

Scan 1

Structural Calculations

For:
Block 8L
60 NW Davis

Structural Calculations Package
Revised Foundation Permit Response



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DOCUMENT SERVICES

Prepared For:
Ankrom Moisan Architects, Inc.
6820 SW Macadam Ave, Ste 100
Portland, OR 98104

22-Dec-14

Job Number: 14031-0013

14-211482-STR-01-CO

Structural Checksheet Response

Permit #: 14-211482-STR-01-CO

Date: 12/22/14

Customer name and phone number: DCI Engineers 503-242-2448 (Mike Poulos)

Note: Please number each change in the '#' column. Use as many lines as necessary to describe your changes. Indicate which reviewer's checksheet you are responding to and the item your change addresses. If the item is not in response to a checksheet, write **customer** in the last column.

[illegible]

Units

Geometry Unit:

Item 10.1

Plan Dimensions: feet

Angles: degrees

Slab Thickness: inches

Elevations: inches

Support Dimensions: inches

Support Height: feet

Loading and Reaction Unit

Point Force: Kips

- Report As Zero: 0 Kips

Point Moment: kip-ft

- Report As Zero: 0 kip-ft

Line Force: kips/ft

- Report As Zero: 0 kips/ft

Line Moment: Kips

- Report As Zero: 0 Kips

Area Force: psf

- Report As Zero: 0 psf

Area Moment: #/foot

- Report As Zero: 0 #/foot

Spring and Stiffness Unit

Point Force Spring: kips/in

Point Moment Spring: k-ft/°

Line Force Spring: ksi

Line Moment Spring: k/°

Area Force Spring: pci

Area Moment Spring: k/ft°

Slab Analysis Unit:

Force: Kips

- Report As Zero: 0 Kips

Force Per Width: kips/ft

- Report As Zero: 0 kips/ft

Moment: kip-ft

- Report As Zero: 0 kip-ft

Moment Per Width: Kips

- Report As Zero: 0 Kips

Concrete Stress: psi

- Report As Zero: 0 psi

Deflection: inches

- Report As Zero: 0 inches

Materials Unit:

Concrete Volume: yd³

Reinforcement Weight: tons

PT Weight: pounds

Reinforcing Area: in²

Tendon Profile: inches

Cover: inches

PT Force: Kips

Reinforcing Stress: ksi

Miscellaneous Unit

Floor Area: ft²

Tendon Angles (for friction): radians

Density: pcf

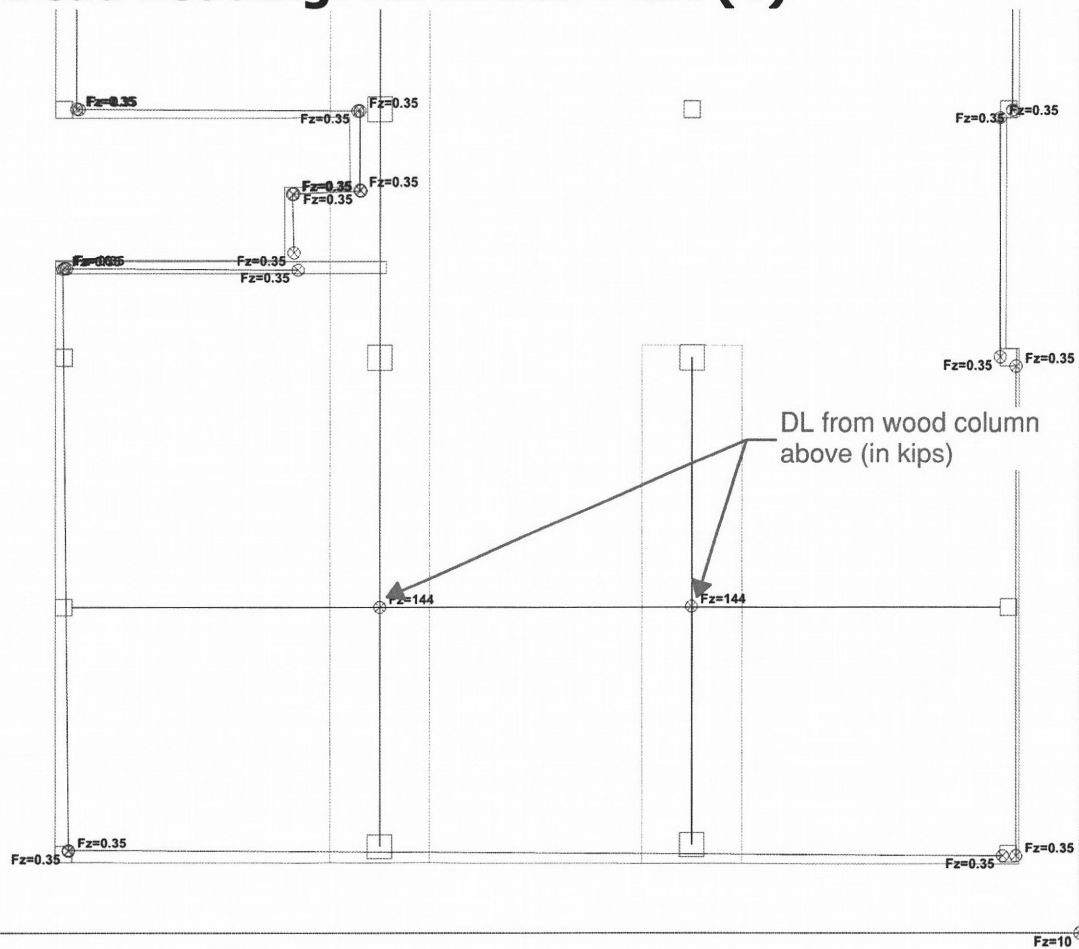
Elongations: inches

Other Dead Loading: User Lines; User Notes; User Dimensions; Point Loads; Point Load Icons; Point Load Values; Line Loads; Line Load Icons; Line Load Values; Area Loads; Area Load Icons; Area Load Values;
Drawing Import: User Lines; User Notes; User Dimensions;
Element: Wall Elements Below; Wall Elements Above; Wall Element Outline Only; Column Elements Below; Column Elements Above; Slab Elements; Slab Element Outline Only;
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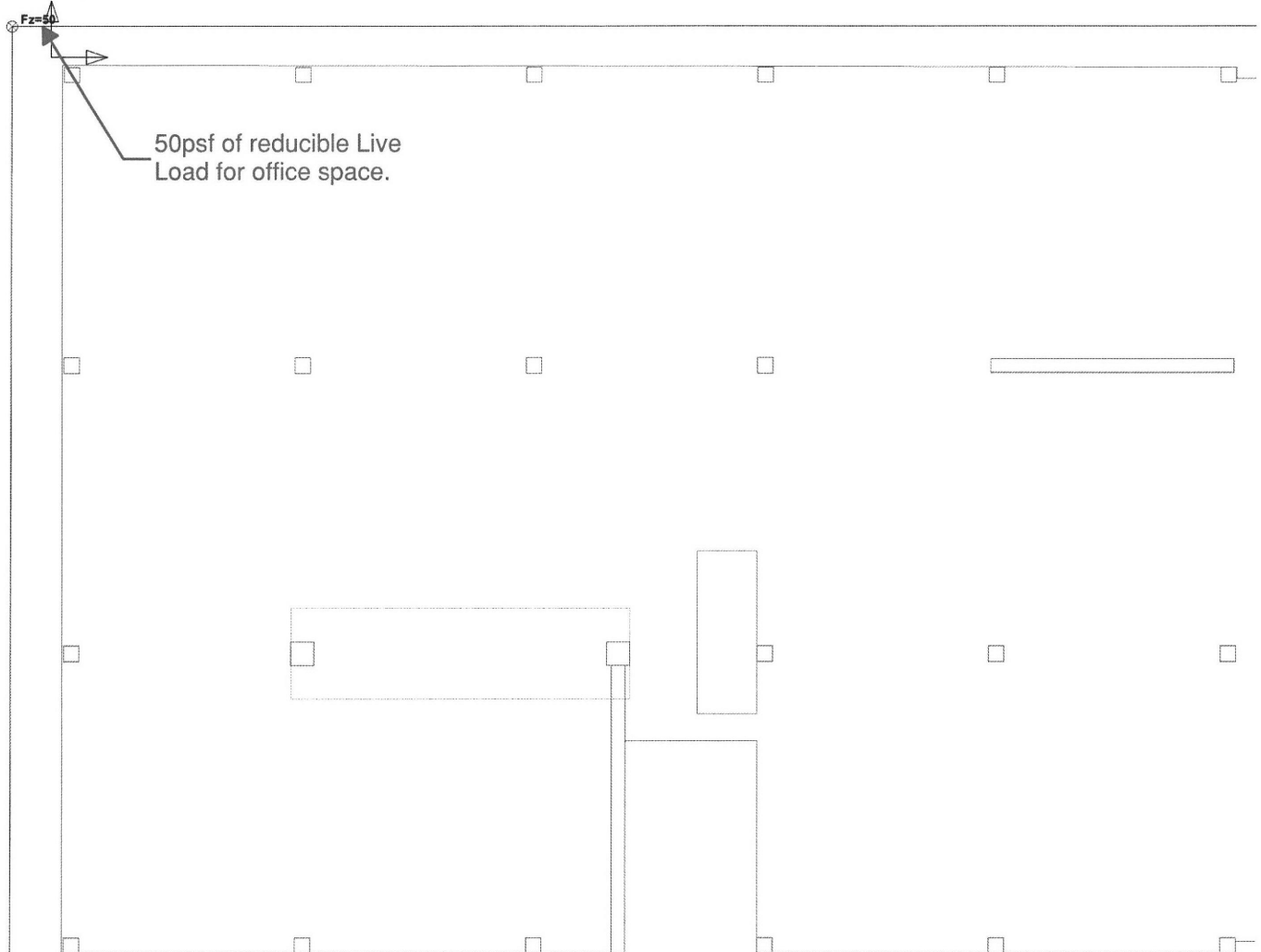
Other Dead Loading: All Loads Plan - 14

Other Dead Loading: All Loads Plan (4)

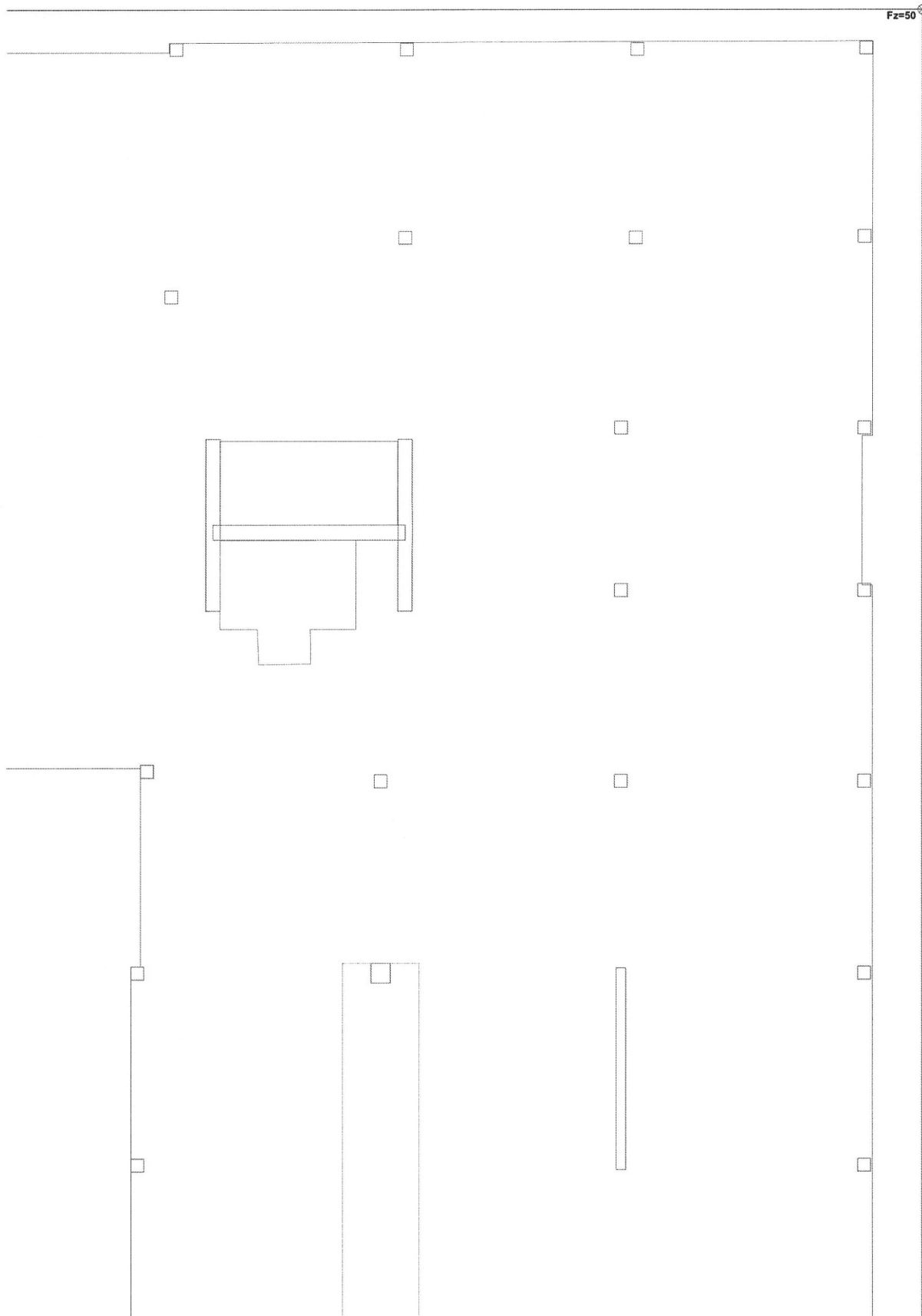


Live (Reducible) Loading: All Loads Plan

Live (Reducible) Loading: User Lines; User Notes; User Dimensions; Point Loads; Point Load Icons; Point Load Values; Line Loads; Line Load Icons; Line Load Values; Area Loads; Area Load Icons; Area Load Values;
Drawing Import: User Lines; User Notes; User Dimensions;
Element: Wall Elements Below; Wall Elements Above; Wall Element Outline Only; Column Elements Below; Column Elements Above; Slab Elements; Slab Element Outline Only;
Scale = 1:185



Live (Reducible) Loading: All Loads Plan (2)



