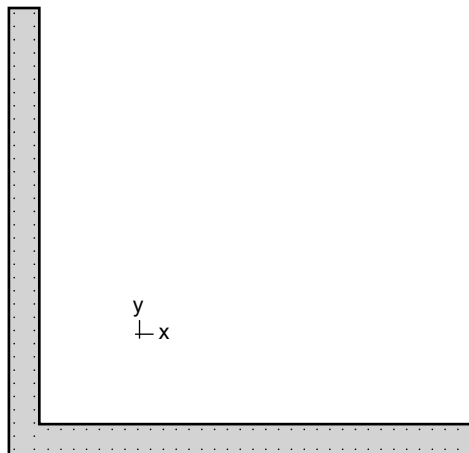




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## 1. General Information

File Name	c:\users\asus\documents\nitip najib\t... 16.col
Project	SW
Column	---
Engineer	BN
Code	ACI 318-14
Bar Set	ASTM 615M
Units	Metric
Run Option	Investigation
Run Axis	Biaxial
Slenderness	Not Considered
Column Type	Structural

## 2. Material Properties

### 2.1. Concrete

Type	Standard
$f_c$	30 MPa
$E_c$	25743 MPa
$f_c$	25.5 MPa
$\epsilon_u$	0.003 mm/mm
$\beta_1$	0.83245

### 2.2. Steel

Type	Standard
$f_y$	400 MPa
$E_s$	200000 MPa
$\epsilon_{yt}$	0.002 mm/mm

## 3. Section

### 3.1. Shape and Properties

Type	Irregular
$A_g$	2.61e+006 mm <sup>2</sup>
$I_x$	4.88104e+012 mm <sup>4</sup>
$I_y$	5.44884e+012 mm <sup>4</sup>
$r_x$	1367.53 mm
$r_y$	1444.88 mm
$X_o$	0.000147126 mm
$Y_o$	0 mm

### 3.2. Section Figure

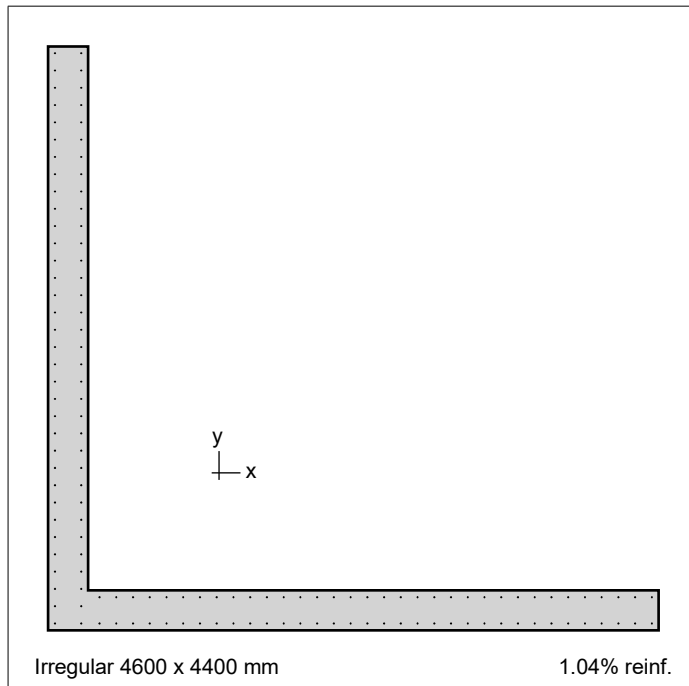


Figure 1: Column section

### 3.3. Exterior Points

Points	X mm	Y mm	Points	X mm	Y mm	Points	X mm	Y mm
1	3313.2	-886.8	2	-986.8	-886.8	3	-986.8	3213.2
4	-1286.8	3213.2	5	-1286.8	-1186.8	6	3313.2	-1186.8

## 4. Reinforcement

### 4.1. Bar Set: ASTM 615M

Bar	Diameter mm	Area mm <sup>2</sup>	Bar	Diameter mm	Area mm <sup>2</sup>	Bar	Diameter mm	Area mm <sup>2</sup>
#10	9.50	71.00	#13	12.70	129.00	#16	15.90	199.00
#19	19.10	284.00	#22	22.20	387.00	#25	25.40	510.00
#29	28.70	645.00	#32	32.30	819.00	#36	35.80	1006.00
#43	43.00	1452.00	#57	57.30	2581.00			

### 4.2. Confinement and Factors

Confinement type	Tied
For #16 bars or less	#10 ties
For larger bars	#13 ties
<b>Capacity Reduction Factors</b>	
Axial compression, (a)	0.8
Tension controlled $\phi$ , (b)	0.9
Compression controlled $\phi$ , (c)	0.65

### 4.3. Arrangement

Pattern	Irregular
Bar layout	---
Cover to	---
Clear cover	---

Bars	---
Total steel area, A <sub>s</sub>	27064 mm <sup>2</sup>
Rho	1.04 %
Minimum clear spacing	110 mm

