THE NELSON GROUP
ENGINEERING & DEVELOPING, INC.
1136 EAST HARMONY AVE. • SUITE 202-C
MESA, ARIZONA 85204
[480] 497-0003 • FAX: [480] 497-0038

Job Name: Aristone - Column Design
Job No.: 2003-251 **Sheet No.:** 1
By: C.A.N. **Date:** 04.27.04

CLIENT:

Aristone Concrete Design

1615 East Weber Drive

Tempe, Arizona

PROJECT DESCRIPTION AND ADDRESS:

Structural Design of

PRECAST CONCRETE COLUMNS

Great State of Arizona

GENERAL INFORMATION:

BUILDING CODES:

2000 I.B.C

1997 U.B.C.

1994 U.B.C.

NOTES:

FOR ADDITIONAL INFORMATION - SEE BASIS OF DESIGN.

Basis

THE NELSON GROUP
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MESA, ARIZONA 85204
[480] 497-0003 • FAX: [480] 497-0038

BASIS FOR DESIGN:

BUILDING CODE:

- 2000 EDITION OF THE INTERNATIONAL BUILDING CODE.
- 1997 EDITION OF THE UNIFORM BUILDING CODE.
- 1994 EDITION OF THE UNIFORM BUILDING CODE.

LOADS:

- MAXIMUM VERTICAL POINT LOAD ALLOWED, TO BE DETERMINED DURING CALCULATIONS.

FOUNDATIONS:

- TO BE DESIGNED BY THE STRUCTURAL ENGINEER OF RECORD FOR SPECIFIC PROJECTS.

CONCRETE:

- MINIMUM 28 DAY STRENGTH = 3,000 P.S.I. EXCEPT AS FOLLOWS:

COLUMNS ---------- 4,000 p.s.i..

REINFORCING:

- BARS #4 AND SMALLER: - F_Y = 40,000 P.S.I..
- BARS #5 AND LARGER: - F_Y = 60,000 P.S.I..

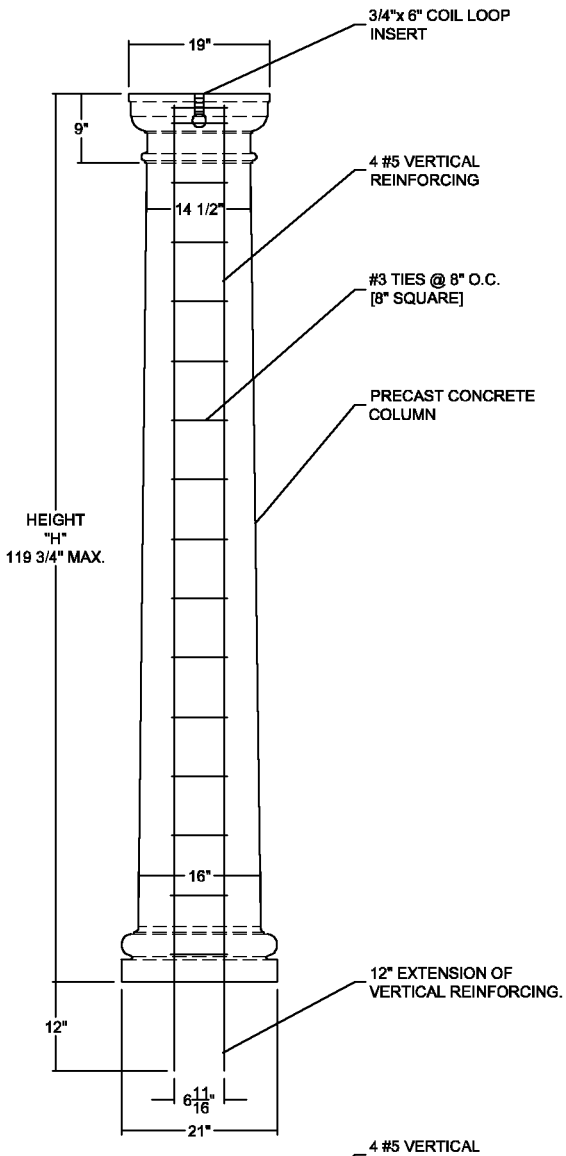
INSERTS:

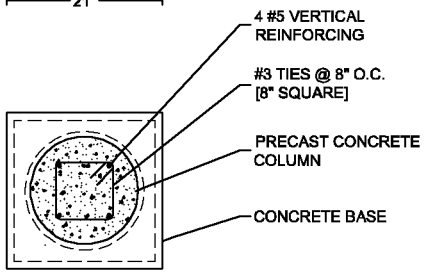
- COIL LOOP INSERTS SHALL BE MANUFACTURED BY 'DAYTON RICHMOND' OR EQUIVALENT WITH CURRENT 'ICBO' EVALUATION REPORT.

CT21 – ALLOWABLE LOADS			
HEIGHT		ALLOWABLE LOADS	
DESIGN	ACTUAL [H]	VERTICAL	MOMENT
10'-0"	119 3/4"	25 kips	7.0 ft-kips
		15 kips	8.0ft-kips
		7.5 kips	9.0 ft-kips

GENERAL STRUCTURAL NOTES

A. BUILDING CODES:
   2000 EDITION OF INTERNATIONAL BUILDING CODE.
   1997 EDITION OF UNIFORM BUILDING CODE.
   1994 EDITION OF UNIFORM BUILDING CODE.
B. CONCRETE STRENGTH = 4,000 PSI.
C. REINFORCING STRENGTH: Fy = 40,000 PSI
D. ALL CONCRETE SHALL BE VIBRATED DURING PLACEMENT.
E. REINFORCING SHALL BE RESTRAINED DURING PLACEMENT OF CONCRETE.
F. REINFORCING AND CONCRETE PLACEMENT SHALL CONFORM TO "ACI 318" SPECIFICATION AND REQUIREMENTS.
G. CONNECTION AT TOP AND BOTTOM SHALL BE SPECIFIED ON CONSTRUCTION DOCUMENTS.
H. ALL COLUMNS SHALL BE BRACED AGAINST SIDESWAY.
I. COIL LOOP INSERTS SHALL BE MANUFACTURED BY DAYTON RICHMOND OR EQUIVALENT.





COLUMN SECTION
CT21

Registered Professional Engineer (Structural)
CERTIFICATE NO. 26915
CRAIG A. NELSON
Date Signed
ARIZONA, U.S.A.

CT21 PRECAST CONCRETE COLUMN LOAD TABLE

SCALE: NONE

THE NELSON GROUP
ENGINEERING & DEVELOPING
1156 East Harmony Ave., Suite 202-C
Mesa, Arizona 85204
Ph: (480) 497-0003 Fax: (480) 497-0038

ARISTONE CONCRETE DESIGN
1615 East Weber Drive
Tempe, Arizona

DATE:	DRWN BY:	4 OF
04.27.04	C.A.N.	
JOB NO.	REV'D BY:	18
03-251	C.A.N.	

