General Building Permit Application

If you or the property owner owes real estate or personal property taxes or user charges on any property within the City, payment arrangements must be made before permits of any kind are accepted

Location/Address of Construction: 138 CANCO ROAD		
Total Square Footage of Proposed Structure/Area: 874 SF ADDITION	Square Footage of Lot: 308,500 SF	
Tax Assessor's Chart, Block & Lot Chart# 148 Block# A006 Lot# 001	Applicant *must be owner, Lessee or Buyer* Name CENTRAL MAINE POWER CO. Address 83 EDISON DRIVE City, State & Zip AUGUSTA, ME 04336	Telephone: (207) 623-3521 EXT 2390 BOB MANOR
Lessee/DBA (If Applicable) N/A	Owner (if different from Applicant) Name Address N/A City, State & Zip	Cost Of Work: $ 350,000 C of O Fee: $ Total Fee: $
Current legal use (i.e. single family): BUSINESS/STORAGE/WAREHOUSE CMP UTILITY SERVICE BLDG. If vacant, what was the previous use? N/A Proposed Specific use: ADDITION OF EAST TRUCK STORAGE BAYS TO ALLOW STORAGE OF LONGER TRUCKS Is property part of a subdivision? NO If yes, please name Project description: THIS PROJECT WILL BE AN ADDITION OF 5'-6" DEEP x ± 160' LONG @ THE EXISTING EAST TRUCK BAYS. THE ADDITION IS REQUIRED TO ALLOW NEW CMP LINE TRUCKS WHICH ARE NOW LONGER TO CONTINUE TO BE STORED IN THE EAST TRUCK BAYS		
Contractor's name: PROJECT IS CURRENTLY OUT TO BID Address: City, State & Zip Telephone: Who should we contact when the permit is ready: DAN SPAULDING Telephone: (207) 861-9923 Mailing address: SPAULDING ENGINEERING, 24 COMMON ST, WATERVILLE, ME 04901		

Please submit all of the information outlined on the applicable Checklist. Failure to do so will result in the automatic denial of your permit.

In order to be sure the City fully understands the full scope of the project, the Planning and Development Department may request additional information prior to the issuance of a permit. For further information or to download copies of this form and other applications visit the Inspections Division on-line at www.portlandmaine.gov, or stop by the Inspections Division office, room 315 City Hall or call 874-8703.

I hereby certify that I am the Owner of record of the named property, or that the owner of record authorizes the proposed work and that I have been authorized by the owner to make this application as his/her authorized agent. I agree to conform to all applicable laws of this jurisdiction. In addition, if a permit for work described in this application is issued, I certify that the Code Official's authorized representative shall have the authority to enter all areas covered by this permit at any reasonable hour to enforce the provisions of the codes applicable to this permit.

Signature: Robert J Manor Date: 7/27/11

This is not a permit; you may not commence ANY work until the permit is issue

Certificate of Design

Date: July 27, 2011

From: Spaulding Engineering & Construction Services, Inc.

These plans and / or specifications covering construction work on:

874 square foot addition (5'-6" deep x ± 160' long) to the existing east truck bays at CMP's Portland Service Building

Have been designed and drawn up by the undersigned, a Maine registered Architect / Engineer according to the ~~2003~~ 2009 ***International Building Code*** and local amendments.

STATE OF MAINE
DANIEL E. SPAULDING
No. 6097
LICENSED
PROFESSIONAL ENGINEER

(SEAL)

Signature: Daniel E. Spaulding

Title: Civil Engineer

Firm: Spaulding Engineering & Constr. Svc. Inc.

Address: 24 Common Street
Waterville, Maine 04901

Phone: (207) 861-9923

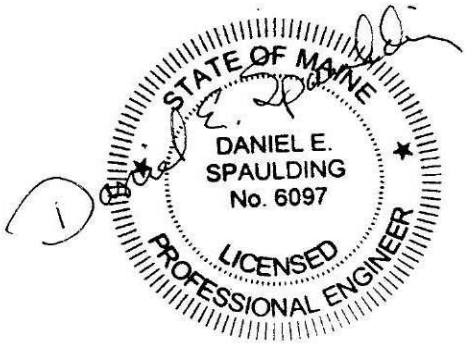
For more information or to download this form and other permit applications visit the Inspections Division on our website at www.portlandmaine.gov

Spaulding Engineering and Construction Services, Inc.
24 Common Street ~ Waterville, Maine 04901
Phone (207) 861-9923 ~ Fax (207) 861-9923

CENTRAL MAINE POWER COMPANY

NEW 874 SQUARE FOOT EAST TRUCK BAYS ADDITION TO THE EXISTING SERVICE BUILDING LOCATED AT 138 CANCO ROAD IN PORTLAND, MAINE

CERTIFICATE OF DESIGN APPLICATION



07/27/11

Prepared By: Daniel E. Spaulding P.E.
Spaulding Engineering and Construction Services, Inc.
24 Common Street
Waterville, Maine 04901
(207) 861-9923

CERTIFICATE OF DESIGN APPLICATION

From Designer:

Daniel E. Spaulding P.E.
State of Maine PE Number: 6097
Spaulding Engineering and Construction Services, Inc.
24 Common Street
Waterville, Maine 04901
Tel. (207) 861-9923
Email: dan@spauldingengineering.com

Date: July 27, 2011

Job Name: Central Maine Power Company
2011 East Truck Bay Extension

Address of Construction: 138 Canco Road, Portland, Maine
Chart/Block/Lot: 148 A006001

Owner's Name and Address:

Central Maine Power Company
83 Edison Drive
Augusta, Maine 04336
Contact person: Mr. Robert Meader, Project Manager
Tel. (207) 623-3521 ext. 2390
Fax: (207) 621-4737
Cell: 458-3262
Email: robert.meader@cmpco.com

Project Data:

1. The total site area is 308,640 square feet.
2. The total disturb area for the new addition would be approximately 2685 square feet which would be represented by the 874 square feet for the building footprint and approximately 1811 square feet of repaving in front and on the sides of the new addition.
3. Proposed Paved Area: 218,500 square feet
4. Existing total impervious area: 284,510 square feet
5. Proposed total impervious area: 284,510 square feet
6. Proposed Impervious net change: 0 square feet

7. Proposed Building Foot Print: 53,242 square feet
8. Proposed Building footprint net change: 854 square feet
9. Existing Total Building Floor Area: 103,375 square feet
10. Proposed Total Building Floor Area: 104,249 square feet.
11. Proposed Building Floor Area Net change: 874 square feet

The existing building is a Mixed Use Group consisting of IBC Use groups B (business), S1 (moderate hazard storage) and S2 (low hazard storage). The structure is a separated mixed use. NFPA classifies the Classification of Occupancy as Business, Low Hazard Storage (Vehicle Parking) and Ordinary Hazard Storage for Maintenance Garage Portion of building.

The new truck bay addition will be an extension of the existing truck bay used to store vehicles only in IBC Use Group S2.

The new 874 square foot addition/extension will have the existing sprinkler system extended from the existing truck bays into the new addition/extension. The Sprinkler system modifications will be completed by Eastern Fire Systems in accordance with the 2009 IBC and NFPA 13.

The existing building is equipped with a supervisory alarm system.

No geotechnical/soils report was performed as the new addition loads are very small. Test pits were performed by Maine Test Borings to determine distance to rock. All test pits indicated that the structure foundations will be founded on rock or on gravel. A copy of the Maine Test Borings information is attached as Appendix A.

Photos of the existing east truck bay along Canco Road are attached in Appendix B.

Structure Design Calculations are included in Appendix C.

New 874 square foot truck bay addition/extension has been designed in accordance with the 2009 International Building Code (IBC) and the American Society of Civil Engineers (ASCE) "2010 Minimum Design Loads for Buildings and Other Structures" ASCE/SEI 7-10.

Use Group Classification(s): The new addition/extension will be attached to the existing S2 low hazard storage east truck bays. The truck bays are used for CMP line truck service only. No vehicle service is performed in this area.

Type of Construction: Type III.

Building Frame:	Steel beams and columns.
Wall construction:	Exterior walls will be 3 inch thick insulated wall panels. Interior walls will be finished with ½" fire rated plywood. Roof: 22 steel gauge deck with isocyanurate insulation and low slope fire rated (LSFR) EPDM membrane.

Wind Loads:

Wind loads were determined based on ASCE 7-10 Part 1: Enclosed, Partially Enclosed and Open Building of All Heights. The building while classified as an Enclosed structure when overhead doors are closed was also evaluated as a Partially Enclosed structure if doors are left open.

Basic Wind Speed for a Category IV is V=130 mph from ASCE 7-10 Figure 26.5-1B.

