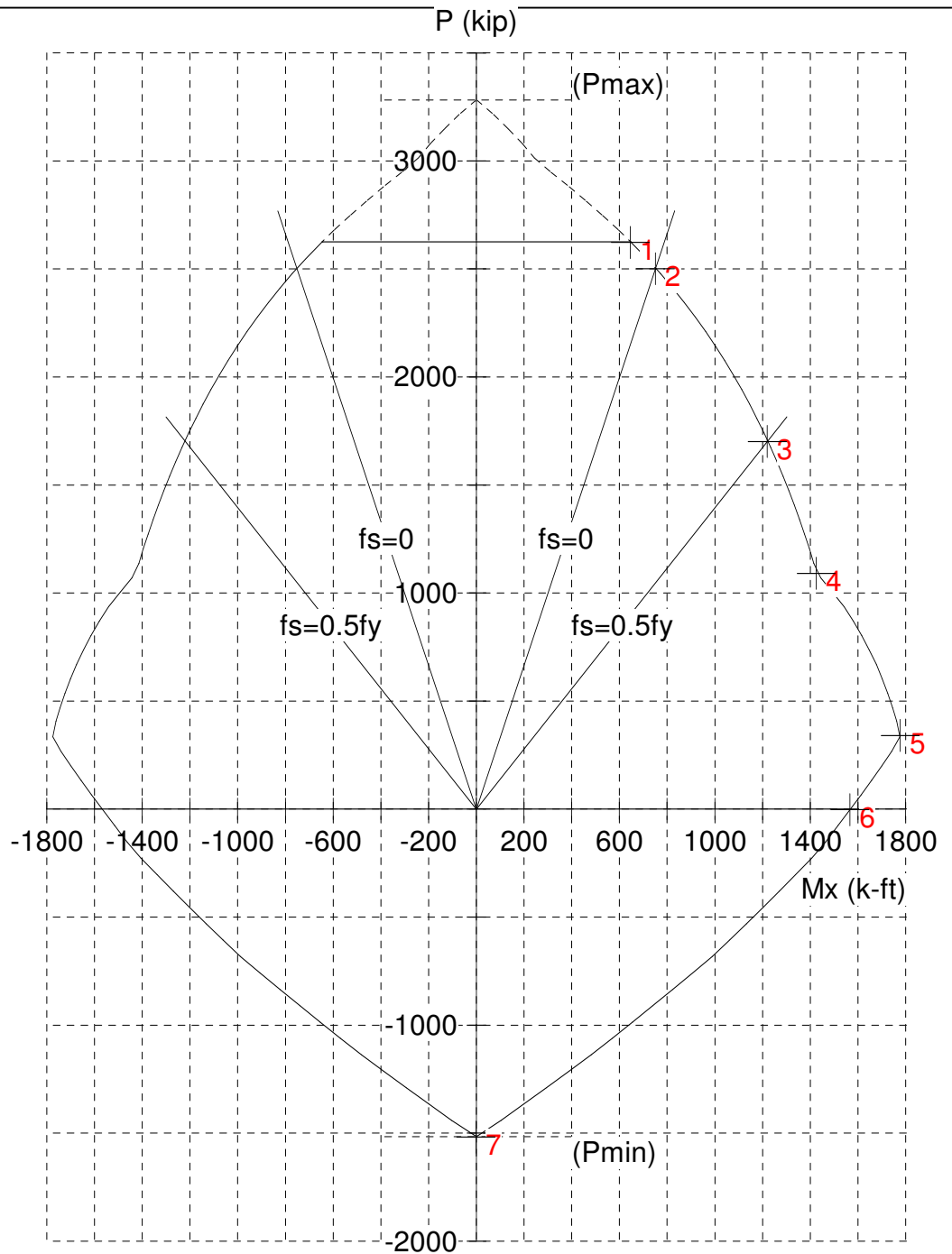
Column type: Structural

Bars: ASTM A615

Date: 02/09/07

Time: 09:19:22

PCACOL is updated for ACI 318-05 but erroneously indicates ACI 318-02



pcaColumn v3.64.

