FLSMIDTH

CALCULATION
COVER SHEET

JOB NUMBER	CLIENT	PROJECT	CALC. NUMBER
11021	CC&V	High Grade Ore	C-005b

TITLE/SUBJECT:

Mill Mat Foundation Design

STATEMENT OF PROBLEM:

Design Mat foundation for Ball and Rod Mill and Primary Sump.

P.E. SEAL

COLORADO LICENSED PROFESSIONAL ENGINEER
EDWARD CARTER SUMMERS
45828
7-16-12

SOURCES OF DATA, FORMULA & REFERENCES:

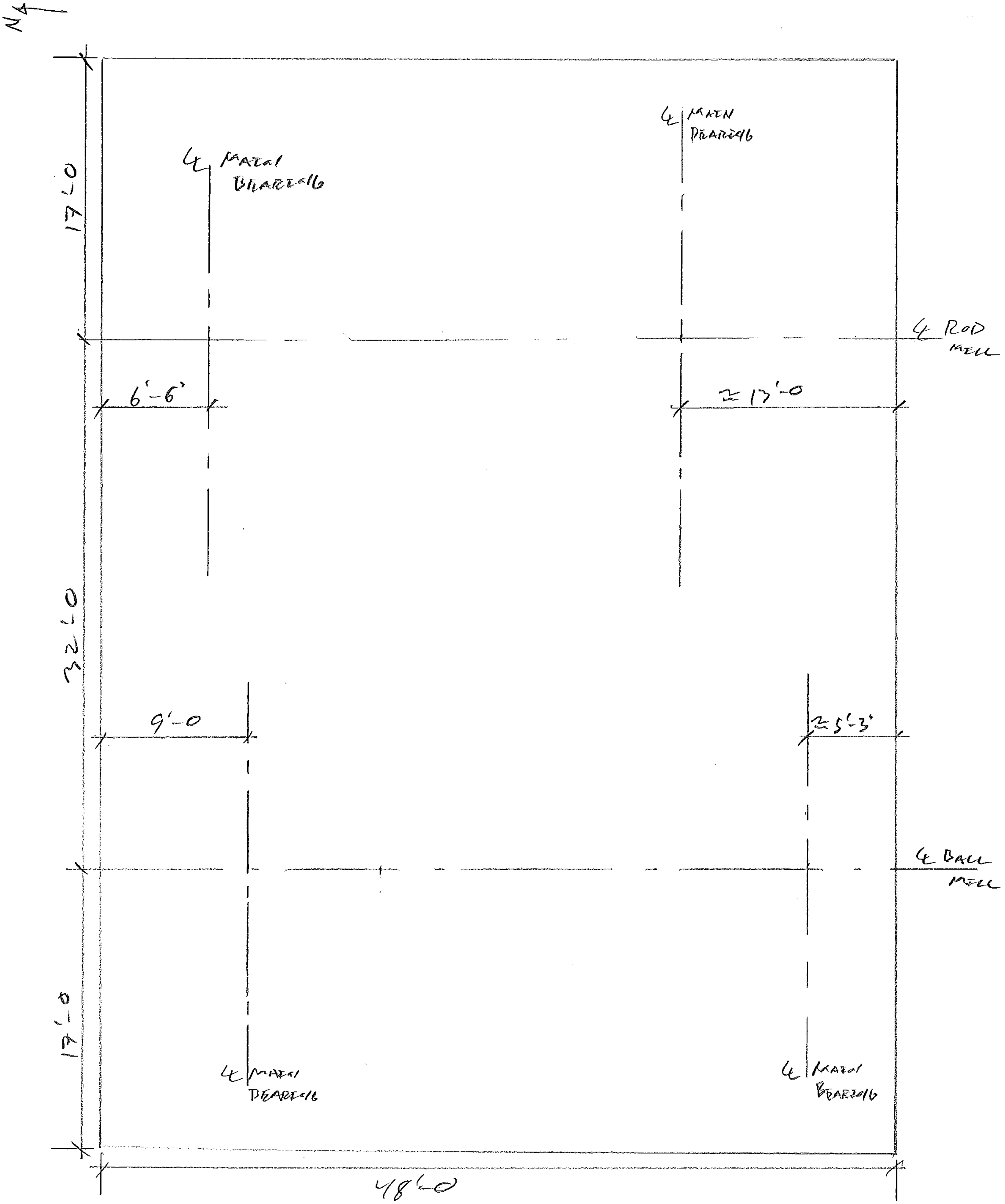
Autodesk Robot Structural Analysis 2012
Dyna6 Simulation
IBC 2009
ACI 318-08
ASCE 7-05
AMEC Mill Foundation Recommendations letter dated February 29, 2012

CONCLUSIONS & RECOMMENDATIONS:

See details in report

REV	DATE	DESCRIPTION/STATUS	CALC BY	CHKD BY	DWG./SPECS REVISED	QA REVIEW
A	6/5/2012	Ready for Check	ECS	WC		
0	7/16/2012	Issued for Permit	ECS	WC		

FLSMIDTH	PROJECT CCEV HIGH GRADE ORE	PROJ NO. 11021
		CALC NO. C-005
	SUBJECT MILL MAT FOUNDATION	BY ECS DATE 11-3-11
		CHK DATE
		SHEET OF REV



FLSMIDTH	PROJECT	CC&V High Grade Ore	PROJ NO.		11021	
			CALC NO.		C-005	
	SCOPE	Rod Mill Foundation	BY	ECS	DATE	16-Jul-12
			CHK		DATE	
			SHEET		OF	REV

ROD MILL

Foundation Center of Gravity

Using CL Main Gear & CL Rod Mill as Axis Origin

$\gamma =$ 150 pcf

	Pedestal Dimensions			**Weight**	**Center of Gravity**			
Pedestal	**L_x (ft)**	**L_y (ft)**	**H (ft)**	**F (kip)**	**X (ft)**	**Y (ft)**	**F*X (k*ft)**	**F*Y (k*ft)**
A	4.0	9.5	19.7	112.4	0.8	0.0	84.3	0.0
B	4.0	9.5	19.7	112.4	-29.3	0.0	-3289.4	0.0
$(C/D)_1$	4.0	2.7	19.7	31.6	0.8	6.1	23.7	191.9
$(C/D)_2$	1.2	1.3	19.7	4.5	-2.4	6.5	-10.7	28.9
$(C/D)_3$	5.2	6.1	19.7	92.9	0.2	10.5	15.6	971.6
$(C/D)_4$	3.3	1.6	19.7	15.6	-4.1	12.5	-63.7	195.8
$(C/D)_5$	1.5	6.1	19.7	27.0	-6.5	10.5	-175.4	282.3
$(C/D)_6$	3.3	4.5	16.6	37.2	-4.1	9.7	-152.1	360.0
E_1	3.9	6.1	18.1	64.3	-9.2	10.3	-591.3	664.3
E_2	3.6	6.9	19.1	71.1	-12.9	10.7	-919.4	763.9
F	9.1	5.0	18.8	128.2	-19.3	11.8	-2472.6	1517.5
G	4.5	5.0	19.4	65.5	-26.1	11.8	-1707.4	774.6
H	2.5	2.5	19.9	18.7	-4.1	-11.9	-76.2	-222.6
J	3.0	4.0	13.8	24.9	-9.1	0.0	-227.0	0.0
K	5.5	9.5	13.8	108.3	-25.3	0.0	-2735.1	0.0
			Resultants	**914.4**	**-13.4**	**6.0**	**-12296.7**	**5528.3**

Equipment Center of Gravity

Using CL Main Gear & CL Rod Mill as Axis Origin

	Weight	**Center of Gravity**			
Location	**F (kip)**	**X (ft)**	**Y (ft)**	**F*X (k*ft)**	**F*Y (k*ft)**
A	493.0	0.0	0.0	0.0	0.0
B	462.0	-28.5	0.0	-13174.2	0.0
C	3.4	-1.7	10.3	-5.8	34.9
D	6.1	-6.4	10.3	-39.3	62.7
E	6.4	-12.9	10.7	-83.2	69.1
F	17.0	-19.3	11.8	-327.8	201.2
G	2.2	-26.0	11.8	-55.9	25.4
H_1	8.8	-3.9	12.5	-34.5	110.0
H_2	8.8	-3.9	-11.9	-34.5	-105.0
Resultants	**1007.7**	**-13.7**	**0.4**	**-13755.2**	**398.3**

FLSMIDTH	PROJECT	CC&V High Grade Ore	PROJ NO.	11021	
			CALC NO.	C-005	
	SCOPE	Ball Mill Foundation	BY ECS	DATE	16-Jul-12
			CHK	DATE	
			SHEET	OF	REV

BALL MILL

Foundation Center of Gravity

Using CL Main Gear & CL Ball Mill as Axis Origin

γ = 150 pcf

	Pedestal Dimensions			Weight	Center of Gravity			
Pedestal	**L_x (ft)**	**L_y (ft)**	**H (ft)**	**F (kip)**	**X (ft)**	**Y (ft)**	**F*X (k*ft)**	**F*Y (k*ft)**
A	4.5	9.5	19.7	126.5	1.0	0.0	126.5	0.0
B	4.5	9.5	19.7	126.4	-34.8	0.0	-4396.0	0.0
(C/D)$_1$	4.5	10.2	19.7	135.2	1.0	-9.8	135.2	-1328.6
(C/D)$_2$	1.5	3.7	19.7	17.1	-1.8	-7.2	-30.1	-123.6
(C/D)$_3$	1.5	6.4	19.7	29.3	-2.0	-11.7	-59.2	-342.5
(C/D)$_4$	2.7	1.8	19.7	14.5	-4.1	-14.0	-59.4	-202.3
(C/D)$_5$	1.7	6.4	19.7	31.6	-6.3	-11.7	-198.5	-370.0
(C/D)$_6$	2.7	4.6	16.6	30.3	-4.1	-10.8	-124.7	-327.2
E$_1$	4.9	6.4	18.1	84.7	-9.5	-11.7	-807.9	-990.5
E$_2$	3.0	6.9	19.1	59.2	-13.5	-12.1	-797.4	-713.4
E$_3$	1.8	5.0	19.1	26.3	-15.9	-13.6	-417.6	-357.0
F/G	15.6	5.0	18.8	219.5	-24.6	-13.6	-5399.6	-2981.6
H	2.5	2.5	19.9	18.7	-4.1	13.3	-76.6	247.1
J	3.0	4.0	13.8	24.9	-9.0	0.0	-224.2	0.0
K	5.5	9.5	13.8	108.3	-30.8	0.0	-3330.6	0.0
			Resultants	**1052.3**	**-14.9**	**-7.1**	**-15660.2**	**-7489.5**

Equipment Center of Gravity

Using CL Main Gear & CL Rod Mill as Axis Origin

	Weight	Center of Gravity			
Location	**F (kip)**	**X (ft)**	**Y (ft)**	**F*X (k*ft)**	**F*Y (k*ft)**
A	537.0	0.0	0.0	0.0	0.0
B	497.0	-33.8	0.0	-16781.6	0.0
C	4.5	-2.0	-11.7	-9.1	-52.6
D	8.6	-6.3	-11.7	-54.0	-100.6
E	13.0	-13.5	-12.1	-175.2	-156.7
F	31.0	-20.9	-13.6	-646.5	-421.1
G	3.0	-29.4	-13.6	-88.3	-40.8
H$_1$	8.8	-4.1	13.3	-36.2	116.6
H$_2$	8.8	-4.1	-14.0	-36.2	-123.1
Resultants	**1111.7**	**-16.0**	**-0.7**	**-17826.9**	**-778.3**

FLSMIDTH

PROJECT	CC&V High Grade Ore	PROJ NO.	11021		
		CALC NO.	C-005		
SCOPE	~~Ball~~ Mill Foundation	BY	ECS	DATE	16-Jul-12
		CHK		DATE	
		SHEET		OF	REV

Sump

Foundation Center of Gravity

Using CL Sump & CL Sump as Axis Origin

$\gamma =$ 150 pcf

	Dimensions			Weight	Center of Gravity			
Item	**L_x (ft)**	**L_y (ft)**	**H (ft)**	**F (kip)**	**X (ft)**	**Y (ft)**	**F*X (k*ft)**	**F*Y (k*ft)**
Wall 1	19.0	1.0	12.75	36.3	0.0	8.0	0.0	290.7
Wall 2	19.0	1.0	12.75	36.3	0.0	-8.0	0.0	-290.7
Wall 3	1.0	16.0	12.00	28.8	9.5	0.0	273.6	0.0
Wall 4	1.0	16.0	12.75	30.6	-9.5	0.0	-290.7	0.0
Foundation	13.5	18.0	3.25	118.5	-3.8	0.0	-444.2	0.0
			Resultants	**250.5**	**-1.8**	**0.0**	**-461.3**	**0.0**

FLSMIDTH	PROJECT	CC&V High Grade Ore	PROJ NO.	11021	
			CALC NO.	C-005	
	SCOPE	Mill Foundation	BY ECS	DATE	16-Jul-12
			CHK	DATE	
			SHEET	OF	REV

Translation Vector

COMBINED CENTER OF GRAVITY

	X (ft)	Y (ft)
Rod Mill	-11.0	-16.0
Ball Mill	-18.8	16.0
Sump	-27.0	3.3

Foundation Center of Gravity

Using CL Mat & CL Mat as Axis Origin

$\gamma =$ 150 pcf

	Weight	Center of Gravity			
	F (kip)	**X (ft)**	**Y (ft)**	**F*X (k*ft)**	**F*Y (k*ft)**
Rod Mill	914.4	2.4	-22.0	2238.6	-20158.2
Ball Mill	1052.3	14.9	7.1	15660.2	7489.5
Mat	1900.8	0.0	0.0	0.0	0.0
Sump	250.5	-25.2	3.3	-6303.2	814.2
Resultants	**4118.0**	**2.8**	**-2.9**	**11595.6**	**-11854.5**

Equipment Center of Gravity

Using CL Mat & CL Mat as Axis Origin

	Weight	Center of Gravity			
Location	**F (kip)**	**X (ft)**	**Y (ft)**	**F*X (k*ft)**	**F*Y (k*ft)**
Rod Mill	1007.7	2.7	-16.4	2670.8	-16521.2
Ball Mill	1111.7	-2.7	16.7	-3039.7	18565.5
Resultants	**2119.4**	**-0.2**	**1.0**	**-368.9**	**2044.3**

Foundation Mass/ Rod Mill Mass Ratio =	4.09
Foundation Mass/ Ball Mill Mass Ratio =	3.70

FLSMIDTH				
	PROJECT CC&V High Grade Ore	PROJ NO. 11021		
		CALC NO. C-005		
	SCOPE ~~Ball~~ Mill Foundation	BY ECS	DATE	16-Jul-12
		CHK	DATE	
		SHEET	OF	REV

Using Corner Mat as Axis Origin

DYNA 6.0

INPUT DATA

Translation Vector

	X (ft)	Y (ft)
Rod Mill	-35.0	-49.0
Ball Mill	-42.8	-17.0
Sump	49.5	21.25

Pedestal Mass Input

	Item	Corner X (ft)	Corner Y (ft)	Corner Z (ft)	Length X (ft)	Width Y (ft)	Height Z (ft)	Density (Slug/ft^3)
Rod Mill	A	33.75	44.25	4.00	4.00	9.50	19.72	4.66
	B	3.73	44.25	4.00	4.00	9.50	19.72	4.66
	(C/D)1	33.75	53.75	4.00	4.00	2.67	19.72	4.66
	(C/D)2	32.03	54.83	4.00	1.17	1.29	19.72	4.66
	(C/D)3	32.59	56.42	4.00	5.16	6.08	19.72	4.66
	(C/D)4	29.25	60.75	4.00	3.33	1.58	19.72	4.66
	(C/D)5	27.75	56.42	4.00	1.50	6.08	19.72	4.66
	(C/D)6	29.25	56.42	4.00	3.33	4.50	16.55	4.66
	E1	23.85	56.29	4.00	3.90	6.08	18.08	4.66
	E2	20.27	56.29	4.00	3.58	6.92	19.11	4.66
	F	11.17	58.33	4.00	9.10	5.00	18.78	4.66
	G	6.67	58.33	4.00	4.50	5.00	19.40	4.66
	H	29.67	35.82	4.00	2.50	2.50	19.90	4.66
	J	24.37	47.00	4.00	3.00	4.00	13.81	4.66
	K	6.98	44.25	4.00	5.50	9.50	13.81	4.66
Ball Mill	A	41.52	12.25	4.00	4.50	9.50	19.72	4.66
	B	5.75	12.25	4.00	4.50	9.50	19.72	4.66
	(C/D)1	41.52	2.09	4.00	4.50	10.16	19.72	4.66
	(C/D)2	40.23	7.89	4.00	1.54	3.74	19.72	4.66
	(C/D)3	39.98	2.09	4.00	1.54	6.42	19.72	4.66
	(C/D)4	37.33	2.09	4.00	2.67	1.83	19.72	4.66
	(C/D)5	35.66	2.09	4.00	1.67	6.42	19.72	4.66
	(C/D)6	37.33	3.93	4.00	2.67	4.58	16.55	4.66
	E1	30.80	2.09	4.00	4.86	6.42	18.08	4.66
	E2	27.80	1.51	4.00	3.00	6.88	19.11	4.66
	E3	25.96	0.92	4.00	1.83	5.00	19.11	4.66
	F/G	10.38	0.92	4.00	15.58	5.00	18.78	4.66
	H	37.41	29.00	4.00	2.50	2.50	19.90	4.66
	J	32.25	15.00	4.00	3.00	4.00	13.81	4.66
	K	9.25	12.25	4.00	5.50	9.50	13.81	4.66
Sump	Wall 1	40.50	36.75	3.25	19.00	1.00	12.75	4.66
	Wall 2	40.50	21.75	3.25	19.00	1.00	12.75	4.66
	Wall 3	59.50	21.75	3.25	1.00	16.00	12.75	4.66
	Wall 4	40.50	21.75	4.00	1.00	16.00	2.00	4.66
	Foundation	48.00	20.75	0.00	13.50	18.00	3.25	4.66
	Mat	0.00	0.00	0.00	48.00	66.00	4.00	4.66

Equipment Dynamic Forces - Case 1 (Mill Frequency)

	Item	X (ft)	Y (ft)	Z (ft)	Fx (slug)	Fy (slug)	Fz (slug)
Rod Mill	A	35.0	49.0	23.7	234.7	984.5	-785.7
	B	6.5	49.0	23.7	0.0	1382.0	1031.1
	C	33.3	59.3	23.7	0.0	-857.1	962.7
	D	28.6	59.3	23.7	-234.7	-798.1	-962.7
	E	22.1	59.7	23.1	0.0	0.0	0.0
	F	15.7	60.8	22.8	0.0	0.0	0.0
	G	9.0	60.8	23.4	0.0	0.0	0.0
Ball Mill	A	42.8	17.0	23.7	493.1	1031.1	-1077.6
	B	9.0	17.0	23.7	0.0	1826.1	1397.5
	C	40.7	5.3	23.7	0.0	-944.1	-1267.1
	D	36.5	5.3	23.7	-493.1	-1102.5	-1229.8
	E	29.3	4.9	23.1	0.0	0.0	0.0
	F	21.9	3.4	22.8	0.0	0.0	0.0
	G	13.3	3.4	22.8	0.0	0.0	0.0

Equipment Dynamic Forces - Case 2 (Motor Frequency)

	Item	X (ft)	Y (ft)	Z (ft)	Fx (slug)	Fy (slug)	Fz (slug)
Rod Mill	A	35.0	49.0	23.7	0.0	0.0	0.0
	B	6.5	49.0	23.7	0.0	0.0	0.0
	C	33.3	59.3	23.7	0.0	0.0	0.0
	D	28.6	59.3	23.7	0.0	0.0	0.0
	E	22.1	59.7	23.1	0.0	0.0	0.0
	F	15.7	60.8	22.8	0.0	0.0	109.5
	G	9.0	60.8	23.4	0.0	0.0	40.4
Ball Mill	A	42.8	17.0	23.7	0.0	0.0	0.0
	B	9.0	17.0	23.7	0.0	0.0	0.0
	C	40.7	5.3	23.7	0.0	0.0	0.0
	D	36.5	5.3	23.7	0.0	0.0	0.0
	E	29.3	4.9	23.1	0.0	0.0	1054.3
	F	21.9	3.4	22.8	0.0	0.0	486.0
	G	13.3	3.4	22.8	0.0	0.0	0.0

Equipment Masses

	Item	X (ft)	Y (ft)	Z (ft)	Fx (slug)	Fy (slug)	Fz (slug)
Rod Mill	A	35.0	49.0	23.72	0	0	15311
	B	6.5	49.0	23.72	0	0	14348
	C	33.3	59.3	23.72	0	0	106
	D	28.6	59.3	23.72	0	0	189
	E	22.1	59.7	23.11	0	0	200
	F	15.7	60.8	22.78	0	0	528
	G	9.0	60.8	23.40	0	0	67
Ball Mill	A	42.8	17.0	23.72	0	0	16677
	B	9.0	17.0	23.72	0	0	15435
	C	40.7	5.3	23.72	0	0	140
	D	36.5	5.3	23.72	0	0	267
	E	29.3	4.9	23.11	0	0	404
	F	21.9	3.4	22.78	0	0	963
	G	13.3	3.4	22.78	0	0	93

OUTPUT - CASE 1 (MILL VIBRATION)

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*************************************************
*                                               *
*        D Y N A 6   S I M U L A T I O N        *
*                                               *
*          Copyright (c) Western - 2011         *
*             RUN DATE -  2012/ 7/10            *
*             TIME     -     15: 2:40           *
*             REVISION -  Jan.21/201            *
*                                               *
*************************************************

Mill Mat Foundation

                     DATA ECHO
                     *********

GRAVITATIONAL CONSTANT SET TO  32.20 ft/s**2
*****************************

FREQUENCY UNITS :  RPM
***************

LENGTH UNITS : ft
************

FORCE UNITS : lb
***********

MASS UNITS : slug
**********

RESPONSE TO BE PLOTTED
**********************

STIFFNESS AND DAMPING CONSTANTS TO BE PRINTED
*********************************************


DAMPING SAFETY FACTOR -    2.00
*********************


FOUNDATION TYPE - HALF-SPACE
***************

RECTANGULAR FOUNDATION  -    48.000 ft  BY  66.000 ft
**********************


MASS CONSTANTS
**************

TOTAL MASS OF FOOTING  ......... 1.9265E+05  slug
MASS MOMENT ABOUT X-AXIS  ...... 9.0643E+07  slug.ft**2
MASS MOMENT ABOUT Y-AXIS  ...... 6.0555E+07  slug.ft**2
MASS MOMENT ABOUT Z-AXIS  ...... 1.1716E+08  slug.ft**2
CROSS PRODUCT X-Y  .............-7.8857E+06  slug.ft**2
CROSS PRODUCT X-Z  .............-1.3754E+06  slug.ft**2
CROSS PRODUCT Y-Z  .............-5.4366E+05  slug.ft**2

COORDINATES OF BASE CENTRE
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X-COORD. OF BASE CENTRE REL. TO C.G.  ..     -1.448  ft
Y-COORD. OF BASE CENTRE REL. TO C.G.  ..      1.134  ft
Z-COORD. OF BASE CENTRE REL. TO C.G.  ..     11.007  ft


SOIL
****

SOIL CONSTANTS  NUMBER OF SIDE LAYERS -   1
**************

LAYER  LAYER  SHEAR WAVE   UNIT   POISSON'S  MATERIAL
 NO.   DEPTH   VELOCITY   WEIGHT    RATIO     DAMPING
        ft       ft/s    lb/ft**3

  1    6.000   1200.00    120.00    0.250      0.100

HALF-SPACE SOIL
***************

SHEAR WAVE    UNIT    POISSON'S  MATERIAL
 VELOCITY    WEIGHT     RATIO     DAMPING
   ft/s     lb/ft**3

 1.20E+03     120.00   0.250     0.100


HARMONIC LOAD (QUADRATIC)
*************

MAXIMUM FREQUENCY  ...........    20.000  RPM
MINIMUM FREQUENCY  ...........    10.000  RPM
STEP FREQUENCY  ..............     1.000  RPM
FORCE IN X-DIRECTION  ......... 0.00E+00 slug.ft
FORCE IN Y-DIRECTION  ......... 1.52E+03 slug.ft
FORCE IN Z-DIRECTION  .........-1.93E+03 slug.ft
MOMENT ABOUT X-AXIS  .......... 4.95E+04 slug.ft**2
MOMENT ABOUT Y-AXIS  .......... 9.71E+04 slug.ft**2
MOMENT ABOUT Z-AXIS  ..........-6.81E+04 slug.ft**2
♀

 *************************************************
 *                                               *
 *        D Y N A 6   S I M U L A T I O N        *
 *                                               *
 *          Copyright (c) Western - 2011         *
 *             RUN DATE -  2012/ 7/10            *
 *             TIME     -    15: 2:40            *
 *             REVISION -  Jan.21/201            *
 *                                               *
 *************************************************

 Mill Mat Foundation

                                    RESULTS
                                    *******


 FREQUENCY  -     10.000   RPM
 *********
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STIFFNESS CONSTANTS (K)
***********************

HORIZONTAL TRANSLATION  (X) ...  8.806E+08  lb/ft
HORIZONTAL TRANSLATION  (Y) ...  8.806E+08  lb/ft
VERTICAL TRANSLATION  (Z) .....  9.580E+08  lb/ft
ROTATION ABOUT  (X) ...........  1.027E+12  lb.ft/rad
ROTATION ABOUT  (Y) ...........  6.900E+11  lb.ft/rad
TORSION ABOUT  (Z) ............  1.415E+12  lb.ft/rad
CROSS-STIFFNESS (YZ PLANE) ....  9.386E+09  lb/rad
CROSS-STIFFNESS (XZ PLANE) .... -9.386E+09  lb/rad

DAMPING CONSTANTS (C)
*********************

HORIZONTAL TRANSLATION  (X) ...  5.358E+07  lb/ft/s
HORIZONTAL TRANSLATION  (Y) ...  5.358E+07  lb/ft/s
VERTICAL TRANSLATION  (Z) .....  5.997E+07  lb/ft/s
ROTATION ABOUT  (X) ...........  5.032E+10  lb.ft/rad/s
ROTATION ABOUT  (Y) ...........  3.417E+10  lb.ft/rad/s
TORSION ABOUT  (Z) ............  6.777E+10  lb.ft/rad/s
CROSS-DAMPING (YZ PLANE) ......  5.607E+08  lb/rad/s
CROSS-DAMPING (XZ PLANE) ...... -5.607E+08  lb/rad/s


FREQUENCY  -    11.000   RPM
*********


STIFFNESS CONSTANTS (K)
***********************

HORIZONTAL TRANSLATION  (X) ...  8.805E+08  lb/ft
HORIZONTAL TRANSLATION  (Y) ...  8.805E+08  lb/ft
VERTICAL TRANSLATION  (Z) .....  9.579E+08  lb/ft
ROTATION ABOUT  (X) ...........  1.027E+12  lb.ft/rad
ROTATION ABOUT  (Y) ...........  6.899E+11  lb.ft/rad
TORSION ABOUT  (Z) ............  1.415E+12  lb.ft/rad
CROSS-STIFFNESS (YZ PLANE) ....  9.385E+09  lb/rad
CROSS-STIFFNESS (XZ PLANE) .... -9.385E+09  lb/rad

DAMPING CONSTANTS (C)
*********************

HORIZONTAL TRANSLATION  (X) ...  4.976E+07  lb/ft/s
HORIZONTAL TRANSLATION  (Y) ...  4.976E+07  lb/ft/s
VERTICAL TRANSLATION  (Z) .....  5.580E+07  lb/ft/s
ROTATION ABOUT  (X) ...........  4.587E+10  lb.ft/rad/s
ROTATION ABOUT  (Y) ...........  3.118E+10  lb.ft/rad/s
TORSION ABOUT  (Z) ............  6.164E+10  lb.ft/rad/s
CROSS-DAMPING (YZ PLANE) ......  5.199E+08  lb/rad/s
CROSS-DAMPING (XZ PLANE) ...... -5.199E+08  lb/rad/s


FREQUENCY  -    12.000   RPM
*********


STIFFNESS CONSTANTS (K)
***********************
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HORIZONTAL TRANSLATION  (X) ...  8.805E+08  lb/ft
HORIZONTAL TRANSLATION  (Y) ...  8.805E+08  lb/ft
VERTICAL TRANSLATION  (Z) .....  9.577E+08  lb/ft
ROTATION ABOUT  (X) ...........  1.027E+12  lb.ft/rad
ROTATION ABOUT  (Y) ...........  6.898E+11  lb.ft/rad
TORSION ABOUT  (Z) ............  1.415E+12  lb.ft/rad
CROSS-STIFFNESS (YZ PLANE) ....  9.384E+09  lb/rad
CROSS-STIFFNESS (XZ PLANE) .... -9.384E+09  lb/rad

DAMPING CONSTANTS (C)
*********************

HORIZONTAL TRANSLATION  (X) ...  4.657E+07  lb/ft/s
HORIZONTAL TRANSLATION  (Y) ...  4.657E+07  lb/ft/s
VERTICAL TRANSLATION  (Z) .....  5.234E+07  lb/ft/s
ROTATION ABOUT  (X) ...........  4.216E+10  lb.ft/rad/s
ROTATION ABOUT  (Y) ...........  2.869E+10  lb.ft/rad/s
TORSION ABOUT  (Z) ............  5.653E+10  lb.ft/rad/s
CROSS-DAMPING (YZ PLANE) ......  4.860E+08  lb/rad/s
CROSS-DAMPING (XZ PLANE) ...... -4.860E+08  lb/rad/s


FREQUENCY  -     13.000   RPM
*********


STIFFNESS CONSTANTS (K)
***********************

HORIZONTAL TRANSLATION  (X) ...  8.804E+08  lb/ft
HORIZONTAL TRANSLATION  (Y) ...  8.804E+08  lb/ft
VERTICAL TRANSLATION  (Z) .....  9.576E+08  lb/ft
ROTATION ABOUT  (X) ...........  1.027E+12  lb.ft/rad
ROTATION ABOUT  (Y) ...........  6.898E+11  lb.ft/rad
TORSION ABOUT  (Z) ............  1.415E+12  lb.ft/rad
CROSS-STIFFNESS (YZ PLANE) ....  9.383E+09  lb/rad
CROSS-STIFFNESS (XZ PLANE) .... -9.383E+09  lb/rad

DAMPING CONSTANTS (C)
*********************

HORIZONTAL TRANSLATION  (X) ...  4.387E+07  lb/ft/s
HORIZONTAL TRANSLATION  (Y) ...  4.387E+07  lb/ft/s
VERTICAL TRANSLATION  (Z) .....  4.940E+07  lb/ft/s
ROTATION ABOUT  (X) ...........  3.902E+10  lb.ft/rad/s
ROTATION ABOUT  (Y) ...........  2.658E+10  lb.ft/rad/s
TORSION ABOUT  (Z) ............  5.221E+10  lb.ft/rad/s
CROSS-DAMPING (YZ PLANE) ......  4.572E+08  lb/rad/s
CROSS-DAMPING (XZ PLANE) ...... -4.572E+08  lb/rad/s


FREQUENCY  -     14.000   RPM
*********


STIFFNESS CONSTANTS (K)
***********************

HORIZONTAL TRANSLATION  (X) ...  8.803E+08  lb/ft
HORIZONTAL TRANSLATION  (Y) ...  8.803E+08  lb/ft
VERTICAL TRANSLATION  (Z) .....  9.575E+08  lb/ft
ROTATION ABOUT  (X) ...........  1.027E+12  lb.ft/rad
ROTATION ABOUT  (Y) ...........  6.897E+11  lb.ft/rad
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TORSION ABOUT  (Z) ............  1.415E+12  lb.ft/rad
CROSS-STIFFNESS (YZ PLANE) ....  9.383E+09  lb/rad
CROSS-STIFFNESS (XZ PLANE) .... -9.383E+09  lb/rad

DAMPING CONSTANTS (C)
*********************

HORIZONTAL TRANSLATION  (X) ...  4.156E+07  lb/ft/s
HORIZONTAL TRANSLATION  (Y) ...  4.156E+07  lb/ft/s
VERTICAL TRANSLATION  (Z) .....  4.688E+07  lb/ft/s
ROTATION ABOUT  (X) ...........  3.633E+10  lb.ft/rad/s
ROTATION ABOUT  (Y) ...........  2.477E+10  lb.ft/rad/s
TORSION ABOUT  (Z) ............  4.851E+10  lb.ft/rad/s
CROSS-DAMPING (YZ PLANE) ......  4.326E+08  lb/rad/s
CROSS-DAMPING (XZ PLANE) ...... -4.326E+08  lb/rad/s


FREQUENCY  -     15.000   RPM
*********


STIFFNESS CONSTANTS (K)
***********************

HORIZONTAL TRANSLATION  (X) ...  8.803E+08  lb/ft
HORIZONTAL TRANSLATION  (Y) ...  8.803E+08  lb/ft
VERTICAL TRANSLATION  (Z) .....  9.573E+08  lb/ft
ROTATION ABOUT  (X) ...........  1.027E+12  lb.ft/rad
ROTATION ABOUT  (Y) ...........  6.896E+11  lb.ft/rad
TORSION ABOUT  (Z) ............  1.414E+12  lb.ft/rad
CROSS-STIFFNESS (YZ PLANE) ....  9.382E+09  lb/rad
CROSS-STIFFNESS (XZ PLANE) .... -9.382E+09  lb/rad

DAMPING CONSTANTS (C)
*********************

HORIZONTAL TRANSLATION  (X) ...  3.955E+07  lb/ft/s
HORIZONTAL TRANSLATION  (Y) ...  3.955E+07  lb/ft/s
VERTICAL TRANSLATION  (Z) .....  4.470E+07  lb/ft/s
ROTATION ABOUT  (X) ...........  3.400E+10  lb.ft/rad/s
ROTATION ABOUT  (Y) ...........  2.321E+10  lb.ft/rad/s
TORSION ABOUT  (Z) ............  4.530E+10  lb.ft/rad/s
CROSS-DAMPING (YZ PLANE) ......  4.112E+08  lb/rad/s
CROSS-DAMPING (XZ PLANE) ...... -4.112E+08  lb/rad/s


FREQUENCY  -     16.000   RPM
*********


STIFFNESS CONSTANTS (K)
***********************

HORIZONTAL TRANSLATION  (X) ...  8.802E+08  lb/ft
HORIZONTAL TRANSLATION  (Y) ...  8.802E+08  lb/ft
VERTICAL TRANSLATION  (Z) .....  9.572E+08  lb/ft
ROTATION ABOUT  (X) ...........  1.026E+12  lb.ft/rad
ROTATION ABOUT  (Y) ...........  6.895E+11  lb.ft/rad
TORSION ABOUT  (Z) ............  1.414E+12  lb.ft/rad
CROSS-STIFFNESS (YZ PLANE) ....  9.381E+09  lb/rad
CROSS-STIFFNESS (XZ PLANE) .... -9.381E+09  lb/rad

DAMPING CONSTANTS (C)
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*********************

HORIZONTAL TRANSLATION  (X) ...  3.780E+07  lb/ft/s
HORIZONTAL TRANSLATION  (Y) ...  3.780E+07  lb/ft/s
VERTICAL TRANSLATION  (Z) .....  4.280E+07  lb/ft/s
ROTATION ABOUT  (X) ...........  3.197E+10  lb.ft/rad/s
ROTATION ABOUT  (Y) ...........  2.184E+10  lb.ft/rad/s
TORSION ABOUT  (Z) ............  4.250E+10  lb.ft/rad/s
CROSS-DAMPING (YZ PLANE) ......  3.925E+08  lb/rad/s
CROSS-DAMPING (XZ PLANE) ...... -3.925E+08  lb/rad/s


FREQUENCY  -    17.000   RPM
*********


STIFFNESS CONSTANTS (K)
***********************

HORIZONTAL TRANSLATION  (X) ...  8.801E+08  lb/ft
HORIZONTAL TRANSLATION  (Y) ...  8.801E+08  lb/ft
VERTICAL TRANSLATION  (Z) .....  9.570E+08  lb/ft
ROTATION ABOUT  (X) ...........  1.026E+12  lb.ft/rad
ROTATION ABOUT  (Y) ...........  6.894E+11  lb.ft/rad
TORSION ABOUT  (Z) ............  1.414E+12  lb.ft/rad
CROSS-STIFFNESS (YZ PLANE) ....  9.380E+09  lb/rad
CROSS-STIFFNESS (XZ PLANE) .... -9.380E+09  lb/rad

DAMPING CONSTANTS (C)
*********************

HORIZONTAL TRANSLATION  (X) ...  3.625E+07  lb/ft/s
HORIZONTAL TRANSLATION  (Y) ...  3.625E+07  lb/ft/s
VERTICAL TRANSLATION  (Z) .....  4.111E+07  lb/ft/s
ROTATION ABOUT  (X) ...........  3.017E+10  lb.ft/rad/s
ROTATION ABOUT  (Y) ...........  2.063E+10  lb.ft/rad/s
TORSION ABOUT  (Z) ............  4.002E+10  lb.ft/rad/s
CROSS-DAMPING (YZ PLANE) ......  3.760E+08  lb/rad/s
CROSS-DAMPING (XZ PLANE) ...... -3.760E+08  lb/rad/s


FREQUENCY  -    18.000   RPM
*********


STIFFNESS CONSTANTS (K)
***********************

HORIZONTAL TRANSLATION  (X) ...  8.801E+08  lb/ft
HORIZONTAL TRANSLATION  (Y) ...  8.801E+08  lb/ft
VERTICAL TRANSLATION  (Z) .....  9.569E+08  lb/ft
ROTATION ABOUT  (X) ...........  1.026E+12  lb.ft/rad
ROTATION ABOUT  (Y) ...........  6.893E+11  lb.ft/rad
TORSION ABOUT  (Z) ............  1.414E+12  lb.ft/rad
CROSS-STIFFNESS (YZ PLANE) ....  9.380E+09  lb/rad
CROSS-STIFFNESS (XZ PLANE) .... -9.380E+09  lb/rad

DAMPING CONSTANTS (C)
*********************

HORIZONTAL TRANSLATION  (X) ...  3.488E+07  lb/ft/s
HORIZONTAL TRANSLATION  (Y) ...  3.488E+07  lb/ft/s
VERTICAL TRANSLATION  (Z) .....  3.962E+07  lb/ft/s
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ROTATION ABOUT  (X) ...........  2.858E+10  lb.ft/rad/s
ROTATION ABOUT  (Y) ...........  1.956E+10  lb.ft/rad/s
TORSION ABOUT  (Z) ............  3.783E+10  lb.ft/rad/s
CROSS-DAMPING (YZ PLANE) ......  3.614E+08  lb/rad/s
CROSS-DAMPING (XZ PLANE) ...... -3.614E+08  lb/rad/s


FREQUENCY  -    19.000   RPM
*********


STIFFNESS CONSTANTS (K)
***********************

HORIZONTAL TRANSLATION  (X) ...  8.800E+08  lb/ft
HORIZONTAL TRANSLATION  (Y) ...  8.800E+08  lb/ft
VERTICAL TRANSLATION  (Z) .....  9.572E+08  lb/ft
ROTATION ABOUT  (X) ...........  1.026E+12  lb.ft/rad
ROTATION ABOUT  (Y) ...........  6.892E+11  lb.ft/rad
TORSION ABOUT  (Z) ............  1.414E+12  lb.ft/rad
CROSS-STIFFNESS (YZ PLANE) ....  9.379E+09  lb/rad
CROSS-STIFFNESS (XZ PLANE) .... -9.379E+09  lb/rad

DAMPING CONSTANTS (C)
*********************

HORIZONTAL TRANSLATION  (X) ...  3.365E+07  lb/ft/s
HORIZONTAL TRANSLATION  (Y) ...  3.365E+07  lb/ft/s
VERTICAL TRANSLATION  (Z) .....  3.828E+07  lb/ft/s
ROTATION ABOUT  (X) ...........  2.715E+10  lb.ft/rad/s
ROTATION ABOUT  (Y) ...........  1.860E+10  lb.ft/rad/s
TORSION ABOUT  (Z) ............  3.586E+10  lb.ft/rad/s
CROSS-DAMPING (YZ PLANE) ......  3.483E+08  lb/rad/s
CROSS-DAMPING (XZ PLANE) ...... -3.483E+08  lb/rad/s


FREQUENCY  -    20.000   RPM
*********


STIFFNESS CONSTANTS (K)
***********************

HORIZONTAL TRANSLATION  (X) ...  8.799E+08  lb/ft
HORIZONTAL TRANSLATION  (Y) ...  8.799E+08  lb/ft
VERTICAL TRANSLATION  (Z) .....  9.576E+08  lb/ft
ROTATION ABOUT  (X) ...........  1.026E+12  lb.ft/rad
ROTATION ABOUT  (Y) ...........  6.891E+11  lb.ft/rad
TORSION ABOUT  (Z) ............  1.413E+12  lb.ft/rad
CROSS-STIFFNESS (YZ PLANE) ....  9.378E+09  lb/rad
CROSS-STIFFNESS (XZ PLANE) .... -9.378E+09  lb/rad

DAMPING CONSTANTS (C)
*********************

HORIZONTAL TRANSLATION  (X) ...  3.254E+07  lb/ft/s
HORIZONTAL TRANSLATION  (Y) ...  3.254E+07  lb/ft/s
VERTICAL TRANSLATION  (Z) .....  3.707E+07  lb/ft/s
ROTATION ABOUT  (X) ...........  2.587E+10  lb.ft/rad/s
ROTATION ABOUT  (Y) ...........  1.774E+10  lb.ft/rad/s
TORSION ABOUT  (Z) ............  3.410E+10  lb.ft/rad/s
CROSS-DAMPING (YZ PLANE) ......  3.365E+08  lb/rad/s
CROSS-DAMPING (XZ PLANE) ...... -3.365E+08  lb/rad/s
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♀

**************************************************
*                                                *
*        D Y N A 6   S I M U L A T I O N         *
*                                                *
*          Copyright (c) Western - 2011          *
*             RUN DATE -  2012/ 7/10             *
*             TIME     -     15: 2:40            *
*             REVISION -  Jan.21/201             *
*                                                *
**************************************************

Mill Mat Foundation

                                RESULTS
                                *******

                       FOOTING RESPONSE AMPLITUDES
                       ---------------------------

  FREQ.     TRANS. X  TRANS. Y  VERTICAL  ROT ABOUT ROT ABOUT TORSIONAL
   RPM     DIRECTION DIRECTION DIRECTION   X AXIS    Y AXIS    Z AXIS
             (ft)      (ft)      (ft)      (rad)     (rad)     (rad)
 -------   --------- --------- --------- --------- --------- ---------

   10.00    1.94E-06  1.58E-06  1.91E-06  3.68E-08  1.76E-07  5.45E-08
   11.00    2.34E-06  1.91E-06  2.31E-06  4.45E-08  2.13E-07  6.60E-08
   12.00    2.79E-06  2.27E-06  2.75E-06  5.30E-08  2.53E-07  7.86E-08
   13.00    3.27E-06  2.67E-06  3.23E-06  6.22E-08  2.97E-07  9.22E-08
   14.00    3.80E-06  3.09E-06  3.75E-06  7.21E-08  3.45E-07  1.07E-07
   15.00    4.36E-06  3.55E-06  4.30E-06  8.28E-08  3.96E-07  1.23E-07
   16.00    4.96E-06  4.04E-06  4.89E-06  9.43E-08  4.50E-07  1.40E-07
   17.00    5.60E-06  4.56E-06  5.52E-06  1.06E-07  5.08E-07  1.58E-07
   18.00    6.28E-06  5.12E-06  6.19E-06  1.19E-07  5.70E-07  1.77E-07
   19.00    7.00E-06  5.70E-06  6.90E-06  1.33E-07  6.35E-07  1.97E-07
   20.00    7.76E-06  6.32E-06  7.64E-06  1.47E-07  7.04E-07  2.19E-07

 MAXIMA OF FOOTING RESPONSE AMPLITUDES
 *************************************

                                                               FREQ.
                                                                RPM
                                                              -------

 MAX. TRANS. IN X-DIRECTION  -     7.759E-06  ft        20.00
 MAX. TRANS. IN Y-DIRECTION  -     6.316E-06  ft        20.00
 MAX. TRANS. IN Z-DIRECTION  -     7.639E-06  ft        20.00
 MAX. ROT. ABOUT X AXIS      -     1.474E-07  rad       20.00
 MAX. ROT. ABOUT Y AXIS      -     7.042E-07  rad       20.00
 MAX. ROT. ABOUT Z AXIS      -     2.185E-07  rad       20.00
♀
                       FOOTING RESPONSE CURVE
                       ----------------------
     CURVE-X= TRANS X-DIRECTION      CURVE-Y= TRANS Y-DIRECTION
                      CURVE-Z= TRANS Z-DIRECTION
  FREQ.
   RPM                     DISPLACEMENT (ft)
          1.00E-06  2.40E-06  3.80E-06  5.20E-06  6.60E-06  8.00E-06
   10.0    +---Y--Z--+---------+---------+---------+---------+
   11.0    I      Y ZX
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 12.0     I        Y   Z
 13.0     I           Y   Z
 14.0     I              Y    Z
 15.0     I                 Y     Z
 16.0     I                     Y     Z
 17.0     I                        Y      ZX
 18.0     I                            Y       ZX
 19.0     I                                 Y       ZX
 20.0     +                                     Y        ZX
♀
                      FOOTING RESPONSE CURVE
                      ----------------------
    CURVE-X= ROT ABOUT X AXIS       CURVE-Y= ROT ABOUT Y AXIS
                    CURVE-Z= ROT ABOUT Z AXIS
FREQ.
 RPM                       ROTATION (rad)
         0.00E+00  1.60E-07  3.20E-07  4.80E-07  6.40E-07  8.00E-07
 10.0     +-XZ------+Y--------+---------+---------+---------+
 11.0     I  XZ        Y
 12.0     I  X Z          Y
 13.0     I   X Z            Y
 14.0     I    X Z              Y
 15.0     I    X  Z                Y
 16.0     I     X  Z                  Y
 17.0     I      X  Z                     Y
 18.0     I      X   Z                        Y
 19.0     I       X   Z                           Y
 20.0     +        X    Z                             Y
```

DYNA 6.0 Results Stiffness Table (Case 1)

7/16/2012

Frequency (rpm)	Horizontal Stiffness X (lb/ft)	Horizontal Damping X (lb/ft/S)	Horizontal Stiffness Y (lb/ft)	Horizontal Damping Y (lb/ft/S)	Vertical Stiffness Z (lb/ft)	Vertical Damping Z (lb/ft/S)
10	8.81E+08	5.36E+07	8.81E+08	5.36E+07	9.58E+08	6.00E+07
11	8.81E+08	4.98E+07	8.81E+08	4.98E+07	9.58E+08	5.58E+07
12	8.81E+08	4.66E+07	8.81E+08	4.66E+07	9.58E+08	5.23E+07
13	8.80E+08	4.39E+07	8.80E+08	4.39E+07	9.58E+08	4.94E+07
14	8.80E+08	4.16E+07	8.80E+08	4.16E+07	9.58E+08	4.69E+07
15	8.80E+08	3.96E+07	8.80E+08	3.96E+07	9.57E+08	4.47E+07
16	8.80E+08	3.78E+07	8.80E+08	3.78E+07	9.57E+08	4.28E+07
17	8.80E+08	3.63E+07	8.80E+08	3.63E+07	9.57E+08	4.11E+07
18	8.80E+08	3.49E+07	8.80E+08	3.49E+07	9.57E+08	3.96E+07
19	8.80E+08	3.37E+07	8.80E+08	3.37E+07	9.57E+08	3.83E+07
20	8.80E+08	3.25E+07	8.80E+08	3.25E+07	9.58E+08	3.71E+07

Frequency (rpm)	Rocking Stiffness X (lb/ft/Rad)	Rocking Damping X (lb.ft/Rad/S)	Rocking Stiffness Y (lb/ft/Rad)	Rocking Damping Y (lb.ft/Rad/S)	Torsional Stiffness Z (lb/ft/Rad)	Torsional Damping Z (lb.ft/Rad/S)
10	1.03E+12	5.03E+10	6.90E+11	3.42E+10	1.42E+12	6.78E+10
11	1.03E+12	4.59E+10	6.90E+11	3.12E+10	1.42E+12	6.16E+10
12	1.03E+12	4.22E+10	6.90E+11	2.87E+10	1.42E+12	5.65E+10
13	1.03E+12	3.90E+10	6.90E+11	2.66E+10	1.42E+12	5.22E+10
14	1.03E+12	3.63E+10	6.90E+11	2.48E+10	1.42E+12	4.85E+10
15	1.03E+12	3.40E+10	6.90E+11	2.32E+10	1.41E+12	4.53E+10
16	1.03E+12	3.20E+10	6.90E+11	2.18E+10	1.41E+12	4.25E+10
17	1.03E+12	3.02E+10	6.89E+11	2.06E+10	1.41E+12	4.00E+10
18	1.03E+12	2.86E+10	6.89E+11	1.96E+10	1.41E+12	3.78E+10
19	1.03E+12	2.72E+10	6.89E+11	1.86E+10	1.41E+12	3.59E+10
20	1.03E+12	2.59E+10	6.89E+11	1.77E+10	1.41E+12	3.41E+10

DYNA 6.0 Results Response Table (Case 1)

7/16/2012

Frequency(rpm)	Translational Response at CG - X (in)	Translational Response at CG - Y (in)	Translational Response at CG - Z (in)	Rotational Response at CG - X (Rad)	Rotational Response at CG - Y (Rad)	Rotational Response at CG - Z (Rad)
10	2.33E-05	1.90E-05	2.29E-05	3.68E-08	1.76E-07	5.45E-08
11	2.81E-05	2.29E-05	2.77E-05	4.45E-08	2.13E-07	6.60E-08
12	3.35E-05	2.72E-05	3.30E-05	5.30E-08	2.53E-07	7.86E-08
13	3.92E-05	3.20E-05	3.88E-05	6.22E-08	2.97E-07	9.22E-08
14	4.56E-05	3.72E-05	4.50E-05	7.21E-08	3.45E-07	1.07E-07
15	5.23E-05	4.26E-05	5.16E-05	8.28E-08	3.96E-07	1.23E-07
16	5.95E-05	4.85E-05	5.87E-05	9.43E-08	4.50E-07	1.40E-07
17	6.72E-05	5.47E-05	6.64E-05	1.06E-07	5.09E-07	1.58E-07
18	7.54E-05	6.14E-05	7.43E-05	1.19E-07	5.70E-07	1.77E-07
19	8.40E-05	6.84E-05	8.28E-05	1.33E-07	6.35E-07	1.97E-07
20	9.31E-05	7.58E-05	9.17E-05	1.47E-07	7.04E-07	2.19E-07

CASE 2
- MOTOR VIBRATION

```
**************************************************
*                                                *
*       D Y N A 6   S I M U L A T I O N          *
*                                                *
*         Copyright (c) Western - 2011           *
*            RUN DATE -  2012/ 7/10              *
*            TIME     -    15: 7:17              *
*            REVISION -  Jan.21/201              *
*                                                *
**************************************************

Mill Mat Foundation

                     DATA ECHO
                     *********

GRAVITATIONAL CONSTANT SET TO  32.20 ft/s**2
******************************

FREQUENCY UNITS : Hertz
***************

LENGTH UNITS : ft
************

FORCE UNITS : lb
***********

MASS UNITS : slug
**********

RESPONSE TO BE PLOTTED
**********************

STIFFNESS AND DAMPING CONSTANTS TO BE PRINTED
*********************************************


DAMPING SAFETY FACTOR -    2.00
*********************


FOUNDATION TYPE - HALF-SPACE
***************

RECTANGULAR FOUNDATION  -    48.000 ft  BY  66.000 ft
**********************


MASS CONSTANTS
**************

TOTAL MASS OF FOOTING  ......... 1.9265E+05  slug
MASS MOMENT ABOUT X-AXIS  ...... 9.0643E+07  slug.ft**2
MASS MOMENT ABOUT Y-AXIS  ...... 6.0555E+07  slug.ft**2
MASS MOMENT ABOUT Z-AXIS  ...... 1.1716E+08  slug.ft**2
CROSS PRODUCT X-Y  .............-7.8857E+06  slug.ft**2
CROSS PRODUCT X-Z  .............-1.3754E+06  slug.ft**2
CROSS PRODUCT Y-Z  .............-5.4366E+05  slug.ft**2