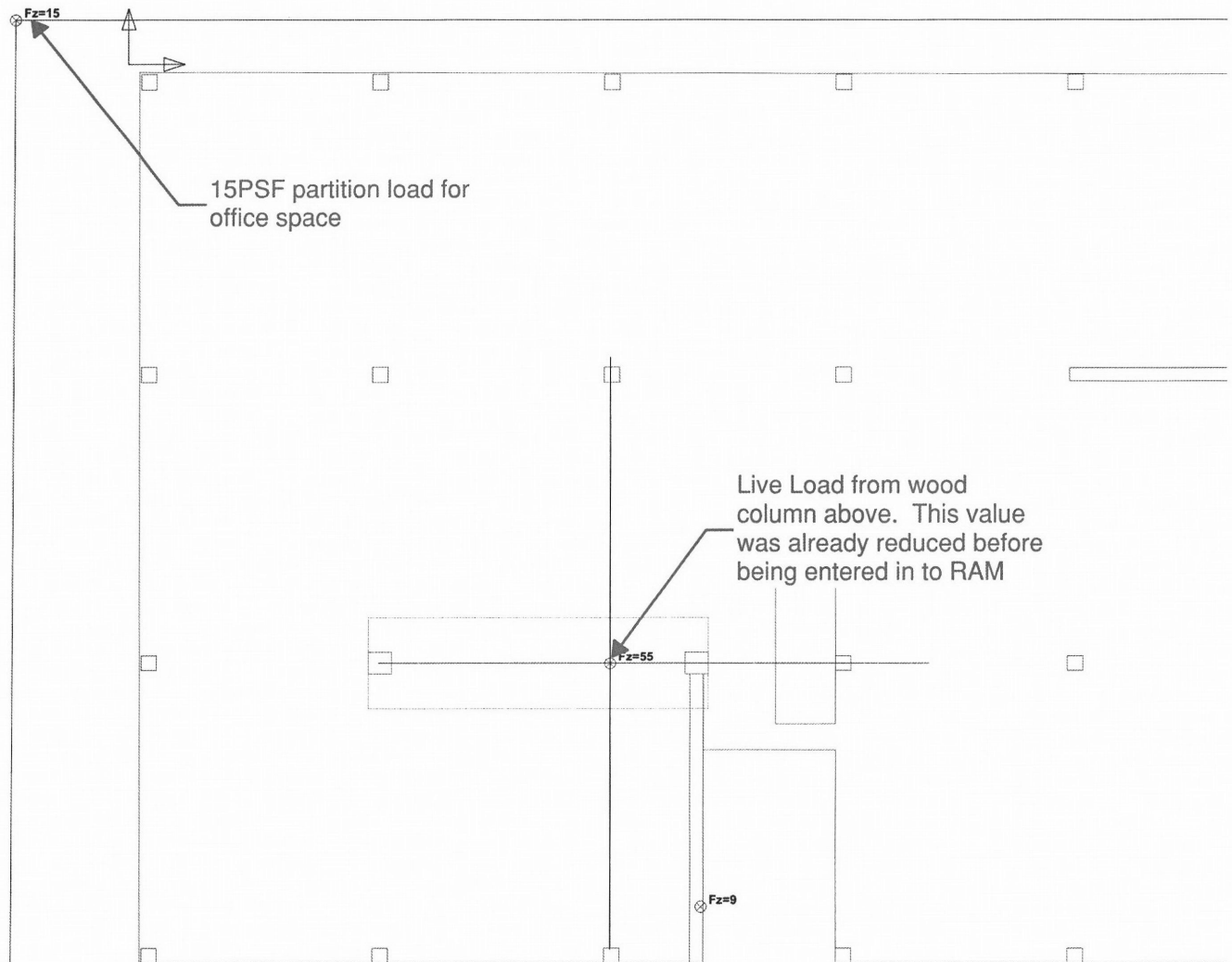
Live (Reducible) Loading: All Loads Plan (4)

Item 10.7



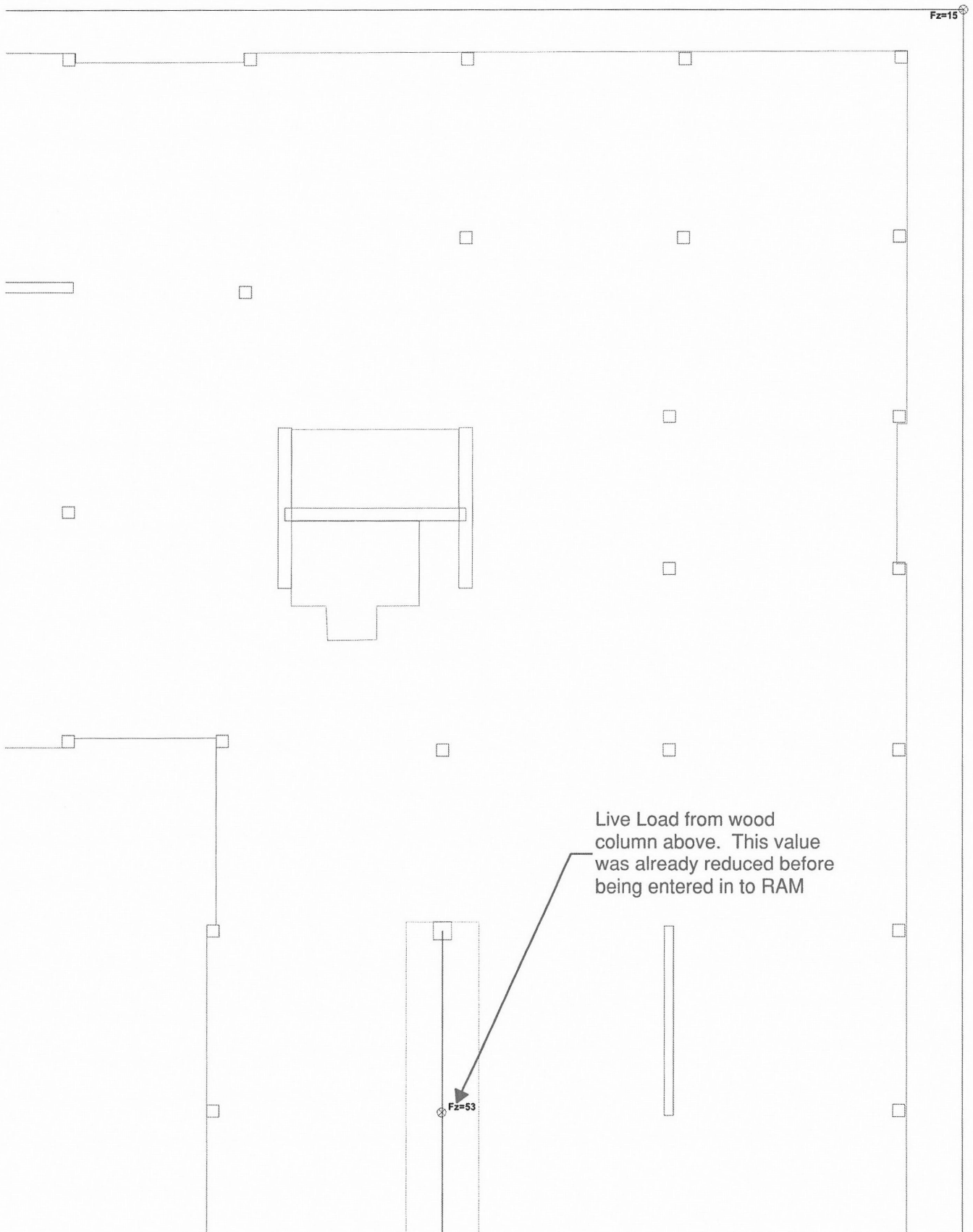
Live (Unreducible) Loading: All Loads Plan

Live (Unreducible) Loading: User Lines; User Notes; User Dimensions; Point Loads; Point Load Icons; Point Load Values; Line Loads; Line Load Icons; Line Load Values; Area Loads; Area Load Icons; Area Load Value
 Drawing Import: User Lines; User Notes; User Dimensions;
 Element: Wall Elements Below; Wall Elements Above; Wall Element Outline Only; Column Elements Below; Column Elements Above; Slab Elements; Slab Element Outline Only;
 Scale = 1:185

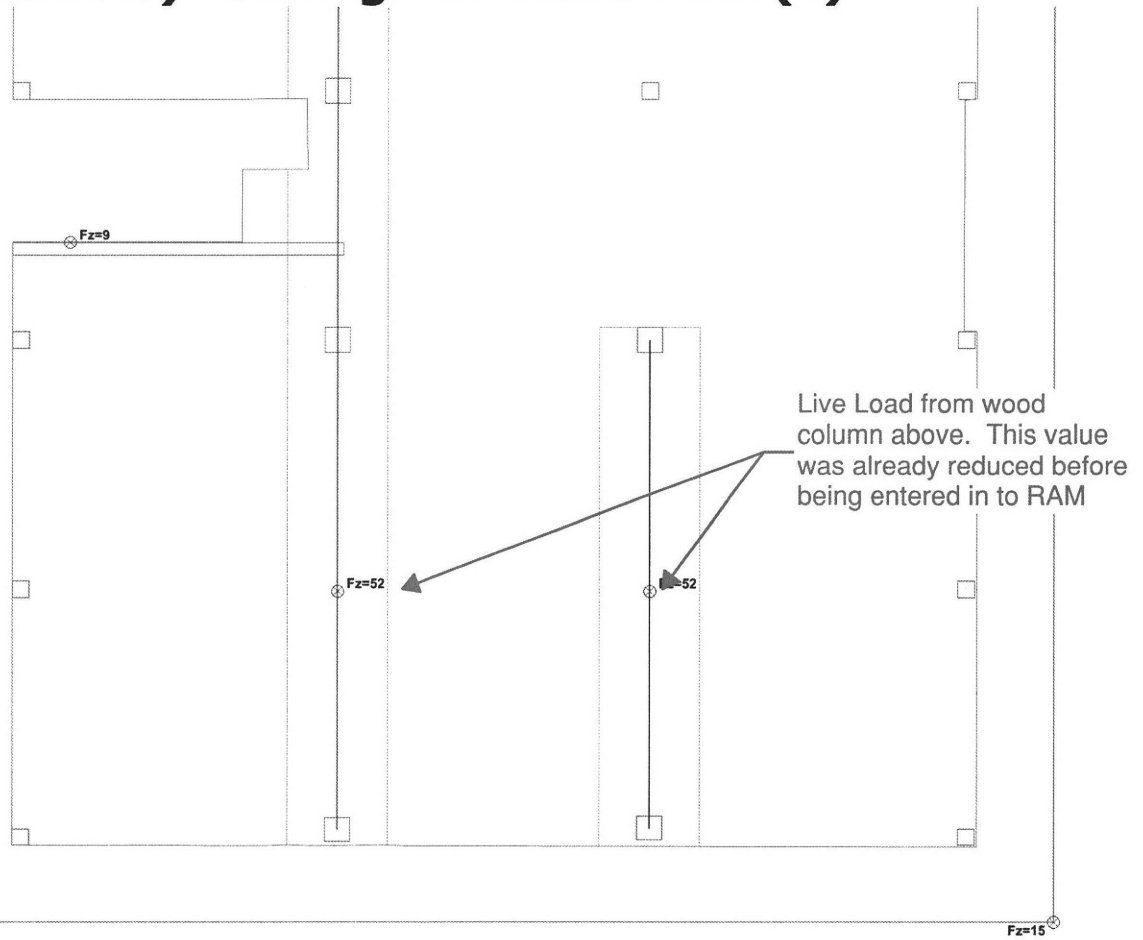


Live (Unreducible) Loading: All Loads Plan (2)

s;

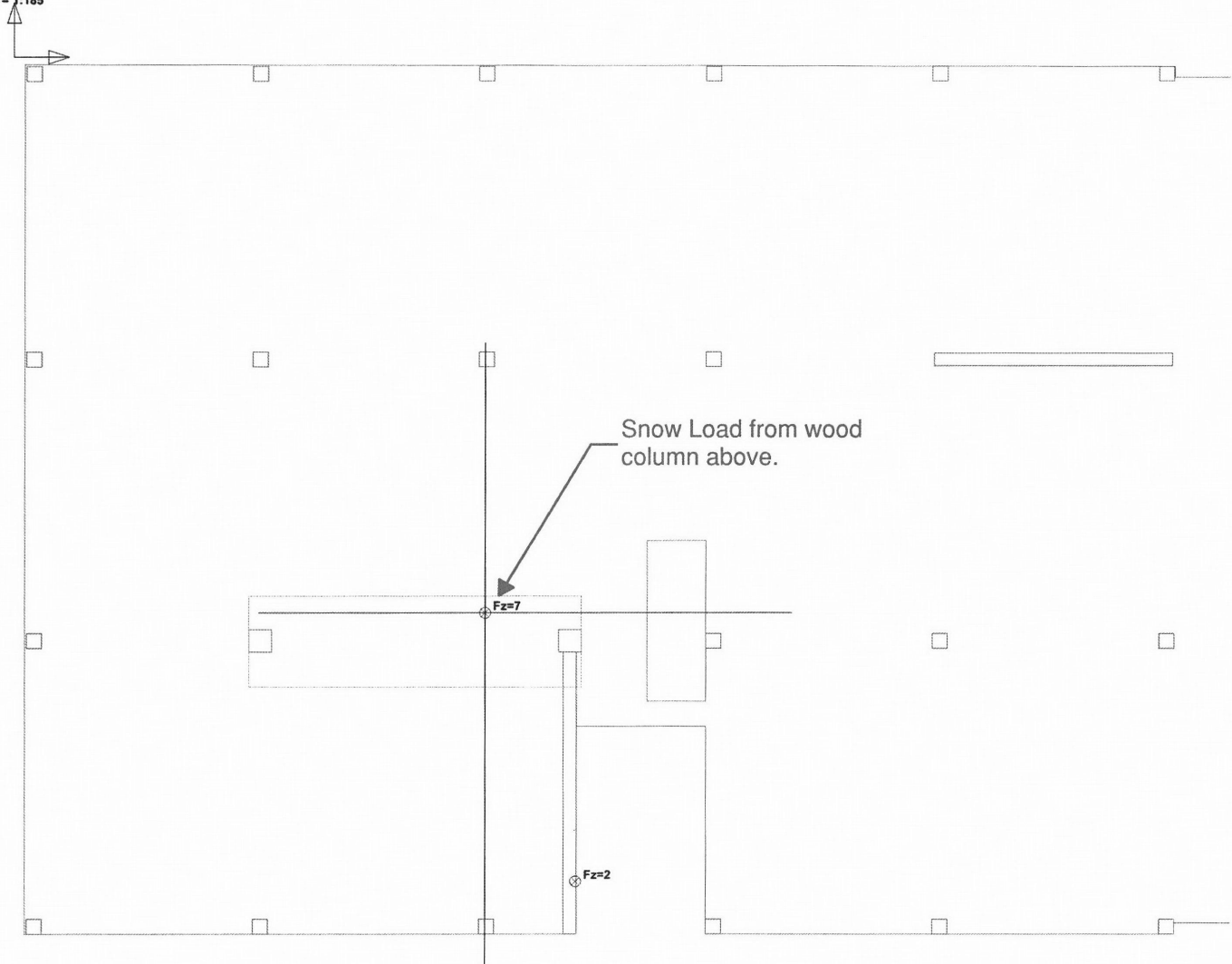


Live (Unreducible) Loading: All Loads Plan (4)