File: PCAcol_rect.col

Project: Verification of ShortCol

Column: Circular

$f'_c = 4$ ksi

$E_c = 3605$ ksi

$f_c = 3.4$ ksi

$e_u = 0.003$ in/in

Beta1 = 0.85

Confinement: Tied

$f_y = 60$ ksi

$E_s = 29000$ ksi

$f_c = 3.4$ ksi

$\phi(a) = 0.8, \phi(b) = 0.9, \phi(c) = 0.65$

Engineer:

$A_g = 1017.88$ in²

$A_s = 28.08$ in²

$X_o = 0.00$ in

$Y_o = 0.00$ in

Clear spacing = 3.90 in

18 #11 bars

Rho = 2.76%

$I_x = 82448$ in⁴

$I_y = 82448$ in⁴

Clear cover = 2.00 in

				pcacol_circ			
0.31	# 3	0.38	0.11	# 4	0.50	0.20	# 5 0.63
0.79	# 6	0.75	0.44	# 7	0.88	0.60	# 8 1.00
1.56	# 9	1.13	1.00	# 10	1.27	1.27	# 11 1.41
	# 14	1.69	2.25	# 18	2.26	4.00	

Confinement: Tied; #3 ties with #10 bars, #4 with larger bars.
 $\phi(a) = 0.8$, $\phi(b) = 0.9$, $\phi(c) = 0.65$

Layout: Circular
 Pattern: All Sides Equal (Cover to longitudinal reinforcement)
 Total steel area, $A_s = 28.08 \text{ in}^2$ at 2.76%
 18 #11 Cover = 2 in

Factored Loads and Moments with Corresponding Capacities: (see user's manual for notation)

No.	Pu kip	Mux k-ft	fMnx k-ft	fMn/Mu
1	2626.1	646.0	-----Pu > Pmax-----#	
2	2504.5	751.0	751.1	1.000
3	1704.7	1220.0	1220.0	1.000
4	1094.2	1425.0	1424.9	1.000
5	344.0	1777.0	1777.2	1.000
6	0.0	1567.0	1566.6	1.000#
7	-1516.0	0.0	0.3	999.999

#- Column section cannot resist applied loads
 $P_{max} = 2626.1 \text{ kips}$

*** Program completed as requested! ***

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=====
 Computer program for the Strength Design of Reinforced Concrete Sections
 =====

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General Information:

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=====
File Name: C:\Documents and Settings\pol yaky\My Documents\PCAcolum_rect.col
Project:  Verification of ShortColumn
Column:  Circular                               Engineer:
Code:    ACI 318-02                             Units:  English

Run Option: Investigation                       Slenderness: Not considered
Run Axis:   X-axis                             Column Type: Structural
    
```

Material Properties:

```

=====
f'c = 4 ksi           fy = 60 ksi
Ec = 3605 ksi        Es = 29000 ksi
Ultimate strain = 0.003 in/in
Beta1 = 0.85
    
```

Section:

```

=====
Circular:  Diameter = 36 in

Gross section area, Ag = 1017.88 in^2
Ix = 82448 in^4           Iy = 82448 in^4
Xo = 0 in                 Yo = 0 in
    
```

Reinforcement:

```

=====
Rebar Database: ASTM A615
Size Diam (in) Area (in^2)  Size Diam (in) Area (in^2)  Size Diam (in) Area
(in^2)
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```

COMPANY NAME AND ADDRESS	Project: VERIFICATION COMPARISON WITH PCACOL RESULTS	Engineer: YP Date: 2/13/07	Project #
ShortCol Copyright © 2007	Subject: RECTANGULAR SECTION WITH ASSYMETRICAL REINFORCEMENT	Checker: Date:	Page:

Reinforced concrete column capacity

Materials:

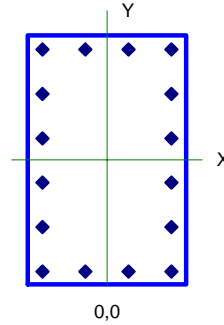
Concrete $f'_c = 4$ ksi $E_c = 3,640$ ksi
 Steel $f_y = 60$ ksi $E_s = 29,000$ ksi
 Ultimate conc. strain $\epsilon_c = -0.003$