COORDINATES OF BASE CENTRE
```

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**************************

X-COORD. OF BASE CENTRE REL. TO C.G.  ..    -1.448  ft
Y-COORD. OF BASE CENTRE REL. TO C.G.  ..     1.134  ft
Z-COORD. OF BASE CENTRE REL. TO C.G.  ..    11.007  ft


SOIL
****

SOIL CONSTANTS  NUMBER OF SIDE LAYERS -   1
**************

LAYER  LAYER  SHEAR WAVE   UNIT   POISSON'S  MATERIAL
 NO.   DEPTH   VELOCITY   WEIGHT    RATIO     DAMPING
         ft      ft/s    lb/ft**3

  1    6.000   1200.00    120.00    0.250      0.100

HALF-SPACE SOIL
***************

SHEAR WAVE    UNIT    POISSON'S  MATERIAL
 VELOCITY    WEIGHT     RATIO     DAMPING
   ft/s     lb/ft**3

 1.20E+03     120.00   0.250     0.100


HARMONIC LOAD (QUADRATIC)
*************

MAXIMUM FREQUENCY  ...........    69.000 Hertz
MINIMUM FREQUENCY  ...........    51.000 Hertz
STEP FREQUENCY  ..............     1.000 Hertz
FORCE IN X-DIRECTION  ........  0.00E+00 slug.ft
FORCE IN Y-DIRECTION  ........  0.00E+00 slug.ft
FORCE IN Z-DIRECTION  ........  1.69E+03 slug.ft
MOMENT ABOUT X-AXIS  .......... -3.79E+04 slug.ft**2
MOMENT ABOUT Y-AXIS  .......... -6.04E+02 slug.ft**2
MOMENT ABOUT Z-AXIS  ..........  0.00E+00 slug.ft**2
♀

*************************************************
*                                               *
*        D Y N A 6   S I M U L A T I O N        *
*                                               *
*          Copyright (c) Western - 2011         *
*             RUN DATE -  2012/ 7/10            *
*             TIME     -     15: 7:17           *
*             REVISION -  Jan.21/201            *
*                                               *
*************************************************

Mill Mat Foundation

                                   RESULTS
                                   *******


FREQUENCY  -    51.000  Hertz
*********
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STIFFNESS CONSTANTS (K)
***********************

HORIZONTAL TRANSLATION  (X) ...  5.920E+08  lb/ft
HORIZONTAL TRANSLATION  (Y) ...  5.920E+08  lb/ft
VERTICAL TRANSLATION  (Z) .....  2.227E+08  lb/ft
ROTATION ABOUT  (X) ...........  3.435E+11  lb.ft/rad
ROTATION ABOUT  (Y) ...........  2.630E+11  lb.ft/rad
TORSION ABOUT  (Z) ............  6.955E+11  lb.ft/rad
CROSS-STIFFNESS (YZ PLANE) ....  6.434E+09  lb/rad
CROSS-STIFFNESS (XZ PLANE) .... -6.434E+09  lb/rad

DAMPING CONSTANTS (C)
*********************

HORIZONTAL TRANSLATION  (X) ...  1.053E+07  lb/ft/s
HORIZONTAL TRANSLATION  (Y) ...  1.053E+07  lb/ft/s
VERTICAL TRANSLATION  (Z) .....  1.513E+07  lb/ft/s
ROTATION ABOUT  (X) ...........  7.518E+09  lb.ft/rad/s
ROTATION ABOUT  (Y) ...........  4.657E+09  lb.ft/rad/s
TORSION ABOUT  (Z) ............  6.864E+09  lb.ft/rad/s
CROSS-DAMPING (YZ PLANE) ......  1.048E+08  lb/rad/s
CROSS-DAMPING (XZ PLANE) ...... -1.048E+08  lb/rad/s


FREQUENCY  -    52.000  Hertz
*********


STIFFNESS CONSTANTS (K)
***********************

HORIZONTAL TRANSLATION  (X) ...  5.855E+08  lb/ft
HORIZONTAL TRANSLATION  (Y) ...  5.855E+08  lb/ft
VERTICAL TRANSLATION  (Z) .....  2.127E+08  lb/ft
ROTATION ABOUT  (X) ...........  3.383E+11  lb.ft/rad
ROTATION ABOUT  (Y) ...........  2.597E+11  lb.ft/rad
TORSION ABOUT  (Z) ............  6.906E+11  lb.ft/rad
CROSS-STIFFNESS (YZ PLANE) ....  6.369E+09  lb/rad
CROSS-STIFFNESS (XZ PLANE) .... -6.369E+09  lb/rad

DAMPING CONSTANTS (C)
*********************

HORIZONTAL TRANSLATION  (X) ...  1.052E+07  lb/ft/s
HORIZONTAL TRANSLATION  (Y) ...  1.052E+07  lb/ft/s
VERTICAL TRANSLATION  (Z) .....  1.513E+07  lb/ft/s
ROTATION ABOUT  (X) ...........  7.519E+09  lb.ft/rad/s
ROTATION ABOUT  (Y) ...........  4.658E+09  lb.ft/rad/s
TORSION ABOUT  (Z) ............  6.866E+09  lb.ft/rad/s
CROSS-DAMPING (YZ PLANE) ......  1.047E+08  lb/rad/s
CROSS-DAMPING (XZ PLANE) ...... -1.047E+08  lb/rad/s


FREQUENCY  -    53.000  Hertz
*********


STIFFNESS CONSTANTS (K)
***********************
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```
HORIZONTAL TRANSLATION  (X) ...  5.792E+08  lb/ft
HORIZONTAL TRANSLATION  (Y) ...  5.792E+08  lb/ft
VERTICAL TRANSLATION  (Z) .....  2.030E+08  lb/ft
ROTATION ABOUT  (X) ...........  3.332E+11  lb.ft/rad
ROTATION ABOUT  (Y) ...........  2.565E+11  lb.ft/rad
TORSION ABOUT  (Z) ............  6.853E+11  lb.ft/rad
CROSS-STIFFNESS (YZ PLANE) ....  6.306E+09  lb/rad
CROSS-STIFFNESS (XZ PLANE) .... -6.306E+09  lb/rad

DAMPING CONSTANTS (C)
*********************

HORIZONTAL TRANSLATION  (X) ...  1.052E+07  lb/ft/s
HORIZONTAL TRANSLATION  (Y) ...  1.052E+07  lb/ft/s
VERTICAL TRANSLATION  (Z) .....  1.513E+07  lb/ft/s
ROTATION ABOUT  (X) ...........  7.521E+09  lb.ft/rad/s
ROTATION ABOUT  (Y) ...........  4.659E+09  lb.ft/rad/s
TORSION ABOUT  (Z) ............  6.867E+09  lb.ft/rad/s
CROSS-DAMPING (YZ PLANE) ......  1.047E+08  lb/rad/s
CROSS-DAMPING (XZ PLANE) ...... -1.047E+08  lb/rad/s


FREQUENCY  -    54.000  Hertz
*********


STIFFNESS CONSTANTS (K)
***********************

HORIZONTAL TRANSLATION  (X) ...  5.728E+08  lb/ft
HORIZONTAL TRANSLATION  (Y) ...  5.728E+08  lb/ft
VERTICAL TRANSLATION  (Z) .....  1.933E+08  lb/ft
ROTATION ABOUT  (X) ...........  3.281E+11  lb.ft/rad
ROTATION ABOUT  (Y) ...........  2.532E+11  lb.ft/rad
TORSION ABOUT  (Z) ............  6.804E+11  lb.ft/rad
CROSS-STIFFNESS (YZ PLANE) ....  6.242E+09  lb/rad
CROSS-STIFFNESS (XZ PLANE) .... -6.242E+09  lb/rad

DAMPING CONSTANTS (C)
*********************

HORIZONTAL TRANSLATION  (X) ...  1.052E+07  lb/ft/s
HORIZONTAL TRANSLATION  (Y) ...  1.052E+07  lb/ft/s
VERTICAL TRANSLATION  (Z) .....  1.513E+07  lb/ft/s
ROTATION ABOUT  (X) ...........  7.522E+09  lb.ft/rad/s
ROTATION ABOUT  (Y) ...........  4.660E+09  lb.ft/rad/s
TORSION ABOUT  (Z) ............  6.869E+09  lb.ft/rad/s
CROSS-DAMPING (YZ PLANE) ......  1.047E+08  lb/rad/s
CROSS-DAMPING (XZ PLANE) ...... -1.047E+08  lb/rad/s


FREQUENCY  -    55.000  Hertz
*********


STIFFNESS CONSTANTS (K)
***********************

HORIZONTAL TRANSLATION  (X) ...  5.665E+08  lb/ft
HORIZONTAL TRANSLATION  (Y) ...  5.665E+08  lb/ft
VERTICAL TRANSLATION  (Z) .....  1.838E+08  lb/ft
ROTATION ABOUT  (X) ...........  3.230E+11  lb.ft/rad
ROTATION ABOUT  (Y) ...........  2.500E+11  lb.ft/rad
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TORSION ABOUT  (Z) ............  6.756E+11  lb.ft/rad
CROSS-STIFFNESS (YZ PLANE) ....  6.179E+09  lb/rad
CROSS-STIFFNESS (XZ PLANE) .... -6.179E+09  lb/rad

DAMPING CONSTANTS (C)
*********************

HORIZONTAL TRANSLATION  (X) ...  1.051E+07  lb/ft/s
HORIZONTAL TRANSLATION  (Y) ...  1.051E+07  lb/ft/s
VERTICAL TRANSLATION  (Z) .....  1.513E+07  lb/ft/s
ROTATION ABOUT  (X) ...........  7.523E+09  lb.ft/rad/s
ROTATION ABOUT  (Y) ...........  4.661E+09  lb.ft/rad/s
TORSION ABOUT  (Z) ............  6.870E+09  lb.ft/rad/s
CROSS-DAMPING (YZ PLANE) ......  1.046E+08  lb/rad/s
CROSS-DAMPING (XZ PLANE) ...... -1.046E+08  lb/rad/s


FREQUENCY  -    56.000  Hertz
*********


STIFFNESS CONSTANTS (K)
***********************

HORIZONTAL TRANSLATION  (X) ...  5.601E+08  lb/ft
HORIZONTAL TRANSLATION  (Y) ...  5.601E+08  lb/ft
VERTICAL TRANSLATION  (Z) .....  1.741E+08  lb/ft
ROTATION ABOUT  (X) ...........  3.180E+11  lb.ft/rad
ROTATION ABOUT  (Y) ...........  2.468E+11  lb.ft/rad
TORSION ABOUT  (Z) ............  6.708E+11  lb.ft/rad
CROSS-STIFFNESS (YZ PLANE) ....  6.115E+09  lb/rad
CROSS-STIFFNESS (XZ PLANE) .... -6.115E+09  lb/rad

DAMPING CONSTANTS (C)
*********************

HORIZONTAL TRANSLATION  (X) ...  1.051E+07  lb/ft/s
HORIZONTAL TRANSLATION  (Y) ...  1.051E+07  lb/ft/s
VERTICAL TRANSLATION  (Z) .....  1.513E+07  lb/ft/s
ROTATION ABOUT  (X) ...........  7.524E+09  lb.ft/rad/s
ROTATION ABOUT  (Y) ...........  4.661E+09  lb.ft/rad/s
TORSION ABOUT  (Z) ............  6.871E+09  lb.ft/rad/s
CROSS-DAMPING (YZ PLANE) ......  1.046E+08  lb/rad/s
CROSS-DAMPING (XZ PLANE) ...... -1.046E+08  lb/rad/s


FREQUENCY  -    57.000  Hertz
*********


STIFFNESS CONSTANTS (K)
***********************

HORIZONTAL TRANSLATION  (X) ...  5.537E+08  lb/ft
HORIZONTAL TRANSLATION  (Y) ...  5.537E+08  lb/ft
VERTICAL TRANSLATION  (Z) .....  1.643E+08  lb/ft
ROTATION ABOUT  (X) ...........  3.129E+11  lb.ft/rad
ROTATION ABOUT  (Y) ...........  2.437E+11  lb.ft/rad
TORSION ABOUT  (Z) ............  6.660E+11  lb.ft/rad
CROSS-STIFFNESS (YZ PLANE) ....  6.051E+09  lb/rad
CROSS-STIFFNESS (XZ PLANE) .... -6.051E+09  lb/rad

DAMPING CONSTANTS (C)
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*********************

HORIZONTAL TRANSLATION  (X) ...  1.051E+07  lb/ft/s
HORIZONTAL TRANSLATION  (Y) ...  1.051E+07  lb/ft/s
VERTICAL TRANSLATION  (Z) .....  1.513E+07  lb/ft/s
ROTATION ABOUT  (X) ...........  7.525E+09  lb.ft/rad/s
ROTATION ABOUT  (Y) ...........  4.662E+09  lb.ft/rad/s
TORSION ABOUT  (Z) ............  6.872E+09  lb.ft/rad/s
CROSS-DAMPING (YZ PLANE) ......  1.046E+08  lb/rad/s
CROSS-DAMPING (XZ PLANE) ...... -1.046E+08  lb/rad/s


FREQUENCY  -    58.000  Hertz
*********


STIFFNESS CONSTANTS (K)
***********************

HORIZONTAL TRANSLATION  (X) ...  5.473E+08  lb/ft
HORIZONTAL TRANSLATION  (Y) ...  5.473E+08  lb/ft
VERTICAL TRANSLATION  (Z) .....  1.546E+08  lb/ft
ROTATION ABOUT  (X) ...........  3.079E+11  lb.ft/rad
ROTATION ABOUT  (Y) ...........  2.405E+11  lb.ft/rad
TORSION ABOUT  (Z) ............  6.612E+11  lb.ft/rad
CROSS-STIFFNESS (YZ PLANE) ....  5.987E+09  lb/rad
CROSS-STIFFNESS (XZ PLANE) .... -5.987E+09  lb/rad

DAMPING CONSTANTS (C)
*********************

HORIZONTAL TRANSLATION  (X) ...  1.051E+07  lb/ft/s
HORIZONTAL TRANSLATION  (Y) ...  1.051E+07  lb/ft/s
VERTICAL TRANSLATION  (Z) .....  1.513E+07  lb/ft/s
ROTATION ABOUT  (X) ...........  7.526E+09  lb.ft/rad/s
ROTATION ABOUT  (Y) ...........  4.663E+09  lb.ft/rad/s
TORSION ABOUT  (Z) ............  6.873E+09  lb.ft/rad/s
CROSS-DAMPING (YZ PLANE) ......  1.046E+08  lb/rad/s
CROSS-DAMPING (XZ PLANE) ...... -1.046E+08  lb/rad/s


FREQUENCY  -    59.000  Hertz
*********


STIFFNESS CONSTANTS (K)
***********************

HORIZONTAL TRANSLATION  (X) ...  5.408E+08  lb/ft
HORIZONTAL TRANSLATION  (Y) ...  5.408E+08  lb/ft
VERTICAL TRANSLATION  (Z) .....  1.449E+08  lb/ft
ROTATION ABOUT  (X) ...........  3.029E+11  lb.ft/rad
ROTATION ABOUT  (Y) ...........  2.371E+11  lb.ft/rad
TORSION ABOUT  (Z) ............  6.564E+11  lb.ft/rad
CROSS-STIFFNESS (YZ PLANE) ....  5.923E+09  lb/rad
CROSS-STIFFNESS (XZ PLANE) .... -5.923E+09  lb/rad

DAMPING CONSTANTS (C)
*********************

HORIZONTAL TRANSLATION  (X) ...  1.050E+07  lb/ft/s
HORIZONTAL TRANSLATION  (Y) ...  1.050E+07  lb/ft/s
VERTICAL TRANSLATION  (Z) .....  1.513E+07  lb/ft/s
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ROTATION ABOUT  (X) ........... 7.527E+09  lb.ft/rad/s
ROTATION ABOUT  (Y) ........... 4.664E+09  lb.ft/rad/s
TORSION ABOUT  (Z) ............ 6.874E+09  lb.ft/rad/s
CROSS-DAMPING (YZ PLANE) ...... 1.045E+08  lb/rad/s
CROSS-DAMPING (XZ PLANE) ...... -1.045E+08  lb/rad/s


FREQUENCY  -    60.000  Hertz
*********


STIFFNESS CONSTANTS (K)
***********************

HORIZONTAL TRANSLATION  (X) ...  5.344E+08  lb/ft
HORIZONTAL TRANSLATION  (Y) ...  5.344E+08  lb/ft
VERTICAL TRANSLATION  (Z) .....  1.352E+08  lb/ft
ROTATION ABOUT  (X) ...........  2.979E+11  lb.ft/rad
ROTATION ABOUT  (Y) ...........  2.340E+11  lb.ft/rad
TORSION ABOUT  (Z) ............  6.517E+11  lb.ft/rad
CROSS-STIFFNESS (YZ PLANE) ....  5.859E+09  lb/rad
CROSS-STIFFNESS (XZ PLANE) .... -5.859E+09  lb/rad

DAMPING CONSTANTS (C)
*********************

HORIZONTAL TRANSLATION  (X) ...  1.050E+07  lb/ft/s
HORIZONTAL TRANSLATION  (Y) ...  1.050E+07  lb/ft/s
VERTICAL TRANSLATION  (Z) .....  1.513E+07  lb/ft/s
ROTATION ABOUT  (X) ...........  7.528E+09  lb.ft/rad/s
ROTATION ABOUT  (Y) ...........  4.664E+09  lb.ft/rad/s
TORSION ABOUT  (Z) ............  6.875E+09  lb.ft/rad/s
CROSS-DAMPING (YZ PLANE) ......  1.045E+08  lb/rad/s
CROSS-DAMPING (XZ PLANE) ...... -1.045E+08  lb/rad/s


FREQUENCY  -    61.000  Hertz
*********


STIFFNESS CONSTANTS (K)
***********************

HORIZONTAL TRANSLATION  (X) ...  5.280E+08  lb/ft
HORIZONTAL TRANSLATION  (Y) ...  5.280E+08  lb/ft
VERTICAL TRANSLATION  (Z) .....  1.255E+08  lb/ft
ROTATION ABOUT  (X) ...........  2.929E+11  lb.ft/rad
ROTATION ABOUT  (Y) ...........  2.308E+11  lb.ft/rad
TORSION ABOUT  (Z) ............  6.470E+11  lb.ft/rad
CROSS-STIFFNESS (YZ PLANE) ....  5.795E+09  lb/rad
CROSS-STIFFNESS (XZ PLANE) .... -5.795E+09  lb/rad

DAMPING CONSTANTS (C)
*********************

HORIZONTAL TRANSLATION  (X) ...  1.050E+07  lb/ft/s
HORIZONTAL TRANSLATION  (Y) ...  1.050E+07  lb/ft/s
VERTICAL TRANSLATION  (Z) .....  1.513E+07  lb/ft/s
ROTATION ABOUT  (X) ...........  7.529E+09  lb.ft/rad/s
ROTATION ABOUT  (Y) ...........  4.665E+09  lb.ft/rad/s
TORSION ABOUT  (Z) ............  6.875E+09  lb.ft/rad/s
CROSS-DAMPING (YZ PLANE) ......  1.045E+08  lb/rad/s
CROSS-DAMPING (XZ PLANE) ...... -1.045E+08  lb/rad/s
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FREQUENCY  -    62.000  Hertz
*********


STIFFNESS CONSTANTS (K)
***********************

HORIZONTAL TRANSLATION  (X) ...  5.215E+08  lb/ft
HORIZONTAL TRANSLATION  (Y) ...  5.215E+08  lb/ft
VERTICAL TRANSLATION  (Z) .....  1.158E+08  lb/ft
ROTATION ABOUT  (X) ...........  2.879E+11  lb.ft/rad
ROTATION ABOUT  (Y) ...........  2.277E+11  lb.ft/rad
TORSION ABOUT  (Z) ............  6.423E+11  lb.ft/rad
CROSS-STIFFNESS (YZ PLANE) ....  5.731E+09  lb/rad
CROSS-STIFFNESS (XZ PLANE) .... -5.731E+09  lb/rad

DAMPING CONSTANTS (C)
*********************

HORIZONTAL TRANSLATION  (X) ...  1.050E+07  lb/ft/s
HORIZONTAL TRANSLATION  (Y) ...  1.050E+07  lb/ft/s
VERTICAL TRANSLATION  (Z) .....  1.513E+07  lb/ft/s
ROTATION ABOUT  (X) ...........  7.530E+09  lb.ft/rad/s
ROTATION ABOUT  (Y) ...........  4.665E+09  lb.ft/rad/s
TORSION ABOUT  (Z) ............  6.876E+09  lb.ft/rad/s
CROSS-DAMPING (YZ PLANE) ......  1.045E+08  lb/rad/s
CROSS-DAMPING (XZ PLANE) ...... -1.045E+08  lb/rad/s


FREQUENCY  -    63.000  Hertz
*********


STIFFNESS CONSTANTS (K)
***********************

HORIZONTAL TRANSLATION  (X) ...  5.151E+08  lb/ft
HORIZONTAL TRANSLATION  (Y) ...  5.151E+08  lb/ft
VERTICAL TRANSLATION  (Z) .....  1.061E+08  lb/ft
ROTATION ABOUT  (X) ...........  2.829E+11  lb.ft/rad
ROTATION ABOUT  (Y) ...........  2.246E+11  lb.ft/rad
TORSION ABOUT  (Z) ............  6.376E+11  lb.ft/rad
CROSS-STIFFNESS (YZ PLANE) ....  5.667E+09  lb/rad
CROSS-STIFFNESS (XZ PLANE) .... -5.667E+09  lb/rad

DAMPING CONSTANTS (C)
*********************

HORIZONTAL TRANSLATION  (X) ...  1.050E+07  lb/ft/s
HORIZONTAL TRANSLATION  (Y) ...  1.050E+07  lb/ft/s
VERTICAL TRANSLATION  (Z) .....  1.513E+07  lb/ft/s
ROTATION ABOUT  (X) ...........  7.530E+09  lb.ft/rad/s
ROTATION ABOUT  (Y) ...........  4.666E+09  lb.ft/rad/s
TORSION ABOUT  (Z) ............  6.877E+09  lb.ft/rad/s
CROSS-DAMPING (YZ PLANE) ......  1.044E+08  lb/rad/s
CROSS-DAMPING (XZ PLANE) ...... -1.044E+08  lb/rad/s


FREQUENCY  -    64.000  Hertz
*********
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STIFFNESS CONSTANTS (K)
***********************

HORIZONTAL TRANSLATION  (X) ...  5.087E+08  lb/ft
HORIZONTAL TRANSLATION  (Y) ...  5.087E+08  lb/ft
VERTICAL TRANSLATION  (Z) .....  9.645E+07  lb/ft
ROTATION ABOUT  (X) ...........  2.780E+11  lb.ft/rad
ROTATION ABOUT  (Y) ...........  2.215E+11  lb.ft/rad
TORSION ABOUT  (Z) ............  6.329E+11  lb.ft/rad
CROSS-STIFFNESS (YZ PLANE) ....  5.602E+09  lb/rad
CROSS-STIFFNESS (XZ PLANE) .... -5.602E+09  lb/rad

DAMPING CONSTANTS (C)
*********************

HORIZONTAL TRANSLATION  (X) ...  1.049E+07  lb/ft/s
HORIZONTAL TRANSLATION  (Y) ...  1.049E+07  lb/ft/s
VERTICAL TRANSLATION  (Z) .....  1.513E+07  lb/ft/s
ROTATION ABOUT  (X) ...........  7.531E+09  lb.ft/rad/s
ROTATION ABOUT  (Y) ...........  4.666E+09  lb.ft/rad/s
TORSION ABOUT  (Z) ............  6.877E+09  lb.ft/rad/s
CROSS-DAMPING (YZ PLANE) ......  1.044E+08  lb/rad/s
CROSS-DAMPING (XZ PLANE) ...... -1.044E+08  lb/rad/s


FREQUENCY  -    65.000  Hertz
*********


STIFFNESS CONSTANTS (K)
***********************

HORIZONTAL TRANSLATION  (X) ...  5.022E+08  lb/ft
HORIZONTAL TRANSLATION  (Y) ...  5.022E+08  lb/ft
VERTICAL TRANSLATION  (Z) .....  8.679E+07  lb/ft
ROTATION ABOUT  (X) ...........  2.730E+11  lb.ft/rad
ROTATION ABOUT  (Y) ...........  2.183E+11  lb.ft/rad
TORSION ABOUT  (Z) ............  6.283E+11  lb.ft/rad
CROSS-STIFFNESS (YZ PLANE) ....  5.538E+09  lb/rad
CROSS-STIFFNESS (XZ PLANE) .... -5.538E+09  lb/rad

DAMPING CONSTANTS (C)
*********************

HORIZONTAL TRANSLATION  (X) ...  1.049E+07  lb/ft/s
HORIZONTAL TRANSLATION  (Y) ...  1.049E+07  lb/ft/s
VERTICAL TRANSLATION  (Z) .....  1.513E+07  lb/ft/s
ROTATION ABOUT  (X) ...........  7.531E+09  lb.ft/rad/s
ROTATION ABOUT  (Y) ...........  4.667E+09  lb.ft/rad/s
TORSION ABOUT  (Z) ............  6.878E+09  lb.ft/rad/s
CROSS-DAMPING (YZ PLANE) ......  1.044E+08  lb/rad/s
CROSS-DAMPING (XZ PLANE) ...... -1.044E+08  lb/rad/s


FREQUENCY  -    66.000  Hertz
*********


STIFFNESS CONSTANTS (K)
***********************

HORIZONTAL TRANSLATION  (X) ...  4.958E+08  lb/ft
```

```
HORIZONTAL TRANSLATION  (Y) ...  4.958E+08  lb/ft
VERTICAL TRANSLATION  (Z) .....  7.714E+07  lb/ft
ROTATION ABOUT  (X) ...........  2.681E+11  lb.ft/rad
ROTATION ABOUT  (Y) ...........  2.152E+11  lb.ft/rad
TORSION ABOUT  (Z) ............  6.237E+11  lb.ft/rad
CROSS-STIFFNESS (YZ PLANE) ....  5.474E+09  lb/rad
CROSS-STIFFNESS (XZ PLANE) .... -5.474E+09  lb/rad

DAMPING CONSTANTS (C)
*********************

HORIZONTAL TRANSLATION  (X) ...  1.049E+07  lb/ft/s
HORIZONTAL TRANSLATION  (Y) ...  1.049E+07  lb/ft/s
VERTICAL TRANSLATION  (Z) .....  1.513E+07  lb/ft/s
ROTATION ABOUT  (X) ...........  7.532E+09  lb.ft/rad/s
ROTATION ABOUT  (Y) ...........  4.667E+09  lb.ft/rad/s
TORSION ABOUT  (Z) ............  6.878E+09  lb.ft/rad/s
CROSS-DAMPING (YZ PLANE) ......  1.044E+08  lb/rad/s
CROSS-DAMPING (XZ PLANE) ...... -1.044E+08  lb/rad/s


FREQUENCY  -    67.000  Hertz
*********


STIFFNESS CONSTANTS (K)
***********************

HORIZONTAL TRANSLATION  (X) ...  4.893E+08  lb/ft
HORIZONTAL TRANSLATION  (Y) ...  4.893E+08  lb/ft
VERTICAL TRANSLATION  (Z) .....  6.749E+07  lb/ft
ROTATION ABOUT  (X) ...........  2.631E+11  lb.ft/rad
ROTATION ABOUT  (Y) ...........  2.121E+11  lb.ft/rad
TORSION ABOUT  (Z) ............  6.190E+11  lb.ft/rad
CROSS-STIFFNESS (YZ PLANE) ....  5.409E+09  lb/rad
CROSS-STIFFNESS (XZ PLANE) .... -5.409E+09  lb/rad

DAMPING CONSTANTS (C)
*********************

HORIZONTAL TRANSLATION  (X) ...  1.049E+07  lb/ft/s
HORIZONTAL TRANSLATION  (Y) ...  1.049E+07  lb/ft/s
VERTICAL TRANSLATION  (Z) .....  1.513E+07  lb/ft/s
ROTATION ABOUT  (X) ...........  7.533E+09  lb.ft/rad/s
ROTATION ABOUT  (Y) ...........  4.668E+09  lb.ft/rad/s
TORSION ABOUT  (Z) ............  6.879E+09  lb.ft/rad/s
CROSS-DAMPING (YZ PLANE) ......  1.044E+08  lb/rad/s
CROSS-DAMPING (XZ PLANE) ...... -1.044E+08  lb/rad/s


FREQUENCY  -    68.000  Hertz
*********


STIFFNESS CONSTANTS (K)
***********************

HORIZONTAL TRANSLATION  (X) ...  4.829E+08  lb/ft
HORIZONTAL TRANSLATION  (Y) ...  4.829E+08  lb/ft
VERTICAL TRANSLATION  (Z) .....  5.785E+07  lb/ft
ROTATION ABOUT  (X) ...........  2.582E+11  lb.ft/rad
ROTATION ABOUT  (Y) ...........  2.091E+11  lb.ft/rad
TORSION ABOUT  (Z) ............  6.144E+11  lb.ft/rad
```

```
 CROSS-STIFFNESS (YZ PLANE) ....  5.345E+09  lb/rad
 CROSS-STIFFNESS (XZ PLANE) .... -5.345E+09  lb/rad

 DAMPING CONSTANTS (C)
 *********************

 HORIZONTAL TRANSLATION  (X) ...  1.049E+07  lb/ft/s
 HORIZONTAL TRANSLATION  (Y) ...  1.049E+07  lb/ft/s
 VERTICAL TRANSLATION  (Z) .....  1.513E+07  lb/ft/s
 ROTATION ABOUT  (X) ...........  7.533E+09  lb.ft/rad/s
 ROTATION ABOUT  (Y) ...........  4.668E+09  lb.ft/rad/s
 TORSION ABOUT  (Z) ............  6.879E+09  lb.ft/rad/s
 CROSS-DAMPING (YZ PLANE) ......  1.044E+08  lb/rad/s
 CROSS-DAMPING (XZ PLANE) ...... -1.044E+08  lb/rad/s


 FREQUENCY  -    69.000  Hertz
 *********


 STIFFNESS CONSTANTS (K)
 ***********************

 HORIZONTAL TRANSLATION  (X) ...  4.764E+08  lb/ft
 HORIZONTAL TRANSLATION  (Y) ...  4.764E+08  lb/ft
 VERTICAL TRANSLATION  (Z) .....  4.822E+07  lb/ft
 ROTATION ABOUT  (X) ...........  2.533E+11  lb.ft/rad
 ROTATION ABOUT  (Y) ...........  2.060E+11  lb.ft/rad
 TORSION ABOUT  (Z) ............  6.098E+11  lb.ft/rad
 CROSS-STIFFNESS (YZ PLANE) ....  5.281E+09  lb/rad
 CROSS-STIFFNESS (XZ PLANE) .... -5.281E+09  lb/rad

 DAMPING CONSTANTS (C)
 *********************

 HORIZONTAL TRANSLATION  (X) ...  1.048E+07  lb/ft/s
 HORIZONTAL TRANSLATION  (Y) ...  1.048E+07  lb/ft/s
 VERTICAL TRANSLATION  (Z) .....  1.513E+07  lb/ft/s
 ROTATION ABOUT  (X) ...........  7.533E+09  lb.ft/rad/s
 ROTATION ABOUT  (Y) ...........  4.668E+09  lb.ft/rad/s
 TORSION ABOUT  (Z) ............  6.880E+09  lb.ft/rad/s
 CROSS-DAMPING (YZ PLANE) ......  1.043E+08  lb/rad/s
 CROSS-DAMPING (XZ PLANE) ...... -1.043E+08  lb/rad/s
♀


 *************************************************
 *                                               *
 *        D Y N A 6   S I M U L A T I O N        *
 *                                               *
 *          Copyright (c) Western - 2011         *
 *             RUN DATE -  2012/ 7/10            *
 *             TIME     -    15: 7:17            *
 *             REVISION -  Jan.21/201            *
 *                                               *
 *************************************************

 Mill Mat Foundation

                                        RESULTS
                                        *******

                                FOOTING RESPONSE AMPLITUDES
```

```
 FREQ.    TRANS. X  TRANS. Y  VERTICAL  ROT ABOUT ROT ABOUT TORSIONAL
 Hertz    DIRECTION DIRECTION DIRECTION  X AXIS    Y AXIS    Z AXIS
             (ft)      (ft)      (ft)     (rad)     (rad)     (rad)
-------   --------- --------- --------- --------- --------- ---------

  51.00    7.81E-05  7.35E-04  8.59E-03  4.20E-04  4.51E-05  5.29E-06
  52.00    7.63E-05  7.19E-04  8.59E-03  4.20E-04  4.50E-05  5.26E-06
  53.00    7.47E-05  7.04E-04  8.60E-03  4.19E-04  4.50E-05  5.24E-06
  54.00    7.31E-05  6.89E-04  8.60E-03  4.19E-04  4.50E-05  5.22E-06
  55.00    7.16E-05  6.75E-04  8.60E-03  4.19E-04  4.50E-05  5.20E-06
  56.00    7.02E-05  6.62E-04  8.60E-03  4.19E-04  4.49E-05  5.18E-06
  57.00    6.88E-05  6.49E-04  8.61E-03  4.19E-04  4.49E-05  5.16E-06
  58.00    6.75E-05  6.37E-04  8.61E-03  4.19E-04  4.49E-05  5.15E-06
  59.00    6.63E-05  6.25E-04  8.61E-03  4.19E-04  4.49E-05  5.13E-06
  60.00    6.50E-05  6.14E-04  8.61E-03  4.19E-04  4.49E-05  5.12E-06
  61.00    6.39E-05  6.03E-04  8.62E-03  4.19E-04  4.49E-05  5.10E-06
  62.00    6.27E-05  5.93E-04  8.62E-03  4.19E-04  4.48E-05  5.09E-06
  63.00    6.17E-05  5.82E-04  8.62E-03  4.19E-04  4.48E-05  5.08E-06
  64.00    6.06E-05  5.73E-04  8.62E-03  4.19E-04  4.48E-05  5.07E-06
  65.00    5.96E-05  5.63E-04  8.62E-03  4.19E-04  4.48E-05  5.05E-06
  66.00    5.86E-05  5.54E-04  8.63E-03  4.19E-04  4.48E-05  5.04E-06
  67.00    5.77E-05  5.45E-04  8.63E-03  4.19E-04  4.48E-05  5.03E-06
  68.00    5.68E-05  5.37E-04  8.63E-03  4.19E-04  4.48E-05  5.02E-06
  69.00    5.59E-05  5.28E-04  8.63E-03  4.19E-04  4.48E-05  5.02E-06

MAXIMA OF FOOTING RESPONSE AMPLITUDES
*************************************

                                                     FREQ.
                                                     Hertz
                                                    -------

MAX. TRANS. IN X-DIRECTION  -     7.806E-05  ft       51.00
MAX. TRANS. IN Y-DIRECTION  -     7.349E-04  ft       51.00
MAX. TRANS. IN Z-DIRECTION  -     8.631E-03  ft       69.00
MAX. ROT. ABOUT X AXIS      -     4.197E-04  rad      51.00
MAX. ROT. ABOUT Y AXIS      -     4.507E-05  rad      51.00
MAX. ROT. ABOUT Z AXIS      -     5.288E-06  rad      51.00
♀
                       FOOTING RESPONSE CURVE
                       ----------------------
     CURVE-X= TRANS X-DIRECTION      CURVE-Y= TRANS Y-DIRECTION
                     CURVE-Z= TRANS Z-DIRECTION
 FREQ.
 Hertz                    DISPLACEMENT (ft)
          0.00E+00  1.80E-03  3.60E-03  5.40E-03  7.20E-03  9.00E-03
  51.0     X---Y-----+---------+---------+---------+--------Z-+
  52.0     X   Y                                            Z
  53.0     X   Y                                            Z
  54.0     X   Y                                            Z
  55.0     X   Y                                            Z
  56.0     X   Y                                            Z
  57.0     X   Y                                            Z
  58.0     X   Y                                            Z
  59.0     X  Y                                             Z
  60.0     X  Y                                             Z
  61.0     X  Y                                             Z
  62.0     X  Y                                             Z
  63.0     X  Y                                             Z
  64.0     X  Y                                             Z
```

```
 65.0     X  Y                                            Z
 66.0     X  Y                                            Z
 67.0     X  Y                                            Z
 68.0     X  Y                                            Z
 69.0     X  Y                                            Z
♀
                      FOOTING RESPONSE CURVE
                      ----------------------
   CURVE-X= ROT ABOUT X AXIS        CURVE-Y= ROT ABOUT Y AXIS
                    CURVE-Z= ROT ABOUT Z AXIS
FREQ.
Hertz                      ROTATION (rad)
         0.00E+00  1.00E-04  2.00E-04  3.00E-04  4.00E-04  5.00E-04
 51.0     +Z---Y----+---------+---------+---------+-X-------+
 52.0     IZ   Y                                    X
 53.0     IZ   Y                                    X
 54.0     IZ  Y                                     X
 55.0     IZ  Y                                     X
 56.0     IZ  Y                                     X
 57.0     IZ  Y                                     X
 58.0     IZ  Y                                     X
 59.0     IZ  Y                                     X
 60.0     IZ  Y                                     X
 61.0     +Z  Y                                     X
 62.0     IZ  Y                                     X
 63.0     IZ  Y                                     X
 64.0     IZ  Y                                     X
 65.0     IZ  Y                                     X
 66.0     IZ  Y                                     X
 67.0     IZ  Y                                     X
 68.0     IZ  Y                                     X
 69.0     IZ  Y                                     X
```

DYNA 6.0 Results Stiffness Table (Case 2)

7/16/2012

Frequency (Hz)	Horizontal Stiffness X (lb/ft)	Horizontal Damping X (lb/ft/S)	Horizontal Stiffness Y (lb/ft)	Horizontal Damping Y (lb/ft/S)	Vertical Stiffness Z (lb/ft)	Vertical Damping Z (lb/ft/S)
51	5.92E+08	1.05E+07	5.92E+08	1.05E+07	2.23E+08	1.51E+07
52	5.86E+08	1.05E+07	5.86E+08	1.05E+07	2.13E+08	1.51E+07
53	5.79E+08	1.05E+07	5.79E+08	1.05E+07	2.03E+08	1.51E+07
54	5.73E+08	1.05E+07	5.73E+08	1.05E+07	1.93E+08	1.51E+07
55	5.67E+08	1.05E+07	5.67E+08	1.05E+07	1.84E+08	1.51E+07
56	5.60E+08	1.05E+07	5.60E+08	1.05E+07	1.74E+08	1.51E+07
57	5.54E+08	1.05E+07	5.54E+08	1.05E+07	1.64E+08	1.51E+07
58	5.47E+08	1.05E+07	5.47E+08	1.05E+07	1.55E+08	1.51E+07
59	5.41E+08	1.05E+07	5.41E+08	1.05E+07	1.45E+08	1.51E+07
60	5.34E+08	1.05E+07	5.34E+08	1.05E+07	1.35E+08	1.51E+07
61	5.28E+08	1.05E+07	5.28E+08	1.05E+07	1.26E+08	1.51E+07
62	5.22E+08	1.05E+07	5.22E+08	1.05E+07	1.16E+08	1.51E+07
63	5.15E+08	1.05E+07	5.15E+08	1.05E+07	1.06E+08	1.51E+07
64	5.09E+08	1.05E+07	5.09E+08	1.05E+07	9.65E+07	1.51E+07
65	5.02E+08	1.05E+07	5.02E+08	1.05E+07	8.68E+07	1.51E+07
66	4.96E+08	1.05E+07	4.96E+08	1.05E+07	7.71E+07	1.51E+07
67	4.89E+08	1.05E+07	4.89E+08	1.05E+07	6.75E+07	1.51E+07
68	4.83E+08	1.05E+07	4.83E+08	1.05E+07	5.79E+07	1.51E+07
69	4.76E+08	1.05E+07	4.76E+08	1.05E+07	4.82E+07	1.51E+07

Frequency (Hz)	Rocking Stiffness X (lb/ft/Rad)	Rocking Damping X (lb.ft/Rad/S)	Rocking Stiffness Y (lb/ft/Rad)	Rocking Damping Y (lb.ft/Rad/S)	Torsional Stiffness Z (lb/ft/Rad)	Torsional Damping Z (lb.ft/Rad/S)
51	3.33E+11	7.35E+09	2.53E+11	4.49E+09	6.95E+11	6.86E+09
52	3.28E+11	7.35E+09	2.50E+11	4.49E+09	6.90E+11	6.86E+09
53	3.23E+11	7.35E+09	2.47E+11	4.49E+09	6.85E+11	6.86E+09
54	3.18E+11	7.36E+09	2.44E+11	4.50E+09	6.80E+11	6.86E+09
55	3.13E+11	7.36E+09	2.40E+11	4.50E+09	6.75E+11	6.87E+09
56	3.08E+11	7.36E+09	2.37E+11	4.50E+09	6.71E+11	6.87E+09
57	3.03E+11	7.36E+09	2.34E+11	4.50E+09	6.66E+11	6.87E+09
58	2.99E+11	7.36E+09	2.31E+11	4.50E+09	6.61E+11	6.87E+09
59	2.94E+11	7.36E+09	2.28E+11	4.50E+09	6.56E+11	6.87E+09
60	2.89E+11	7.36E+09	2.25E+11	4.50E+09	6.52E+11	6.87E+09
61	2.84E+11	7.36E+09	2.22E+11	4.50E+09	6.47E+11	6.87E+09
62	2.79E+11	7.36E+09	2.19E+11	4.50E+09	6.42E+11	6.87E+09
63	2.74E+11	7.36E+09	2.16E+11	4.50E+09	6.37E+11	6.87E+09
64	2.69E+11	7.36E+09	2.13E+11	4.50E+09	6.33E+11	6.87E+09
65	2.64E+11	7.37E+09	2.10E+11	4.50E+09	6.28E+11	6.87E+09
66	2.60E+11	7.37E+09	2.07E+11	4.50E+09	6.23E+11	6.87E+09
67	2.55E+11	7.37E+09	2.04E+11	4.50E+09	6.19E+11	6.87E+09
68	2.50E+11	7.37E+09	2.01E+11	4.50E+09	6.14E+11	6.88E+09
69	2.45E+11	7.37E+09	1.98E+11	4.50E+09	6.10E+11	6.88E+09

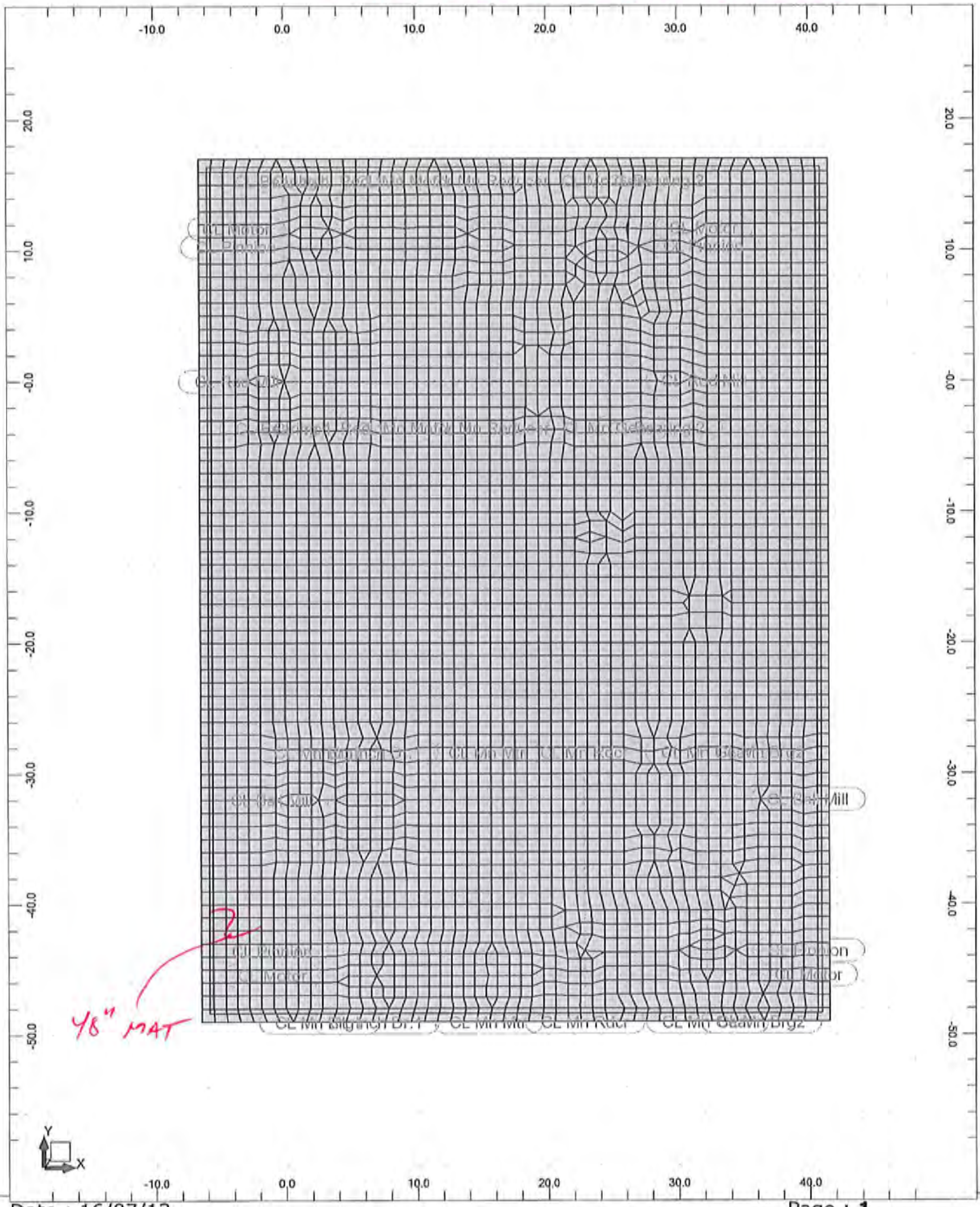
DYNA 6.0 Results Response Table (Case 2)

7/16/2012

Frequency(Hz)	Translational Response at CG - X (in)	Translational Response at CG - Y (in)	Translational Response at CG - Z (in)	Rotational Response at CG - X (Rad)	Rotational Response at CG - Y (Rad)	Rotational Response at CG - Z (Rad)
51	5.56E-04	6.20E-03	8.95E-02	3.72E-04	3.37E-05	3.60E-06
52	5.44E-04	6.06E-03	8.95E-02	3.72E-04	3.37E-05	3.58E-06
53	5.32E-04	5.94E-03	8.96E-02	3.72E-04	3.36E-05	3.57E-06
54	5.21E-04	5.81E-03	8.96E-02	3.72E-04	3.36E-05	3.56E-06
55	5.10E-04	5.70E-03	8.96E-02	3.72E-04	3.36E-05	3.54E-06
56	4.99E-04	5.58E-03	8.96E-02	3.71E-04	3.36E-05	3.53E-06
57	4.90E-04	5.47E-03	8.96E-02	3.71E-04	3.35E-05	3.52E-06
58	4.80E-04	5.36E-03	8.96E-02	3.71E-04	3.35E-05	3.51E-06
59	4.70E-04	5.27E-03	8.96E-02	3.71E-04	3.35E-05	3.50E-06
60	4.62E-04	5.17E-03	8.96E-02	3.71E-04	3.35E-05	3.49E-06
61	4.54E-04	5.08E-03	8.96E-02	3.71E-04	3.34E-05	3.48E-06
62	4.45E-04	4.99E-03	8.96E-02	3.71E-04	3.34E-05	3.48E-06

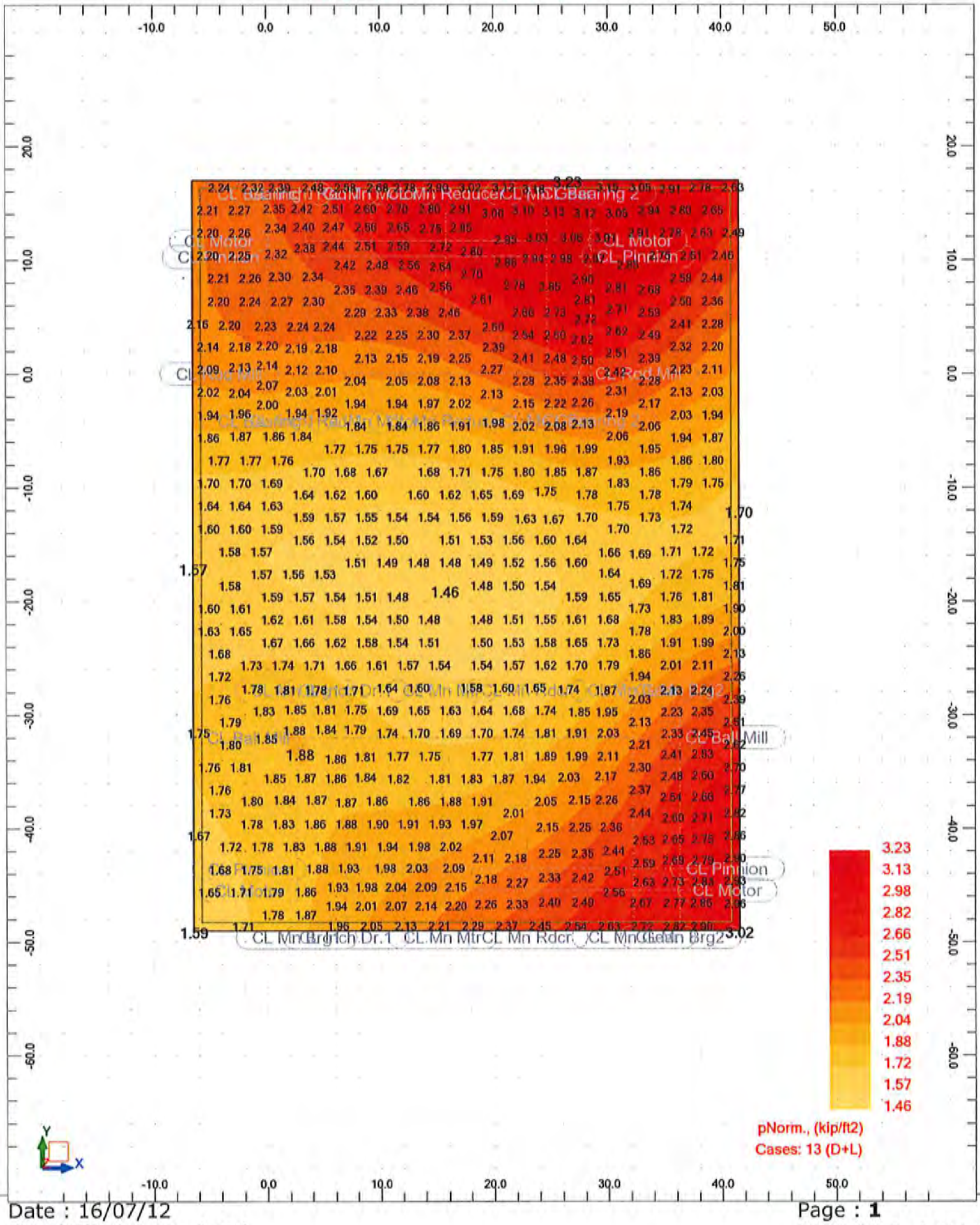
View - Cases: 1 (Self Weight)

MILL MAT - FINITE ELEMENTS



View - pNorm. (kip/ft2) Cases: 13 (D+L)

BEARING PRESSURE



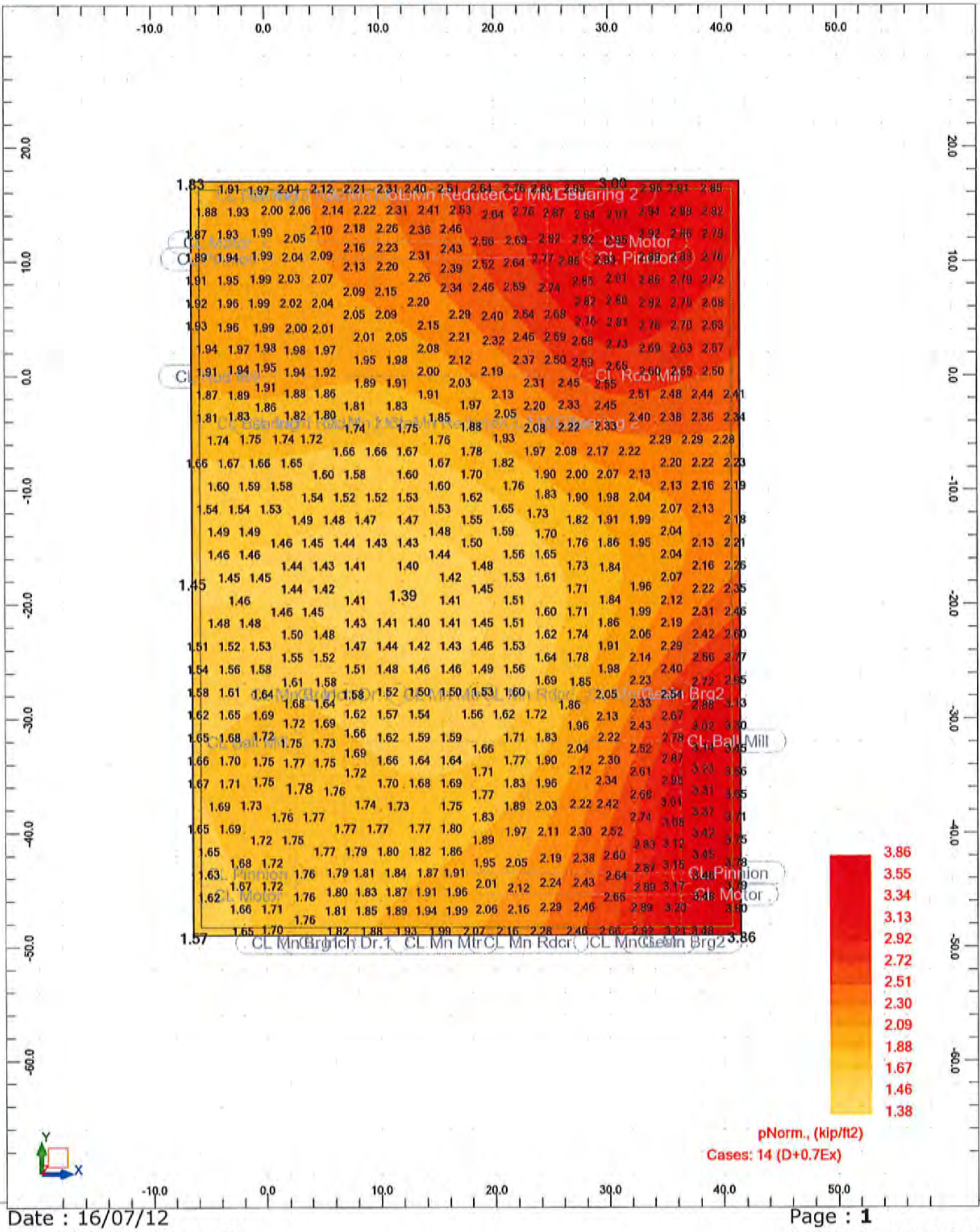
FLSMIDTH

7158 S. FLSmidth Drive
Midvale, UT 84047-5559

Engineer: **Ed Summers**
Calc No..: **C-005** Job.:**11021**
Project: **Mill Mat rev.1**
Client: **CC&V**

View - pNorm. (kip/ft2) Cases: 14 (D+0.7Ex)

BEARING PRESSURE



Date : 16/07/12
File: **Mill Mat rev.1.rtd**

Page : **1**
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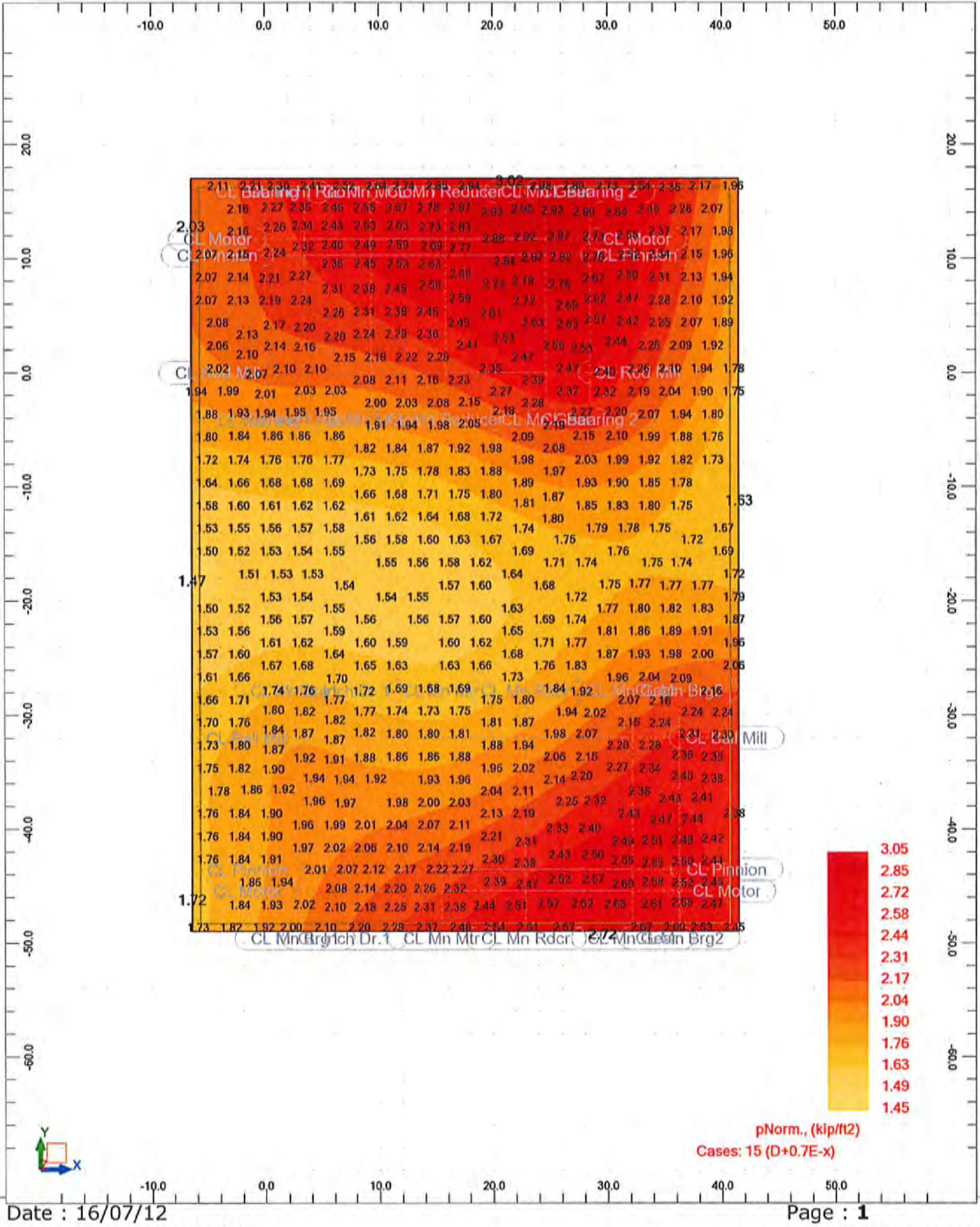
Engineer: **Ed Summers**
Calc No..: **C-005** Job.:**11021**
Project: **Mill Mat rev.1**
Client: **CC&V**

View - pNorm. (kip/ft2) Cases: 15 (D+0.7E-x)

BEARING PRESSURE



Date : 16/07/12
File: **Mill Mat rev.1.rtd**

Page : **1**
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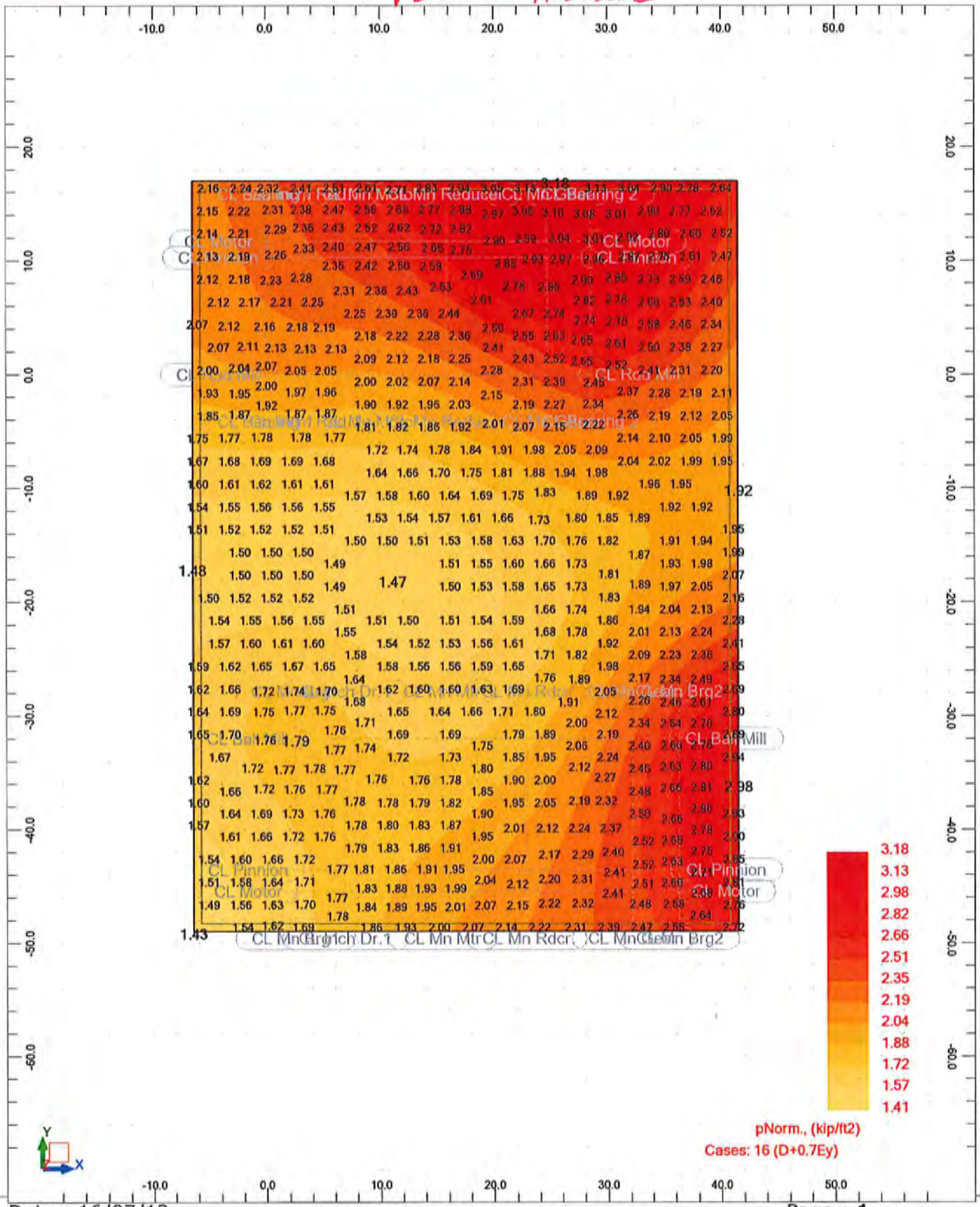
7158 S. FLSmidth Drive
Midvale, UT 84047-5559

Engineer: **Ed Summers**
Calc No..: **C-005** Job.:**11021**
Project: **Mill Mat rev.1**
Client: **CC&V**

View - pNorm. (kip/ft2) Cases: 16 (D+0.7Ey)

BEARING PRESSURE

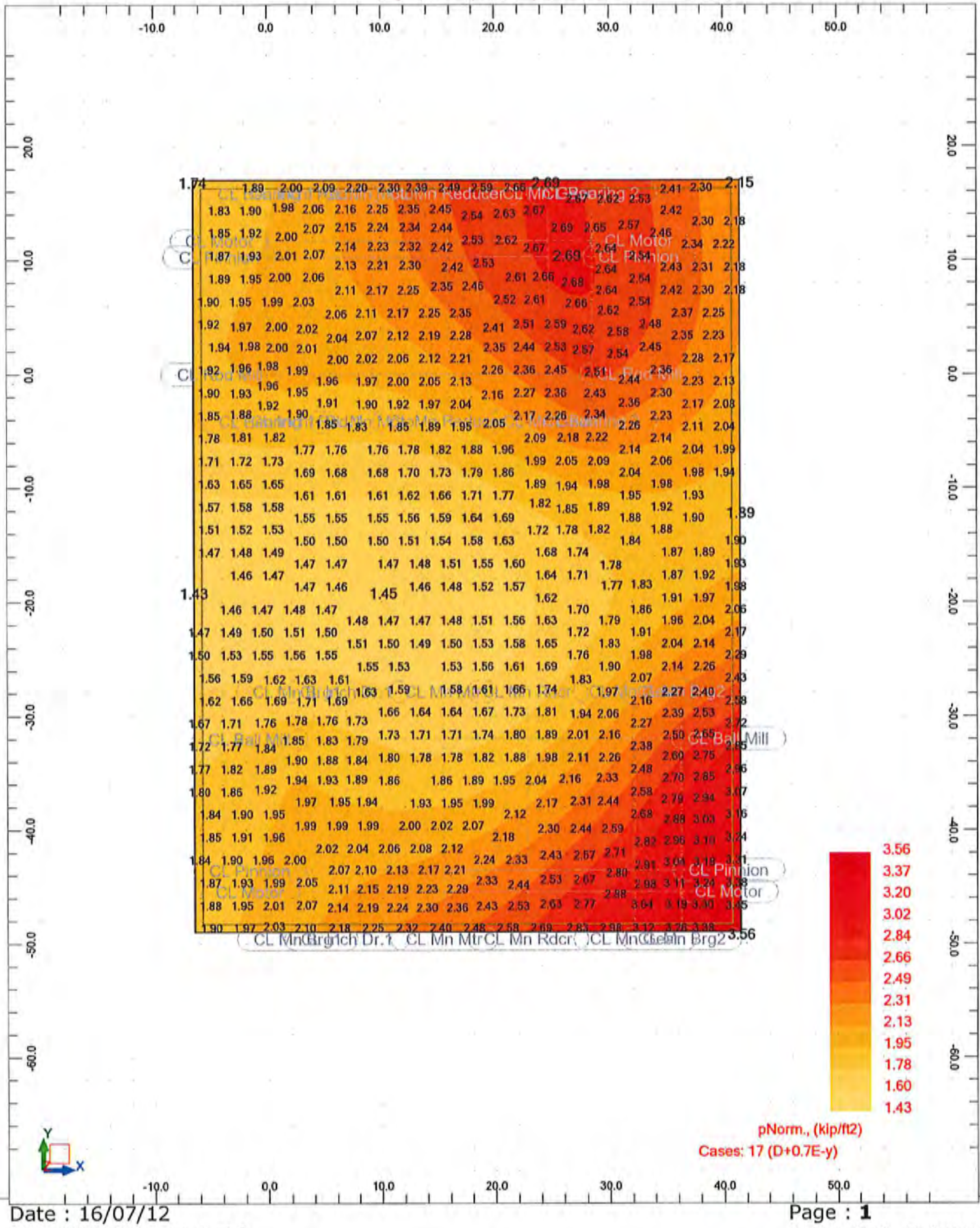


7158 S. FLSmidth Drive
Midvale, UT 84047-5559

Engineer: **Ed Summers**
Calc No..: **C-005** Job.:**11021**
Project: **Mill Mat rev.1**
Client: **CC&V**