#### 4.4. Bars Provided

Area mm <sup>2</sup>	X mm	Y mm	Area mm <sup>2</sup>	X mm	Y mm	Area mm <sup>2</sup>	X mm	Y mm
199.0	-1235.7	-1135.7	199.0	-1037.9	-1135.7	199.0	-1037.9	-1005.4
199.0	-1037.9	-875.2	199.0	-1037.9	-745.0	199.0	-1037.9	-614.7
199.0	-1037.9	-484.5	199.0	-1037.9	-354.3	199.0	-1037.9	-224.0
199.0	-1037.9	-93.8	199.0	-1037.9	36.4	199.0	-1037.9	166.7
199.0	-1037.9	296.9	199.0	-1037.9	427.2	199.0	-1037.9	557.4
199.0	-1037.9	687.6	199.0	-1037.9	817.9	199.0	-1037.9	948.1
199.0	-1037.9	1078.3	199.0	-1037.9	1208.6	199.0	-1037.9	1338.8
199.0	-1037.9	1469.0	199.0	-1037.9	1599.3	199.0	-1037.9	1729.5
199.0	-1037.9	1859.8	199.0	-1037.9	1990.0	199.0	-1037.9	2120.2
199.0	-1037.9	2250.5	199.0	-1037.9	2380.7	199.0	-1037.9	2510.9
199.0	-1037.9	2641.2	199.0	-1037.9	2771.4	199.0	-1037.9	2901.6
199.0	-1037.9	3031.9	199.0	-1037.9	3162.1	199.0	-1235.7	3162.1
199.0	-1235.7	3031.9	199.0	-1235.7	2901.6	199.0	-1235.7	2771.4
199.0	-1235.7	2641.2	199.0	-1235.7	2510.9	199.0	-1235.7	2380.7
199.0	-1235.7	2250.5	199.0	-1235.7	2120.2	199.0	-1235.7	1990.0
199.0	-1235.7	1859.8	199.0	-1235.7	1729.5	199.0	-1235.7	1599.3
199.0	-1235.7	1469.0	199.0	-1235.7	1338.8	199.0	-1235.7	1208.6
199.0	-1235.7	1078.3	199.0	-1235.7	948.1	199.0	-1235.7	817.9
199.0	-1235.7	687.6	199.0	-1235.7	557.4	199.0	-1235.7	427.2
199.0	-1235.7	296.9	199.0	-1235.7	166.7	199.0	-1235.7	36.4
199.0	-1235.7	-93.8	199.0	-1235.7	-224.0	199.0	-1235.7	-354.3
199.0	-1235.7	-484.5	199.0	-1235.7	-614.7	199.0	-1235.7	-745.0
199.0	-1235.7	-875.2	199.0	-1235.7	-1005.4	199.0	3262.1	-937.9
199.0	3136.0	-937.9	199.0	3009.9	-937.9	199.0	2883.7	-937.9
199.0	2757.6	-937.9	199.0	2631.5	-937.9	199.0	2505.4	-937.9
199.0	2379.2	-937.9	199.0	2253.1	-937.9	199.0	2127.0	-937.9
199.0	2000.9	-937.9	199.0	1874.7	-937.9	199.0	1748.6	-937.9
199.0	1622.5	-937.9	199.0	1496.4	-937.9	199.0	1370.2	-937.9
199.0	1244.1	-937.9	199.0	1118.0	-937.9	199.0	991.9	-937.9
199.0	865.7	-937.9	199.0	739.6	-937.9	199.0	613.5	-937.9
199.0	487.4	-937.9	199.0	361.2	-937.9	199.0	235.1	-937.9
199.0	109.0	-937.9	199.0	-17.1	-937.9	199.0	-143.3	-937.9
199.0	-269.4	-937.9	199.0	-395.5	-937.9	199.0	-521.6	-937.9
199.0	-647.8	-937.9	199.0	-773.9	-937.9	199.0	-900.0	-937.9
199.0	-900.0	-1135.7	199.0	-773.9	-1135.7	199.0	-647.8	-1135.7
199.0	-521.6	-1135.7	199.0	-395.5	-1135.7	199.0	-269.4	-1135.7
199.0	-143.3	-1135.7	199.0	-17.1	-1135.7	199.0	109.0	-1135.7
199.0	235.1	-1135.7	199.0	361.2	-1135.7	199.0	487.4	-1135.7
199.0	613.5	-1135.7	199.0	739.6	-1135.7	199.0	865.7	-1135.7
199.0	991.9	-1135.7	199.0	1118.0	-1135.7	199.0	1244.1	-1135.7
199.0	1370.2	-1135.7	199.0	1496.4	-1135.7	199.0	1622.5	-1135.7
199.0	1748.6	-1135.7	199.0	1874.7	-1135.7	199.0	2000.9	-1135.7
199.0	2127.0	-1135.7	199.0	2253.1	-1135.7	199.0	2379.2	-1135.7
199.0	2505.4	-1135.7	199.0	2631.5	-1135.7	199.0	2757.6	-1135.7
199.0	2883.7	-1135.7	199.0	3009.9	-1135.7	199.0	3136.0	-1135.7
199.0	3262.1	-1135.7						