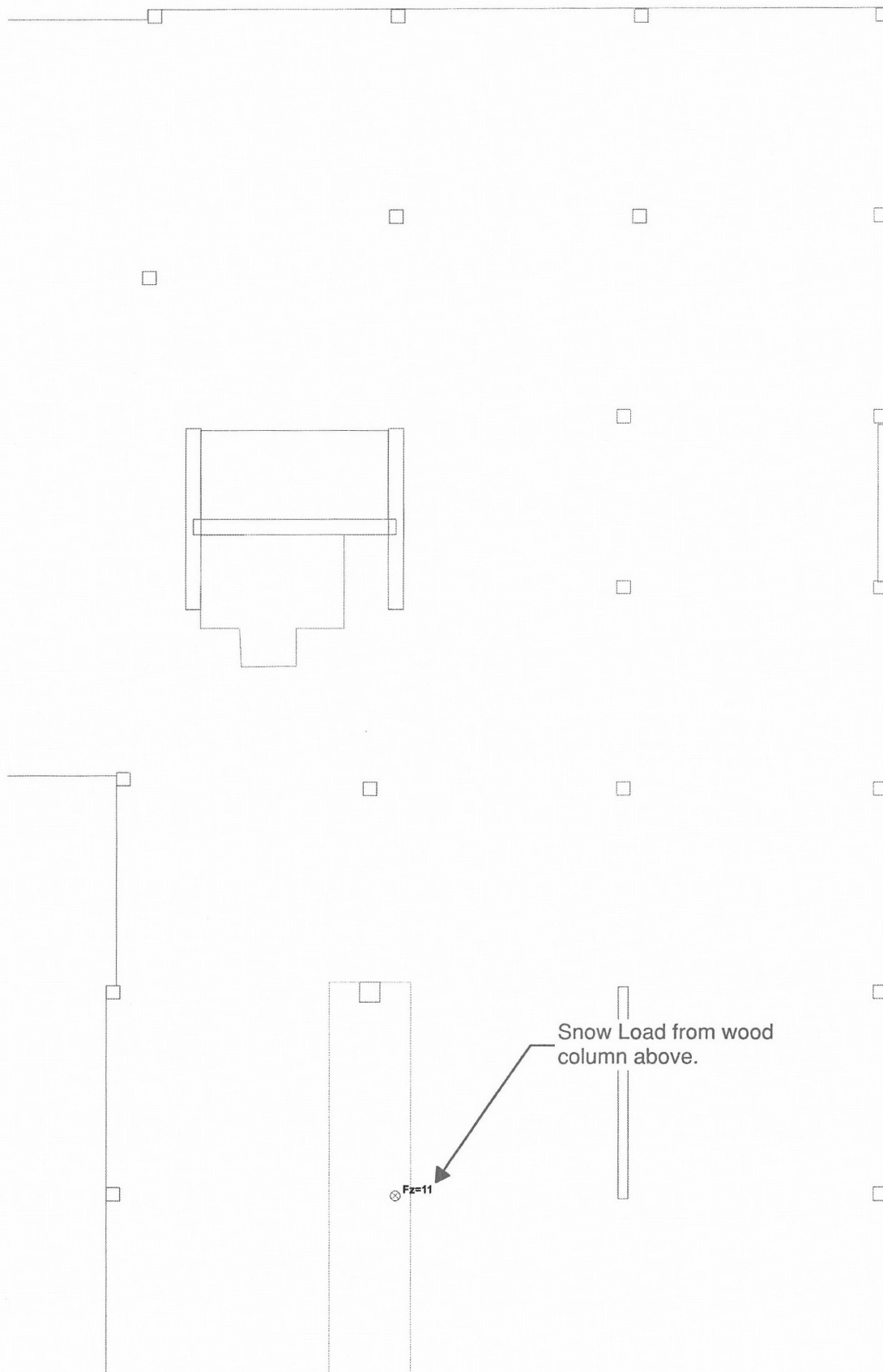


Snow Loading: All Loads Plan

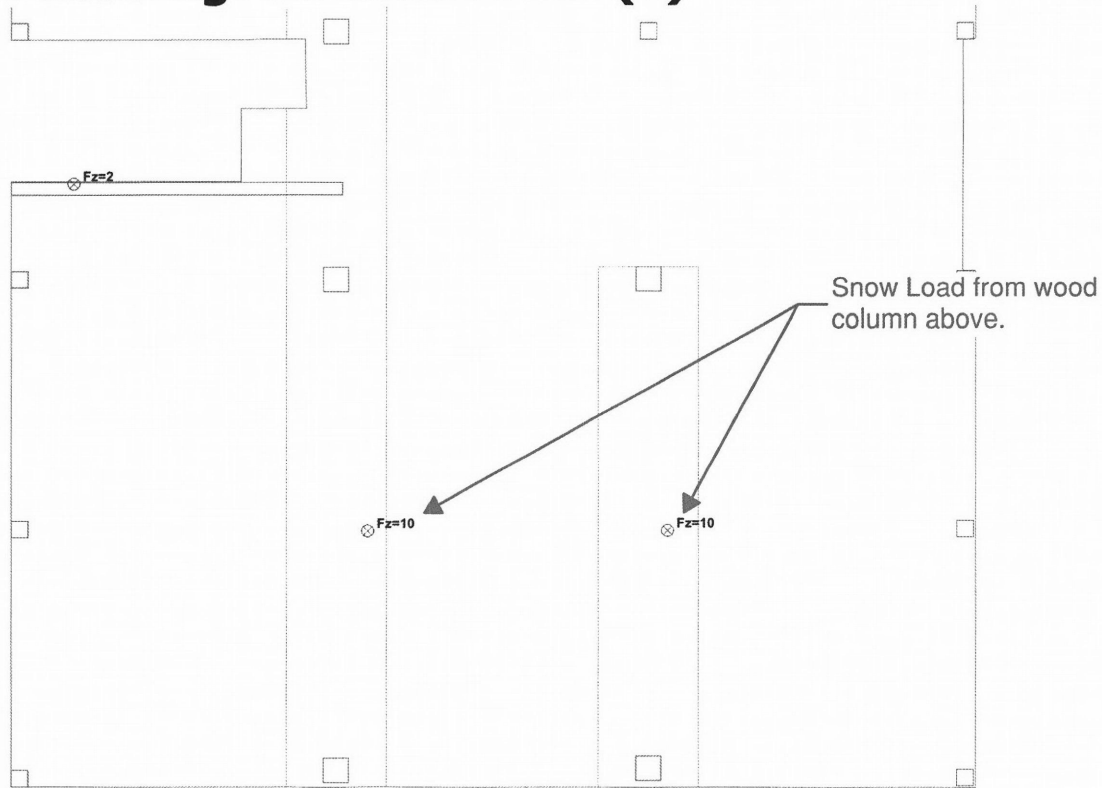
Snow Loading: User Lines; User Notes; User Dimensions; Point Loads; Point Load Icons; Point Load Values; Line Loads; Line Load Icons; Line Load Values; Area Loads; Area Load Icons; Area Load Values;
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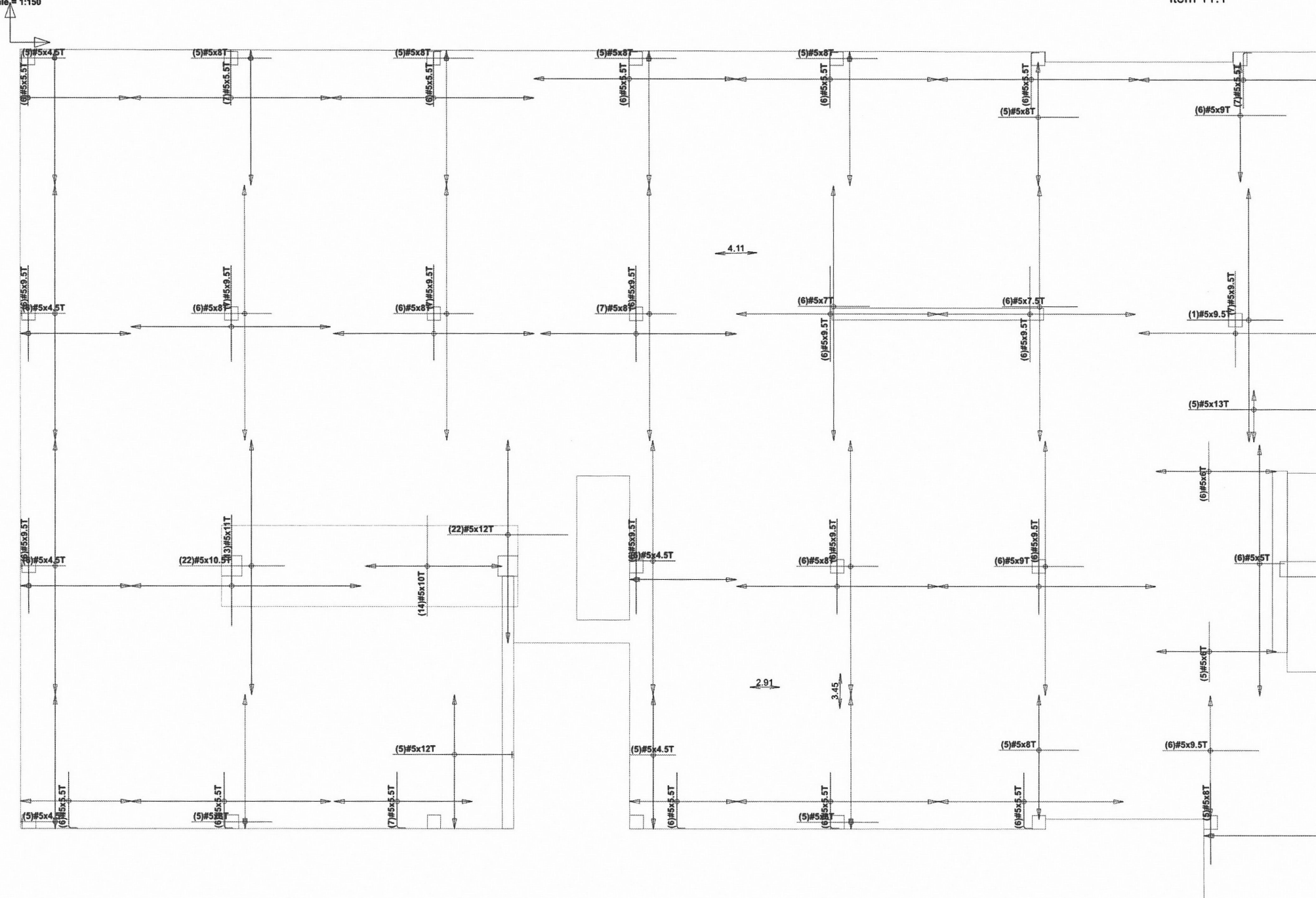
Snow Loading: All Loads Plan (2)



Snow Loading: All Loads Plan (4)

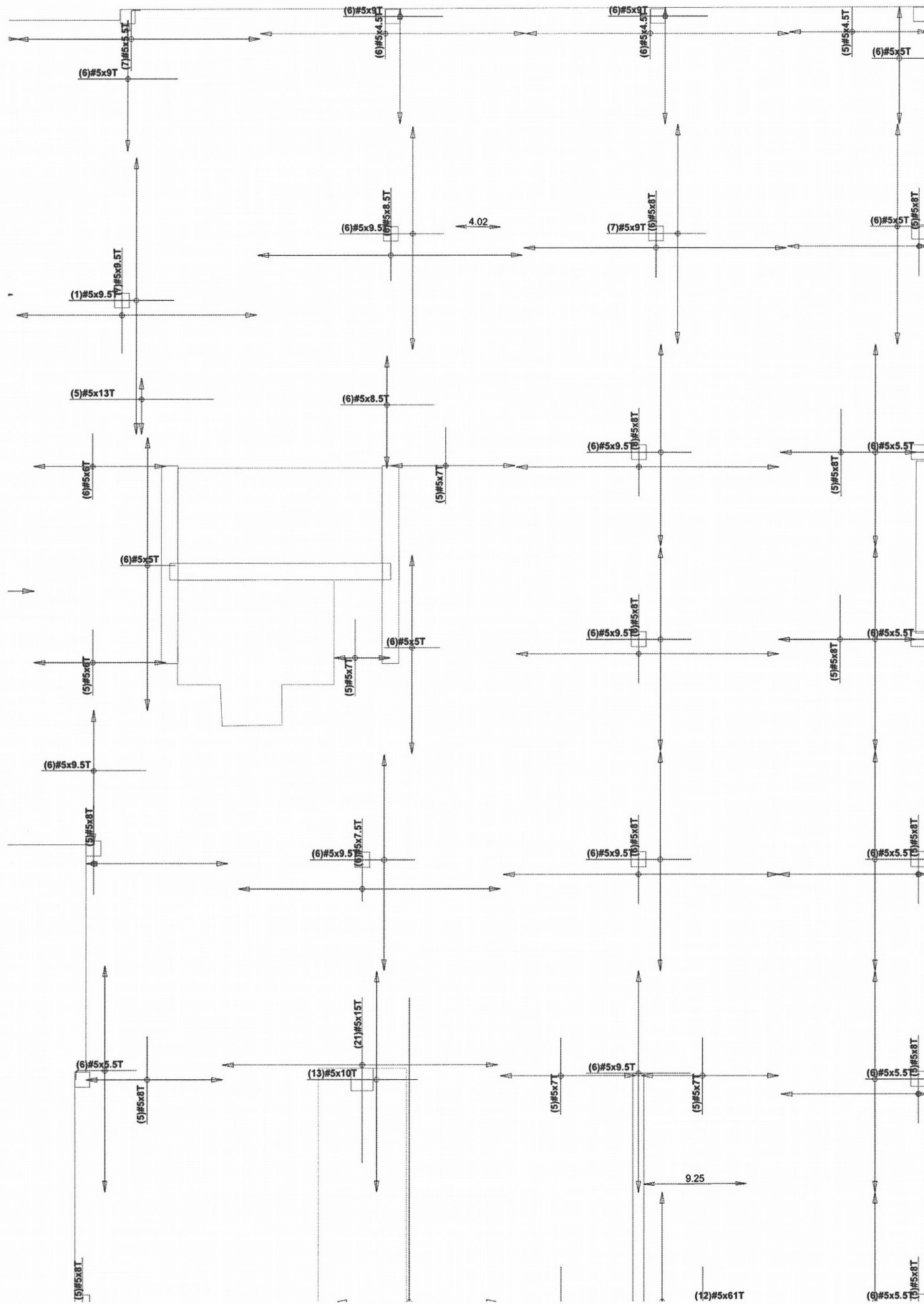


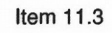
Item 11.1



Reinforcement: Top Bars Plan -

Item 11.2

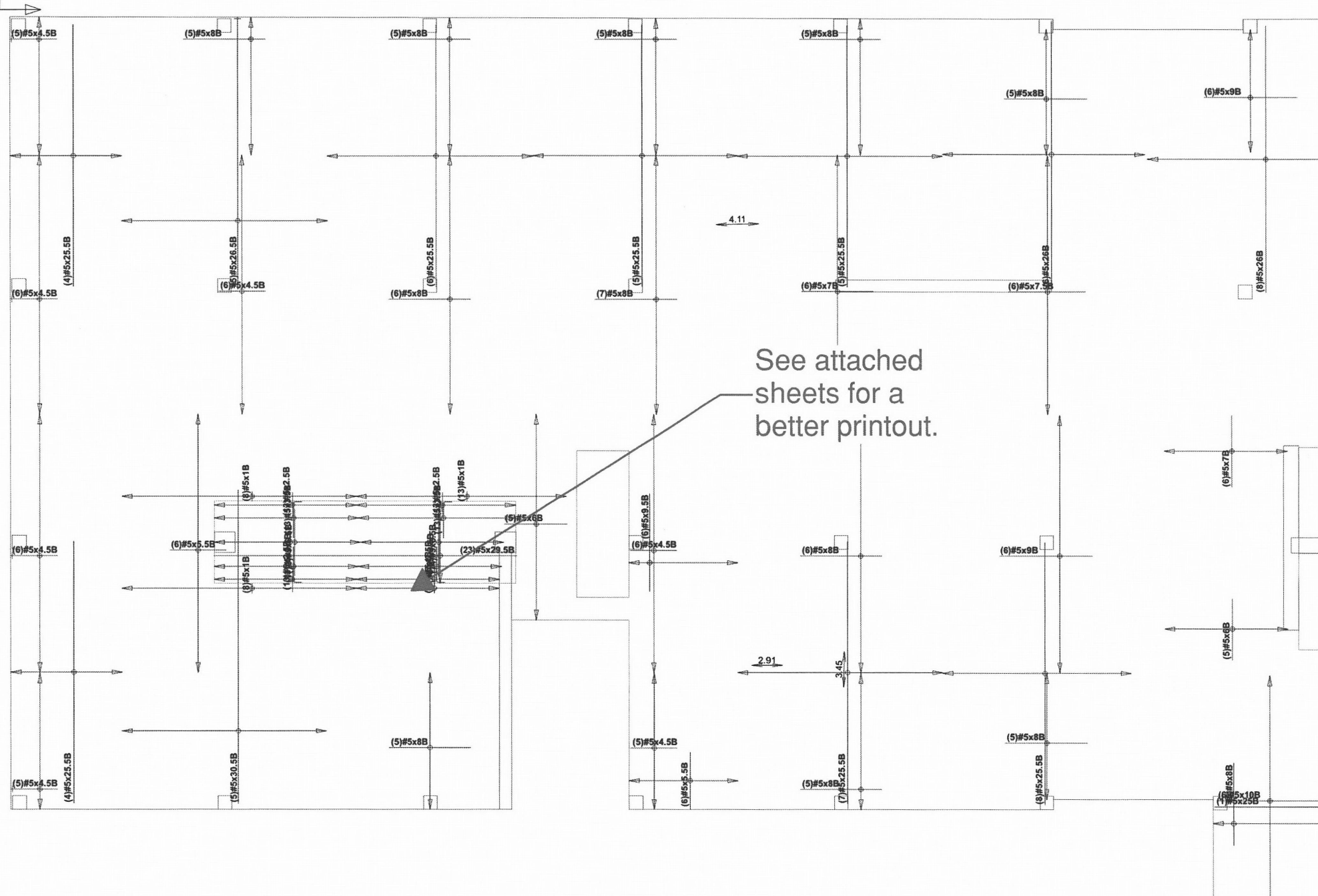




Reinforcement: Bottom Bars Plan

inforcement: User Lines; User Notes; User Dimensions; Latitude User Concentrated Reinf.; Latitude Program Concentrated Reinf.; Latitude User Distributed Reinf.; Latitude Program Distributed Reinf.; Longitude User Concentrated Reinf.; Longitude Program Concentrated Reinf.; Longitude User Distributed Reinf.; L
 awing Import; User Lines; User Notes; User Dimensions;
 ament: Wall Elements Below; Wall Elements Above; Wall Element Outline Only; Column Elements Below; Column Elements Above; Slab Elements; Slab Element Outline Only;
 ale #1:150