View - pNorm. (kip/ft2) Cases: 17 (D+0.7E-y)

BEARING PRESSURE



Date : 16/07/12
File: **Mill Mat rev.1.rtd**

Page : **1**
Robot 2012 © AutoDesk

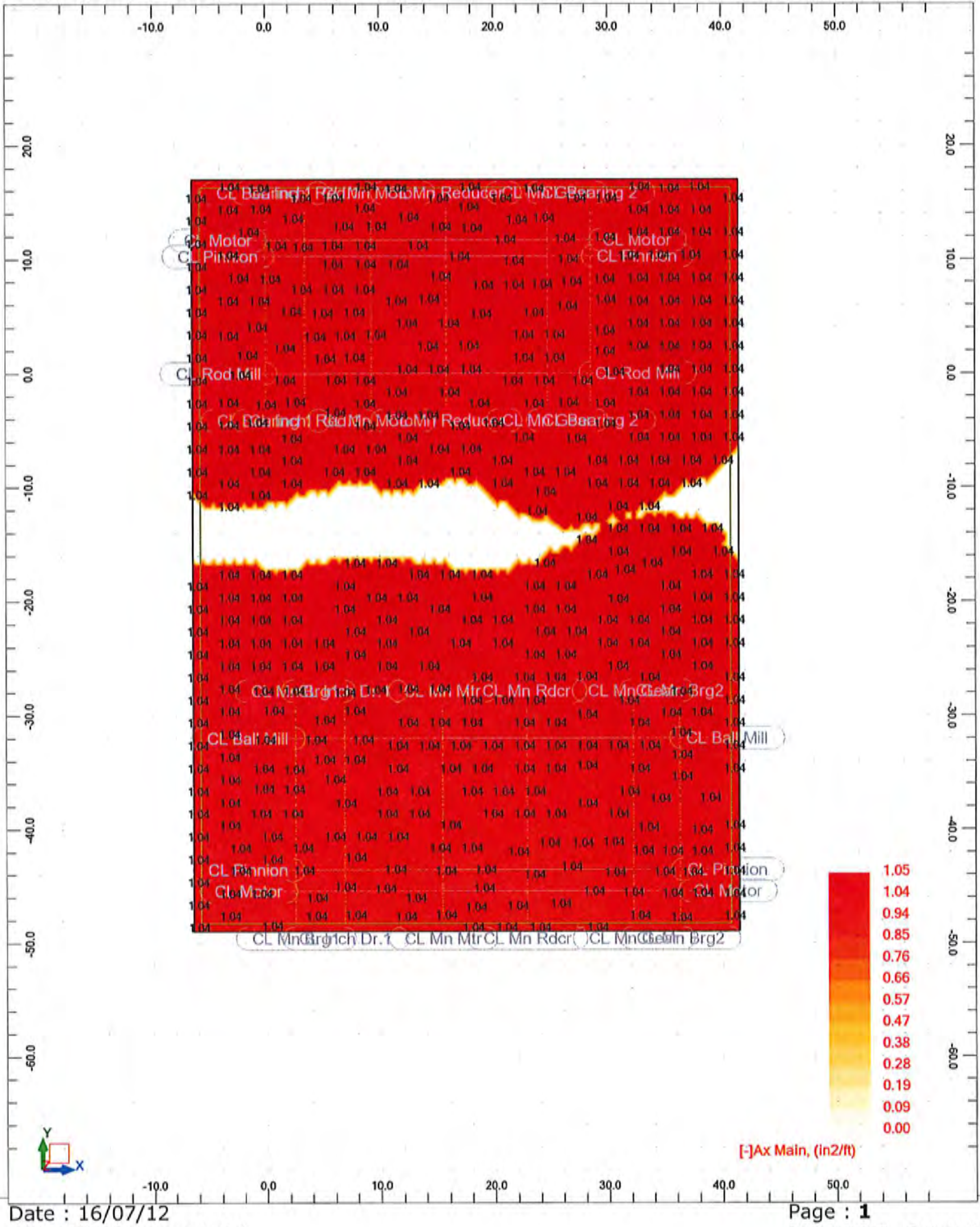
FLSmidth

7158 S. FLSmidth Drive
Midvale, UT 84047-5559

Engineer: **Ed Summers**
Calc No..: **C-005** Job.:**11021**
Project: **Mill Mat rev.1**
Client: **CC&V**

View - [-]Ax Main (in2/ft)

REQ'D REINFORCEMENT



Date : 16/07/12
File: **Mill Mat rev.1.rtd**

Robot 2012 © AutoDesk

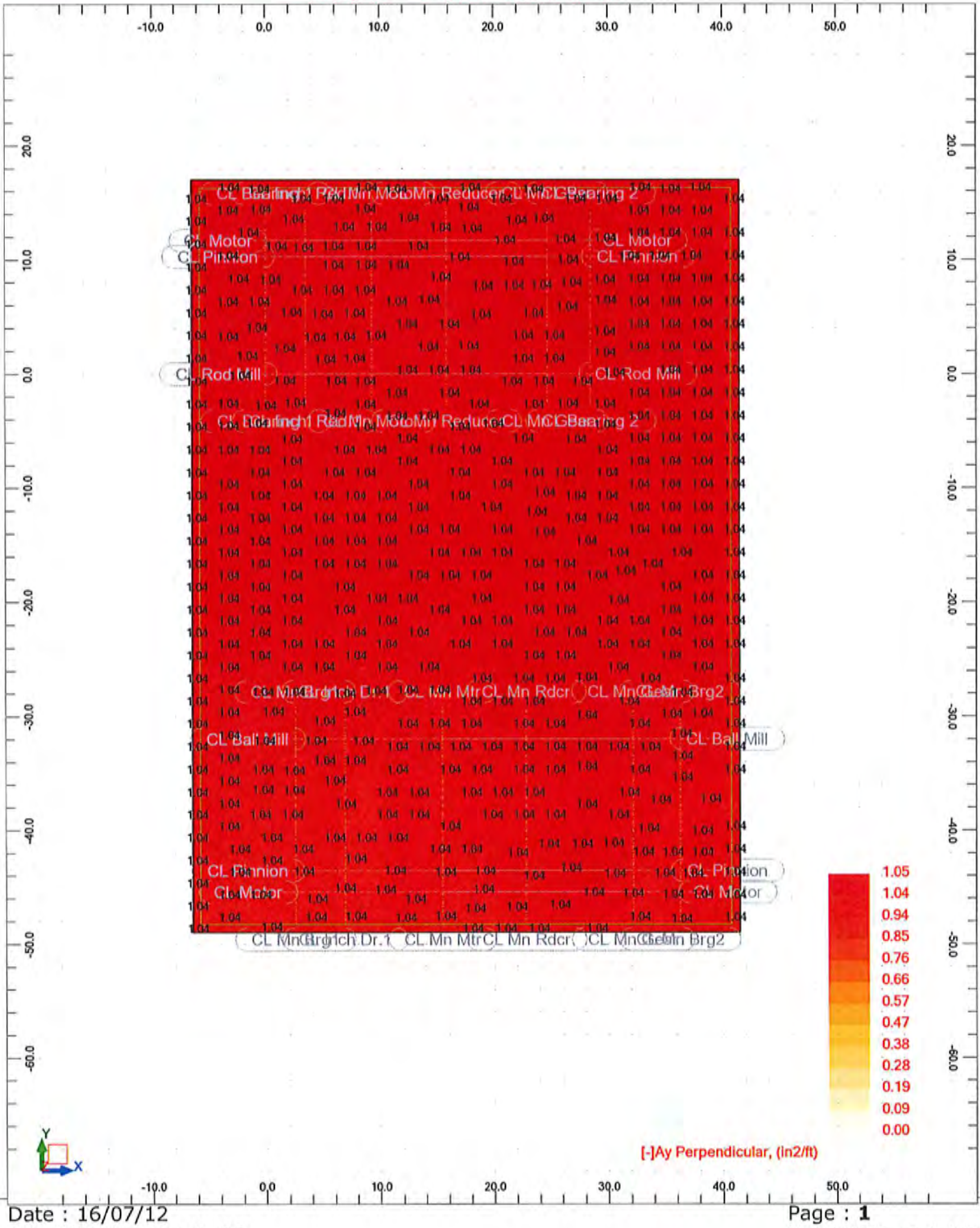
FLSMIDTH

7158 S. FLSmidth Drive
Midvale, UT 84047-5559

Engineer: **Ed Summers**
Calc No..: **C-005** Job.:**11021**
Project: **Mill Mat rev.1**
Client: **CC&V**

View - [-]Ay Perpendicular (in2/ft)

REQ'D REINFORCEMENT



Date : 16/07/12
File: **Mill Mat rev.1.rtd**

Page : **1**
Robot 2012 © AutoDesk

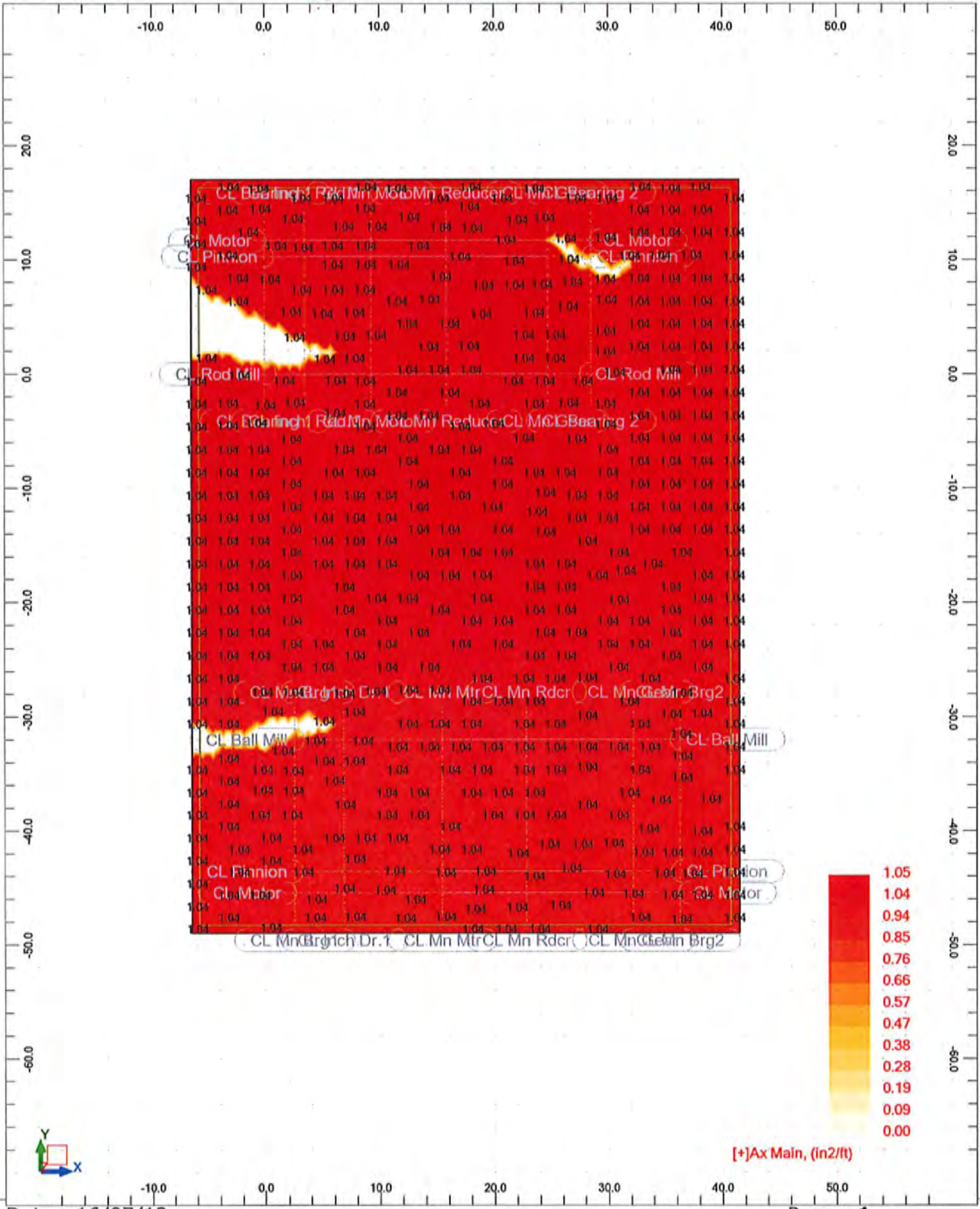
FLSmidth

7158 S. FLSmidth Drive
Midvale, UT 84047-5559

Engineer: **Ed Summers**
Calc No..: **C-005** Job.:**11021**
Project: **Mill Mat rev.1**
Client: **CC&V**

View - [+]Ax Main (in2/ft)

REQ'D REINFORCEMENT

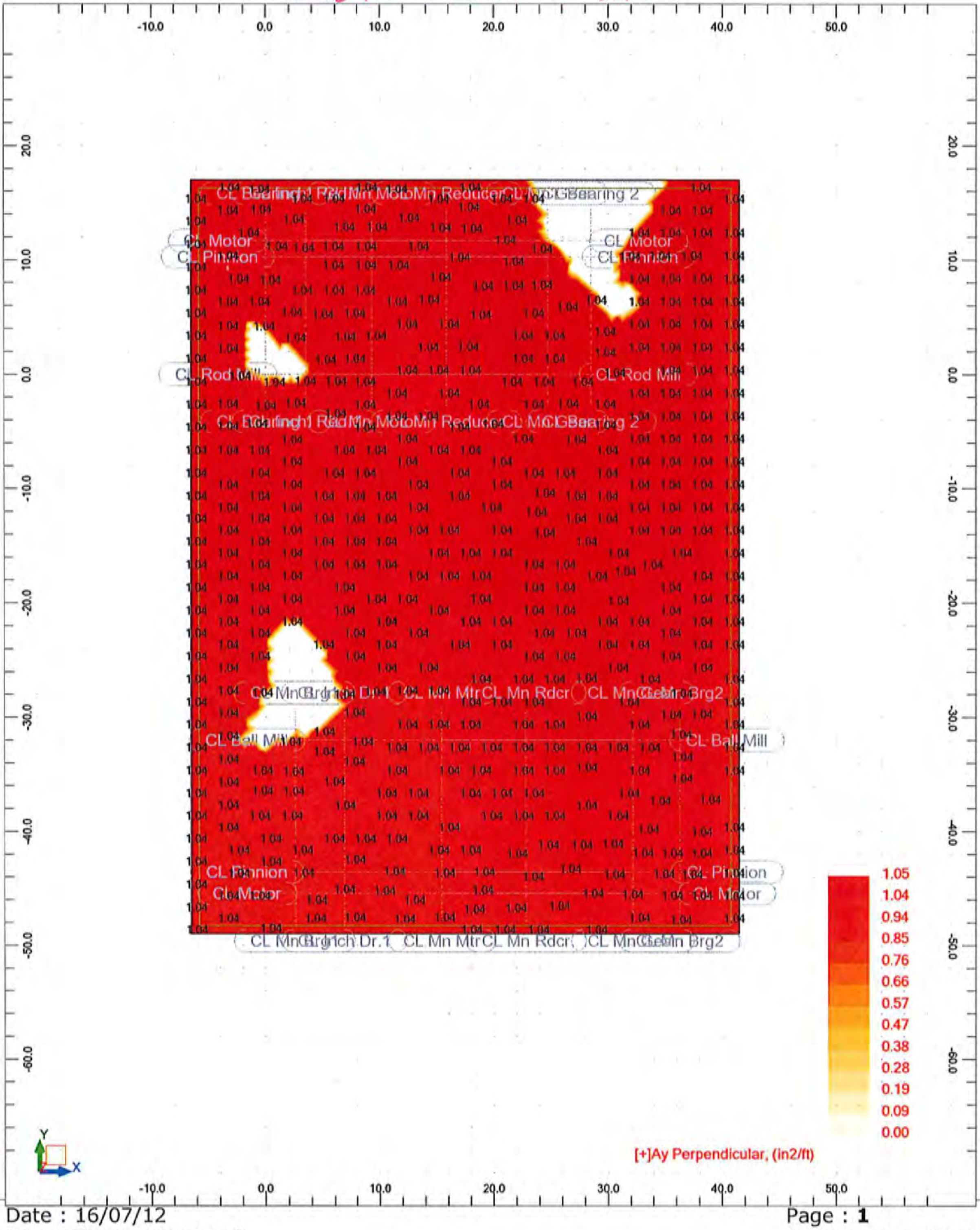


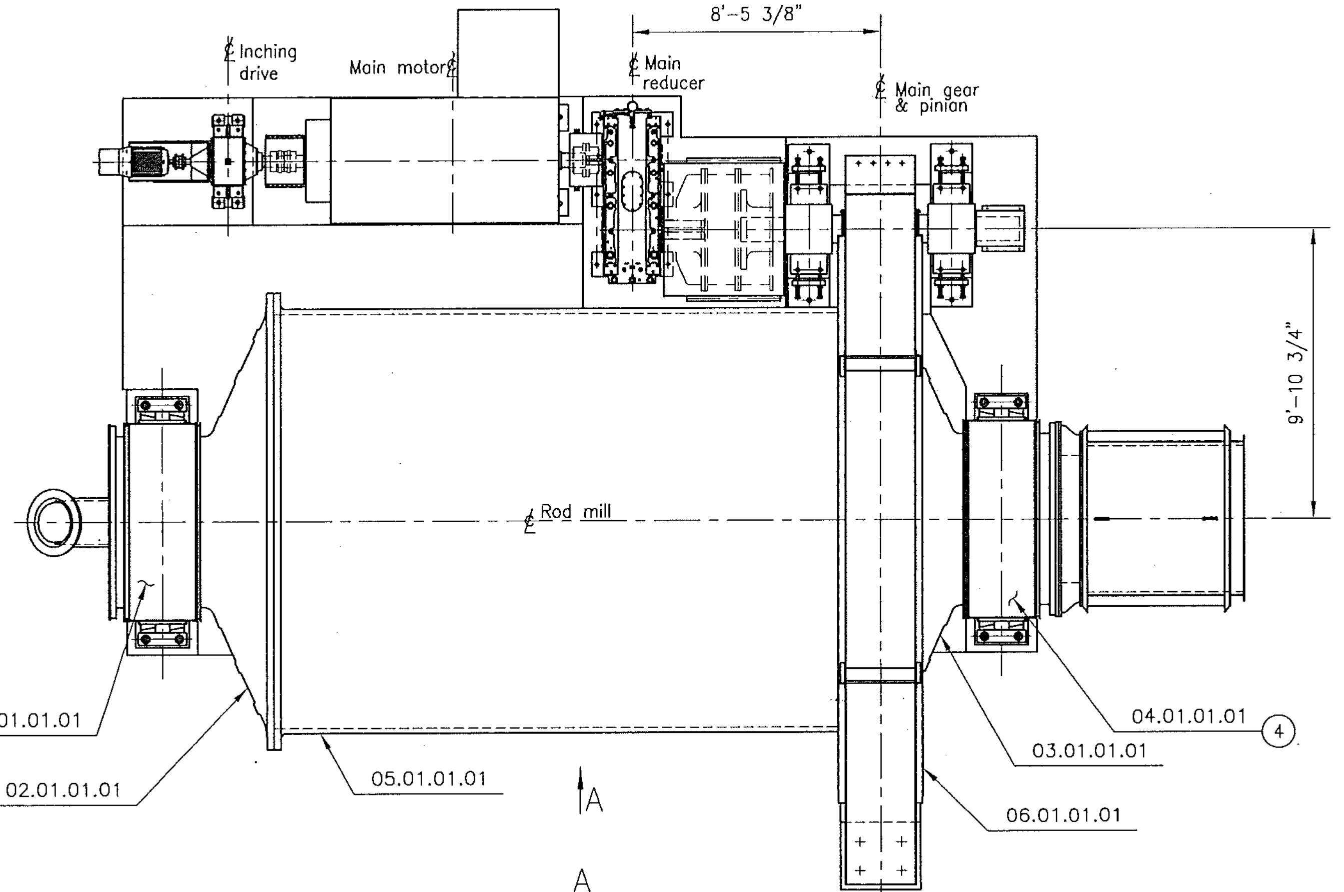
Date : 16/07/12
File: **Mill Mat rev.1.rtd**

Page : **1**
Robot 2012 © AutoDesk

View - [+]Ay Perpendicular (in2/ft)

REQ'D REINFORCEMENT





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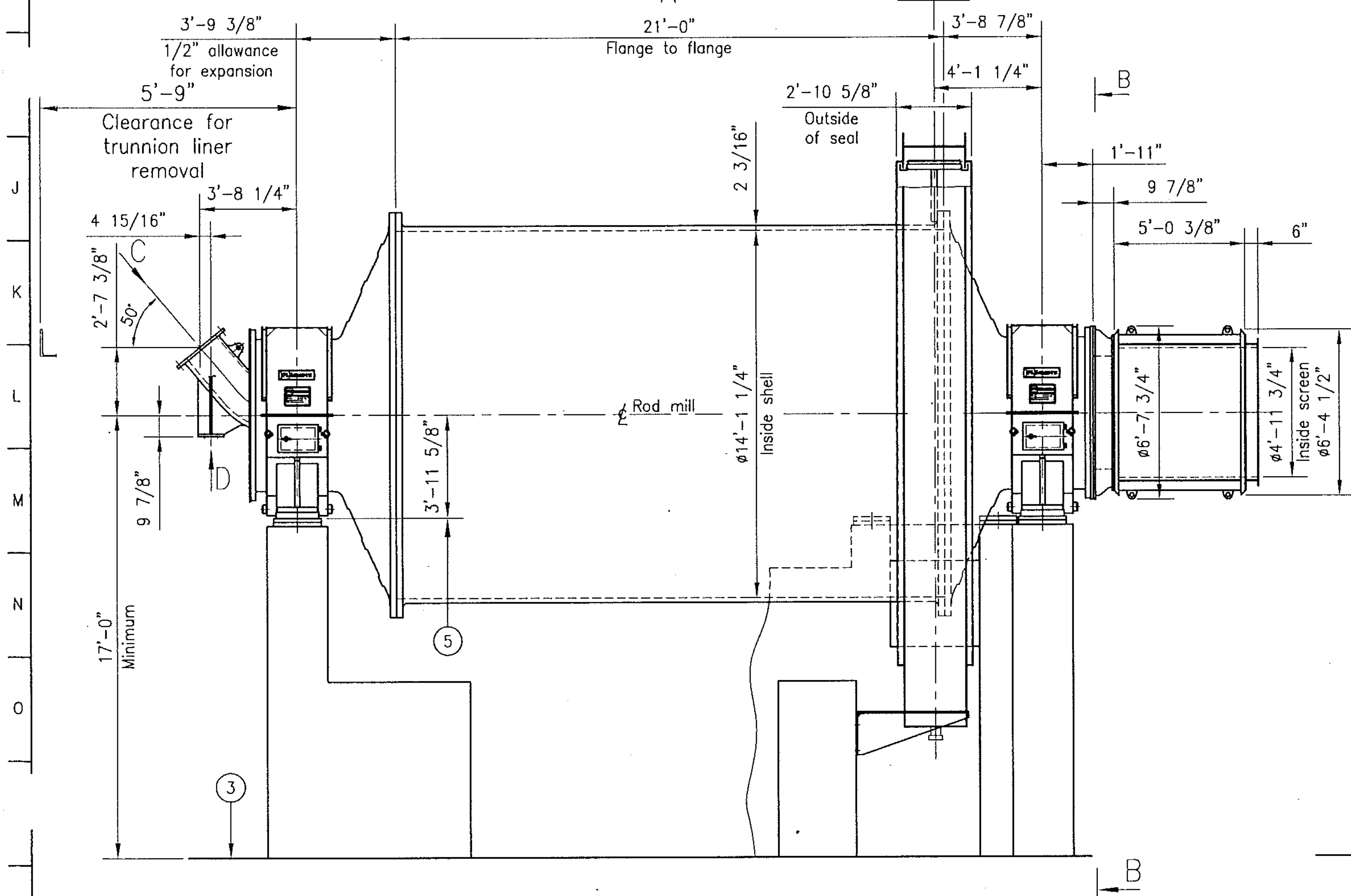

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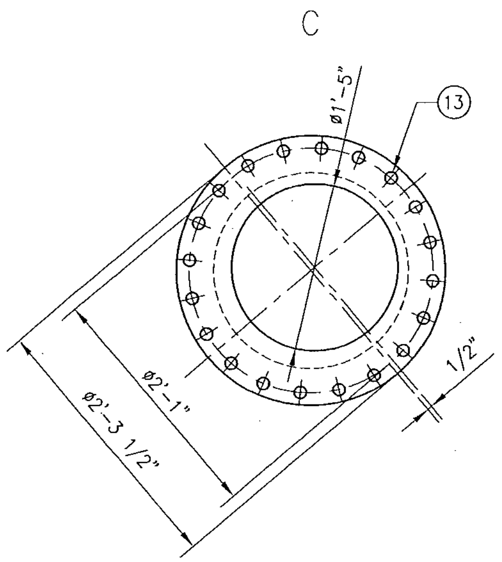

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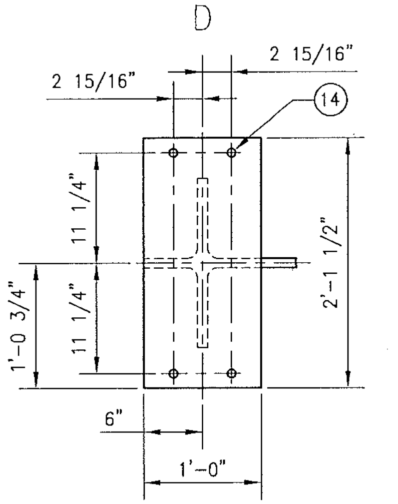
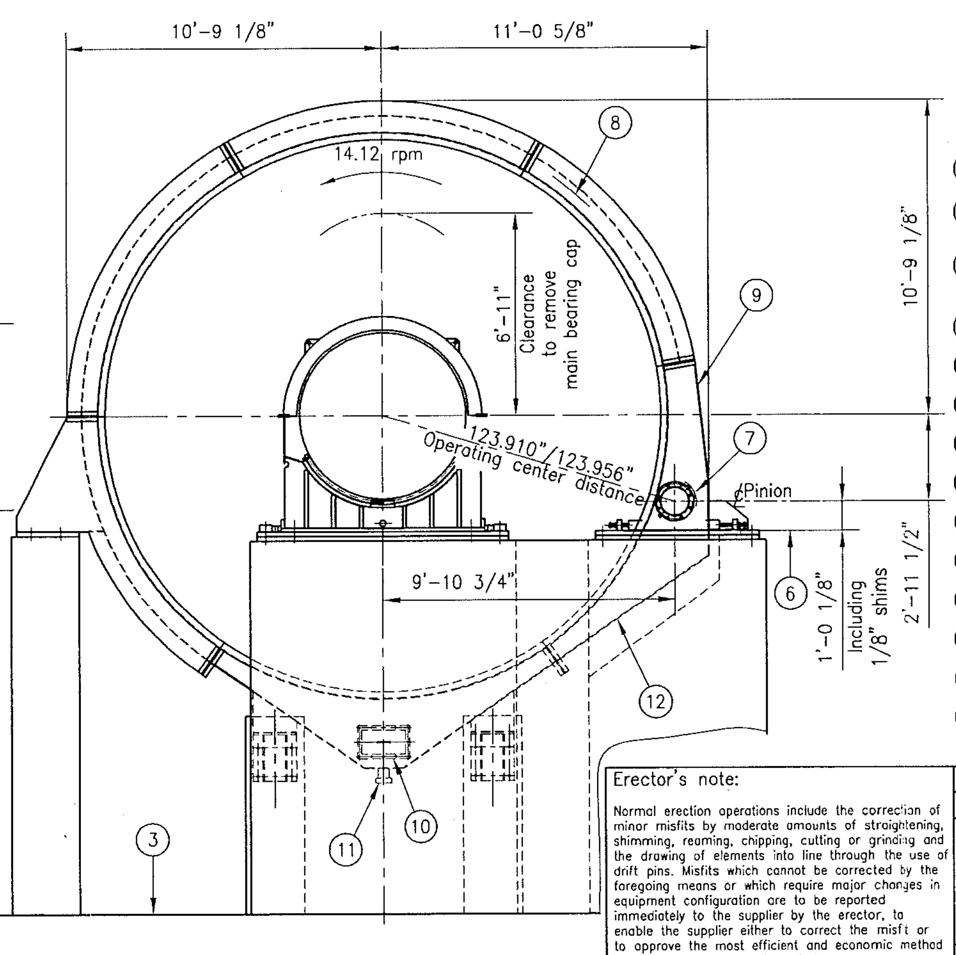


Project: High grade mill project
PO number: PR-11-100
Equipment: Rod mill
Equipment No.: 1720-647-003

FLSMIDTH
CERTIFIED FOR CONSTRUCTION
SIGNATURE Kilan Haufeal
DATE 23 Apr 12

B–B



⑭ 4 x ø 1 1/8" holes, 1 3/16" grip.
⑬ 20 x ø 1 1/4" holes equally spaced and straddle centerlines, 1 1/4" grip.
⑫ This section of the gear guard is to be in place before assembling the main gear or pinion shaft.
⑪ 4" NPT pipe drain.
⑩ Clean out port (farside).
⑨ Gear spray system.
⑧ Main gear 266 teeth 2'-0" face.
⑦ Main pinion 18 teeth 2'-1/2" face.
⑥ Finish machined surface for pillow blocks.
⑤ Finish machined surface far main bearing.
④ 68" x 24" main bearing.
③ Reference line.
② Use only "Certified print" for final setting.
① All dimensions are in inches.

Erector's note:

Normal erection operations include the correction of minor misfits by moderate amounts of straightening, shimming, reaming, chipping, cutting or grinding and the drawing of elements into line through the use of drift pins. Misfits which cannot be corrected by the foregoing means or which require major changes in equipment configuration are to be reported immediately to the supplier by the erector, to enable the supplier either to correct the misft or to approve the most efficient and economic method of correction to be implemented.

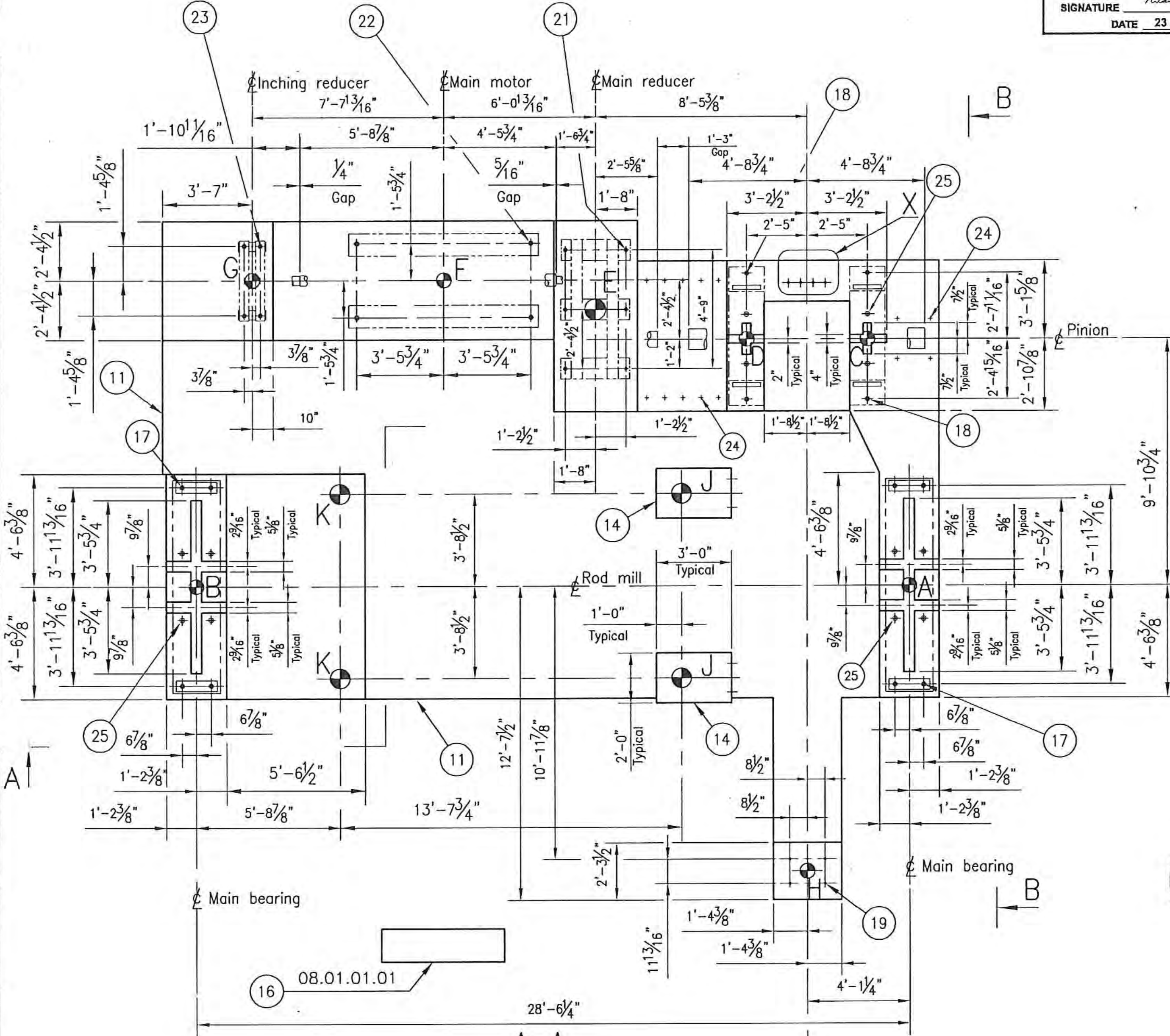
Scale:	Drawn	Appr.	Appr. Date	Zone/Descr.: General revision
5/16"=1'	IBA	SPN	23-Apr-12	

Cripple Creek & Victor Gold Mining Co – Cripple Creek, CO, USA

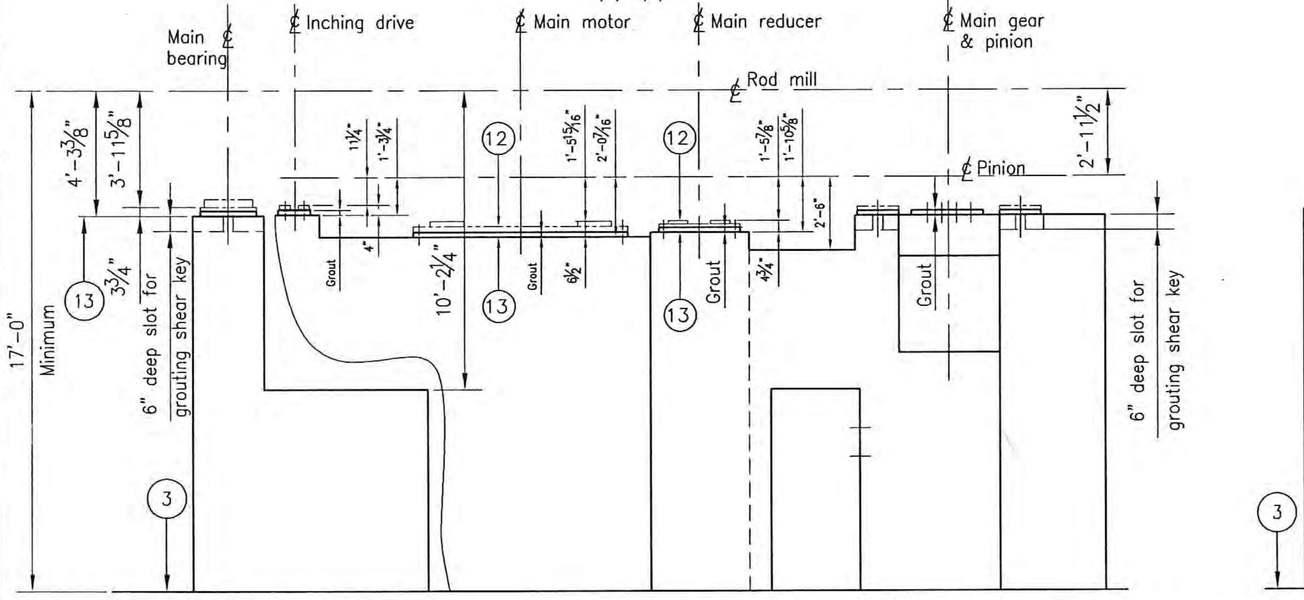
321 Rod mill
Rod mill 4.3m Dia. x 6.4m
Plan and elevation
Outline and Load Drawing

FLSMIDTH
No.: 10269298
Ver.: 2.0

FLSMIDTH
CERTIFIED FOR CONSTRUCTION
SIGNATURE
DATE 23 Apr 12



A–A



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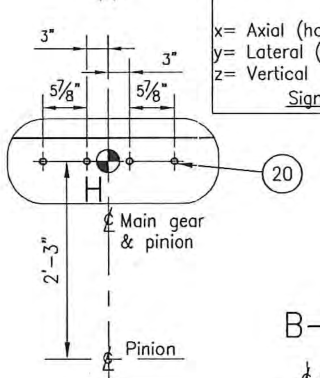
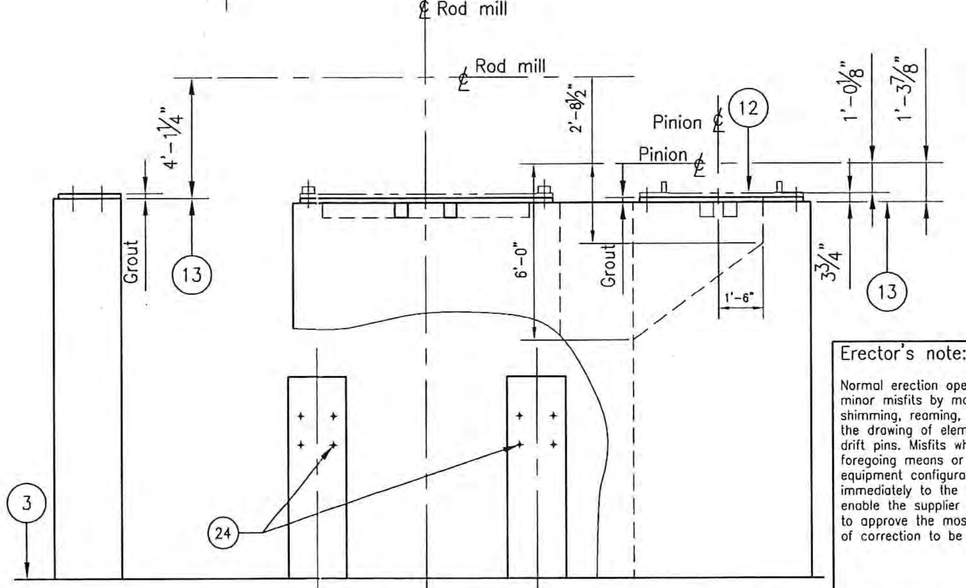


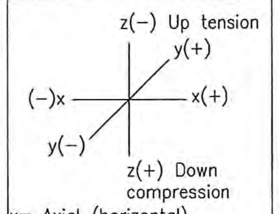
B–B



Foundation loads

Based on 40% total charge including 40% Rods and metal liners
CCW rotation when facing discharge end

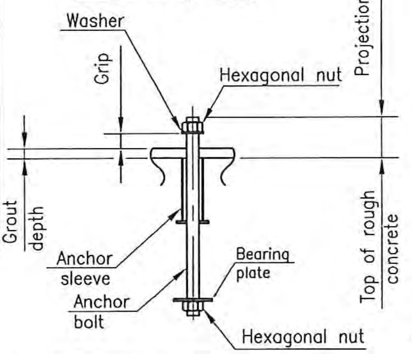
	Mass	Dynamic
AX – Drive bearing pier axial load	0	7,557 lb.
AY – Drive bearing pier lateral load	0	31,700 lb.
AZ – Drive bearing pier vertical load	493,000 lb.	–25,300 lb.
BX – Non–drive bearing pier axial load	0	0
BY – Non–drive bearing pier lateral load	0	44,500 lb.
BZ – Non–drive bearing pier vertical load	462,000 lb.	33,200 lb.
CX – Pinion pier axial load	0	0
CY – Pinion pier lateral load	0	27,600 lb.
CZ – Pinion pier vertical load	3,400 lb.	31,000 lb.
DX – Pinion pier axial load	0	–7,557 lb.
DY – Pinion pier lateral load	0	25,700 lb.
DZ – Pinion pier vertical load	6,100 lb.	–31,000 lb.
EX – Main reducer pier axial load	0	0
EY – Main reducer pier lateral load	0	0
EZ – Main reducer pier vertical load	6,430 Lb.	±10,850 lb.
FX – Main motor pier axial load	0	0
FY – Main motor pier lateral load	0	0
FZ – Main motor pier vertical load	17,000 Lb.	±3,525 lb.
GZ – Inching drive pier vertical load	2,150 Lb.	1,300 lb.
HZ – Gear guard pier vertical load (load per point)	8,800 Lb.	0
Jacking loads:		
JZ – Lift empty mill (load per point)	147,000 lb.	
KZ – Lift empty mill (load per point)	63,000 lb.	
JZ – Lift loaded mill (load per point)	290,500 lb.	
KZ – Lift loaded mill (load per point)	150,000 lb.	
Seismic loads (IBC 2003 Site class D)		
AX – Drive bearing pier axial load	± 152,800 lb.	
AY – Drive bearing pier lateral load	± 78,880 lb.	
BX – Non–drive bearing pier axial load	0	
BY – Non–drive bearing pier lateral load	± 73,920 lb.	



x= Axial (horizontal)
y= Lateral (horizontal)
z= Vertical

Sign convention

Typical foundation bolt arrangement



Project: High grade mill project
PO number: PR-11-100
Equipment: Rod mill
Equipment No.: 1720-647-003

㉙ Anchor bolts are to be located within 1/8" of the indicated position. Tolerance must not be accumulative.

㉘ Direction of dynamic loads are reversed during start-up and shut down.

㉗ Dynamic loads are based on 100% motor output torque. Foundation design shall consider starting and overload forces equal to motor pull out torque and not less than 200% of rated torque.

㉖ Operating WR^2 of mill referred to motor shaft is 4800 lb/ft^2 WR^2 includes 35% total charge including 35% rods, metal liners, pinion, clutch, reducer, and coupling.

㉕ Red head wedge anchor Cat. No. WS3470 (by others). Use to achieve soleplate flatness. Location to be established using the soleplates as templates.

㉔ Red head sleeve anchor Cat. No. HN3424 (by others). See note ⑩

㉓ 4 foundation bolts ø 1 1/2" x 2" grip, 7 1/4" projection.

㉒ 4 foundation bolts ø 1 3/4" x 2 3/8" grip, 8" projection.

㉑ 6 foundation bolts ø 1 1/4" x 1 1/2" grip, 6 1/2" projection.

⑳ 4 foundation bolts ø 3/4" x 5/8" grip, 5" projection.

⑲ 4 foundation bolts ø 3/4" x 1/2" grip, 4 1/2" projection.

⑱ 2 foundation bolts ø 2" x 2" grip, 7 1/4" projection.

⑰ 4 foundation bolts ø 2" x 4 3/4" grip, 10" projection.

⑯ Main bearing and pinion bearing lubrication system.

⑮ Foundation designer must provide adequate support for jacking cradle assembly. See jacking cradle assembly 10271541 for location.

⑭ Jacking pads.

⑬ Top of rough concrete.

⑫ Finish machined surface of soleplate.

⑪ It is suggested to tie the main drive end bearing and drive piers together as shown using an integral reinforced concrete foundation. All foundations should be tied together using an integral reinforced sub surface concrete mat. The mat is to be structurally capable of carrying all static and dynamic loads.

⑩ The location for the sleeve type anchors must be established using the guards and gear guard support brackets as templates at field installation. The maximum clearance between guards and stationary objects is 1/2" (anchors supplied by others).

⑨ Grout shall be high quality, non shrinking and have mechanical properties suitable for the static and dynamic loads specified. A pourable epoxy resin compound is recommended.

⑧ Allow for grout on top of mill bearing and drive piers as shown (approximately 2").

⑦ The foundation is to be designed so that no natural frequencies fall in the range of 53 Hz – 72 Hz. This is to ensure that no significant resonance occurs with the girth gear / pinion meshing frequency of 62.6 Hz.

⑥ Foundation bolts, nuts, washers, anchor sleeves and bearing plates are not supplied by FLSmidth mill group, unless specifically ordered.

⑤ Anchor bolts to be set in anchor sleeve to allow for adjustment.

④ Depth of foundation depends on nature of soil.

③ Reference line.

② Use only "Certified print" for final setting.

① All dimensions are in inches.

Important : Equipment foundations are the responsibility of the purchaser and shall be designed to meet the duty service, soil conditions and the specified operating loads. Foundation dimensions Shown by FLSmidth Inc. are intended to define the interface and battery limits for the equipment supplied and are not intended to imply or represent the final foundation design.

Erector's note:

Normal erection operations include the correction of minor misfits by moderate amounts of straightening, shimming, reaming, chipping, cutting or grinding and the drawing of elements into line through the use of drift pins. Misfits which cannot be corrected by the foregoing means or which require major changes in equipment configuration are to be reported immediately to the supplier by the erector, to enable the supplier either to correct the misfit or to approve the most efficient and economic method of correction to be implemented.

Scale:	Drawn	Appr.	Appr. Date	Zone/Descr.: General revision
5/16"=1'	IBA	SPN	23–Apr–12	

Cripple Creek & Victor Gold Mining Co – Cripple Creek, CO, USA

321 Rod mill
Rod mill 4.3m Dia. x 6.4m
Foundation and loads
Outline and Load Drawing

FLSMIDTH
No.: 10269299
Ver.: 2.0

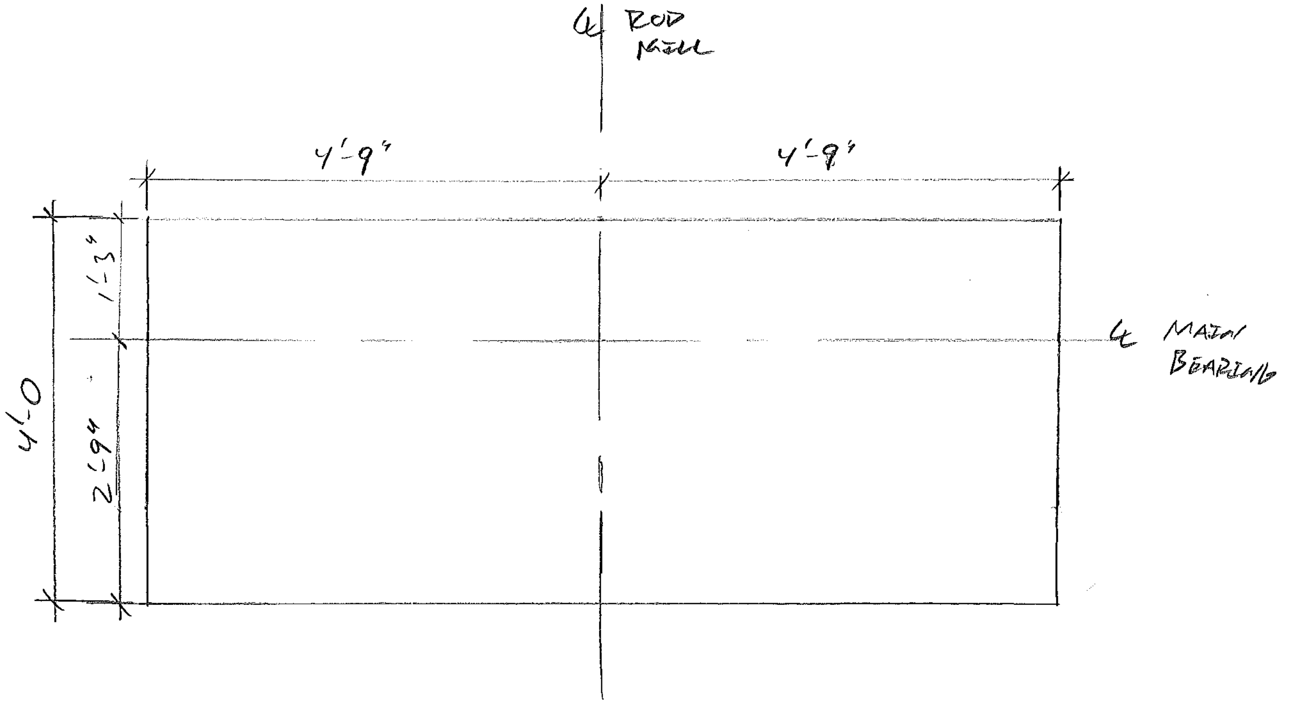
FLSmidth

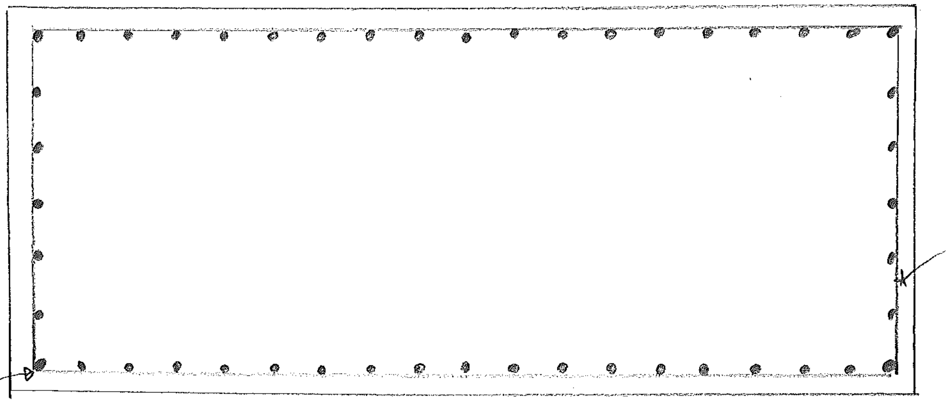
PROJECT
CC&V HIGH GRADE ORE

SUBJECT
ROD MILL FOUNDATION

PROJ NO. 11021
CALC NO. C-005
BY ECS DATE 10-25-11
CHK DATE
SHEET OF REV

PEDESTAL A/B DESIGN





#4 TIES @ 12"

(48) #10 BARS EVENLY SPACED

USE #5 @ 12"
EACH WAY
FOR TOP MAT

FLSMIDTH

Project: CC&V High Grade Ore
Subject: Rod Mill Foundation Design

Proj. No. 11021
Calc No. C-005
By: ECS **Date:** 10/25/2011
Chk: **Date:**
Sheet 1 of 1 **Rev:** 0

Concrete Pedestal Natural Period of Vibration
Pedestal A/B

Pedestal Dimensions:

$L_x := 4\text{ft} + 0\text{in} = 48\,\text{in}$ Pedestal Length X Direction

$L_y := 9\text{ft} + 6\text{in} = 114\,\text{in}$ Pedestal Length Y Direction

$H := 19\text{ft} + 3.375\text{in} = 231.375\,\text{in}$ Pedestal Height

Concrete Properties:

$\gamma_c := 145\text{pcf}$ Concrete Unit Weight

$f_c := 4000\text{psi}$ Concrete Compressive Strength

$E := 57000\text{psi}\cdot\sqrt{\frac{f_c}{\text{psi}}} = 3.605 \times 10^3\,\text{ksi}$ Concrete Modulus of Elasticity

Loads and Masses:

$m := L_x \cdot L_y \cdot H \cdot \frac{\gamma_c}{g} = 1.062 \times 10^5\,\text{lb}$ Pedestal Mass

$F_x := 7557\text{lb}$ $F_y := 44500\text{lb}$ Applied Mass

$m_x := F_x + 0.23m = 3.199 \times 10^4\,\text{lb}$ $m_y := F_y + 0.23m = 6.894 \times 10^4\,\text{lb}$ Equivalent Mass

Dynamic Properties:

$I_x := \frac{L_x^{\,3} \cdot L_y}{12} = 1.051 \times 10^6\,\text{in}^4$ $I_y := \frac{L_x \cdot L_y^{\,3}}{12} = 5.926 \times 10^6\,\text{in}^4$ Moment of Inertia

$k_x := \frac{(3 \cdot E \cdot I_x)}{H^3} = 1.101 \times 10^4\,\frac{\text{kip}}{\text{ft}}$ $k_y := \frac{(3 \cdot E \cdot I_y)}{H^3} = 6.209 \times 10^4\,\frac{\text{kip}}{\text{ft}}$ Stiffness Factor

$\omega_x := \sqrt{\frac{k_x}{0.23m}} = 120.392\,\text{Hz}$ $\omega_y := \sqrt{\frac{k_y}{0.23m}} = 285.931\,\text{Hz}$ Natural Frequency without added Mass

$\omega_{x.} := \sqrt{\frac{k_x}{m_x}} = 105.217\,\text{Hz}$ $\omega_{y.} := \sqrt{\frac{k_y}{m_y}} = 170.235\,\text{Hz}$ Natural Frequency with added Mass

```
        OOOOOOO    OOOOO    OOOOO    OOOOO    OOOOO   OO
        OO    OO  OO   OO  OO   OO  OO   OO  OO   OO  OO
        OO    OO  OO   OO  OO   OO  OO   OO  OO   OO  OO
        OO    OO  OO       OO   OO  OO       OO   OO  OO
        OO    OO  OO       OOOOOOO  OO       OO   OO  OO
        OOOOOOO   OO   OO  OO   OO  OO   OO  OO   OO  OO
        OO        OO   OO  OO   OO  OO   OO  OO   OO  OO
        OO         OOOOO   OO   OO   OOOOO    OOOOO   OOOOO  (TM)


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


     Licensee stated above acknowledges that Portland Cement Association
(PCA) is not and cannot be responsible for either the accuracy or
adequacy of the material supplied as input for processing by the
pcaColumn(tm) computer program. Furthermore, PCA neither makes any
warranty expressed nor implied with respect to the correctness of the
output prepared by the pcaColumn(tm) program.Although PCA has endeavored
to produce pcaColumn(tm) error free, the program is not and can't be
certified infallible. The final and only responsibility for analysis,
design and engineering documents is the licensees. Accordingly, PCA
disclaims all responsibility in contract, negligence or other tort for
any analysis, design or engineering documents prepared in connection
with the use of the pcaColumn(tm) program.
```

```
 General Information:
 ====================
    File Name: P:\11021\116 - Calculations\116.d - Arch_Civil_Struc\C-005 Grinding Area Concrete
    Project:  CC&V High Grade Ore
    Column:   A/B                           Engineer: ECS
    Code:     ACI 318-02                    Units: English

    Run Option: Investigation               Slenderness: Not considered
    Run Axis:   Biaxial                     Column Type: Architectural

 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:
 ========
    Rectangular: Width = 48 in              Depth = 114 in

    Gross section area, Ag =  5472 in^2
    Ix =  5.92618e+006 in^4                 Iy =  1.05062e+006 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)
    ---- --------- -----------   ---- --------- -----------   ---- --------- -----------
    #  3      0.38        0.11   #  4      0.50        0.20   #  5      0.63        0.31
    #  6      0.75        0.44   #  7      0.88        0.60   #  8      1.00        0.79
    #  9      1.13        1.00   # 10      1.27        1.27   # 11      1.41        1.56
    # 14      1.69        2.25   # 18      2.26        4.00

    Confinement: Tied; #3 ties with #7 bars,  #4 with larger bars.
    phi(a) = 0.8,  phi(b) = 0.9,  phi(c) = 0.65

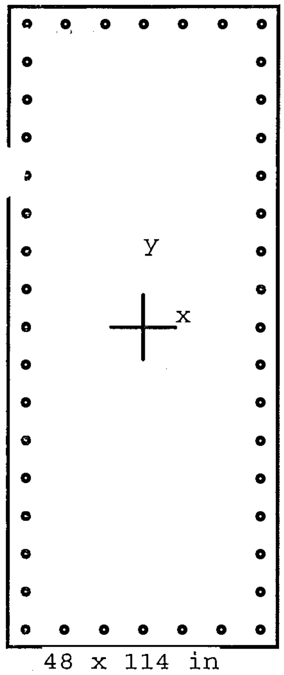
    Layout: Rectangular
    Pattern: Equal Bar Spacing  (Cover to transverse reinforcement)
    Total steel area, As = 55.88 in^2 at 1.02%
    44 #10   Cover = 2 in

 Load Combinations:
 ==================
    U1   =  1.400*Dead + 0.000*Live + 0.000*Wind + 0.000*EarthQuake
    U2   =  1.200*Dead + 1.600*Live + 0.000*Wind + 0.000*EarthQuake
    U3   =  1.200*Dead + 1.000*Live + 0.000*Wind + 0.000*EarthQuake
    U4   =  1.200*Dead + 0.000*Live + 0.800*Wind + 0.000*EarthQuake
    U5   =  1.200*Dead + 1.000*Live + 1.600*Wind + 0.000*EarthQuake
    U6   =  0.900*Dead + 0.000*Live + 1.600*Wind + 0.000*EarthQuake
    U7   =  1.200*Dead + 0.000*Live - 0.800*Wind + 0.000*EarthQuake
    U8   =  1.200*Dead + 1.000*Live - 1.600*Wind + 0.000*EarthQuake
    U9   =  0.900*Dead + 0.000*Live - 1.600*Wind + 0.000*EarthQuake
    U10  =  1.200*Dead + 1.000*Live + 0.000*Wind + 1.000*EarthQuake
    U11  =  0.900*Dead + 0.000*Live + 0.000*Wind + 1.000*EarthQuake
    U12  =  1.200*Dead + 1.000*Live + 0.000*Wind - 1.000*EarthQuake
    U13  =  0.900*Dead + 0.000*Live + 0.000*Wind - 1.000*EarthQuake
```

```
  Service Loads:
  ==============
         Load   Axial Load      Mx @ Top      Mx @ Bot      My @ Top      My @ Bot
     No. Case          kip          k-ft          k-ft          k-ft          k-ft
     --- ---- ------------ ------------ ------------ ------------ ------------
       1 Dead        493.0         369.8        369.8           0.0           0.0
         Live        -25.3           0.0        856.6           0.0         145.5
         Wind          0.0           0.0          0.0           0.0           0.0
         E.Q.          0.0           0.0       1538.5           0.0        2926.0

  Factored Loads and Moments with Corresponding Capacities: (see user's manual for notation)
  ========================================================
     NOTE: Each loading combination includes the following cases:
           First line  - at column top
           Second line - at column bottom
          Load            Pu          Mux          Muy         fMnx         fMny
     No.  Combo          kip         k-ft         k-ft         k-ft         k-ft   fMn/Mu
     --- ------ ----------- ----------- ----------- ----------- ----------- --------
       1   1 U1        690.2        517.6          0.0      15274.1          0.0   29.507
       2               690.2       -517.6          0.0     -15274.1         -0.0   29.507
       3   1 U2        551.1        443.7          0.0      14812.7          0.0   33.384
       4               551.1      -1814.3       -232.8     -14126.1      -1812.2    7.786
       5   1 U3        566.3        443.7          0.0      14864.8          0.0   33.502
       6               566.3      -1300.3       -145.5     -14303.5      -1600.2   11.000
       7   1 U4        591.6        443.7          0.0      14949.5          0.0   33.693
       8               591.6       -443.7          0.0     -14949.5         -0.0   33.693
       9   1 U5        566.3        443.7          0.0      14864.8          0.0   33.502
      10               566.3      -1300.3       -145.5     -14303.5      -1600.2   11.000
      11   1 U6        443.7        332.8          0.0      14441.4          0.0   43.397
      12               443.7       -332.8          0.0     -14441.4         -0.0   43.397
      13   1 U7        591.6        443.7          0.0      14949.5          0.0   33.693
      14               591.6       -443.7          0.0     -14949.5         -0.0   33.693
      15   1 U8        566.3        443.7          0.0      14864.8          0.0   33.502
      16               566.3      -1300.3       -145.5     -14303.5      -1600.2   11.000
      17   1 U9        443.7        332.8          0.0      14441.4          0.0   43.397
      18               443.7       -332.8          0.0     -14441.4         -0.0   43.397
      19   1 U10       566.3        443.7          0.0      14864.8          0.0   33.502
      20               566.3      -2838.8      -3071.5      -5442.0      -5888.0    1.917
      21   1 U11       443.7        332.8          0.0      14441.4          0.0   43.397
      22               443.7      -1871.3      -2926.0      -3731.7      -5835.1    1.994
      23   1 U12       566.3        443.7          0.0      14864.8          0.0   33.502
      24               566.3        238.2       2780.5        538.4       6285.1    2.260
      25   1 U13       443.7        332.8          0.0      14441.4          0.0   43.397
      26               443.7       1205.7       2926.0       2445.8       5935.5    2.029

     *** Program completed as requested! ***
```