### 5. Factored Loads and Moments with Corresponding Capacities

No	$P_u$	$M_{ux}$	$M_{uy}$	$\phi M_{nx}$	$\phi M_{ny}$	$\phi M_n/M_u$	NA Depth	$d_t$ Depth	$\epsilon_t$	$\phi$
	kN	kNm	kNm	kNm	kNm		mm	mm		
1	2000.00	29080.00	500.00	12704.28	218.44	0.437	300	4334	0.06939	0.900 #

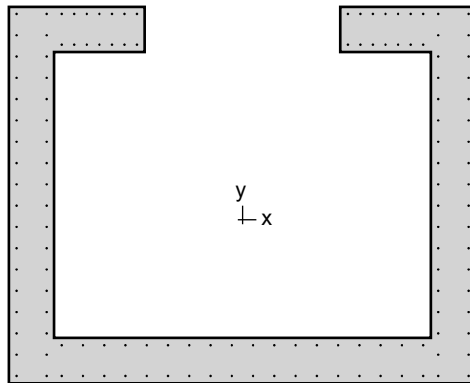
# Section capacity exceeded. Revise design!



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## 1. General Information

File Name	c:\users\asus\documents\nitip na...\lift #16.col
Project	SW
Column	1
Engineer	BN
Code	ACI 318-14
Bar Set	ASTM 615M
Units	Metric
Run Option	Investigation
Run Axis	Biaxial
Slenderness	Not Considered
Column Type	Structural

## 2. Material Properties

### 2.1. Concrete

Type	Standard
$f_c$	30 MPa
$E_c$	25743 MPa
$f_c$	25.5 MPa
$\epsilon_u$	0.003 mm/mm
$\beta_1$	0.83245

### 2.2. Steel

Type	Standard
$f_y$	400 MPa
$E_s$	200000 MPa
$\epsilon_{yt}$	0.002 mm/mm

## 3. Section

### 3.1. Shape and Properties

Type	Irregular
$A_g$	2.61e+006 mm <sup>2</sup>
$I_x$	2.06216e+012 mm <sup>4</sup>
$I_y$	3.67757e+012 mm <sup>4</sup>
$r_x$	888.876 mm
$r_y$	1187.03 mm
$X_o$	0 mm
$Y_o$	0 mm

### 3.2. Section Figure

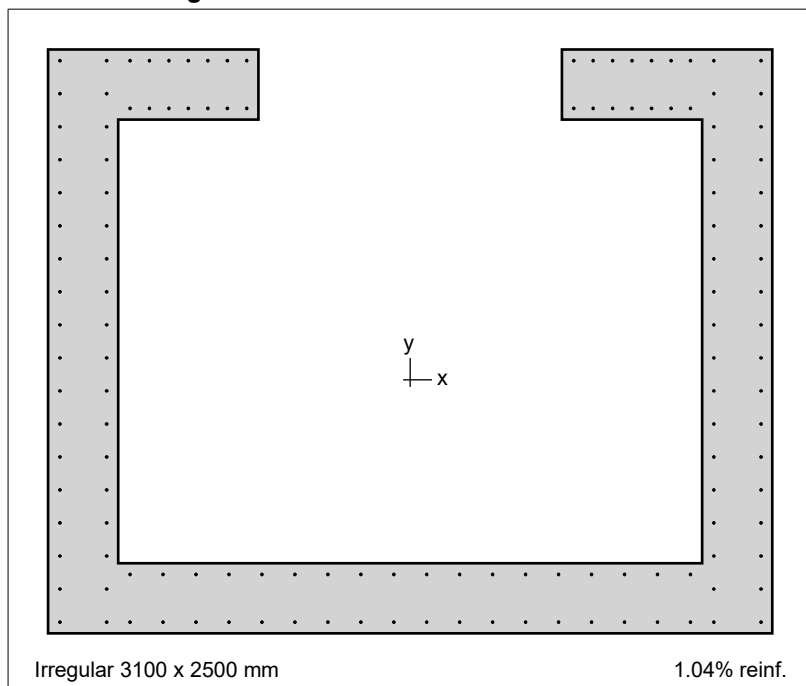


Figure 1: Column section

### 3.3. Exterior Points

Points	X mm	Y mm	Points	X mm	Y mm	Points	X mm	Y mm
1	1550.0	1414.4	2	650.0	1414.4	3	650.0	1114.4
4	1250.0	1114.4	5	1250.0	-785.6	6	-1250.0	-785.6
7	-1250.0	1114.4	8	-650.0	1114.4	9	-650.0	1414.4
10	-1550.0	1414.4	11	-1550.0	-1085.6	12	1550.0	-1085.6

## 4. Reinforcement

### 4.1. Bar Set: ASTM 615M

Bar	Diameter mm	Area mm <sup>2</sup>	Bar	Diameter mm	Area mm <sup>2</sup>	Bar	Diameter mm	Area mm <sup>2</sup>
#10	9.50	71.00	#13	12.70	129.00	#16	15.90	199.00
#19	19.10	284.00	#22	22.20	387.00	#25	25.40	510.00
#29	28.70	645.00	#32	32.30	819.00	#36	35.80	1006.00
#43	43.00	1452.00	#57	57.30	2581.00			