Building Category: Building is a Category IV from IBC Table 1604.5

Wind Exposure Category: Exposure B IBC 1609.4.3

Internal Wind Pressure: ASSCE 7-10

Enclosed Buildings: GCpi = +/- 0.18 Table 26.11-1

Partially Enclosed Building: GCpi = +/- 0.55 Table 26.11-1

Component and Cladding pressures: ASCE 7-10

Main Force Wind Pressures:

Enclosed Building:

Windward = 18.1 psf
Leeward = -7.4 psf
Sidewall = -16.3 psf

Partially Enclosed Building:

Windward = 25.8 psf
Leeward = -15.1 psf
Sidewall = -24.0 psf

Earth Design Data:

Design Option Utilized: Allowable Stress Design
Seismic Use Group Category: C
Spectral Response Coefficients:
SDs = 0.267
SD1= 0.128
Site Class: D

Roof Snow Load: ASCE 7-10

Roof Design Snow load: 50 psf
Roof Design Snow Load w/Drift: 110 psf
Ground Snow Load: 60 psf Figure 7-1
Flat Roof Snow Load: 50 psf
Snow Exposure Factor (Ce) = 1.0 Table 7-2., 26.7.3
Snow Importance Factor (Is) = 1.2 Table 1.5-2
Roof Thermal Factor (Ct) = 1.0 Table 7-3
Seismic Design Category: C
Basis Seismic Force Resisting System: Cantilevered Columns
Response Modification Coefficient (R): R= 1.25
Deflection Amplification factor (Cd): Cd=1.25
Analysis Procedure: ASCE Section 12.0 – Equivalent Lateral Force Procedure
Design Total Base Shear (V): V= 14,518 pounds

APPENDIX A

MAINE TEST BORINGS –SITE TEST PROBES

MAINE TEST BORINGS INC. BREWER, ME 04412	Spaulding Engineering & Construction Dan Spaulding 24 Common St Waterville ME	PROBE LOG

DRILLER:	Alonzo Francis	**Ref#:**	**PO#:**	**Auger Size O.D.**	4"
		PROJECT NAME and LOCATION:			
MTB JOB NO:	2011-096	CMP Bldg, 162 Canco Rd Portland ME			

BORING NO.	P-5	BORING NO.	P-6
LINE and STATION:		LINE and STATION:	
OFFSET:	6 ft off bldg	OFFSET:	6 ft off bldg
ELEVATION:		ELEVATION:	
DATE:	06/21/2011	DATE:	06/21/2011

DEPTH	STRATUM DESCRIPTION
0.4	Tar
	Brown Sandy Gravel
3.2	
6.2	Dark Brown Sand w/Trace of Gravel
6.5	Weathered Rock
	Auger Refusal @ 6.5'
	Open & Dry

DEPTH	STRATUM DESCRIPTION
0.4	Tar
	Brown Sandy Gravel
3.7	
6.0	Dark Brown Sand w/Gravel
7.1	Dark Brown Sand w/Trace of Silt
7.5	Light Brown Fine Sand w/Gravel
7.7	Weathered Rock
	Auger Refusal @ 7.7'
	Caved & Dry @ 6.2'

REMARKS:

REMARKS:

X SOIL CLASSIFIED BY DRILLER VISUALLY

MAINE TEST BORINGS INC. BREWER, ME 04412	Spaulding Engineering & Construction Dan Spaulding 24 Common St Waterville ME	PROBE LOG

DRILLER:	Alonzo Francis	**Ref#:**	**PO#:**	**Auger Size O.D.**	4"
		PROJECT NAME and LOCATION:			
MTB JOB NO:	2011-096	CMP Bldg, 162 Canco Rd Portland ME			

BORING NO.	P-3	BORING NO.	P-4
LINE and STATION:		LINE and STATION:	
OFFSET:	6 ft off bldg	OFFSET:	6 ft off bldg
ELEVATION:		ELEVATION:	
DATE:	06/21/2011	DATE:	06/21/2011

DEPTH	STRATUM DESCRIPTION
0.4	Tar
3.5	Brown Sandy Gravel
3.8	Weathered Rock
	Auger Refusal @ 3.8'
	Open & Dry

DEPTH	STRATUM DESCRIPTION
0.4	Tar
3.6	Brown Sandy Gravel
4.2	Light Brown Fine Sand
4.5	Weathered Rock
	Auger Refusal @ 4.5'
	Open & Dry

REMARKS:

REMARKS:

X SOIL CLASSIFIED BY DRILLER VISUALLY

MAINE TEST BORINGS INC. BREWER, ME 04412	Spaulding Engineering & Construction Dan Spaulding 24 Common St Waterville ME	PROBE LOG

DRILLER:	Alonzo Francis	**Ref#:**	**PO#:**	**Auger Size O.D.**	4"
		PROJECT NAME and LOCATION:			
MTB JOB NO:	2011-096	CMP Bldg, 162 Canco Rd Portland ME			

BORING NO.	P-1	BORING NO.	P-2
LINE and STATION:		LINE and STATION:	
OFFSET:	6 ft off bldg	OFFSET:	6 ft off bldg
ELEVATION:		ELEVATION:	
DATE:	06/21/2011	DATE:	06/21/2011

DEPTH	STRATUM DESCRIPTION
0.4	Tar
3.0	Brown Sandy Gravel
3.2	Weathered Rock
	Auger Refusal @ 3.2'
	Open & Dry

DEPTH	STRATUM DESCRIPTION
0.4	Tar
2.8	Brown Sandy Gravel
3.3	Weathered Rock
	Auger Refusal @ 3.3'
	Open & Dry

REMARKS:

REMARKS:

X SOIL CLASSIFIED BY DRILLER VISUALLY

MAINE TEST BORINGS INC. BREWER, ME 04412	Spaulding Engineering & Construction Dan Spaulding 24 Common St Waterville ME	PROBE LOG

DRILLER:	Alonzo Francis	**Ref#:**	**PO#:**	**Auger Size O.D.**	4"
		PROJECT NAME and LOCATION:			
MTB JOB NO:	2011-096	CMP Bldg, 162 Canco Rd Portland ME			

BORING NO.	P-7	BORING NO.	
LINE and STATION:		LINE and STATION:	
OFFSET:	6 ft off bldg	OFFSET:	
ELEVATION:		ELEVATION:	
DATE:	06/21/2011	DATE:	

DEPTH	STRATUM DESCRIPTION
0.4	Tar
	Brown Sandy Gravel
7.3	
9.1	Light Brown Fine Sand w/Trace of Gravel
9.2	Weathered Rock
	Auger Refusal @ 9.2'
	Caved & Dry @ 7.1'

DEPTH	STRATUM DESCRIPTION

REMARKS:

REMARKS:

X SOIL CLASSIFIED BY DRILLER VISUALLY

APPENDIX B

PHOTOS –EXISTING EAST TRUCK BAYS ALONG CANCO ROAD
LOCATION OF NEW ADDITION

138 Canco Road Portland. Existing East Truck with 12 overhead doors facing Canco Road. New addition will be out 5’-6” toward Canco Road to provide storage space for new longer line trucks.

138 Canco Road Portland. Existing East Truck with 12 overhead doors facing Canco Road. New addition will be out 5’-6” toward Canco Road to provide storage space for new longer line trucks.

138 Canco Road Portland. Existing landscaping to the north of the east truck bays that will remain.

138 Canco Road Portland. Existing landscaping to the north of the east truck bays that will remain.

APPENDIX C

STRUCTURE DESIGN CALCULATIONS

2011 EAST TRUCK BAY ADDITION
PORTLAND SERVICE BUILDING LOADINGS

D.E. SPANLDING P.E.
SHT 1 OF 27
7/28/11

IN ACCORDANCE WITH IBC 2009 & ASCE 7-10

ASCE 7-10 CHAPTER 7 SNOW LOADS

$P_f = 0.7 C_e C_t I_s p_g$ EQUATION (7.3-1)