Design Code: ACI 318-05

Resistance Factors $\phi_b = 0.9$ $\phi_c = 0.65$
 Confinement: Other

Section Properties:

Height = 48 in Width = 24 in
 $A_c = 1152$ in² $A_T = 1234.8$ in²
 $I_c = 221184$ in⁴ $I_T = 252493.3$ in⁴
 $Y_{bc} = 24$ in $Y_{bT} = 24.36$ in

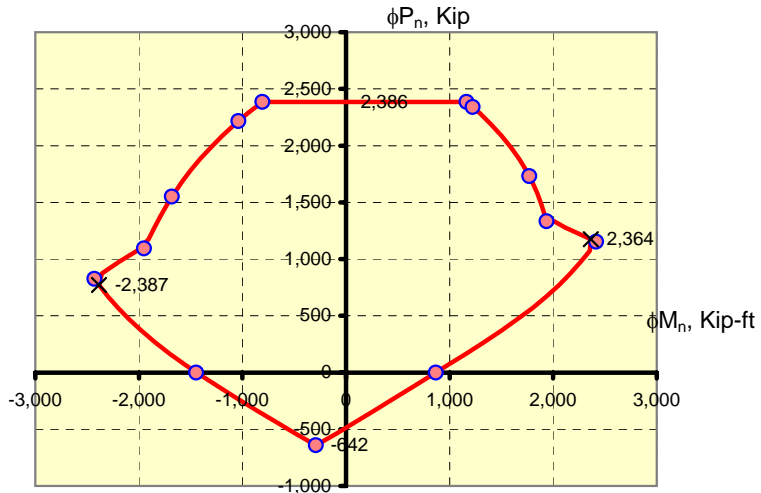


Reinforcing bars:

No. bars = 16 (< 100)
 $\Sigma(A_s) = 11.88$ in²
 $A_s/A_c = 1.03\%$

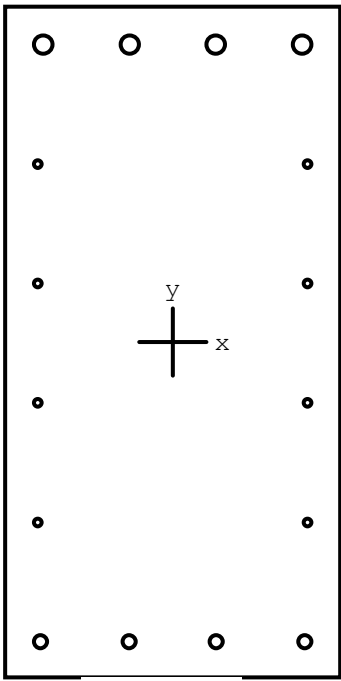
Reinforcing Bar No.	Area A_s in ²	Coordinates, in	
		X (from ctr.)	Y (from bot.)
1	0.79	-9.75	2.50
2	0.79	-3.25	2.50
3	0.79	3.25	2.50
4	0.79	9.75	2.50
5	0.31	-9.75	11.06
6	0.31	9.75	11.06
7	0.31	-9.75	19.62
8	0.31	9.75	19.62
9	0.31	-9.75	28.18
10	0.31	9.75	28.18
11	0.31	-9.75	36.74
12	0.31	9.75	36.74
13	1.56	-9.75	45.30
14	1.56	-3.25	45.30
15	1.56	3.25	45.30
16	1.56	9.75	45.30