### 4.2. Confinement and Factors

Confinement type	Tied
For #16 bars or less	#10 ties
For larger bars	#10 ties
<b>Capacity Reduction Factors</b>	
Axial compression, (a)	0.8
Tension controlled $\phi$ , (b)	0.9
Compression controlled $\phi$ , (c)	0.65

### 4.3. Arrangement

Pattern	Irregular
Bar layout	---

Cover to	---
Clear cover	---
Bars	---
Total steel area, A <sub>s</sub>	27064 mm <sup>2</sup>
Rho	1.04 %
Minimum clear spacing	67 mm

#### 4.4. Bars Provided

Area mm <sup>2</sup>	X mm	Y mm	Area mm <sup>2</sup>	X mm	Y mm	Area mm <sup>2</sup>	X mm	Y mm
199.0	-1500.0	1366.4	199.0	-1300.0	1366.4	199.0	-1300.0	1225.0
199.0	-1300.0	1083.6	199.0	-1300.0	942.2	199.0	-1300.0	800.7
199.0	-1300.0	659.3	199.0	-1300.0	517.9	199.0	-1300.0	376.5
199.0	-1300.0	235.1	199.0	-1300.0	93.7	199.0	-1300.0	-47.8
199.0	-1300.0	-189.2	199.0	-1300.0	-330.6	199.0	-1300.0	-472.0
199.0	-1300.0	-613.4	199.0	-1300.0	-754.8	199.0	-1300.0	-896.3
199.0	-1300.0	-1037.7	199.0	-1500.0	-1037.7	199.0	-1500.0	-896.3
199.0	-1500.0	-754.8	199.0	-1500.0	-613.4	199.0	-1500.0	-472.0
199.0	-1500.0	-330.6	199.0	-1500.0	-189.2	199.0	-1500.0	-47.8
199.0	-1500.0	93.7	199.0	-1500.0	235.1	199.0	-1500.0	376.5
199.0	-1500.0	517.9	199.0	-1500.0	659.3	199.0	-1500.0	800.7
199.0	-1500.0	942.2	199.0	-1500.0	1083.6	199.0	-1500.0	1225.0
199.0	1502.1	1366.4	199.0	1300.0	1366.4	199.0	1300.0	1225.0
199.0	1300.0	1083.6	199.0	1300.0	942.2	199.0	1300.0	800.7
199.0	1300.0	659.3	199.0	1300.0	517.9	199.0	1300.0	376.5
199.0	1300.0	235.1	199.0	1300.0	93.7	199.0	1300.0	-47.8
199.0	1300.0	-189.2	199.0	1300.0	-330.6	199.0	1300.0	-472.0
199.0	1300.0	-613.4	199.0	1300.0	-754.8	199.0	1300.0	-896.3
199.0	1300.0	-1037.7	199.0	1502.1	-1037.7	199.0	1502.1	-896.3
199.0	1502.1	-754.8	199.0	1502.1	-613.4	199.0	1502.1	-472.0
199.0	1502.1	-330.6	199.0	1502.1	-189.2	199.0	1502.1	-47.8
199.0	1502.1	93.7	199.0	1502.1	235.1	199.0	1502.1	376.5
199.0	1502.1	517.9	199.0	1502.1	659.3	199.0	1502.1	800.7
199.0	1502.1	942.2	199.0	1502.1	1083.6	199.0	1502.1	1225.0
199.0	-1200.0	-833.6	199.0	-1058.8	-833.6	199.0	-917.6	-833.6
199.0	-776.5	-833.6	199.0	-635.3	-833.6	199.0	-494.1	-833.6
199.0	-352.9	-833.6	199.0	-211.8	-833.6	199.0	-70.6	-833.6
199.0	70.6	-833.6	199.0	211.8	-833.6	199.0	352.9	-833.6
199.0	494.1	-833.6	199.0	635.3	-833.6	199.0	776.5	-833.6
199.0	917.6	-833.6	199.0	1058.8	-833.6	199.0	1200.0	-833.6
199.0	1200.0	-1037.7	199.0	1058.8	-1037.7	199.0	917.6	-1037.7
199.0	776.5	-1037.7	199.0	635.3	-1037.7	199.0	494.1	-1037.7
199.0	352.9	-1037.7	199.0	211.8	-1037.7	199.0	70.6	-1037.7
199.0	-70.6	-1037.7	199.0	-211.8	-1037.7	199.0	-352.9	-1037.7
199.0	-494.1	-1037.7	199.0	-635.3	-1037.7	199.0	-776.5	-1037.7
199.0	-917.6	-1037.7	199.0	-1058.8	-1037.7	199.0	-1200.0	-1037.7
199.0	-700.0	1366.4	199.0	-783.3	1366.4	199.0	-866.7	1366.4
199.0	-950.0	1366.4	199.0	-1033.3	1366.4	199.0	-1116.7	1366.4
199.0	-1200.0	1366.4	199.0	-1200.0	1162.3	199.0	-1116.7	1162.3
199.0	-1033.3	1162.3	199.0	-950.0	1162.3	199.0	-866.7	1162.3
199.0	-783.3	1162.3	199.0	-700.0	1162.3	199.0	700.0	1366.4
199.0	783.3	1366.4	199.0	866.7	1366.4	199.0	950.0	1366.4
199.0	1033.3	1366.4	199.0	1116.7	1366.4	199.0	1200.0	1366.4
199.0	1200.0	1162.3	199.0	1116.7	1162.3	199.0	1033.3	1162.3
199.0	950.0	1162.3	199.0	866.7	1162.3	199.0	783.3	1162.3
199.0	700.0	1162.3						