THE NELSON GROUP
ENGINEERING & DEVELOPING, INC.
1136 EAST HARMONY AVE. • SUITE 222
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Job Name: Aristone - Column Design
Job No.: 2003-251 **Sheet No.:** 5
By: C.A.N. **Date:** 04.27.04

COLUMN 'CT21'

GRAVITY LOADS:

- **DESIGN VALUES:**

  L_{MAX} ..... 119 ¾" ..... USE 10'-0"

  F'_C ..... 4,000 PSI

  F_Y ..... 40,000 PSI

  DIA. [DESIGN] ..... 12.5" ..... [Actual Dia. = 14.5" Minimum]

  CONC. COVER ..... 1.25" ..... [Actual Cover = 1.25" + 1" = 2.25"]

  LOAD ECCENTRICITY ... 4"

  CONNECTIONS AT TOP AND BOTTOM OF COLUMN SHALL BE DETAILED BY DESIGN ENGINEER.

- **DESIGN LOADS:**

  P_1 = 25,000 #

  P_2 = 15,000 #

  P_3 = 7,500 #

  LOAD ARE ENTERED INTO THE DESIGN PROGRAM AS LIVE LOADS SO THAT THE HIGHER LOAD FACTOR OF 1.7 WOULD BE APPLIED TO LOADS. THIS PRODUCES A MORE CONSERVATIVE DESIGN.

- **ALLOWABLE MOMENTS:** [DETERMINED FROM DESIGN PROGRAM RESULTS]

  P_1 = 25,000 # ..... M_1 = 7.0 ft-kips

  P_2 = 15,000 # ..... M_2 = 8.0 ft-kips

  P_3 = 7,500 # ..... M_3 = 9.0 ft-kips

  REFER TO ATTACHED CALCULATIONS RESULTS FROM "ENERCALC" DESIGN PROGRAM FOR ADDITIONAL INFORMATION.

The Nelson Group
Engineering & Developing, Inc.
1136 East Harmony Ave., Suite 202-C
Mesa, Arizona 85204
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Title : ARISTONE - COLUMN DESIGN **Job #** 03-251
Dsgnr: C.A.N. **Date:**
Description : ARISTONE CONCRETE DESIGN
1615 East Weber Drive
Scope : Structural Design of Reinforced Concrete Columns

Rev: 580000
User: KW-0603042, Ver 5.8.0, 1-Dec-2003

Circular Concrete Column

Description

CT21-10 [25k & 7.0k-f]]

General Information

Code Ref: ACI 318-02, 1997 UBC, 2003 IBC, 2003 NFPA 5000

Diameter	12.500 in	f'c	4,000.0 psi	Total Height	10.000 ft
Number of Bars	4	Fy	40,000.0 psi	Unbraced Length	10.000 ft
Bar Size	5	Seismic Zone	4	Eff. Length Factor	1.000
Total Rebar Area	1.240 in2	LL & ST Loads Act Separate		Column is BRACED	
Rebar Percent	1.010 %	Spiral Ties NOT Used			
Bar Cover	1.250 in				

Loads

Note: Load factoring supports 2003 IBC and 2003 NFPA 5000 by virtue of their references to ACI 318-02 for concrete design.
Factoring of entered loads to ultimate loads within this program is according to ACI 318-02 C.2

	Dead Load	Live Load	Short Term	Eccentricity
Axial Loads	k	25.000 k	k	4.000 in
Applied Moments...				
@ Top	k-ft	7.000 k-ft	k-ft	
@ Bottom	k-ft	k-ft	k-ft	

Summary

Column is OK

Column Diameter= 12.50in, with 4 #5 Bars

	ACI C-1	ACI C-2	ACI C-3
Applied Pu : Max Factored	**42.50** k	**0.00** k	**0.00** k
Allowable Pn * Phi @ Design Ecc.	**43.41** k	**0.00** k	**0.00** k
M-critical	26.07 k-ft	0.00 k-ft	0.00 k-ft
Combined Eccentricity	7.3600 in	0.0000 in	0.0000 in
Magnification Factor	1.05	0.00	0.00
Design Eccentricity	7.7298 in	0.0000 in	0.0000 in
Magnified Design Moment	27.38 k-ft	0.00 k-ft	0.00 k-ft
Po * .80	370.10 k	370.10 k	370.10 k
P : Balanced	183.08 k	183.08 k	183.08 k
Ecc : Balanced	3.9044 in	3.9044 in	3.9044 in

Slenderness *per ACI 318-02 Section 10.12 & 10.13*

Actual k Lu / r 38.400 | Elastic Modulus 3,605.0 ksi | Beta 0.850

	ACI Eq. C-1	ACI Eq. C-2	ACI Eq. C-3
Neutral Axis Distance	3.4562 in	17.3462 in	17.3462 in
Phi	0.7305	0.7000	0.7000
Max Limit kl/r	34.0000	34.0000	34.0000
Beta = M:sustained/M:max	0.0000	0.0000	0.0000
Cm	1.0000	1.0000	1.0000
EI / 1000	1,728.12	0.00	0.00
Pc : pi^2 E I / (k Lu)^2	1,184.44	0.00	0.00
alpha: MaxPu / (.75 Pc)	0.0478	0.0000	0.0000
Delta	1.0502	0.0000	0.0000
Ecc: Ecc Loads + Moments	7.3600	0.0000	0.0000 in
Design Ecc = Ecc * Delta	**0.0000**	**0.0000**	**0.0000** in

ACI Factors (per ACI 318-02, applied internally to entered loads)

ACI C-1 & C-2 DL	1.400	ACI C-2 Group Factor	0.750	Add"l "1.4" Factor for Seismic	1.400
ACI C-1 & C-2 LL	1.700	ACI C-3 Dead Load Factor	0.900	Add"l "0.9" Factor for Seismic	0.900
ACI C-1 & C-2 ST	1.700	ACI C-3 Short Term Factor	1.300		
....seismic = ST * :	1.100				

The Nelson Group
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Mesa, Arizona 85204
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Title : ARISTONE - COLUMN DESIGN **Job #** 03-251
Dsgnr: C.A.N. **Date:**
Description : ARISTONE CONCRETE DESIGN
1615 East Weber Drive
Scope : Structural Design of Reinforced Concrete Columns

Rev: 580000
User: KW-0603042, Ver 5.8.0, 1-Dec-2003

Circular Concrete Column

Description

CT21-10 [15k & 8.0k-f]

General Information

Code Ref: ACI 318-02, 1997 UBC, 2003 IBC, 2003 NFPA 5000

Diameter	12.500 in	f'c	4,000.0 psi	Total Height	10.000 ft
Number of Bars	4	Fy	40,000.0 psi	Unbraced Length	10.000 ft
Bar Size	5	Seismic Zone	4	Eff. Length Factor	1.000
Total Rebar Area	1.240 in2	LL & ST Loads Act Separate		Column is BRACED	
Rebar Percent	1.010 %	Spiral Ties NOT Used			
Bar Cover	1.250 in				