Axial Force/Bending Moment Interaction Diagram



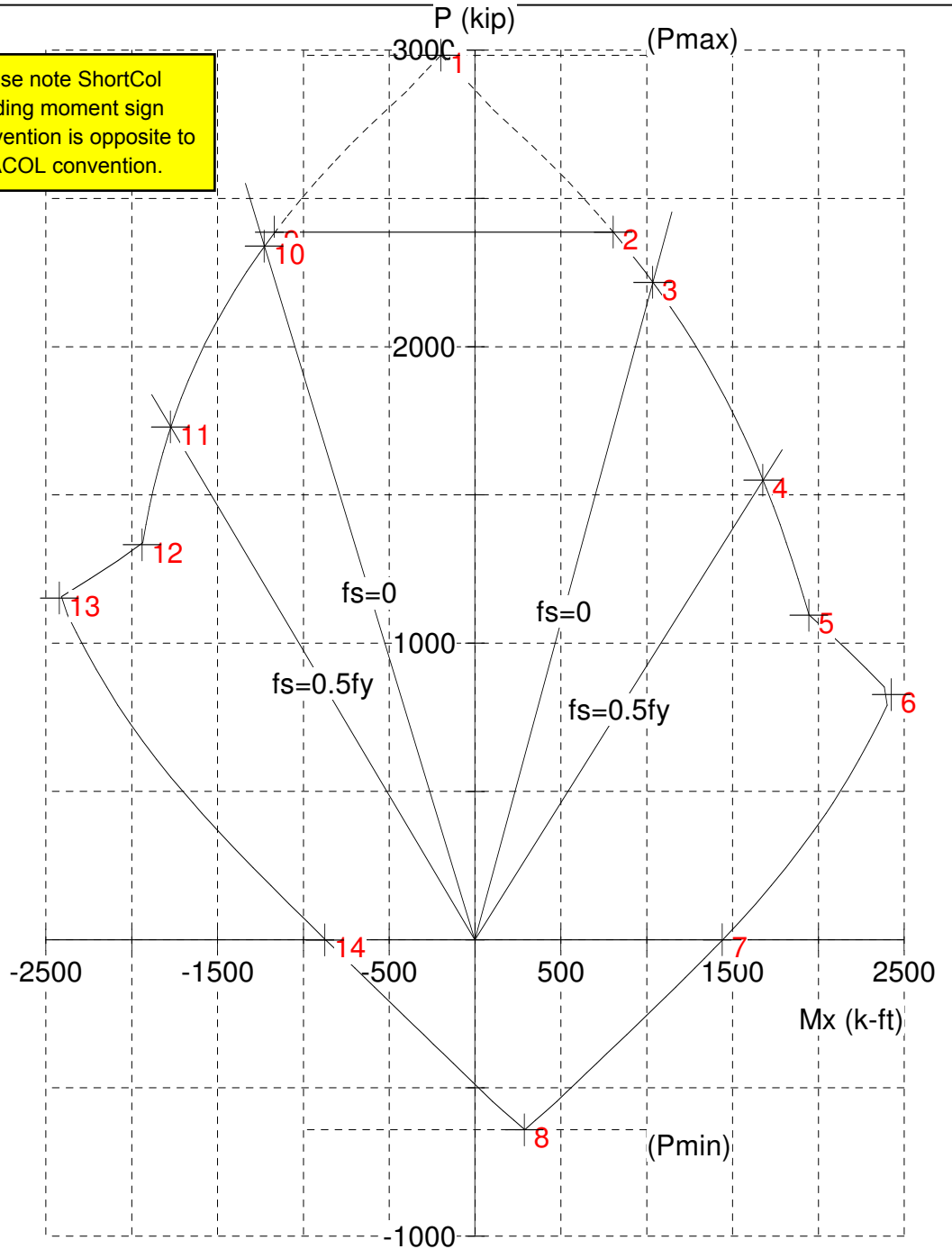
Positive moment corresponds to tension in bottom fibers of the section
 Positive axial force is compressive force

Description	Factored Loads		Capacity	Demand/ Capacity Ratio
	Pu kip	Mu kip-ft	ϕM_n kip-ft	
1	2386	-807	-808	100%
2	2216.8	-1038	-1037	100%
3	1549.7	-1680	-1680	100%
4	1094	-1948	-1997	98%
5	826.4	-2429	-2371	102%
6	0	-1445	-1444	100%
7	-641.5	-291	-291	100%
8	2386	1165	1165	100%
9	2339.2	1225	1223	100%
10	1729.5	1771	1770	100%
11	1332.4	1936.1	2010	96%
12	1153.4	2416.8	2362	102%
13	0	869.6	869	100%
14				



24 x 48 in

Please note ShortCol bending moment sign convention is opposite to PCACOL convention.