Item 11.4



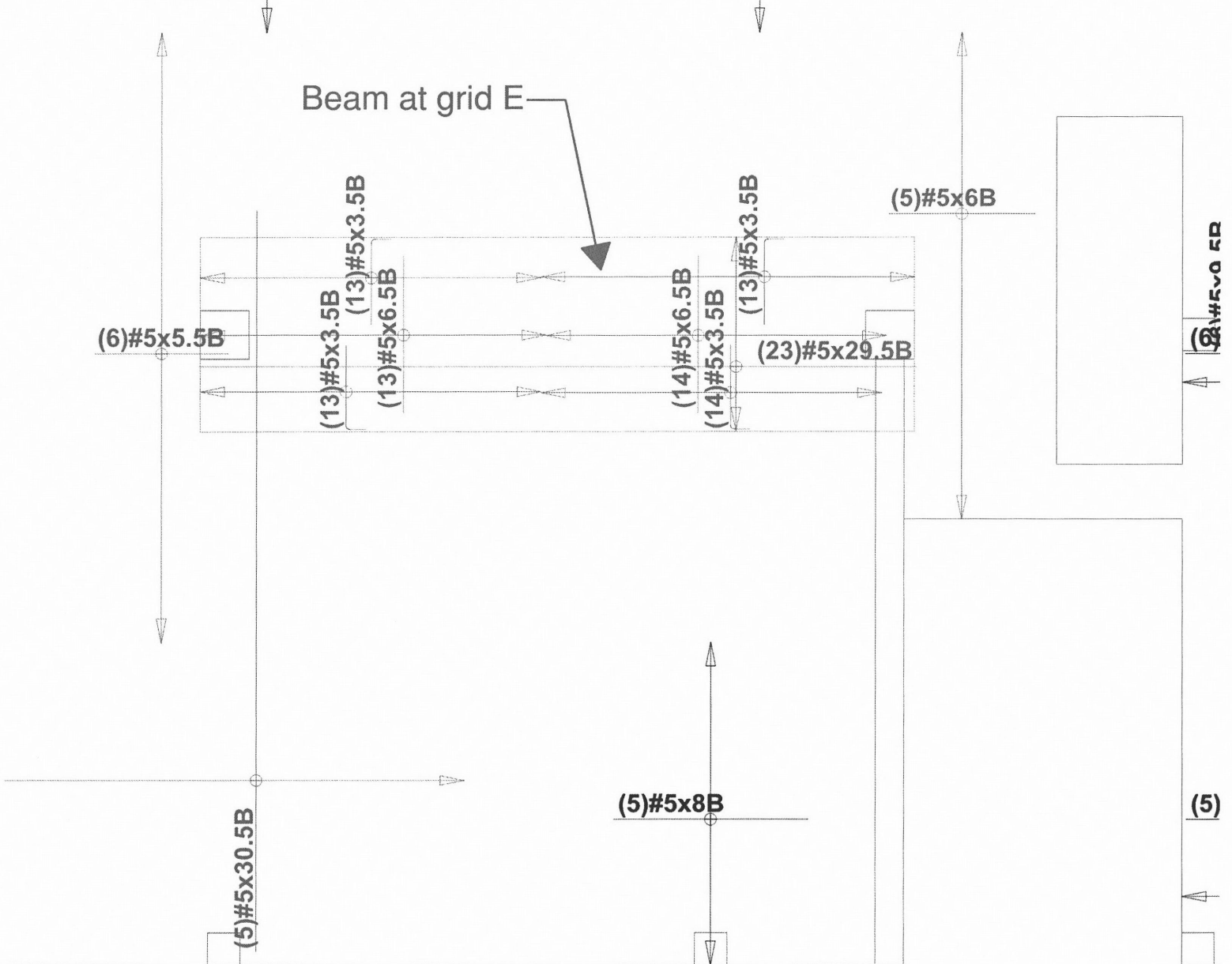
Reinforcement: Bottom Bars Plan -

Drawing Input: User Lines; User Notes; User Dimensions;
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 Scale = 1:150

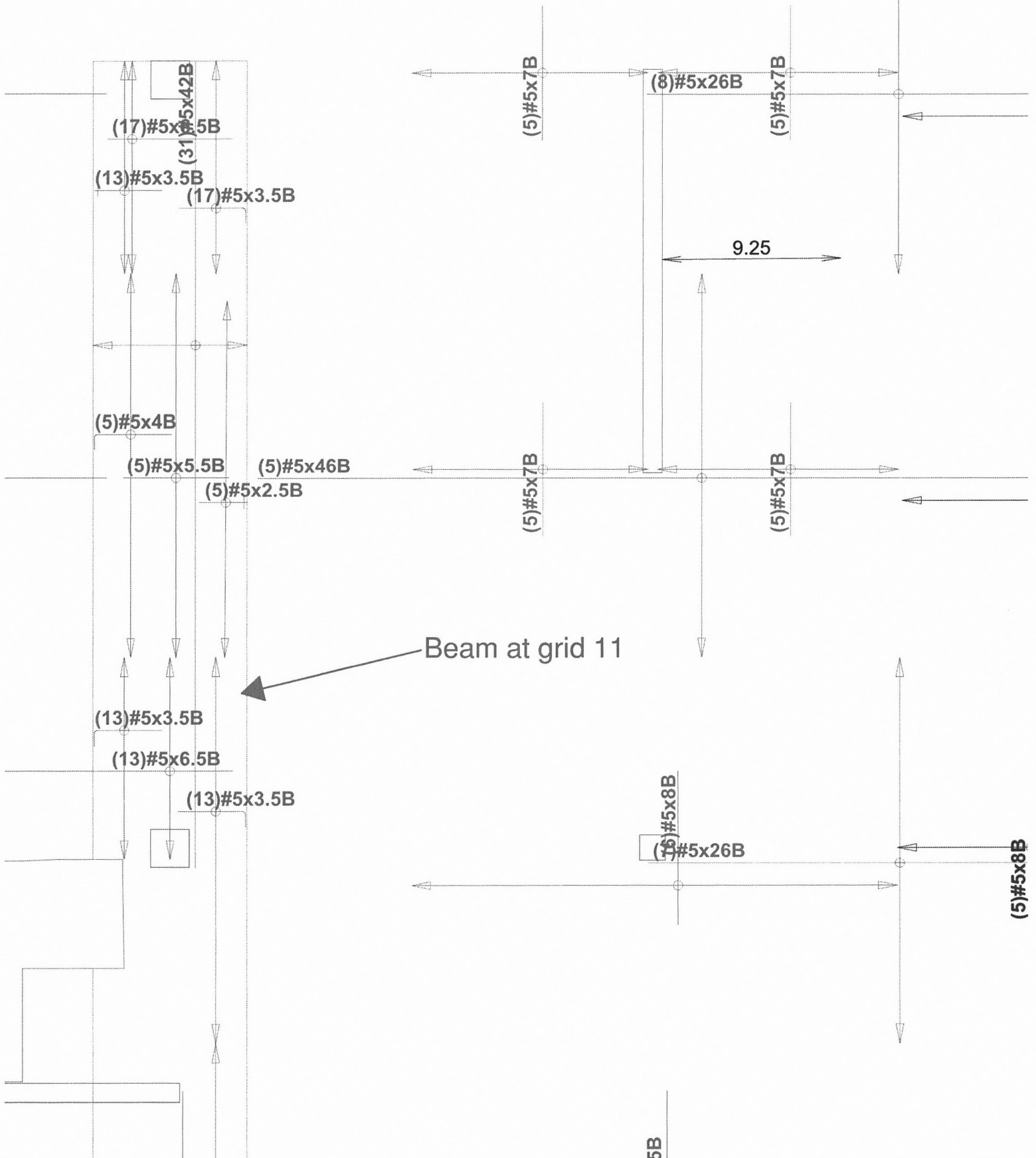
See attached
-sheets for a
better printout.

Reinforcement: Bottom Bars Plan

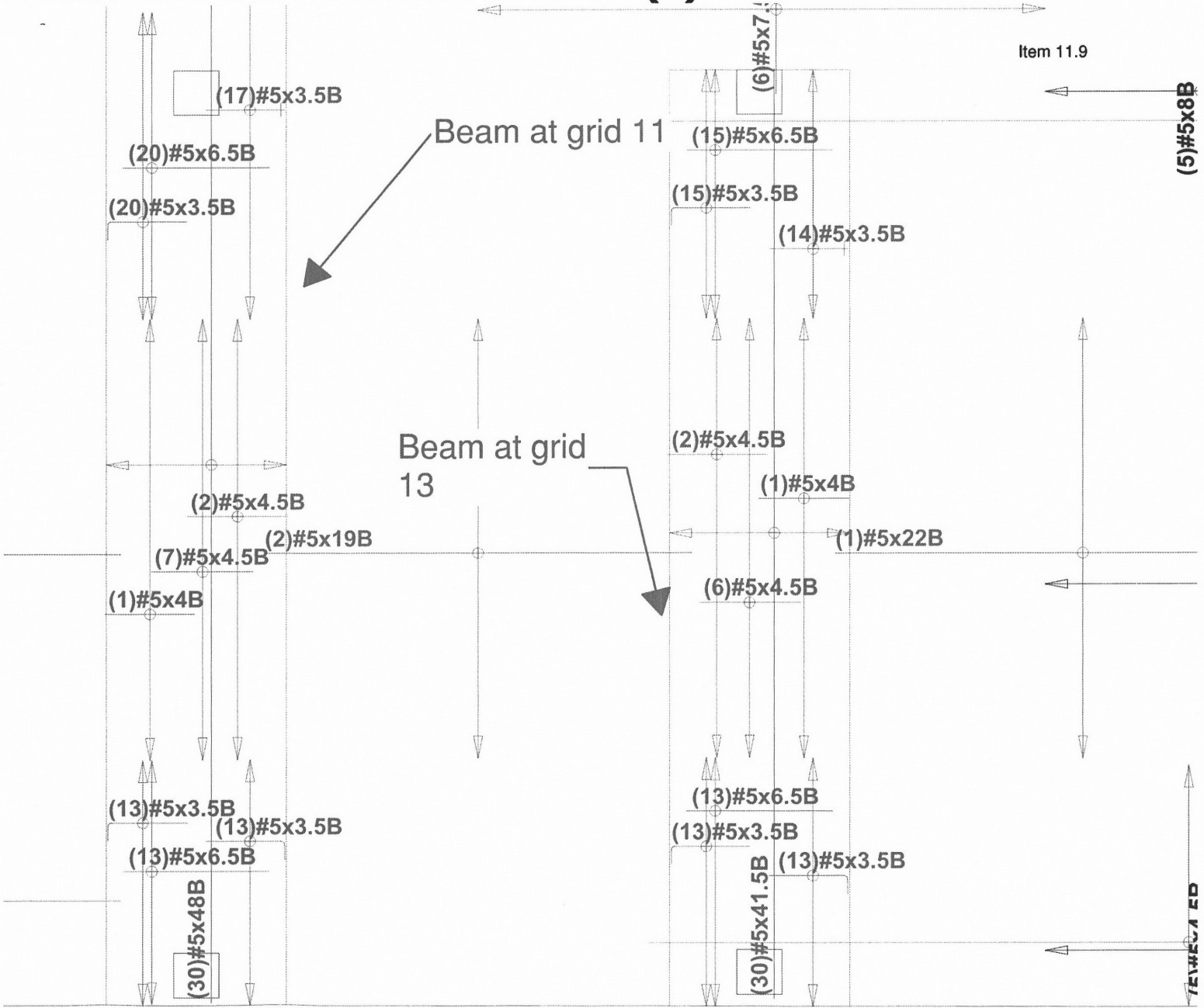
Reinforcement: User Lines; User Notes; User Dimensions; Latitude User Concentrated Reinf.; Latitude
 Drawing Import: User Lines; User Notes; User Dimensions; Item 11.7
 Element: Wall Elements Below; Wall Elements Above; Wall Element Outline Only; Column Elements I
 Scale = 1:75



Item 11.8



Reinforcement: Bottom Bars Plan (2)



This is Ta (eq. 12.8-7 from ASCE 7-10)
 Ta generates a Cs = 0.121 (eq. 12.8.2 ASCE 7-10)

Seismic Base Shear and Distribution

Seismic Coefficient $C_s = 0.121$
 Period of Structure $T_a = 0.504 \text{ sec}$
 Exponent due to period $k = 1.0$

See sheet L14 (original calc package for Etabs print out with building period.