Loads

Note: Load factoring supports 2003 IBC and 2003 NFPA 5000 by virtue of their references to ACI 318-02 for concrete design.
Factoring of entered loads to ultimate loads within this program is according to ACI 318-02 C.2

	Dead Load	Live Load	Short Term	Eccentricity
Axial Loads	k	15.000 k	k	4.000 in
Applied Moments...				
@ Top	k-ft	8.000 k-ft	k-ft	
@ Bottom	k-ft	k-ft	k-ft	

Summary

Column is OK

Column Diameter= 12.50in, with 4 #5 Bars

	ACI C-1	ACI C-2	ACI C-3
Applied Pu : Max Factored	**25.50** k	**0.00** k	**0.00** k
Allowable Pn * Phi @ Design Ecc.	**28.04** k	**0.00** k	**0.00** k
M-critical	22.10 k-ft	0.00 k-ft	0.00 k-ft
Combined Eccentricity	10.4000 in	0.0000 in	0.0000 in
Magnification Factor	1.03	0.00	0.00
Design Eccentricity	10.7074 in	0.0000 in	0.0000 in
Magnified Design Moment	22.75 k-ft	0.00 k-ft	0.00 k-ft
Po * .80	370.10 k	370.10 k	370.10 k
P : Balanced	183.08 k	183.08 k	183.08 k
Ecc : Balanced	3.9044 in	3.9044 in	3.9044 in

Slenderness *per ACI 318-02 Section 10.12 & 10.13*

Actual k Lu / r 38.400 | Elastic Modulus 3,605.0 ksi | Beta 0.850

	ACI Eq. C-1	ACI Eq. C-2	ACI Eq. C-3
Neutral Axis Distance	2.9062 in	17.3462 in	17.3462 in
Phi	0.8000	0.7000	0.7000
Max Limit kl/r	34.0000	34.0000	34.0000
Beta = M:sustained/M:max	0.0000	0.0000	0.0000
Cm	1.0000	1.0000	1.0000
EI / 1000	1,728.12	0.00	0.00
Pc : pi^2 E I / (k Lu)^2	1,184.44	0.00	0.00
alpha: MaxPu / (.75 Pc)	0.0287	0.0000	0.0000
Delta	1.0296	0.0000	0.0000
Ecc: Ecc Loads + Moments	10.4000	0.0000	0.0000 in
Design Ecc = Ecc * Delta	**0.0000**	**0.0000**	**0.0000** in

ACI Factors (per ACI 318-02, applied internally to entered loads)

ACI C-1 & C-2 DL	1.400	ACI C-2 Group Factor	0.750	Add"l "1.4" Factor for Seismic	1.400
ACI C-1 & C-2 LL	1.700	ACI C-3 Dead Load Factor	0.900	Add"l "0.9" Factor for Seismic	0.900
ACI C-1 & C-2 ST	1.700	ACI C-3 Short Term Factor	1.300		
....seismic = ST * :	1.100				

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Title : ARISTONE - COLUMN DESIGN **Job #** 03-251
Dsgnr: C.A.N. **Date:**
Description : ARISTONE CONCRETE DESIGN
1615 East Weber Drive
Scope : Structural Design of Reinforced Concrete Columns

Rev: 580000
User: KW-0603042, Ver 5.8.0, 1-Dec-2003

Circular Concrete Column

Description

CT21-10 [7.5k & 9.0k-f]

General Information

Code Ref: ACI 318-02, 1997 UBC, 2003 IBC, 2003 NFPA 5000

Diameter	12.500 in	f'c	4,000.0 psi	Total Height	10.000 ft
Number of Bars	4	Fy	40,000.0 psi	Unbraced Length	10.000 ft
Bar Size	5	Seismic Zone	4	Eff. Length Factor	1.000
Total Rebar Area	1.240 in2	LL & ST Loads Act Separate		Column is BRACED	
Rebar Percent	1.010 %	Spiral Ties NOT Used			
Bar Cover	1.250 in				

Loads

Note: Load factoring supports 2003 IBC and 2003 NFPA 5000 by virtue of their references to ACI 318-02 for concrete design.
Factoring of entered loads to ultimate loads within this program is according to ACI 318-02 C.2

	Dead Load	Live Load	Short Term	Eccentricity
Axial Loads	k	7.500 k	k	4.000 in
Applied Moments...				
@ Top	k-ft	9.000 k-ft	k-ft	
@ Bottom	k-ft	k-ft	k-ft	

Summary

Column is OK

Column Diameter= 12.50in, with 4 #5 Bars

	ACI C-1	ACI C-2	ACI C-3
Applied Pu : Max Factored	**12.75** k	**0.00** k	**0.00** k
Allowable Pn * Phi @ Design Ecc.	**13.99** k	**0.00** k	**0.00** k
M-critical	19.55 k-ft	0.00 k-ft	0.00 k-ft
Combined Eccentricity	18.4000 in	0.0000 in	0.0000 in
Magnification Factor	1.01	0.00	0.00
Design Eccentricity	18.6679 in	0.0000 in	0.0000 in
Magnified Design Moment	19.83 k-ft	0.00 k-ft	0.00 k-ft
Po * .80	370.10 k	370.10 k	370.10 k
P : Balanced	183.08 k	183.08 k	183.08 k
Ecc : Balanced	3.9044 in	3.9044 in	3.9044 in

Slenderness *per ACI 318-02 Section 10.12 & 10.13*

Actual k Lu / r 38.400 | Elastic Modulus 3,605.0 ksi | Beta 0.850

	ACI Eq. C-1	ACI Eq. C-2	ACI Eq. C-3
Neutral Axis Distance	2.4762 in	17.3462 in	17.3462 in
Phi	0.8532	0.7000	0.7000
Max Limit kl/r	34.0000	34.0000	34.0000
Beta = M:sustained/M:max	0.0000	0.0000	0.0000
Cm	1.0000	1.0000	1.0000
EI / 1000	1,728.12	0.00	0.00
Pc : pi^2 E I / (k Lu)^2	1,184.44	0.00	0.00
alpha: MaxPu / (.75 Pc)	0.0144	0.0000	0.0000
Delta	1.0146	0.0000	0.0000
Ecc: Ecc Loads + Moments	18.4000	0.0000	0.0000 in
Design Ecc = Ecc * Delta	**0.0000**	**0.0000**	**0.0000** in