Code: ACI 318-02

Units: English

Run axis: About X-axis

Run option: Investigation

Slenderness: Not considered

Column type: Structural

Bars: ASTM A615

Date: 02/09/07

Time: 08:59:46

PCACOL is updated for ACI 318-05 but erroneously indicates ACI 318-02

pcaColumn v3.64.

File: untitled.col

Project: Verification of ShortCol

Column: Rectangular

$f'_c = 4$ ksi

$f_y = 60$ ksi

Engineer:

$A_g = 1152$ in²

16 bars

$E_c = 3605$ ksi

$E_s = 29000$ ksi

$A_s = 11.88$ in²

$Rho = 1.03\%$

$f_c = 3.4$ ksi

$f_c = 3.4$ ksi

$X_o = 0.00$ in

$I_x = 221184$ in⁴

$e_u = 0.003$ in/in

$Y_o = 0.00$ in

$I_y = 55296$ in⁴

Beta1 = 0.85

Clear spacing = 4.79 in

Clear cover = 2.00 in

Confinement: Tied

$\phi(a) = 0.8, \phi(b) = 0.9, \phi(c) = 0.65$

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00  00000  00  00  00000  00000  00000  (TM)
  
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 Computer program for the Strength Design of Reinforced Concrete Sections
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General Information:

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File Name: untitled.col
Project:  Verification of ShortCol
Column:  Rectangular
Code:    ACI 318-02
Engi neer:
Units:  English

Run Option:  Investigation
Run Axis:    X-axis
Slenderness: Not considered
Column Type: Structural
  
```

Material Properties:

=====

```

f'c = 4 ksi
Ec = 3605 ksi
Ultimate strain = 0.003 in/in
Beta1 = 0.85
fy = 60 ksi
Es = 29000 ksi
  
```

Section:

=====

```

Rectangular: Width = 24 in
Depth = 48 in

Gross section area, Ag = 1152 in^2
Ix = 221184 in^4
Xo = 0 in
Iy = 55296 in^4
Yo = 0 in
  
```

Reinforcement:

=====

```

Rebar Database: ASTM A615
Size Diam (in) Area (in^2)  Size Diam (in) Area (in^2)  Size Diam (in) Area
(in^2)
-----
  
```

	pcacol_rect_ouput							
0.31	# 3	0.38	0.11	# 4	0.50	0.20	# 5	0.63
0.79	# 6	0.75	0.44	# 7	0.88	0.60	# 8	1.00
1.56	# 9	1.13	1.00	# 10	1.27	1.27	# 11	1.41
	# 14	1.69	2.25	# 18	2.26	4.00		

Confinement: Tied; #3 ties with #10 bars, #4 with larger bars.
 phi (a) = 0.8, phi (b) = 0.9, phi (c) = 0.65

Layout: Rectangular

Pattern: Sides Different (Cover to longitudinal reinforcement)

Total steel area, $A_s = 11.88 \text{ in}^2$ at 1.03%

	Top		Bottom		Left		Right	
Bars	4	#11	4	# 8	4	# 5	4	# 5
Cover(in)		2		2		2		2

Factored Loads and Moments with Corresponding Capacities: (see user's manual for notation)

No.	Pu kip	Mux k-ft	fMnx k-ft	fMn/Mu
1	2386.0	807.0	807.9	1.001
2	2216.8	1038.0	1038.1	1.000
3	1549.7	1680.0	1680.4	1.000
4	1094.0	1948.0	1947.9	1.000
5	826.4	2429.0	2429.1	1.000
6	0.0	1445.0	1444.8	1.000#
7	-641.5	291.0	291.1	Minimum#
			291.1	Maximum
8	2386.0	-1165.0	-1165.3	1.000
9	2339.2	-1225.0	-1225.0	1.000
10	1729.5	-1771.0	-1770.6	1.000#
11	1332.4	-1936.0	-1936.1	1.000
12	1153.4	-2417.0	-2416.8	1.000#
13	0.0	-870.0	-869.6	0.999#

#- Column section cannot resist applied loads

*** Program completed as requested! ***