Tx (from etabs) = 0.503
 Tx generates a Cs = 0.121 (eq 12.8.2 and 12.8.3)

Ty (from etabs) = 0.706
 Ty generates a Cs = 0.105 (eq 12.8.2 and 12.8.3)

Level	Story	Height	Weight Description	Weight
ROOF	5th	72.0 ft	Roof	1859.1 kip
L6	4th	60.0 ft	L6 Residential	2239.6 kip
L5	3rd	48.0 ft	L5 Residential	2536.9 kip
L4	2nd	36.0 ft	L4 Office	2293.2 kip
L3	3rd	24.0 ft	L4 Office	2293.2 kip
L2	1st	12.0 ft	L2 Office	5013.3 kip
Seismic Weight of Building				W = 16235.4 kip

<--- See Detailed Breakdown
 <--- See Detailed Breakdown
 <--- See Detailed Breakdown
 <--- See Detailed Breakdown
 <--- See Detailed Breakdown
 <--- See Detailed Breakdown

V =	Seismic Base Shear $C_s W (T_a)$	1962.6 kip
Vx =	Using Etabs Periof	1962.6 kip
Vy =	Using Etabs Periof	1698.6 kip

ELF Distribution of Seismic Forces Per ASCE 7-05 12.8.3:

	A_i	W_i	h_i	$W_i h_i^k$	C_{vx}	F_x	ΣF_x
ROOF	18844 ft ²	1859.1 k	72.0 ft	134,936	0.228	447.4 k	447.4 k
L6	24375 ft ²	2239.6 k	60.0 ft	135,414	0.229	449.0 k	896.4 k
L5	24375 ft ²	2536.9 k	48.0 ft	122,660	0.207	406.7 k	1,303.1 k
L4	24375 ft ²	2293.2 k	36.0 ft	83,111	0.140	275.6 k	1,578.7 k
L3	24375 ft ²	2293.2 k	24.0 ft	55,365	0.094	183.6 k	1,762.2 k
L2	0 ft ²	5013.3 k	12.0 ft	60,441	0.102	200.4 k	1,962.6 k

$$\Sigma W_i h_i^k = 591,928$$

$$f'_c = 5000 \text{ psi}$$

$$3\sqrt{f'_c} = 212.1 \text{ psi}$$

$$\text{Conc SW req'd} = 9252 \text{ in}^2$$

$$w/12" \text{ thick wall, length req'd} = 64.25 \text{ ft}$$

(With an R of 6)

Seismic Forces at Diaphragm Per ASCE 7-05 12.10.1.1:

Spectral Accel at 0.2 sec

$$S_{DS} = 0.73$$

Seismic Importance

$$I_E = 1.0$$

$$F_{px \text{ max}} = 0.4 (S_{DS}) I_E * w_p$$

$$0.290 * w_p \text{ max}$$

$$F_{px \text{ min}} = 0.2 (S_{DS}) I_E * w_p$$

$$0.145 * w_p \text{ min}$$

	F_i	W_i	$\Sigma F_i / \Sigma W_i$	governing	F_{px}	$\gamma = F_{px} / F_x$
ROOF	447.4 k	1859.1 k	0.241	0.241 calc'd	447.4 kip	1.00
L6	449.0 k	2239.6 k	0.219	0.219 calc'd	489.8 kip	1.09
L5	406.7 k	2536.9 k	0.196	0.196 calc'd	498.2 kip	1.22
L4	275.6 k	2293.2 k	0.177	0.177 calc'd	405.4 kip	1.47
L3	183.6 k	2293.2 k	0.157	0.157 calc'd	360.1 kip	1.96
L2	200.4 k	5013.3 k	0.121	0.145 min	727.3 kip	3.63

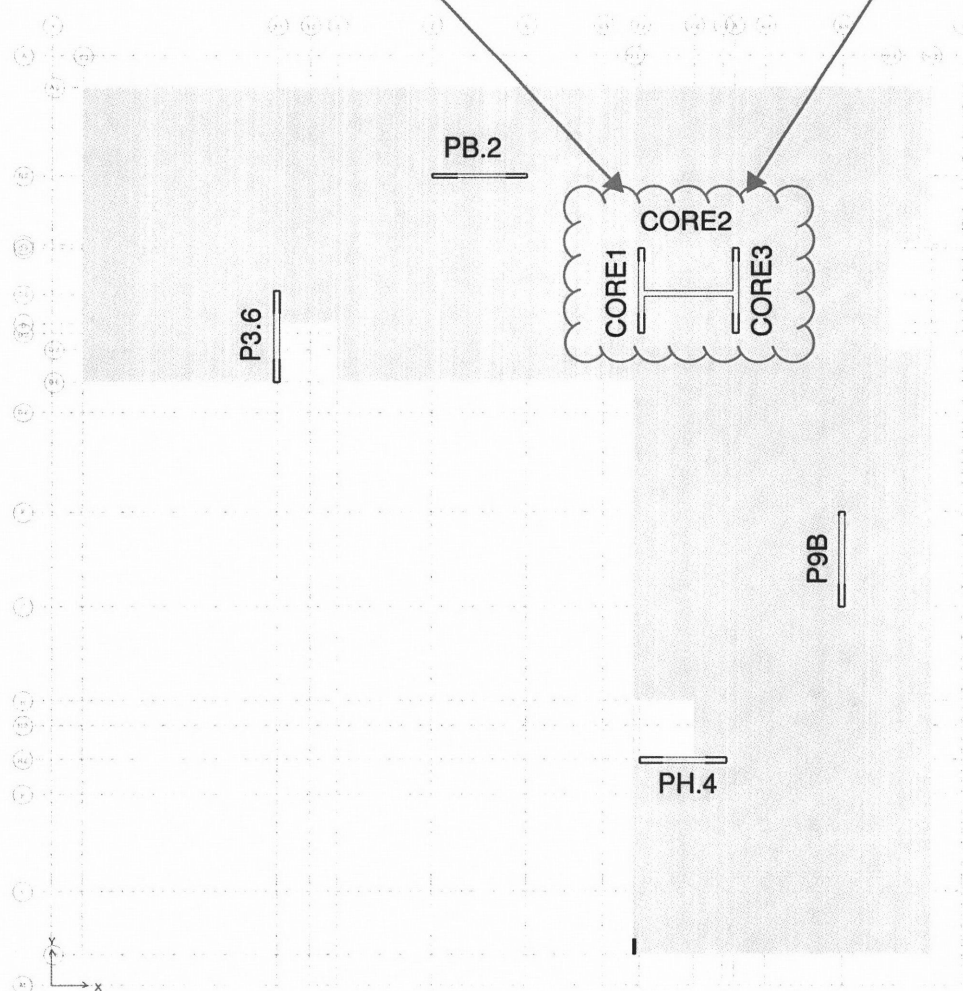
ETABS 2013 13.1.5

11/17/2014

ROOF PLAN

For the moment, since we want the H-shaped core to act as one piece, a separate model was created and the entire core is labeled Core1.

Core1, Core2 and Core3 are the names of each individual shear pier that was modeled in ETabs for the H-shaped core.



Project No. 14031-013	Sheet No. 1
Project BLOCK BL	Date 8/27/14
Subject NON-SFRS COLUMN : GL 1	By GM

1/9 - 24x24

$$P_D = 398^k \quad P_L = 171^k \quad P_S = 20^k \quad S_u = 0.41''$$

$$1.34 D + 0.5L + 0.2S = 616.1^k$$

$$0.76 D = 298.7^k$$

$$0.2 S_{DS} = 0.2 \times 0.724 = 0.14$$

RISA OUTPUT: $M_8 = 70.1^k$ < SPCOL; $\phi M_n = 86.7^k$ HP
 $V_8 = 4.7^k$ $\phi V_n = 188^k$ *

• ACI 21.13.3 APPLIES

$$A_g f'_c / 10 = 24^2 \cdot 6000 / 10 = 345.6^k$$

$$0.35 P_D = 1321^k$$

• ACI 21.13.3.2 APPLIES
 $A_g f'_c / 10 < P_u < 0.35 P_D$

• ACI 21.6.3.1

$$A_{gt} = 12 \times 10 = 15.24 \text{ in}^2$$

$$A_g = 24^2 = 576 \text{ in}^2$$

$$\beta_g = 0.020, \quad 0.01 < \beta_g < 0.06$$

• ACI 21.6.4.2, TIE SPACING < 14"

• ACI 21.6.5 - Mpr CALC

$$\text{SPCOL: } M_{pr} = 1175^k \quad w/ \phi = 1.0 + 1.25 f_y$$

$$V_{pr} = 2 M_{pr} / h_L = 162^k \quad h_L = 14'0"$$

$$\phi V_c = \phi 2 \sqrt{f'_c} b d = 0.75 \cdot 2 \sqrt{6000} \cdot 24 \cdot 21.4 = 59.6^k$$

$$S = \frac{\phi A_v f_y d}{V_{pr} - \phi V_c} = \frac{0.654 \cdot 0.2 \cdot 2 \cdot 60 \cdot 21.4}{162 - 59.6} = 6.63"$$

• ACI 21.6.5.2 -

$$b) P_u = 298.7^k > A_g f'_c / 20 = 172.8^k$$

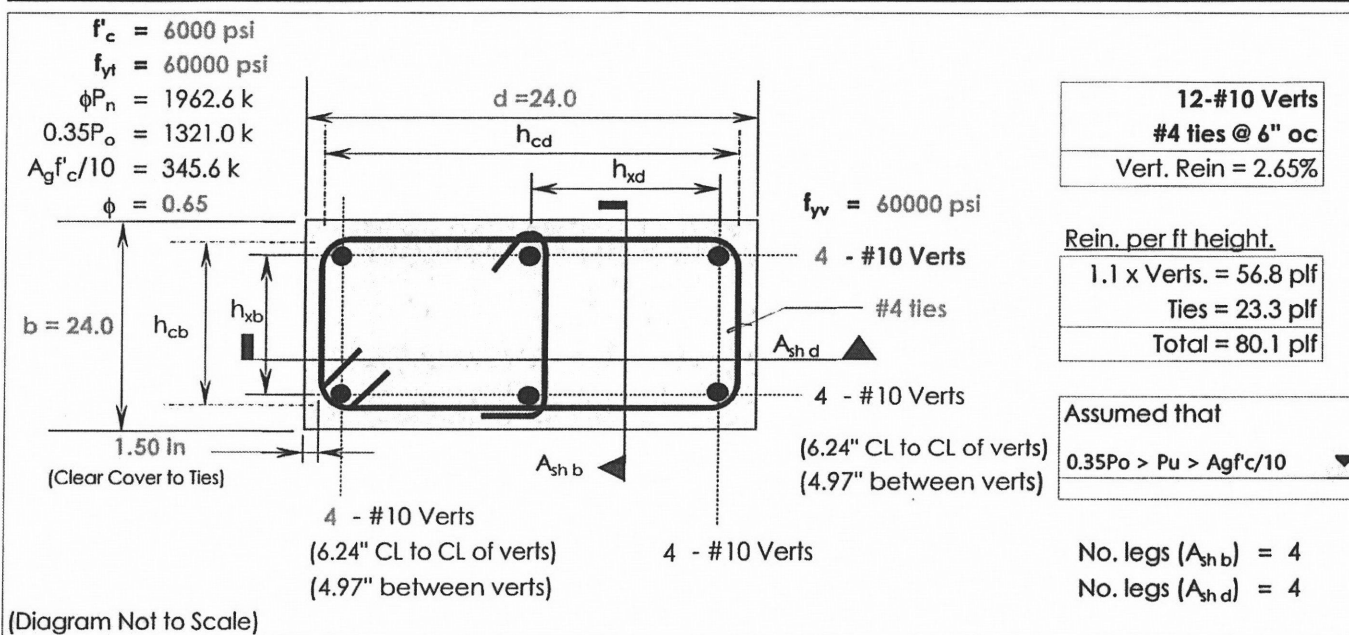
OK TO USE V_c

USE 4 LEGS #4 TIE @ 6" O.C - SEE SPREADSHEET

$$* \phi V_n: \phi V_c + \phi V_s = 59.6 + 0.75 \cdot (4 \cdot 0.2) \cdot 60 \cdot 21.4 / 6 = 59.6 + 128.2 = 188^k$$

Project No. 14031-013	Sheet No. 2 C-2
Project Block 8L	Date 8/27/14
Subject Non-SFRS Column: GL I/9	By GM

24" x 24" Column w/ 12-#10 Verts & #4 ties @ 6" oc



ACI 318-11 Section 21.13.3.1

$$s_{max} = d / 2$$

x-direction $s = 10.68 \text{ in}$
 use $s = 10.68 \text{ in}$

y-direction $s = 10.68 \text{ in}$

Section Not Used

Max spacing per ACI
 21.13.3.1
 $s = 10.68 \text{ in}$

ACI 318-11 Section 21.6.4.4 as amended by 21.13.3.3

$$(I) A_{sh} = 0.3 \left(\frac{s b_c f'_c}{f_{yt}} \right) \left(\left(\frac{A_g}{A_{ch}} \right) - 1 \right) \text{ Eq. (21-4)}$$

IF $A_{shb} = 0.80 \text{ sq in}$
 $b_{cb} = 21.000 \text{ in}$
 $f'_c = 6000 \text{ psi}$
 $f_{yt} = 60000 \text{ psi}$
 $A_g = 576 \text{ sq in}$
 $A_{ch} = 441 \text{ sq in}$
 THEN $s_b = 4.1 \text{ in}$

IF $A_{shd} = 0.80 \text{ sq in}$
 $b_{cd} = 21.000 \text{ in}$
 $f'_c = 6000 \text{ psi}$
 $f_{yt} = 60000 \text{ psi}$
 $A_g = 576 \text{ sq in}$
 $A_{ch} = 441 \text{ sq in}$
 THEN $s_d = 4.1 \text{ in}$

Column Core Capacity

$0.3 P_o = 925.7 \text{ k}$
 $\phi P_n = 1604.6 \text{ k}$

Section Not Used

Half of Trans. Reinf. Req'd
 per 21.13.3.3, if $P_u > 0.35 P_o$
 $2s = 8.30 \text{ in}$

$$(II) A_{sh} = 0.09 \left(\frac{s b_c f'_c}{f_{yt}} \right) \text{ Eq. (21-5)}$$

IF $A_{shb} = 0.80 \text{ sq in}$
 $b_{cb} = 21.000 \text{ in}$
 $f'_c = 6000 \text{ psi}$
 $f_{yt} = 60000 \text{ psi}$
 THEN $s_b = 4.2 \text{ in}$

IF $A_{shd} = 0.80 \text{ sq in}$
 $b_{cd} = 21.000 \text{ in}$
 $f'_c = 6000 \text{ psi}$
 $f_{yt} = 60000 \text{ psi}$
 THEN $s_d = 4.2 \text{ in}$

Section Not Used

Half of Trans. Reinf. Req'd
 per 21.13.3.3, if $P_u > 0.35 P_o$
 $2s = 8.47 \text{ in}$

ACI 318-08 Section 21.13.3.2

(a) $s_{max} = 6 \times 1.270 \text{ in} = 7.62 \text{ in}$
 use $s = 7.62 \text{ in}$

(b) $s_{max} = 6.0 \text{ in}$

Min per ACI 21.13.3.2

$$s = 4.00 \text{ in}$$

C-3

General Information:

File Name: P:\2014 Portland Jobs\14031-0013 Block 8L\Calculations\GM Calcs\SPcol\8L - col i 9.col
 Project: Block 8L
 Column: I/7 Engineer: GM
 Code: ACI 318-11 Units: English
 Run Option: Investigation Slenderness: Not considered
 Run Axis: X-axis Column Type: Structural

Material Properties:

f'c = 6 ksi fy = 60 ksi
 Ec = 4415.21 ksi Es = 29000 ksi
 Ultimate strain = 0.003 in/in
 Beta1 = 0.75

Section:

Rectangular: Width = 24 in Depth = 24 in
 Gross section area, Ag = 576 in²
 Ix = 27648 in⁴ Iy = 27648 in⁴
 rx = 6.9282 in ry = 6.9282 in
 Xo = 0 in Yo = 0 in

Reinforcement:

Bar Set: 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 #10 bars, #4 with larger bars.
 phi(a) = 0.8, phi(b) = 0.9, phi(c) = 0.65

Layout: Rectangular
 Pattern: All Sides Equal (Cover to transverse reinforcement)
 Total steel area: As = 15.24 in² at rho = 2.65%
 Minimum clear spacing = 5.06 in

12 #10 Cover = 1.5 in

Service Loads:

Load No.	Case	Axial Load kip	Mx @ Top k-ft	Mx @ Bot k-ft	My @ Top k-ft	My @ Bot k-ft
1	Dead	393.00	0.00	0.00	0.00	0.00
	Live	171.00	0.00	0.00	0.00	0.00
	Wind	0.00	0.00	0.00	0.00	0.00
	EQ	0.00	0.00	0.00	0.00	0.00
	Snow	20.00	0.00	0.00	0.00	0.00

Sustained Load Factors:

Load Case	Factor (%)
Dead	100
Live	0
Wind	0
EQ	0
Snow	0

Load Combinations:

U1 = 1.340*Dead + 0.500*Live + 0.000*Wind + 0.000*EarthQuake + 0.200*Snow
 U2 = 0.760*Dead + 0.000*Live + 0.000*Wind + 0.000*EarthQuake + 0.000*Snow
 U3 = 1.200*Dead + 1.600*Live + 0.000*Wind + 0.000*EarthQuake + 0.500*Snow

C-4

Factored Loads and Moments with Corresponding Capacities:

NOTE: Each loading combination includes the following cases:

First line - at column top

Second line - at column bottom

No.	Load Combo	Pu kip	Mux k-ft	PhiMnx k-ft	PhiMn/Mu	NA depth in	Dt depth in	eps_t	Phi
1	1 U1	616.12	0.00	867.41	999.999	9.99	21.49	0.00345	0.768
2		616.12	0.00	867.41	999.999	9.99	21.49	0.00345	0.768
3	1 U2	298.68	0.00	849.47	999.999	6.66	21.49	0.00668	0.900
4		298.68	0.00	849.47	999.999	6.66	21.49	0.00668	0.900
5	1 U3	755.20	0.00	773.07	999.999	12.76	21.49	0.00205	0.650
6		755.20	0.00	773.07	999.999	12.76	21.49	0.00205	0.650

*** End of output ***

C-5

General Information:

File Name: P:\2014 Portland Jobs\14031-0013 Block 8L\Calculations\GM Calcs\S...\8L - col i 9 Mpr.col
 Project: Block 8L
 Column: I/7
 Code: ACI 318-11
 Engineer: GM
 Units: English

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

Material Properties:

f'c = 6 ksi
 Ec = 4415.21 ksi
 Ultimate strain = 0.003 in/in
 Beta1 = 0.75
 fy = 75 ksi
 Es = 29000 ksi

Section:

Rectangular: Width = 24 in
 Depth = 24 in
 Gross section area, Ag = 576 in^2
 Ix = 27648 in^4
 rx = 6.9282 in
 Xo = 0 in
 Iy = 27648 in^4
 ry = 6.9282 in
 Yo = 0 in

Reinforcement:

Bar Set: 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: Other; #3 ties with #10 bars, #4 with larger bars.
 phi(a) = 1, phi(b) = 1, phi(c) = 1

Layout: Rectangular
 Pattern: All Sides Equal (Cover to transverse reinforcement)
 Total steel area: As = 15.24 in^2 at rho = 2.65%
 Minimum clear spacing = 5.06 in

12 #10 Cover = 1.5 in

Service Loads:

Load No.	Case	Axial Load kip	Mx @ Top k-ft	Mx @ Bot k-ft	My @ Top k-ft	My @ Bot k-ft
1	Dead	393.00	0.00	0.00	0.00	0.00
	Live	171.00	0.00	0.00	0.00	0.00
	Wind	0.00	0.00	0.00	0.00	0.00
	EQ	0.00	0.00	0.00	0.00	0.00
	Snow	20.00	0.00	0.00	0.00	0.00

Sustained Load Factors:

Load Case	Factor (%)
Dead	100
Live	0
Wind	0
EQ	0
Snow	0

Load Combinations:

U1 = 1.340*Dead + 0.500*Live + 0.000*Wind + 0.000*EarthQuake + 0.200*Snow
 U2 = 0.760*Dead + 0.000*Live + 0.000*Wind + 0.000*EarthQuake + 0.000*Snow

C-6

Factored Loads and Moments with Corresponding Capacities:

=====

NOTE: Each loading combination includes the following cases:

First line - at column top

Second line - at column bottom

No.	Load Combo	Pu kip	Mux k-ft	PhiMnx k-ft	PhiMn/Mu	NA depth in	Dt depth in	eps_t	Phi
1	1 U1	616.12	0.00	1174.53	999.999	9.15	21.49	0.00405	1.000
2		616.12	0.00	1174.53	999.999	9.15	21.49	0.00405	1.000
3	1 U2	298.68	0.00	1056.43	999.999	7.18	21.49	0.00597	1.000
4		298.68	0.00	1056.43	999.999	7.18	21.49	0.00597	1.000

*** End of output ***

Project No. 14031-013		Sheet No. 1
Project BLOCK BL		Date 8/27/14
Subject NON-SFRC COL : GL1		By GM

1/7 - 16x16

$$P_0 = 72^k \quad P_L = 37^k \quad P_S = 3^k \quad \delta_u = 0.41''$$

$$1.34D + 0.5L + 0.2S = 116.3^k$$

$$0.76D = 54.7^k$$

RISA OUTPUT: $M_E = 41.7^k < \text{SPCOL: } \phi M_n = 228^k$

$V_8 = 2.13^k \quad \phi V_n = 53^k$

• ACI 21.13.3 APPLIES

$$\phi V_n = \phi V_c + \phi V_s$$

$$= 0.65 \left(2 \sqrt{6000} \cdot 16 \cdot 13.5 + (2 \cdot 0.2) \cdot 60 \cdot 13.5 / 6 \right)$$

$$= 0.65 (21.75 + 31.2)$$

$$= 53^k$$

$$A_g f'_c / 10 = 16^2 \cdot 6000 / 10 = 153.6^k > P_u$$

• ACI 21.13.3.1 APPLIES

• ACI 21.5.2.1

$$\rho = A_{st} / b d = (3 \cdot 0.79) / 16 \cdot 13.5 = 0.011 < 0.025$$

$$A_{s, \min} = \frac{3 \sqrt{f'_c}}{f_y} b d = 0.837 \text{ in}^2$$

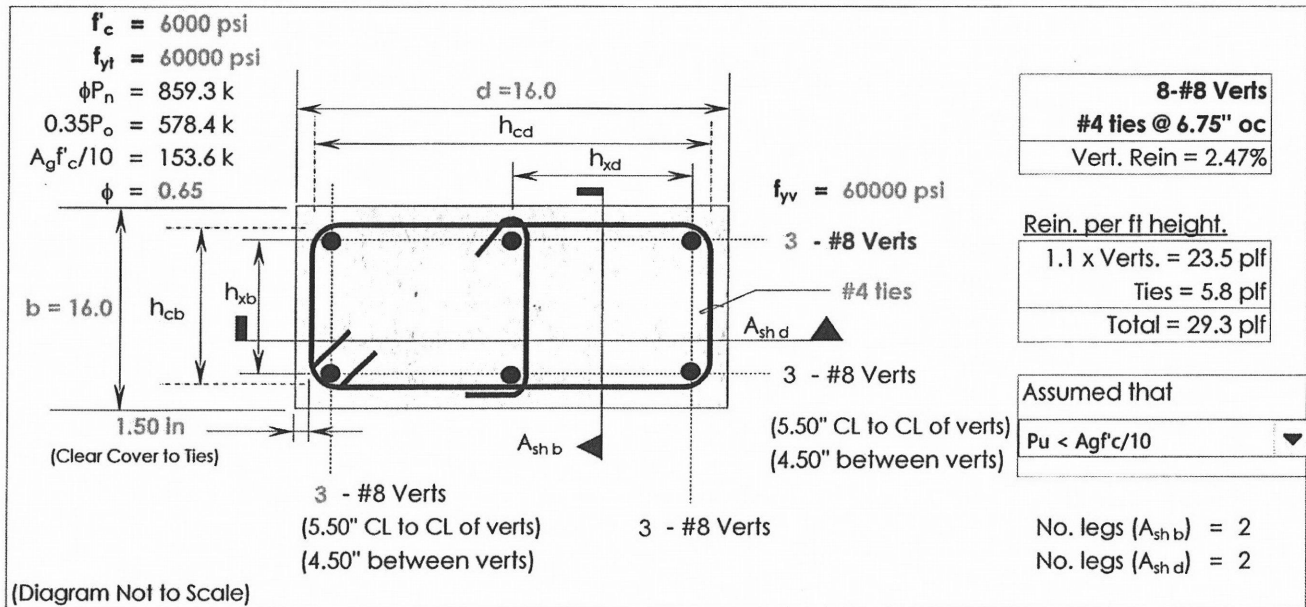
$$200 b w d / f_y = 0.72$$

$$3.79 = 2.37 \text{ in}^2 \text{ PROVIDED.}$$

PROVIDE 2 LEGS #4 TIE @ 6"

Project No. 14031-013		Sheet No. 2
Project BLOCK BL		Date 8/27/14
Subject ACI 318-11 Column - GL 1/3		By GM

16" x 16" Column w/ 8-#8 Verts & #4 ties @ 6.75" oc



ACI 318-11 Section 21.13.3.1

$$s_{max} = d / 2$$

x-direction $s = 6.75 \text{ in}$ y-direction $s = 6.75 \text{ in}$ Max spacing per ACI 21.13.3.1
 use $s = 6.75 \text{ in}$ $s = 6.75 \text{ in}$

ACI 318-11 Section 21.6.4.4 as amended by 21.13.3.3

$$(I) A_{sh} = 0.3 \left(\frac{s b_c f'_c}{f_{yt}} \right) \left(\left(\frac{A_g}{A_{ch}} \right) - 1 \right) \text{ Eq. (21-4)}$$

IF $A_{shb} = 0.40 \text{ sq in}$
 $b_{cb} = 13.000 \text{ in}$
 $f'_c = 6000 \text{ psi}$
 $f_{yt} = 60000 \text{ psi}$
 $A_g = 256 \text{ sq in}$
 $A_{ch} = 169 \text{ sq in}$
 THEN $s_b = 2.0 \text{ in}$

IF $A_{shd} = 0.40 \text{ sq in}$
 $b_{cd} = 13.000 \text{ in}$
 $f'_c = 6000 \text{ psi}$
 $f_{yt} = 60000 \text{ psi}$
 $A_g = 256 \text{ sq in}$
 $A_{ch} = 169 \text{ sq in}$
 THEN $s_d = 2.0 \text{ in}$

Column Core Capacity
 $0.3 P_o = 362.7 \text{ k}$
 $\phi P_n = 628.6 \text{ k}$

Section Not Used

Half of Trans. Reinf. Req'd
 per 21.13.3.3, if $P_u > 0.35 P_o$
 $2s = 3.98 \text{ in}$

$$(II) A_{sh} = 0.09 \left(\frac{s b_c f'_c}{f_{yt}} \right) \text{ Eq. (21-5)}$$

IF $A_{shb} = 0.40 \text{ sq in}$
 $b_{cb} = 13.000 \text{ in}$
 $f'_c = 6000 \text{ psi}$
 $f_{yt} = 60000 \text{ psi}$
 THEN $s_b = 3.4 \text{ in}$

IF $A_{shd} = 0.40 \text{ sq in}$
 $b_{cd} = 13.000 \text{ in}$
 $f'_c = 6000 \text{ psi}$
 $f_{yt} = 60000 \text{ psi}$
 THEN $s_d = 3.4 \text{ in}$

Section Not Used

Half of Trans. Reinf. Req'd
 per 21.13.3.3, if $P_u > 0.35 P_o$
 $2s = 6.84 \text{ in}$

ACI 318-08 Section 21.13.3.2

(a) $s_{max} = 6 \times 1.000 \text{ in} = 6.00 \text{ in}$
 use $s = 6.00 \text{ in}$

Section Not Used

(b) $s_{max} = 6.0 \text{ in}$

Min per ACI 21.13.3.2
 $s = 6.00 \text{ in}$

C-9

General Information:

File Name: P:\2014 Portland Jobs\14031-0013 Block 8L\Calculations\GM Calcs\SPcol\8L - col i 7.col
 Project: Block 8L
 Column: I/7
 Code: ACI 318-11
 Engineer: GM
 Units: English
 Run Option: Investigation
 Run Axis: X-axis
 Slenderness: Not considered
 Column Type: Structural

Material Properties:

f'c = 6 ksi
 Ec = 4415.21 ksi
 Ultimate strain = 0.003 in/in
 Beta1 = 0.75
 fy = 60 ksi
 Es = 29000 ksi

Section:

Rectangular: Width = 16 in
 Depth = 16 in
 Gross section area, Ag = 256 in^2
 Ix = 5461.33 in^4
 rx = 4.6188 in
 Xo = 0 in
 Iy = 5461.33 in^4
 ry = 4.6188 in
 Yo = 0 in

Reinforcement:

Bar Set: 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 #10 bars, #4 with larger bars.
 phi(a) = 0.8, phi(b) = 0.9, phi(c) = 0.65

Layout: Rectangular
 Pattern: All Sides Equal (Cover to transverse reinforcement)
 Total steel area: As = 6.32 in^2 at rho = 2.47%
 Minimum clear spacing = 4.63 in

8 #8 Cover = 1.5 in

Service Loads:

No.	Load Case	Axial Load kip	Mx @ Top k-ft	Mx @ Bot k-ft	My @ Top k-ft	My @ Bot k-ft
1	Dead	72.00	0.00	0.00	0.00	0.00
	Live	37.00	0.00	0.00	0.00	0.00
	Wind	0.00	0.00	0.00	0.00	0.00
	EQ	0.00	0.00	0.00	0.00	0.00
	Snow	3.00	0.00	0.00	0.00	0.00

Sustained Load Factors:

Load Case	Factor (%)
Dead	100
Live	0
Wind	0
EQ	0
Snow	0

Load Combinations:

U1 = 1.340*Dead + 0.500*Live + 0.000*Wind + 1.000*EarthQuake + 0.200*Snow
 U2 = 0.760*Dead + 0.000*Live + 0.000*Wind + 1.000*EarthQuake + 0.000*Snow
 U3 = 1.200*Dead + 1.600*Live + 0.000*Wind + 0.000*EarthQuake + 0.500*Snow

C-1C

Factored Loads and Moments with Corresponding Capacities:

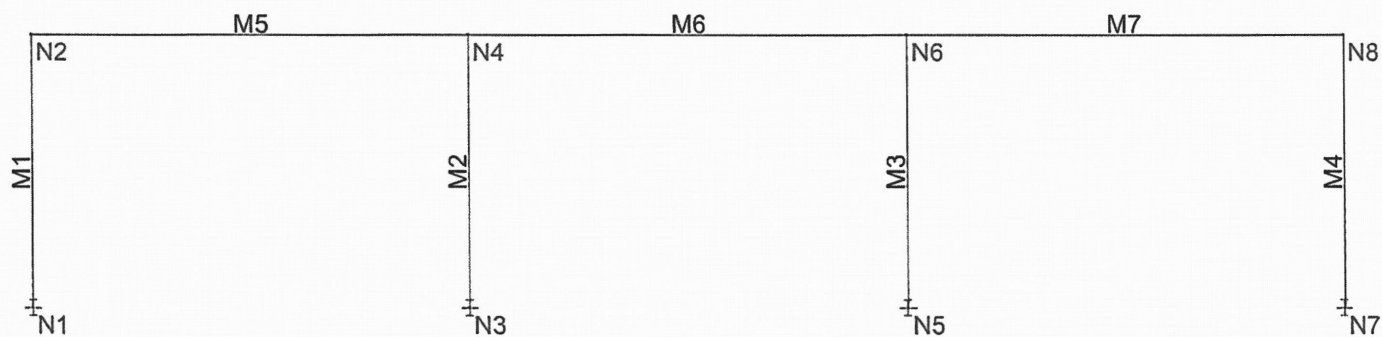
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NOTE: Each loading combination includes the following cases:
 First line - at column top
 Second line - at column bottom

No.	Load Combo	Pu kip	Mux k-ft	PhiMnx k-ft	PhiMn/Mu	NA depth in	Dt depth in	eps_t	Phi
1	1 U1	115.58	0.00	228.07	999.999	4.56	13.63	0.00597	0.900
2		115.58	0.00	228.07	999.999	4.56	13.63	0.00597	0.900
3	1 U2	54.72	0.00	202.20	999.999	3.80	13.63	0.00776	0.900
4		54.72	0.00	202.20	999.999	3.80	13.63	0.00776	0.900
5	1 U3	147.10	0.00	238.00	999.999	4.89	13.63	0.00536	0.900
6		147.10	0.00	238.00	999.999	4.89	13.63	0.00536	0.900

*** End of output ***

8L



Results for LC 1, Induced Moments 1

DCI Engineers	Block 8L - Line I	SK - 1
GM		Sept 9, 2014 at 4:30 PM
14031-0013		Block 8L - non SFRS col, line i.r3d



Company : DCI Engineers
 Designer : GM
 Job Number : 14031-0013
 Model Name : Block 8L - Line I

Sept 5, 2014

Checked By: _____

Concrete Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (1/E...)	Density[k/ft...]	f'c[ksi]	Lambda	Flex Steel[...]	Shear Stee...
1	Conc6000NW	4415	1920	.15	.6	.145	6	1	60	60

Joint Coordinates and Temperatures

	Label	X [ft]	Y [ft]	Z [ft]	Temp [F]	Detach From Diap...
1	N1	0	0	0	0	
2	N2	0	15	0	0	
3	N7	72	0	0	0	
4	N8	72	15	0	0	
5	N3	24	0	0	0	
6	N4	24	15	0	0	
7	N5	48	0	0	0	
8	N6	48	15	0	0	

Concrete Beam Design Parameters

	Label	Shape	Length[ft]	B-eff Left[in]	B-eff Right[in]	Slab Thic...	Slab Thic...	Icr Factor	Flexural L...	Shear Lay...
1	M5	CRECT8X64	24					.8	Use Desi...	Use Desi...
2	M6	CRECT8X128	24					.8	Use Desi...	Use Desi...
3	M7	CRECT8X64	24					.8	Use Desi...	Use Desi...