C_e Table 7-2

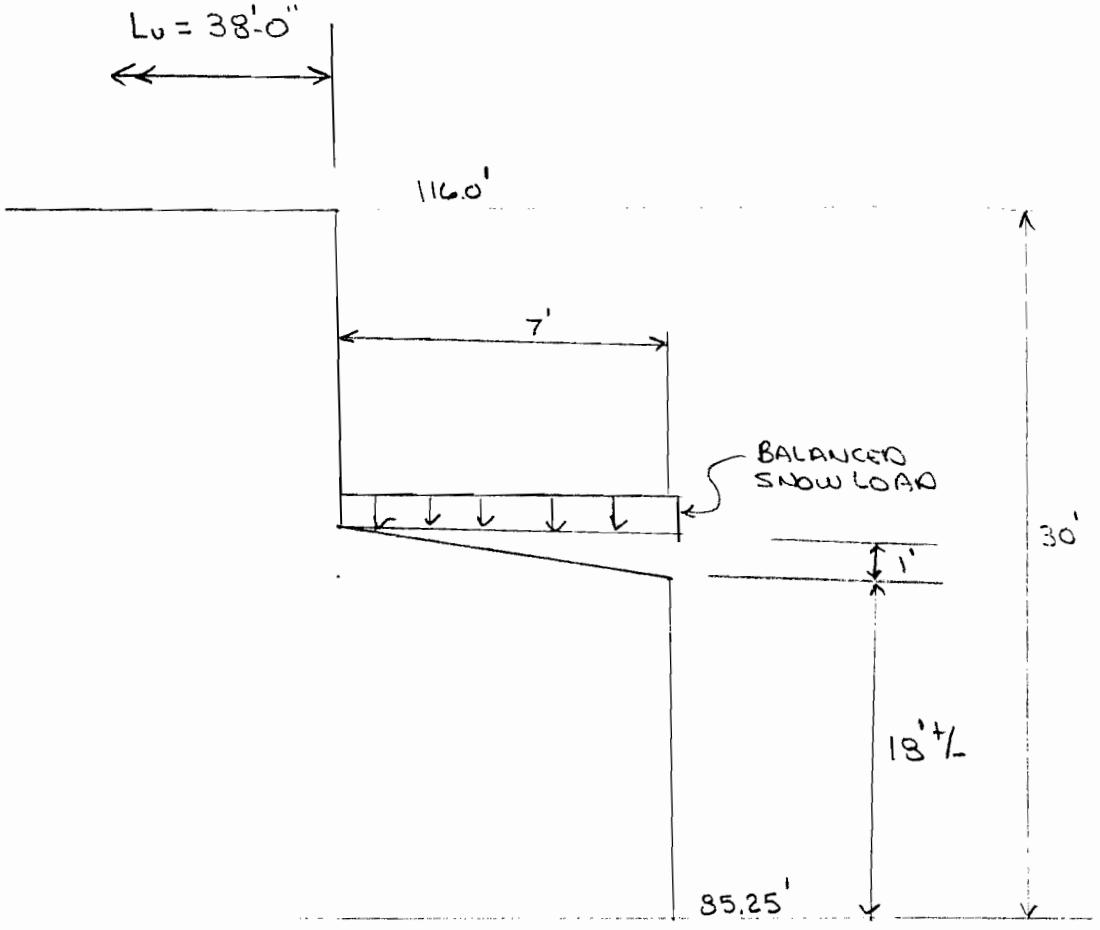
26.7.3 EXPOSURE B - PARTIALLY EXPOSED
$C_e = 1.0$

C_t Table 7-3 $C_t = 1.0$

I_s - TABLE 1.5-2 RISK CATEGORY IV
$I_s = 1.2$

p_g Figure 7-1 = 60 psf

$P_f = 0.7(1.0)(1.0)(1.2)(60\ psf) =$ 50.4 PSF SAY 50 PSF



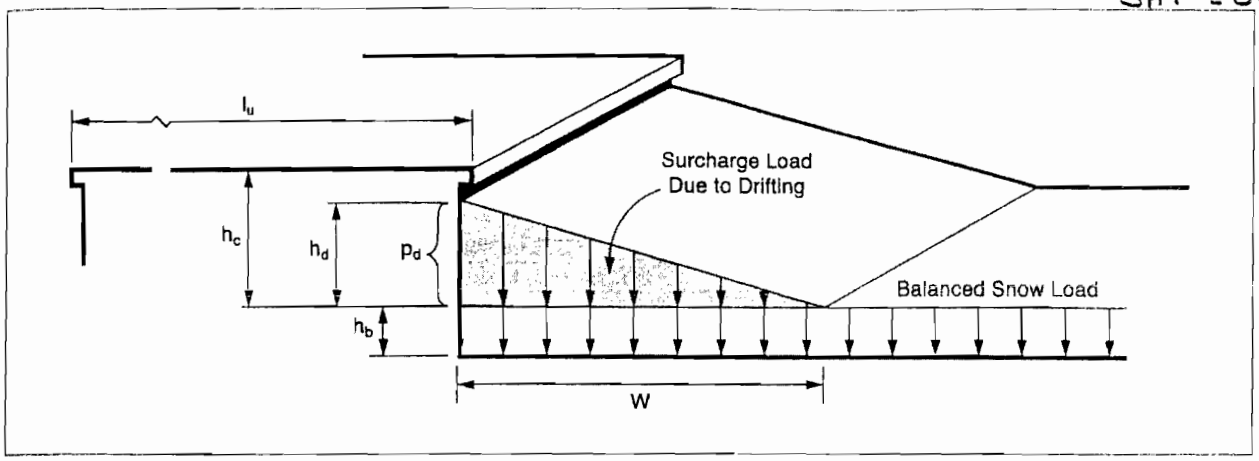
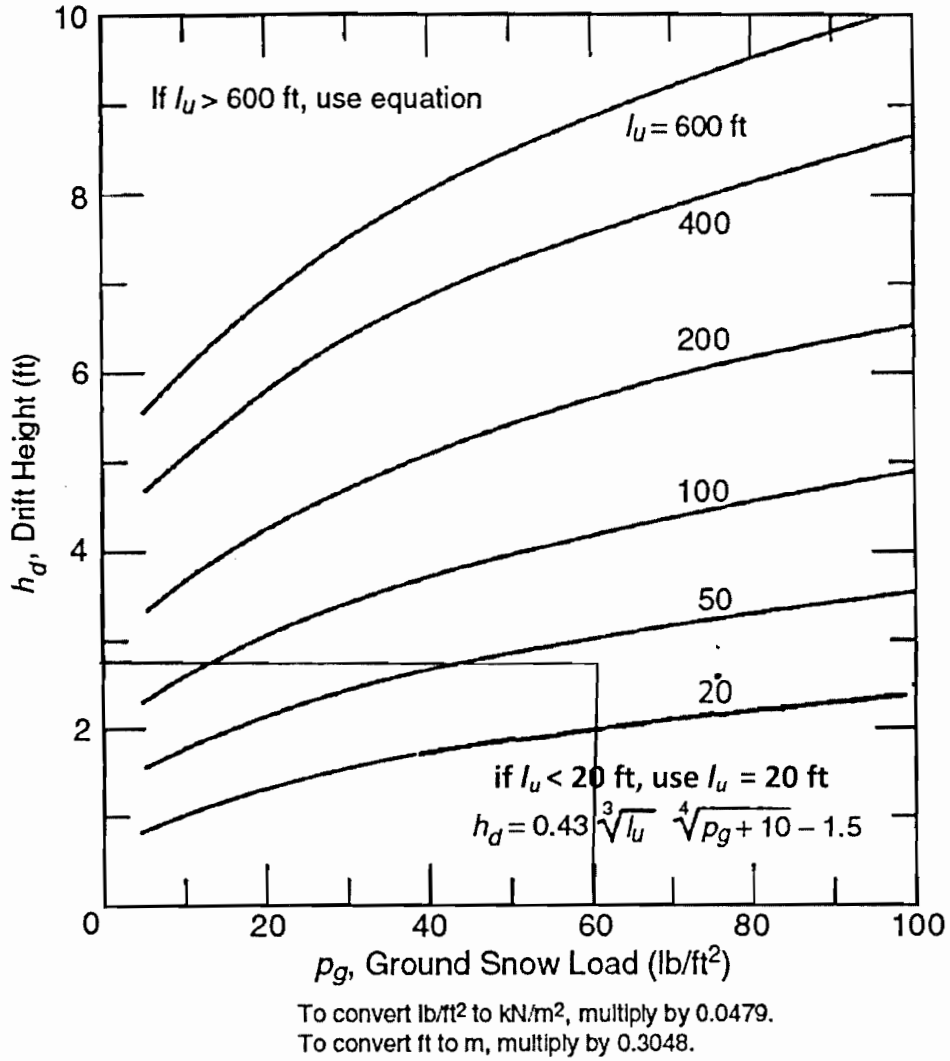


FIGURE 7-8 Configuration of Snow Drifts on Lower Roofs.