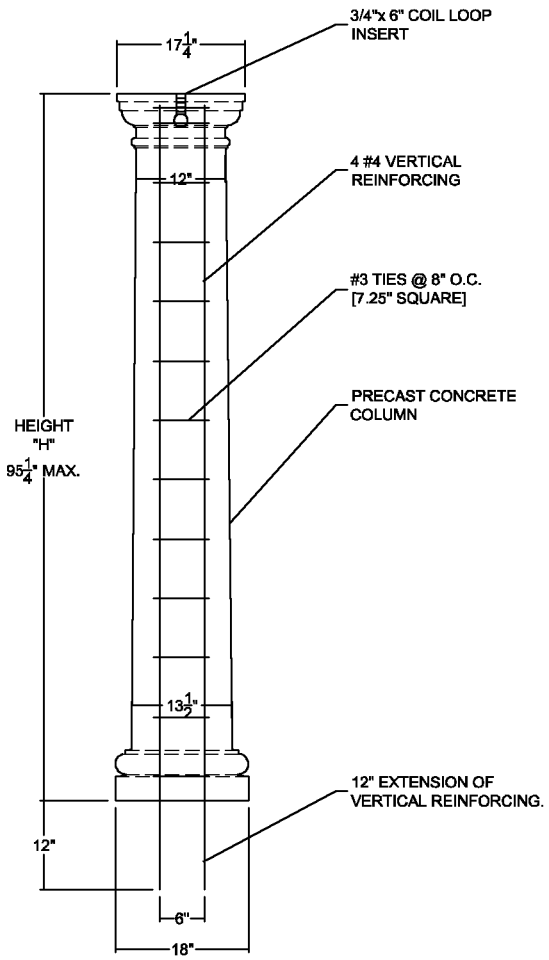
ACI Factors (per ACI 318-02, applied internally to entered loads)

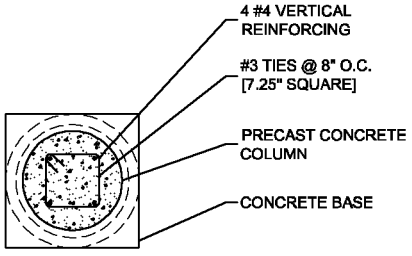
ACI C-1 & C-2 DL	1.400	ACI C-2 Group Factor	0.750	Add"l "1.4" Factor for Seismic	1.400
ACI C-1 & C-2 LL	1.700	ACI C-3 Dead Load Factor	0.900	Add"l "0.9" Factor for Seismic	0.900
ACI C-1 & C-2 ST	1.700	ACI C-3 Short Term Factor	1.300		
....seismic = ST * :	1.100				

CT18 – ALLOWABLE LOADS			
HEIGHT		ALLOWABLE LOADS	
DESIGN	ACTUAL [H]	VERTICAL	MOMENT
8'-0"	95 1/4"	15 kips	2.5 ft-kips
		10 kips	2.5 ft-kips
		5 kips	3.0 ft-kips

GENERAL STRUCTURAL NOTES

A. BUILDING CODES:
   2000 EDITION OF INTERNATIONAL BUILDING CODE.
   1997 EDITION OF UNIFORM BUILDING CODE.
   1994 EDITION OF UNIFORM BUILDING CODE.
B. CONCRETE STRENGTH = 4,000 PSI.
C. REINFORCING STRENGTH: Fy = 40,000 PSI
D. ALL CONCRETE SHALL BE VIBRATED DURING PLACEMENT.
E. REINFORCING SHALL BE RESTRAINED DURING PLACEMENT OF CONCRETE.
F. REINFORCING AND CONCRETE PLACEMENT SHALL CONFORM TO "ACI 318" SPECIFICATION AND REQUIREMENTS.
G. CONNECTION AT TOP AND BOTTOM SHALL BE SPECIFIED ON CONSTRUCTION DOCUMENTS.
H. ALL COLUMNS SHALL BE BRACED AGAINST SIDESWAY.
I. COIL LOOP INSERTS SHALL BE MANUFACTURED BY DAYTON RICHMOND OR EQUIVALENT.





COLUMN SECTION
CT18

Registered Professional Engineer (Structural)
CERTIFICATE NO.
26915
CRAIG A. NELSON
Date Signed
ARIZONA, U.S.A.

CT18 PRECAST CONCRETE COLUMN LOAD TABLE

SCALE: NONE

THE NELSON GROUP
ENGINEERING & DEVELOPING
1156 East Harmony Ave., Suite 202-C
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Ph: (480) 497-0003 Fax: (480) 497-0038

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MESA, ARIZONA 85204
[480] 497-0003 • FAX: [480] 497-0038

COLUMN 'CT18'

GRAVITY LOADS:

- **DESIGN VALUES:**

  L_{MAX} ..... 95¼" ..... USE 8'-0"

  F'_C ..... 4,000 PSI

  F_Y ..... 40,000 PSI

  DIA. [DESIGN] ..... 10" ..... [Actual Dia. = 12" Minimum]

  CONC. COVER ..... 1.75" ..... [Actual Cover = 1.75" + 1" = 2.75"]

  LOAD ECCENTRICITY ... 4"

  CONNECTIONS AT TOP AND BOTTOM OF COLUMN SHALL BE DETAILED BY DESIGN ENGINEER.

- **DESIGN LOADS:**

  P_1 = 15,000 #

  P_2 = 10,000 #

  P_3 = 5,000 #

  LOAD ARE ENTERED INTO THE DESIGN PROGRAM AS LIVE LOADS SO THAT THE HIGHER LOAD FACTOR OF 1.7 WOULD BE APPLIED TO LOADS. THIS PRODUCES A MORE CONSERVATIVE DESIGN.

- **ALLOWABLE MOMENTS:** [DETERMINED FROM DESIGN PROGRAM RESULTS]

  P_1 = 15,000 # ..... M_1 = 2.5 ft-kips

  P_2 = 10,000 # ..... M_2 = 2.5 ft-kips

  P_3 = 5,000 # ..... M_3 = 3.0 ft-kips

  REFER TO ATTACHED CALCULATIONS RESULTS FROM "ENERCALC" DESIGN PROGRAM FOR ADDITIONAL INFORMATION.

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Title : ARISTONE - COLUMN DESIGN **Job #** 03-251
Dsgnr: C.A.N. **Date:**
Description : ARISTONE CONCRETE DESIGN
1615 East Weber Drive
Scope : Structural Design of Reinforced Concrete Columns

Rev: 580000
User: KW-0603042, Ver 5.8.0, 1-Dec-2003

Circular Concrete Column

Description

CT18-8 [15k & 2.5k-f]

General Information

Code Ref: ACI 318-02, 1997 UBC, 2003 IBC, 2003 NFPA 5000

Diameter	10.000 in	f'c	4,000.0 psi	Total Height	8.000 ft
Number of Bars	4	Fy	40,000.0 psi	Unbraced Length	8.000 ft
Bar Size	4	Seismic Zone	4	Eff. Length Factor	1.000
Total Rebar Area	0.800 in2	LL & ST Loads Act Separate		Column is BRACED	
Rebar Percent	1.019 %	Spiral Ties NOT Used			
Bar Cover	1.750 in				

Loads

Note: Load factoring supports 2003 IBC and 2003 NFPA 5000 by virtue of their references to ACI 318-02 for concrete design.
Factoring of entered loads to ultimate loads within this program is according to ACI 318-02 C.2

	Dead Load	Live Load	Short Term	Eccentricity
Axial Loads	k	15.000 k	k	4.000 in
Applied Moments...				
@ Top	k-ft	2.500 k-ft	k-ft	
@ Bottom	k-ft	k-ft	k-ft	