Code: ACI 318-02

Units: English

Run axis: Biaxial

Run option: Investigation

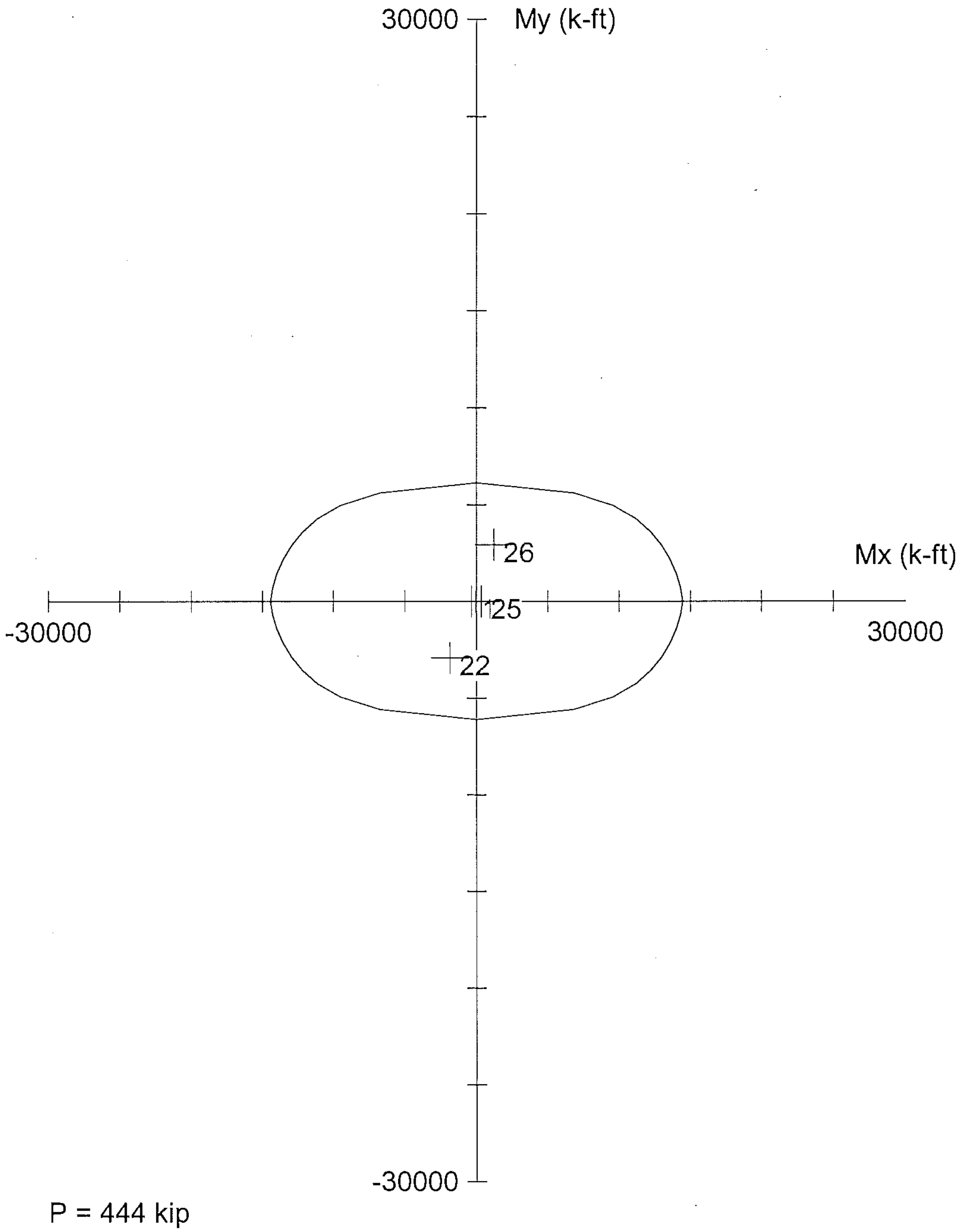
Slenderness: Not considered

Column type: Architectural

Bars: ASTM A615

Date: 10/25/11

Time: 15:38:24



pcaColumn v3.63 - Licensed to: FLSmidth

File: P:\11021\116 - Calculations\116.d - Arch_Civil_Struc\C-005 Grinding Area Concrete\Column A-B.col

Project: CC&V High Grade Ore

Column: A/B
Engineer: ECS

f'c = 4 ksi
fy = 60 ksi
Ag = 5472 in^2
44 #10 bars

Ec = 3605 ksi
Es = 29000 ksi
As = 55.88 in^2
Rho = 1.02%

fc = 3.4 ksi
fc = 3.4 ksi
Xo = 0.00 in
Ix = 5.92618e+006 in^4

ı = 0.003 in/in
Yo = 0.00 in
Iy = 1.05062e+006 in^4

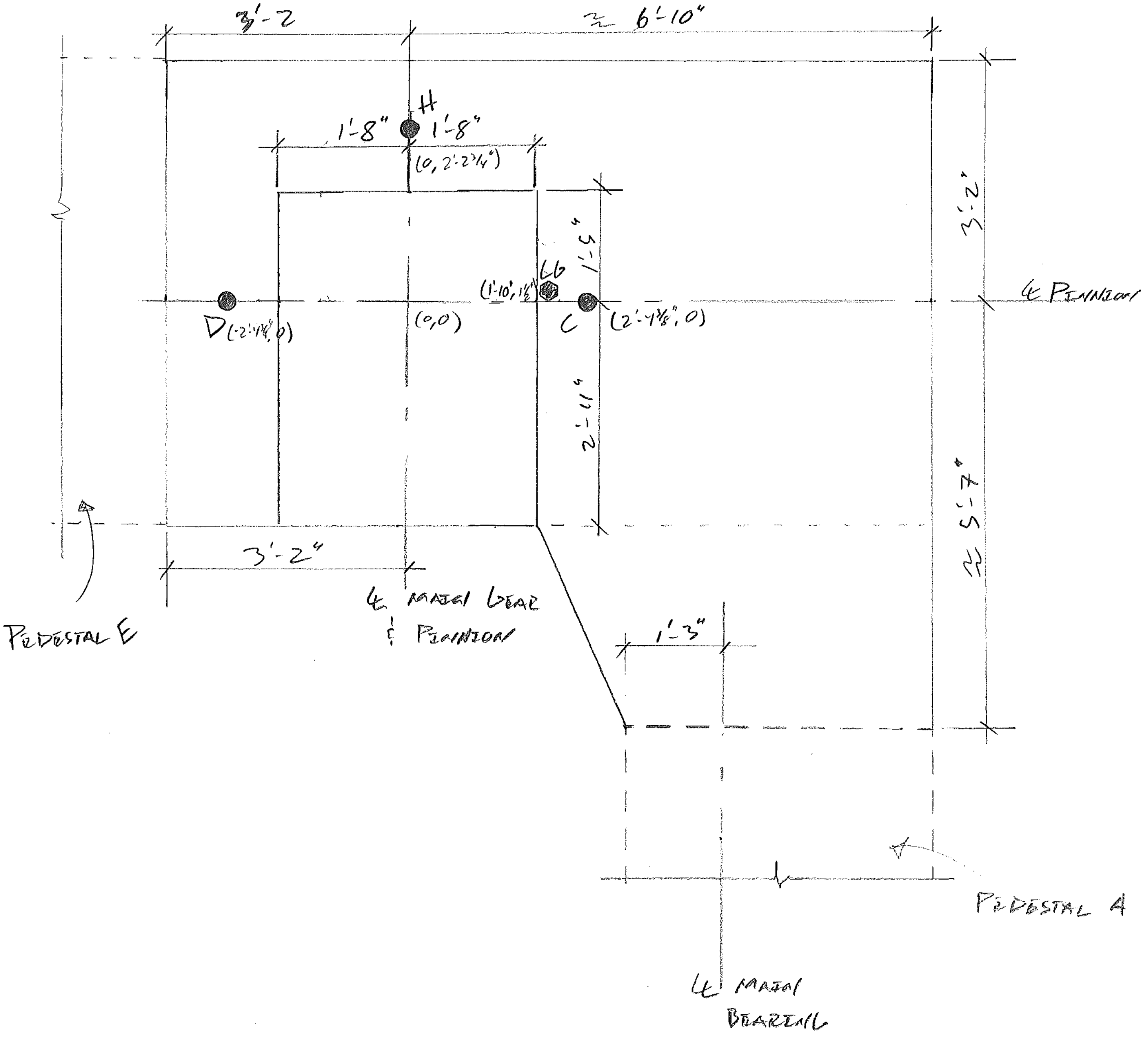
Beta1 = 0.85
Clear spacing = 5.46 in
Clear cover = 2.50 in

Confinement: Tied
phi(a) = 0.8, phi(b) = 0.9, phi(c) = 0.65

FLSMIDTH

PROJECT CC&V HIGH GRADE ORE
SUBJECT ROD MILL FOUNDATION
PROJ NO. 11021
CALC NO. C-005
BY ECS DATE 10-26-11
CHK DATE
SHEET OF REV

PEDESTAL C/D DESIGN

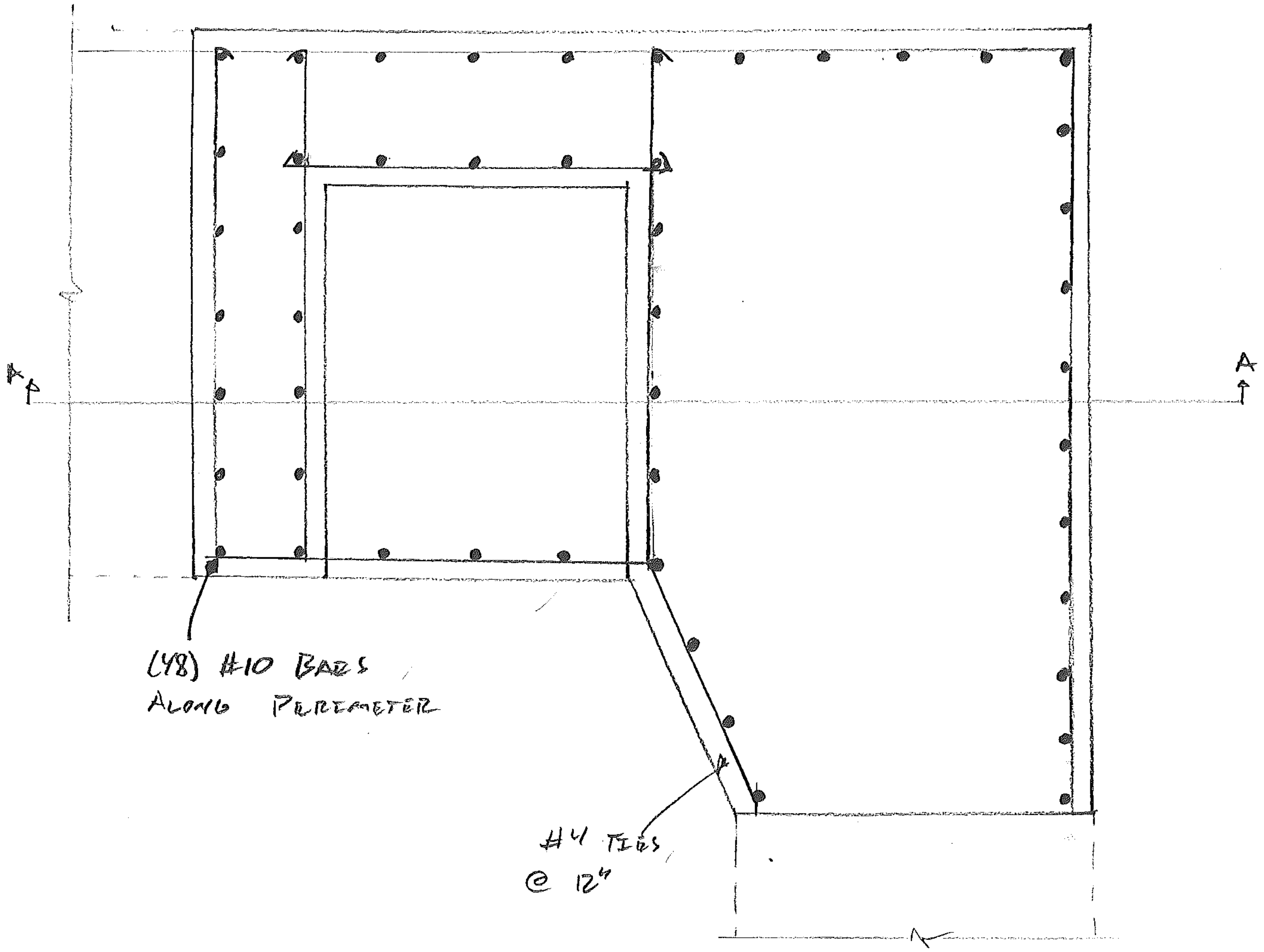


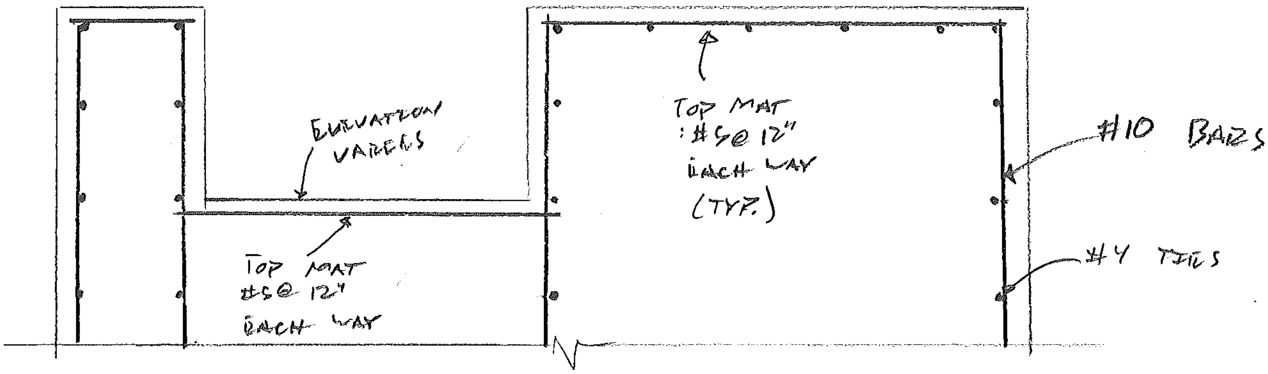
FLSMIDTH

PROJECT CC & V HIGH GRADE ORE
SUBJECT ROD MILL FOUNDATION

PROJ NO. 11021
CALC NO. C-005
BY ECS DATE 10-26-11
CHK DATE
SHEET OF REV

PEDESTAL C/D DESIGN:





A-A

Pedestal C/D Loading

Pedestal Height (ft): 19.25

Load Locations:

Using CL Main Gear & CL Pinnion as Axis Origin

	X (ft)	Y (ft)
Pedestal Center of Gravity	1.83	0.13

Location	Coordinates		Eccentricity	
	X (ft)	Y (ft)	e_x (ft)	e_y (ft)
C	2.36	0.00	0.53	-0.13
D	-2.36	0.00	-4.20	-0.13
H	0.00	2.23	-1.83	2.10

Dead Load:

Location	F_x (kip)	F_y (kip)	F_z (kip)	M_x (k*ft)		M_y (k*ft)	
				Top	Bot	Top	Bot
C	0.0	0.0	3.4	-0.4	-0.4	1.8	1.8
D	0.0	0.0	6.1	-0.8	-0.8	-25.6	-25.6
H	0.0	0.0	8.8	18.5	18.5	-16.1	-16.1
Result	**0.0**	**0.0**	**18.3**	**17.3**	**17.3**	**-39.9**	**-39.9**

Live Load:

Location	F_x (kip)	F_y (kip)	F_z (kip)	M_x (k*ft)		M_y (k*ft)	
				Top	Bot	Top	Bot
C	0.0	27.6	31.0	-3.9	527.4	16.5	16.5
D	-7.6	25.7	-31.0	3.9	498.6	130.1	-15.3
H	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Result	**-7.6**	**53.3**	**0.0**	**0.0**	**1026.0**	**146.6**	**1.1**

FLSMIDTH

Project:	CC&V High Grade Ore	**Proj. No.**	11021
		Calc No.	C-005
Subject:	Rod Mill Foundation Design	**By:** ECS	**Date:** 10/26/2011
		Chk:	**Date:**
		Sheet 1 of 1	**Rev:** 0

Concrete Pedestal Natural Period of Vibration
Pedestal C/D

Pedestal Dimensions:

$L_x := 10\text{ft} + 0\text{in} = 120\text{ in}$	Pedestal Length X Direction
$L_y := 6\text{ft} + 1\text{in} = 73\text{ in}$	Pedestal Length Y Direction
$H := 19\text{ft} + 3.375\text{in} = 231.375\text{ in}$	Pedestal Height

Concrete Properties:

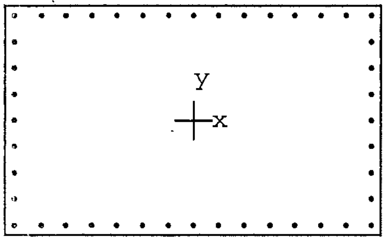
$\gamma_c := 145\text{pcf}$	Concrete Unit Weight
$f_c := 4000\text{psi}$	Concrete Compressive Strength
$E := 57000\text{psi}\cdot\sqrt{\frac{f_c}{\text{psi}}} = 3.605\times 10^3\text{ ksi}$	Concrete Modulus of Elasticity

Loads and Masses:

$m := L_x\cdot L_y\cdot H\cdot\frac{\gamma_c}{g} = 1.701\times 10^5\text{ lb}$		Pedestal Mass
$F_x := 7557\text{lb}$	$F_y := 53300\text{lb}$	Applied Mass
$m_x := F_x + 0.23m = 4.667\times 10^4\text{ lb}$	$m_y := F_y + 0.23m = 9.242\times 10^4\text{ lb}$	Equivalent Mass

Dynamic Properties:

$I_x := \frac{L_x^{\,3}\cdot L_y}{12} = 1.051\times 10^7\text{ in}^4$	$I_y := \frac{L_x\cdot L_y^{\,3}}{12} = 3.89\times 10^6\text{ in}^4$	Moment of Inertia
$k_x := \frac{(3\cdot E\cdot I_x)}{H^3} = 1.101\times 10^5\,\frac{\text{kip}}{\text{ft}}$	$k_y := \frac{(3\cdot E\cdot I_y)}{H^3} = 4.076\times 10^4\,\frac{\text{kip}}{\text{ft}}$	Stiffness Factor
$\omega_x := \sqrt{\frac{k_x}{0.23m}} = 300.98\text{ Hz}$	$\omega_y := \sqrt{\frac{k_y}{0.23m}} = 183.096\text{ Hz}$	Natural Frequency without added Mass
$\omega_{x.} := \sqrt{\frac{k_x}{m_x}} = 275.54\text{ Hz}$	$\omega_{y.} := \sqrt{\frac{k_y}{m_y}} = 119.121\text{ Hz}$	Natural Frequency with added Mass



120 x 73 in

Code: ACI 318-02

Units: English

Run axis: Biaxial

Run option: Investigation

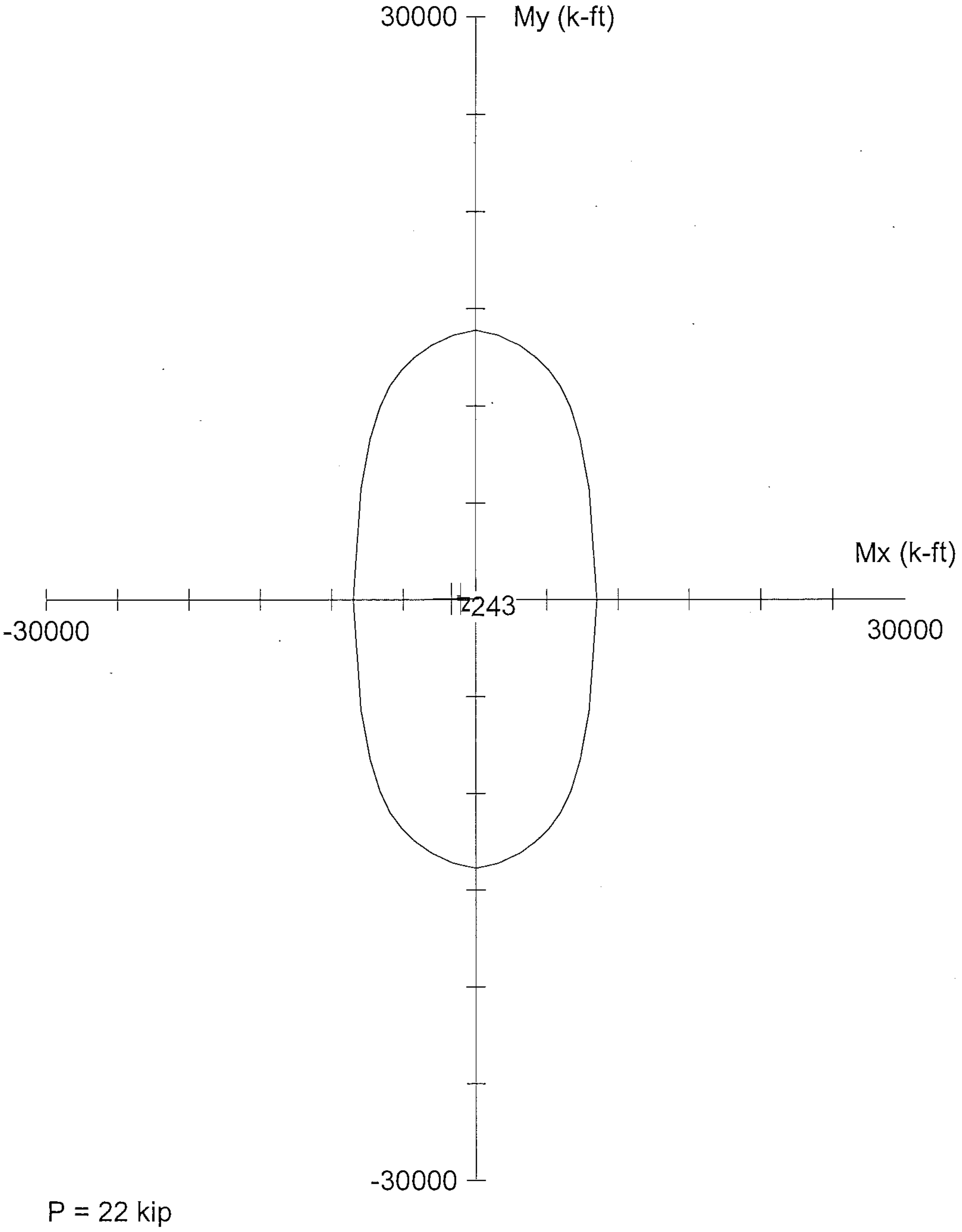
Slenderness: Not considered

Column type: Architectural

Bars: ASTM A615

Date: 10/26/11

Time: 12:32:40



pcaColumn v3.63 - Licensed to: FLSmidth

File: P:\11021\116 - Calculations\116.d - Arch_Civil_Struc\C-005 Grinding Area Concrete\Column C-D.col

Project: CC&V High Grade Ore

Column: A/B		Engineer: ECS	
f'c = 4 ksi	fy = 60 ksi	Ag = 8760 in^2	44 #10 bars
Ec = 3605 ksi	Es = 29000 ksi	As = 55.88 in^2	Rho = 0.64%
fc = 3.4 ksi	fc = 3.4 ksi	Xo = 0.00 in	Ix = 3.89017e+006 in^4
= 0.003 in/in		Yo = 0.00 in	Iy = 1.0512e+007 in^4
Beta1 = 0.85		Clear spacing = 6.85 in	Clear cover = 2.50 in
Confinement: Tied	phi(a) = 0.8, phi(b) = 0.9, phi(c) = 0.65		

```
OOOOOOO   OOOOO   OOOOO   OOOOO   OOOOO  OO
OO   OO OO   OO OO   OO OO   OO OO   OO OO
OO   OO OO   OO OO   OO OO   OO OO   OO OO
OO   OO OO      OO   OO OO      OO   OO OO
OO   OO OO      OOOOOOO OO      OO   OO OO
OOOOOOO OO   OO OO   OO OO   OO OO   OO OO
OO      OO   OO OO   OO OO   OO OO   OO OO
OO       OOOOO  OO   OO  OOOOO   OOOOO  OOOOO  (TM)
```

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

```
General Information:
====================
   File Name: P:\11021\116 - Calculations\116.d - Arch_Civil_Struc\C-005 Grinding Area Concrete
   Project:  CC&V High Grade Ore
   Column:   A/B                               Engineer: ECS
   Code:     ACI 318-02                        Units: English

   Run Option: Investigation                   Slenderness: Not considered
   Run Axis:   Biaxial                         Column Type: Architectural

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:
========
   Rectangular: Width = 120 in                 Depth = 73 in

   Gross section area, Ag =  8760 in^2
   Ix =  3.89017e+006 in^4                     Iy =  1.0512e+007 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)
   ---- --------- -----------   ---- --------- -----------   ---- --------- -----------
   #  3      0.38        0.11   #  4      0.50        0.20   #  5      0.63        0.31
   #  6      0.75        0.44   #  7      0.88        0.60   #  8      1.00        0.79
   #  9      1.13        1.00   # 10      1.27        1.27   # 11      1.41        1.56
   # 14      1.69        2.25   # 18      2.26        4.00

   Confinement: Tied; #3 ties with #7 bars,  #4 with larger bars.
   phi(a) = 0.8,  phi(b) = 0.9,  phi(c) = 0.65

   Layout: Rectangular
   Pattern: Equal Bar Spacing  (Cover to transverse reinforcement)
   Total steel area, As = 55.88 in^2 at 0.64%
   44 #10   Cover = 2 in

Load Combinations:
==================
   U1   =  1.400*Dead + 0.000*Live + 0.000*Wind + 0.000*EarthQuake
   U2   =  1.200*Dead + 1.600*Live + 0.000*Wind + 0.000*EarthQuake
   U3   =  1.200*Dead + 1.000*Live + 0.000*Wind + 0.000*EarthQuake
   U4   =  1.200*Dead + 0.000*Live + 0.800*Wind + 0.000*EarthQuake
   U5   =  1.200*Dead + 1.000*Live + 1.600*Wind + 0.000*EarthQuake
   U6   =  0.900*Dead + 0.000*Live + 1.600*Wind + 0.000*EarthQuake
   U7   =  1.200*Dead + 0.000*Live - 0.800*Wind + 0.000*EarthQuake
   U8   =  1.200*Dead + 1.000*Live - 1.600*Wind + 0.000*EarthQuake
   U9   =  0.900*Dead + 0.000*Live - 1.600*Wind + 0.000*EarthQuake
   U10  =  1.200*Dead + 1.000*Live + 0.000*Wind + 1.000*EarthQuake
   U11  =  0.900*Dead + 0.000*Live + 0.000*Wind + 1.000*EarthQuake
   U12  =  1.200*Dead + 1.000*Live + 0.000*Wind - 1.000*EarthQuake
   U13  =  0.900*Dead + 0.000*Live + 0.000*Wind - 1.000*EarthQuake
```

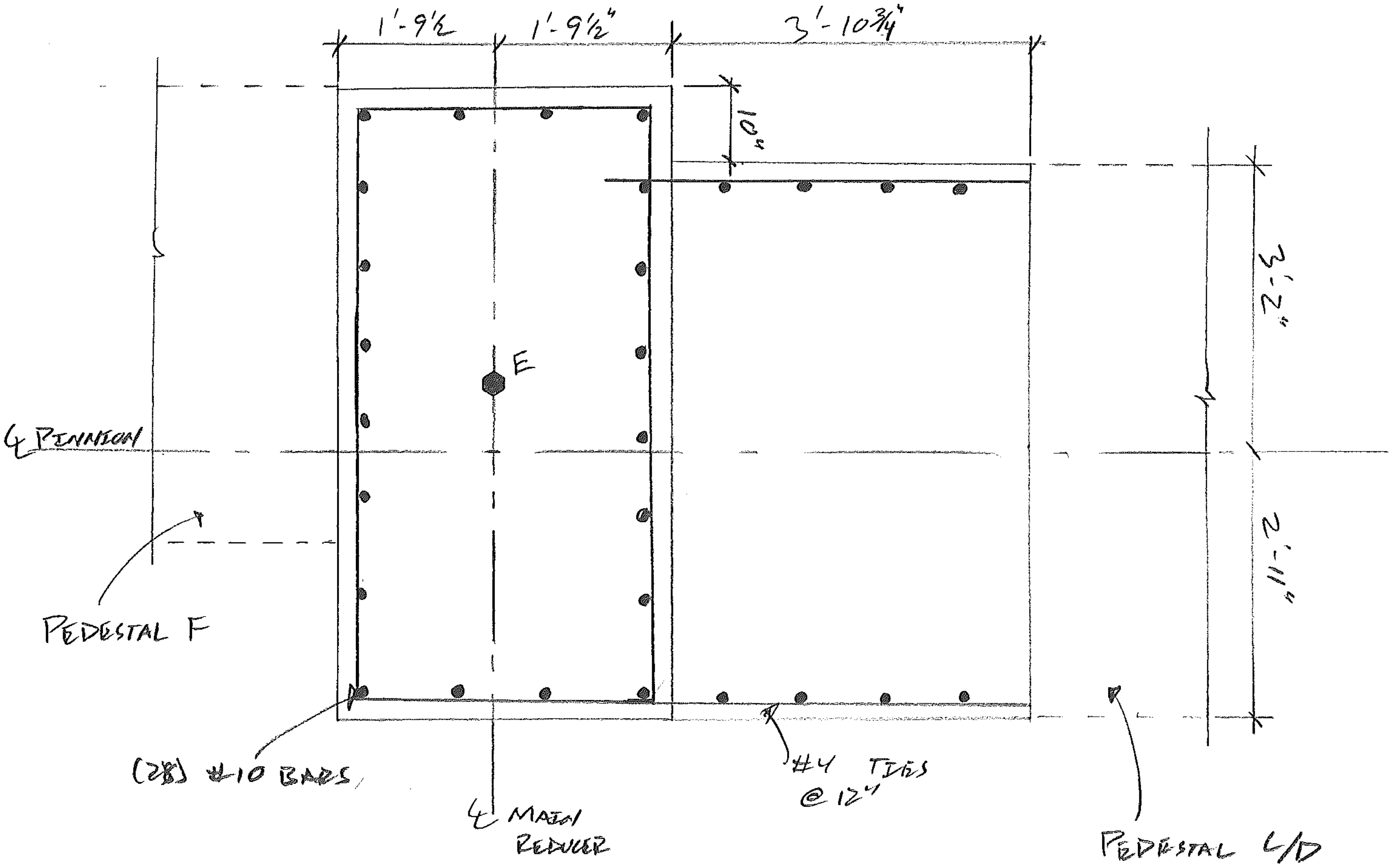
```
  Service Loads:
  ==============
         Load   Axial Load      Mx @ Top      Mx @ Bot      My @ Top      My @ Bot
     No. Case          kip          k-ft          k-ft          k-ft          k-ft
     --- ---- ------------ ------------ ------------ ------------ ------------
       1 Dead         18.3          17.3          17.3         -39.9         -39.9
         Live          0.0           0.0        1026.0         146.6           1.1
         Wind          0.0           0.0           0.0           0.0           0.0
         E.Q.          0.0           0.0           0.0           0.0           0.0

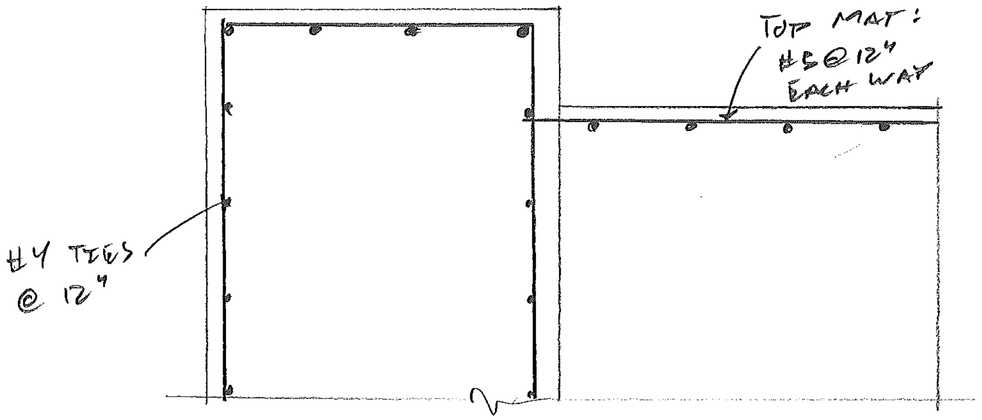
  Factored Loads and Moments with Corresponding Capacities: (see user's manual for notation)
  =========================================================
     NOTE: Each loading combination includes the following cases:
           First line  - at column top
           Second line - at column bottom
          Load          Pu           Mux         Muy        fMnx        fMny
     No.  Combo         kip        k-ft        k-ft        k-ft        k-ft  fMn/Mu
     --- ------ ----------- ----------- ----------- ----------- ----------- --------
       1  1 U1         25.6        24.2       -55.9      5135.3    -11843.8  212.027
       2               25.6       -24.2        55.9     -5135.3     11843.8  212.027
       3  1 U2         22.0        20.8       186.7      1515.9     13631.4   73.020
       4               22.0     -1662.4        46.1     -8472.7       235.1    5.097
       5  1 U3         22.0        20.8        98.7      2777.7     13209.0  133.803
       6               22.0     -1046.8        46.8     -8459.9       378.1    8.082
       7  1 U4         22.0        20.8       -47.9      5130.6    -11833.1  247.140
       8               22.0       -20.8        47.9     -5130.6     11833.1  247.140
       9  1 U5         22.0        20.8        98.7      2777.7     13209.0  133.803
      10               22.0     -1046.8        46.8     -8459.9       378.1    8.082
      11  1 U6         16.5        15.6       -35.9      5123.6    -11816.9  329.069
      12               16.5       -15.6        35.9     -5123.6     11816.9  329.069
      13  1 U7         22.0        20.8       -47.9      5130.6    -11833.1  247.140
      14               22.0       -20.8        47.9     -5130.6     11833.1  247.140
      15  1 U8         22.0        20.8        98.7      2777.7     13209.0  133.803
      16               22.0     -1046.8        46.8     -8459.9       378.1    8.082
      17  1 U9         16.5        15.6       -35.9      5123.6    -11816.9  329.069
      18               16.5       -15.6        35.9     -5123.6     11816.9  329.069
      19  1 U10        22.0        20.8        98.7      2777.7     13209.0  133.803
      20               22.0     -1046.8        46.8     -8459.9       378.1    8.082
      21  1 U11        16.5        15.6       -35.9      5123.6    -11816.9  329.069
      22               16.5       -15.6        35.9     -5123.6     11816.9  329.069
      23  1 U12        22.0        20.8        98.7      2777.7     13209.0  133.803
      24               22.0     -1046.8        46.8     -8459.9       378.1    8.082
      25  1 U13        16.5        15.6       -35.9      5123.6    -11816.9  329.069
      26               16.5       -15.6        35.9     -5123.6     11816.9  329.069

     *** Program completed as requested! ***
```

PROJECT CC&V HIGH GRADE ORE
SUBJECT ROD MILL FOUNDATION
PROJ NO. 11021
CALC NO. C-005
BY ECS DATE 10-26-11
CHK DATE
SHEET OF REV

PEDESTAL E DESIGN





ELEVATION

FLSMIDTH

Project: CC&V High Grade Ore
Subject: Rod Mill Foundation Design

Proj. No. 11021
Calc No. C-005
By: ECS **Date:**10/26/2011
Chk: **Date:**
Sheet 1 of 1 **Rev:** 0

Concrete Pedestal Natural Period of Vibration
Pedestal E

Pedestal Dimensions:

$L_x := 3ft + 7in = 43\,in$ Pedestal Length X Direction

$L_y := 6ft + 11in = 83\,in$ Pedestal Length Y Direction

$H := 19ft + 1.375in = 229.375\,in$ Pedestal Height

Concrete Properties:

$\gamma_c := 145pcf$ Concrete Unit Weight

$f_c := 4000psi$ Concrete Compressive Strength

$E := 57000psi \cdot \sqrt{\frac{f_c}{psi}} = 3.605 \times 10^3\,ksi$ Concrete Modulus of Elasticity

Loads and Masses:

$m := L_x \cdot L_y \cdot H \cdot \frac{\gamma_c}{g} = 6.869 \times 10^4\,lb$ Pedestal Mass

$F_x := 0lb$ $F_y := 0lb$ Applied Mass

$m_x := F_x + 0.23m = 1.58 \times 10^4\,lb$ $m_y := F_y + 0.23m = 1.58 \times 10^4\,lb$ Equivalent Mass

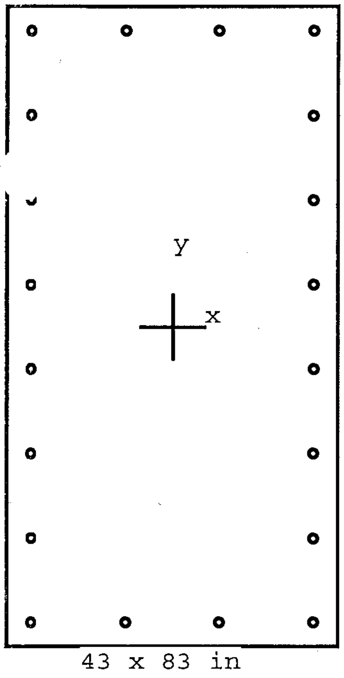
Dynamic Properties:

$I_x := \frac{L_x^{\,3} \cdot L_y}{12} = 5.499 \times 10^5\,in^4$ $I_y := \frac{L_x \cdot L_y^{\,3}}{12} = 2.049 \times 10^6\,in^4$ Moment of Inertia

$k_x := \frac{(3 \cdot E \cdot I_x)}{H^3} = 5.914 \times 10^3\,\frac{kip}{ft}$ $k_y := \frac{(3 \cdot E \cdot I_y)}{H^3} = 2.203 \times 10^4\,\frac{kip}{ft}$ Stiffness Factor

$\omega_x := \sqrt{\frac{k_x}{0.23m}} = 109.74\,Hz$ $\omega_y := \sqrt{\frac{k_y}{0.23m}} = 211.824\,Hz$ Natural Frequency without added Mass

$\omega_{x.} := \sqrt{\frac{k_x}{m_x}} = 109.74\,Hz$ $\omega_{y.} := \sqrt{\frac{k_y}{m_y}} = 211.824\,Hz$ Natural Frequency with added Mass



Code: ACI 318-02

Units: English

Run axis: Biaxial

Run option: Investigation

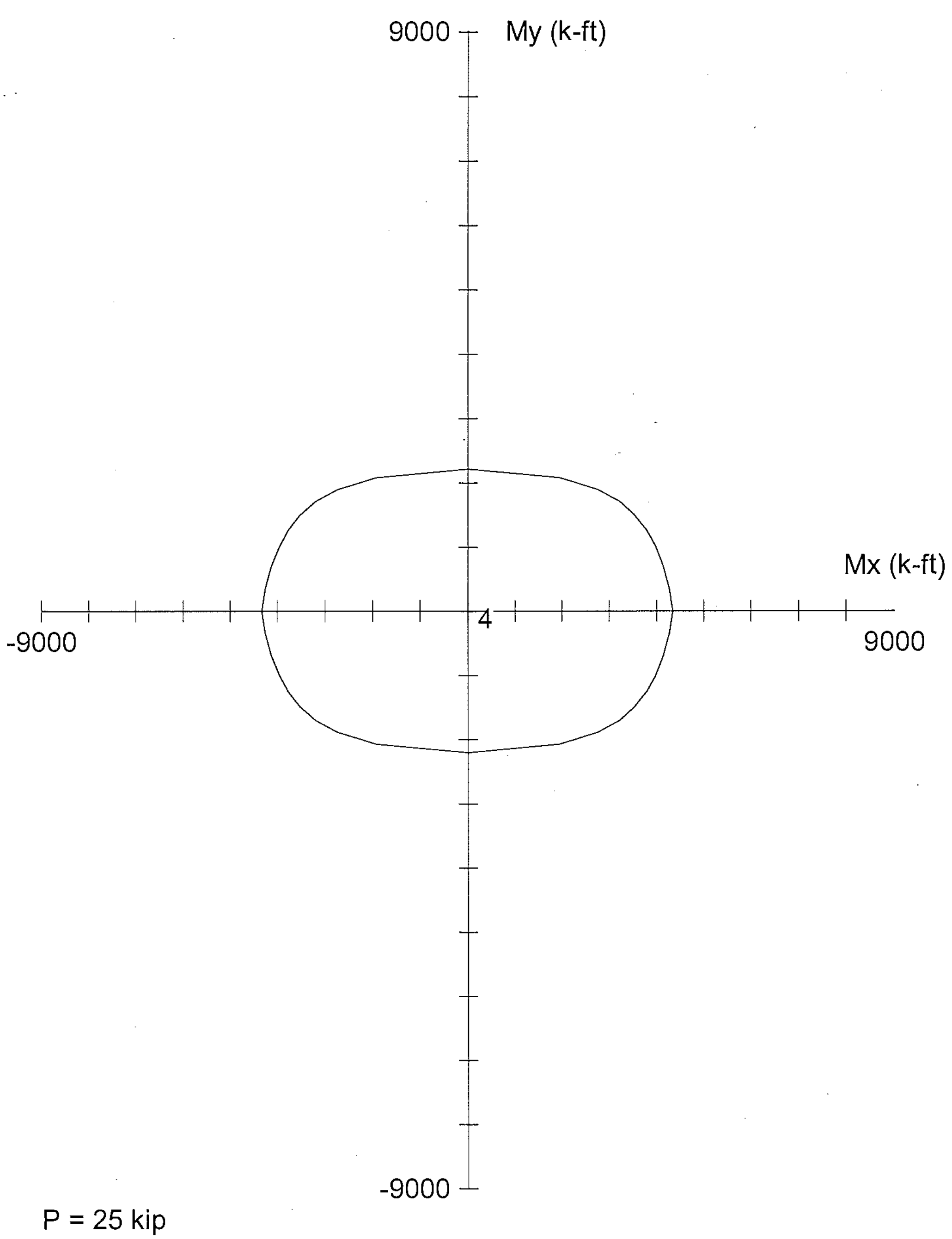
Slenderness: Not considered

Column type: Architectural

Bars: ASTM A615

Date: 10/26/11

Time: 14:15:35



pcaColumn v3.63 - Licensed to: FLSmidth

File: P:\11021\116 - Calculations\116.d - Arch_Civil_Struc\C-005 Grinding Area Concrete\Column E.col

Project: CC&V High Grade Ore

Column: A/B		Engineer: ECS	
f'c = 4 ksi	fy = 60 ksi	Ag = 3569 in^2	20 #10 bars
Ec = 3605 ksi	Es = 29000 ksi	As = 25.40 in^2	Rho = 0.71%
fc = 3.4 ksi	fc = 3.4 ksi	Xo = 0.00 in	Ix = 2.0489e+006 in^4
[illegible] = 0.003 in/in		Yo = 0.00 in	Iy = 549923 in^4
Beta1 = 0.85		Clear spacing = 9.69 in	Clear cover = 2.50 in
Confinement: Tied	phi(a) = 0.8, phi(b) = 0.9, phi(c) = 0.65		

```
0000000    00000    00000    00000    00000   00
00     00  00    00  00    00  00    00  00    00  00
00     00  00    00  00    00  00    00  00    00  00
00     00  00        00    00  00        00    00  00
00     00  00        0000000  00        00    00  00
0000000    00    00  00    00  00    00  00    00  00
00         00    00  00    00  00    00  00    00  00
00          00000    00    00   00000    00000    00000   (TM)
```

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

```
  General Information:
  ====================
     File Name: P:\11021\116 - Calculations\116.d - Arch_Civil_Struc\C-005 Grinding Area Concrete
     Project:  CC&V High Grade Ore
     Column:   A/B                              Engineer: ECS
     Code:     ACI 318-02                       Units: English

     Run Option: Investigation                  Slenderness: Not considered
     Run Axis:   Biaxial                        Column Type: Architectural

  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:
  ========
     Rectangular: Width = 43 in                 Depth = 83 in

     Gross section area, Ag =  3569 in^2
     Ix =  2.0489e+006 in^4                     Iy =  549923 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)
     ---- --------- -----------   ---- --------- -----------   ---- --------- -----------
     #  3      0.38        0.11   #  4      0.50        0.20   #  5      0.63        0.31
     #  6      0.75        0.44   #  7      0.88        0.60   #  8      1.00        0.79
     #  9      1.13        1.00   # 10      1.27        1.27   # 11      1.41        1.56
     # 14      1.69        2.25   # 18      2.26        4.00

     Confinement: Tied; #3 ties with #7 bars,  #4 with larger bars.
     phi(a) = 0.8,  phi(b) = 0.9,  phi(c) = 0.65

     Layout: Rectangular
     Pattern: Equal Bar Spacing  (Cover to transverse reinforcement)
     Total steel area, As = 25.40 in^2 at 0.71%
     20 #10   Cover = 2 in

  Load Combinations:
  ==================
     U1   =  1.400*Dead + 0.000*Live + 0.000*Wind + 0.000*EarthQuake
     U2   =  1.200*Dead + 1.600*Live + 0.000*Wind + 0.000*EarthQuake
     U3   =  1.200*Dead + 1.000*Live + 0.000*Wind + 0.000*EarthQuake
     U4   =  1.200*Dead + 0.000*Live + 0.800*Wind + 0.000*EarthQuake
     U5   =  1.200*Dead + 1.000*Live + 1.600*Wind + 0.000*EarthQuake
     U6   =  0.900*Dead + 0.000*Live + 1.600*Wind + 0.000*EarthQuake
     U7   =  1.200*Dead + 0.000*Live - 0.800*Wind + 0.000*EarthQuake
     U8   =  1.200*Dead + 1.000*Live - 1.600*Wind + 0.000*EarthQuake
     U9   =  0.900*Dead + 0.000*Live - 1.600*Wind + 0.000*EarthQuake
     U10  =  1.200*Dead + 1.000*Live + 0.000*Wind + 1.000*EarthQuake
     U11  =  0.900*Dead + 0.000*Live + 0.000*Wind + 1.000*EarthQuake
     U12  =  1.200*Dead + 1.000*Live + 0.000*Wind - 1.000*EarthQuake
     U13  =  0.900*Dead + 0.000*Live + 0.000*Wind - 1.000*EarthQuake
```

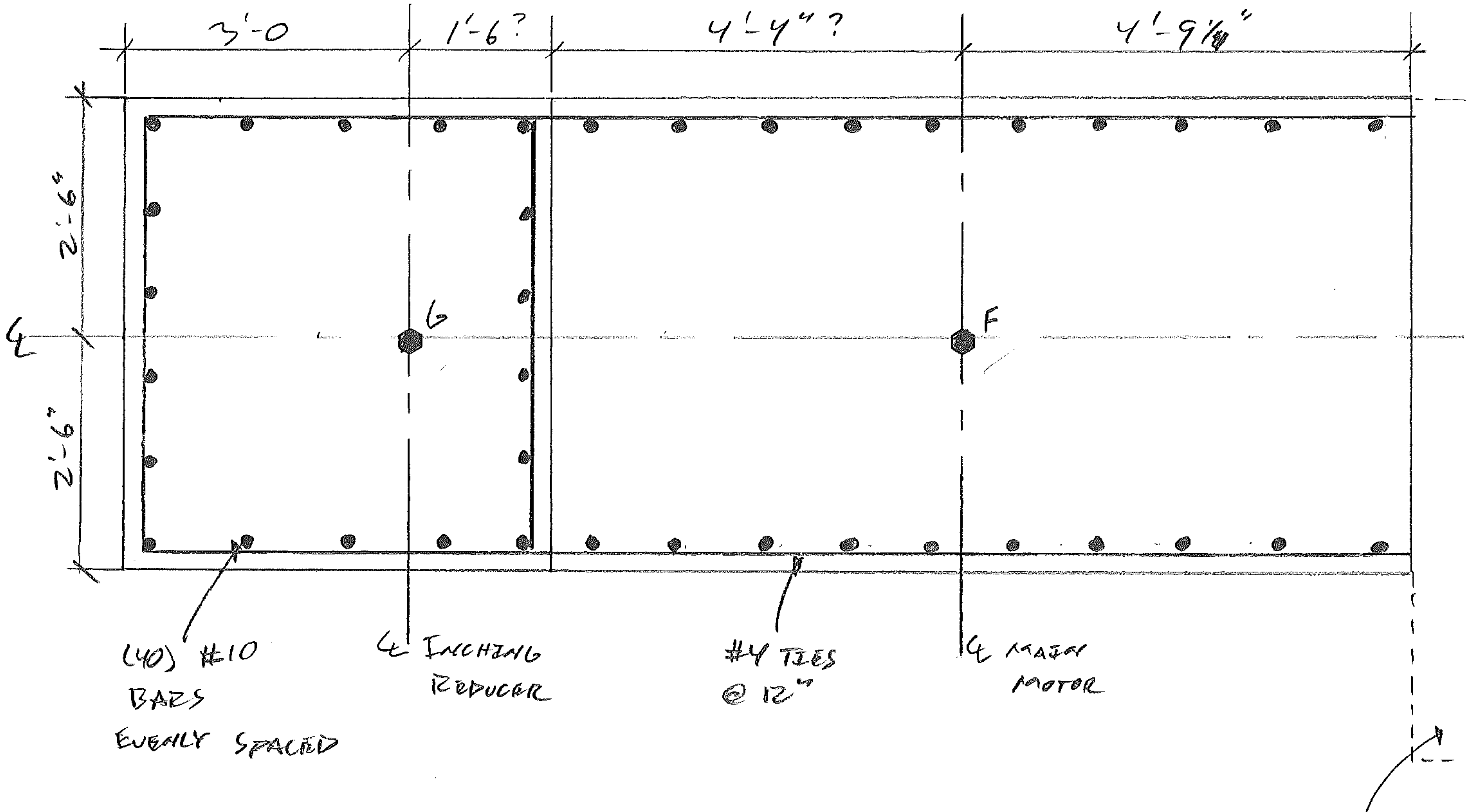
```
  Service Loads:
  ==============
        Load   Axial Load      Mx @ Top      Mx @ Bot      My @ Top      My @ Bot
    No. Case          kip          k-ft          k-ft          k-ft          k-ft
    --- ---- ------------ ------------ ------------ ------------ ------------
      1 Dead          6.4          0.0          0.0          0.0          0.0
        Live         10.9          0.0          0.0          0.0          0.0
        Wind          0.0          0.0          0.0          0.0          0.0
        E.Q.          0.0          0.0          0.0          0.0          0.0
      2 Dead          6.4          0.0          0.0          0.0          0.0
        Live        -10.9          0.0          0.0          0.0          0.0
        Wind          0.0          0.0          0.0          0.0          0.0
        E.Q.          0.0          0.0          0.0          0.0          0.0

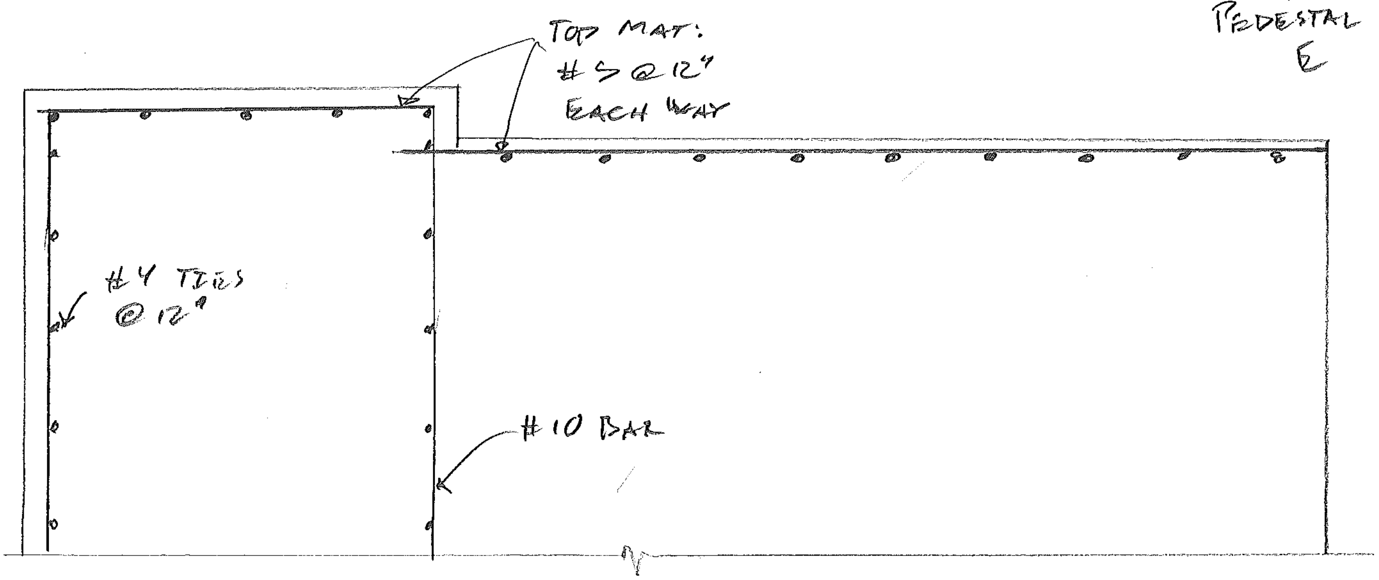
  Factored Loads and Moments with Corresponding Capacities: (see user's manual for notation)
  ==========================================================
     NOTE: Each loading combination includes the following cases:
           First line  - at column top
           Second line - at column bottom
         Load               Pu          Mux          Muy         fMnx         fMny
    No.  Combo             kip         k-ft         k-ft         k-ft         k-ft   fMn/Mu
    --- ------ ----------- ----------- ----------- ----------- ----------- --------
      1  1 U1          9.0          0.0          0.0       4292.9          0.0  999.999
      2                9.0          0.0          0.0       4292.9          0.0  999.999
      3  1 U2         25.1          0.0          0.0       4336.0          0.0  999.999
      4               25.1          0.0          0.0       4336.0          0.0  999.999
      5  1 U3         18.6          0.0          0.0       4318.5          0.0  999.999
      6               18.6          0.0          0.0       4318.5          0.0  999.999
      7  1 U4          7.7          0.0          0.0       4289.4          0.0  999.999
      8                7.7          0.0          0.0       4289.4          0.0  999.999
      9  1 U5         18.6          0.0          0.0       4318.5          0.0  999.999
     10               18.6          0.0          0.0       4318.5          0.0  999.999
     11  1 U6          5.8          0.0          0.0       4284.2          0.0  999.999
     12                5.8          0.0          0.0       4284.2          0.0  999.999
     13  1 U7          7.7          0.0          0.0       4289.4          0.0  999.999
     14                7.7          0.0          0.0       4289.4          0.0  999.999
     15  1 U8         18.6          0.0          0.0       4318.5          0.0  999.999
     16               18.6          0.0          0.0       4318.5          0.0  999.999
     17  1 U9          5.8          0.0          0.0       4284.2          0.0  999.999
     18                5.8          0.0          0.0       4284.2          0.0  999.999
     19  1 U10        18.6          0.0          0.0       4318.5          0.0  999.999
     20               18.6          0.0          0.0       4318.5          0.0  999.999
     21  1 U11         5.8          0.0          0.0       4284.2          0.0  999.999
     22                5.8          0.0          0.0       4284.2          0.0  999.999
     23  1 U12        18.6          0.0          0.0       4318.5          0.0  999.999
     24               18.6          0.0          0.0       4318.5          0.0  999.999
     25  1 U13         5.8          0.0          0.0       4284.2          0.0  999.999
     26                5.8          0.0          0.0       4284.2          0.0  999.999
     27  2 U1          9.0          0.0          0.0       4292.9          0.0  999.999
     28                9.0          0.0          0.0       4292.9          0.0  999.999
     29  2 U2         -9.6          0.0          0.0       4242.7          0.0  999.999
     30               -9.6          0.0          0.0       4242.7          0.0  999.999
     31  2 U3         -3.1          0.0          0.0       4260.3          0.0  999.999
     32               -3.1          0.0          0.0       4260.3          0.0  999.999
     33  2 U4          7.7          0.0          0.0       4289.4          0.0  999.999
     34                7.7          0.0          0.0       4289.4          0.0  999.999
     35  2 U5         -3.1          0.0          0.0       4260.3          0.0  999.999
     36               -3.1          0.0          0.0       4260.3          0.0  999.999
     37  2 U6          5.8          0.0          0.0       4284.2          0.0  999.999
     38                5.8          0.0          0.0       4284.2          0.0  999.999
     39  2 U7          7.7          0.0          0.0       4289.4          0.0  999.999
     40                7.7          0.0          0.0       4289.4          0.0  999.999
     41  2 U8         -3.1          0.0          0.0       4260.3          0.0  999.999
     42               -3.1          0.0          0.0       4260.3          0.0  999.999
```

```
     43   2 U9          5.8         0.0         0.0       4284.2         0.0  999.999
     44                 5.8         0.0         0.0       4284.2         0.0  999.999
     45   2 U10        -3.1         0.0         0.0       4260.3         0.0  999.999
     46                -3.1         0.0         0.0       4260.3         0.0  999.999
     47   2 U11         5.8         0.0         0.0       4284.2         0.0  999.999
     48                 5.8         0.0         0.0       4284.2         0.0  999.999
     49   2 U12        -3.1         0.0         0.0       4260.3         0.0  999.999
     50                -3.1         0.0         0.0       4260.3         0.0  999.999
     51   2 U13         5.8         0.0         0.0       4284.2         0.0  999.999
     52                 5.8         0.0         0.0       4284.2         0.0  999.999

    *** Program completed as requested! ***
```

Pedestal F/G Design





Elevation

Pedestal F/G Loading

Pedestal Height (ft): 18.75

Load Locations:

Using CL Main Motor & CL Pedestal

	X (ft)	Y (ft)
Pedestal Center of Gravity	-2.03	0.00

Location	Coordinates		Eccentricity	
	X (ft)	Y (ft)	e_x (ft)	e_y (ft)
G	-5.83	0.00	-3.80	0.00
F	0.00	0.00	2.03	0.00