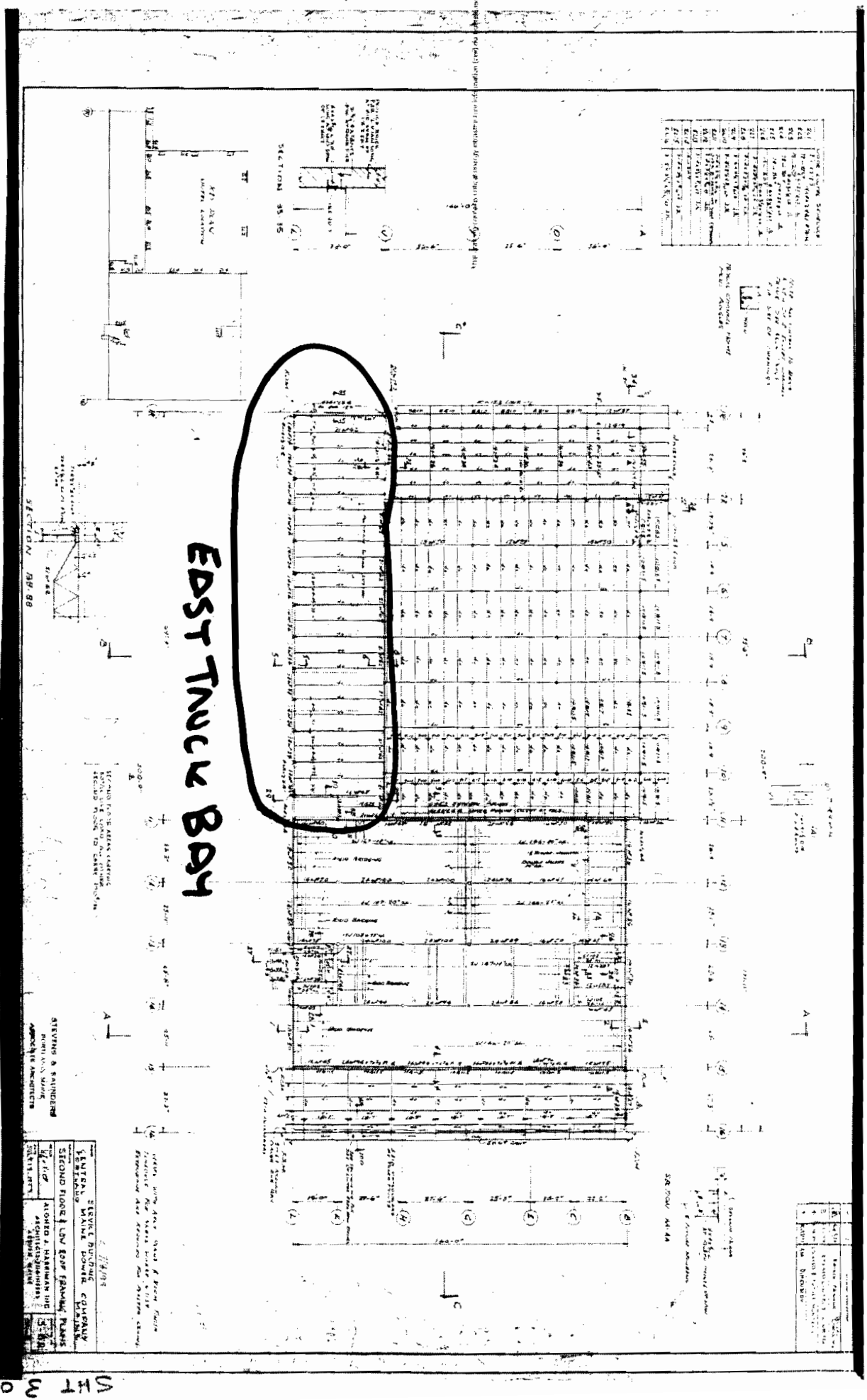
To convert lb/ft2 to kN/m2, multiply by 0.0479.
To convert ft to m, multiply by 0.3048.

FIGURE 7-9 Graph and Equation for Determining Drift Height, h_d.

51-367

S-DR

SHT 3 OF 27



SHT 3 OF

51-367

5-14

SHT 4 of 27

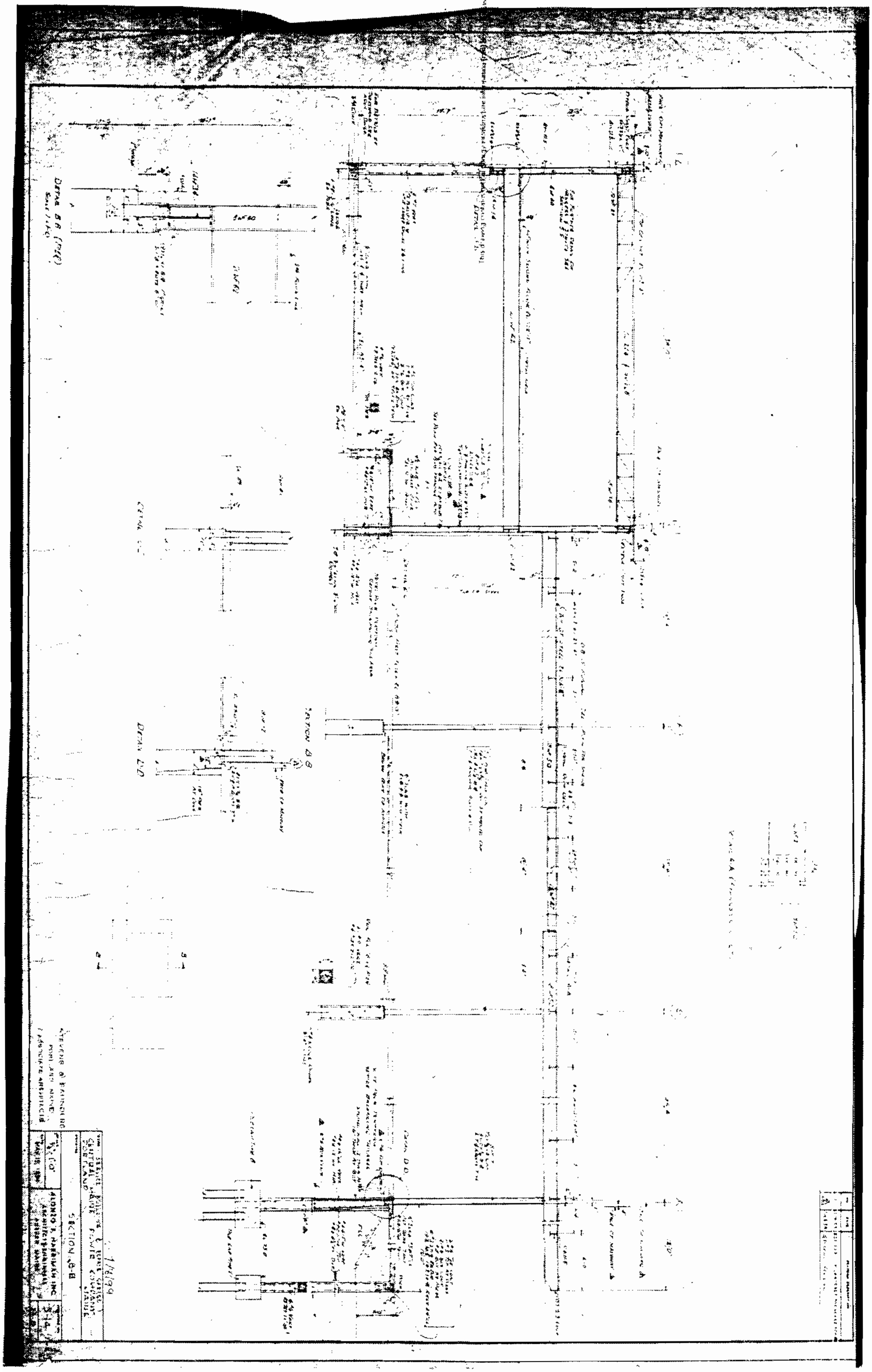


FIGURE 7-9

$$h_d = 0.43 \sqrt[3]{l_u} \sqrt[4]{p_g + 10} - 1.5$$

$p_g = 60$ psf
$l_u = 39'$
$h_c = 116.0' - 104.25' = 11.75'$

$$h_d = 0.43 \sqrt[3]{38.0'} \sqrt[4]{60 + 10} - 1.5$$

$$(1.446)(2.893) - 1.5 = 2.68'$$

$\gamma = 0.13(60\ \text{PSF}) + 14 = 21.8$ pcf

$h_b = 50.4$ psf $/ 21.8$ pcf $= 2.31'$

$h_d = 2.66'$ $\quad p_d = 2.66'(21.8\ \text{pcf}) = 58$ psf

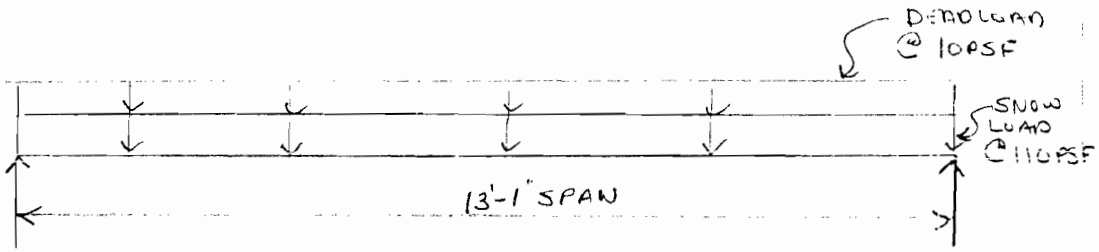
DESIGN ENTIRE ROOF FOR $50.4\ \text{PSF} + 58 = 109.4\ \text{PSF}$
USE 109 PSF