Concrete Column Design Parameters

	Label	Shape	Length[ft]	Lu-yy[ft]	Lu-zz[ft]	Cm-yy	Cm-zz	Kyy	Kzz	y sway	z sway	Icr Fa...	Flexural Lay...	Shear Layout
1	M1	CRECT...	15									.5	Use Design ...	Use Design Ru...
2	M2	CRECT...	15									.5	Use Design ...	Use Design Ru...
3	M3	CRECT...	15									.5	Use Design ...	Use Design Ru...
4	M4	CRECT...	15									.5	Use Design ...	Use Design Ru...

Joint Loads and Enforced Displacements (BLC 1 : DL)

	Joint Label	L.D.M	Direction	Magnitude[(k.k-ft), (in.rad), (k*s^2/ft...]
1	N2	L	Y	-72
2	N8	L	Y	-94
3	N4	L	Y	-316
4	N6	L	Y	-393

Joint Loads and Enforced Displacements (BLC 2 : LL)

	Joint Label	L.D.M	Direction	Magnitude[(k.k-ft), (in.rad), (k*s^2/ft...]
1	N2	L	Y	-37
2	N8	L	Y	-49
3	N6	L	Y	-171
4	N4	L	Y	-133

Joint Loads and Enforced Displacements (BLC 3 : EQ)

	Joint Label	L.D.M	Direction	Magnitude[(k.k-ft), (in.rad), (k*s^2/ft...]
1	N2	D	X	.41

Joint Loads and Enforced Displacements (BLC 4 : SL)

	Joint Label	L.D.M	Direction	Magnitude[(k.k-ft), (in.rad), (k*s^2/ft...]
1	N6	L	Y	-20
2	N4	L	Y	-14



Company : DCI Engineers
 Designer : GM
 Job Number : 14031-0013
 Model Name : Block 8L - Line I

Sept 5, 2014

Checked By: _____

Joint Loads and Enforced Displacements (BLC 4 : SL) (Continued)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/ft...]
3	N2	L	Y	-3
4	N8	L	Y	-5

Basic Load Cases

	BLC Description	Category	X Gravity	Y Gravity	Z Gravity	Joint	Point	Distributed Area(Me... Surface(...]
1	DL	DL				4		
2	LL	LL				4		
3	EQ	EL				1		
4	SL	SL				4		

Load Combinations

	Description	Solve PD...	SR...	BLC Factor	BLC Factor	BLC Factor	BLC Factor	BLC Factor	BLC Factor	BLC Factor	BLC Factor	BLC Factor	BLC Factor	BLC Factor	BLC Factor	BLC Factor	BLC Factor	BLC Factor
1	Induced Mo...	Yes	Y		DL	1.34	EL	1	LL	.5	SL	1						
2	Induced Mo...	Yes	Y		DL	.76	EL	1										

Member Section Forces

	LC	Member Label	Sec	Axial[k]	y Shear[k]	z Shear[k]	Torque[k-ft]	y-y Moment[k-...]	z-z Moment[k-...
1	1	M1	1	116.274	1.3	0	0	0	0
2			2	116.274	1.3	0	0	0	-4.874
3			3	116.274	1.3	0	0	0	-9.748
4			4	116.274	1.3	0	0	0	-14.622
5			5	116.274	1.3	0	0	0	-19.496
6	1	M2	1	501.705	4.587	0	0	0	0
7			2	501.705	4.587	0	0	0	-17.202
8			3	501.705	4.587	0	0	0	-34.405
9			4	501.705	4.587	0	0	0	-51.607
10			5	501.705	4.587	0	0	0	-68.81
11	1	M3	1	634.244	4.675	0	0	0	0
12			2	634.244	4.675	0	0	0	-17.533
13			3	634.244	4.675	0	0	0	-35.065
14			4	634.244	4.675	0	0	0	-52.598
15			5	634.244	4.675	0	0	0	-70.13
16	1	M4	1	157.277	1.378	0	0	0	0
17			2	157.277	1.378	0	0	0	-5.167
18			3	157.277	1.378	0	0	0	-10.335
19			4	157.277	1.378	0	0	0	-15.502
20			5	157.277	1.378	0	0	0	-20.67
21	1	M5	1	7.707	-1.705	0	0	0	-19.496
22			2	7.707	-1.705	0	0	0	-9.266
23			3	7.707	-1.705	0	0	0	.964
24			4	7.707	-1.705	0	0	0	11.194
25			5	7.707	-1.705	0	0	0	21.424
26	1	M6	1	4.258	-3.941	0	0	0	-47.386
27			2	4.258	-3.941	0	0	0	-23.741
28			3	4.258	-3.941	0	0	0	-.096
29			4	4.258	-3.941	0	0	0	23.549
30			5	4.258	-3.941	0	0	0	47.194
31	1	M7	1	1.021	-1.817	0	0	0	-22.936
32			2	1.021	-1.817	0	0	0	-12.035
33			3	1.021	-1.817	0	0	0	-1.133
34			4	1.021	-1.817	0	0	0	9.768
35			5	1.021	-1.817	0	0	0	20.67

Member Section Forces (Continued)

	LC	Member Label	Sec	Axial[k]	y Shear[k]	z Shear[k]	Torque[k-ft]	y-y Moment[k-...	z-z Moment[k-...
36	2	M1	1	52.991	1.318	0	0	0	0
37			2	52.991	1.318	0	0	0	-4.941
38			3	52.991	1.318	0	0	0	-9.883
39			4	52.991	1.318	0	0	0	-14.824
40			5	52.991	1.318	0	0	0	-19.765
41	2	M2	1	237.915	4.632	0	0	0	0
42			2	237.915	4.632	0	0	0	-17.369
43			3	237.915	4.632	0	0	0	-34.739
44			4	237.915	4.632	0	0	0	-52.108
45			5	237.915	4.632	0	0	0	-69.477
46	2	M3	1	300.873	4.673	0	0	0	0
47			2	300.873	4.673	0	0	0	-17.523
48			3	300.873	4.673	0	0	0	-35.045
49			4	300.873	4.673	0	0	0	-52.568
50			5	300.873	4.673	0	0	0	-70.091
51	2	M4	1	73.221	1.353	0	0	0	0
52			2	73.221	1.353	0	0	0	-5.075
53			3	73.221	1.353	0	0	0	-10.15
54			4	73.221	1.353	0	0	0	-15.226
55			5	73.221	1.353	0	0	0	-20.301
56	2	M5	1	9.269	-1.729	0	0	0	-19.765
57			2	9.269	-1.729	0	0	0	-9.391
58			3	9.269	-1.729	0	0	0	.984
59			4	9.269	-1.729	0	0	0	11.358
60			5	9.269	-1.729	0	0	0	21.732
61	2	M6	1	5.178	-3.975	0	0	0	-47.745
62			2	5.178	-3.975	0	0	0	-23.898
63			3	5.178	-3.975	0	0	0	-.051
64			4	5.178	-3.975	0	0	0	23.796
65			5	5.178	-3.975	0	0	0	47.643
66	2	M7	1	1.187	-1.781	0	0	0	-22.448
67			2	1.187	-1.781	0	0	0	-11.76
68			3	1.187	-1.781	0	0	0	-1.073
69			4	1.187	-1.781	0	0	0	9.614
70			5	1.187	-1.781	0	0	0	20.301



Project No. 14031-013		Sheet No. 1
Project BLOCK BL		Date 8/27/14
Subject NON-SFRS COL: GL2		By GM

B2/2 - 16x16

$$P_D = 224^k \quad P_L = 110^k \quad P_S = 13^k \quad \delta_u = 0.47''$$

$$1.34P + 0.5L + 0.2S = 360^k$$

$$0.76D = 170.2^k$$

$$\text{RISA OUTPUT: } M_8 = 34.1^k \quad L \text{ SPCL: } \phi M_n = 210^k$$

$$V_E = 2.3^k \quad \phi V_n = 57^k$$

• ACI 21.13.3 APPLIES

$$\phi V_n = \phi V_c + \phi V_s$$

$$= 0.65(2 \cdot 16000 \cdot 16 \cdot 13.5 + (2 \cdot 0.2) \cdot 60 \cdot 13.5/4)$$

$$= 57^k$$

$$A_g f'_c / 10 = 16^2 \cdot 6000 / 10 = 153.6^k > P_u \quad \bullet \text{ ACI 21.13.3.2 APPLIES}$$

$$0.35P_D = 578.4^k > P_u$$

• ACI 21.6.3.1

$$A_{st}/A_g = 8 \cdot 0.79 / 16^2 = 0.0247, \quad 0.01 < \rho_s < 0.06$$

• ACI 21.6.4.2, TIE SPACING < 14"

• ACI 21.6.5 - MPR CALL

$$\text{SPCL: } M_{PR} = 330^k \quad w/ \phi = 1.0 + 1.25f_y$$

$$V_{PR} = 2M_{PR}/h_L = 45.5^k, \quad h_L = 14'6''$$

$$\phi V_c = 21.75^k$$

$$S = \frac{\phi A_v f_d}{V_{PR} - \phi V_c} = \frac{0.65 \cdot (2 \cdot 0.2) \cdot 60 \cdot 13.5}{45.5 - 21.75^k} = 8.9''$$

• ACI 21.6.5.2

$$b) \quad P_u = 170.2^k > A_g f'_c / 20 = 76.8^k$$

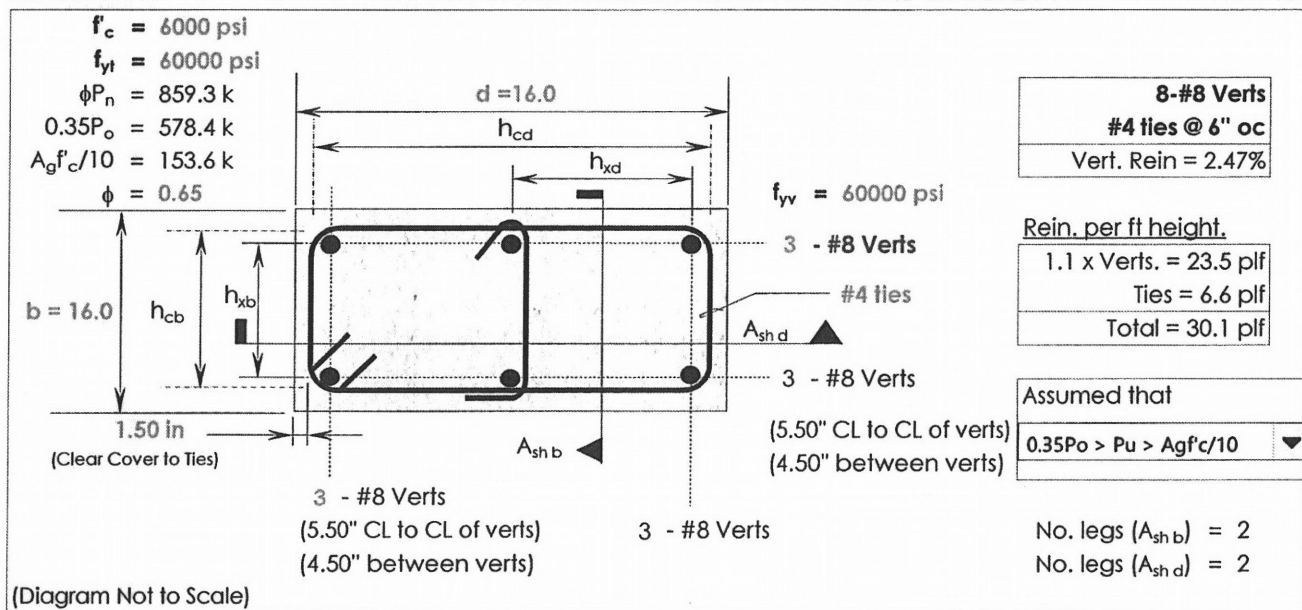
OK TO USE V_c

USE 2 LEGS #4 TIE @ 6" O.C. - SEE SPREADSHEET



Project No.	Sheet No.
14031-013	2
Project	Date
Block 8L	8/27/14
Subject	By
Non-SFRS Column GL B.2/2	GM

16" x 16" Column w/ 8-#8 Verts & #4 ties @ 6" oc



ACI 318-11 Section 21.13.3.1

$$s_{max} = d / 2$$

x-direction $s = 6.75 \text{ in}$
 use $s = 6.75 \text{ in}$

y-direction $s = 6.75 \text{ in}$

Section Not Used

Max spacing per ACI-21.13.3.1
 $s = 6.75 \text{ in}$

ACI 318-11 Section 21.6.4.4 as amended by 21.13.3.3

$$(I) A_{sh} = 0.3 \left(\frac{s b_c f'_c}{f_{yt}} \right) \left(\left(\frac{A_g}{A_{ch}} \right) - 1 \right) \text{ Eq. (21-4)}$$

IF $A_{shb} = 0.40 \text{ sq in}$
 $b_{cb} = 13.000 \text{ in}$
 $f'_c = 6000 \text{ psi}$
 $f_{yt} = 60000 \text{ psi}$
 $A_g = 256 \text{ sq in}$
 $A_{ch} = 169 \text{ sq in}$

THEN $s_b = 2.0 \text{ in}$

$$(II) A_{sh} = 0.09 \left(\frac{s b_c f'_c}{f_{yt}} \right) \text{ Eq. (21-5)}$$

IF $A_{shb} = 0.40 \text{ sq in}$
 $b_{cb} = 13.000 \text{ in}$
 $f'_c = 6000 \text{ psi}$
 $f_{yt} = 60000 \text{ psi}$

THEN $s_b = 3.4 \text{ in}$

IF $A_{shd} = 0.40 \text{ sq in}$
 $b_{cd} = 13.000 \text{ in}$
 $f'_c = 6000 \text{ psi}$
 $f_{yt} = 60000 \text{ psi}$
 $A_g = 256 \text{ sq in}$
 $A_{ch} = 169 \text{ sq in}$

THEN $s_d = 2.0 \text{ in}$

IF $A_{shd} = 0.40 \text{ sq in}$
 $b_{cd} = 13.000 \text{ in}$
 $f'_c = 6000 \text{ psi}$
 $f_{yt} = 60000 \text{ psi}$

THEN $s_d = 3.4 \text{ in}$

Column Core Capacity
$0.3P_o = 362.7 \text{ k}$
$\phi P_n = 628.6 \text{ k}$

Section Not Used

Half of Trans. Reinf. Req'd
 per 21.13.3.3, if $P_u > 0.35 P_o$
 $2s = 3.98 \text{ in}$

Section Not Used

Half of Trans. Reinf. Req'd
 per 21.13.3.3, if $P_u > 0.35 P_o$
 $2s = 6.84 \text{ in}$