Dead Load:

Location	F_x (kip)	F_y (kip)	F_z (kip)	M_x (k*ft)		M_y (k*ft)	
				Top	Bot	Top	Bot
G	0.0	0.0	17.0	0.0	0.0	-64.6	-64.6
F	0.0	0.0	2.2	0.0	0.0	4.4	4.4
Result	**0.0**	**0.0**	**19.2**	**0.0**	**0.0**	**-60.3**	**-60.3**

Live Load:

Location	F_x (kip)	F_y (kip)	F_z (kip)	M_x (k*ft)		M_y (k*ft)	
				Top	Bot	Top	Bot
G	0.0	0.0	3.5	0.0	0.0	-13.4	-13.4
F	0.0	0.0	1.1	0.0	0.0	2.3	2.3
Result	**0.0**	**0.0**	**4.7**	**0.0**	**0.0**	**-11.1**	**-11.1**

```
        OOOOOOO    OOOOO    OOOOO    OOOOO    OOOOO   OO
        OO    OO  OO   OO  OO   OO  OO   OO  OO   OO  OO
        OO    OO  OO   OO  OO   OO  OO   OO  OO   OO  OO
        OO    OO  OO       OO   OO  OO       OO   OO  OO
        OO    OO  OO       OOOOOOO  OO       OO   OO  OO
        OOOOOOO   OO   OO  OO   OO  OO   OO  OO   OO  OO
        OO        OO   OO  OO   OO  OO   OO  OO   OO  OO
        OO         OOOOO   OO   OO   OOOOO    OOOOO   OOOOO  (TM)


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


     Licensee stated above acknowledges that Portland Cement Association
(PCA) is not and  cannot  be  responsible  for  either  the  accuracy or
adequacy  of the  material  supplied  as input  for  processing  by  the
pcaColumn(tm)  computer  program.  Furthermore, PCA  neither  makes  any
warranty expressed  nor implied  with respect to  the correctness of the
output prepared by the pcaColumn(tm) program.Although PCA has endeavored
to  produce  pcaColumn(tm)  error free, the program  is not and can't be
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disclaims all responsibility in contract, negligence  or other  tort for
any  analysis, design or  engineering  documents prepared in  connection
with the use of the pcaColumn(tm) program.
```

```
  General Information:
  ====================
     File Name: P:\11021\116 - Calculations\116.d - Arch_Civil_Struc\C-005 Grinding Area Concrete
     Project:  CC&V High Grade Ore
     Column:   A/B                           Engineer: ECS
     Code:     ACI 318-02                    Units: English

     Run Option: Investigation               Slenderness: Not considered
     Run Axis:   Biaxial                     Column Type: Architectural

  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:
  ========
     Rectangular: Width = 163.25 in          Depth = 60 in

     Gross section area, Ag =  9795 in^2
     Ix =  2.9385e+006 in^4                  Iy =  2.17535e+007 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)
     ---- --------- -----------   ---- --------- -----------   ---- --------- -----------
     #  3      0.38        0.11   #  4      0.50        0.20   #  5      0.63        0.31
     #  6      0.75        0.44   #  7      0.88        0.60   #  8      1.00        0.79
     #  9      1.13        1.00   # 10      1.27        1.27   # 11      1.41        1.56
     # 14      1.69        2.25   # 18      2.26        4.00

     Confinement: Tied; #3 ties with #7 bars,  #4 with larger bars.
     phi(a) = 0.8,  phi(b) = 0.9,  phi(c) = 0.65

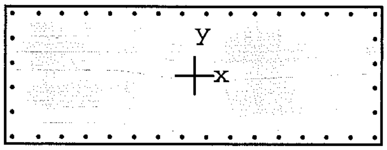
     Layout: Rectangular
     Pattern: Equal Bar Spacing  (Cover to transverse reinforcement)
     Total steel area, As = 50.80 in^2 at 0.52%
     40 #10   Cover = 2 in

  Load Combinations:
  ==================
     U1   =  1.400*Dead + 0.000*Live + 0.000*Wind + 0.000*EarthQuake
     U2   =  1.200*Dead + 1.600*Live + 0.000*Wind + 0.000*EarthQuake
     U3   =  1.200*Dead + 1.000*Live + 0.000*Wind + 0.000*EarthQuake
     U4   =  1.200*Dead + 0.000*Live + 0.800*Wind + 0.000*EarthQuake
     U5   =  1.200*Dead + 1.000*Live + 1.600*Wind + 0.000*EarthQuake
     U6   =  0.900*Dead + 0.000*Live + 1.600*Wind + 0.000*EarthQuake
     U7   =  1.200*Dead + 0.000*Live - 0.800*Wind + 0.000*EarthQuake
     U8   =  1.200*Dead + 1.000*Live - 1.600*Wind + 0.000*EarthQuake
     U9   =  0.900*Dead + 0.000*Live - 1.600*Wind + 0.000*EarthQuake
     U10  =  1.200*Dead + 1.000*Live + 0.000*Wind + 1.000*EarthQuake
     U11  =  0.900*Dead + 0.000*Live + 0.000*Wind + 1.000*EarthQuake
     U12  =  1.200*Dead + 1.000*Live + 0.000*Wind - 1.000*EarthQuake
     U13  =  0.900*Dead + 0.000*Live + 0.000*Wind - 1.000*EarthQuake
```

```
Service Loads:
==============
       Load    Axial Load      Mx @ Top      Mx @ Bot      My @ Top      My @ Bot
   No. Case           kip          k-ft          k-ft          k-ft          k-ft
   --- ---- ------------ ------------ ------------ ------------ ------------
     1 Dead          19.2           0.0           0.0         -60.3         -60.3
       Live           4.7           0.0           0.0         -11.1         -11.1
       Wind           0.0           0.0           0.0           0.0           0.0
       E.Q.           0.0           0.0           0.0           0.0           0.0

Factored Loads and Moments with Corresponding Capacities: (see user's manual for notation)
========================================================
   NOTE: Each loading combination includes the following cases:
         First line  - at column top
         Second line - at column bottom
         Load             Pu          Mux          Muy         fMnx         fMny
   No.   Combo           kip         k-ft         k-ft         k-ft         k-ft    fMn/Mu
   ---  ------ ----------- ----------- ----------- ----------- ----------- --------
     1   1 U1          26.9          0.0        -84.4          0.0    -16996.6   201.334
     2                 26.9          0.0         84.4         -0.0     16996.6   201.334
     3   1 U2          30.6          0.0        -90.1          0.0    -17015.4   188.808
     4                 30.6          0.0         90.1         -0.0     17015.4   188.808
     5   1 U3          27.7          0.0        -83.5          0.0    -17001.0   203.702
     6                 27.7          0.0         83.5         -0.0     17001.0   203.702
     7   1 U4          23.0          0.0        -72.4          0.0    -16976.4   234.610
     8                 23.0          0.0         72.4         -0.0     16976.4   234.610
     9   1 U5          27.7          0.0        -83.5          0.0    -17001.0   203.702
    10                 27.7          0.0         83.5         -0.0     17001.0   203.702
    11   1 U6          17.3          0.0        -54.3          0.0    -16946.4   312.260
    12                 17.3          0.0         54.3         -0.0     16946.4   312.260
    13   1 U7          23.0          0.0        -72.4          0.0    -16976.4   234.610
    14                 23.0          0.0         72.4         -0.0     16976.4   234.610
    15   1 U8          27.7          0.0        -83.5          0.0    -17001.0   203.702
    16                 27.7          0.0         83.5         -0.0     17001.0   203.702
    17   1 U9          17.3          0.0        -54.3          0.0    -16946.4   312.260
    18                 17.3          0.0         54.3         -0.0     16946.4   312.260
    19   1 U10         27.7          0.0        -83.5          0.0    -17001.0   203.702
    20                 27.7          0.0         83.5         -0.0     17001.0   203.702
    21   1 U11         17.3          0.0        -54.3          0.0    -16946.4   312.260
    22                 17.3          0.0         54.3         -0.0     16946.4   312.260
    23   1 U12         27.7          0.0        -83.5          0.0    -17001.0   203.702
    24                 27.7          0.0         83.5         -0.0     17001.0   203.702
    25   1 U13         17.3          0.0        -54.3          0.0    -16946.4   312.260
    26                 17.3          0.0         54.3         -0.0     16946.4   312.260

   *** Program completed as requested! ***
```



163.25 x 60 in

Code: ACI 318-02

Units: English

Run axis: Biaxial

Run option: Investigation

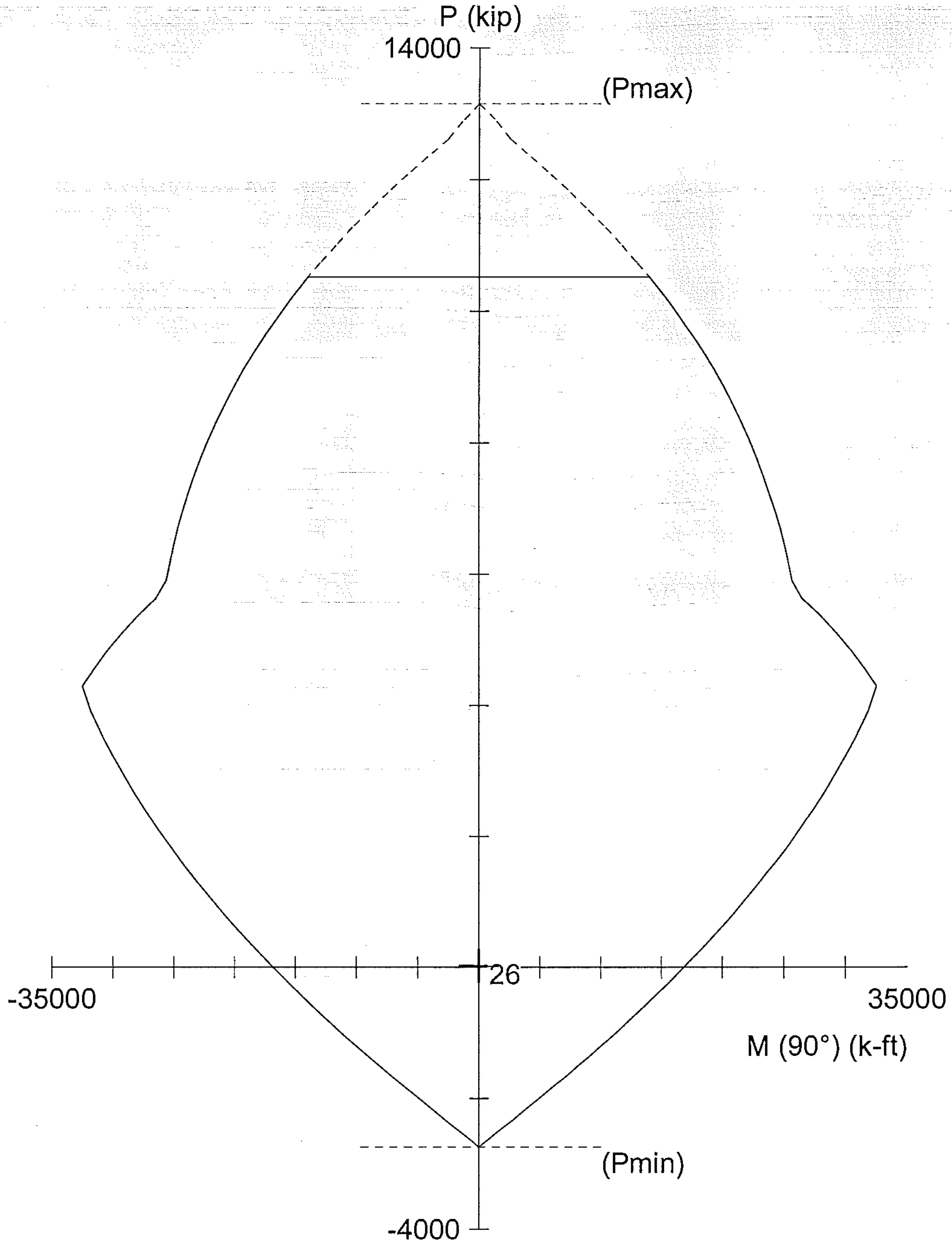
Slenderness: Not considered

Column type: Architectural

Bars: ASTM A615

Date: 10/27/11

Time: 09:03:04



pcaColumn v3.63 - Licensed to: FLSmidth

File: P:\11021\116 - Calculations\116.d - Arch_Civil_Struc\C-005 Grinding Area Concrete\Column G.col

Project: CC&V High Grade Ore

Column: A/B
Engineer: ECS

f'c = 4 ksi
fy = 60 ksi
Ag = 9795 in^2
40 #10 bars

Ec = 3605 ksi
Es = 29000 ksi
As = 50.80 in^2
Rho = 0.52%

fc = 3.4 ksi
fc = 3.4 ksi
Xo = 0.00 in
Ix = 2.9385e+006 in^4

ı = 0.003 in/in
Yo = 0.00 in
Iy = 2.17535e+007 in^4

Beta1 = 0.85
Clear spacing = 9.19 in
Clear cover = 2.50 in

Confinement: Tied
phi(a) = 0.8, phi(b) = 0.9, phi(c) = 0.65

FLSMIDTH

Project: CC&V High Grade Ore
Subject: Rod Mill Foundation Design

Proj. No. 11021
Calc No. C-005
By: ECS **Date:**10/27/2011
Chk: **Date:**
Sheet 1 of 1 **Rev:** 0

Concrete Pedestal Natural Period of Vibration
Pedestal F/G

Pedestal Dimensions:

$L_x := 13\text{ft} + 7.25\text{in} = 163.25\text{ in}$ Pedestal Length X Direction

$L_y := 5\text{ft} + 0\text{in} = 60\text{in}$ Pedestal Length Y Direction

$H := 18\text{ft} + 9.375\text{in} = 225.375\text{ in}$ Pedestal Height

Concrete Properties:

$\gamma_c := 145\text{pcf}$ Concrete Unit Weight

$f_c := 4000\text{psi}$ Concrete Compressive Strength

$E := 57000\text{psi}\cdot\sqrt{\frac{f_c}{\text{psi}}} = 3.605 \times 10^3\text{ ksi}$ Concrete Modulus of Elasticity

Loads and Masses:

$m := L_x \cdot L_y \cdot H \cdot \frac{\gamma_c}{g} = 1.852 \times 10^5\text{ lb}$ Pedestal Mass

$F_x := 0\text{lb}$ $F_y := 0\text{lb}$ Applied Mass

$m_x := F_x + 0.23m = 4.261 \times 10^4\text{ lb}$ $m_y := F_y + 0.23m = 4.261 \times 10^4\text{ lb}$ Equivalent Mass

Dynamic Properties:

$I_x := \frac{L_x^{\,3} \cdot L_y}{12} = 2.175 \times 10^7\text{ in}^4$ $I_y := \frac{L_x \cdot L_y^{\,3}}{12} = 2.939 \times 10^6\text{ in}^4$ Moment of Inertia

$k_x := \frac{(3 \cdot E \cdot I_x)}{H^3} = 2.466 \times 10^5\ \frac{\text{kip}}{\text{ft}}$ $k_y := \frac{(3 \cdot E \cdot I_y)}{H^3} = 3.331 \times 10^4\ \frac{\text{kip}}{\text{ft}}$ Stiffness Factor

$\omega_x := \sqrt{\frac{k_x}{0.23m}} = 431.55\text{ Hz}$ $\omega_y := \sqrt{\frac{k_y}{0.23m}} = 158.61\text{ Hz}$ Natural Frequency without added Mass

$\omega_{x.} := \sqrt{\frac{k_x}{m_x}} = 431.55\text{ Hz}$ $\omega_{y.} := \sqrt{\frac{k_y}{m_y}} = 158.61\text{ Hz}$ Natural Frequency with added Mass

FLSMIDTH

PROJECT CC&V HIGH GRADE ORE

SUBJECT ROD MILL FOUNDATION

PROJ NO. 11021

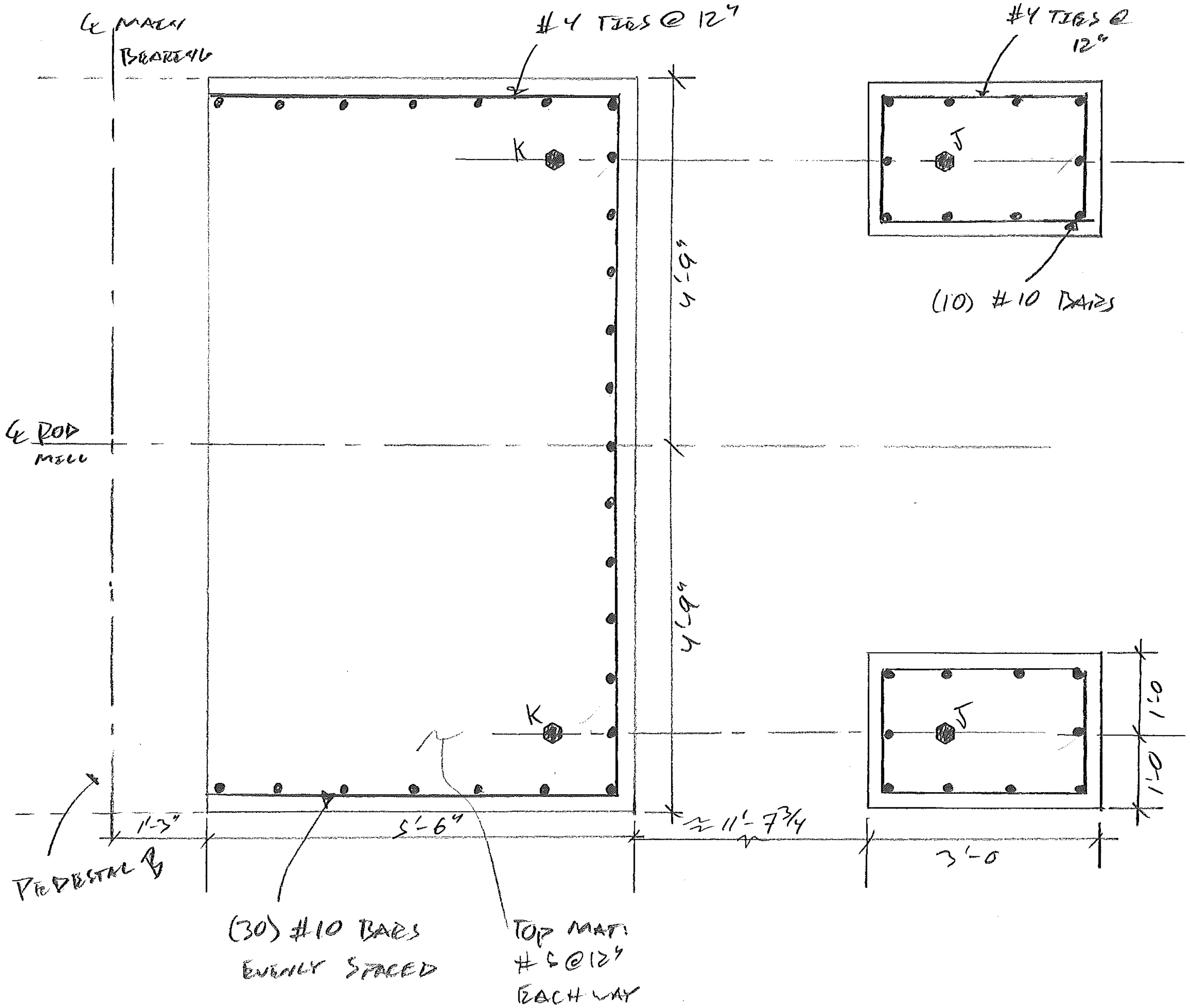
CALC NO. C-005

BY ECS DATE 10-27-11

CHK DATE

SHEET OF REV

PEDESTAL J/K DESIGN



FLSmidth

Project:	CC&V High Grade Ore	**Proj. No.**	11021
		Calc No.	C-005
Subject:	Rod Mill Foundation Design	**By:** ECS	**Date:** 10/27/2011
		Chk:	**Date:**
		Sheet 1 of 1	**Rev:** 0

Concrete Pedestal Natural Period of Vibration
Pedestal J

Pedestal Dimensions:

$L_x := 3\text{ft} + 0\text{in} = 36\,\text{in}$	Pedestal Length X Direction
$L_y := 2\text{ft} + 0\text{in} = 24\,\text{in}$	Pedestal Length Y Direction
$H := 13\text{ft} + 9.75\text{in} = 165.75\,\text{in}$	Pedestal Height

Concrete Properties:

$\gamma_c := 145\text{pcf}$	Concrete Unit Weight
$f_c := 4000\text{psi}$	Concrete Compressive Strength
$E := 57000\text{psi}\cdot\sqrt{\frac{f_c}{\text{psi}}} = 3.605 \times 10^3\,\text{ksi}$	Concrete Modulus of Elasticity

Loads and Masses:

$m := L_x \cdot L_y \cdot H \cdot \frac{\gamma_c}{g} = 1.202 \times 10^4\,\text{lb}$		Pedestal Mass
$F_x := 0\text{lb}$	$F_y := 0\text{lb}$	Applied Mass
$m_x := F_x + 0.23m = 2.764 \times 10^3\,\text{lb}$	$m_y := F_y + 0.23m = 2.764 \times 10^3\,\text{lb}$	Equivalent Mass

Dynamic Properties:

$I_x := \frac{L_x^3 \cdot L_y}{12} = 9.331 \times 10^4\,\text{in}^4$	$I_y := \frac{L_x \cdot L_y^3}{12} = 4.147 \times 10^4\,\text{in}^4$	Moment of Inertia
$k_x := \frac{(3 \cdot E \cdot I_x)}{H^3} = 2.659 \times 10^3\,\frac{\text{kip}}{\text{ft}}$	$k_y := \frac{(3 \cdot E \cdot I_y)}{H^3} = 1.182 \times 10^3\,\frac{\text{kip}}{\text{ft}}$	Stiffness Factor
$\omega_x := \sqrt{\frac{k_x}{0.23m}} = 175.948\,\text{Hz}$	$\omega_y := \sqrt{\frac{k_y}{0.23m}} = 117.299\,\text{Hz}$	Natural Frequency without added Mass
$\omega_{x.} := \sqrt{\frac{k_x}{m_x}} = 175.948\,\text{Hz}$	$\omega_{y.} := \sqrt{\frac{k_y}{m_y}} = 117.299\,\text{Hz}$	Natural Frequency with added Mass

```
        OOOOOOO    OOOOO    OOOOO    OOOOO    OOOOO   OO
        OO     OO OO   OO  OO   OO  OO   OO  OO   OO  OO
        OO     OO OO   OO  OO   OO  OO   OO  OO   OO  OO
        OO     OO OO       OO   OO  OO       OO   OO  OO
        OO     OO OO       OOOOOOO  OO       OO   OO  OO
        OOOOOOO   OO   OO  OO   OO  OO   OO  OO   OO  OO
        OO        OO   OO  OO   OO  OO   OO  OO   OO  OO
        OO         OOOOO   OO   OO   OOOOO    OOOOO   OOOOO  (TM)


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

Licensee stated above acknowledges that Portland Cement Association (PCA) is not and cannot be responsible for either the accuracy or adequacy of the material supplied as input for processing by the pcaColumn(tm) computer program. Furthermore, PCA neither makes any warranty expressed nor implied with respect to the correctness of the output prepared by the pcaColumn(tm) program.Although PCA has endeavored to produce pcaColumn(tm) error free, the program is not and can't be certified infallible. The final and only responsibility for analysis, design and engineering documents is the licensees. Accordingly, PCA disclaims all responsibility in contract, negligence or other tort for any analysis, design or engineering documents prepared in connection with the use of the pcaColumn(tm) program.

```
  General Information:
  ====================
     File Name: P:\11021\116 - Calculations\116.d - Arch_Civil_Struc\C-005 Grinding Area Concrete
     Project:  CC&V High Grade Ore
     Column:   A/B                                Engineer: ECS
     Code:     ACI 318-02                         Units: English

     Run Option: Investigation                    Slenderness: Not considered
     Run Axis:   Biaxial                          Column Type: Architectural

  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:
  ========
     Rectangular: Width = 36 in                   Depth = 24 in

     Gross section area, Ag =  864 in^2
     Ix =  41472 in^4                             Iy =  93312 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)
     ---- --------- -----------   ---- --------- -----------   ---- --------- -----------
     #  3      0.38        0.11   #  4      0.50        0.20   #  5      0.63        0.31
     #  6      0.75        0.44   #  7      0.88        0.60   #  8      1.00        0.79
     #  9      1.13        1.00   # 10      1.27        1.27   # 11      1.41        1.56
     # 14      1.69        2.25   # 18      2.26        4.00

     Confinement: Tied; #3 ties with #7 bars,  #4 with larger bars.
     phi(a) = 0.8,  phi(b) = 0.9,  phi(c) = 0.65

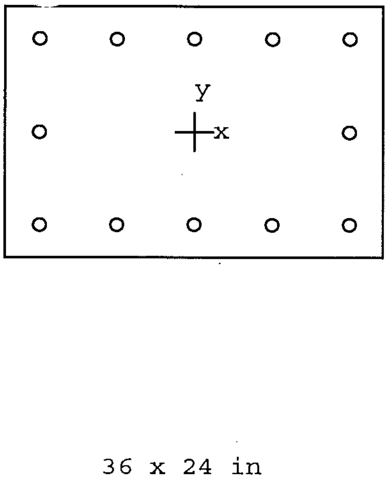
     Layout: Rectangular
     Pattern: Equal Bar Spacing  (Cover to transverse reinforcement)
     Total steel area, As = 15.24 in^2 at 1.76%
     12 #10   Cover = 2 in

  Load Combinations:
  ==================
     U1   =  1.400*Dead + 0.000*Live + 0.000*Wind + 0.000*EarthQuake
     U2   =  1.200*Dead + 1.600*Live + 0.000*Wind + 0.000*EarthQuake
     U3   =  1.200*Dead + 1.000*Live + 0.000*Wind + 0.000*EarthQuake
     U4   =  1.200*Dead + 0.000*Live + 0.800*Wind + 0.000*EarthQuake
     U5   =  1.200*Dead + 1.000*Live + 1.600*Wind + 0.000*EarthQuake
     U6   =  0.900*Dead + 0.000*Live + 1.600*Wind + 0.000*EarthQuake
     U7   =  1.200*Dead + 0.000*Live - 0.800*Wind + 0.000*EarthQuake
     U8   =  1.200*Dead + 1.000*Live - 1.600*Wind + 0.000*EarthQuake
     U9   =  0.900*Dead + 0.000*Live - 1.600*Wind + 0.000*EarthQuake
     U10 =  1.200*Dead + 1.000*Live + 0.000*Wind + 1.000*EarthQuake
     U11 =  0.900*Dead + 0.000*Live + 0.000*Wind + 1.000*EarthQuake
     U12 =  1.200*Dead + 1.000*Live + 0.000*Wind - 1.000*EarthQuake
     U13 =  0.900*Dead + 0.000*Live + 0.000*Wind - 1.000*EarthQuake
```

```
 Service Loads:
 ==============
        Load   Axial Load      Mx @ Top      Mx @ Bot      My @ Top      My @ Bot
    No. Case          kip          k-ft          k-ft          k-ft          k-ft
    --- ---- ------------ ------------ ------------ ------------ ------------
      1 Dead        147.0           0.0           0.0          73.5          73.5
        Live        143.0           0.0           0.0          71.5          71.5
        Wind          0.0           0.0           0.0           0.0           0.0
        E.Q.          0.0           0.0           0.0           0.0           0.0

 Factored Loads and Moments with Corresponding Capacities: (see user's manual for notation)
 =========================================================
    NOTE: Each loading combination includes the following cases:
          First line  - at column top
          Second line - at column bottom
         Load              Pu         Mux         Muy        fMnx        fMny
    No.  Combo            kip        k-ft        k-ft        k-ft        k-ft   fMn/Mu
    --- ------ ----------- ----------- ----------- ----------- ----------- --------
      1  1 U1           205.8         0.0       102.9        -0.0      1188.1   11.546
      2                 205.8         0.0      -102.9         0.0     -1188.1   11.546
      3  1 U2           405.2         0.0       202.6        -0.0      1339.6    6.612
      4                 405.2         0.0      -202.6         0.0     -1339.6    6.612
      5  1 U3           319.4         0.0       159.7        -0.0      1282.1    8.028
      6                 319.4         0.0      -159.7         0.0     -1282.1    8.028
      7  1 U4           176.4         0.0        88.2        -0.0      1162.8   13.184
      8                 176.4         0.0       -88.2         0.0     -1162.8   13.184
      9  1 U5           319.4         0.0       159.7        -0.0      1282.1    8.028
     10                 319.4         0.0      -159.7         0.0     -1282.1    8.028
     11  1 U6           132.3         0.0        66.2        -0.0      1124.4   16.997
     12                 132.3         0.0       -66.2         0.0     -1124.4   16.997
     13  1 U7           176.4         0.0        88.2        -0.0      1162.8   13.184
     14                 176.4         0.0       -88.2         0.0     -1162.8   13.184
     15  1 U8           319.4         0.0       159.7        -0.0      1282.1    8.028
     16                 319.4         0.0      -159.7         0.0     -1282.1    8.028
     17  1 U9           132.3         0.0        66.2        -0.0      1124.4   16.997
     18                 132.3         0.0       -66.2         0.0     -1124.4   16.997
     19  1 U10          319.4         0.0       159.7        -0.0      1282.1    8.028
     20                 319.4         0.0      -159.7         0.0     -1282.1    8.028
     21  1 U11          132.3         0.0        66.2        -0.0      1124.4   16.997
     22                 132.3         0.0       -66.2         0.0     -1124.4   16.997
     23  1 U12          319.4         0.0       159.7        -0.0      1282.1    8.028
     24                 319.4         0.0      -159.7         0.0     -1282.1    8.028
     25  1 U13          132.3         0.0        66.2        -0.0      1124.4   16.997
     26                 132.3         0.0       -66.2         0.0     -1124.4   16.997

    *** Program completed as requested! ***
```



Code: ACI 318-02

Units: English

Run axis: Biaxial

Run option: Investigation

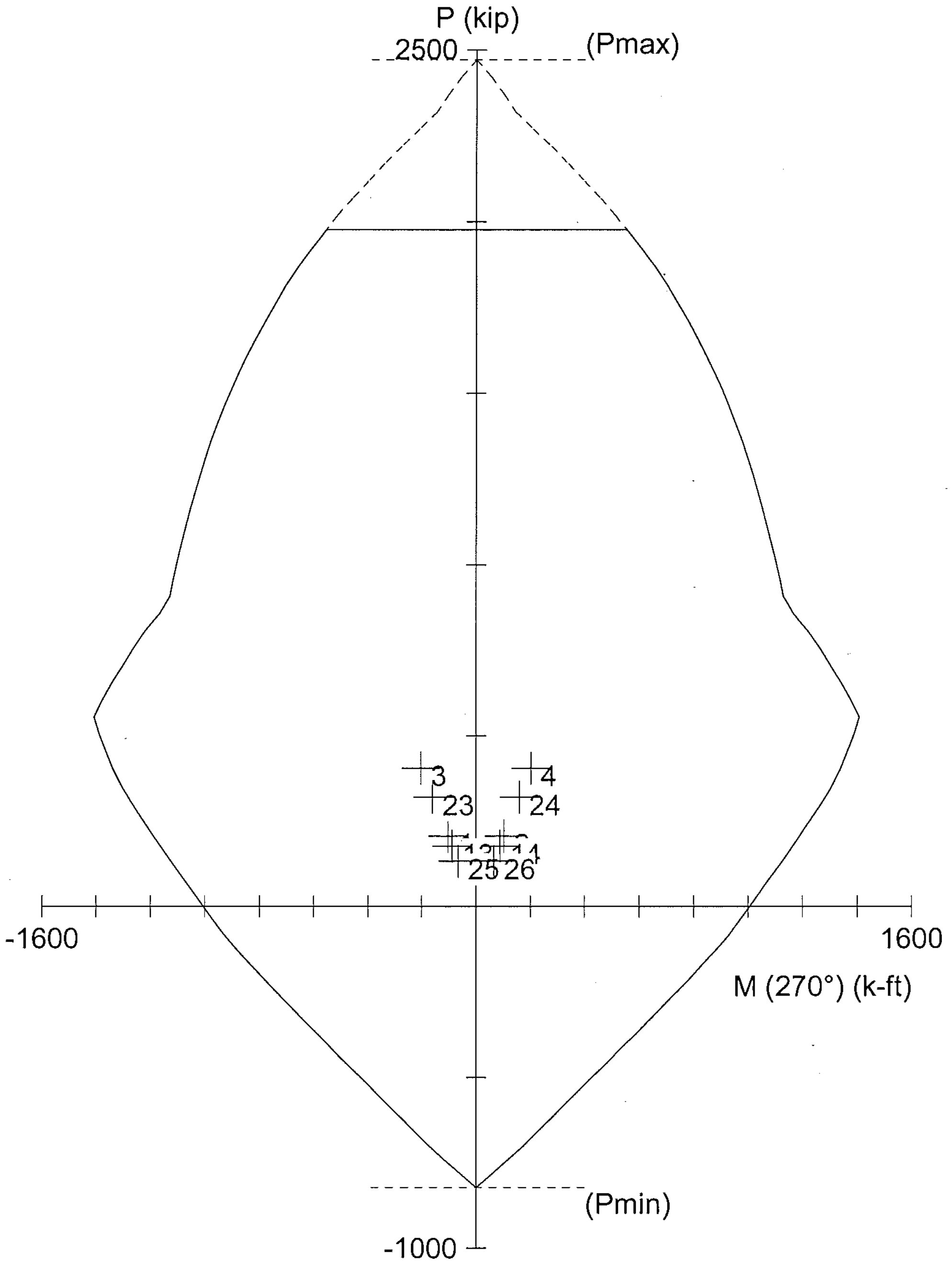
Slenderness: Not considered

Column type: Architectural

Bars: ASTM A615

Date: 10/27/11

Time: 09:17:09



pcaColumn v3.63 - Licensed to: FLSmidth

File: P:\11021\116 - Calculations\116.d - Arch_Civil_Struc\C-005 Grinding Area Concrete\Column J.col

Project: CC&V High Grade Ore

Column: A/B
Engineer: ECS

f'c = 4 ksi
fy = 60 ksi
Ag = 864 in^2
12 #10 bars

Ec = 3605 ksi
Es = 29000 ksi
As = 15.24 in^2
Rho = 1.76%

fc = 3.4 ksi
fc = 3.4 ksi
Xo = 0.00 in
Ix = 41472 in^4

u = 0.003 in/in
Yo = 0.00 in
Iy = 93312 in^4

Beta1 = 0.85
Clear spacing = 6.16 in
Clear cover = 2.50 in

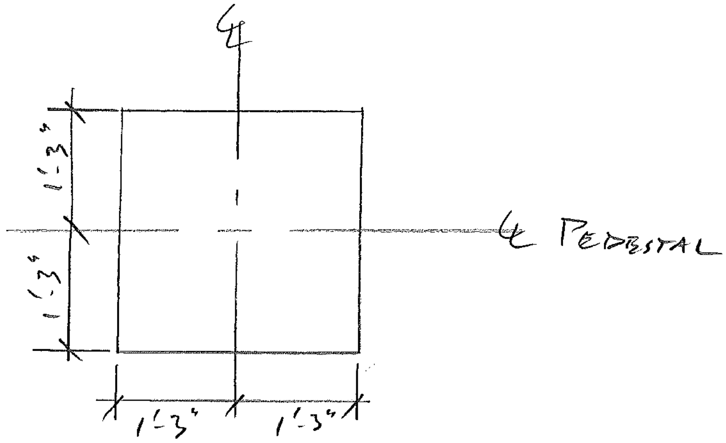
Confinement: Tied
phi(a) = 0.8, phi(b) = 0.9, phi(c) = 0.65

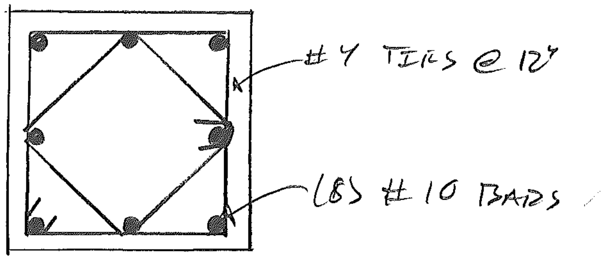
PROJECT
CC&V HIGH GRADE ORE

SUBJECT
ROD MILL FOUNDATION

PROJ NO. 11021
CALC NO. C-005
BY BCS DATE 10-27-11
CHK DATE
SHEET OF REV

PEDESTAL H DESIGN





FLSMIDTH

Project: CC&V High Grade Ore
Subject: Rod Mill Foundation Design

Proj. No. 11021
Calc No. C-005
By: ECS **Date:**10/27/2011
Chk: **Date:**
Sheet 1 of 1 **Rev:** 0

Concrete Pedestal Natural Period of Vibration
Pedestal H

Pedestal Dimensions:

$L_x := 2ft + 6in = 30\,in$ Pedestal Length X Direction

$L_y := 2ft + 6in = 30\,in$ Pedestal Length Y Direction

$H := 19ft + 10.75in = 238.75\,in$ Pedestal Height

Concrete Properties:

$\gamma_c := 145pcf$ Concrete Unit Weight

$f_c := 4000psi$ Concrete Compressive Strength

$E := 57000psi \cdot \sqrt{\frac{f_c}{psi}} = 3.605 \times 10^3\,ksi$ Concrete Modulus of Elasticity

Loads and Masses:

$m := L_x \cdot L_y \cdot H \cdot \frac{\gamma_c}{g} = 1.803 \times 10^4\,lb$ Pedestal Mass

$F_x := 0lb$ $F_y := 0lb$ Applied Mass

$m_x := F_x + 0.23m = 4.147 \times 10^3\,lb$ $m_y := F_y + 0.23m = 4.147 \times 10^3\,lb$ Equivalent Mass

Dynamic Properties:

$I_x := \frac{L_x^{\,3} \cdot L_y}{12} = 6.75 \times 10^4\,in^4$ $I_y := \frac{L_x \cdot L_y^{\,3}}{12} = 6.75 \times 10^4\,in^4$ Moment of Inertia

$k_x := \frac{(3 \cdot E \cdot I_x)}{H^3} = 643.696\,\frac{kip}{ft}$ $k_y := \frac{(3 \cdot E \cdot I_y)}{H^3} = 643.696\,\frac{kip}{ft}$ Stiffness Factor

$\omega_x := \sqrt{\frac{k_x}{0.23m}} = 70.668\,Hz$ $\omega_y := \sqrt{\frac{k_y}{0.23m}} = 70.668\,Hz$ Natural Frequency without added Mass

$\omega_{x.} := \sqrt{\frac{k_x}{m_x}} = 70.668\,Hz$ $\omega_{y.} := \sqrt{\frac{k_y}{m_y}} = 70.668\,Hz$ Natural Frequency with added Mass

WITHIN RESONANCE RANGE. OK FOR GUARD SUPPORT

```
        OOOOOOO    OOOOO    OOOOO    OOOOO    OOOOO   OO
        OO    OO  OO   OO  OO   OO  OO   OO  OO   OO  OO
        OO    OO  OO   OO  OO   OO  OO   OO  OO   OO  OO
        OO    OO  OO       OO   OO  OO       OO   OO  OO
        OO    OO  OO       OOOOOOO  OO       OO   OO  OO
        OOOOOOO   OO   OO  OO   OO  OO   OO  OO   OO  OO
        OO        OO   OO  OO   OO  OO   OO  OO   OO  OO
        OO         OOOOO   OO   OO   OOOOO    OOOOO   OOOOO  (TM)



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


     Licensee stated above acknowledges that Portland Cement Association
(PCA) is not and cannot be responsible for either the accuracy or
adequacy of the material supplied as input for processing by the
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design and engineering documents is the licensees. Accordingly, PCA
disclaims all responsibility in contract, negligence or other tort for
any analysis, design or engineering documents prepared in connection
with the use of the pcaColumn(tm) program.
```

```
  General Information:
  ====================
     File Name: P:\11021\116 - Calculations\116.d - Arch_Civil_Struc\C-005 Grinding Area Concrete
     Project:  CC&V High Grade Ore
     Column:   A/B                             Engineer: ECS
     Code:     ACI 318-02                      Units: English

     Run Option: Investigation                 Slenderness: Not considered
     Run Axis:   Biaxial                       Column Type: Architectural

  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:
  ========
     Rectangular: Width = 30 in                Depth = 30 in

     Gross section area, Ag =  900 in^2
     Ix =  67500 in^4                          Iy =  67500 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)
     ---- --------- -----------   ---- --------- -----------   ---- --------- -----------
     #  3      0.38        0.11   #  4      0.50        0.20   #  5      0.63        0.31
     #  6      0.75        0.44   #  7      0.88        0.60   #  8      1.00        0.79
     #  9      1.13        1.00   # 10      1.27        1.27   # 11      1.41        1.56
     # 14      1.69        2.25   # 18      2.26        4.00

     Confinement: Tied; #3 ties with #7 bars,  #4 with larger bars.
     phi(a) = 0.8,  phi(b) = 0.9,  phi(c) = 0.65

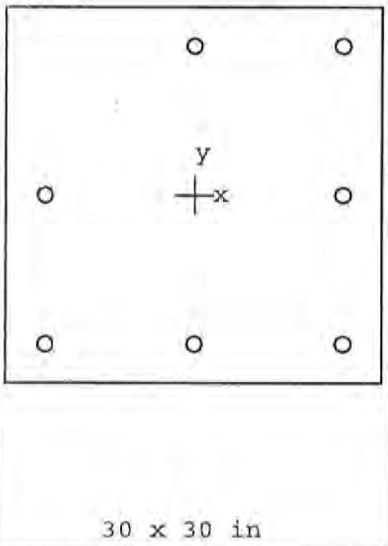
     Layout: Rectangular
     Pattern: Equal Bar Spacing  (Cover to transverse reinforcement)
     Total steel area, As = 10.16 in^2 at 1.13%
     8 #10   Cover = 2 in

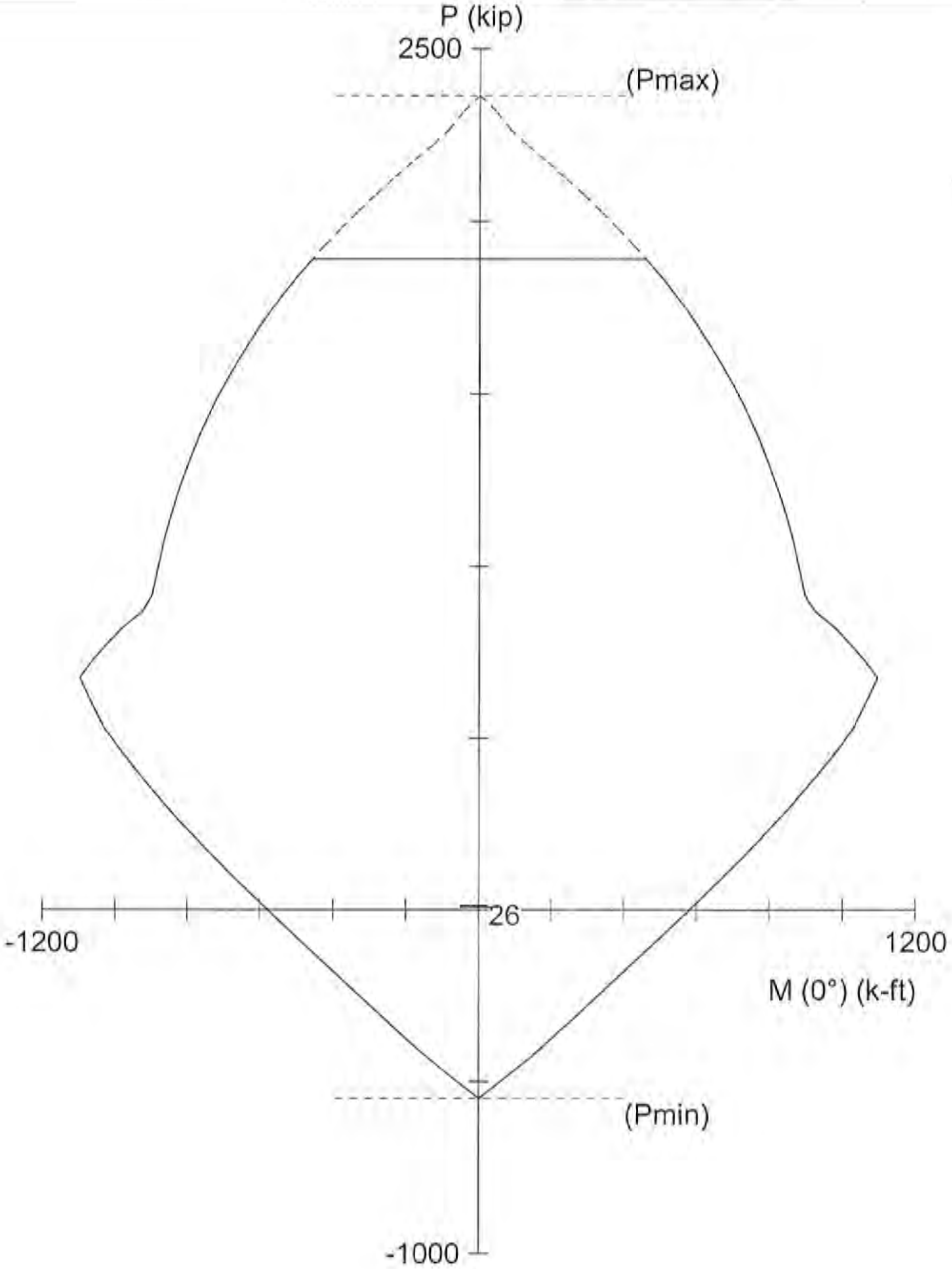
  Load Combinations:
  ==================
     U1   =  1.400*Dead + 0.000*Live + 0.000*Wind + 0.000*EarthQuake
     U2   =  1.200*Dead + 1.600*Live + 0.000*Wind + 0.000*EarthQuake
     U3   =  1.200*Dead + 1.000*Live + 0.000*Wind + 0.000*EarthQuake
     U4   =  1.200*Dead + 0.000*Live + 0.800*Wind + 0.000*EarthQuake
     U5   =  1.200*Dead + 1.000*Live + 1.600*Wind + 0.000*EarthQuake
     U6   =  0.900*Dead + 0.000*Live + 1.600*Wind + 0.000*EarthQuake
     U7   =  1.200*Dead + 0.000*Live - 0.800*Wind + 0.000*EarthQuake
     U8   =  1.200*Dead + 1.000*Live - 1.600*Wind + 0.000*EarthQuake
     U9   =  0.900*Dead + 0.000*Live - 1.600*Wind + 0.000*EarthQuake
     U10 =  1.200*Dead + 1.000*Live + 0.000*Wind + 1.000*EarthQuake
     U11 =  0.900*Dead + 0.000*Live + 0.000*Wind + 1.000*EarthQuake
     U12 =  1.200*Dead + 1.000*Live + 0.000*Wind - 1.000*EarthQuake
     U13 =  0.900*Dead + 0.000*Live + 0.000*Wind - 1.000*EarthQuake
```

```
  Service Loads:
  ==============
         Load   Axial Load      Mx @ Top      Mx @ Bot      My @ Top      My @ Bot
     No. Case          kip          k-ft          k-ft          k-ft          k-ft
     --- ---- ------------ ------------ ------------ ------------ ------------
       1 Dead          8.8          0.0          0.0          0.0          0.0
         Live          0.0          0.0          0.0          0.0          0.0
         Wind          0.0          0.0          0.0          0.0          0.0
         E.Q.          0.0          0.0          0.0          0.0          0.0

  Factored Loads and Moments with Corresponding Capacities: (see user's manual for notation)
  ========================================================
     NOTE: Each loading combination includes the following cases:
           First line  - at column top
           Second line - at column bottom
          Load            Pu          Mux          Muy         fMnx         fMny
     No.  Combo          kip         k-ft         k-ft         k-ft         k-ft   fMn/Mu
     --- ------ ----------- ----------- ----------- ----------- ----------- --------
       1  1 U1          12.3          0.0          0.0        592.1          0.0  999.999
       2                12.3          0.0          0.0        592.1          0.0  999.999
       3  1 U2          10.6          0.0          0.0        590.4          0.0  999.999
       4                10.6          0.0          0.0        590.4          0.0  999.999
       5  1 U3          10.6          0.0          0.0        590.4          0.0  999.999
       6                10.6          0.0          0.0        590.4          0.0  999.999
       7  1 U4          10.6          0.0          0.0        590.4          0.0  999.999
       8                10.6          0.0          0.0        590.4          0.0  999.999
       9  1 U5          10.6          0.0          0.0        590.4          0.0  999.999
      10                10.6          0.0          0.0        590.4          0.0  999.999
      11  1 U6           7.9          0.0          0.0        587.8          0.0  999.999
      12                 7.9          0.0          0.0        587.8          0.0  999.999
      13  1 U7          10.6          0.0          0.0        590.4          0.0  999.999
      14                10.6          0.0          0.0        590.4          0.0  999.999
      15  1 U8          10.6          0.0          0.0        590.4          0.0  999.999
      16                10.6          0.0          0.0        590.4          0.0  999.999
      17  1 U9           7.9          0.0          0.0        587.8          0.0  999.999
      18                 7.9          0.0          0.0        587.8          0.0  999.999
      19  1 U10         10.6          0.0          0.0        590.4          0.0  999.999
      20                10.6          0.0          0.0        590.4          0.0  999.999
      21  1 U11          7.9          0.0          0.0        587.8          0.0  999.999
      22                 7.9          0.0          0.0        587.8          0.0  999.999
      23  1 U12         10.6          0.0          0.0        590.4          0.0  999.999
      24                10.6          0.0          0.0        590.4          0.0  999.999
      25  1 U13          7.9          0.0          0.0        587.8          0.0  999.999
      26                 7.9          0.0          0.0        587.8          0.0  999.999