### 5. Factored Loads and Moments with Corresponding Capacities

No	$P_u$	$M_{ux}$	$M_{uy}$	$\phi M_{nx}$	$\phi M_{ny}$	$\phi M_n/M_u$	NA Depth	$d_t$ Depth	$\epsilon_t$	$\phi$
	kN	kNm	kNm	kNm	kNm		mm	mm		
1	2000.00	29080.00	500.00	13012.55	223.74	0.447	151	2464	0.04727	0.900 #

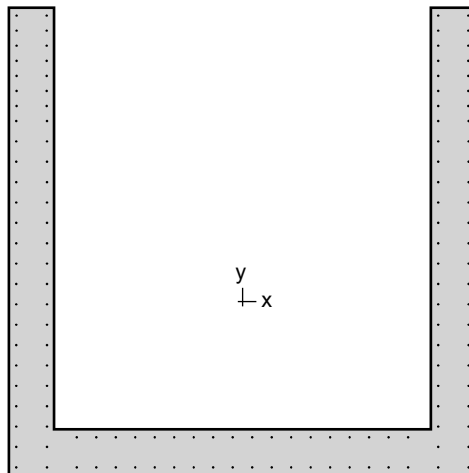
# Section capacity exceeded. Revise design!



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## 1. General Information

File Name	c:\users\asus\documents\nitip najib...\u #16.col
Project	SW
Column	1
Engineer	BN
Code	ACI 318-14
Bar Set	ASTM 615M
Units	Metric
Run Option	Investigation
Run Axis	Biaxial
Slenderness	Not Considered
Column Type	Structural

## 2. Material Properties

### 2.1. Concrete

Type	Standard
$f_c$	30 MPa
$E_c$	25743 MPa
$f_c$	25.5 MPa
$\epsilon_u$	0.003 mm/mm
$\beta_1$	0.83245

### 2.2. Steel

Type	Standard
$f_y$	400 MPa
$E_s$	200000 MPa
$\epsilon_{yt}$	0.002 mm/mm

## 3. Section

### 3.1. Shape and Properties

Type	Irregular
$A_g$	2.61e+006 mm <sup>2</sup>
$I_x$	2.54276e+012 mm <sup>4</sup>
$I_y$	4.05018e+012 mm <sup>4</sup>
$r_x$	987.035 mm
$r_y$	1245.71 mm
$X_o$	0 mm
$Y_o$	0 mm

### 3.2. Section Figure

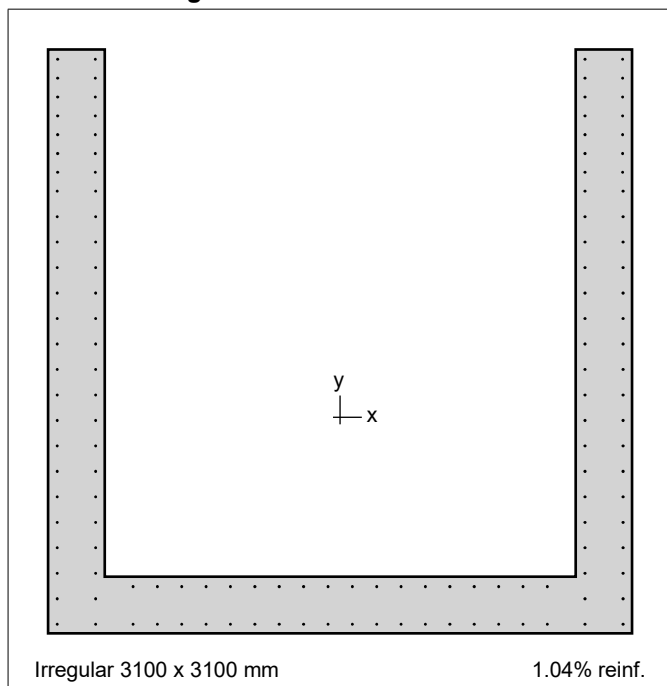


Figure 1: Column section

### 3.3. Exterior Points

Points	X mm	Y mm	Points	X mm	Y mm	Points	X mm	Y mm
1	1550.0	1952.3	2	1250.0	1952.3	3	1250.0	-847.7
4	-1250.0	-847.7	5	-1250.0	1952.3	6	-1550.0	1952.3
7	-1550.0	-1147.7	8	1550.0	-1147.7			

## 4. Reinforcement

### 4.1. Bar Set: ASTM 615M

Bar	Diameter mm	Area mm <sup>2</sup>	Bar	Diameter mm	Area mm <sup>2</sup>	Bar	Diameter mm	Area mm <sup>2</sup>
#10	9.50	71.00	#13	12.70	129.00	#16	15.90	199.00
#19	19.10	284.00	#22	22.20	387.00	#25	25.40	510.00
#29	28.70	645.00	#32	32.30	819.00	#36	35.80	1006.00
#43	43.00	1452.00	#57	57.30	2581.00			