$h_d = 2.66'$
$h_c = 11.75'$

$w = 4(h_d) = 4(2.66') = 10.64' > 7'$ ∴ DESIGN FOR 109 PSF

USE 110 PSF ACROSS ENTIRE ROOF BEAMS

CROSS BEAM SUPPORT STEEL



TRIB WIDTH MAX = (3'-6" + 2'-9")/2 = 3.13'

M_{max} = (120 PSF)(3.13')(13.09')²/8 = 8032.5 ft-lb

ASSUME F_b = 0.6(50ksi) A992 GRADE 50 STEEL

$S_{x\,REQ'D}$ = (8.033 in-k × 12"/1)/30ksi = 3.2 IN³

TRY W8x15 d = 8.11 in b_f = 4.02 in
t_w = 0.245 in t_f = 0.315 in
I_x = 48.0 IN⁴
S_x = 11.8 IN³ > 3.2 IN³

CHECK V

V_{max} = (120PSF)(3.13')(13.09')/2 = 2456.4 lb

f_v = 2.46 k/(8.11 in)(0.245 in) = 1.24 ksi << 0.4(50ksi)

CHECK Δ

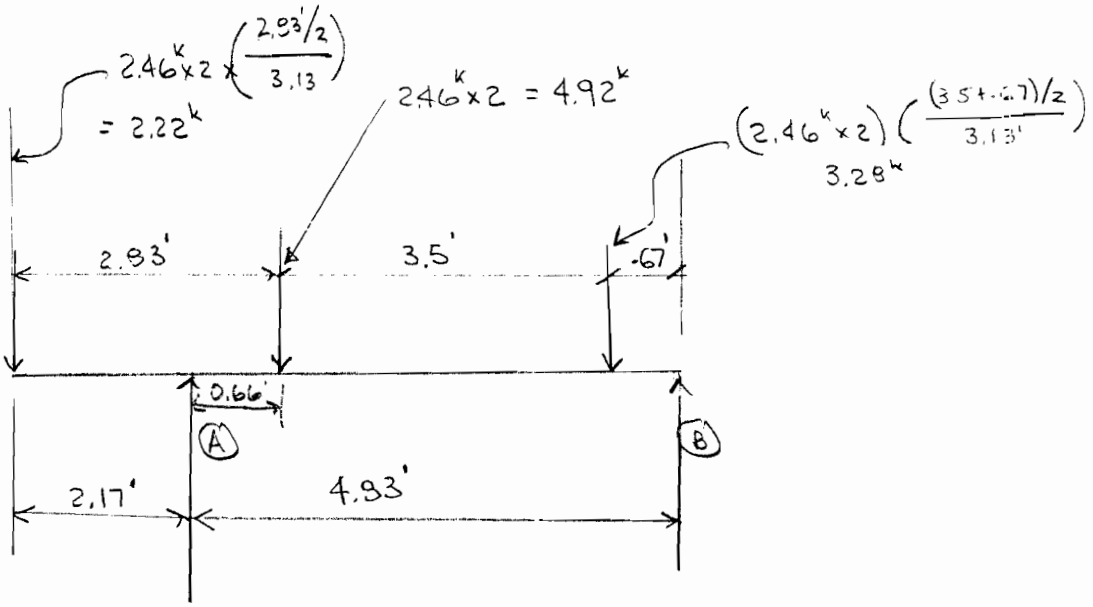
$$\Delta = \frac{5wl^4}{384EI}$$

$$= \frac{5\left(\frac{120(3.13')}{12}\right)(157)^4}{384\,(29{,}000{,}000\,psi)(48.0\,IN^4)} = 0.18\,IN$$

$$l/240 = \frac{13.09' \times 12"/1}{240} = 0.65\,IN$$

USE W8x15 FOR CROSS BEAMS

MAIN ROOF GIRDER SUPPORTS @ COLUMNS



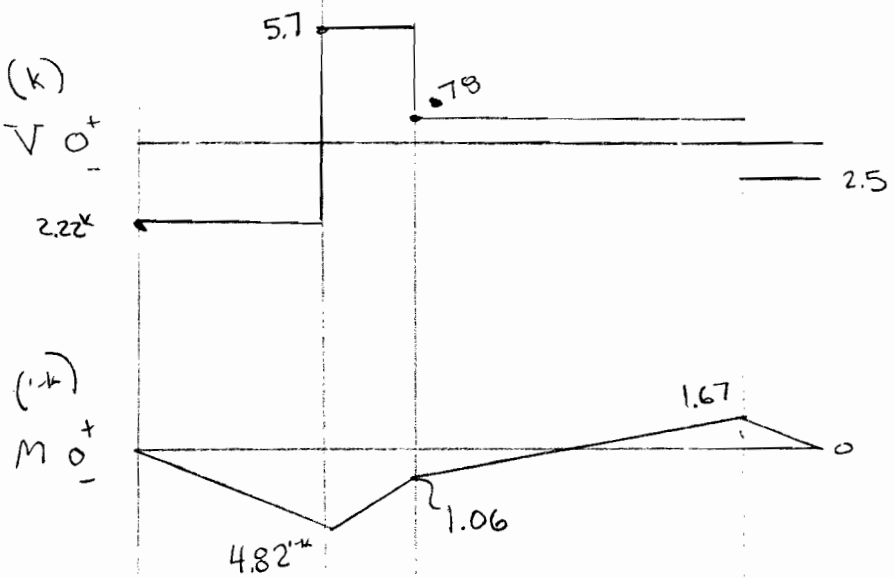
$\Sigma M_{@A} = 0$ ↺

$-2.22^k(2.17') + 4.92^k(0.66') + 3.28^k(4.16') = 4.83' R_B$ (→)

$R_B = 2.5^k$

$\Sigma F_V = 0$

$\therefore R_A = 2.22^k + 4.92^k + 3.28^k - 2.5^k = 7.92^k$



$M_{MAX} = 4.82^{1-k}$

$F_b = 0.6(50ksi)$

$S_{x\ REQ'D} = \frac{4.92^{1-k} \times 12''/_1}{30ksi} = 1.93\ IN^3$

USE W10x15 FOR FRAMING $d = 9.99\ IN$ $b_f = 4.0\ IN$
$t_w = 0.23\ IN$ $t_f = 0.27\ IN$
$S_x = 10.9\ IN^3$ $I_x = 53.9\ IN^4$

CHECK V

$M_{AX}\ V = 5.7^k$

$f_v = {}^{5.7^k}/_{9.99\ IN \times 0.23\ IN} = 2.48ksi << 0.4(50ksi)$

$\therefore$ O.K BY INSPECTION USE W10x15

MAX DEAD & SNOW LOAD ON COLUMNS:

$W6x15 = 7.92^k$
$HSS5x5 = 2.5^k$

WIND LOAD CHAPTER 26/27 SHT 9 OF 27

BUILDING RISK CATEGORY IV TABLE 1.5-2

V = 130MPH FIGURE 26.5-1B

K_d TABLE 26.6-1 BUILDING K_d = 0.95

EXPOSURE CATEGORY 26.7 EXPOSURE B

K_z topographic factor TABLE 27.3-1 z = 18'

EXPOSURE B USE 20' = z K_{z_t} = 1.0

GUST EFFECT FACTOR G SECTION 26.9 G = 0.85

ENCLOSURE CLASSIFICATION 26.10

PARTIALLY ENCLOSED $G_{C_{pi}} = \begin{matrix} +0.55 \\ -0.55 \end{matrix}$

ENCLOSED $GC_{pi} = \begin{matrix} +0.18 \\ -0.18 \end{matrix}$

OPEN $GC_{pi} = 0.00$

VELOCITY PRESSURE EXPOSURE COEFFICIENT

K_z or K_h = 0.57 TABLE 27.3-1

$$q_z = 0.00256\, K_z\, K_{zt}\, K_d\, V^2$$

$$= 0.00256(0.57)(1.0)(0.95)(130\text{MPH})^2 = 21\text{ PSF}$$

ENCLOSED & PARTIALLY ENCLOSED

WINDWARD

$$p = q G C_p - q_i (GC_{pi}) \qquad q_i = 21\text{PSF}$$

$$= 21\text{PSF}(0.85)(0.8) \pm 21\text{PSF}(0.18)$$

q = 21PSF
G = 0.85
C_p = 0.8 WINDWARD WALL
q_i = 21 PSF
GC_{pi} = ±0.18

$$p = (21\text{PSF})(0.85)(0.8) \pm 21\text{psf}(0.18) = \underline{18.06\text{ psf}}$$