     *** Program completed as requested! ***
```





Code: ACI 318-02

Units: English

Run axis: Biaxial

Run option: Investigation

Slenderness: Not considered

Column type: Architectural

Bars: ASTM A615

Date: 10/27/11

Time: 10:07:33

pcaColumn v3.63 - Licensed to: FLSmidth

File: P:\11021\116 - Calculations\116.d - Arch_Civil_Struc\C-005 Grinding Area Concrete\Column H.col

Project: CC&V High Grade Ore

Column: A/B

Engineer: ECS

f'c = 4 ksi

fy = 60 ksi

Ag = 900 in^2

8 #10 bars

Ec = 3605 ksi

Es = 29000 ksi

As = 10.16 in^2

Rho = 1.13%

fc = 3.4 ksi

fc = 3.4 ksi

Xo = 0.00 in

Ix = 67500 in^4

ı = 0.003 in/in

Yo = 0.00 in

Iy = 67500 in^4

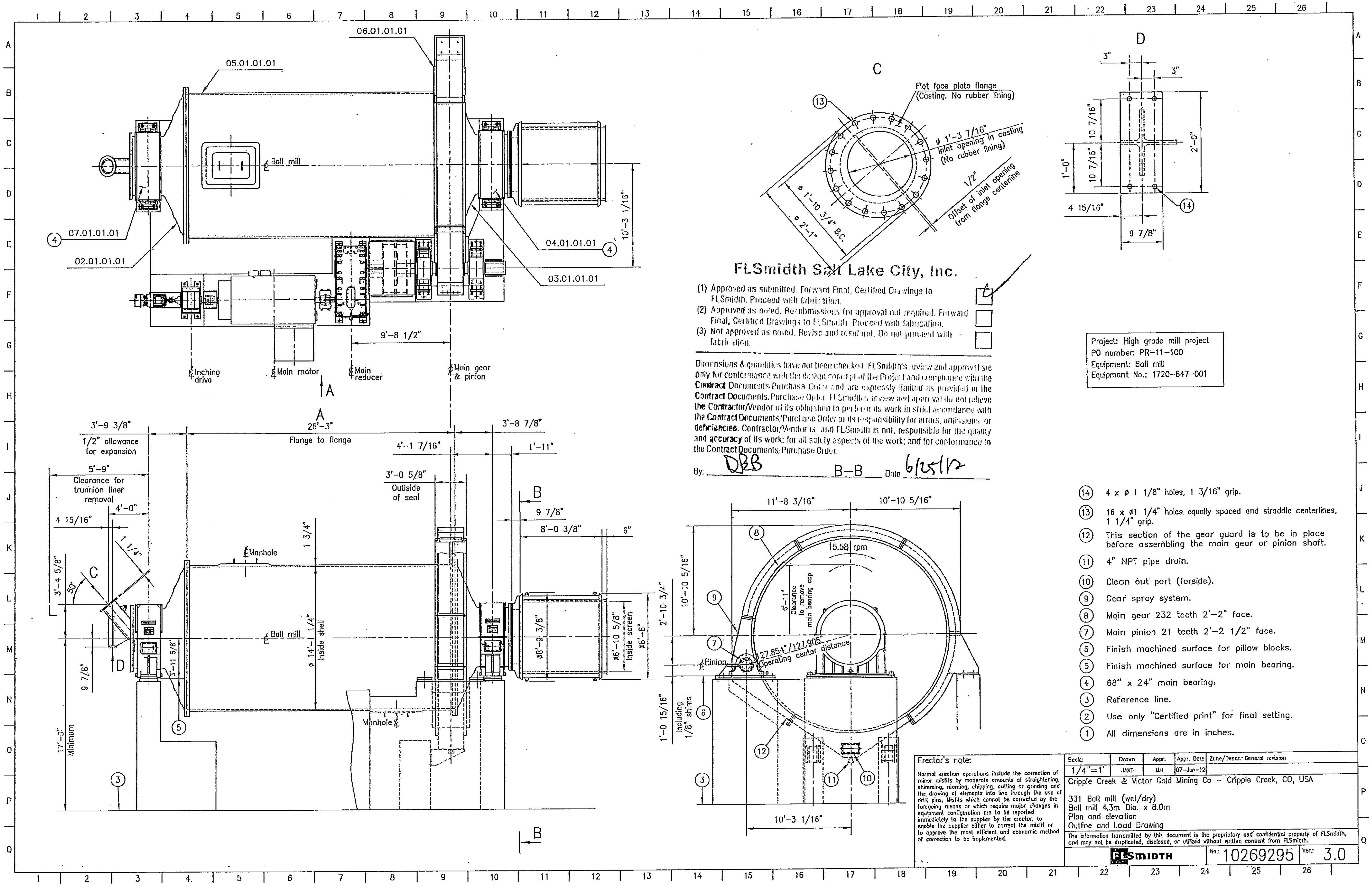
Beta1 = 0.85

Clear spacing = 10.59 in

Clear cover = 2.50 in

Confinement: Tied

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



FLSmidth Salt Lake City, Inc.

(1) Approved as submitted. Forward Final, Certified Drawings to FLSmidth. Proceed with fabrication. ☑

(2) Approved as noted. Resubmission for approval not required. Forward Final, Certified Drawings to FLSmidth. Proceed with fabrication. ☐

(3) Not approved as noted. Revise and resubmit. Do not proceed with fabrication. ☐

Dimensions & quantities have not been checked. FLSmidth's review and approval are only for conformance with the design concept of the Project and compliance with the Contract Documents/Purchase Order and are expressly limited as provided in the Contract Documents/Purchase Order. FLSmidth's review and approval do not relieve the Contractor/Vendor of its obligation to perform its work in strict accordance with the Contract Documents/Purchase Order or its responsibility for errors, omissions or deficiencies. Contractor/Vendor is, and FLSmidth is not, responsible for the quality and accuracy of its work; for all safety aspects of the work; and for conformance to the Contract Documents/Purchase Order.

By: DBB Date 6/25/12

Project: High grade mill project
PO number: PR-11-100
Equipment: Ball mill
Equipment No.: 1720-647-001

⑭ 4 x ø 1 1/8" holes, 1 3/16" grip.

⑬ 16 x ø1 1/4" holes equally spaced and straddle centerlines, 1 1/4" grip.

⑫ This section of the gear guard is to be in place before assembling the main gear or pinion shaft.

⑪ 4" NPT pipe drain.

⑩ Clean out port (farside).

⑨ Gear spray system.

⑧ Main gear 232 teeth 2'-2" face.

⑦ Main pinion 21 teeth 2'-2 1/2" face.

⑥ Finish machined surface for pillow blocks.

⑤ Finish machined surface for main bearing.

④ 68" x 24" main bearing.

③ Reference line.

② Use only "Certified print" for final setting.

① All dimensions are in inches.

Erector's note:

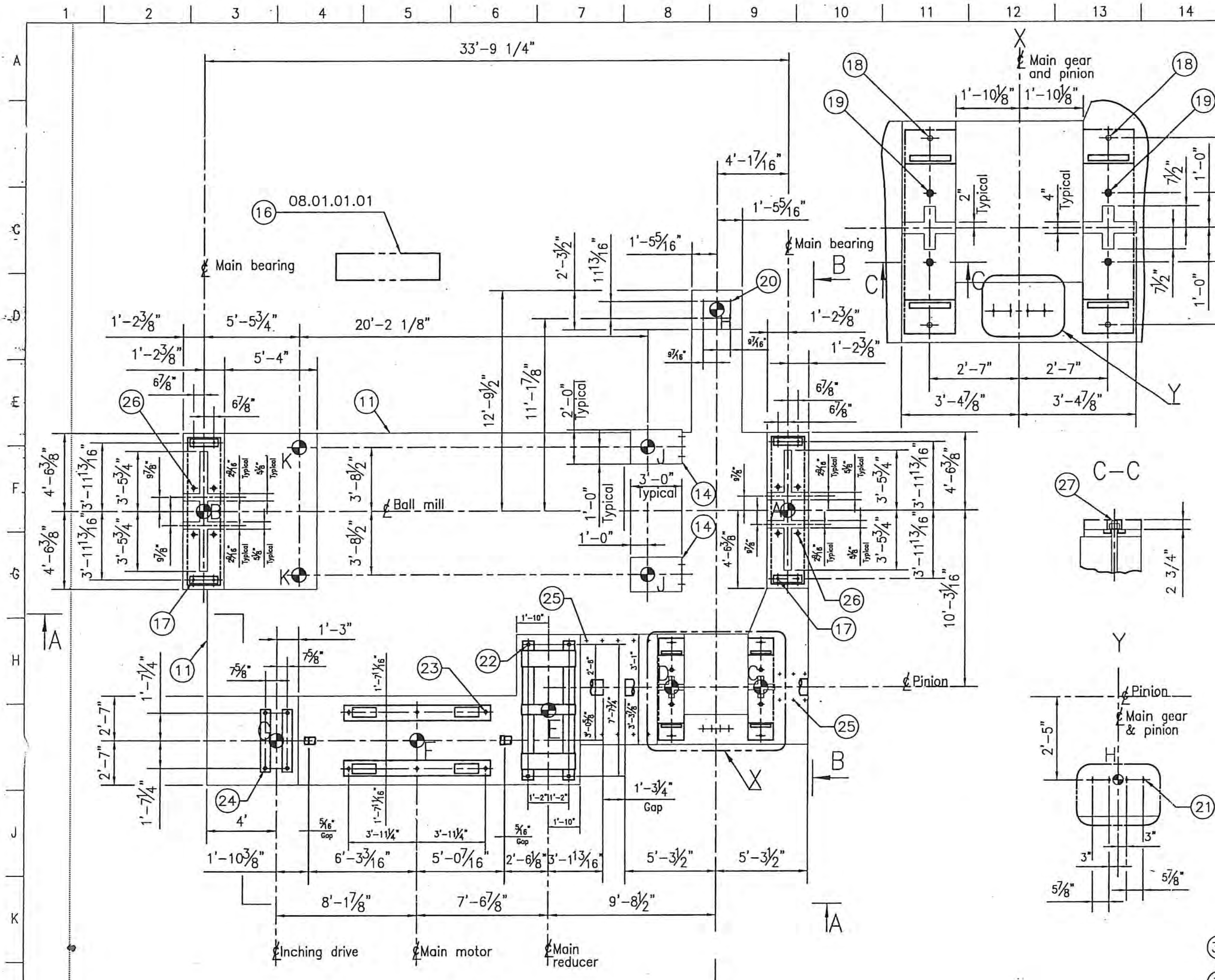
Normal erection operations include the correction of minor misfits by moderate amounts of straightening, shimming, reaming, chipping, cutting or grinding and the drawing of elements into line through the use of drift pins. Misfits which cannot be corrected by the foregoing means or which require major changes in equipment configuration are to be reported immediately to the supplier by the erector, to enable the supplier either to correct the misfit or to approve the most efficient and economic method of correction to be implemented.

Scale:	Drawn	Appr.	Appr. Date	Zone/Descr.: General revision
1/4"=1'	JAKT	MH	07-Jun-12	

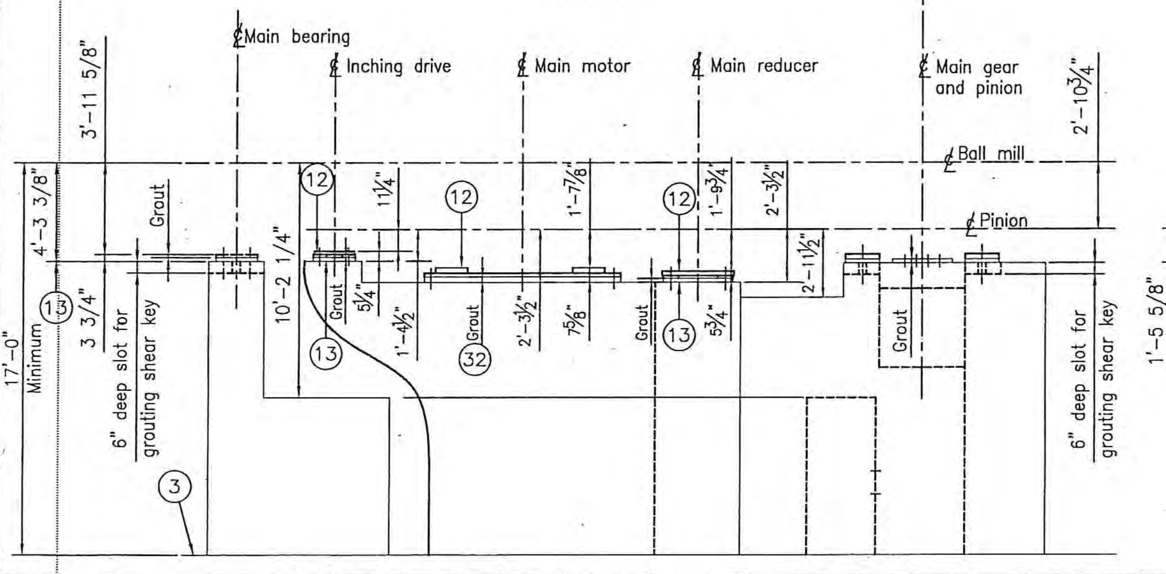
Cripple Creek & Victor Gold Mining Co – Cripple Creek, CO, USA

331 Ball mill (wet/dry)
Ball mill 4.3m Dia. x 8.0m
Plan and elevation
Outline and Load Drawing

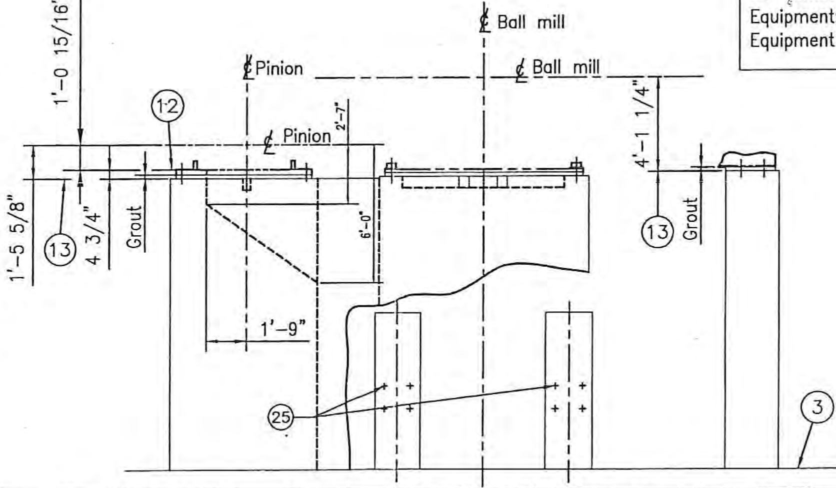
FLSMIDTH No.: 10269295 Ver.: 3.0



A–A



B–B



㉜ Allow for grout on top of main motor drive piers as shown (approximately 2 3/4").

㉛ Anchor bolts are to be located within 1/8" of the indicated position. Tolerance must not be accumulative.

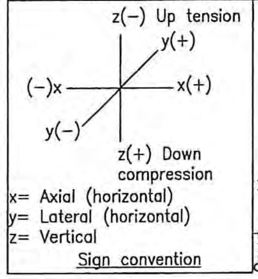
㉚ Direction of dynamic loads are reversed during start-up and shut down.

Project: High grade mill project
PO number: PR-11-100
Equipment: Ball mill
Equipment No.: 1720-647-001

Foundation loads

Based on 40% total charge including 40% balls and metal liners
CW rotation when facing discharge end

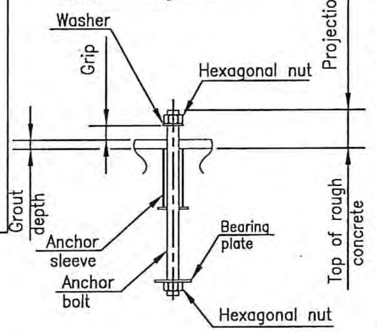
	Mass	Dynamic
AX – Drive bearing pier axial load	0	15,878 lb.
AY – Drive bearing pier lateral load	0	33,200 lb.
AZ – Drive bearing pier vertical load	537,000 lb.	–34,700 lb.
BX – Non-drive bearing pier axial load	0	0
BY – Non-drive bearing pier lateral load	0	58,800 lb.
BZ – Non-drive bearing pier vertical load	497,000 lb.	45,000 lb.
CX – Pinion pier axial load	0	0
CY – Pinion pier lateral load	0	–30,400 lb.
CZ – Pinion pier vertical load	4,500 lb.	–40,800 lb.
DX – Pinion pier axial load	0	–15,878 lb.
DY – Pinion pier lateral load	0	–35,500 lb.
DZ – Pinion pier vertical load	8,600 lb.	–39,600 lb.
EX – Main reducer pier axial load	0	0
EY – Main reducer pier lateral load	0	0
EZ – Main reducer pier vertical load	13,000 lb.	±33,947 lb.
FX – Main motor pier axial load	0	0
FY – Main motor pier lateral load	0	0
FZ – Main motor pier vertical load	31,000 lb.	±15,650 lb.
GZ – Inching drive pier vertical load	3,000 lb.	0
HZ – Gear guard pier vertical load (load per point)	8,800 lb.	0
Jacking loads:		
JZ – Lift empty mill (load per point)	149,000 lb.	
KZ – Lift empty mill (load per point)	85,300 lb.	
JZ – Lift loaded mill (load per point)	286,000 lb.	
KZ – Lift loaded mill (load per point)	190,600 lb.	
Seismic loads (IBC 2003 Site class D)		
AX – Drive bearing pier axial load	± 165,440 lb.	
AY – Drive bearing pier lateral load	± 85,920 lb.	
BX – Non-drive bearing pier axial load	0	
BY – Non-drive bearing pier lateral load	± 79,520 lb.	



x= Axial (horizontal)
y= Lateral (horizontal)
z= Vertical

Sign convention

Typical foundation bolt arrangement



㉙ Dynamic loads are based on 100% motor output torque. Foundation design shall consider starting and overload forces equal to motor pull out torque and not less than 200% of rated torque.

㉘ Operating WR^2 of mill referred to motor shaft is 5600 lb/ft^2
WR^2 includes 35% total charge including 35% balls, rubber liners, pinion, clutch, reducer and coupling.

㉗ Foundation bolt can not extend above soleplate.

㉖ Red head wedge anchor Cat. No. WS3470 (by others). Use to achieve soleplate flatness. Location to be established using the soleplates as templates.

㉕ Red head wedge anchor Cat. No. HN3424 (by others). See note ⑩

㉔ 4 foundation bolts ø2" x 1 1/2" grip, 7 3/4" projection.

㉓ 6 foundation bolts ø1 3/4" x 2" grip, 8 1/2" projection.

㉒ 4 foundation bolts ø2" x 1 1/2" grip, 7 3/4" projection.

㉑ 4 foundation bolts ø3/4" x 5/8" grip, 5" projection.

⑳ 4 foundation bolts ø3/4" x 1/2" grip, 4 1/2" projection.

⑲ 2 foundation bolts ø1 1/2" x 1" grip, 4 1/4" projection.

⑱ 2 foundation bolts ø2" x 3" grip, 8 1/4" projection.

⑰ 4 foundation bolts ø2" x 4 3/4" grip, 10" projection.

⑯ Main bearing and pinion bearing lubrication system.

⑮ Foundation designer must provide adequate support for jacking cradle assembly. See jacking cradle assembly 10271539 for location.

⑭ Jacking pads.

⑬ Top of rough concrete.

⑫ Finish machined surface of soleplate.

⑪ It is suggested to tie the main drive end bearing and drive piers together as shown using an integral reinforced concrete foundation. All foundations should be tied together using an integral reinforced sub surface concrete mat. The mat is to be structurally capable of carrying all static and dynamic loads.

⑩ The location for the sleeve type anchors must be established using the guards and gear guard support brackets as templates at field installation. The maximum clearance between guards and stationary objects is 1/2" (anchors supplied by others).

⑨ Grout shall be high quality, non shrinking and have mechanical properties suitable for the static and dynamic loads specified. A pourable epoxy resin compound is recommended.

⑧ Allow for grout on top of mill bearing and drive piers (except main motor) shown (approximately 2").

⑦ The foundation is to be designed so that no natural frequencies fall in the range of 51 Hz – 69 Hz. This is to ensure that no significant resonance occurs with the girth gear / pinion meshing frequency of 60.2 Hz.

⑥ Foundation bolts, nuts, washers, anchor sleeves and bearing plates are not supplied by FLSmidth mill group, unless specifically ordered.

⑤ Anchor bolts to be set in anchor sleeve to allow for adjustment.

④ Depth of foundation depends on nature of soil.

③ Reference line.

② Use only "Certified print" for final setting.

① All dimensions are in inches.

Important : Equipment foundations are the responsibility of the purchaser and shall be designed to meet the duty service, soil conditions and the specified operating loads. Foundation dimensions shown by FLSmidth Inc. are intended to define the interface and battery limits for the equipment supplied and are not intended

Erector's note:

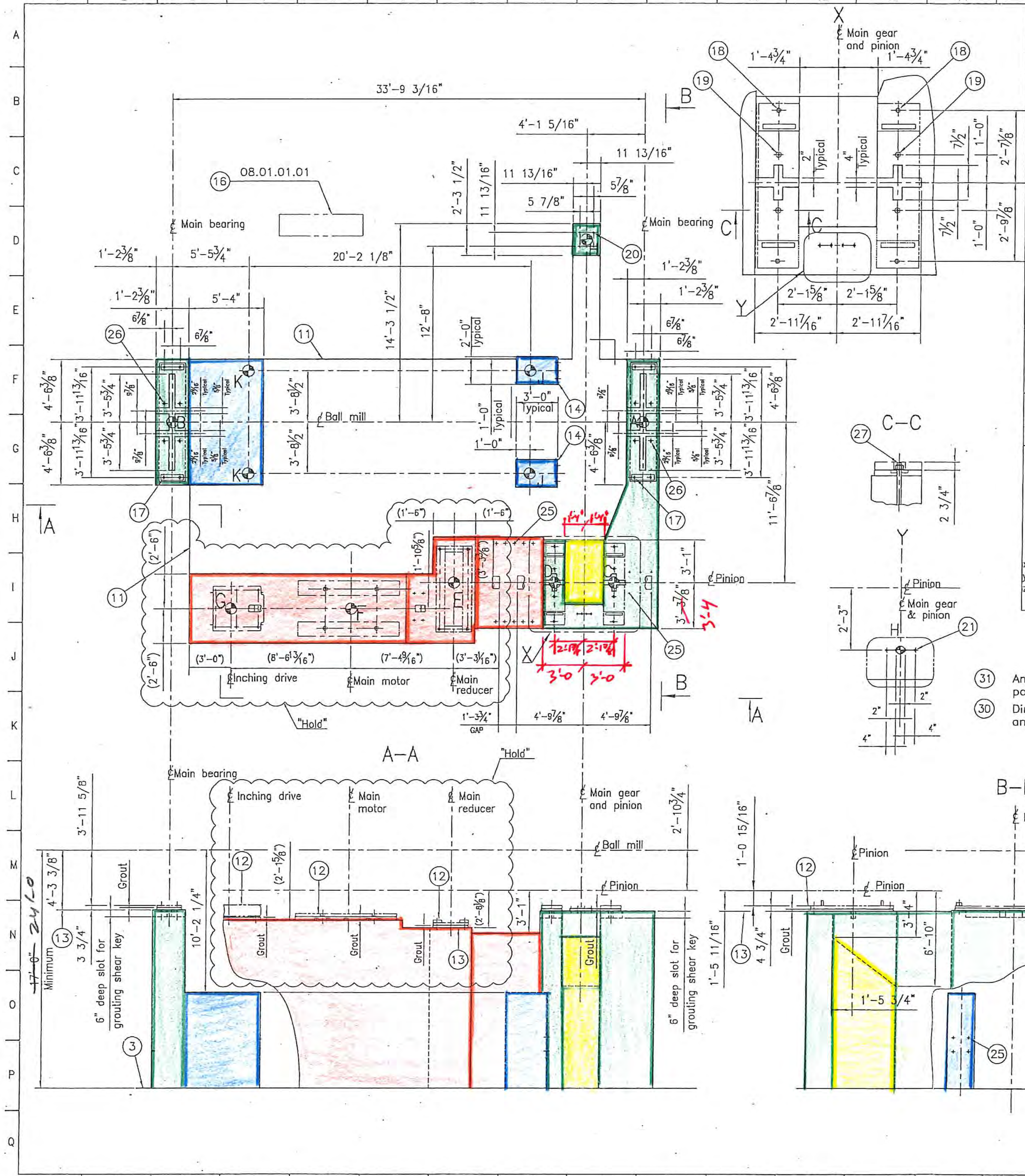
Normal erection operations include the correction of minor misfits by moderate amounts of straightening, shimming, reaming, chipping, cutting or grinding and the drawing of elements into line through the use of drift pins. Misfits which cannot be corrected by the foregoing means or which require major changes in equipment configuration are to be reported immediately to the supplier by the erector, to enable the supplier either to correct the misfit or to approve the most efficient and economic method of correction to be implemented.

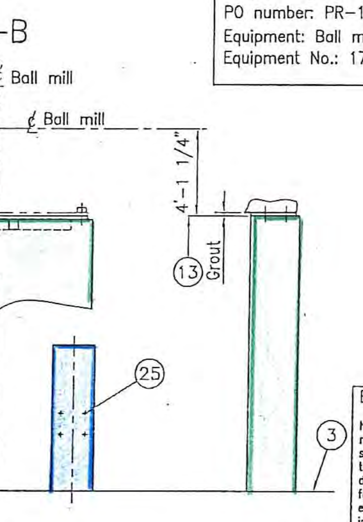
Scale:	Drawn	Appr.	Appr. Date	Zone/Descr.: General revision
1/4"=1'	IBA	SPN	23-Apr-12	Reference No. with ○ see legend No.

Cripple Creek & Victor Gold Mining Co – Cripple Creek, CO, USA

331 Ball mill (wet/dry)
Ball mill 4.3m Dia. x 8.0m
Foundation and loads
Outline and Load Drawing

FLSMIDTH
No.: 10269296
Ver.: 2.0

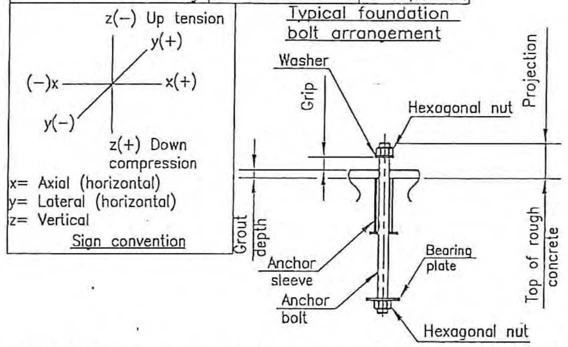




Foundation loads

Based on 40% total charge including 40% balls and metal liners
CW rotation when facing discharge end

	Mass	Dynamic
AX – Drive bearing pier axial load	0	15,878 lb.
AY – Drive bearing pier lateral load	0	33,200 lb.
AZ – Drive bearing pier vertical load	537,000 lb.	–34,700 lb.
BX – Non–drive bearing pier axial load	0	0
BY – Non–drive bearing pier lateral load	0	58,800 lb.
BZ – Non–drive bearing pier vertical load	497,000 lb.	45,000 lb.
CX – Pinion pier axial load	0	0
CY – Pinion pier lateral load	0	–30,400 lb.
CZ – Pinion pier vertical load	4,500 lb.	–40,800 lb.
DX – Pinion pier axial load	0	–15,878 lb.
DY – Pinion pier lateral load	0	–35,500 lb.
DZ – Pinion pier vertical load	8,600 lb.	–39,600 lb.
EX – Main reducer pier axial load	0	0
EY – Main reducer pier lateral load	0	0
EZ – Main reducer pier vertical load	13,000 lb.	±33,947 lb.
FX – Main motor pier axial load	0	0
FY – Main motor pier lateral load	0	0
FZ – Main motor pier vertical load	31,000 lb.	±15,650 lb.
GZ – Inching drive pier vertical load	3,000 lb.	0
HZ – Gear guard pier vertical load (load per point)	8,800 lb.	0
Jacking loads:		
JZ – Lift empty mill (load per point)	149,000 lb.	"Hold"
KZ – Lift empty mill (load per point)	85,300 lb.	
JZ – Lift loaded mill (load per point)	286,000 lb.	
KZ – Lift loaded mill (load per point)	190,600 lb.	
Seismic loads (IBC 2003 Site class D)		
AX – Drive bearing pier axial load	± 165,440 lb.	
AY – Drive bearing pier lateral load	± 85,920 lb.	
BX – Non–drive bearing pier axial load	0	
BY – Non–drive bearing pier lateral load	± 79,520 lb.	



㉛ Anchor bolts to be located within 1/8" of the indicated position. Tolerance must not be accumulative.

㉚ Direction of dynamic loads are reversed during start–up and shut down.

Project: High grade mill project
PO number: PR–11–100
Equipment: Ball mill
Equipment No.: 1720–647–001

㉙ Dynamic loads are based on 100% motor output torque. Foundation design shall consider starting and overload forces equal to motor pull out torque and not less than 200% of rated torque.

㉘ Operating WR^2 of mill referred to motor shaft is 5600 lb/ft^2 WR^2 includes 35% total charge including 35% balls, rubber liners, pinion, clutch, reducer and coupling.

㉗ Foundation bolt can not extend above soleplate.

㉖ Red head wedge anchor Cat. No. WS3470 (by others). Use to achieve soleplate flatness. Location to be established using the soleplates as templates.

㉕ Red head wedge anchor Cat. No. HN3424 (by others). See note

㉔ "Later"

㉓ "Later"

㉒ "Later"

㉑ 4 foundation bolts ø3/4" x 5/8" grip, 5" projection.

⑳ 4 foundation bolts ø3/4" x 1/2" grip, 4 1/2" projection.

⑲ 2 foundation bolts ø1 1/2" x 1" grip, 4 1/4" projection.

⑱ 2 foundation bolts ø2" x 3" grip, 8 1/4" projection.

⑰ 4 foundation bolts ø2" x 4 3/4" grip, 10" projection.

⑯ Main bearing and pinion bearing lubrication system.

⑮ Foundation designer must provide adequate support for jacking cradle assembly. See jacking cradle assembly "Later" for location.

⑭ Jacking pads.

⑬ Top of rough concrete.

⑫ Finish machined surface of soleplate.

⑪ It is suggested to tie the main drive end bearing and drive piers together as shown using an integral reinforced concrete foundation. All foundations should be tied together using an integral reinforced sub surface concrete mat. The mat is to be structurally capable of carrying all static and dynamic loads.

⑩ The location for the sleeve type anchors must be established using the guards and gear guard support brackets as templates at field installation. The maximum clearance between guards and stationary objects is 1/2" (anchors supplied by others).

⑨ Grout shall be high quality, non shrinking and have mechanical properties suitable for the static and dynamic loads specified. A pourable epoxy resin compound is recommended.

⑧ Allow for grout on top of mill bearing and drive piers (except main motor) shown (approximately 2").

⑦ The foundation is to be designed so that no natural frequencies fall in the range of 74 Hz – 100 Hz. This is to ensure that no significant resonance occurs with the girth gear / pinion meshing frequency of 86.7 Hz.

⑥ Foundation bolts, nuts, washers, anchor sleeves and bearing plates are not furnished by FLSmidth unless specifically ordered.

⑤ Anchor bolts to be set in anchor sleeve to allow for adjustment.

④ Depth of foundation depends on nature of soil.

③ Reference line.

② Use only "Certified print" for final setting.

① All dimensions are in inches.

Important : Equipment foundations are the responsibility of the purchaser and shall be designed to meet the duty service, soil conditions and the specified operating loads. Foundation dimensions shown by FLSmidth Inc. are intended to define the interface and battery limits for the equipment supplied and are not intended

Erector's note:

Normal erection operations include the correction of minor misfits by moderate amounts of straightening, shimming, reaming, chipping, cutting or grinding and the drawing of elements into line through the use of drift pins. Misfits which cannot be corrected by the foregoing means or which require major changes in equipment configuration are to be reported immediately to the supplier by the erector, to enable the supplier either to correct the misfit or to approve the most efficient and economic method of correction to be implemented.

Scale:	Drawn	Appr.	Appr. Date	Zone/Descr.:
1/4"=1'	IBA	MH	14–Oct–11	

Cripple Creek & Victor Gold Mining Co – Cripple Creek, CO, USA

331 Ball mill (wet/dry)
Ball mill 4.3m Dia. x 8.0m
Foundation and loads
Outline and Load Drawing

FLSMIDTH No.: 10269296 Ver.: 1.0

FLSMIDTH

PROJECT CC & V HIGH GRADE ORE

SUBJECT BALL MILL FOUNDATION

PROJ NO. 11021

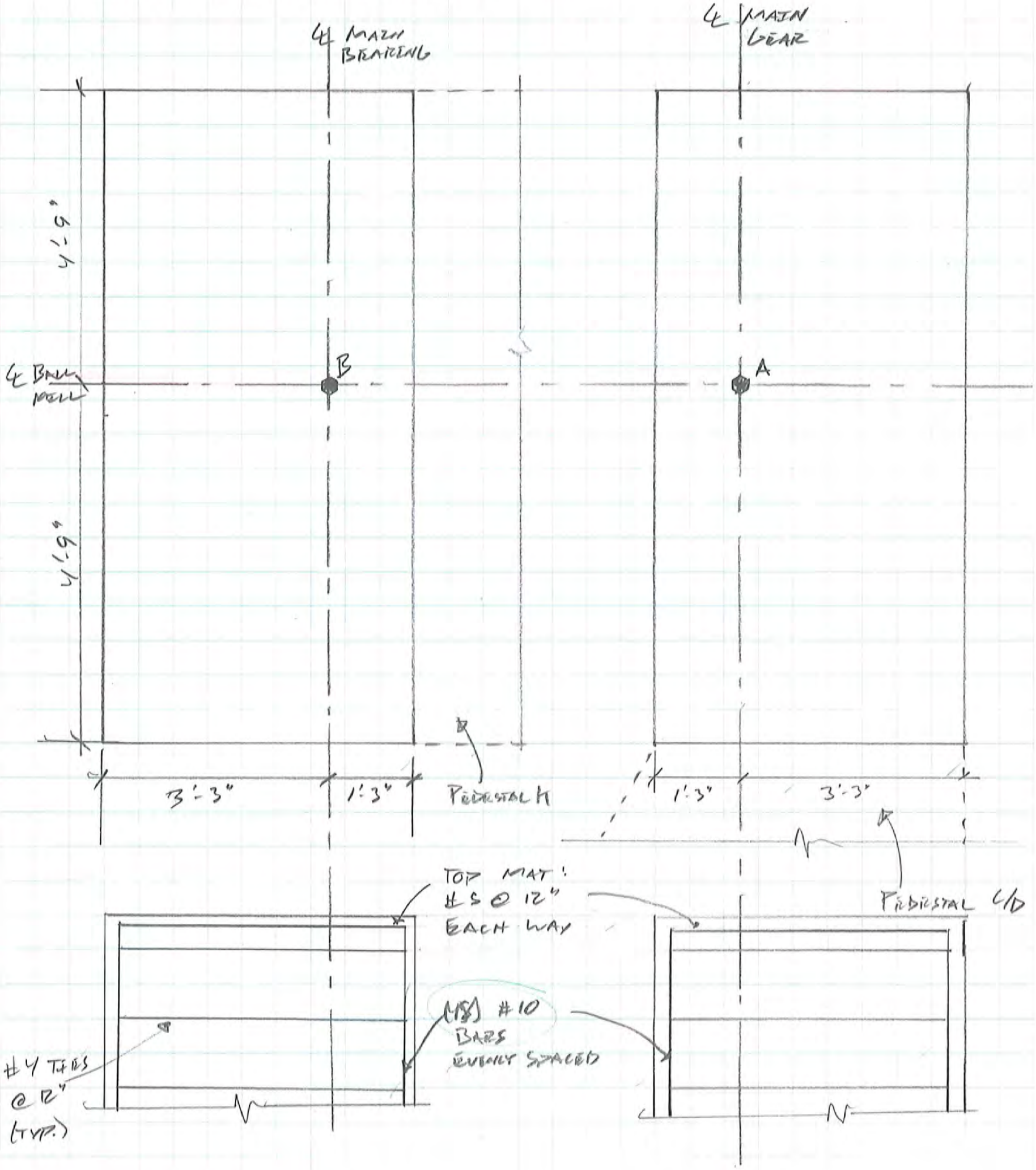
CALC NO. C-005

BY ECS DATE 10-28-11

CHK DATE

SHEET OF REV

PEDESTAL A/B DESIGN



FLSMIDTH

Project: CC&V High Grade Ore
Subject: Ball Mill Foundation Design

Proj. No. 11021
Calc No. C-005
By: ECS **Date:**10/28/2011
Chk: **Date:**
Sheet 1 of 1 **Rev:** 0

Concrete Pedestal Natural Period of Vibration
Pedestal A/B

Pedestal Dimensions:

$L_x := 4ft + 6in = 54\,in$	Pedestal Length X Direction
$L_y := 9ft + 6in = 114\,in$	Pedestal Length Y Direction
$H := 19ft + 8.675in = 236.675\,in$	Pedestal Height

Concrete Properties:

$\gamma_c := 145pcf$	Concrete Unit Weight
$f_c := 4000psi$	Concrete Compressive Strength
$E := 57000psi \cdot \sqrt{\dfrac{f_c}{psi}} = 3.605 \times 10^3 \cdot ksi$	Concrete Modulus of Elasticity

Loads and Masses:

$m := L_x \cdot L_y \cdot H \cdot \dfrac{\gamma_c}{g} = 1.223 \times 10^5 \cdot lb$		Pedestal Mass
$F_x := 15878lb$	$F_y := 58800lb$	Applied Mass
$m_x := F_x + 0.23m = 4.4 \times 10^4\,lb$	$m_y := F_y + 0.23m = 8.692 \times 10^4\,lb$	Equivalent Mass

Dynamic Properties:

$I_x := \dfrac{L_x^{\,3} \cdot L_y}{12} = 1.496 \times 10^6\,in^4$	$I_y := \dfrac{L_x \cdot L_y^{\,3}}{12} = 6.667 \times 10^6 \cdot in^4$	Moment of Inertia
$k_x := \dfrac{(3 \cdot E \cdot I_x)}{H^3} = 1.464 \times 10^4 \cdot \dfrac{kip}{ft}$	$k_y := \dfrac{(3 \cdot E \cdot I_y)}{H^3} = 6.526 \times 10^4 \cdot \dfrac{kip}{ft}$	Stiffness Factor
$\omega_x := \sqrt{\dfrac{k_x}{0.23m}} = 129.443 \cdot Hz$	$\omega_y := \sqrt{\dfrac{k_y}{0.23m}} = 273.269 \cdot Hz$	Natural Frequency without added Mass
$\omega_{x.} := \sqrt{\dfrac{k_x}{m_x}} = 103.483 \cdot Hz$	$\omega_{y.} := \sqrt{\dfrac{k_y}{m_y}} = 155.43 \cdot Hz$	Natural Frequency with added Mass

```
        OOOOOOO    OOOOO    OOOOO    OOOOO    OOOOO   OO
        OO    OO  OO   OO  OO   OO  OO   OO  OO   OO  OO
        OO    OO  OO   OO  OO   OO  OO   OO  OO   OO  OO
        OO    OO  OO       OO   OO  OO       OO   OO  OO
        OO    OO  OO       OOOOOOO  OO       OO   OO  OO
        OOOOOOO   OO   OO  OO   OO  OO   OO  OO   OO  OO
        OO        OO   OO  OO   OO  OO   OO  OO   OO  OO
        OO         OOOOO   OO   OO   OOOOO    OOOOO    OOOOO  (TM)
```

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

```
     Licensee stated above acknowledges that Portland Cement Association
(PCA) is not and cannot be responsible for either the accuracy or
adequacy of the material supplied as input for processing by the
pcaColumn(tm) computer program. Furthermore, PCA neither makes any
warranty expressed nor implied with respect to the correctness of the
output prepared by the pcaColumn(tm) program.Although PCA has endeavored
to produce pcaColumn(tm) error free, the program is not and can't be
certified infallible. The final and only responsibility for analysis,
design and engineering documents is the licensees. Accordingly, PCA
disclaims all responsibility in contract, negligence or other tort for
any analysis, design or engineering documents prepared in connection
with the use of the pcaColumn(tm) program.
```

```
General Information:
====================
   File Name: C:\Users\esum-us\Desktop\Pedestal Design\Column A-B.col
   Project:  CC&V High Grade Ore
   Column:   A/B                             Engineer: ECS
   Code:     ACI 318-02                      Units: English

   Run Option: Investigation                 Slenderness: Not considered
   Run Axis:   Biaxial                       Column Type: Architectural

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:
========
   Rectangular: Width = 54 in                Depth = 114 in

   Gross section area, Ag =  6156 in^2
   Ix =  6.66695e+006 in^4                   Iy =  1.49591e+006 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)
   ---- --------- -----------   ---- --------- -----------   ---- --------- -----------
   #  3      0.38        0.11   #  4      0.50        0.20   #  5      0.63        0.31
   #  6      0.75        0.44   #  7      0.88        0.60   #  8      1.00        0.79
   #  9      1.13        1.00   # 10      1.27        1.27   # 11      1.41        1.56
   # 14      1.69        2.25   # 18      2.26        4.00

   Confinement: Tied; #3 ties with #7 bars,  #4 with larger bars.
   phi(a) = 0.8,  phi(b) = 0.9,  phi(c) = 0.65

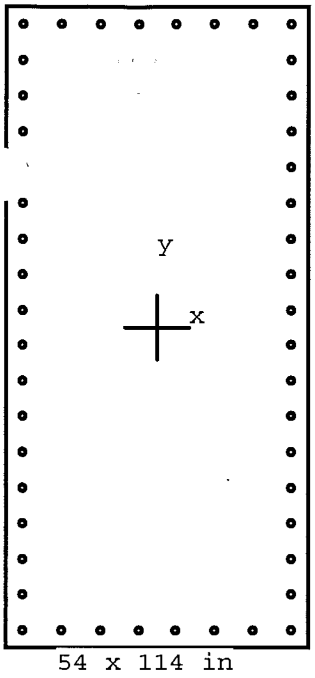
   Layout: Rectangular
   Pattern: Equal Bar Spacing  (Cover to transverse reinforcement)
   Total steel area, As = 60.96 in^2 at 0.99%
   48 #10   Cover = 2 in

Load Combinations:
==================
   U1  =  1.400*Dead + 0.000*Live + 0.000*Wind + 0.000*EarthQuake
   U2  =  1.200*Dead + 1.600*Live + 0.000*Wind + 0.000*EarthQuake
   U3  =  1.200*Dead + 1.000*Live + 0.000*Wind + 0.000*EarthQuake
   U4  =  1.200*Dead + 0.000*Live + 0.800*Wind + 0.000*EarthQuake
   U5  =  1.200*Dead + 1.000*Live + 1.600*Wind + 0.000*EarthQuake
   U6  =  0.900*Dead + 0.000*Live + 1.600*Wind + 0.000*EarthQuake
   U7  =  1.200*Dead + 0.000*Live - 0.800*Wind + 0.000*EarthQuake
   U8  =  1.200*Dead + 1.000*Live - 1.600*Wind + 0.000*EarthQuake
   U9  =  0.900*Dead + 0.000*Live - 1.600*Wind + 0.000*EarthQuake
   U10 =  1.200*Dead + 1.000*Live + 0.000*Wind + 1.000*EarthQuake
   U11 =  0.900*Dead + 0.000*Live + 0.000*Wind + 1.000*EarthQuake
   U12 =  1.200*Dead + 1.000*Live + 0.000*Wind - 1.000*EarthQuake
   U13 =  0.900*Dead + 0.000*Live + 0.000*Wind - 1.000*EarthQuake
```

```
Service Loads:
==============
      Load    Axial Load     Mx @ Top     Mx @ Bot     My @ Top     My @ Bot
  No. Case           kip         k-ft         k-ft         k-ft         k-ft
  --- ---- ------------ ------------ ------------ ------------ ------------
    1 Dead         497.0          0.0          0.0        497.0        497.0
      Live          45.0          0.0          0.0         45.0        930.0
      Wind           0.0          0.0          0.0          0.0          0.0
      E.Q.        ~~85.3~~0          0.0          0.0      ~~85.3~~0     ~~3016.0~~ 3263     OK

Factored Loads and Moments with Corresponding Capacities: (see user's manual for notation)
==========================================================
  NOTE: Each loading combination includes the following cases:
        First line  - at column top
        Second line - at column bottom
       Load            Pu          Mux          Muy         fMnx         fMny
  No.  Combo          kip         k-ft         k-ft         k-ft         k-ft   fMn/Mu
  --- ------ ----------- ------------ ----------- ------------ ----------- --------
    1  1 U1         695.8          0.0        695.8         -0.0      7979.6   11.468
    2               695.8          0.0       -695.8          0.0     -7979.6   11.468
    3  1 U2         668.4          0.0        668.4         -0.0      7929.9   11.864
    4               668.4          0.0      -2084.4          0.0     -7929.9    3.804
    5  1 U3         641.4          0.0        641.4         -0.0      7880.8   12.287
    6               641.4          0.0      -1526.4          0.0     -7880.8    5.163
    7  1 U4         596.4          0.0        596.4         -0.0      7798.9   13.077
    8               596.4          0.0       -596.4          0.0     -7798.9   13.077
    9  1 U5         641.4          0.0        641.4         -0.0      7880.8   12.287
   10               641.4          0.0      -1526.4          0.0     -7880.8    5.163
   11  1 U6         447.3          0.0        447.3         -0.0      7526.1   16.826
   12               447.3          0.0       -447.3          0.0     -7526.1   16.826
   13  1 U7         596.4          0.0        596.4         -0.0      7798.9   13.077
   14               596.4          0.0       -596.4          0.0     -7798.9   13.077
   15  1 U8         641.4          0.0        641.4         -0.0      7880.8   12.287
   16               641.4          0.0      -1526.4          0.0     -7880.8    5.163
   17  1 U9         447.3          0.0        447.3         -0.0      7526.1   16.826
   18               447.3          0.0       -447.3          0.0     -7526.1   16.826
   19  1 U10        726.7          0.0        726.7         -0.0      8035.7   11.058
   20               726.7          0.0      -4542.4          0.0     -8035.7    1.769
   21  1 U11        532.6          0.0        532.6         -0.0      7682.4   14.424
   22               532.6          0.0      -3463.3          0.0     -7682.4    2.218
   23  1 U12        556.1          0.0        556.1         -0.0      7725.4   13.892
   24               556.1          0.0       1489.6         -0.0      7725.4    5.186
   25  1 U13        362.0          0.0        362.0         -0.0      7365.2   20.346
   26               362.0          0.0       2568.7         -0.0      7365.2    2.867

  *** Program completed as requested! ***
```



Code: ACI 318-02

Units: English

Run axis: Biaxial

Run option: Investigation

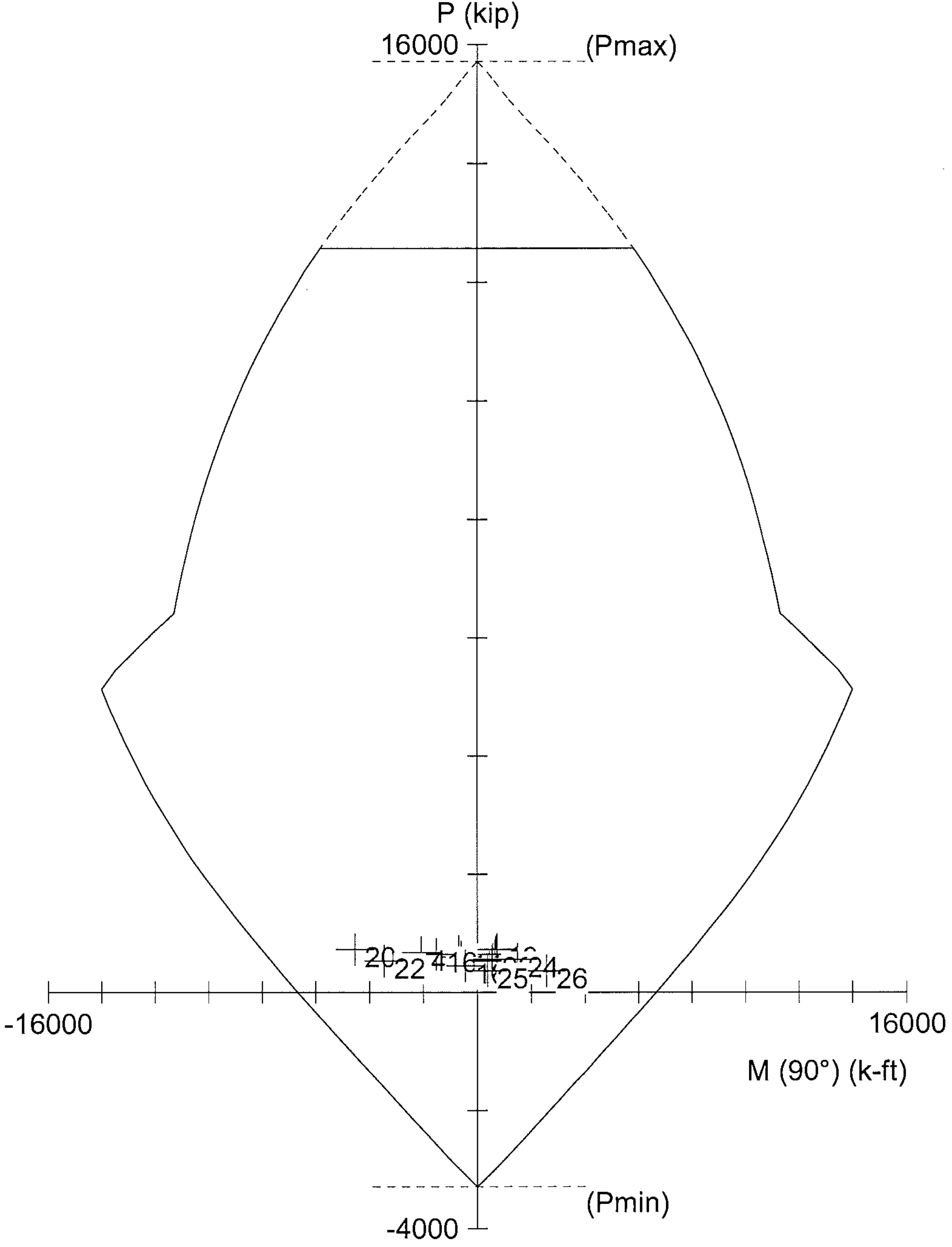
Slenderness: Not considered

Column type: Architectural

Bars: ASTM A615

Date: 10/28/11

Time: 10:08:56



pcaColumn v3.63 - Licensed to: FLSmidth

File: C:\Users\esum-us\Desktop\Pedestal Design\Column A-B.col

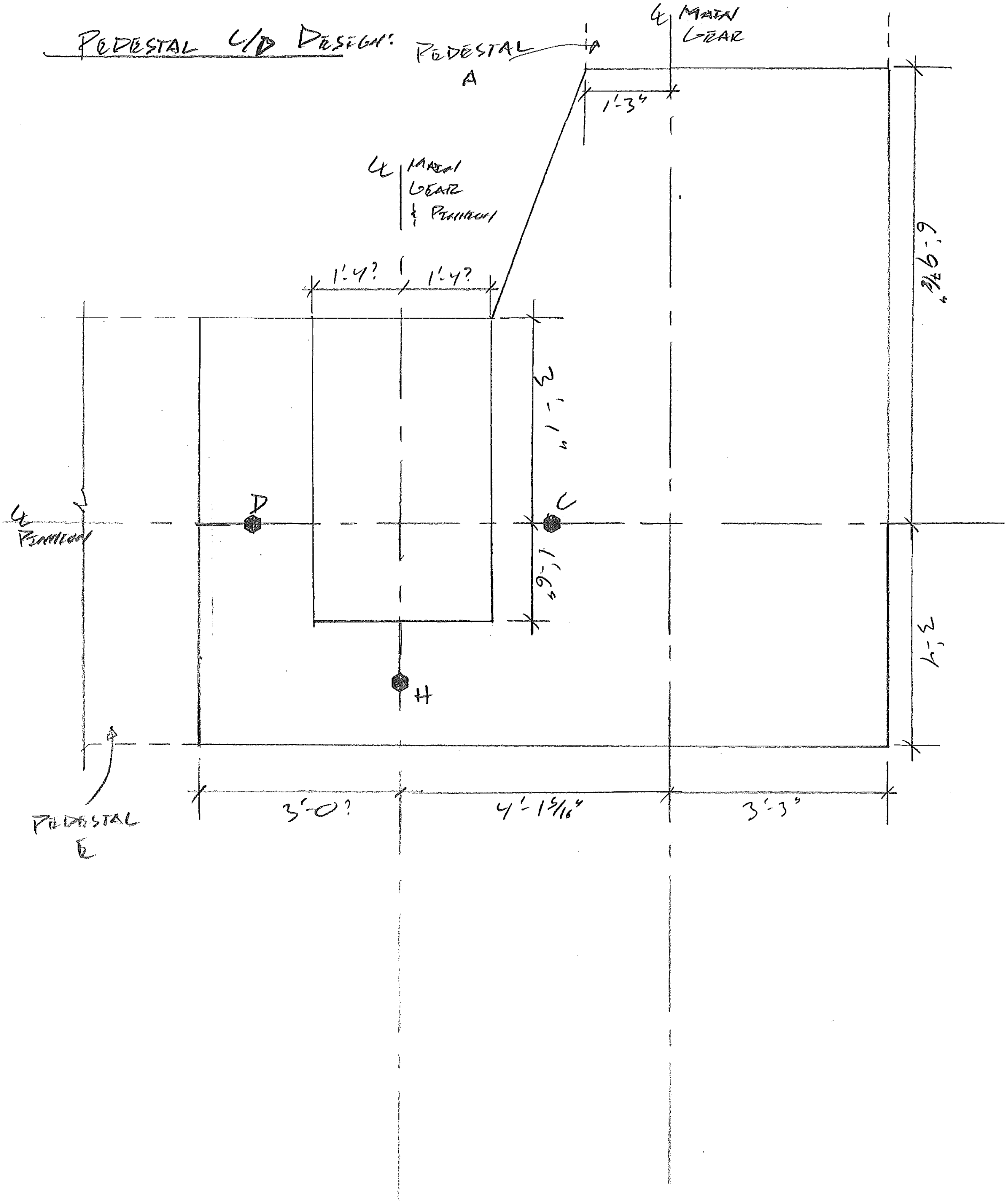
Project: CC&V High Grade Ore

Column: A/B		Engineer: ECS	
f'c = 4 ksi	fy = 60 ksi	Ag = 6156 in^2	48 #10 bars
Ec = 3605 ksi	Es = 29000 ksi	As = 60.96 in^2	Rho = 0.99%
fc = 3.4 ksi	fc = 3.4 ksi	Xo = 0.00 in	Ix = 6.66695e+006 in^4
u = 0.003 in/in		Yo = 0.00 in	Iy = 1.49591e+006 in^4
Beta1 = 0.85		Clear spacing = 5.07 in	Clear cover = 2.50 in
Confinement: Tied	phi(a) = 0.8, phi(b) = 0.9, phi(c) = 0.65		

FLSMIDTH

PROJECT CC&V HIGH GRADE ORE
SUBJECT BALL MILL FOUNDATION
PROJ NO. 11021
CALC NO. C-005
BY ECS DATE 10-28-11
CHK DATE
SHEET OF REV

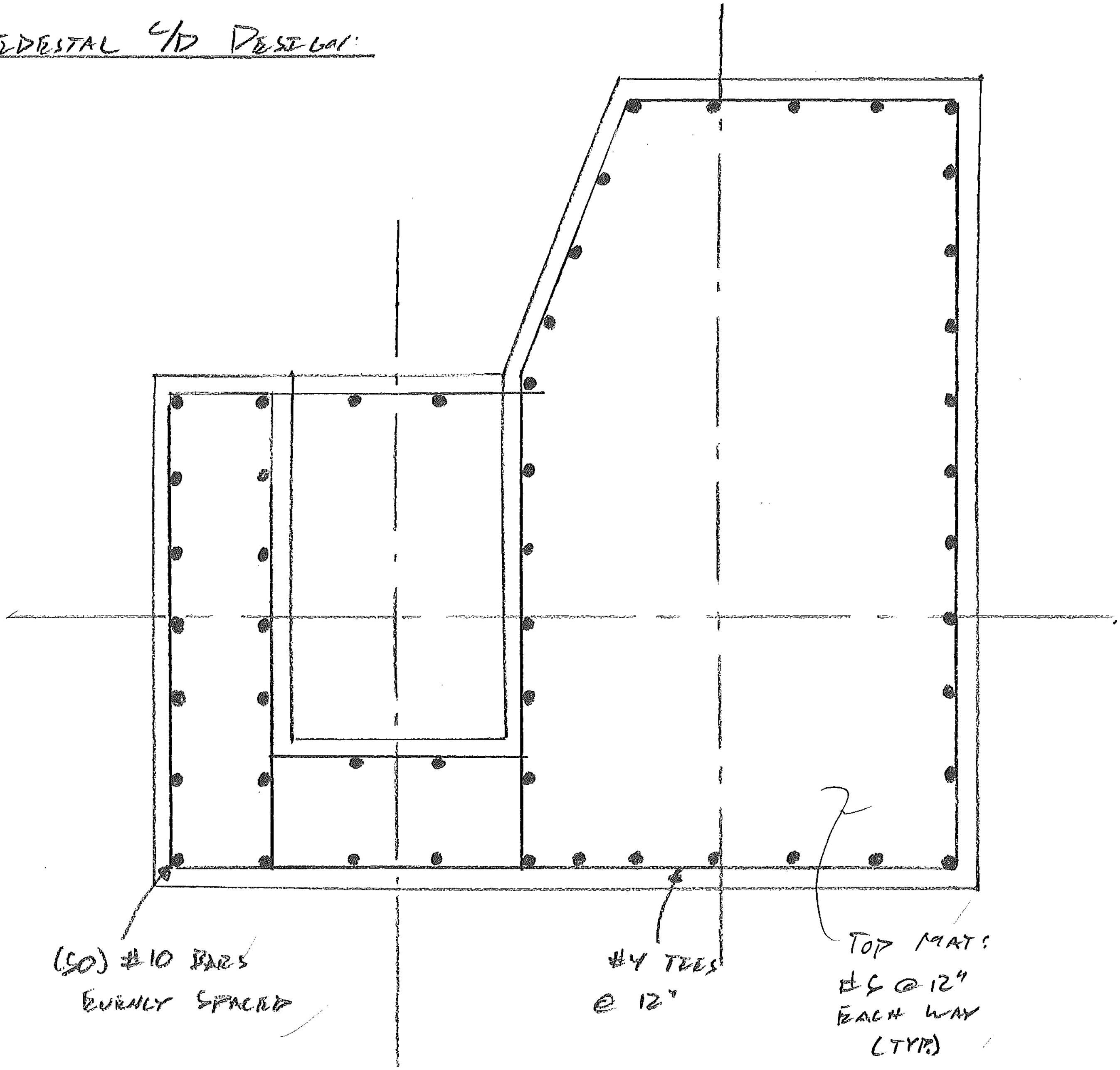
PEDESTAL C/D DESIGN:



FLSmidth

PROJECT CC & V High Grade Ore	PROJ NO. 11021		
	CALC NO. C-005		
SUBJECT Ball Mill Foundation	BY ECS	DATE 10-28-11	
	CHK	DATE	
	SHEET	OF	REV

PEDESTAL C/D DESIGN:



FLSMIDTH

Project: CC&V High Grade Ore
Subject: Rod Mill Foundation Design

Proj. No. 11021
Calc No. C-005
By: ECS **Date:** 10/28/2011
Chk: **Date:**
Sheet 1 of 1 **Rev:** 0

Concrete Pedestal Natural Period of Vibration
Pedestal C/D

Pedestal Dimensions:

$L_x := 10\text{ft} + 5\text{in} = 125\ \text{in}$	Pedestal Length X Direction
$L_y := 6\text{ft} + 5\text{in} = 77\,\text{in}$	Pedestal Length Y Direction
$H := 19\text{ft} + 8.875\text{in} = 236.875\ \text{in}$	Pedestal Height

Concrete Properties:

$\gamma_c := 145\text{pcf}$	Concrete Unit Weight
$f_c := 4000\text{psi}$	Concrete Compressive Strength
$E := 57000\text{psi}\cdot\sqrt{\frac{f_c}{\text{psi}}} = 3.605\times 10^{3}\cdot\text{ksi}$	Concrete Modulus of Elasticity

Loads and Masses:

$m := L_x\cdot L_y\cdot H\cdot\frac{\gamma_c}{g} = 1.913\times 10^{5}\cdot\text{lb}$		Pedestal Mass
$F_x := 15900\text{lb}$	$F_y := 65900\text{lb}$	Applied Mass
$m_x := F_x + 0.23m = 5.99\times 10^{4}\,\text{lb}$	$m_y := F_y + 0.23m = 1.099\times 10^{5}\,\text{lb}$	Equivalent Mass

Dynamic Properties:

$I_x := \frac{L_x^{3}\cdot L_y}{12} = 1.253\times 10^{7}\,\text{in}^{4}$	$I_y := \frac{L_x\cdot L_y^{3}}{12} = 4.756\times 10^{6}\cdot\text{in}^{4}$	Moment of Inertia
$k_x := \frac{(3\cdot E\cdot I_x)}{H^3} = 1.224\times 10^{5}\cdot\frac{\text{kip}}{\text{ft}}$	$k_y := \frac{(3\cdot E\cdot I_y)}{H^3} = 4.644\times 10^{4}\cdot\frac{\text{kip}}{\text{ft}}$	Stiffness Factor
$\omega_x := \sqrt{\frac{k_x}{0.23m}} = 299.131\cdot\text{Hz}$	$\omega_y := \sqrt{\frac{k_y}{0.23m}} = 184.265\cdot\text{Hz}$	Natural Frequency without added Mass
$\omega_{x.} := \sqrt{\frac{k_x}{m_x}} = 256.376\cdot\text{Hz}$	$\omega_{y.} := \sqrt{\frac{k_y}{m_y}} = 116.594\cdot\text{Hz}$	Natural Frequency with added Mass

FLSMIDTH

PROJECT	CC&V High Grade Ore	PROJ NO.	11021		
		CALC NO.	C-005		
SCOPE	Ball Mill Foundation	BY	ECS	DATE	28-Oct-11
		CHK		DATE	
		SHEET		OF	REV

Pedestal C/D Loading

Pedestal Height (ft): 19.67

Load Locations:

Using CL Main Gear & CL Pinnion as Axis Origin

	X (ft)	Y (ft)
Pedestal Center of Gravity	1.15	0.12

Location	Coordinates		Eccentricity	
	X (ft)	Y (ft)	e_x (ft)	e_y (ft)
C	2.20	0.00	1.05	-0.12
D	-2.20	0.00	-3.35	-0.12
H	0.00	2.50	-1.15	2.38

Dead Load:

Location	F_x (kip)	F_y (kip)	F_z (kip)	M_x (k*ft)		M_y (k*ft)	
				Top	Bot	Top	Bot
C	0.0	0.0	4.5	-0.5	-0.5	4.7	4.7
D	0.0	0.0	8.6	-1.0	-1.0	-28.8	-28.8
H	0.0	0.0	8.8	20.9	20.9	-10.1	-10.1
Result	**0.0**	**0.0**	**21.9**	**19.4**	**19.4**	**-34.2**	**-34.2**

Live Load:

Location	F_x (kip)	F_y (kip)	F_z (kip)	M_x (k*ft)		M_y (k*ft)	
				Top	Bot	Top	Bot
C	0.0	-30.4	-40.8	4.9	-593.1	-42.8	-42.8
D	-15.9	-35.5	-39.6	4.8	-693.5	132.7	-179.7
H	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Result	**-15.9**	**-65.9**	**-80.4**	**9.6**	**-1286.6**	**89.8**	**-222.5**

```
        OOOOOOO   OOOOO    OOOOO    OOOOO    OOOOO   OO
        OO   OO  OO   OO  OO   OO  OO   OO  OO   OO  OO
        OO   OO  OO   OO  OO   OO  OO   OO  OO   OO  OO
        OO   OO  OO       OO   OO  OO       OO   OO  OO
        OO   OO  OO       OOOOOOO  OO       OO   OO  OO
        OOOOOOO  OO   OO  OO   OO  OO   OO  OO   OO  OO
        OO       OO   OO  OO   OO  OO   OO  OO   OO  OO
        OO        OOOOO   OO   OO   OOOOO    OOOOO   OOOOO   (TM)



========================================================================
Computer program for the Strength Design of Reinforced Concrete Sections
========================================================================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with the use of the pcaColumn(tm) program.
```

```
 General Information:
 ====================
    File Name: C:\Users\esum-us\Desktop\Pedestal Design\Column C-D.col
    Project:  CC&V High Grade Ore
    Column:   A/B                           Engineer: ECS
    Code:     ACI 318-02                    Units: English

    Run Option: Investigation               Slenderness: Not considered
    Run Axis:   Biaxial                     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:
 ========
    Rectangular: Width = 125 in             Depth = 77 in

    Gross section area, Ag =  9625 in^2
    Ix =  4.75555e+006 in^4                 Iy =  1.25326e+007 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)
    ---- --------- -----------   ---- --------- -----------   ---- --------- -----------
    #  3      0.38        0.11   #  4      0.50        0.20   #  5      0.63        0.31
    #  6      0.75        0.44   #  7      0.88        0.60   #  8      1.00        0.79
    #  9      1.13        1.00   # 10      1.27        1.27   # 11      1.41        1.56
    # 14      1.69        2.25   # 18      2.26        4.00

    Confinement: Tied; #3 ties with #7 bars,  #4 with larger bars.
    phi(a) = 0.8,  phi(b) = 0.9,  phi(c) = 0.65

    Layout: Rectangular
    Pattern: Equal Bar Spacing  (Cover to transverse reinforcement)
    Total steel area, As = 55.88 in^2 at 0.58%
    44 #10   Cover = 2 in

 Load Combinations:
 ==================
    U1  =  1.400*Dead + 0.000*Live + 0.000*Wind + 0.000*EarthQuake
    U2  =  1.200*Dead + 1.600*Live + 0.000*Wind + 0.000*EarthQuake
    U3  =  1.200*Dead + 1.000*Live + 0.000*Wind + 0.000*EarthQuake
    U4  =  1.200*Dead + 0.000*Live + 0.800*Wind + 0.000*EarthQuake
    U5  =  1.200*Dead + 1.000*Live + 1.600*Wind + 0.000*EarthQuake
    U6  =  0.900*Dead + 0.000*Live + 1.600*Wind + 0.000*EarthQuake
    U7  =  1.200*Dead + 0.000*Live - 0.800*Wind + 0.000*EarthQuake
    U8  =  1.200*Dead + 1.000*Live - 1.600*Wind + 0.000*EarthQuake
    U9  =  0.900*Dead + 0.000*Live - 1.600*Wind + 0.000*EarthQuake
    U10 =  1.200*Dead + 1.000*Live + 0.000*Wind + 1.000*EarthQuake
    U11 =  0.900*Dead + 0.000*Live + 0.000*Wind + 1.000*EarthQuake
    U12 =  1.200*Dead + 1.000*Live + 0.000*Wind - 1.000*EarthQuake
    U13 =  0.900*Dead + 0.000*Live + 0.000*Wind - 1.000*EarthQuake
```

```
  Service Loads:
  ==============
          Load   Axial Load      Mx @ Top      Mx @ Bot      My @ Top      My @ Bot
     No.  Case          kip          k-ft          k-ft          k-ft          k-ft
     --- ---- ------------ ------------ ------------ ------------ ------------
       1  Dead         21.9          19.4          19.4         -34.2         -34.2
          Live        -80.4           9.6       -1286.6          89.8        -222.5
          Wind          0.0           0.0           0.0           0.0           0.0
          E.Q.          0.0           0.0           0.0           0.0           0.0

  Factored Loads and Moments with Corresponding Capacities: (see user's manual for notation)
  =========================================================
     NOTE: Each loading combination includes the following cases:
           First line  - at column top
           Second line - at column bottom
           Load          Pu          Mux          Muy         fMnx         fMny
     No.  Combo         kip         k-ft         k-ft         k-ft         k-ft   fMn/Mu
     --- ------ ----------- ----------- ----------- ----------- ----------- --------
       1  1 U1         30.7         27.2        -47.9       6940.1    -12234.7  255.528
       2               30.7        -27.2         47.9      -6940.1     12234.7  255.528
       3  1 U2       -102.4         38.6        102.6       4950.3     13149.7  128.114
       4             -102.4       2035.3        397.0       8633.3      1684.2    4.242
       5  1 U3        -54.1         32.9         48.8       7396.6     10968.9  224.957
       6              -54.1       1263.3        263.5       8762.6      1828.0    6.936
       7  1 U4         26.3         23.3        -41.0       6932.0    -12220.4  297.768
       8               26.3        -23.3         41.0      -6932.0     12220.4  297.768
       9  1 U5        -54.1         32.9         48.8       7396.6     10968.9  224.957
      10              -54.1       1263.3        263.5       8762.6      1828.0    6.936
      11  1 U6         19.7         17.5        -30.8       6919.9    -12198.9  396.327
      12               19.7        -17.5         30.8      -6919.9     12198.9  396.327
      13  1 U7         26.3         23.3        -41.0       6932.0    -12220.4  297.768
      14               26.3        -23.3         41.0      -6932.0     12220.4  297.768
      15  1 U8        -54.1         32.9         48.8       7396.6     10968.9  224.957
      16              -54.1       1263.3        263.5       8762.6      1828.0    6.936
      17  1 U9         19.7         17.5        -30.8       6919.9    -12198.9  396.327
      18               19.7        -17.5         30.8      -6919.9     12198.9  396.327
      19  1 U10       -54.1         32.9         48.8       7396.6     10968.9  224.957
      20              -54.1       1263.3        263.5       8762.6      1828.0    6.936
      21  1 U11        19.7         17.5        -30.8       6919.9    -12198.9  396.327
      22               19.7        -17.5         30.8      -6919.9     12198.9  396.327
      23  1 U12       -54.1         32.9         48.8       7396.6     10968.9  224.957
      24              -54.1       1263.3        263.5       8762.6      1828.0    6.936
      25  1 U13        19.7         17.5        -30.8       6919.9    -12198.9  396.327
      26               19.7        -17.5         30.8      -6919.9     12198.9  396.327