### 4.2. Confinement and Factors

Confinement type	Tied
For #16 bars or less	#10 ties
For larger bars	#13 ties
<b>Capacity Reduction Factors</b>	
Axial compression, (a)	0.8
Tension controlled $\phi$ , (b)	0.9
Compression controlled $\phi$ , (c)	0.65

### 4.3. Arrangement

Pattern	Irregular
Bar layout	---
Cover to	---



Clear cover	---
Bars	---
Total steel area, A <sub>s</sub>	27064 mm <sup>2</sup>
Rho	1.04 %
Minimum clear spacing	84 mm

#### 4.4. Bars Provided

Area mm <sup>2</sup>	X mm	Y mm	Area mm <sup>2</sup>	X mm	Y mm	Area mm <sup>2</sup>	X mm	Y mm
199.0	-1502.1	-1099.8	199.0	-1297.9	-1099.8	199.0	-1297.9	-964.5
199.0	-1297.9	-829.2	199.0	-1297.9	-693.9	199.0	-1297.9	-558.6
199.0	-1297.9	-423.4	199.0	-1297.9	-288.1	199.0	-1297.9	-152.8
199.0	-1297.9	-17.5	199.0	-1297.9	117.8	199.0	-1297.9	253.0
199.0	-1297.9	388.3	199.0	-1297.9	523.6	199.0	-1297.9	658.9
199.0	-1297.9	794.2	199.0	-1297.9	929.4	199.0	-1297.9	1064.7
199.0	-1297.9	1200.0	199.0	-1502.1	1200.0	199.0	-1502.1	1064.7
199.0	-1502.1	929.4	199.0	-1502.1	794.2	199.0	-1502.1	658.9
199.0	-1502.1	523.6	199.0	-1502.1	388.3	199.0	-1502.1	253.0
199.0	-1502.1	117.8	199.0	-1502.1	-17.5	199.0	-1502.1	-152.8
199.0	-1502.1	-288.1	199.0	-1502.1	-423.4	199.0	-1502.1	-558.6
199.0	-1502.1	-693.9	199.0	-1502.1	-829.2	199.0	-1502.1	-964.5
199.0	1300.0	1200.0	199.0	1502.1	1200.0	199.0	1502.1	1064.7
199.0	1502.1	929.4	199.0	1502.1	794.2	199.0	1502.1	658.9
199.0	1502.1	523.6	199.0	1502.1	388.3	199.0	1502.1	253.0
199.0	1502.1	117.8	199.0	1502.1	-17.5	199.0	1502.1	-152.8
199.0	1502.1	-288.1	199.0	1502.1	-423.4	199.0	1502.1	-558.6
199.0	1502.1	-693.9	199.0	1502.1	-829.2	199.0	1502.1	-964.5
199.0	1502.1	-1099.8	199.0	1300.0	-1099.8	199.0	1300.0	-964.5
199.0	1300.0	-829.2	199.0	1300.0	-693.9	199.0	1300.0	-558.6
199.0	1300.0	-423.4	199.0	1300.0	-288.1	199.0	1300.0	-152.8
199.0	1300.0	-17.5	199.0	1300.0	117.8	199.0	1300.0	253.0
199.0	1300.0	388.3	199.0	1300.0	523.6	199.0	1300.0	658.9
199.0	1300.0	794.2	199.0	1300.0	929.4	199.0	1300.0	1064.7
199.0	-1500.0	1900.0	199.0	-1300.0	1900.0	199.0	-1300.0	1800.0
199.0	-1300.0	1700.0	199.0	-1300.0	1600.0	199.0	-1300.0	1500.0
199.0	-1300.0	1400.0	199.0	-1300.0	1300.0	199.0	-1500.0	1300.0
199.0	-1500.0	1400.0	199.0	-1500.0	1500.0	199.0	-1500.0	1600.0
199.0	-1500.0	1700.0	199.0	-1500.0	1800.0	199.0	1300.0	1900.0
199.0	1500.0	1900.0	199.0	1500.0	1800.0	199.0	1500.0	1700.0
199.0	1500.0	1600.0	199.0	1500.0	1500.0	199.0	1500.0	1400.0
199.0	1500.0	1300.0	199.0	1300.0	1300.0	199.0	1300.0	1400.0
199.0	1300.0	1500.0	199.0	1300.0	1600.0	199.0	1300.0	1700.0
199.0	1300.0	1800.0	199.0	-1100.0	-900.0	199.0	-970.6	-900.0
199.0	-841.2	-900.0	199.0	-711.8	-900.0	199.0	-582.4	-900.0
199.0	-452.9	-900.0	199.0	-323.5	-900.0	199.0	-194.1	-900.0
199.0	-64.7	-900.0	199.0	64.7	-900.0	199.0	194.1	-900.0
199.0	323.5	-900.0	199.0	452.9	-900.0	199.0	582.4	-900.0
199.0	711.8	-900.0	199.0	841.2	-900.0	199.0	970.6	-900.0
199.0	1100.0	-900.0	199.0	1100.0	-1099.8	199.0	970.6	-1099.8
199.0	841.2	-1099.8	199.0	711.8	-1099.8	199.0	582.4	-1099.8
199.0	452.9	-1099.8	199.0	323.5	-1099.8	199.0	194.1	-1099.8
199.0	64.7	-1099.8	199.0	-64.7	-1099.8	199.0	-194.1	-1099.8
199.0	-323.5	-1099.8	199.0	-452.9	-1099.8	199.0	-582.4	-1099.8
199.0	-711.8	-1099.8	199.0	-841.2	-1099.8	199.0	-970.6	-1099.8
199.0	-1100.0	-1099.8						