WORST CASE DOOR LEFT OPEN WIND BLOWING IN Z DIRECTION
PARTIALLY ENCLOSED:

$p = (21\,psf)(0.95)(0.8) \pm 21\,psf(0.55) =$
$14.28\,psf \pm 11.55 = 25.83\,psf$ ← USE

Leeward walls $L = 5'$, $B = 160$

$L/B = 5/160 = .32 \therefore C_p = -0.5$

$p = (21\,psf)(0.95)(-0.5) \pm 21\,psf(0.55) =$
$-8.93 - 11.55 = -20.4\,psf$

SIDEWALLS $C_p = -0.7$

$p = (21\,psf)(0.95)(-0.7) \pm 21\,psf(0.55) = -12.5 - 11.55$
$= -24\,psf$

WIND BLOWING IN X DIRECTION

Windward $p = 25.\,psf$

Sidewall $p =$ C

$B = 4.10'$, $L = 160'$ $\quad L/B = \frac{160}{4.10} = C_p = -0.2$

$C_p = -0.2$

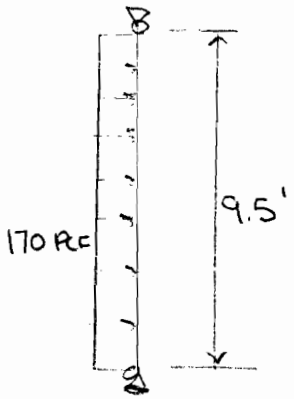
$p = (21\,psf)(0.95)(-0.2) \pm 21\,psf(0.55)$
$-3.57 - 11.55 = -15.12\,psf$