Summary

Column is OK

Column Diameter= 10.00in, with 4 #4 Bars

	ACI C-1	ACI C-2	ACI C-3
Applied Pu : Max Factored	**25.50** k	**0.00** k	**0.00** k
Allowable Pn * Phi @ Design Ecc.	**25.78** k	**0.00** k	**0.00** k
M-critical	12.75 k-ft	0.00 k-ft	0.00 k-ft
Combined Eccentricity	6.0000 in	0.0000 in	0.0000 in
Magnification Factor	1.05	0.00	0.00
Design Eccentricity	6.2818 in	0.0000 in	0.0000 in
Magnified Design Moment	13.35 k-ft	0.00 k-ft	0.00 k-ft
Po * .80	237.05 k	237.05 k	237.05 k
P : Balanced	106.73 k	106.73 k	106.73 k
Ecc : Balanced	3.2250 in	3.2250 in	3.2250 in

Slenderness *per ACI 318-02 Section 10.12 & 10.13*

Actual k Lu / r	38.400	Elastic Modulus	3,605.0 ksi	Beta	0.850

	ACI Eq. C-1	ACI Eq. C-2	ACI Eq. C-3
Neutral Axis Distance	2.8550 in	12.6550 in	12.6550 in
Phi	0.7460	0.7000	0.7000
Max Limit kl/r	34.0000	34.0000	34.0000
Beta = M:sustained/M:max	0.0000	0.0000	0.0000
Cm	1.0000	1.0000	1.0000
EI / 1000	707.84	0.00	0.00
Pc : pi^2 E I / (k Lu)^2	758.04	0.00	0.00
alpha: MaxPu / (.75 Pc)	0.0449	0.0000	0.0000
Delta	1.0470	0.0000	0.0000
Ecc: Ecc Loads + Moments	6.0000	0.0000	0.0000 in
Design Ecc = Ecc * Delta	**0.0000**	**0.0000**	**0.0000** in

ACI Factors (per ACI 318-02, applied internally to entered loads)

ACI C-1 & C-2 DL	1.400	ACI C-2 Group Factor	0.750	Add"l "1.4" Factor for Seismic	1.400
ACI C-1 & C-2 LL	1.700	ACI C-3 Dead Load Factor	0.900	Add"l "0.9" Factor for Seismic	0.900
ACI C-1 & C-2 ST	1.700	ACI C-3 Short Term Factor	1.300		
....seismic = ST * :	1.100				

The Nelson Group
Engineering & Developing, Inc.
1136 East Harmony Ave., Suite 202-C
Mesa, Arizona 85204
[480] 497-0003 Fax [480] 497-0038

Title : ARISTONE - COLUMN DESIGN **Job #** 03-251
Dsgnr: C.A.N. **Date:**
Description : ARISTONE CONCRETE DESIGN
1615 East Weber Drive
Scope : Structural Design of Reinforced Concrete Columns

Rev: 580000
User: KW-0603042, Ver 5.8.0, 1-Dec-2003

Circular Concrete Column

Description

CT18-8 [10k & 2.5k-f]

General Information

Code Ref: ACI 318-02, 1997 UBC, 2003 IBC, 2003 NFPA 5000

Diameter	10.000 in	f'c	4,000.0 psi	Total Height	8.000 ft
Number of Bars	4	Fy	40,000.0 psi	Unbraced Length	8.000 ft
Bar Size	4	Seismic Zone	4	Eff. Length Factor	1.000
Total Rebar Area	0.800 in2	LL & ST Loads Act Separate		Column is BRACED	
Rebar Percent	1.019 %	Spiral Ties NOT Used			
Bar Cover	1.750 in				

Loads

Note: Load factoring supports 2003 IBC and 2003 NFPA 5000 by virtue of their references to ACI 318-02 for concrete design. Factoring of entered loads to ultimate loads within this program is according to ACI 318-02 C.2

	Dead Load	Live Load	Short Term	Eccentricity
Axial Loads	k	10.000 k	k	4.000 in
Applied Moments...				
@ Top	k-ft	2.500 k-ft	k-ft	
@ Bottom	k-ft	k-ft	k-ft	

Summary

Column is OK

Column Diameter= 10.00in, with 4 #4 Bars

	ACI C-1	ACI C-2	ACI C-3
Applied Pu : Max Factored	**17.00** k	**0.00** k	**0.00** k
Allowable Pn * Phi @ Design Ecc.	**21.57** k	**0.00** k	**0.00** k
M-critical	9.92 k-ft	0.00 k-ft	0.00 k-ft
Combined Eccentricity	7.0000 in	0.0000 in	0.0000 in
Magnification Factor	1.03	0.00	0.00
Design Eccentricity	7.2158 in	0.0000 in	0.0000 in
Magnified Design Moment	10.22 k-ft	0.00 k-ft	0.00 k-ft
Po * .80	237.05 k	237.05 k	237.05 k
P : Balanced	106.73 k	106.73 k	106.73 k
Ecc : Balanced	3.2250 in	3.2250 in	3.2250 in

Slenderness *per ACI 318-02 Section 10.12 & 10.13*

Actual k Lu / r 38.400 | Elastic Modulus 3,605.0 ksi | Beta 0.850

	ACI Eq. C-1	ACI Eq. C-2	ACI Eq. C-3
Neutral Axis Distance	2.6350 in	12.6550 in	12.6550 in
Phi	0.7761	0.7000	0.7000
Max Limit kl/r	34.0000	34.0000	34.0000
Beta = M:sustained/M:max	0.0000	0.0000	0.0000
Cm	1.0000	1.0000	1.0000
EI / 1000	707.84	0.00	0.00
Pc : pi^2 E I / (k Lu)^2	758.04	0.00	0.00
alpha: MaxPu / (.75 Pc)	0.0299	0.0000	0.0000
Delta	1.0308	0.0000	0.0000
Ecc: Ecc Loads + Moments	7.0000	0.0000	0.0000 in
Design Ecc = Ecc * Delta	**0.0000**	**0.0000**	**0.0000** in

ACI Factors (per ACI 318-02, applied internally to entered loads)

ACI C-1 & C-2 DL	1.400	ACI C-2 Group Factor	0.750	Add"l "1.4" Factor for Seismic	1.400
ACI C-1 & C-2 LL	1.700	ACI C-3 Dead Load Factor	0.900	Add"l "0.9" Factor for Seismic	0.900
ACI C-1 & C-2 ST	1.700	ACI C-3 Short Term Factor	1.300		
....seismic = ST * :	1.100				

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Title : ARISTONE - COLUMN DESIGN **Job #** 03-251
Dsgnr: C.A.N. **Date:**
Description : ARISTONE CONCRETE DESIGN
1615 East Weber Drive
Scope : Structural Design of Reinforced Concrete Columns

Rev: 580000
User: KW-0603042, Ver 5.8.0, 1-Dec-2003

Circular Concrete Column

Description

CT18-8 [5k & 3f-k]