### 5. Factored Loads and Moments with Corresponding Capacities

No	$P_u$	$M_{ux}$	$M_{uy}$	$\phi M_{nx}$	$\phi M_{ny}$	$\phi M_n/M_u$	NA Depth	$d_t$ Depth	$\epsilon_t$	$\phi$
	kN	kNm	kNm	kNm	kNm		mm	mm		
1	2000.00	29080.00	500.00	13658.43	234.84	0.470	151	3060	0.05953	0.900 #

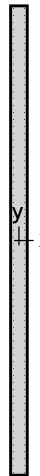
# Section capacity exceeded. Revise design!



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spColumn v6.00  
Computer program for the Strength Design of Reinforced Concrete Sections  
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## 1. General Information

File Name	c:\users\asus\documents\nitip najib\t...i 16.col
Project	SW
Column	---
Engineer	BN
Code	ACI 318-14
Bar Set	ASTM 615M
Units	Metric
Run Option	Investigation
Run Axis	Biaxial
Slenderness	Not Considered
Column Type	Architectural

## 2. Material Properties

### 2.1. Concrete

Type	Standard
$f_c$	25 MPa
$E_c$	23500 MPa
$f_c$	21.25 MPa
$\epsilon_u$	0.003 mm/mm
$\beta_1$	0.85

### 2.2. Steel

Type	Standard
$f_y$	400 MPa
$E_s$	200000 MPa
$\epsilon_{yt}$	0.002 mm/mm

## 3. Section

### 3.1. Shape and Properties

Type	Irregular
$A_g$	2.61e+006 mm <sup>2</sup>
$I_x$	1.64626e+013 mm <sup>4</sup>
$I_y$	1.9575e+010 mm <sup>4</sup>
$r_x$	2511.47 mm
$r_y$	86.6025 mm
$X_o$	0 mm
$Y_o$	0 mm

### 3.2. Section Figure

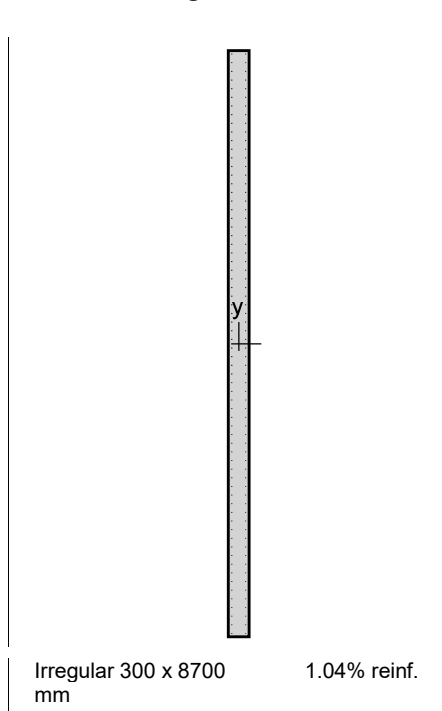


Figure 1: Column section

### 3.3. Exterior Points

Points	X mm	Y mm	Points	X mm	Y mm	Points	X mm	Y mm
1	150.0	4350.0	2	-150.0	4350.0	3	-150.0	-4350.0
4	150.0	-4350.0						

## 4. Reinforcement

### 4.1. Bar Set: ASTM 615M

Bar	Diameter mm	Area mm <sup>2</sup>	Bar	Diameter mm	Area mm <sup>2</sup>	Bar	Diameter mm	Area mm <sup>2</sup>
#10	9.50	71.00	#13	12.70	129.00	#16	15.90	199.00
#19	19.10	284.00	#22	22.20	387.00	#25	25.40	510.00
#29	28.70	645.00	#32	32.30	819.00	#36	35.80	1006.00
#43	43.00	1452.00	#57	57.30	2581.00			

### 4.2. Confinement and Factors

Confinement type	Tied
For #32 bars or less	#10 ties
For larger bars	#13 ties
<b>Capacity Reduction Factors</b>	
Axial compression, (a)	0.8
Tension controlled $\phi$ , (b)	0.9
Compression controlled $\phi$ , (c)	0.65

### 4.3. Arrangement

Pattern	Irregular
Bar layout	---

Cover to	---
Clear cover	---
Bars	---
Total steel area, A <sub>s</sub>	27064 mm <sup>2</sup>
Rho	1.04 %
Minimum clear spacing	112 mm