WIND LOAD ON FRONT FACE OF NEW TRUCK BAY ADDITION

WIND ON C10x15.3 DOOR SIDE MEMBERS

MAX WIND = 26PSF

LOAD ON SIDE CHANNEL (WORST CASE) = 26 PSF x $\frac{13.08'}{2}$ = 170 PLF



V_{max} = 170 PLF x $\frac{9.5'}{2}$ = 807.5 #

M_{max} = 170PLF$(9.5')^2/8$ = 1918'-#

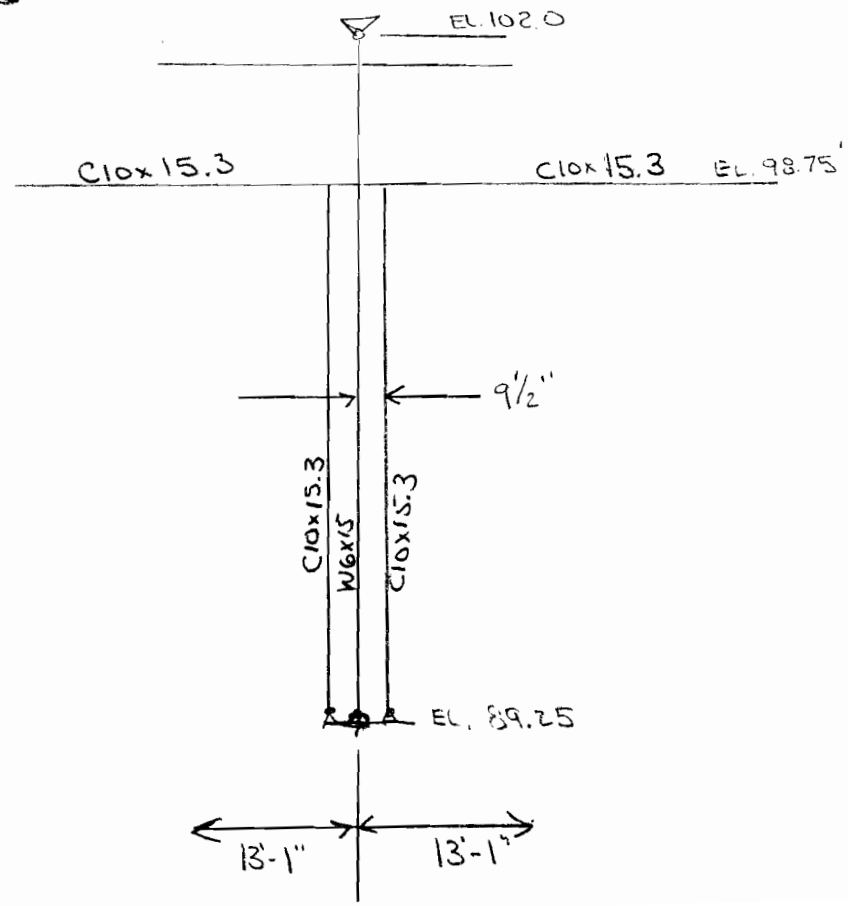
C10x15.3 d=10.0 S_x=13.5IN^3

t_w=0.24 I_x = 67.4IN^4

ASTM A36 F_T = 36 KSI F_b=0.6(36) = 22KSI

f_b = $\frac{1918'^{-\#} \times 12''/'}{13.5 IN^3}$ = 1700PSI << 22,000 PSI

Δ & V O.K BY INSPECTION

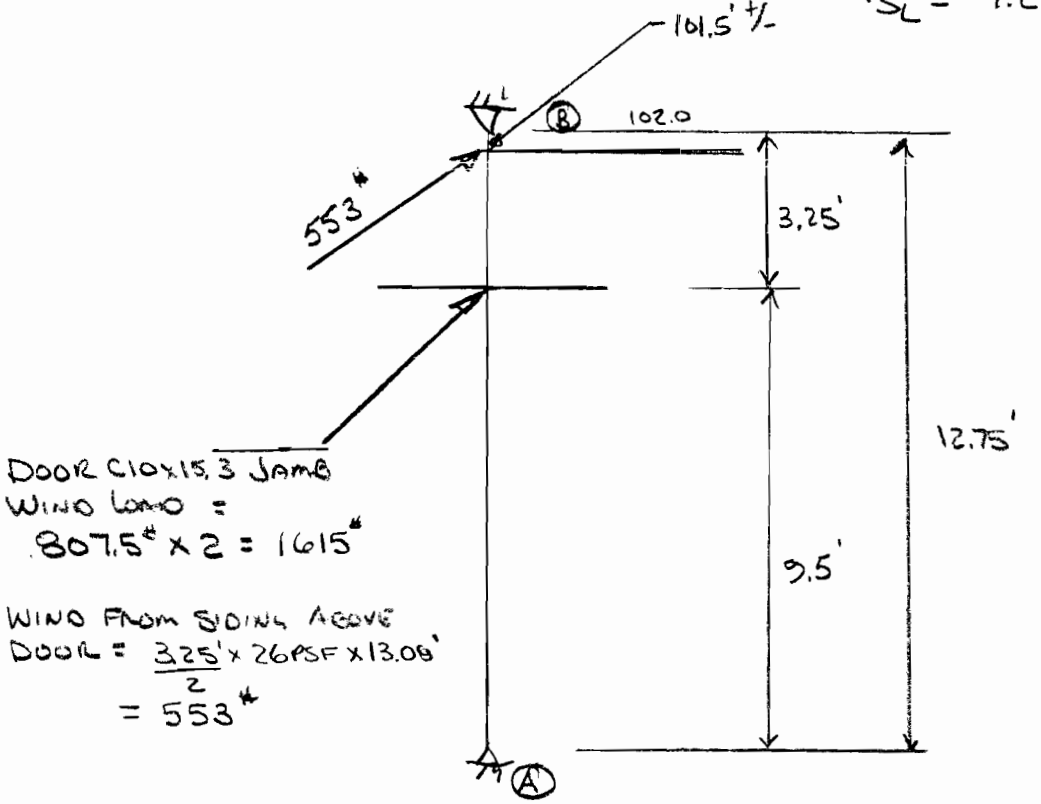


LOAD ON W6x15 COL

PMAX ROOF SNOW & DEAD LOAD = 7.92^k

$P_{DL} = {}^{10}/_{120} \times 7.92^k = 0.66^k$

$P_{SL} = 7.26^k$



DOOR C10x15.3 JAMB

WIND LOAD =

807.5# x 2 = 1615#

WIND FROM SIDING ABOVE DOOR = $\frac{3.25' \times 26PSF \times 13.08'}{2}$

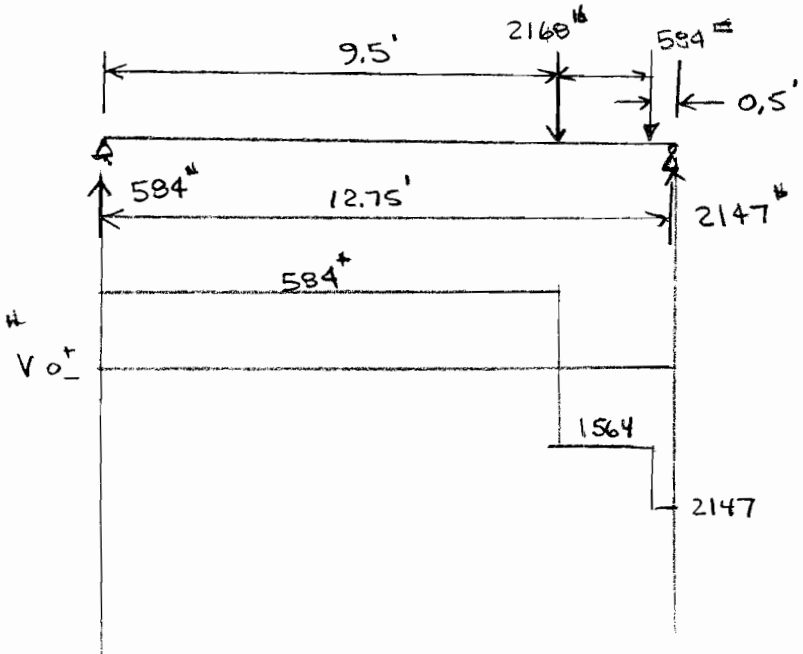
= 553#

$\Sigma M_C A = 0 \quad (1615^{\#} + 553^{\#})(9.5') + 553^{\#}(12.25') = 12.75' R_B$

$20596'^{\#} + 6774.25'^{\#} = 12.75' R_B$

$R_B = 2147^{\#}$

$\Sigma F_H = 0 \quad 559^{\#}(2) + 1615^{\#} - 2147^{\#} = R_A \quad R_A = 584^{\#}$

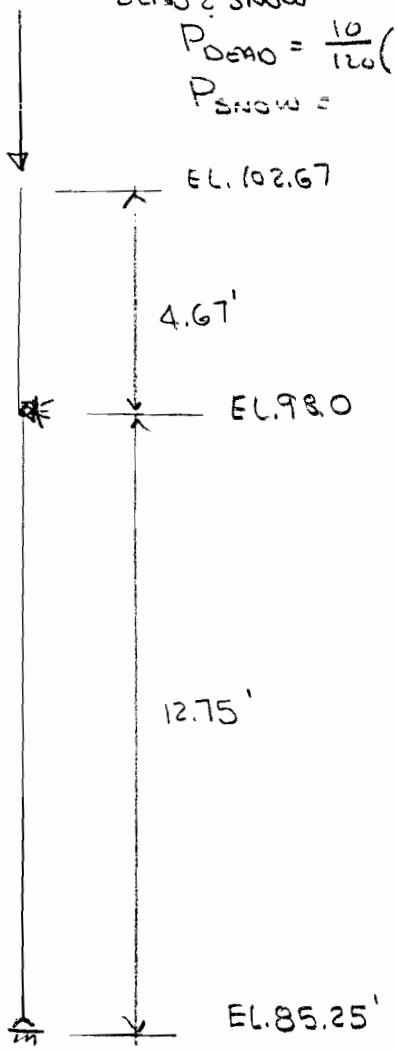


HSS 5x5x1/4 COLUMN

$P_{DEAD\ \&\ SNOW} = 2.5^k$ SEE SHT 7.

$P_{DEAD} = \frac{10}{120}(2.5^k) = 0.21^k$

$P_{SNOW} = \quad = 2.29^k$



LOAD COMB: ALLOWABLE STRESS DESIGN: SHT 14 OF 27

1 D+S

2 D + 0.6W

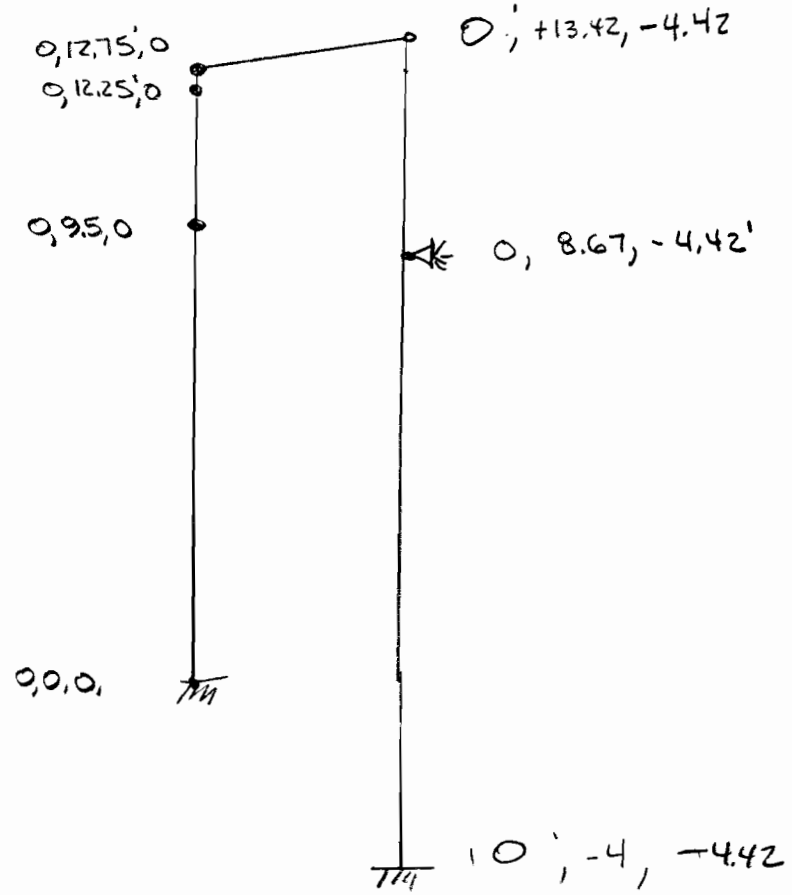
3 D + 0.7E

4 D + 0.75(0.6W) + 0.75 S

5 D + 0.75(0.7E) + 0.75 S

6 0.60 + 0.6W

7 0.60 + 0.7E



JTs					
	0	0	0	0	FIXED
	1	0	9.5	0	
	2	0	12.25	0	
	3	0	12.75	0	
	4	0,	-4,	-4.42	FIXED
	5	0	8.67,	-4.42	PINNED
	6	0	13.42,	-4.42	

Members		
	0 - 1	W6x15
	1 - 2	W6x15
	2 - 3	W6x15
	4-5	HSS 5x5x 1/4
	5-6	HSS 5x5x 1/4
	3 - 6	W10x15

COLUMN W6X15 LOADS
DEAD LOAD = 0.66^k
SNOW LOAD = 7.26^k

HSS 5X5X1/4
DEAD LOAD = 0.21^k
SNOW LOAD = 2.29^k

WIND IN Z DIRECTION
553# @ 12.5'
1615# + 553# = 2168# @ 9.5'

EARTHQUAKE
E_{+x}, E_{-x} = 502# @ 12.75

E_{+z}, E_{-z} = 502# @ 13.42'