General Information

Code Ref: ACI 318-02, 1997 UBC, 2003 IBC, 2003 NFPA 5000

Diameter	10.000 in	f'c	4,000.0 psi	Total Height	8.000 ft
Number of Bars	4	Fy	40,000.0 psi	Unbraced Length	8.000 ft
Bar Size	4	Seismic Zone	4	Eff. Length Factor	1.000
Total Rebar Area	0.800 in2	LL & ST Loads Act Separate		Column is BRACED	
Rebar Percent	1.019 %	Spiral Ties NOT Used			
Bar Cover	1.750 in				

Loads

Note: Load factoring supports 2003 IBC and 2003 NFPA 5000 by virtue of their references to ACI 318-02 for concrete design.
Factoring of entered loads to ultimate loads within this program is according to ACI 318-02 C.2

	Dead Load	Live Load	Short Term	Eccentricity
Axial Loads	k	5.000 k	k	4.000 in
Applied Moments...				
@ Top	k-ft	3.000 k-ft	k-ft	
@ Bottom	k-ft	k-ft	k-ft	

Summary

Column is OK

Column Diameter= 10.00in, with 4 #4 Bars

	ACI C-1	ACI C-2	ACI C-3
Applied Pu : Max Factored	**8.50** k	**0.00** k	**0.00** k
Allowable Pn * Phi @ Design Ecc.	**12.13** k	**0.00** k	**0.00** k
M-critical	7.93 k-ft	0.00 k-ft	0.00 k-ft
Combined Eccentricity	11.2000 in	0.0000 in	0.0000 in
Magnification Factor	1.02	0.00	0.00
Design Eccentricity	11.3700 in	0.0000 in	0.0000 in
Magnified Design Moment	8.05 k-ft	0.00 k-ft	0.00 k-ft
Po * .80	237.05 k	237.05 k	237.05 k
P : Balanced	106.73 k	106.73 k	106.73 k
Ecc : Balanced	3.2250 in	3.2250 in	3.2250 in

Slenderness *per ACI 318-02 Section 10.12 & 10.13*

Actual k Lu / r 38.400 | Elastic Modulus 3,605.0 ksi | Beta 0.850

	ACI Eq. C-1	ACI Eq. C-2	ACI Eq. C-3
Neutral Axis Distance	2.2950 in	12.6550 in	12.6550 in
Phi	0.8353	0.7000	0.7000
Max Limit kl/r	34.0000	34.0000	34.0000
Beta = M:sustained/M:max	0.0000	0.0000	0.0000
Cm	1.0000	1.0000	1.0000
EI / 1000	707.84	0.00	0.00
Pc : pi^2 E I / (k Lu)^2	758.04	0.00	0.00
alpha: MaxPu / (.75 Pc)	0.0150	0.0000	0.0000
Delta	1.0152	0.0000	0.0000
Ecc: Ecc Loads + Moments	11.2000	0.0000	0.0000 in
Design Ecc = Ecc * Delta	**0.0000**	**0.0000**	**0.0000** in

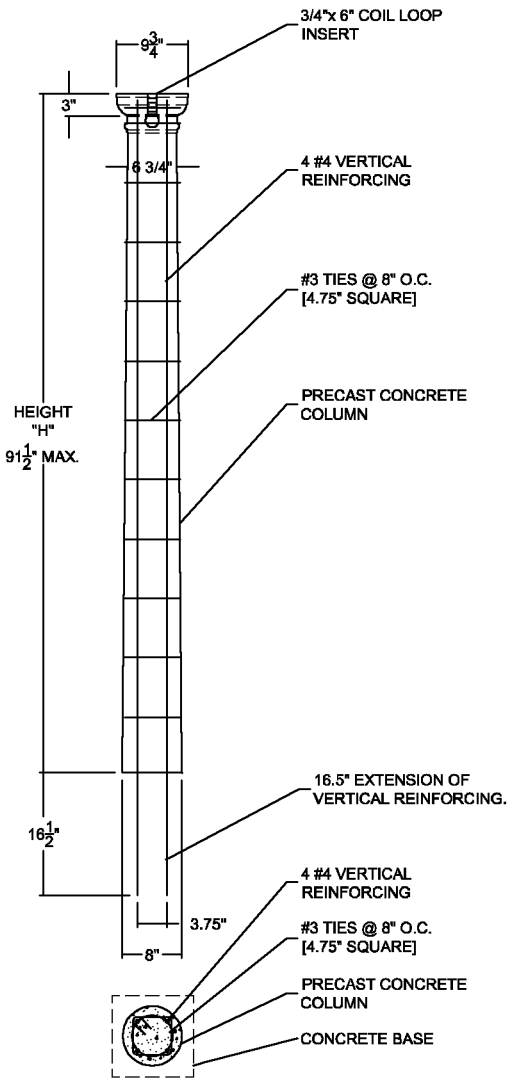
ACI Factors (per ACI 318-02, applied internally to entered loads)

ACI C-1 & C-2 DL	1.400	ACI C-2 Group Factor	0.750	Add"l "1.4" Factor for Seismic	1.400
ACI C-1 & C-2 LL	1.700	ACI C-3 Dead Load Factor	0.900	Add"l "0.9" Factor for Seismic	0.900
ACI C-1 & C-2 ST	1.700	ACI C-3 Short Term Factor	1.300		
....seismic = ST * :	1.100				

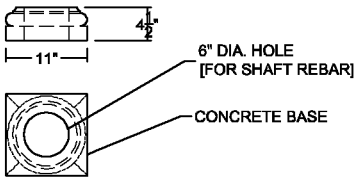
CT11 – ALLOWABLE LOADS			
HEIGHT		ALLOWABLE LOADS	
DESIGN	ACTUAL [H]	VERTICAL	MOMENT
7'-8"	91 1/2"	5 kips	0.5 ft-kips
		2 kips	1.5 ft-kips
		1 kips	2.0 ft-kips

GENERAL STRUCTURAL NOTES

A. BUILDING CODES:
   2000 EDITION OF INTERNATIONAL BUILDING CODE.
   1997 EDITION OF UNIFORM BUILDING CODE.
   1994 EDITION OF UNIFORM BUILDING CODE.
B. CONCRETE STRENGTH = 4,000 PSI.
C. REINFORCING STRENGTH: Fy = 40,000 PSI
D. ALL CONCRETE SHALL BE VIBRATED DURING PLACEMENT.
E. REINFORCING SHALL BE RESTRAINED DURING PLACEMENT OF CONCRETE.
F. REINFORCING AND CONCRETE PLACEMENT SHALL CONFORM TO "ACI 318" SPECIFICATION AND REQUIREMENTS.
G. CONNECTION AT TOP AND BOTTOM SHALL BE SPECIFIED ON CONSTRUCTION DOCUMENTS.
H. ALL COLUMNS SHALL BE BRACED AGAINST SIDESWAY.
I. COIL LOOP INSERTS SHALL BE MANUFACTURED BY DAYTON RICHMOND OR EQUIVALENT.



COLUMN SECTION
CT11



BASE SECTION & ELEVATION
CT11

Registered Professional Engineer (Structural)
CERTIFICATE NO. 26915
CRAIG A. NELSON
Date Signed
ARIZONA, U.S.A.