ACI 318-08 Section 21.13.3.2

(a) $s_{max} = 6 \times 1.000 \text{ in} = 6.00 \text{ in}$
 use $s = 6.00 \text{ in}$

(b) $s_{max} = 6.0 \text{ in}$

Min per ACI 21.13.3.2
 $s = 6.00 \text{ in}$

C-17

General Information:

File Name: P:\2014 Portland Jobs\14031-0013 Block 8L\Calculations\GM Calcs\SPcol\8L - col b.2 2.col
 Project: Block 8L
 Column: I/7
 Code: ACI 318-11
 Engineer: GM
 Units: English

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

Material Properties:

f'c = 6 ksi
 Ec = 4415.21 ksi
 Ultimate strain = 0.003 in/in
 Betal = 0.75
 fy = 60 ksi
 Es = 29000 ksi

Section:

Rectangular: Width = 16 in
 Depth = 16 in
 Gross section area, Ag = 256 in^2
 Ix = 5461.33 in^4
 rx = 4.6188 in
 Xo = 0 in
 Iy = 5461.33 in^4
 ry = 4.6188 in
 Yo = 0 in

Reinforcement:

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

Layout: Rectangular
 Pattern: All Sides Equal (Cover to transverse reinforcement)
 Total steel area: As = 6.32 in^2 at rho = 2.47%
 Minimum clear spacing = 4.50 in

8 #8 Cover = 1.5 in

Service Loads:

No.	Load Case	Axial Load kip	Mx @ Top k-ft	Mx @ Bot k-ft	My @ Top k-ft	My @ Bot k-ft
1	Dead	224.00	0.00	0.00	0.00	0.00
	Live	110.00	0.00	0.00	0.00	0.00
	Wind	0.00	0.00	0.00	0.00	0.00
	EQ	0.00	0.00	0.00	0.00	0.00
	Snow	13.00	0.00	0.00	0.00	0.00

Sustained Load Factors:

Load Case	Factor (%)
Dead	100
Live	0
Wind	0
EQ	0
Snow	0

Load Combinations:

U1 = 1.340*Dead + 0.500*Live + 0.000*Wind + 1.000*Earthquake + 0.200*Snow
 U2 = 0.760*Dead + 0.000*Live + 0.000*Wind + 1.000*Earthquake + 0.000*Snow
 U3 = 1.200*Dead + 1.600*Live + 0.000*Wind + 0.000*Earthquake + 0.500*Snow

Factored Loads and Moments with Corresponding Capacities:

=====

NOTE: Each loading combination includes the following cases:

First line - at column top

Second line - at column bottom

No.	Load Combo	Pu kip	Mux k-ft	PhiMnx k-ft	PhiMn/Mu	NA depth in	Dt depth in	eps_t	Phi
1	1 U1	357.76	0.00	209.79	999.999	8.62	13.50	0.00170	0.650
2		357.76	0.00	209.79	999.999	8.62	13.50	0.00170	0.650
3	1 U2	170.24	0.00	237.73	999.999	5.16	13.50	0.00485	0.887
4		170.24	0.00	237.73	999.999	5.16	13.50	0.00485	0.887
5	1 U3	451.30	0.00	201.35	999.999	9.97	13.50	0.00106	0.650
6		451.30	0.00	201.35	999.999	9.97	13.50	0.00106	0.650

*** End of output ***

C-19

General Information:

=====

File Name: P:\2014 Portland Jobs\14031-0013 Block 8L\Calculations\GM Calcs...\8L - col b.2 2 Mpr.col

Project: Block 8L

Column: I/7

Code: ACI 318-11

Engineer: GM

Units: English

Run Option: Investigation

Run Axis: X-axis

Slenderness: Not considered

Column Type: Structural

Material Properties:

=====

f'c = 6 ksi

Ec = 4415.21 ksi

Ultimate strain = 0.003 in/in

Beta1 = 0.75

fy = 75 ksi

Es = 29000 ksi

Section:

=====

Rectangular: Width = 16 in

Depth = 16 in

Gross section area, Ag = 256 in²Ix = 5461.33 in⁴

rx = 4.6188 in

Xo = 0 in

Iy = 5461.33 in⁴

ry = 4.6188 in

Yo = 0 in

Reinforcement:

=====

Bar Set: 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: Other; #4 ties with #10 bars, #4 with larger bars.

phi(a) = 1, phi(b) = 1, phi(c) = 1

Layout: Rectangular

Pattern: All Sides Equal (Cover to transverse reinforcement)

Total steel area: As = 6.32 in² at rho = 2.47%

Minimum clear spacing = 4.50 in

8 #8 Cover = 1.5 in

Service Loads:

=====

No.	Load Case	Axial Load kip	Mx @ Top k-ft	Mx @ Bot k-ft	My @ Top k-ft	My @ Bot k-ft
1	Dead	224.00	0.00	0.00	0.00	0.00
	Live	110.00	0.00	0.00	0.00	0.00
	Wind	0.00	0.00	0.00	0.00	0.00
	EQ	0.00	0.00	0.00	0.00	0.00
	Snow	13.00	0.00	0.00	0.00	0.00

Sustained Load Factors:

=====

Load Case	Factor (%)
Dead	100
Live	0
Wind	0
EQ	0
Snow	0

Load Combinations:

=====

U1 = 1.340*Dead + 0.500*Live + 0.000*Wind + 1.000*Earthquake + 0.200*Snow

U2 = 0.760*Dead + 0.000*Live + 0.000*Wind + 1.000*Earthquake + 0.000*Snow

Factored Loads and Moments with Corresponding Capacities:

=====

NOTE: Each loading combination includes the following cases:

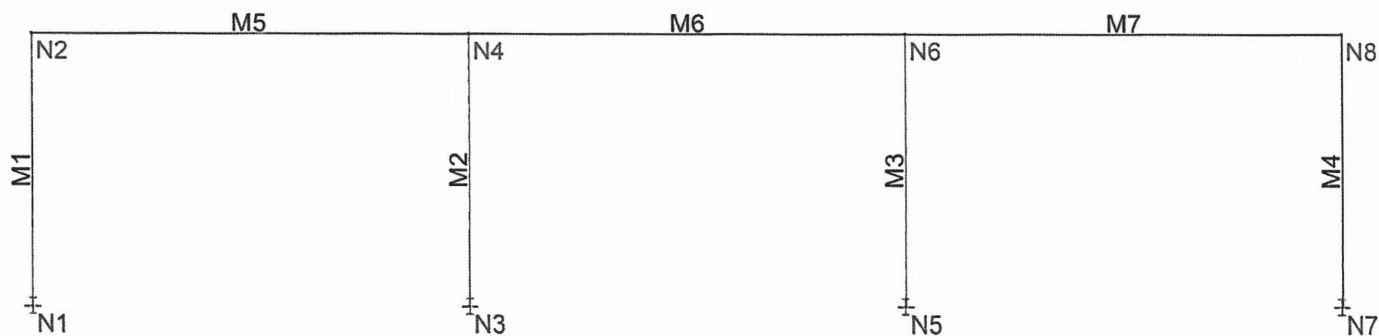
First line - at column top

Second line - at column bottom

No.	Load Combo	Pu kip	Mux k-ft	PhiMnx k-ft	PhiMn/Mu	NA depth in	Dt depth in	eps_t	Phi
1	1 U1	357.76	0.00	329.82	999.999	7.07	13.50	0.00273	1.000
2		357.76	0.00	329.82	999.999	7.07	13.50	0.00273	1.000
3	1 U2	170.24	0.00	287.60	999.999	5.27	13.50	0.00468	1.000
4		170.24	0.00	287.60	999.999	5.27	13.50	0.00468	1.000

*** End of output ***

EL.



Results for LC 1, Induced Moments 1

DCI Engineers	Block 8L - Line 2	SK - 1
GM		Sept 9, 2014 at 4:31 PM
14031-0013		Block 8L - non SFRS col, line 2.r3d

C-21



Company : DCI Engineers
 Designer : GM
 Job Number : 14031-0013
 Model Name : Block 8L - Line 2

Sept 5, 2014

Checked By: _____

Concrete Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (1/E...)	Density[k/ft...]	fc[ksi]	Lambda	Flex Steel[...]	Shear Steel...
1	Conc6000NW	4415	1920	.15	.6	.145	6	1	60	60

Joint Coordinates and Temperatures

	Label	X [ft]	Y [ft]	Z [ft]	Temp [F]	Detach From Diap...
1	N1	0	0	0	0	
2	N2	0	15	0	0	
3	N7	72	0	0	0	
4	N8	72	15	0	0	
5	N3	24	0	0	0	
6	N4	24	15	0	0	
7	N5	48	0	0	0	
8	N6	48	15	0	0	

Concrete Beam Design Parameters

	Label	Shape	Length[ft]	B-eff Left[in]	B-eff Right[in]	Slab Thic...	Slab Thic...	Icr Factor	Flexural L...	Shear Lay...
1	M5	CRECT8X64	24					.8	Use Desi...	Use Desi...
2	M6	CRECT8X128	24					.8	Use Desi...	Use Desi...
3	M7	CRECT8X64	24					.8	Use Desi...	Use Desi...

Concrete Column Design Parameters

	Label	Shape	Length[ft]	Lu-yy[ft]	Lu-zz[ft]	Cm-yy	Cm-zz	Kyy	Kzz	y sway	z sway	Icr Fac...	Flexur...	Shear ...
1	M1	CRECT1...	15									.5	Use D...	Use D...
2	M2	CRECT1...	15									.5	Use D...	Use D...
3	M3	CRECT1...	15									.5	Use D...	Use D...
4	M4	CRECT1...	15									.5	Use D...	Use D...

Joint Loads and Enforced Displacements (BLC 1 : DL)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in.rad), (k*s^2/ft...
1	N2	L	Y	-101
2	N4	L	Y	-215
3	N6	L	Y	-224
4	N8	L	Y	-92

Joint Loads and Enforced Displacements (BLC 2 : LL)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in.rad), (k*s^2/ft...
1	N2	L	Y	-51
2	N4	L	Y	-110
3	N6	L	Y	-110
4	N8	L	Y	-45

Joint Loads and Enforced Displacements (BLC 3 : EQ)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in.rad), (k*s^2/ft...
1	N2	D	X	.47

Joint Loads and Enforced Displacements (BLC 4 : SL)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in.rad), (k*s^2/ft...
1	N2	L	Y	-5
2	N4	L	Y	-11

Joint Loads and Enforced Displacements (BLC 4 : SL) (Continued)

	Joint Label	L.D.M	Direction	Magnitude[(k.k-ft), (in.rad), (k*s^2/ft...]
3	N6	L	Y	-13
4	N8	L	Y	-5

Basic Load Cases

	BLC Description	Category	X Gravity	Y Gravity	Z Gravity	Joint	Point	Distributed Area(Me... Surface(...
1	DL	DL				4		
2	LL	LL				4		
3	EQ	EL				1		
4	SL	SL				4		

Load Combinations

	Description	SolvePD...	SR...	BLC Factor	BLC Factor	BLC Factor	BLC Factor	BLC Factor	BLC Factor	BLC Factor	BLC Factor	BLC Factor	BLC Factor	BLC Factor	BLC Factor	BLC Factor	BLC Factor	BLC Factor
1	Induced Mo...	Yes	Y		DL	1.34	EL	1	LL	.5	SL	1						
2	Induced Mo...	Yes	Y		DL	.76	EL	1										

Member Section Forces

	LC	Member Label	Sec	Axial[k]	y Shear[k]	z Shear[k]	Torque[k-ft]	y-y Moment[k-...	z-z Moment[k-...
1	1	M1	1	164.505	1.232	0	0	0	0
2			2	164.505	1.232	0	0	0	-4.62
3			3	164.505	1.232	0	0	0	-9.241
4			4	164.505	1.232	0	0	0	-13.861
5			5	164.505	1.232	0	0	0	-18.482
6	1	M2	1	353.836	2.212	0	0	0	0
7			2	353.836	2.212	0	0	0	-8.296
8			3	353.836	2.212	0	0	0	-16.592
9			4	353.836	2.212	0	0	0	-24.887
10			5	353.836	2.212	0	0	0	-33.183
11	1	M3	1	368.252	2.299	0	0	0	0
12			2	368.252	2.299	0	0	0	-8.623
13			3	368.252	2.299	0	0	0	-17.245
14			4	368.252	2.299	0	0	0	-25.868
15			5	368.252	2.299	0	0	0	-34.491
16	1	M4	1	152.287	1.362	0	0	0	0
17			2	152.287	1.362	0	0	0	-5.109
18			3	152.287	1.362	0	0	0	-10.219
19			4	152.287	1.362	0	0	0	-15.328
20			5	152.287	1.362	0	0	0	-20.437
21	1	M5	1	3.595	-1.335	0	0	0	-18.482
22			2	3.595	-1.335	0	0	0	-10.473
23			3	3.595	-1.335	0	0	0	-2.464
24			4	3.595	-1.335	0	0	0	5.545
25			5	3.595	-1.335	0	0	0	13.554
26	1	M6	1	2.306	-1.599	0	0	0	-19.63
27			2	2.306	-1.599	0	0	0	-10.035
28			3	2.306	-1.599	0	0	0	-.441
29			4	2.306	-1.599	0	0	0	9.153
30			5	2.306	-1.599	0	0	0	18.747
31	1	M7	1	.966	-1.508	0	0	0	-15.744
32			2	.966	-1.508	0	0	0	-6.699
33			3	.966	-1.508	0	0	0	2.347
34			4	.966	-1.508	0	0	0	11.392
35			5	.966	-1.508	0	0	0	20.437

Member Section Forces (Continued)

	LC	Member Label	Sec	Axial[k]	v Shear[k]	z Shear[k]	Torque[k-ft]	y-y Moment[k-...	z-z Moment[k-...
36	2	M1	1	75.383	1.265	0	0	0	0
37			2	75.383	1.265	0	0	0	-4.742
38			3	75.383	1.265	0	0	0	-9.484
39			4	75.383	1.265	0	0	0	-14.226
40			5	75.383	1.265	0	0	0	-18.968
41	2	M2	1	163.171	2.237	0	0	0	0
42			2	163.171	2.237	0	0	0	-8.388
43			3	163.171	2.237	0	0	0	-16.775
44			4	163.171	2.237	0	0	0	-25.163
45			5	163.171	2.237	0	0	0	-33.55
46	2	M3	1	170.391	2.276	0	0	0	0
47			2	170.391	2.276	0	0	0	-8.535
48			3	170.391	2.276	0	0	0	-17.071
49			4	170.391	2.276	0	0	0	-25.606
50			5	170.391	2.276	0	0	0	-34.142
51	2	M4	1	71.375	1.323	0	0	0	0
52			2	71.375	1.323	0	0	0	-4.962
53			3	71.375	1.323	0	0	0	-9.924
54			4	71.375	1.323	0	0	0	-14.885
55			5	71.375	1.323	0	0	0	-19.847
56	2	M5	1	4.781	-1.377	0	0	0	-18.968
57			2	4.781	-1.377	0	0	0	-10.707
58			3	4.781	-1.377	0	0	0	-2.446
59			4	4.781	-1.377	0	0	0	5.815
60			5	4.781	-1.377	0	0	0	14.076
61	2	M6	1	2.969	-1.606	0	0	0	-19.475
62			2	2.969	-1.606	0	0	0	-9.839
63			3	2.969	-1.606	0	0	0	-.203
64			4	2.969	-1.606	0	0	0	9.432
65			5	2.969	-1.606	0	0	0	19.068
66	2	M7	1	1.137	-1.455	0	0	0	-15.074
67			2	1.137	-1.455	0	0	0	-6.344
68			3	1.137	-1.455	0	0	0	2.387
69			4	1.137	-1.455	0	0	0	11.117
70			5	1.137	-1.455	0	0	0	19.847