    *** Program completed as requested! ***
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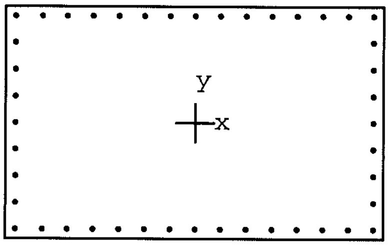


125 x 77 in

Code: ACI 318-02

Units: English

Run axis: Biaxial

Run option: Investigation

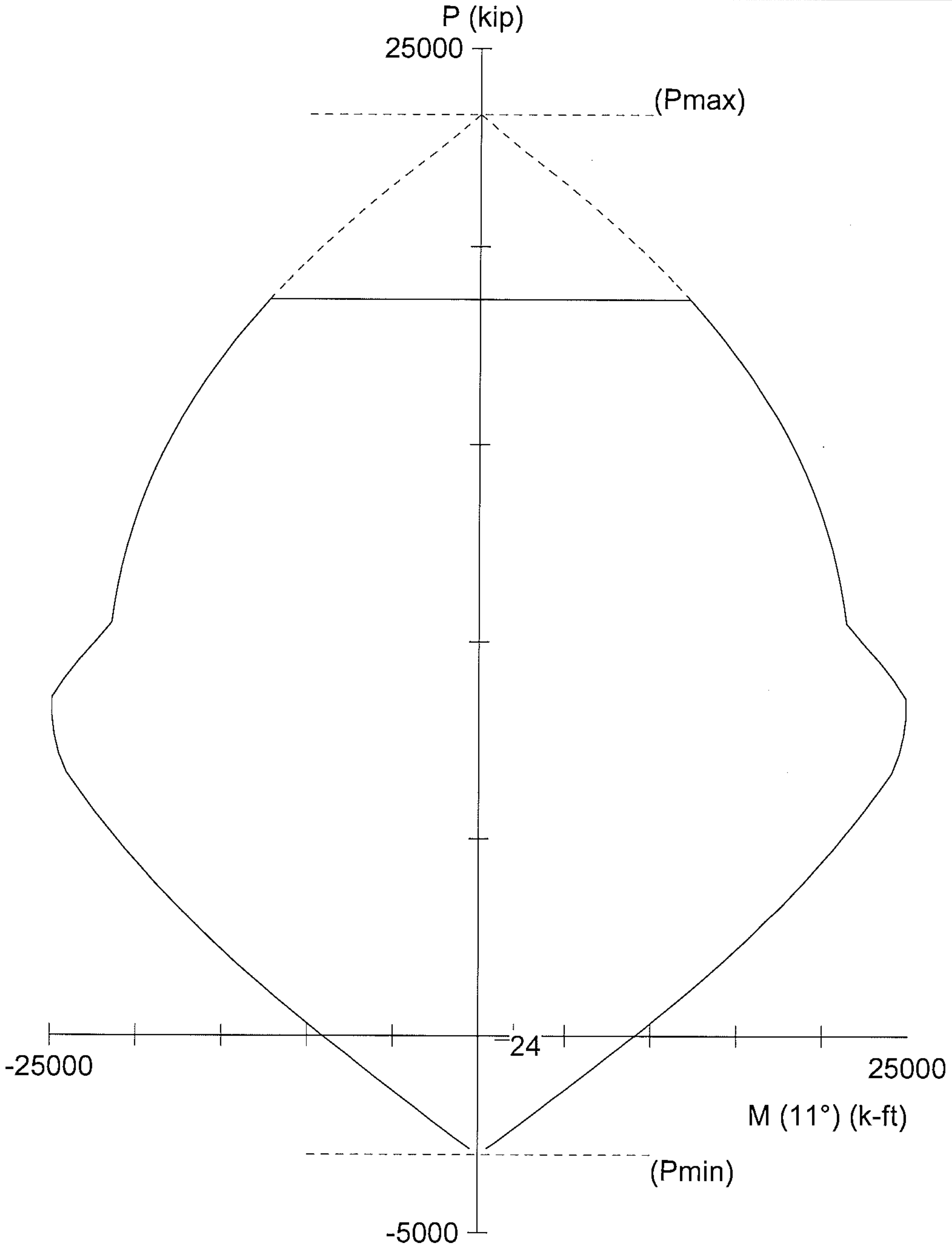
Slenderness: Not considered

Column type: Structural

Bars: ASTM A615

Date: 10/28/11

Time: 12:23:54



pcaColumn v3.63 - Licensed to: FLSmidth

File: C:\Users\esum-us\Desktop\Pedestal Design\Column C-D.col

Project: CC&V High Grade Ore

Column: A/B
Engineer: ECS

f'c = 4 ksi
fy = 60 ksi
Ag = 9625 in^2
44 #10 bars

Ec = 3605 ksi
Es = 29000 ksi
As = 55.88 in^2
Rho = 0.58%

fc = 3.4 ksi
fc = 3.4 ksi
Xo = 0.00 in
Ix = 4.75555e+006 in^4

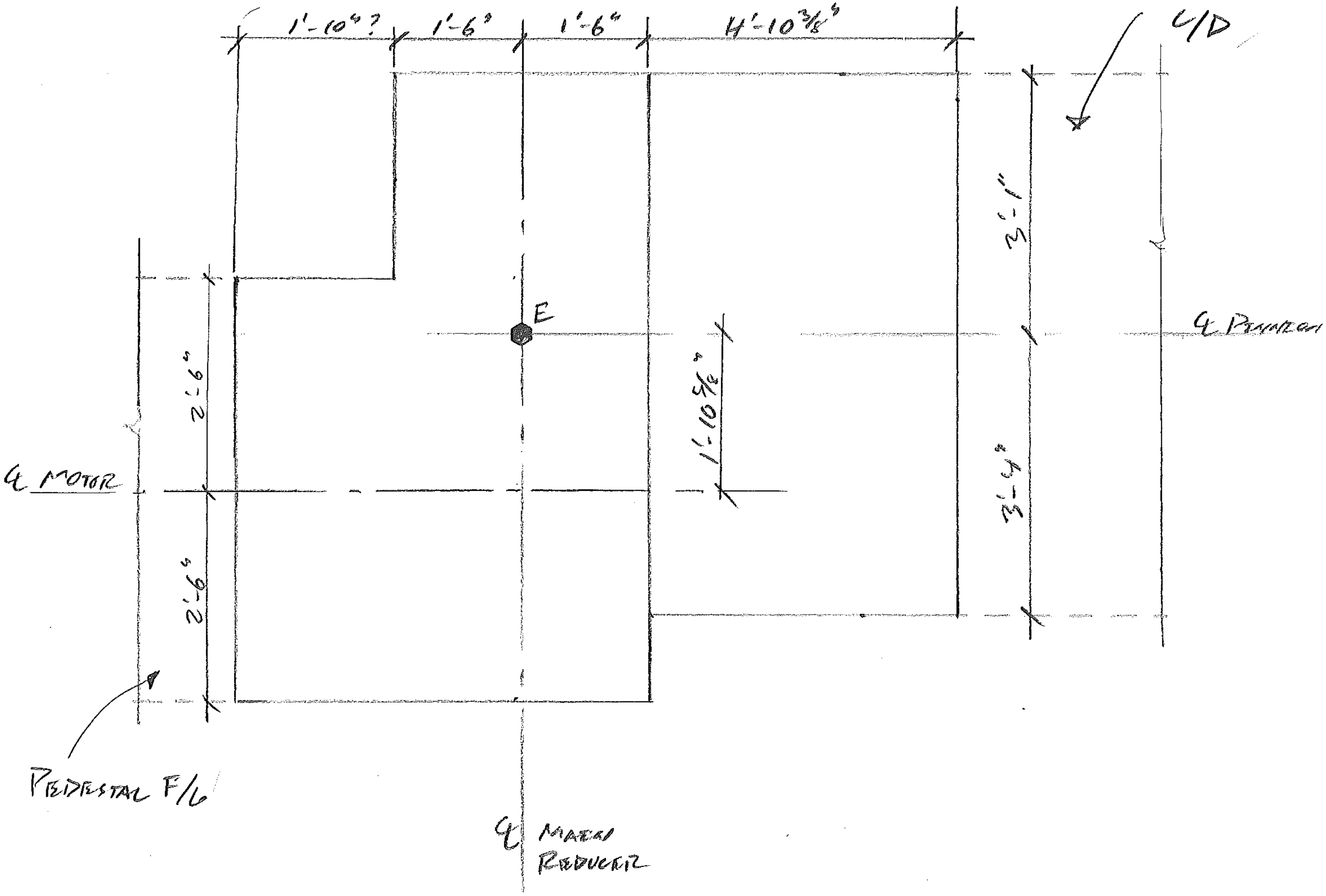
= 0.003 in/in
Yo = 0.00 in
Iy = 1.25326e+007 in^4

Beta1 = 0.85
Clear spacing = 7.21 in
Clear cover = 2.50 in

Confinement: Tied
phi(a) = 0.8, phi(b) = 0.9, phi(c) = 0.65

FLSMIDTH	PROJECT CC&V High Grade Ore	PROJ NO. 11021 CALC NO. C-005
	SUBJECT Ball Mill Foundation	BY ECS DATE 10-28-11 CHK DATE SHEET OF REV

PEDESTAL E DESIGN:

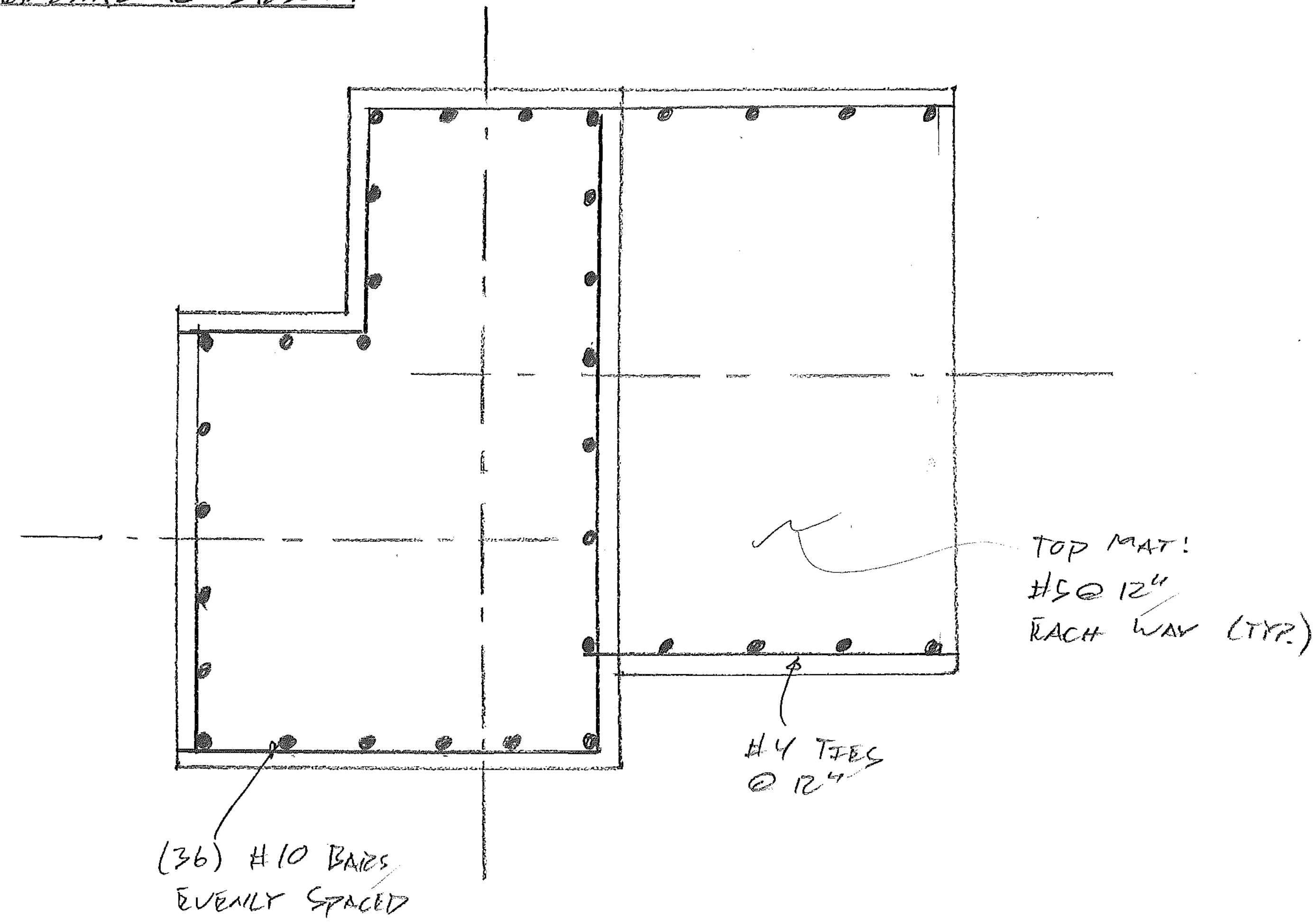


FLSMIDTH

PROJECT CC & V HIGH GRADE ORE
SUBJECT BALL MILL FOUNDATION

PROJ NO. 11021
CALC NO. C-005
BY GCS DATE 10.28.11
CHK DATE
SHEET OF REV

PEDESTAL E DESIGN:



FLSmidth

Project: CC&V High Grade Ore
Subject: Rod Mill Foundation Design

Proj. No. 11021
Calc No. C-005
By: ECS **Date:**10/28/2011
Chk: **Date:**
Sheet 1 of 1 **Rev:** 0

Concrete Pedestal Natural Period of Vibration
Pedestal E

Pedestal Dimensions:

$L_x := 9ft + 6.3125in = 114.313\ in$ Pedestal Length X Direction

$L_y := 6ft + 5in = 77\ in$ Pedestal Length Y Direction

$H := 18ft + 5.125in = 221.125\ in$ Pedestal Height

Concrete Properties:

$\gamma_c := 145pcf$ Concrete Unit Weight

$f_c := 4000psi$ Concrete Compressive Strength

$E := 57000psi \cdot \sqrt{\frac{f_c}{psi}} = 3.605 \times 10^3 \cdot ksi$ Concrete Modulus of Elasticity

Loads and Masses:

$m := L_x \cdot L_y \cdot H \cdot \frac{\gamma_c}{g} = 1.633 \times 10^5 \cdot lb$ Pedestal Mass

$F_x := 0lb$ $F_y := 0lb$ Applied Mass

$m_x := F_x + 0.23m = 3.756 \times 10^4\ lb$ $m_y := F_y + 0.23m = 3.756 \times 10^4\ lb$ Equivalent Mass

Dynamic Properties:

$I_x := \frac{L_x^3 \cdot L_y}{12} = 9.585 \times 10^6\ in^4$ $I_y := \frac{L_x \cdot L_y^3}{12} = 4.349 \times 10^6 \cdot in^4$ Moment of Inertia

$k_x := \frac{(3 \cdot E \cdot I_x)}{H^3} = 1.15 \times 10^5 \cdot \frac{kip}{ft}$ $k_y := \frac{(3 \cdot E \cdot I_y)}{H^3} = 5.22 \times 10^4 \cdot \frac{kip}{ft}$ Stiffness Factor

$\omega_x := \sqrt{\frac{k_x}{0.23m}} = 313.912 \cdot Hz$ $\omega_y := \sqrt{\frac{k_y}{0.23m}} = 211.449 \cdot Hz$ Natural Frequency without added Mass

$\omega_{x.} := \sqrt{\frac{k_x}{m_x}} = 313.912 \cdot Hz$ $\omega_{y.} := \sqrt{\frac{k_y}{m_y}} = 211.449 \cdot Hz$ Natural Frequency with added Mass

```
        OOOOOOO    OOOOO    OOOOO    OOOOO    OOOOO   OO
        OO    OO  OO   OO  OO   OO  OO   OO  OO   OO  OO
        OO    OO  OO   OO  OO   OO  OO   OO  OO   OO  OO
        OO    OO  OO       OO   OO  OO       OO   OO  OO
        OO    OO  OO       OOOOOOO  OO       OO   OO  OO
        OOOOOOO   OO   OO  OO   OO  OO   OO  OO   OO  OO
        OO        OO   OO  OO   OO  OO   OO  OO   OO  OO
        OO         OOOOO   OO   OO   OOOOO    OOOOO   OOOOO  (TM)



========================================================================
Computer program for the Strength Design of Reinforced Concrete Sections
========================================================================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design  and  engineering documents  is the licensees.  Accordingly,  PCA
disclaims all responsibility in contract, negligence  or other  tort for
any  analysis, design or  engineering  documents prepared in  connection
with the use of the pcaColumn(tm) program.
```
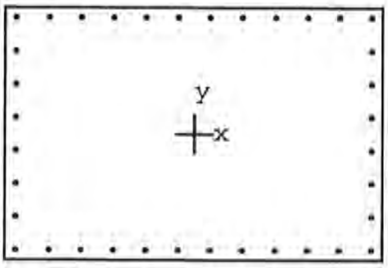

```
  General Information:
  ====================
     File Name: C:\Users\esum-us\Desktop\Pedestal Design\Column E.col
     Project:  CC&V High Grade Ore
     Column:   A/B                             Engineer: ECS
     Code:     ACI 318-02                      Units: English

     Run Option: Investigation                 Slenderness: Not considered
     Run Axis:   Biaxial                       Column Type: Architectural

  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:
  ========
     Rectangular: Width = 114.313 in           Depth = 77 in

     Gross section area, Ag =  8802.1 in^2
     Ix =  4.34897e+006 in^4                   Iy =  9.58509e+006 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)
     ---- --------- -----------    ---- --------- -----------    ---- --------- -----------
     #  3      0.38        0.11    #  4      0.50        0.20    #  5      0.63        0.31
     #  6      0.75        0.44    #  7      0.88        0.60    #  8      1.00        0.79
     #  9      1.13        1.00    # 10      1.27        1.27    # 11      1.41        1.56
     # 14      1.69        2.25    # 18      2.26        4.00

     Confinement: Tied; #3 ties with #7 bars,  #4 with larger bars.
     phi(a) = 0.8,  phi(b) = 0.9,  phi(c) = 0.65

     Layout: Rectangular
     Pattern: Equal Bar Spacing  (Cover to transverse reinforcement)
     Total steel area, As = 45.72 in^2 at 0.52%
     36 #10   Cover = 2 in

  Load Combinations:
  ==================
     U1  =  1.400*Dead + 0.000*Live + 0.000*Wind + 0.000*EarthQuake
     U2  =  1.200*Dead + 1.600*Live + 0.000*Wind + 0.000*EarthQuake
     U3  =  1.200*Dead + 1.000*Live + 0.000*Wind + 0.000*EarthQuake
     U4  =  1.200*Dead + 0.000*Live + 0.800*Wind + 0.000*EarthQuake
     U5  =  1.200*Dead + 1.000*Live + 1.600*Wind + 0.000*EarthQuake
     U6  =  0.900*Dead + 0.000*Live + 1.600*Wind + 0.000*EarthQuake
     U7  =  1.200*Dead + 0.000*Live - 0.800*Wind + 0.000*EarthQuake
     U8  =  1.200*Dead + 1.000*Live - 1.600*Wind + 0.000*EarthQuake
     U9  =  0.900*Dead + 0.000*Live - 1.600*Wind + 0.000*EarthQuake
     U10 =  1.200*Dead + 1.000*Live + 0.000*Wind + 1.000*EarthQuake
     U11 =  0.900*Dead + 0.000*Live + 0.000*Wind + 1.000*EarthQuake
     U12 =  1.200*Dead + 1.000*Live + 0.000*Wind - 1.000*EarthQuake
     U13 =  0.900*Dead + 0.000*Live + 0.000*Wind - 1.000*EarthQuake
```

```
  Service Loads:
  ==============
         Load   Axial Load      Mx @ Top      Mx @ Bot      My @ Top      My @ Bot
     No. Case          kip          k-ft          k-ft          k-ft          k-ft
     --- ---- ------------ ------------ ------------ ------------ ------------
       1 Dead         13.0           0.0           0.0           0.0           0.0
         Live         33.9           0.0           0.0           0.0           0.0
         Wind          0.0           0.0           0.0           0.0           0.0
         E.Q.          0.0           0.0           0.0           0.0           0.0
       2 Dead         13.0           0.0           0.0           0.0           0.0
         Live        -33.9           0.0           0.0           0.0           0.0
         Wind          0.0           0.0           0.0           0.0           0.0
         E.Q.          0.0           0.0           0.0           0.0           0.0

  Factored Loads and Moments with Corresponding Capacities: (see user's manual for notation)
  =========================================================
     NOTE: Each loading combination includes the following cases:
           First line  - at column top
           Second line - at column bottom
          Load            Pu         Mux         Muy        fMnx        fMny
     No.  Combo          kip        k-ft        k-ft        k-ft        k-ft   fMn/Mu
     --- ------- ----------- ----------- ----------- ----------- ----------- --------
       1  1 U1          18.2         0.0         0.0      7351.9         0.0  999.999
       2                18.2         0.0         0.0      7351.9         0.0  999.999
       3  1 U2          69.9         0.0         0.0      7496.5         0.0  999.999
       4                69.9         0.0         0.0      7496.5         0.0  999.999
       5  1 U3          49.5         0.0         0.0      7439.6         0.0  999.999
       6                49.5         0.0         0.0      7439.6         0.0  999.999
       7  1 U4          15.6         0.0         0.0      7344.6         0.0  999.999
       8                15.6         0.0         0.0      7344.6         0.0  999.999
       9  1 U5          49.5         0.0         0.0      7439.6         0.0  999.999
      10                49.5         0.0         0.0      7439.6         0.0  999.999
      11  1 U6          11.7         0.0         0.0      7333.6         0.0  999.999
      12                11.7         0.0         0.0      7333.6         0.0  999.999
      13  1 U7          15.6         0.0         0.0      7344.6         0.0  999.999
      14                15.6         0.0         0.0      7344.6         0.0  999.999
      15  1 U8          49.5         0.0         0.0      7439.6         0.0  999.999
      16                49.5         0.0         0.0      7439.6         0.0  999.999
      17  1 U9          11.7         0.0         0.0      7333.6         0.0  999.999
      18                11.7         0.0         0.0      7333.6         0.0  999.999
      19  1 U10         49.5         0.0         0.0      7439.6         0.0  999.999
      20                49.5         0.0         0.0      7439.6         0.0  999.999
      21  1 U11         11.7         0.0         0.0      7333.6         0.0  999.999
      22                11.7         0.0         0.0      7333.6         0.0  999.999
      23  1 U12         49.5         0.0         0.0      7439.6         0.0  999.999
      24                49.5         0.0         0.0      7439.6         0.0  999.999
      25  1 U13         11.7         0.0         0.0      7333.6         0.0  999.999
      26                11.7         0.0         0.0      7333.6         0.0  999.999
      27  2 U1          18.2         0.0         0.0      7351.9         0.0  999.999
      28                18.2         0.0         0.0      7351.9         0.0  999.999
      29  2 U2         -38.7         0.0         0.0      7192.0         0.0  999.999
      30               -38.7         0.0         0.0      7192.0         0.0  999.999
      31  2 U3         -18.3         0.0         0.0      7249.4         0.0  999.999
      32               -18.3         0.0         0.0      7249.4         0.0  999.999
      33  2 U4          15.6         0.0         0.0      7344.6         0.0  999.999
      34                15.6         0.0         0.0      7344.6         0.0  999.999
      35  2 U5         -18.3         0.0         0.0      7249.4         0.0  999.999
      36               -18.3         0.0         0.0      7249.4         0.0  999.999
      37  2 U6          11.7         0.0         0.0      7333.6         0.0  999.999
      38                11.7         0.0         0.0      7333.6         0.0  999.999
      39  2 U7          15.6         0.0         0.0      7344.6         0.0  999.999
      40                15.6         0.0         0.0      7344.6         0.0  999.999
      41  2 U8         -18.3         0.0         0.0      7249.4         0.0  999.999
      42               -18.3         0.0         0.0      7249.4         0.0  999.999
```

```
     43  2 U9        11.7         0.0          0.0       7333.6          0.0  999.999
     44              11.7         0.0          0.0       7333.6          0.0  999.999
     45  2 U10      -18.3         0.0          0.0       7249.4          0.0  999.999
     46             -18.3         0.0          0.0       7249.4          0.0  999.999
     47  2 U11       11.7         0.0          0.0       7333.6          0.0  999.999
     48              11.7         0.0          0.0       7333.6          0.0  999.999
     49  2 U12      -18.3         0.0          0.0       7249.4          0.0  999.999
     50             -18.3         0.0          0.0       7249.4          0.0  999.999
     51  2 U13       11.7         0.0          0.0       7333.6          0.0  999.999
     52              11.7         0.0          0.0       7333.6          0.0  999.999

    *** Program completed as requested! ***
```



114.313 x 77 in

Code: ACI 318-02

Units: English

Run axis: Biaxial

Run option: Investigation

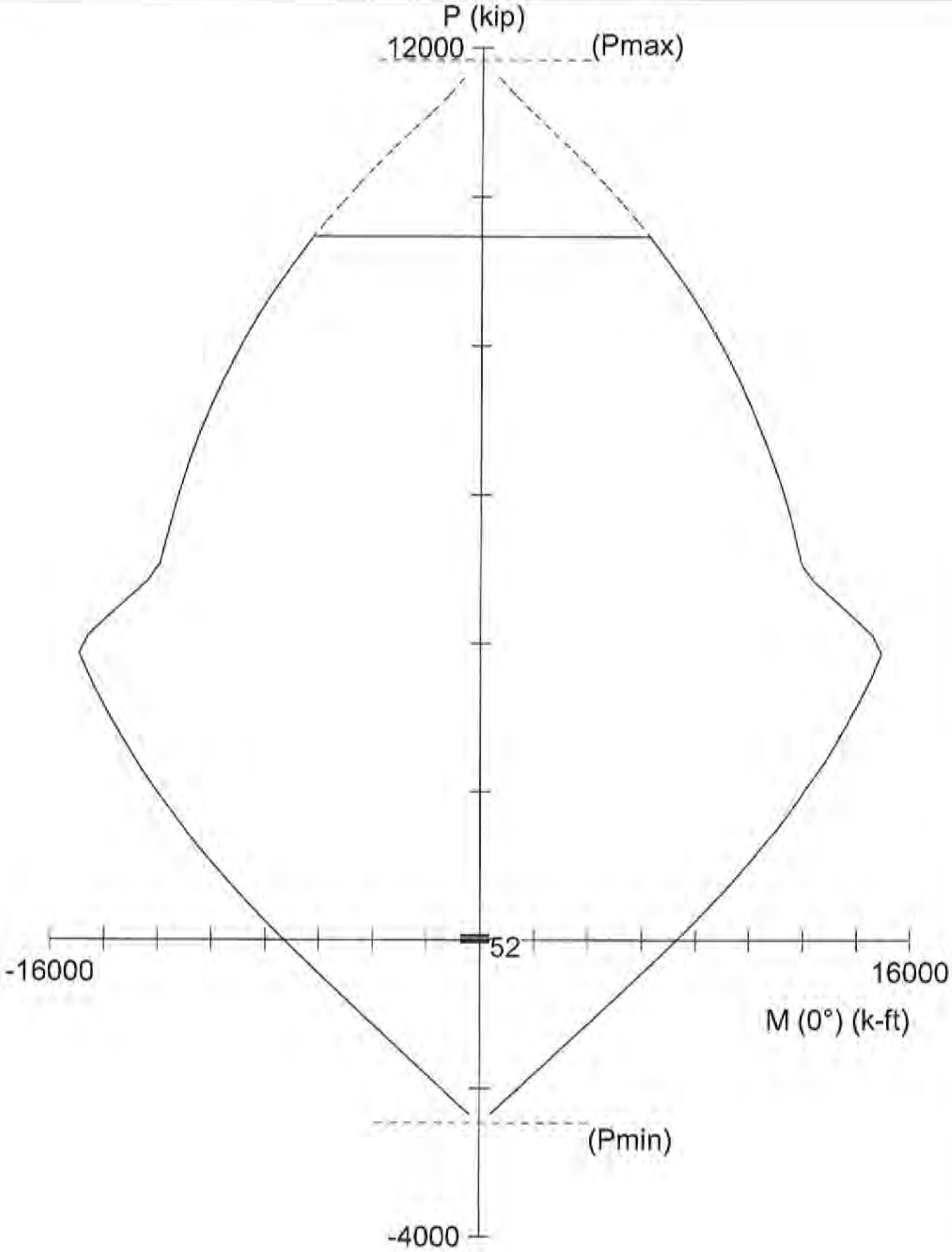
Slenderness: Not considered

Column type: Architectural

Bars: ASTM A615

Date: 10/28/11

Time: 12:59:24



pcaColumn v3.63 - Licensed to: FLSmidth

File: C:\Users\esum-us\Desktop\Pedestal Design\Column E.col

Project: CC&V High Grade Ore

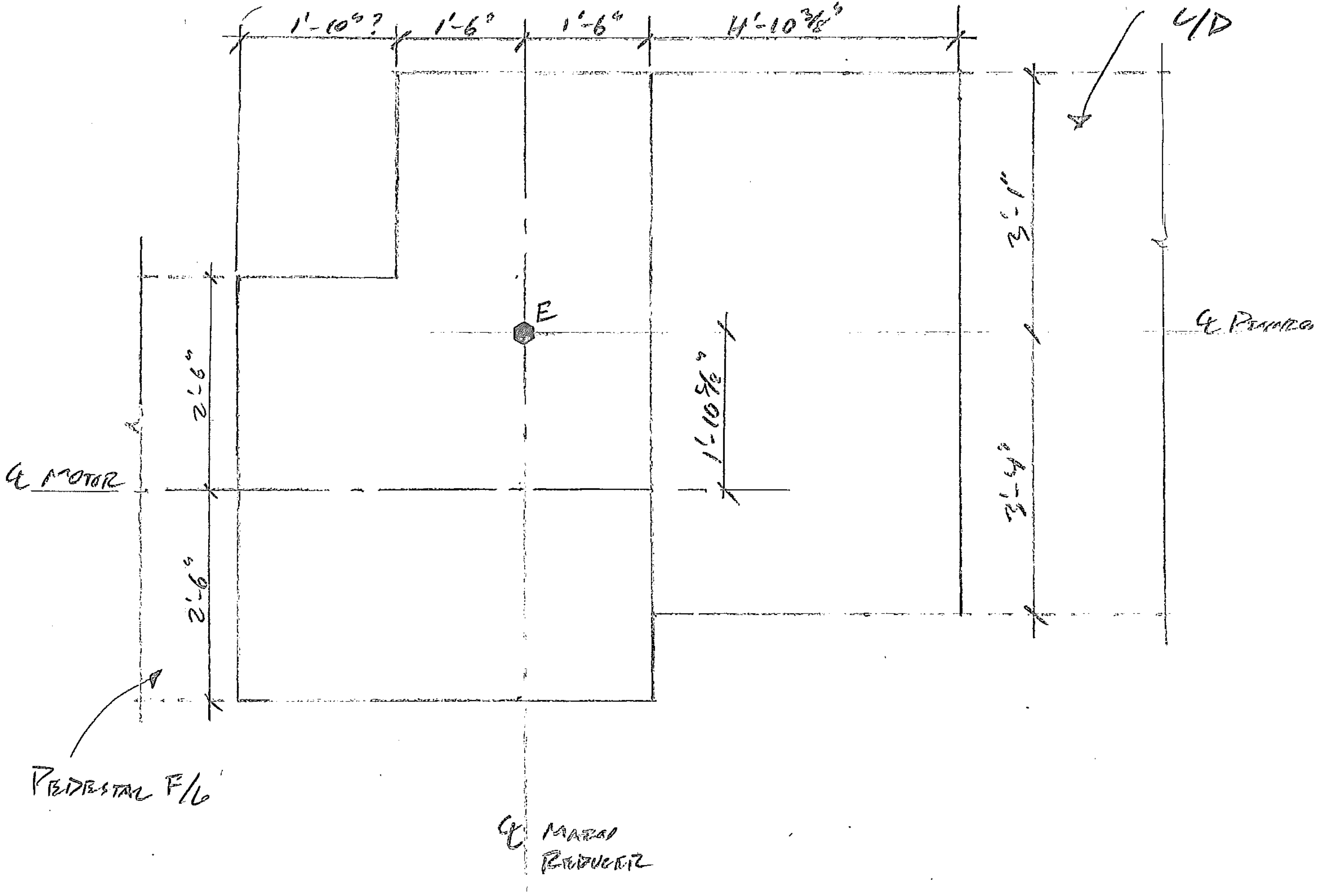
Column: A/B		Engineer: ECS	
f'c = 4 ksi	fy = 60 ksi	Ag = 8802.1 in^2	36 #10 bars
Ec = 3605 ksi	Es = 29000 ksi	As = 45.72 in^2	Rho = 0.52%
fc = 3.4 ksi	fc = 3.4 ksi	Xo = 0.00 in	Ix = 4.34897e+006 in^4
ı = 0.003 in/in		Yo = 0.00 in	Iy = 9.58509e+006 in^4
Beta1 = 0.85		Clear spacing = 8.55 in	Clear cover = 2.50 in
Confinement: Tied	phi(a) = 0.8, phi(b) = 0.9, phi(c) = 0.65		

FLSMIDTH

PROJECT CC&V High Grade Ore
SUBJECT Ball Mill Foundation

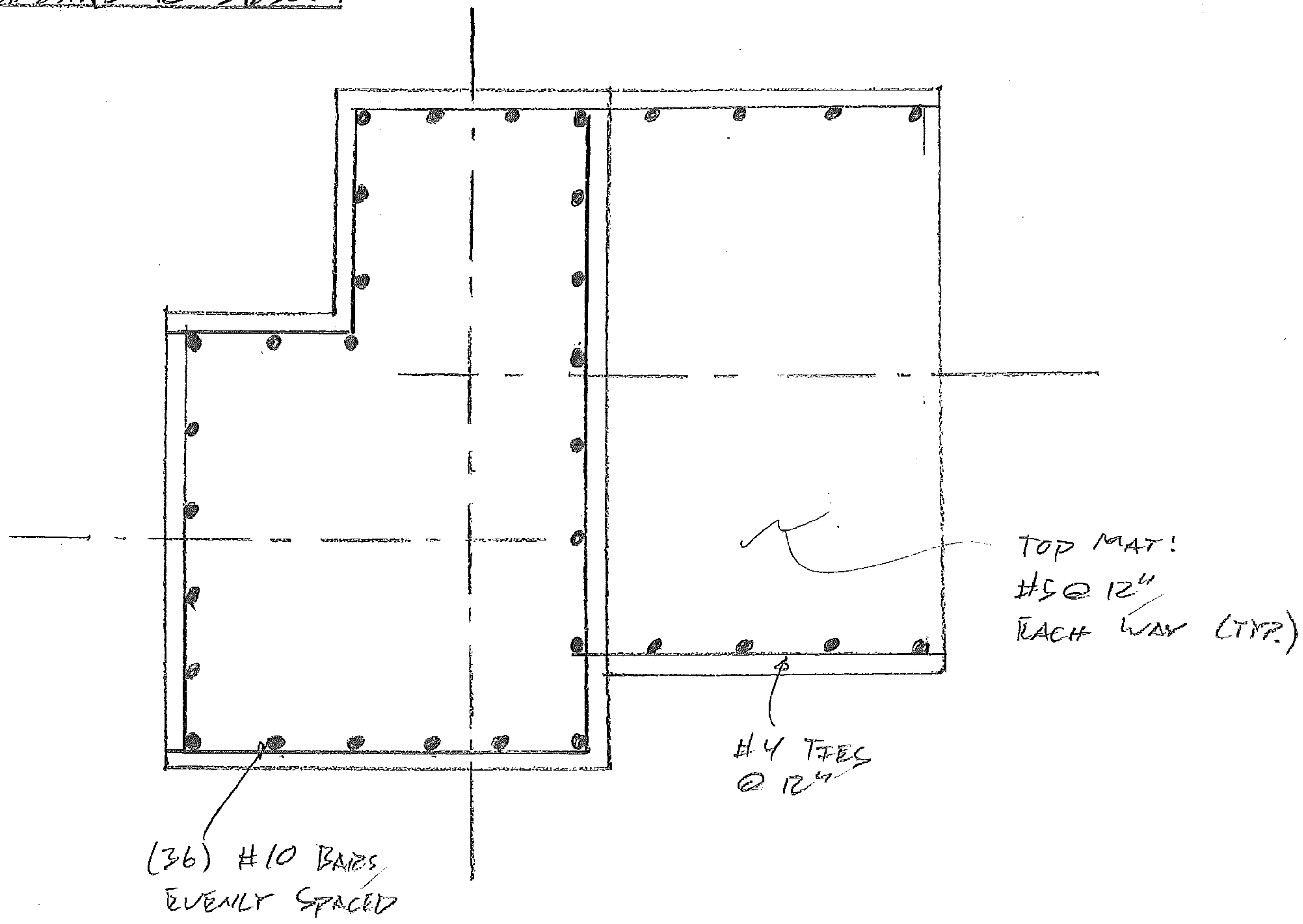
PROJ NO. 11021
CALC NO. C-005
BY ECS DATE 10-28-11
CHK DATE
SHEET OF REV

PEDESTAL E DESIGN:



FLSMIDTH	PROJECT CC&V HIGH GRADE ORE	PROJ NO. 11021 CALC NO. C-005
	SUBJECT BALL MILL FOUNDATION	BY GCS DATE 10-28-11 CHK DATE SHEET OF REV

PEDESTAL E DESIGN:



TOP MAT: #5 @ 12" EACH WAY (TYP.)

#4 TIES @ 12"

(36) #10 BARS EVENLY SPACED

FLSmidth

Project: CC&V High Grade Ore
Subject: Rod Mill Foundation Design

Proj. No. 11021
Calc No. C-005
By: ECS **Date:**10/28/2011
Chk: **Date:**
Sheet 1 of 1 **Rev:** 0

Concrete Pedestal Natural Period of Vibration
Pedestal E

Pedestal Dimensions:

$L_x := 9ft + 6.3125in = 114.313\ in$ Pedestal Length X Direction

$L_y := 6ft + 5in = 77\ in$ Pedestal Length Y Direction

$H := 18ft + 5.125in = 221.125\ in$ Pedestal Height

Concrete Properties:

$\gamma_c := 145pcf$ Concrete Unit Weight

$f_c := 4000psi$ Concrete Compressive Strength

$E := 57000psi \cdot \sqrt{\frac{f_c}{psi}} = 3.605 \times 10^3 \cdot ksi$ Concrete Modulus of Elasticity

Loads and Masses:

$m := L_x \cdot L_y \cdot H \cdot \frac{\gamma_c}{g} = 1.633 \times 10^5 \cdot lb$ Pedestal Mass

$F_x := 0lb$ $F_y := 0lb$ Applied Mass

$m_x := F_x + 0.23m = 3.756 \times 10^4\ lb$ $m_y := F_y + 0.23m = 3.756 \times 10^4\ lb$ Equivalent Mass

Dynamic Properties:

$I_x := \frac{L_x^3 \cdot L_y}{12} = 9.585 \times 10^6\ in^4$ $I_y := \frac{L_x \cdot L_y^3}{12} = 4.349 \times 10^6 \cdot in^4$ Moment of Inertia

$k_x := \frac{(3 \cdot E \cdot I_x)}{H^3} = 1.15 \times 10^5 \cdot \frac{kip}{ft}$ $k_y := \frac{(3 \cdot E \cdot I_y)}{H^3} = 5.22 \times 10^4 \cdot \frac{kip}{ft}$ Stiffness Factor

$\omega_x := \sqrt{\frac{k_x}{0.23m}} = 313.912 \cdot Hz$ $\omega_y := \sqrt{\frac{k_y}{0.23m}} = 211.449 \cdot Hz$ Natural Frequency without added Mass

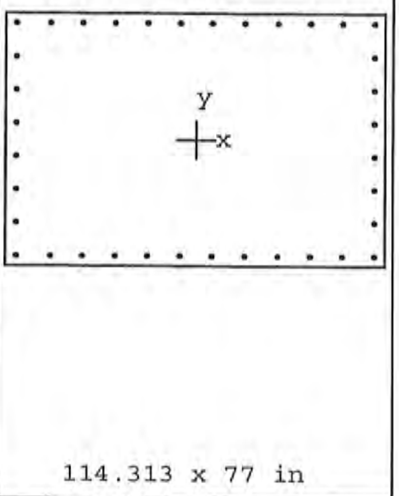
$\omega_{x.} := \sqrt{\frac{k_x}{m_x}} = 313.912 \cdot Hz$ $\omega_{y.} := \sqrt{\frac{k_y}{m_y}} = 211.449 \cdot Hz$ Natural Frequency with added Mass

```
        OOOOOOO    OOOOO    OOOOO    OOOOO    OOOOO   OO
        OO    OO  OO   OO  OO   OO  OO   OO  OO   OO  OO
        OO    OO  OO   OO  OO   OO  OO   OO  OO   OO  OO
        OO    OO  OO       OO   OO  OO       OO   OO  OO
        OO    OO  OO       OOOOOOO  OO       OO   OO  OO
        OOOOOOO   OO   OO  OO   OO  OO   OO  OO   OO  OO
        OO        OO   OO  OO   OO  OO   OO  OO   OO  OO
        OO         OOOOO   OO   OO   OOOOO    OOOOO   OOOOO  (TM)


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

     Licensee stated above acknowledges that Portland Cement Association
(PCA) is not and cannot be responsible for either the accuracy or
adequacy of the material supplied as input for processing by the
pcaColumn(tm) computer program. Furthermore, PCA neither makes any
warranty expressed nor implied with respect to the correctness of the
output prepared by the pcaColumn(tm) program.Although PCA has endeavored
to produce pcaColumn(tm) error free, the program is not and can't be
certified infallible. The final and only responsibility for analysis,
design and engineering documents is the licensees. Accordingly, PCA
disclaims all responsibility in contract, negligence or other tort for
any analysis, design or engineering documents prepared in connection
with the use of the pcaColumn(tm) program.
```

```
General Information:
====================
   File Name: C:\Users\esum-us\Desktop\Pedestal Design\Column E.col
   Project:  CC&V High Grade Ore
   Column:   A/B                             Engineer: ECS
   Code:     ACI 318-02                      Units: English

   Run Option: Investigation                 Slenderness: Not considered
   Run Axis:   Biaxial                       Column Type: Architectural

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:
========
   Rectangular: Width = 114.313 in           Depth = 77 in

   Gross section area, Ag =  8802.1 in^2
   Ix =  4.34897e+006 in^4                   Iy =  9.58509e+006 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)
   ---- --------- -----------   ---- --------- -----------   ---- --------- -----------
   #  3      0.38        0.11   #  4      0.50        0.20   #  5      0.63        0.31
   #  6      0.75        0.44   #  7      0.88        0.60   #  8      1.00        0.79
   #  9      1.13        1.00   # 10      1.27        1.27   # 11      1.41        1.56
   # 14      1.69        2.25   # 18      2.26        4.00

   Confinement: Tied; #3 ties with #7 bars,  #4 with larger bars.
   phi(a) = 0.8,  phi(b) = 0.9,  phi(c) = 0.65

   Layout: Rectangular
   Pattern: Equal Bar Spacing  (Cover to transverse reinforcement)
   Total steel area, As = 45.72 in^2 at 0.52%
   36 #10   Cover = 2 in

Load Combinations:
==================
   U1   =  1.400*Dead + 0.000*Live + 0.000*Wind + 0.000*EarthQuake
   U2   =  1.200*Dead + 1.600*Live + 0.000*Wind + 0.000*EarthQuake
   U3   =  1.200*Dead + 1.000*Live + 0.000*Wind + 0.000*EarthQuake
   U4   =  1.200*Dead + 0.000*Live + 0.800*Wind + 0.000*EarthQuake
   U5   =  1.200*Dead + 1.000*Live + 1.600*Wind + 0.000*EarthQuake
   U6   =  0.900*Dead + 0.000*Live + 1.600*Wind + 0.000*EarthQuake
   U7   =  1.200*Dead + 0.000*Live - 0.800*Wind + 0.000*EarthQuake
   U8   =  1.200*Dead + 1.000*Live - 1.600*Wind + 0.000*EarthQuake
   U9   =  0.900*Dead + 0.000*Live - 1.600*Wind + 0.000*EarthQuake
   U10 =  1.200*Dead + 1.000*Live + 0.000*Wind + 1.000*EarthQuake
   U11 =  0.900*Dead + 0.000*Live + 0.000*Wind + 1.000*EarthQuake
   U12 =  1.200*Dead + 1.000*Live + 0.000*Wind - 1.000*EarthQuake
   U13 =  0.900*Dead + 0.000*Live + 0.000*Wind - 1.000*EarthQuake
```

```
  Service Loads:
  ==============
         Load   Axial Load      Mx @ Top     Mx @ Bot     My @ Top     My @ Bot
     No. Case          kip          k-ft         k-ft         k-ft         k-ft
     --- ---- ------------ ------------ ------------ ------------ ------------
       1 Dead         13.0           0.0          0.0          0.0          0.0
         Live         33.9           0.0          0.0          0.0          0.0
         Wind          0.0           0.0          0.0          0.0          0.0
         E.Q.          0.0           0.0          0.0          0.0          0.0
       2 Dead         13.0           0.0          0.0          0.0          0.0
         Live        -33.9           0.0          0.0          0.0          0.0
         Wind          0.0           0.0          0.0          0.0          0.0
         E.Q.          0.0           0.0          0.0          0.0          0.0

  Factored Loads and Moments with Corresponding Capacities: (see user's manual for notation)
  ========================================================
     NOTE: Each loading combination includes the following cases:
           First line  - at column top
           Second line - at column bottom
          Load             Pu          Mux          Muy         fMnx         fMny
     No.  Combo           kip         k-ft         k-ft         k-ft         k-ft  fMn/Mu
     --- ------ ----------- ----------- ----------- ----------- ----------- --------
       1  1 U1           18.2          0.0          0.0       7351.9          0.0  999.999
       2                 18.2          0.0          0.0       7351.9          0.0  999.999
       3  1 U2           69.9          0.0          0.0       7496.5          0.0  999.999
       4                 69.9          0.0          0.0       7496.5          0.0  999.999
       5  1 U3           49.5          0.0          0.0       7439.6          0.0  999.999
       6                 49.5          0.0          0.0       7439.6          0.0  999.999
       7  1 U4           15.6          0.0          0.0       7344.6          0.0  999.999
       8                 15.6          0.0          0.0       7344.6          0.0  999.999
       9  1 U5           49.5          0.0          0.0       7439.6          0.0  999.999
      10                 49.5          0.0          0.0       7439.6          0.0  999.999
      11  1 U6           11.7          0.0          0.0       7333.6          0.0  999.999
      12                 11.7          0.0          0.0       7333.6          0.0  999.999
      13  1 U7           15.6          0.0          0.0       7344.6          0.0  999.999
      14                 15.6          0.0          0.0       7344.6          0.0  999.999
      15  1 U8           49.5          0.0          0.0       7439.6          0.0  999.999
      16                 49.5          0.0          0.0       7439.6          0.0  999.999
      17  1 U9           11.7          0.0          0.0       7333.6          0.0  999.999
      18                 11.7          0.0          0.0       7333.6          0.0  999.999
      19  1 U10          49.5          0.0          0.0       7439.6          0.0  999.999
      20                 49.5          0.0          0.0       7439.6          0.0  999.999
      21  1 U11          11.7          0.0          0.0       7333.6          0.0  999.999
      22                 11.7          0.0          0.0       7333.6          0.0  999.999
      23  1 U12          49.5          0.0          0.0       7439.6          0.0  999.999
      24                 49.5          0.0          0.0       7439.6          0.0  999.999
      25  1 U13          11.7          0.0          0.0       7333.6          0.0  999.999
      26                 11.7          0.0          0.0       7333.6          0.0  999.999
      27  2 U1           18.2          0.0          0.0       7351.9          0.0  999.999
      28                 18.2          0.0          0.0       7351.9          0.0  999.999
      29  2 U2          -38.7          0.0          0.0       7192.0          0.0  999.999
      30                -38.7          0.0          0.0       7192.0          0.0  999.999
      31  2 U3          -18.3          0.0          0.0       7249.4          0.0  999.999
      32                -18.3          0.0          0.0       7249.4          0.0  999.999
      33  2 U4           15.6          0.0          0.0       7344.6          0.0  999.999
      34                 15.6          0.0          0.0       7344.6          0.0  999.999
      35  2 U5          -18.3          0.0          0.0       7249.4          0.0  999.999
      36                -18.3          0.0          0.0       7249.4          0.0  999.999
      37  2 U6           11.7          0.0          0.0       7333.6          0.0  999.999
      38                 11.7          0.0          0.0       7333.6          0.0  999.999
      39  2 U7           15.6          0.0          0.0       7344.6          0.0  999.999
      40                 15.6          0.0          0.0       7344.6          0.0  999.999
      41  2 U8          -18.3          0.0          0.0       7249.4          0.0  999.999
      42                -18.3          0.0          0.0       7249.4          0.0  999.999
```

```
    43  2 U9         11.7          0.0          0.0       7333.6          0.0  999.999
    44               11.7          0.0          0.0       7333.6          0.0  999.999
    45  2 U10       -18.3          0.0          0.0       7249.4          0.0  999.999
    46              -18.3          0.0          0.0       7249.4          0.0  999.999
    47  2 U11        11.7          0.0          0.0       7333.6          0.0  999.999
    48               11.7          0.0          0.0       7333.6          0.0  999.999
    49  2 U12       -18.3          0.0          0.0       7249.4          0.0  999.999
    50              -18.3          0.0          0.0       7249.4          0.0  999.999
    51  2 U13        11.7          0.0          0.0       7333.6          0.0  999.999
    52               11.7          0.0          0.0       7333.6          0.0  999.999

   *** Program completed as requested! ***
```



Code: ACI 318-02

Units: English

Run axis: Biaxial

Run option: Investigation

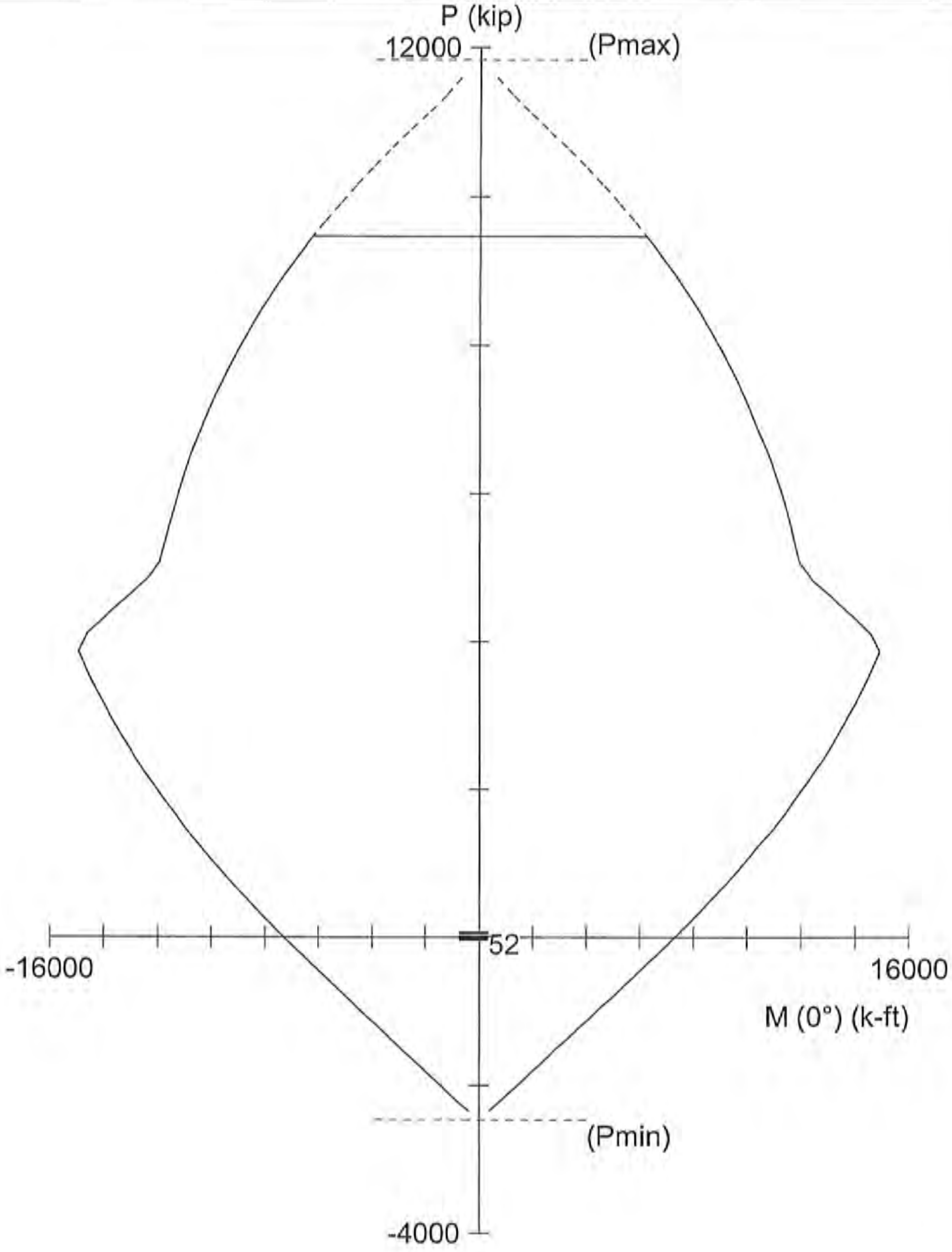
Slenderness: Not considered

Column type: Architectural

Bars: ASTM A615

Date: 10/28/11

Time: 12:59:24



pcaColumn v3.63 - Licensed to: FLSmidth

File: C:\Users\esum-us\Desktop\Pedestal Design\Column E.col

Project: CC&V High Grade Ore

Column: A/B

Engineer: ECS

f'c = 4 ksi

fy = 60 ksi

Ag = 8802.1 in^2

36 #10 bars

Ec = 3605 ksi

Es = 29000 ksi

As = 45.72 in^2

Rho = 0.52%

fc = 3.4 ksi

fc = 3.4 ksi

Xo = 0.00 in

Ix = 4.34897e+006 in^4

ı = 0.003 in/in

Yo = 0.00 in

Iy = 9.58509e+006 in^4

Beta1 = 0.85

Clear spacing = 8.55 in

Clear cover = 2.50 in

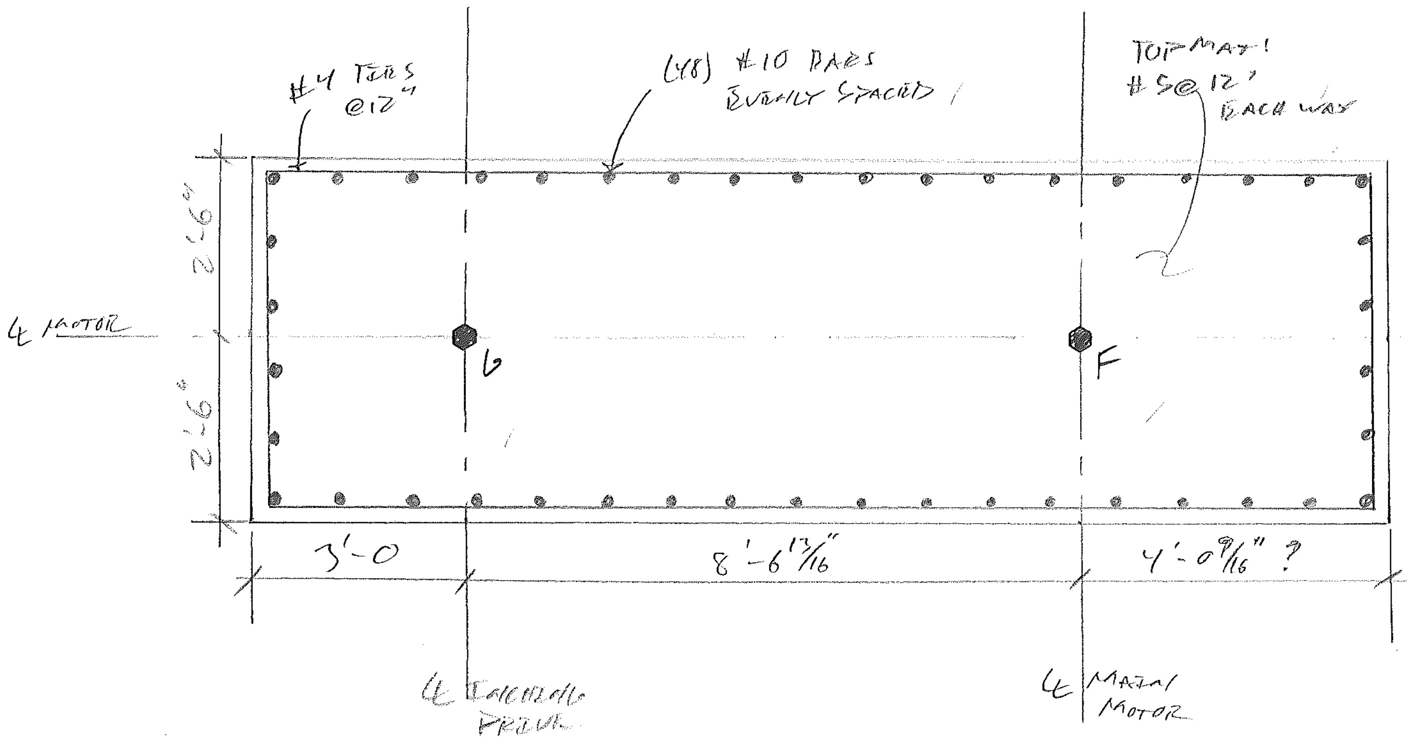
Confinement: Tied

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

FLSMIDTH

PROJECT CC&V HIGH GRADE ORE	PROJ NO. 11021	
	CALC NO. C-005	
SUBJECT BALL MILL FOUNDATION	BY ECS	DATE 10-31-11
	CHK	DATE
	SHEET OF	REV

PEDESTAL F/G DESIGN:



FLSMIDTH

Project: CC&V High Grade Ore
Subject: Ball Mill Foundation Design

Proj. No. 11021
Calc No. C-005
By: ECS **Date:** 10/28/2011
Chk: **Date:**
Sheet 1 of 1 **Rev:** 0

Concrete Pedestal Natural Period of Vibration
Pedestal F/G

Pedestal Dimensions:

$L_x := 15\text{ft} + 9.375\text{in} = 189.375\ \text{in}$ Pedestal Length X Direction

$L_y := 5\text{ft} + 0\text{in} = 60\ \text{in}$ Pedestal Length Y Direction

$H := 18\text{ft} + 11.625\text{in} = 227.625\ \text{in}$ Pedestal Height

Concrete Properties:

$\gamma_c := 145\text{pcf}$ Concrete Unit Weight

$f_c := 4000\text{psi}$ Concrete Compressive Strength

$E := 57000\text{psi}\cdot\sqrt{\frac{f_c}{\text{psi}}} = 3.605\times 10^3\cdot\text{ksi}$ Concrete Modulus of Elasticity

Loads and Masses:

$m := L_x\cdot L_y\cdot H\cdot\frac{\gamma_c}{g} = 2.17\times 10^5\cdot\text{lb}$ Pedestal Mass

$F_x := 0\text{lb}$ $F_y := 0\text{lb}$ Applied Mass

$m_x := F_x + 0.23m = 4.992\times 10^4\ \text{lb}$ $m_y := F_y + 0.23m = 4.992\times 10^4\ \text{lb}$ Equivalent Mass

Dynamic Properties:

$I_x := \frac{L_x^{\ 3}\cdot L_y}{12} = 3.396\times 10^7\ \text{in}^4$ $I_y := \frac{L_x\cdot L_y^{\ 3}}{12} = 3.409\times 10^6\cdot\text{in}^4$ Moment of Inertia

$k_x := \frac{(3\cdot E\cdot I_x)}{H^3} = 3.737\times 10^5\cdot\frac{\text{kip}}{\text{ft}}$ $k_y := \frac{(3\cdot E\cdot I_y)}{H^3} = 3.751\times 10^4\cdot\frac{\text{kip}}{\text{ft}}$ Stiffness Factor

$\omega_x := \sqrt{\frac{k_x}{0.23m}} = 490.764\cdot\text{Hz}$ $\omega_y := \sqrt{\frac{k_y}{0.23m}} = 155.49\cdot\text{Hz}$ Natural Frequency without added Mass

$\omega_{x.} := \sqrt{\frac{k_x}{m_x}} = 490.764\cdot\text{Hz}$ $\omega_{y.} := \sqrt{\frac{k_y}{m_y}} = 155.49\cdot\text{Hz}$ Natural Frequency with added Mass

FLSMIDTH

PROJECT	CC&V High Grade Ore	PROJ NO.	11021	
		CALC NO.	C-005	
SCOPE	Ball Mill Foundation	BY ECS	DATE	28-Oct-11
		CHK	DATE	
		SHEET	OF	REV

Pedestal F/G Loading

Pedestal Height (ft): 18.75

Load Locations:

Using CL Main Motor & CL Motor as Axis Origin

	X (ft)	Y (ft)
Pedestal Center of Gravity	-3.70	0.00

Location	Coordinates		Eccentricity	
	X (ft)	Y (ft)	e_x (ft)	e_y (ft)
G	-8.50	0.00	-4.80	0.00
F	0.00	0.00	3.70	0.00

Dead Load:

Location	F_x (kip)	F_y (kip)	F_z (kip)	M_x (k*ft)		M_y (k*ft)	
				Top	Bot	Top	Bot
G	0.0	0.0	31.0	0.0	0.0	-148.9	-148.9
F	0.0	0.0	3.0	0.0	0.0	11.1	11.1
Result	**0.0**	**0.0**	**34.0**	**0.0**	**0.0**	**-137.8**	**-137.8**

Live Load:

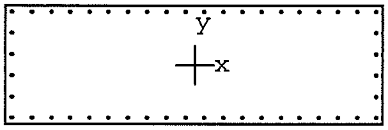
Location	F_x (kip)	F_y (kip)	F_z (kip)	M_x (k*ft)		M_y (k*ft)	
				Top	Bot	Top	Bot
G	0.0	0.0	33.9	0.0	0.0	-163.0	-163.0
F	0.0	0.0	15.7	0.0	0.0	57.9	57.9
Result	**0.0**	**0.0**	**49.6**	**0.0**	**0.0**	**-105.1**	**-105.1**

```
OOOOOOO    OOOOO    OOOOO    OOOOO    OOOOO   OO
OO    OO  OO   OO  OO   OO  OO   OO  OO   OO  OO
OO    OO  OO   OO  OO   OO  OO   OO  OO   OO  OO
OO    OO  OO       OO   OO  OO       OO   OO  OO
OO    OO  OO       OOOOOOO  OO       OO   OO  OO
OOOOOOO   OO   OO  OO   OO  OO   OO  OO   OO  OO
OO        OO   OO  OO   OO  OO   OO  OO   OO  OO
OO         OOOOO   OO   OO   OOOOO    OOOOO   OOOOO  (TM)
```

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

```
General Information:
====================
   File Name: C:\Users\esum-us\Desktop\Pedestal Design\Column F-G.col
   Project:  CC&V High Grade Ore
   Column:   A/B                           Engineer: ECS
   Code:     ACI 318-02                    Units: English

   Run Option: Investigation               Slenderness: Not considered
   Run Axis:   Biaxial                     Column Type: Architectural

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:
========
   Rectangular: Width = 189.375 in         Depth = 60 in

   Gross section area, Ag =  11362.5 in^2
   Ix =  3.40875e+006 in^4                 Iy =  3.39577e+007 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)
   ---- --------- -----------   ---- --------- -----------   ---- --------- -----------
   #  3      0.38        0.11   #  4      0.50        0.20   #  5      0.63        0.31
   #  6      0.75        0.44   #  7      0.88        0.60   #  8      1.00        0.79
   #  9      1.13        1.00   # 10      1.27        1.27   # 11      1.41        1.56
   # 14      1.69        2.25   # 18      2.26        4.00

   Confinement: Tied; #3 ties with #7 bars,  #4 with larger bars.
   phi(a) = 0.8,  phi(b) = 0.9,  phi(c) = 0.65

   Layout: Rectangular
   Pattern: Equal Bar Spacing  (Cover to transverse reinforcement)
   Total steel area, As = 60.96 in^2 at 0.54%
   48 #10   Cover = 2 in

Load Combinations:
==================
   U1  =  1.400*Dead + 0.000*Live + 0.000*Wind + 0.000*EarthQuake
   U2  =  1.200*Dead + 1.600*Live + 0.000*Wind + 0.000*EarthQuake
   U3  =  1.200*Dead + 1.000*Live + 0.000*Wind + 0.000*EarthQuake
   U4  =  1.200*Dead + 0.000*Live + 0.800*Wind + 0.000*EarthQuake
   U5  =  1.200*Dead + 1.000*Live + 1.600*Wind + 0.000*EarthQuake
   U6  =  0.900*Dead + 0.000*Live + 1.600*Wind + 0.000*EarthQuake
   U7  =  1.200*Dead + 0.000*Live - 0.800*Wind + 0.000*EarthQuake
   U8  =  1.200*Dead + 1.000*Live - 1.600*Wind + 0.000*EarthQuake
   U9  =  0.900*Dead + 0.000*Live - 1.600*Wind + 0.000*EarthQuake
   U10 =  1.200*Dead + 1.000*Live + 0.000*Wind + 1.000*EarthQuake
   U11 =  0.900*Dead + 0.000*Live + 0.000*Wind + 1.000*EarthQuake
   U12 =  1.200*Dead + 1.000*Live + 0.000*Wind - 1.000*EarthQuake
   U13 =  0.900*Dead + 0.000*Live + 0.000*Wind - 1.000*EarthQuake
```

```
  Service Loads:
  ==============
       Load   Axial Load      Mx @ Top      Mx @ Bot      My @ Top      My @ Bot
   No. Case          kip          k-ft          k-ft          k-ft          k-ft
   --- ---- ------------ ------------ ------------ ------------ ------------
     1 Dead         34.0          0.0          0.0        -137.8       -137.8
       Live         49.6          0.0          0.0        -105.1       -105.1
       Wind          0.0          0.0          0.0           0.0          0.0
       E.Q.          0.0          0.0          0.0           0.0          0.0

  Factored Loads and Moments with Corresponding Capacities: (see user's manual for notation)
  ========================================================
     NOTE: Each loading combination includes the following cases:
           First line  - at column top
           Second line - at column bottom
        Load           Pu          Mux          Muy         fMnx         fMny
   No.  Combo         kip         k-ft         k-ft         k-ft         k-ft   fMn/Mu
   --- ------ ----------- ----------- ----------- ----------- ----------- --------
     1  1 U1         47.6         0.0      -192.9          0.0    -23589.0  122.273
     2               47.6         0.0       192.9         -0.0     23589.0  122.273
     3  1 U2        120.2         0.0      -333.5          0.0    -24014.9   72.004
     4              120.2         0.0       333.5         -0.0     24014.9   72.004
     5  1 U3         90.4         0.0      -270.5          0.0    -23840.4   88.148
     6               90.4         0.0       270.5         -0.0     23840.4   88.148
     7  1 U4         40.8         0.0      -165.4          0.0    -23548.7  142.409
     8               40.8         0.0       165.4         -0.0     23548.7  142.409
     9  1 U5         90.4         0.0      -270.5          0.0    -23840.4   88.148
    10               90.4         0.0       270.5         -0.0     23840.4   88.148
    11  1 U6         30.6         0.0      -124.0          0.0    -23487.0  189.380
    12               30.6         0.0       124.0         -0.0     23487.0  189.380
    13  1 U7         40.8         0.0      -165.4          0.0    -23548.7  142.409
    14               40.8         0.0       165.4         -0.0     23548.7  142.409
    15  1 U8         90.4         0.0      -270.5          0.0    -23840.4   88.148
    16               90.4         0.0       270.5         -0.0     23840.4   88.148
    17  1 U9         30.6         0.0      -124.0          0.0    -23487.0  189.380
    18               30.6         0.0       124.0         -0.0     23487.0  189.380
    19  1 U10        90.4         0.0      -270.5          0.0    -23840.4   88.148
    20               90.4         0.0       270.5         -0.0     23840.4   88.148
    21  1 U11        30.6         0.0      -124.0          0.0    -23487.0  189.380
    22               30.6         0.0       124.0         -0.0     23487.0  189.380
    23  1 U12        90.4         0.0      -270.5          0.0    -23840.4   88.148
    24               90.4         0.0       270.5         -0.0     23840.4   88.148
    25  1 U13        30.6         0.0      -124.0          0.0    -23487.0  189.380
    26               30.6         0.0       124.0         -0.0     23487.0  189.380

   *** Program completed as requested! ***
```



189.375 x 60 in

Code: ACI 318-02

Units: English

Run axis: Biaxial

Run option: Investigation

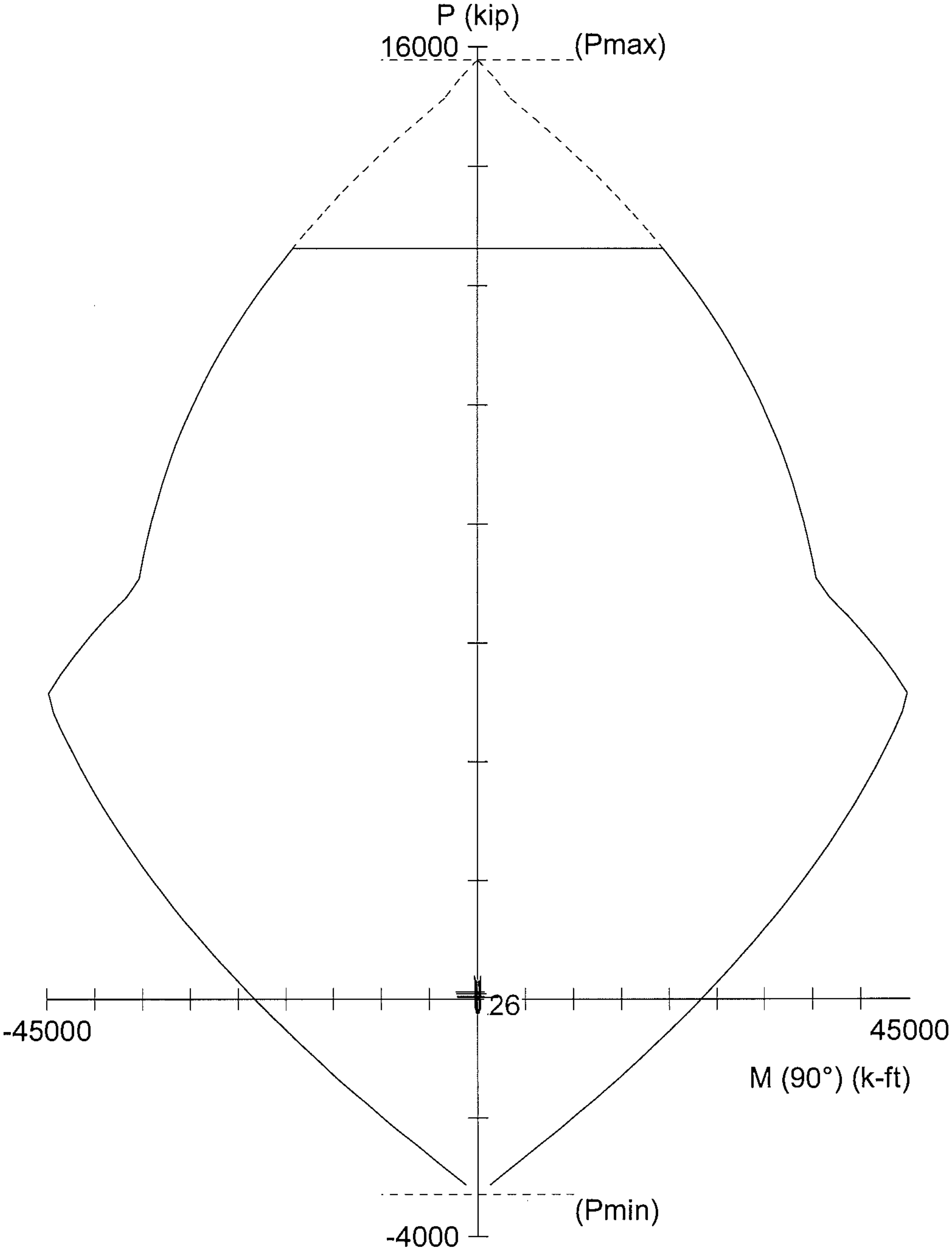
nderness: Not considered

Column type: Architectural

Bars: ASTM A615

Date: 10/28/11

Time: 13:39:46



pcaColumn v3.63 - Licensed to: FLSmidth

File: C:\Users\esum-us\Desktop\Pedestal Design\Column F-G.col

Project: CC&V High Grade Ore

Column: A/B

Engineer: ECS

f'c = 4 ksi

fy = 60 ksi

Ag = 11362.5 in^2

48 #10 bars

Ec = 3605 ksi

Es = 29000 ksi

As = 60.96 in^2

Rho = 0.54%

fc = 3.4 ksi

fc = 3.4 ksi

Xo = 0.00 in

Ix = 3.40875e+006 in^4

= 0.003 in/in

Yo = 0.00 in

Iy = 3.39577e+007 in^4

Beta1 = 0.85

Clear spacing = 8.37 in

Clear cover = 2.50 in

Confinement: Tied

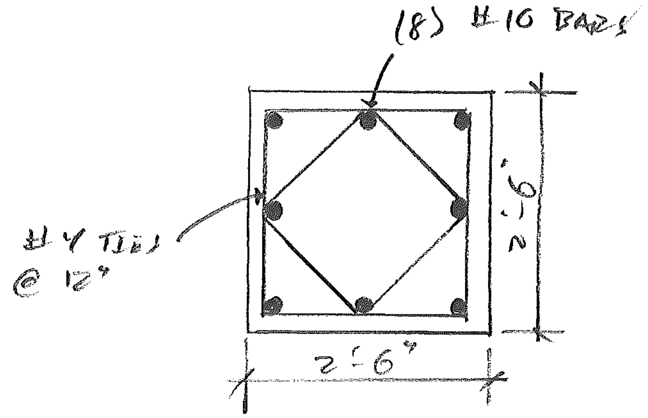
phi(a) = 0.8, phi(b) = 0.9, phi(c) = 0.65

FLSMIDTH

PROJECT CC&V High Grade Ore
SUBJECT Ball Mill Foundation

PROJ NO. 11021
CALC NO. C-005
BY ECS DATE 10-31-11
CHK DATE
SHEET OF REV

PEDESTAL H DESIGN:



FLSMIDTH

Project: CC&V High Grade Ore
Subject: Ball Mill Foundation Design

Proj. No. 11021
Calc No. C-005
By: ECS **Date:**10/31/2011
Chk: **Date:**
Sheet 1 of 1 **Rev:** 0

Concrete Pedestal Natural Period of Vibration
Pedestal H

Pedestal Dimensions:

$L_x := 2ft + 6in = 30\,in$ Pedestal Length X Direction

$L_y := 2ft + 6in = 30\,in$ Pedestal Length Y Direction

$H := 19ft + 10.75in = 238.75\,in$ Pedestal Height

Concrete Properties:

$\gamma_c := 145pcf$ Concrete Unit Weight

$f_c := 4000psi$ Concrete Compressive Strength

$E := 57000psi \cdot \sqrt{\frac{f_c}{psi}} = 3.605 \times 10^3 \cdot ksi$ Concrete Modulus of Elasticity

Loads and Masses:

$m := L_x \cdot L_y \cdot H \cdot \frac{\gamma_c}{g} = 1.803 \times 10^4 \cdot lb$ Pedestal Mass

$F_x := 0lb$ $F_y := 0lb$ Applied Mass

$m_x := F_x + 0.23m = 4.147 \times 10^3\,lb$ $m_y := F_y + 0.23m = 4.147 \times 10^3\,lb$ Equivalent Mass

Dynamic Properties:

$I_x := \frac{L_x^{\,3} \cdot L_y}{12} = 6.75 \times 10^4\,in^4$ $I_y := \frac{L_x \cdot L_y^{\,3}}{12} = 6.75 \times 10^4 \cdot in^4$ Moment of Inertia

$k_x := \frac{(3 \cdot E \cdot I_x)}{H^3} = 643.696 \cdot \frac{kip}{ft}$ $k_y := \frac{(3 \cdot E \cdot I_y)}{H^3} = 643.696 \cdot \frac{kip}{ft}$ Stiffness Factor

$\omega_x := \sqrt{\frac{k_x}{0.23m}} = 70.668 \cdot Hz$ $\omega_y := \sqrt{\frac{k_y}{0.23m}} = 70.668 \cdot Hz$ Natural Frequency without added Mass

$\omega_{x.} := \sqrt{\frac{k_x}{m_x}} = 70.668 \cdot Hz$ $\omega_{y.} := \sqrt{\frac{k_y}{m_y}} = 70.668 \cdot Hz$ Natural Frequency with added Mass

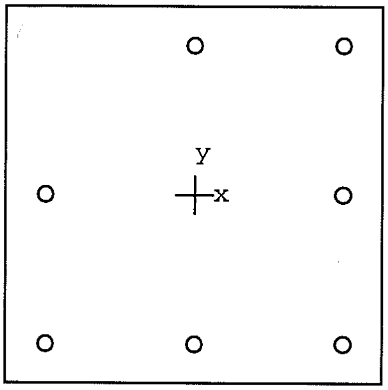
```
        0000000    00000    00000    00000    00000   00
        00    00  00   00  00   00  00   00  00   00  00
        00    00  00   00  00   00  00   00  00   00  00
        00    00  00       00   00  00       00   00  00
        00    00  00       0000000  00       00   00  00
        0000000   00   00  00   00  00   00  00   00  00
        00        00   00  00   00  00   00  00   00  00
        00         00000   00   00   00000    00000   00000  (TM)
```

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

Licensee stated above acknowledges that Portland Cement Association (PCA) is not and cannot be responsible for either the accuracy or adequacy of the material supplied as input for processing by the pcaColumn(tm) computer program. Furthermore, PCA neither makes any warranty expressed nor implied with respect to the correctness of the output prepared by the pcaColumn(tm) program.Although PCA has endeavored to produce pcaColumn(tm) error free, the program is not and can't be certified infallible. The final and only responsibility for analysis, design and engineering documents is the licensees. Accordingly, PCA disclaims all responsibility in contract, negligence or other tort for any analysis, design or engineering documents prepared in connection with the use of the pcaColumn(tm) program.

```
 General Information:
 ====================
    File Name: C:\Users\esum-us\Desktop\Pedestal Design\Column H.col
    Project:  CC&V High Grade Ore
    Column:   A/B                           Engineer: ECS
    Code:     ACI 318-02                    Units: English

    Run Option: Investigation               Slenderness: Not considered
    Run Axis:   Biaxial                     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:
 ========
    Rectangular: Width = 30 in              Depth = 30 in

    Gross section area, Ag =  900 in^2
    Ix =  67500 in^4                        Iy =  67500 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)
    ---- --------- -----------   ---- --------- -----------   ---- --------- -----------
    #  3      0.38        0.11   #  4      0.50        0.20   #  5      0.63        0.31
    #  6      0.75        0.44   #  7      0.88        0.60   #  8      1.00        0.79
    #  9      1.13        1.00   # 10      1.27        1.27   # 11      1.41        1.56
    # 14      1.69        2.25   # 18      2.26        4.00

    Confinement: Tied; #3 ties with #7 bars,  #4 with larger bars.
    phi(a) = 0.8,  phi(b) = 0.9,  phi(c) = 0.65

    Layout: Rectangular
    Pattern: Equal Bar Spacing  (Cover to transverse reinforcement)
    Total steel area, As = 10.16 in^2 at 1.13%
    8 #10   Cover = 2 in

 Load Combinations:
 ==================
    U1  =  1.400*Dead + 0.000*Live + 0.000*Wind + 0.000*EarthQuake
    U2  =  1.200*Dead + 1.600*Live + 0.000*Wind + 0.000*EarthQuake
    U3  =  1.200*Dead + 1.000*Live + 0.000*Wind + 0.000*EarthQuake
    U4  =  1.200*Dead + 0.000*Live + 0.800*Wind + 0.000*EarthQuake
    U5  =  1.200*Dead + 1.000*Live + 1.600*Wind + 0.000*EarthQuake
    U6  =  0.900*Dead + 0.000*Live + 1.600*Wind + 0.000*EarthQuake
    U7  =  1.200*Dead + 0.000*Live - 0.800*Wind + 0.000*EarthQuake
    U8  =  1.200*Dead + 1.000*Live - 1.600*Wind + 0.000*EarthQuake
    U9  =  0.900*Dead + 0.000*Live - 1.600*Wind + 0.000*EarthQuake
    U10 =  1.200*Dead + 1.000*Live + 0.000*Wind + 1.000*EarthQuake
    U11 =  0.900*Dead + 0.000*Live + 0.000*Wind + 1.000*EarthQuake
    U12 =  1.200*Dead + 1.000*Live + 0.000*Wind - 1.000*EarthQuake
    U13 =  0.900*Dead + 0.000*Live + 0.000*Wind - 1.000*EarthQuake
```

```
Service Loads:
==============
     Load   Axial Load      Mx @ Top     Mx @ Bot     My @ Top     My @ Bot
 No. Case          kip          k-ft         k-ft         k-ft         k-ft
 --- ---- ------------ ------------ ------------ ------------ ------------
   1 Dead          8.8           0.0          0.0          0.0          0.0
     Live          0.0           0.0          0.0          0.0          0.0
     Wind          0.0           0.0          0.0          0.0          0.0
     E.Q.          0.0           0.0          0.0          0.0          0.0

Factored Loads and Moments with Corresponding Capacities: (see user's manual for notation)
===========================================================
 NOTE: Each loading combination includes the following cases:
       First line  - at column top
       Second line - at column bottom
      Load            Pu         Mux         Muy        fMnx        fMny
 No.  Combo          kip        k-ft        k-ft        k-ft        k-ft   fMn/Mu
 --- ------ ----------- ----------- ----------- ----------- ----------- --------
   1  1 U1          12.3         0.0         0.0       592.1         0.0  999.999
   2                12.3         0.0         0.0       592.1         0.0  999.999
   3  1 U2          10.6         0.0         0.0       590.4         0.0  999.999
   4                10.6         0.0         0.0       590.4         0.0  999.999
   5  1 U3          10.6         0.0         0.0       590.4         0.0  999.999
   6                10.6         0.0         0.0       590.4         0.0  999.999
   7  1 U4          10.6         0.0         0.0       590.4         0.0  999.999
   8                10.6         0.0         0.0       590.4         0.0  999.999
   9  1 U5          10.6         0.0         0.0       590.4         0.0  999.999
  10                10.6         0.0         0.0       590.4         0.0  999.999
  11  1 U6           7.9         0.0         0.0       587.8         0.0  999.999
  12                 7.9         0.0         0.0       587.8         0.0  999.999
  13  1 U7          10.6         0.0         0.0       590.4         0.0  999.999
  14                10.6         0.0         0.0       590.4         0.0  999.999
  15  1 U8          10.6         0.0         0.0       590.4         0.0  999.999
  16                10.6         0.0         0.0       590.4         0.0  999.999
  17  1 U9           7.9         0.0         0.0       587.8         0.0  999.999
  18                 7.9         0.0         0.0       587.8         0.0  999.999
  19  1 U10         10.6         0.0         0.0       590.4         0.0  999.999
  20                10.6         0.0         0.0       590.4         0.0  999.999
  21  1 U11          7.9         0.0         0.0       587.8         0.0  999.999
  22                 7.9         0.0         0.0       587.8         0.0  999.999
  23  1 U12         10.6         0.0         0.0       590.4         0.0  999.999
  24                10.6         0.0         0.0       590.4         0.0  999.999
  25  1 U13          7.9         0.0         0.0       587.8         0.0  999.999
  26                 7.9         0.0         0.0       587.8         0.0  999.999

 *** Program completed as requested! ***
```



30 x 30 in

Code: ACI 318-02

Units: English

Run axis: Biaxial

Run option: Investigation

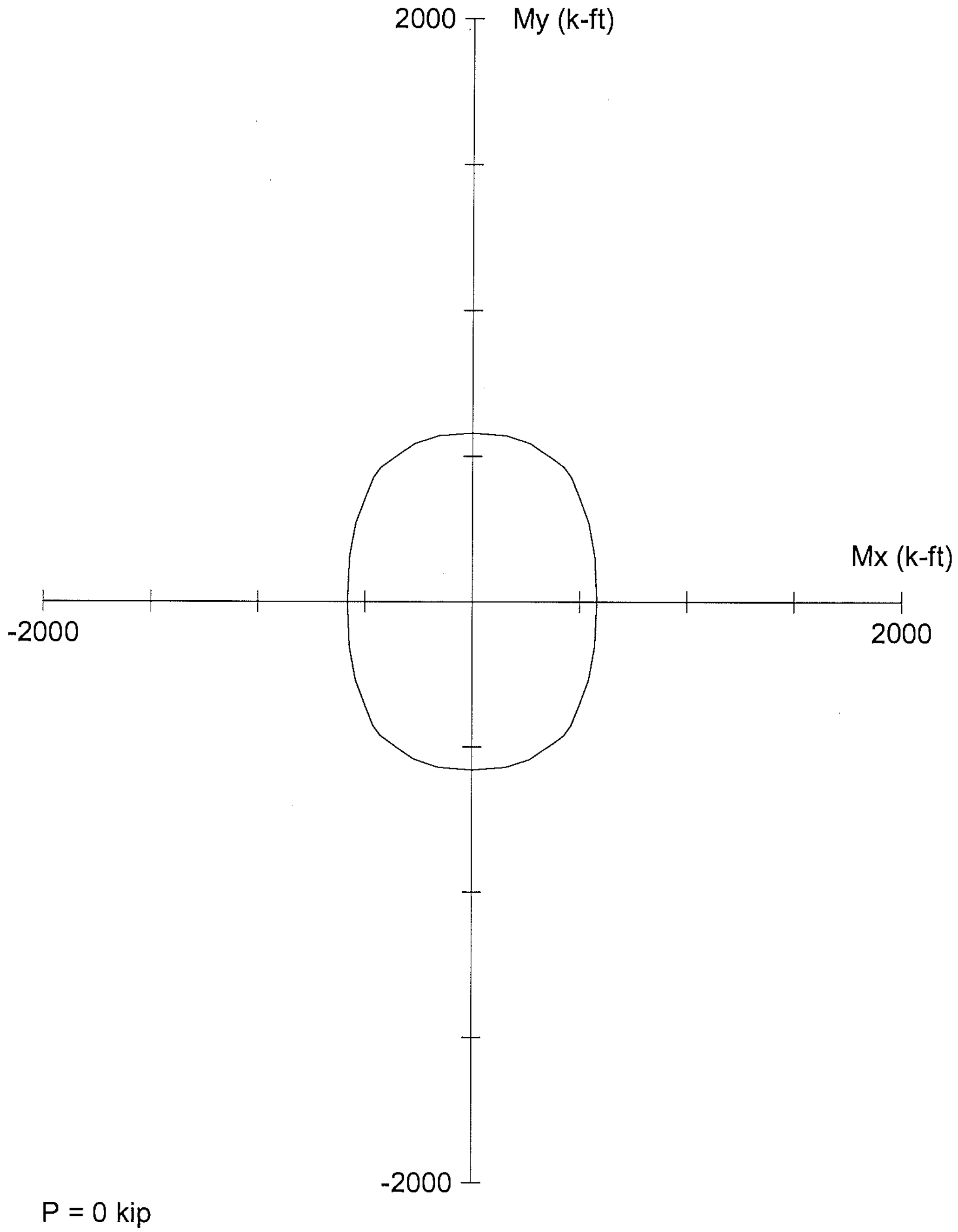
Slenderness: Not considered

Column type: Structural

Bars: ASTM A615

Date: 10/31/11

Time: 08:42:58



pcaColumn v3.63 - Licensed to: FLSmidth

File: C:\Users\esum-us\Desktop\Pedestal Design\Column H.col

Project: CC&V High Grade Ore

Column: A/B

Engineer: ECS

f'c = 4 ksi

fy = 60 ksi

Ag = 900 in^2

8 #10 bars

Ec = 3605 ksi

Es = 29000 ksi

As = 10.16 in^2

Rho = 1.13%

fc = 3.4 ksi

fc = 3.4 ksi

Xo = 0.00 in

Ix = 67500 in^4

= 0.003 in/in

Yo = 0.00 in

Iy = 67500 in^4

Beta1 = 0.85

Clear spacing = 10.59 in

Clear cover = 2.50 in

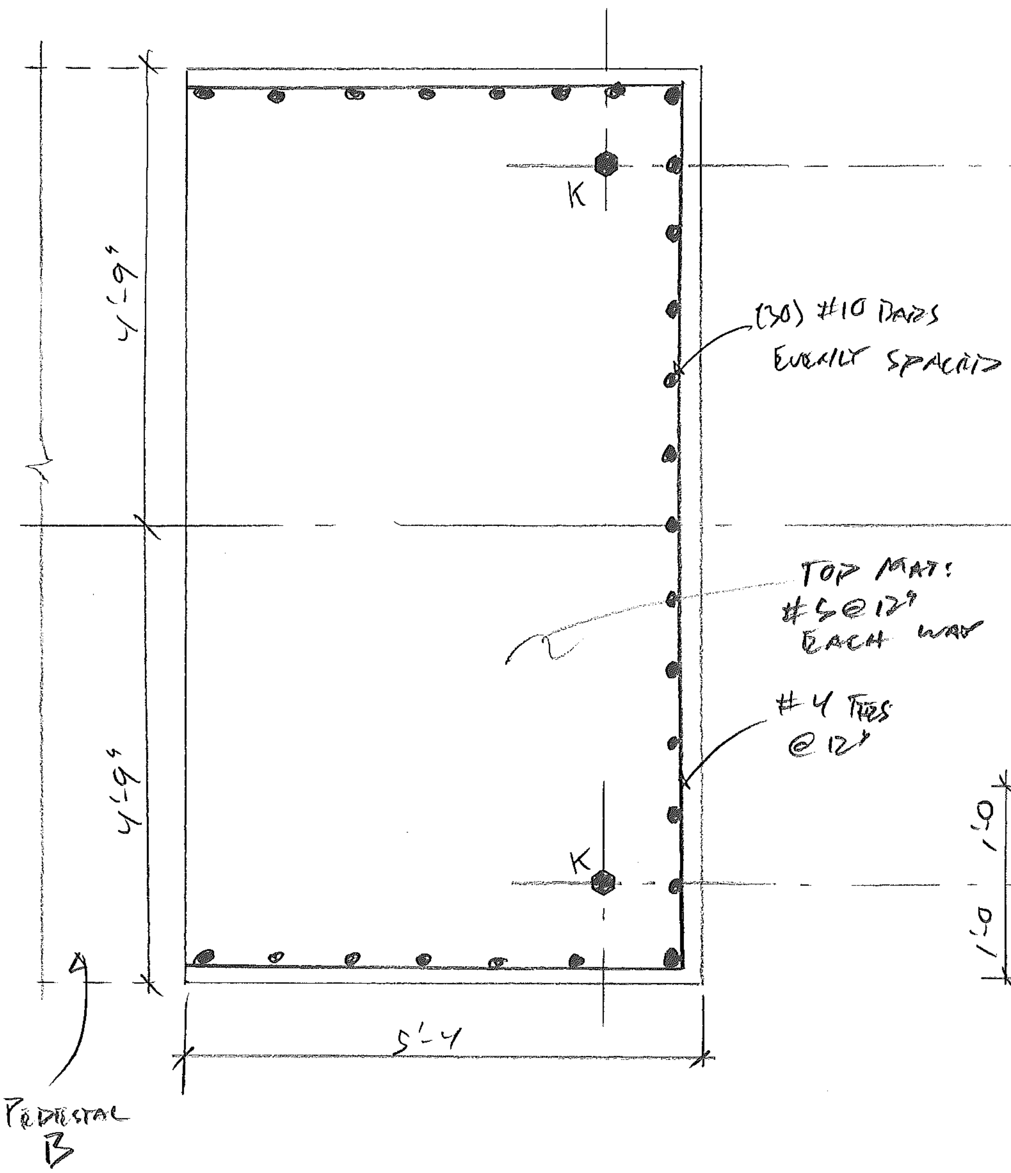
Confinement: Tied

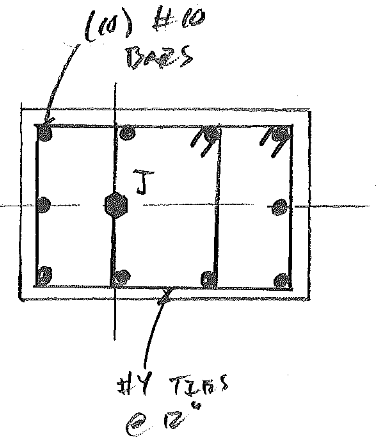
phi(a) = 0.8, phi(b) = 0.9, phi(c) = 0.65

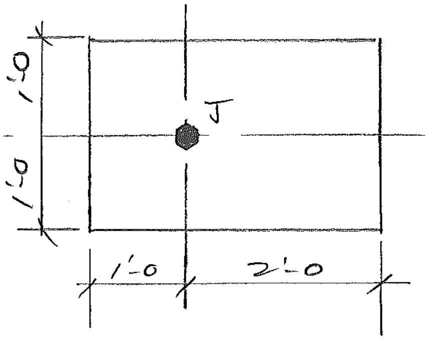
FLSMIDTH

PROJECT CC&V High Grade Ore
SUBJECT Ball Mill Foundation
PROJ NO. 11021
CALC NO. C-005
BY ECS DATE 10-31-11
CHK DATE
SHEET OF REV

PEDESTAL J/K DESIGN:







FLSMIDTH

Project: CC&V High Grade Ore
Subject: Ball Mill Foundation Design

Proj. No. 11021
Calc No. C-005
By: ECS **Date:**10/31/2011
Chk: **Date:**
Sheet 1 of 1 **Rev:** 0

Concrete Pedestal Natural Period of Vibration
Pedestal J

Pedestal Dimensions:

$L_x := 3\text{ft} + 0\text{in} = 36\,\text{in}$ Pedestal Length X Direction

$L_y := 2\text{ft} + 0\text{in} = 24\,\text{in}$ Pedestal Length Y Direction

$H := 13\text{ft} + 9.75\text{in} = 165.75\,\text{in}$ Pedestal Height

Concrete Properties:

$\gamma_c := 145\text{pcf}$ Concrete Unit Weight

$f_c := 4000\text{psi}$ Concrete Compressive Strength

$E := 57000\text{psi}\cdot\sqrt{\frac{f_c}{\text{psi}}} = 3.605\times 10^3\cdot\text{ksi}$ Concrete Modulus of Elasticity

Loads and Masses:

$m := L_x\cdot L_y\cdot H\cdot\frac{\gamma_c}{g} = 1.202\times 10^4\cdot\text{lb}$ Pedestal Mass

$F_x := 0\text{lb}$ $F_y := 0\text{lb}$ Applied Mass

$m_x := F_x + 0.23m = 2.764\times 10^3\,\text{lb}$ $m_y := F_y + 0.23m = 2.764\times 10^3\,\text{lb}$ Equivalent Mass

Dynamic Properties:

$I_x := \frac{L_x^{\,3}\cdot L_y}{12} = 9.331\times 10^4\,\text{in}^4$ $I_y := \frac{L_x\cdot L_y^{\,3}}{12} = 4.147\times 10^4\cdot\text{in}^4$ Moment of Inertia

$k_x := \frac{(3\cdot E\cdot I_x)}{H^3} = 2.659\times 10^3\cdot\frac{\text{kip}}{\text{ft}}$ $k_y := \frac{(3\cdot E\cdot I_y)}{H^3} = 1.182\times 10^3\cdot\frac{\text{kip}}{\text{ft}}$ Stiffness Factor

$\omega_x := \sqrt{\frac{k_x}{0.23m}} = 175.948\cdot\text{Hz}$ $\omega_y := \sqrt{\frac{k_y}{0.23m}} = 117.299\cdot\text{Hz}$ Natural Frequency without added Mass

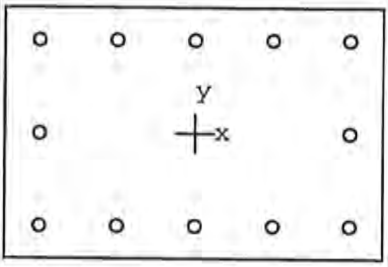
$\omega_{x.} := \sqrt{\frac{k_x}{m_x}} = 175.948\cdot\text{Hz}$ $\omega_{y.} := \sqrt{\frac{k_y}{m_y}} = 117.299\cdot\text{Hz}$ Natural Frequency with added Mass

```
OOOOOOO    OOOOO    OOOOO    OOOOO    OOOOO   OO
OO    OO  OO   OO  OO   OO  OO   OO  OO   OO  OO
OO    OO  OO   OO  OO   OO  OO   OO  OO   OO  OO
OO    OO  OO       OO   OO  OO       OO   OO  OO
OO    OO  OO       OOOOOOO  OO       OO   OO  OO
OOOOOOO   OO   OO  OO   OO  OO   OO  OO   OO  OO
OO        OO   OO  OO   OO  OO   OO  OO   OO  OO
OO         OOOOO   OO   OO   OOOOO    OOOOO   OOOOO  (TM)
```

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

     Licensee stated above acknowledges that Portland Cement Association
(PCA) is not and  cannot  be  responsible  for  either  the  accuracy or
adequacy  of  the  material  supplied  as  input  for  processing  by  the
pcaColumn(tm)  computer  program.  Furthermore, PCA  neither  makes  any
warranty expressed  nor implied  with respect to  the correctness of the
output prepared by the pcaColumn(tm) program.Although PCA has endeavored
to  produce  pcaColumn(tm)  error free, the program  is not and can't be
certified infallible.  The  final and only responsibility  for analysis,
design  and  engineering documents  is the licensees.  Accordingly,  PCA
disclaims all responsibility in contract, negligence  or other  tort for
any  analysis, design or  engineering  documents prepared in  connection
with the use of the pcaColumn(tm) program.
```

```
 General Information:
 ===================
    File Name: C:\Users\esum-us\Desktop\Pedestal Design\Column J.col
    Project:  CC&V High Grade Ore
    Column:   A/B                             Engineer: ECS
    Code:     ACI 318-02                      Units: English

    Run Option: Investigation                 Slenderness: Not considered
    Run Axis:   Biaxial                       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:
 ========
    Rectangular: Width = 36 in                Depth = 24 in

    Gross section area, Ag =  864 in^2
    Ix =  41472 in^4                          Iy =  93312 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)
    ---- --------- -----------   ---- --------- -----------   ---- --------- -----------
    #  3      0.38        0.11   #  4      0.50        0.20   #  5      0.63        0.31
    #  6      0.75        0.44   #  7      0.88        0.60   #  8      1.00        0.79
    #  9      1.13        1.00   # 10      1.27        1.27   # 11      1.41        1.56
    # 14      1.69        2.25   # 18      2.26        4.00

    Confinement: Tied; #3 ties with #7 bars,  #4 with larger bars.
    phi(a) = 0.8,  phi(b) = 0.9,  phi(c) = 0.65

    Layout: Rectangular
    Pattern: Equal Bar Spacing  (Cover to transverse reinforcement)
    Total steel area, As = 15.24 in^2 at 1.76%
    12 #10   Cover = 2 in

 Load Combinations:
 =================
    U1  =  1.400*Dead + 0.000*Live + 0.000*Wind + 0.000*EarthQuake
    U2  =  1.200*Dead + 1.600*Live + 0.000*Wind + 0.000*EarthQuake
    U3  =  1.200*Dead + 1.000*Live + 0.000*Wind + 0.000*EarthQuake
    U4  =  1.200*Dead + 0.000*Live + 0.800*Wind + 0.000*EarthQuake
    U5  =  1.200*Dead + 1.000*Live + 1.600*Wind + 0.000*EarthQuake
    U6  =  0.900*Dead + 0.000*Live + 1.600*Wind + 0.000*EarthQuake
    U7  =  1.200*Dead + 0.000*Live - 0.800*Wind + 0.000*EarthQuake
    U8  =  1.200*Dead + 1.000*Live - 1.600*Wind + 0.000*EarthQuake
    U9  =  0.900*Dead + 0.000*Live - 1.600*Wind + 0.000*EarthQuake
    U10 =  1.200*Dead + 1.000*Live + 0.000*Wind + 1.000*EarthQuake
    U11 =  0.900*Dead + 0.000*Live + 0.000*Wind + 1.000*EarthQuake
    U12 =  1.200*Dead + 1.000*Live + 0.000*Wind - 1.000*EarthQuake
    U13 =  0.900*Dead + 0.000*Live + 0.000*Wind - 1.000*EarthQuake
```

```
Service Loads:
==============
      Load   Axial Load     Mx @ Top     Mx @ Bot     My @ Top     My @ Bot
  No. Case          kip         k-ft         k-ft         k-ft         k-ft
  --- ---- ------------ ------------ ------------ ------------ ------------
    1 Dead        147.0          0.0          0.0         73.5         73.5
      Live        143.0          0.0          0.0         71.5         71.5
      Wind          0.0          0.0          0.0          0.0          0.0
      E.Q.          0.0          0.0          0.0          0.0          0.0

Factored Loads and Moments with Corresponding Capacities: (see user's manual for notation)
========================================================
  NOTE: Each loading combination includes the following cases:
        First line  - at column top
        Second line - at column bottom
       Load              Pu         Mux         Muy        fMnx        fMny
  No.  Combo            kip        k-ft        k-ft        k-ft        k-ft   fMn/Mu
  --- ------ ----------- ----------- ----------- ----------- ----------- --------
    1  1 U1          205.8         0.0       102.9        -0.0      1188.1   11.546
    2                205.8         0.0      -102.9         0.0     -1188.1   11.546
    3  1 U2          405.2         0.0       202.6        -0.0      1339.6    6.612
    4                405.2         0.0      -202.6         0.0     -1339.6    6.612
    5  1 U3          319.4         0.0       159.7        -0.0      1282.1    8.028
    6                319.4         0.0      -159.7         0.0     -1282.1    8.028
    7  1 U4          176.4         0.0        88.2        -0.0      1162.8   13.184
    8                176.4         0.0       -88.2         0.0     -1162.8   13.184
    9  1 U5          319.4         0.0       159.7        -0.0      1282.1    8.028
   10                319.4         0.0      -159.7         0.0     -1282.1    8.028
   11  1 U6          132.3         0.0        66.2        -0.0      1124.4   16.997
   12                132.3         0.0       -66.2         0.0     -1124.4   16.997
   13  1 U7          176.4         0.0        88.2        -0.0      1162.8   13.184
   14                176.4         0.0       -88.2         0.0     -1162.8   13.184
   15  1 U8          319.4         0.0       159.7        -0.0      1282.1    8.028
   16                319.4         0.0      -159.7         0.0     -1282.1    8.028
   17  1 U9          132.3         0.0        66.2        -0.0      1124.4   16.997
   18                132.3         0.0       -66.2         0.0     -1124.4   16.997
   19  1 U10         319.4         0.0       159.7        -0.0      1282.1    8.028
   20                319.4         0.0      -159.7         0.0     -1282.1    8.028
   21  1 U11         132.3         0.0        66.2        -0.0      1124.4   16.997
   22                132.3         0.0       -66.2         0.0     -1124.4   16.997
   23  1 U12         319.4         0.0       159.7        -0.0      1282.1    8.028
   24                319.4         0.0      -159.7         0.0     -1282.1    8.028
   25  1 U13         132.3         0.0        66.2        -0.0      1124.4   16.997
   26                132.3         0.0       -66.2         0.0     -1124.4   16.997

  *** Program completed as requested! ***
```



36 x 24 in

Code: ACI 318-02

Units: English

Run axis: Biaxial

Run option: Investigation

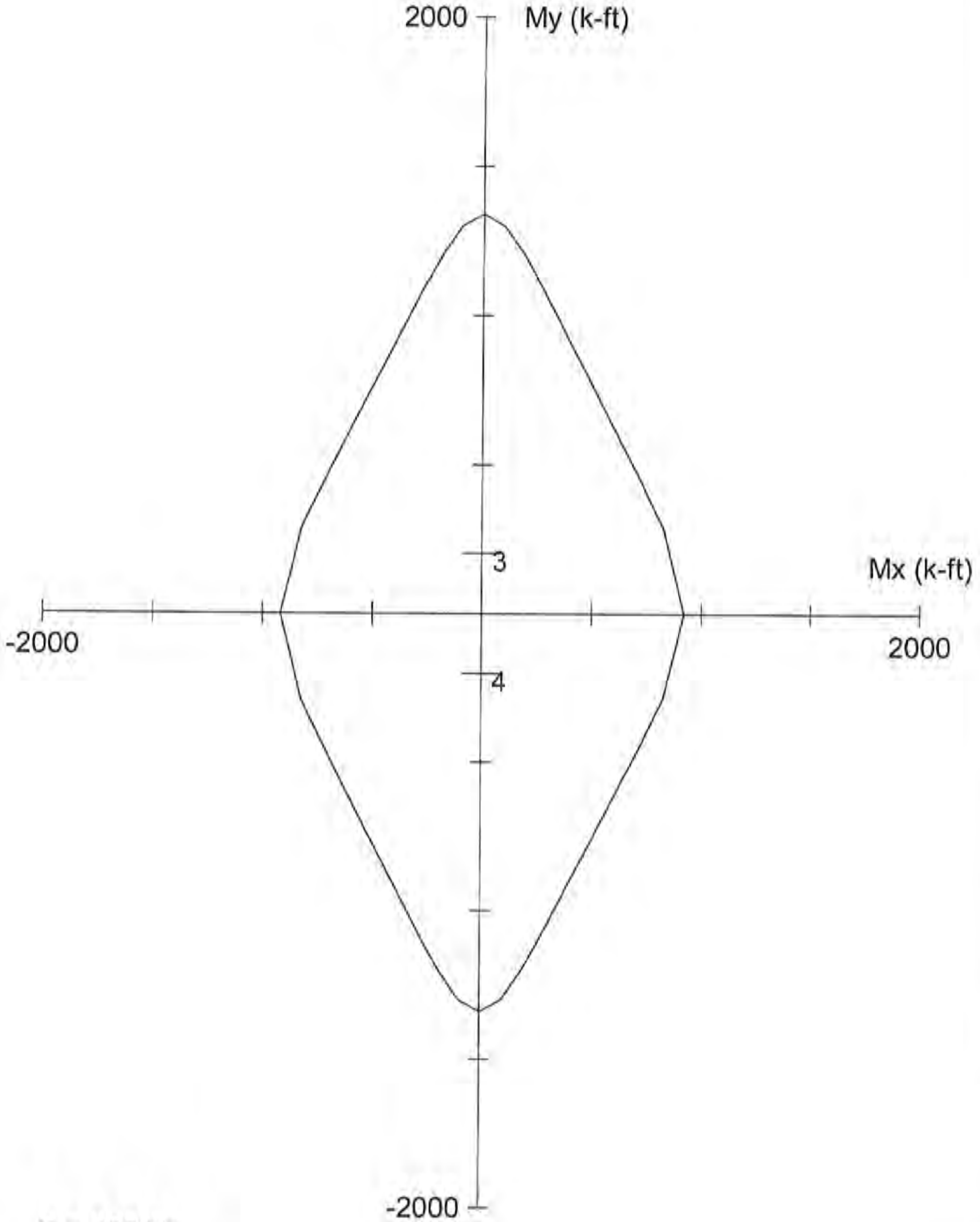
Slenderness: Not considered

Column type: Structural

Bars: ASTM A615

Date: 10/31/11

Time: 10:06:48



P = 405 kip

pcaColumn v3.63 - Licensed to: FLSmidth

File: C:\Users\esum-us\Desktop\Pedestal Design\Column J.col

Project: CC&V High Grade Ore

Column: A/B		Engineer: ECS	
f'c = 4 ksi	fy = 60 ksi	Ag = 864 in^2	12 #10 bars
Ec = 3605 ksi	Es = 29000 ksi	As = 15.24 in^2	Rho = 1.76%
fc = 3.4 ksi	fc = 3.4 ksi	Xo = 0.00 in	Ix = 41472 in^4
= 0.003 in/in		Yo = 0.00 in	Iy = 93312 in^4
Beta1 = 0.85		Clear spacing = 6.16 in	Clear cover = 2.50 in
Confinement: Tied	phi(a) = 0.8, phi(b) = 0.9, phi(c) = 0.65		

Anchor Bolt Design - Pedestal

per ACI 318-08 Appendix D, Wind Loads and Anchor Bol Design for Petrochemical Facilities (ASCE Anchor Bolt Task Committee)

Assumptions: Cast-in-place Anchor Bolts, Cracked Concrete
Intermediate to High Seismic, No eccentric loading

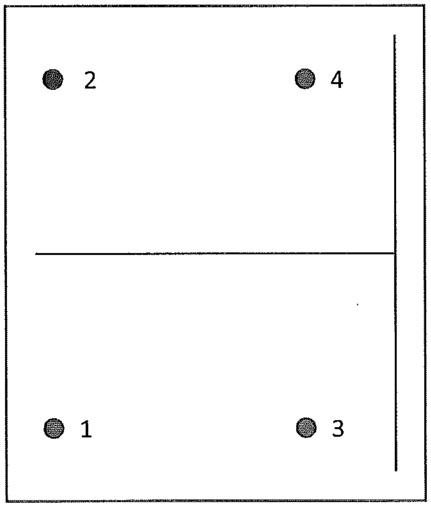
Loads:

N =	34.700	kip	Factored Tensile Load
V_x =	165.440	kip	Factored Shear Load - X Dir.
M_y =	0.000	kip*ft	Factored Moment - About Y Axis
V_y =	0.000	kip	Factored Shear Load - Y Dir.
M_x =	0.000	kip*ft	Factored Moment - about X Axis

Anchor Geometry:

(Origin at Column Centerline)

Bolt #	**X (in)**	**Y (in)**
1	-19	-48
2	-19	48
3	-5	-48
4	-5	48
5		
6		
7		
8		
9		
10		
11		
12		
Max Spacing	14	96
Outside Spacing	14	96



Anchor Loads: *(check bolts that resist shear)*

Update Loads

		Shear			**Tension**
Bolt #		**X Dir.**		**Y Dir.**	**X Dir.**
1	☑	41.4	☑	0.0	8.7
2	☑	41.4	☑	0.0	8.7
3	☑	41.4	☑	0.0	8.7
4	☑	41.4	☑	0.0	8.7
5	☐	0.0	☐	0.0	0.0
6	☐	0.0	☐	0.0	0.0
7	☐	0.0	☐	0.0	0.0
8	☐	0.0	☐	0.0	0.0
9	☐	0.0	☐	0.0	0.0
10	☐	0.0	☐	0.0	0.0
11	☐	0.0	☐	0.0	0.0
12	☐	0.0	☐	0.0	0.0
Sum		**165.4**		**0.00**	**34.70**

FLSMIDTH	PROJECT CC&V	PROJ NO. 11021
	HIGH GRADE ORE	CALC NO. C-004
	SCOPE BALL MILL	BY ECS DATE 16-Jul-12
	ANCHOR BOLT DESIGN	CHK DATE
		SHEET OF REV

Bolt Properties:

$D =$	2	in	Anchor Bolt Diameter
	F1554 36		Anchor Bolt Material
$h_{ef} =$	42	in	Embedment Depth
$h'_{ef} =$	32.00	in	Effective Embedment Depth (D.5.2.3)
$l_e =$	16	in	Load bearing length of anchor for shear (D.6.2.2)
$n_t =$	4		Number of Bolts in Tension
$n_{vx} =$	4		Number of Bolts in Shear X Dir.
$n_{vy} =$	4		Number of Bolts in Shear Y Dir.
$A_{se} =$	2.498	in^2	Effective Tension Bolt Area
$A_{se,v} =$	2.498	in^2	Effective Shear Bolt Area
$A_{brg} =$	5.316	in^2	Bolt Bearing Area
$f_{ya} =$	36	ksi	Anchor Yield Strength
$f_{uta} =$	58	ksi	Ultimate Tensile Anchor Strength

Concrete Properties:

Grout Pad ☑ Tensile Reinforcement ☑ Shear Reinforcement ☑

$f'_c =$	4000	psi	
$H =$	120	in	Pedestal Height
$B =$	54	in	Pedestal Width
$L =$	114	in	Pedestal Length
$c_{at,1} =$	8	in	Tension Edge Distance 1
$c_{at,2} =$	32	in	Tension Edge Distance 2
$c_{at,3} =$	9	in	Tension Edge Distance 3
$c_{at,4} =$	9	in	Tension Edge Distance 4
$c_{av,1} =$	22	in	Shear Edge Distance 1
$c_{av,2} =$	105	in	Shear Edge Distance 2
$c_{a,min} =$	8	in	Minimum Clear Cover
$A_{nc}' =$	6156.0	in^2	Projected Tension Concrete Failure Area (D.5.2.1)
$A_{nco}' =$	9216.0	in^2	Projected Concrete Failure Area of a Single Bolt (D-6)
$A_{vc,x} =$	3762.0	in^2	Projected Shear Concrete Failure Area X Dir. (RD.6.2.1b)
$A_{vc,y} =$	4260.0	in^3	Projected Shear Concrete Failure Area Y Dir. (RD.6.2.1b)
$A_{vco,x} =$	2178.0	in^2	Maximum Projected Area for a Single Anchor X Dir. (D-23)
$A_{vco,y} =$	49612.5	in^3	Maximum Projected Area for a Single Anchor Y Dir. (D-23)

FLSMIDTH	PROJECT CC&V	PROJ NO. 11021
	HIGH GRADE ORE	CALC NO. C-004
	SCOPE BALL MILL	BY ECS DATE 16-Jul-12
	ANCHOR BOLT DESIGN	CHK DATE
		SHEET OF REV

Pedestal Reinforcement:

fy =	60	ksi	Reinforcement Yield Strength
Reinforcement =	# 10		Pedestal Reinforcement Size
N =	48		Total Number of Longitudinal Bars
s =	8	in	Horizontal Clear Distance Between Bolts and Reinforcement
c =	2	in	Concrete Cover (Top of Pedestal to Top of Reinforcement)
ρ =	0.99%		Pedestal Reinforcement Ratio
$A_{s,bar\ Req'd}$ =	0.26	in^2	Required Reinforcement per Tension Bolt (D.3.3.3)
$A_{s,bar}$ =	15.24	in^2	Provided Reinforcement per Tension Bolt
L_d =	60.2	in	Reinforcement Development Length (ACI 318 - 12.2.3)
Reduction Ratio =	0.02		Development Length Reduction Ratio (ACI 318 - 12.2.5)
L_{dev} =	1	in	Reduced Development Length
$h_{ef,\ Req'd}$ =	12	in	Minimum Required Anchor Bolt Embedment

Use (48) # 10 Bars, 12 in. Minimum Anchor Embedment Depth

Factors/ Coefficients:

Tension Factors:

$\psi_{ed,N}$ =	0.750	Factor for insufficient side cover (D-10,D-11)
$\psi_{c,N}$ =	1	Factor for uncracked concrete (D.5.2.6)

Shear Factors:

$\psi_{ed,Vx}$ =	1.000	Factor for insufficient side cover (D-27,D-28)
$\psi_{ed,Vy}$ =	0.742	Factor for insufficient side cover (D-27,D-28)
$\psi_{c,V}$ =	1	Factor for uncracked concrete (D.6.&.&)

Reduction Factors: (D.4.4)

ϕ_{sn} =	0.75	Steel Reduction Factor for Tension
ϕ_{sv} =	0.65	Steel Reduction Factor for Shear
ϕ_{cp} =	0.70	Tensile Pullout and Shear Pryout Reduction Factor
ϕ_{cn} =	0.75	Concrete Reduction Factor for Tension
ϕ_{cv} =	0.75	Concrete Reduction Factor for Shear

FLSMIDTH

PROJECT	CC&V	PROJ NO.	11021	
	HIGH GRADE ORE	CALC NO.	C-004	
SCOPE	BALL MILL	BY ECS	DATE	16-Jul-12
	ANCHOR BOLT DESIGN	CHK	DATE	
		SHEET	OF	REV

Results:

Note: Pedestal reinforcement is designed to prevent all failure modes with a check mark

Tension Results:

	ϕN_{sa} =	434.7	kip	Nominal Strength of Anchor (Group) in Tension (D-3)
	N_b =	326.4	kip	Basic Concrete Breakout Strength of a Single Anchor (D-7, D-8)
☑	ϕN_{cb} =	NA	kip	Concrete Breakout Strength in Tension (Group) (D-5)
	N_p =	170.1	kip	Pullout strength for single headed stud
☐	ϕN_{Pn} =	476.3	kip	The Nominal pullout Strength in Tension (Group) (D-14)
	N_{sb} =	99.159	kip	Side-face blowout strength of a single bolt (D-17)
☐	ϕN_{sbg} =	244.798	kip	Side-face blowout strength of a bolt group (D-18)

ϕN_n =	**244.8**	**kip**	**0.14**	**DESIGN OK**

Shear Results:

☐	$\phi V_{sa,\,x}$ =	180.8	kip	Nominal Steel Shear Strength X Dir. (D-20)
☐	$\phi V_{sa,\,y}$ =	180.8	kip	Nominal Steel Shear Strength Y Dir. (D-20)
	$V_{b,x}$ =	97.9	kip	Basic Concrete Breakout Strength, X Dir. (D-24)
	$V_{b,y}$ =	1021.0	kip	Basic Concrete Breakout Strength, Y Dir. (D-24)
☑	$\phi V_{cbg,x}$ =	NA	kip	Concrete breakout Strength (Group), X Dir. (D-22)
☑	$\phi V_{cbg,y}$ =	NA	kip	Concrete breakout Strength (Group), Y Dir. (D-22)
☐	$\phi V_{cpg,x}$ =	228.9	kip	Nominal Pryout Strength for a group of anchors X Dir. (D-31)
☐	$\phi V_{cpg,y}$ =	228.9	kip	Nominal Pryout Strength for a group of anchors Y Dir. (D-31)

ϕV_{nx} =	**180.8**	**kip**	**0.91**	**DESIGN OK**
ϕV_{ny} =	**180.8**	**kip**	**0.00**	**DESIGN OK**

interaction Ratio:

Ratio = 1.06 **DESIGN OK**