CT11 PRECAST CONCRETE COLUMN LOAD TABLE

SCALE: NONE

THE NELSON GROUP
ENGINEERING & DEVELOPING
1156 East Harmony Ave., Suite 202-C
Mesa, Arizona 85204
Ph: (480) 497-0003 Fax: (480) 497-0038

ARISTONE CONCRETE DESIGN
1615 East Weber Drive
Tempe, Arizona

DATE:	DRWN BY:	14 OF
04.27.04	C.A.N.	
JOB NO.	REV'D BY:	18
03-251	C.A.N.	

THE NELSON GROUP
ENGINEERING & DEVELOPING, INC.
1136 EAST HARMONY AVE. • SUITE 202-C
MESA, ARIZONA 85204
[480] 497-0003 • FAX: [480] 497-0038

Job Name: Aristone - Column Design
Job No.: 2003-251 **Sheet No.:** 15
By: C.A.N. **Date:** 04.27.04

COLUMN 'CT11'

GRAVITY LOADS:

- **DESIGN VALUES:**

  L_{MAX} ..... 71½" ..... USE 7'-8"

  F'_C ..... 4,000 PSI

  F_Y ..... 40,000 PSI

  DIA. [DESIGN] ..... 6.75" ..... [Actual Dia. = 6.75" Minimum]

  CONC. COVER ..... 1.25" ..... [Actual Cover = 1.72"]

  LOAD ECCENTRICITY ... 4"

  CONNECTIONS AT TOP AND BOTTOM OF COLUMN SHALL BE DETAILED BY DESIGN ENGINEER.

- **DESIGN LOADS:**

  P_1 = 5,000 #

  P_2 = 2,000 #

  P_3 = 1,000 #

  LOAD ARE ENTERED INTO THE DESIGN PROGRAM AS LIVE LOADS SO THAT THE HIGHER LOAD FACTOR OF 1.7 WOULD BE APPLIED TO LOADS. THIS PRODUCES A MORE CONSERVATIVE DESIGN.

- **ALLOWABLE MOMENTS:** [DETERMINED FROM DESIGN PROGRAM RESULTS]

  P_1 = 5,000 # ..... M_1 = 0.5 ft-kips

  P_2 = 2,000 # ..... M_2 = 1.5 ft-kips

  P_3 = 1,000 # ..... M_3 = 2.0 ft-kips

  REFER TO ATTACHED CALCULATIONS RESULTS FROM "ENERCALC" DESIGN PROGRAM FOR ADDITIONAL INFORMATION.

The Nelson Group
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Title : ARISTONE - COLUMN DESIGN **Job #** 03-251
Dsgnr: C.A.N. **Date:**
Description : ARISTONE CONCRETE DESIGN
1615 East Weber Drive
Scope : Structural Design of Reinforced Concrete Columns

Rev: 580000
User: KW-0603042, Ver 5.8.0, 1-Dec-2003

Circular Concrete Column

Description

CT11-8 [5k & 0.5k-f]

General Information

Code Ref: ACI 318-02, 1997 UBC, 2003 IBC, 2003 NFPA 5000

Diameter	6.750 in	f'c	4,000.0 psi	Total Height	8.000 ft
Number of Bars	4	Fy	40,000.0 psi	Unbraced Length	8.000 ft
Bar Size	4	Seismic Zone	4	Eff. Length Factor	1.000
Total Rebar Area	0.800 in2	LL & ST Loads Act Separate		Column is BRACED	
Rebar Percent	2.236 %	Spiral Ties NOT Used			
Bar Cover	1.250 in				

Loads

Note: Load factoring supports 2003 IBC and 2003 NFPA 5000 by virtue of their references to ACI 318-02 for concrete design.
Factoring of entered loads to ultimate loads within this program is according to ACI 318-02 C.2

	Dead Load	Live Load	Short Term	Eccentricity
Axial Loads	k	5.000 k	k	4.000 in
Applied Moments...				
@ Top	k-ft	0.500 k-ft	k-ft	
@ Bottom	k-ft	k-ft	k-ft	

Summary

Column is OK

Column Diameter= 6.75in, with 4 #4 Bars

	ACI C-1	ACI C-2	ACI C-3
Applied Pu : Max Factored	**8.50** k	**0.00** k	**0.00** k
Allowable Pn * Phi @ Design Ecc.	**12.44** k	**0.00** k	**0.00** k
M-critical	3.68 k-ft	0.00 k-ft	0.00 k-ft
Combined Eccentricity	5.2000 in	0.0000 in	0.0000 in
Magnification Factor	1.08	0.00	0.00
Design Eccentricity	5.6036 in	0.0000 in	0.0000 in
Magnified Design Moment	3.97 k-ft	0.00 k-ft	0.00 k-ft
Po * .80	120.76 k	120.76 k	120.76 k
P : Balanced	46.55 k	46.55 k	46.55 k
Ecc : Balanced	2.7683 in	2.7683 in	2.7683 in

Slenderness *per ACI 318-02 Section 10.12 & 10.13*

Actual k Lu / r 56.889 Elastic Modulus 3,605.0 ksi Beta 0.850

	ACI Eq. C-1	ACI Eq. C-2	ACI Eq. C-3
Neutral Axis Distance	2.2534 in	8.5834 in	8.5834 in
Phi	0.7344	0.7000	0.7000
Max Limit kl/r	34.0000	34.0000	34.0000
Beta = M:sustained/M:max	0.0000	0.0000	0.0000
Cm	1.0000	1.0000	1.0000
EI / 1000	146.94	0.00	0.00
Pc : pi^2 E I / (k Lu)^2	157.36	0.00	0.00
alpha: MaxPu / (.75 Pc)	0.0720	0.0000	0.0000
Delta	1.0776	0.0000	0.0000
Ecc: Ecc Loads + Moments	5.2000	0.0000	0.0000 in
Design Ecc = Ecc * Delta	**0.0000**	**0.0000**	**0.0000** in

ACI Factors (per ACI 318-02, applied internally to entered loads)

ACI C-1 & C-2 DL	1.400	ACI C-2 Group Factor	0.750	Add"l "1.4" Factor for Seismic	1.400
ACI C-1 & C-2 LL	1.700	ACI C-3 Dead Load Factor	0.900	Add"l "0.9" Factor for Seismic	0.900
ACI C-1 & C-2 ST	1.700	ACI C-3 Short Term Factor	1.300		
....seismic = ST * :	1.100				

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Title : ARISTONE - COLUMN DESIGN **Job #** 03-251
Dsgnr: C.A.N. **Date:**
Description : ARISTONE CONCRETE DESIGN
1615 East Weber Drive
Scope : Structural Design of Reinforced Concrete Columns

Rev: 580000
User: KW-0603042, Ver 5.8.0, 1-Dec-2003

Circular Concrete Column

Description

CT11-8 [2k & 1.5k-f]