#### 4.4. Bars Provided

Area mm <sup>2</sup>	X mm	Y mm	Area mm <sup>2</sup>	X mm	Y mm	Area mm <sup>2</sup>	X mm	Y mm
199.0	-100.0	4300.0	199.0	100.0	4300.0	199.0	100.0	4171.6
199.0	100.0	4043.3	199.0	100.0	3914.9	199.0	100.0	3786.6
199.0	100.0	3658.2	199.0	100.0	3529.9	199.0	100.0	3401.5
199.0	100.0	3273.1	199.0	100.0	3144.8	199.0	100.0	3016.4
199.0	100.0	2888.1	199.0	100.0	2759.7	199.0	100.0	2631.3
199.0	100.0	2503.0	199.0	100.0	2374.6	199.0	100.0	2246.3
199.0	100.0	2117.9	199.0	100.0	1989.6	199.0	100.0	1861.2
199.0	100.0	1732.8	199.0	100.0	1604.5	199.0	100.0	1476.1
199.0	100.0	1347.8	199.0	100.0	1219.4	199.0	100.0	1091.0
199.0	100.0	962.7	199.0	100.0	834.3	199.0	100.0	706.0
199.0	100.0	577.6	199.0	100.0	449.3	199.0	100.0	320.9
199.0	100.0	192.5	199.0	100.0	64.2	199.0	100.0	-64.2
199.0	100.0	-192.5	199.0	100.0	-320.9	199.0	100.0	-449.3
199.0	100.0	-577.6	199.0	100.0	-706.0	199.0	100.0	-834.3
199.0	100.0	-962.7	199.0	100.0	-1091.0	199.0	100.0	-1219.4
199.0	100.0	-1347.8	199.0	100.0	-1476.1	199.0	100.0	-1604.5
199.0	100.0	-1732.8	199.0	100.0	-1861.2	199.0	100.0	-1989.6
199.0	100.0	-2117.9	199.0	100.0	-2246.3	199.0	100.0	-2374.6
199.0	100.0	-2503.0	199.0	100.0	-2631.3	199.0	100.0	-2759.7
199.0	100.0	-2888.1	199.0	100.0	-3016.4	199.0	100.0	-3144.8
199.0	100.0	-3273.1	199.0	100.0	-3401.5	199.0	100.0	-3529.9
199.0	100.0	-3658.2	199.0	100.0	-3786.6	199.0	100.0	-3914.9
199.0	100.0	-4043.3	199.0	100.0	-4171.6	199.0	100.0	-4300.0
199.0	-100.0	-4300.0	199.0	-100.0	-4171.6	199.0	-100.0	-4043.3
199.0	-100.0	-3914.9	199.0	-100.0	-3786.6	199.0	-100.0	-3658.2
199.0	-100.0	-3529.9	199.0	-100.0	-3401.5	199.0	-100.0	-3273.1
199.0	-100.0	-3144.8	199.0	-100.0	-3016.4	199.0	-100.0	-2888.1
199.0	-100.0	-2759.7	199.0	-100.0	-2631.3	199.0	-100.0	-2503.0
199.0	-100.0	-2374.6	199.0	-100.0	-2246.3	199.0	-100.0	-2117.9
199.0	-100.0	-1989.6	199.0	-100.0	-1861.2	199.0	-100.0	-1732.8
199.0	-100.0	-1604.5	199.0	-100.0	-1476.1	199.0	-100.0	-1347.8
199.0	-100.0	-1219.4	199.0	-100.0	-1091.0	199.0	-100.0	-962.7
199.0	-100.0	-834.3	199.0	-100.0	-706.0	199.0	-100.0	-577.6
199.0	-100.0	-449.3	199.0	-100.0	-320.9	199.0	-100.0	-192.5
199.0	-100.0	-64.2	199.0	-100.0	64.2	199.0	-100.0	192.5
199.0	-100.0	320.9	199.0	-100.0	449.3	199.0	-100.0	577.6
199.0	-100.0	706.0	199.0	-100.0	834.3	199.0	-100.0	962.7
199.0	-100.0	1091.0	199.0	-100.0	1219.4	199.0	-100.0	1347.8
199.0	-100.0	1476.1	199.0	-100.0	1604.5	199.0	-100.0	1732.8
199.0	-100.0	1861.2	199.0	-100.0	1989.6	199.0	-100.0	2117.9
199.0	-100.0	2246.3	199.0	-100.0	2374.6	199.0	-100.0	2503.0
199.0	-100.0	2631.3	199.0	-100.0	2759.7	199.0	-100.0	2888.1
199.0	-100.0	3016.4	199.0	-100.0	3144.8	199.0	-100.0	3273.1
199.0	-100.0	3401.5	199.0	-100.0	3529.9	199.0	-100.0	3658.2
199.0	-100.0	3786.6	199.0	-100.0	3914.9	199.0	-100.0	4043.3
199.0	-100.0	4171.6						

## 5. Factored Loads and Moments with Corresponding Capacities

No	$P_u$ kN	$M_{ux}$ kNm	$M_{uy}$ kNm	$\phi M_{nx}$ kNm	$\phi M_{ny}$ kNm	$\phi M_n/M_u$	NA Depth mm	$d_t$ Depth mm	$\epsilon_t$	$\phi$
1	2000.00	29080.00	500.00	32455.60	558.04	1.116	375	1460	0.00929	0.900