General Information

Code Ref: ACI 318-02, 1997 UBC, 2003 IBC, 2003 NFPA 5000

Diameter	6.750 in	f'c	4,000.0 psi	Total Height	8.000 ft
Number of Bars	4	Fy	40,000.0 psi	Unbraced Length	8.000 ft
Bar Size	4	Seismic Zone	4	Eff. Length Factor	1.000
Total Rebar Area	0.800 in2	LL & ST Loads Act Separate		Column is BRACED	
Rebar Percent	2.236 %	Spiral Ties NOT Used			
Bar Cover	1.250 in				

Loads

Note: Load factoring supports 2003 IBC and 2003 NFPA 5000 by virtue of their references to ACI 318-02 for concrete design.
Factoring of entered loads to ultimate loads within this program is according to ACI 318-02 C.2

	Dead Load	Live Load	Short Term	Eccentricity
Axial Loads	k	2.000 k	k	4.000 in
Applied Moments...				
@ Top	k-ft	1.500 k-ft	k-ft	
@ Bottom	k-ft	k-ft	k-ft	

Summary

Column is OK

Column Diameter= 6.75in, with 4 #4 Bars

	ACI C-1	ACI C-2	ACI C-3
Applied Pu : Max Factored	**3.40** k	**0.00** k	**0.00** k
Allowable Pn * Phi @ Design Ecc.	**5.02** k	**0.00** k	**0.00** k
M-critical	3.68 k-ft	0.00 k-ft	0.00 k-ft
Combined Eccentricity	13.0000 in	0.0000 in	0.0000 in
Magnification Factor	1.03	0.00	0.00
Design Eccentricity	13.3856 in	0.0000 in	0.0000 in
Magnified Design Moment	3.79 k-ft	0.00 k-ft	0.00 k-ft
Po * .80	120.76 k	120.76 k	120.76 k
P : Balanced	46.55 k	46.55 k	46.55 k
Ecc : Balanced	2.7683 in	2.7683 in	2.7683 in

Slenderness *per ACI 318-02 Section 10.12 & 10.13*

Actual k Lu / r 56.889 Elastic Modulus 3,605.0 ksi Beta 0.850

	ACI Eq. C-1	ACI Eq. C-2	ACI Eq. C-3
Neutral Axis Distance	1.9134 in	8.5834 in	8.5834 in
Phi	0.8417	0.7000	0.7000
Max Limit kl/r	34.0000	34.0000	34.0000
Beta = M:sustained/M:max	0.0000	0.0000	0.0000
Cm	1.0000	1.0000	1.0000
EI / 1000	146.94	0.00	0.00
Pc : pi^2 E I / (k Lu)^2	157.36	0.00	0.00
alpha: MaxPu / (.75 Pc)	0.0288	0.0000	0.0000
Delta	1.0297	0.0000	0.0000
Ecc: Ecc Loads + Moments	13.0000	0.0000	0.0000 in
Design Ecc = Ecc * Delta	**0.0000**	**0.0000**	**0.0000** in

ACI Factors (per ACI 318-02, applied internally to entered loads)

ACI C-1 & C-2 DL	1.400	ACI C-2 Group Factor	0.750	Add"l "1.4" Factor for Seismic	1.400
ACI C-1 & C-2 LL	1.700	ACI C-3 Dead Load Factor	0.900	Add"l "0.9" Factor for Seismic	0.900
ACI C-1 & C-2 ST	1.700	ACI C-3 Short Term Factor	1.300		
....seismic = ST * :	1.100				

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1615 East Weber Drive
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Rev: 580000
User: KW-0603042, Ver 5.8.0, 1-Dec-2003

Circular Concrete Column

03-251.ecw:Calculations

Description

CT11-8 [1k & 2.0k-f]

General Information

Code Ref: ACI 318-02, 1997 UBC, 2003 IBC, 2003 NFPA 5000

Diameter	6.750 in	f'c	4,000.0 psi	Total Height	8.000 ft
Number of Bars	4	Fy	40,000.0 psi	Unbraced Length	8.000 ft
Bar Size	4	Seismic Zone	4	Eff. Length Factor	1.000
Total Rebar Area	0.800 in2	LL & ST Loads Act Separate		Column is BRACED	
Rebar Percent	2.236 %	Spiral Ties NOT Used			
Bar Cover	1.250 in				

Loads

Note: Load factoring supports 2003 IBC and 2003 NFPA 5000 by virtue of their references to ACI 318-02 for concrete design. Factoring of entered loads to ultimate loads within this program is according to ACI 318-02 C.2

	Dead Load	Live Load	Short Term	Eccentricity
Axial Loads	k	1.000 k	k	4.000 in
Applied Moments...				
@ Top	k-ft	2.000 k-ft	k-ft	
@ Bottom	k-ft	k-ft	k-ft	

Summary

Column is OK

Column Diameter= 6.75in, with 4 #4 Bars

	ACI C-1	ACI C-2	ACI C-3
Applied Pu : Max Factored	**1.70** k	**0.00** k	**0.00** k
Allowable Pn * Phi @ Design Ecc.	**2.36** k	**0.00** k	**0.00** k
M-critical	3.97 k-ft	0.00 k-ft	0.00 k-ft
Combined Eccentricity	28.0000 in	0.0000 in	0.0000 in
Magnification Factor	1.01	0.00	0.00
Design Eccentricity	28.4092 in	0.0000 in	0.0000 in
Magnified Design Moment	4.02 k-ft	0.00 k-ft	0.00 k-ft
Po * .80	120.76 k	120.76 k	120.76 k
P : Balanced	46.55 k	46.55 k	46.55 k
Ecc : Balanced	2.7683 in	2.7683 in	2.7683 in

Slenderness *per ACI 318-02 Section 10.12 & 10.13*

Actual k Lu / r 56.889 Elastic Modulus 3,605.0 ksi Beta 0.850

	ACI Eq. C-1	ACI Eq. C-2	ACI Eq. C-3
Neutral Axis Distance	1.7834 in	8.5834 in	8.5834 in
Phi	0.8736	0.7000	0.7000
Max Limit kl/r	34.0000	34.0000	34.0000
Beta = M:sustained/M:max	0.0000	0.0000	0.0000
Cm	1.0000	1.0000	1.0000
EI / 1000	146.94	0.00	0.00
Pc : pi^2 E I / (k Lu)^2	157.36	0.00	0.00
alpha: MaxPu / (.75 Pc)	0.0144	0.0000	0.0000
Delta	1.0146	0.0000	0.0000
Ecc: Ecc Loads + Moments	28.0000	0.0000	0.0000 in
Design Ecc = Ecc * Delta	**0.0000**	**0.0000**	**0.0000** in

ACI Factors (per ACI 318-02, applied internally to entered loads)

ACI C-1 & C-2 DL	1.400	ACI C-2 Group Factor	0.750	Add"l "1.4" Factor for Seismic	1.400
ACI C-1 & C-2 LL	1.700	ACI C-3 Dead Load Factor	0.900	Add"l "0.9" Factor for Seismic	0.900
ACI C-1 & C-2 ST	1.700	ACI C-3 Short Term Factor	1.300		
....seismic = ST * :	1.100				