$V = C_s W$

W_{ROOF} = (10PSF DEAD LOAD + 0.20 (110PSF SNOW LOAD))
(13.08' x 7.5') = 3139.2#

$C_s = 0.32$

$V = 0.32 (3139.2^{\#}) = 1004.5^{\#}$ / 2 COLUMNS

= 502# ON FRONT W16 COL
= 502# ON HSS 5X5 COL

$T_a = C_t h_n^x$

$C_t = 0.02$
$x = 0.75$
$h_n = 12.75'$

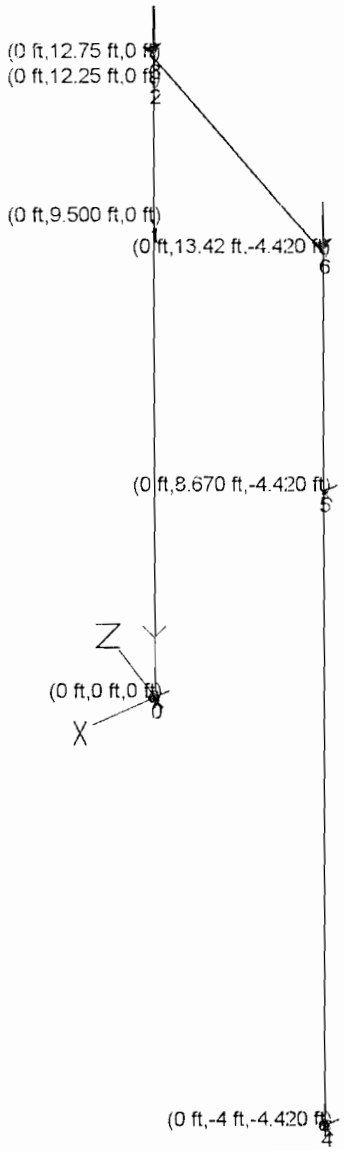
$T_a = 0.02 (12.75)^{0.75} = 0.135$ W6X15

$T_a = 0.02 (17.42')^{0.75} = 0.171$ HSS 5X5 } K = 1.0

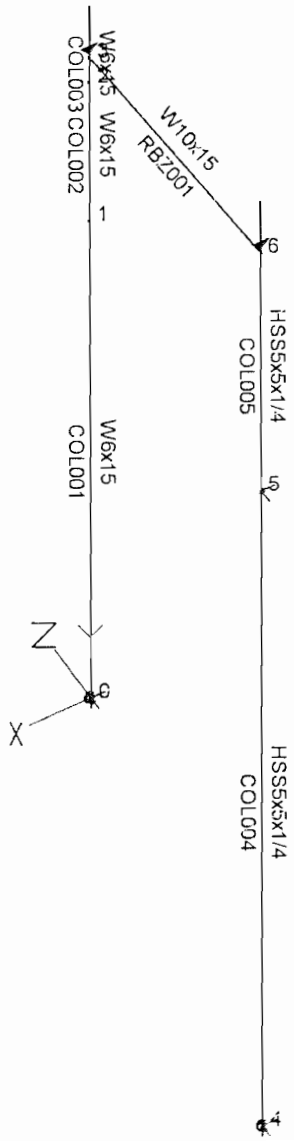
$F_x = \frac{(3139.2^{\#})(12.75)^{1.0}}{(3139.2^{\#})\,12.75\,(1.0)} = 1.0$

$F_x = 1.0 (3139.2^{\#}) = 3139.2^{\#}$ / 2 COL = 1570# ↕

07-28-11 Cantilevered Bays
Spaulding Engineering, Daniel E. Spaulding
Jul 28, 2011; 04:57 PM
Load Case: D
IES VisualAnalysis 8.00 0009



07-28-11 Cantilevered Bays
Spaulding Engineering, Daniel E. Spaulding
Jul 28, 2011; 04:56 PM
Load Case: D
IES VisualAnalysis 8.00.0009



Member Unity Checks

Member	Unity	Check	Model Shape	Design Shape	Material	Reference
COL001	0.155	Weak Flexure Check	W6x15	W6x15	ASTM A992 Grade 50	F6-2
COL002	0.155	Weak Flexure Check	W6x15	W6x15	ASTM A992 Grade 50	F6-2
COL003	0.148	Weak Flexure Check	W6x15	W6x15	ASTM A992 Grade 50	F6-2
COL004	0.117	Weak Flexure Check	HSS5x5x1/4	HSS5x5x1/4	ASTM A500 Grade B (Fy = 46ksi)	F7-1
COL005	0.234	Weak Flexure Check	HSS5x5x1/4	HSS5x5x1/4	ASTM A500 Grade B (Fy = 46ksi)	F7-1
RBZ001	0.109	Combined Check	W10x15	W10x15	ASTM A992 Grade 50	H1-1b

Load Cases

Load Case	Design Checks	Seismic Type	Results	Analyze?	Envelope?
(1)D	-NA-	-NA-	Yes (2 sets)	Yes	No
(2)E+X	-NA-	-NA-	None	No	No
(3)E+Y	-NA-	-NA-	None	No	No
(4)E+Z	-NA-	-NA-	None	No	No
(5)E-X	-NA-	-NA-	None	No	No
(6)E-Y	-NA-	-NA-	None	No	No
(7)E-Z	-NA-	-NA-	None	No	No
(16)S	-NA-	-NA-	None	No	No
(34)W-Z	-NA-	-NA-	None	No	No
(37)0.6D+0.6W »-Z	Allowable (ASD)	-NA-	Yes (2 sets)	Yes	No
(38)0.6D+0.7E »+X	Allowable (ASD)	-NA-	Yes (2 sets)	Yes	No
(39)0.6D+0.7E »+Y	Allowable (ASD)	-NA-	Yes (2 sets)	Yes	No
(40)0.6D+0.7E »+Z	Allowable (ASD)	-NA-	Yes (2 sets)	Yes	No
(41)0.6D+0.7E »-X	Allowable (ASD)	-NA-	Yes (2 sets)	Yes	No
(42)0.6D+0.7E »-Y	Allowable (ASD)	-NA-	Yes (2 sets)	Yes	No
(43)0.6D+0.7E »-Z	Allowable (ASD)	-NA-	Yes (2 sets)	Yes	No
(44)D+0.6H	Allowable (ASD)	-NA-	Yes (2 sets)	Yes	No
(45)D+0.6W »-Z	Allowable (ASD)	-NA-	Yes (2 sets)	Yes	No
(46)D+0.75(L+0.6W+Lr) »-Z	Allowable (ASD)	-NA-	Yes (2 sets)	Yes	No
(47)D+0.75(L+0.6W+S) »-Z	Allowable (ASD)	-NA-	Yes (2 sets)	Yes	No
(48)D+0.75(L+0.7E+Lr) »+X	Allowable (ASD)	-NA-	Yes (2 sets)	Yes	No
(49)D+0.75(L+0.7E+Lr) »+Y	Allowable (ASD)	-NA-	Yes (2 sets)	Yes	No
(50)D+0.75(L+0.7E+Lr) »+Z	Allowable (ASD)	-NA-	Yes (2 sets)	Yes	No
(51)D+0.75(L+0.7E+Lr) »-X	Allowable (ASD)	-NA-	Yes (2 sets)	Yes	No
(52)D+0.75(L+0.7E+Lr) »-Y	Allowable (ASD)	-NA-	Yes (2 sets)	Yes	No
(53)D+0.75(L+0.7E+Lr) »-Z	Allowable (ASD)	-NA-	Yes (2 sets)	Yes	No
(54)D+0.75(L+0.7E+S) »+X	Allowable (ASD)	-NA-	Yes (2 sets)	Yes	No
(55)D+0.75(L+0.7E+S) »+Y	Allowable (ASD)	-NA-	Yes (2 sets)	Yes	No
(56)D+0.75(L+0.7E+S) »+Z	Allowable (ASD)	-NA-	Yes (2 sets)	Yes	No
(57)D+0.75(L+0.7E+S) »-X	Allowable (ASD)	-NA-	Yes (2 sets)	Yes	No
(58)D+0.75(L+0.7E+S) »-Y	Allowable (ASD)	-NA-	Yes (2 sets)	Yes	No
(59)D+0.75(L+0.7E+S) »-Z	Allowable (ASD)	-NA-	Yes (2 sets)	Yes	No
(60)D+0.75L+0.75S	Allowable (ASD)	-NA-	Yes (2 sets)	Yes	No
(61)D+0.7E »+X	Allowable (ASD)	-NA-	Yes (2 sets)	Yes	No
(62)D+0.7E »+Y	Allowable (ASD)	-NA-	Yes (2 sets)	Yes	No
(63)D+0.7E »+Z	Allowable (ASD)	-NA-	Yes (2 sets)	Yes	No
(64)D+0.7E »-X	Allowable (ASD)	-NA-	Yes (2 sets)	Yes	No
(65)D+0.7E »-Y	Allowable (ASD)	-NA-	Yes (2 sets)	Yes	No
(66)D+0.7E »-Z	Allowable (ASD)	-NA-	Yes (2 sets)	Yes	No
(67)D+S	Allowable (ASD)	-NA-	Yes (2 sets)	Yes	No

Member Extreme Results

Member	Fx (lc)	Vy (lc)	Vz (lc)	Mx (lc)	My (lc)	Mz (lc)
	K	K	K	K-in	K-in	K-in
COL001	**-8.123 (67)**	-0.264 (64)	-0.055 (40)	-0.036 (64)	-19.113 (45)	-40.505 (61)
COL001	0.631 (39)	0.264 (61)	0.344 (45)	0.036 (61)	20.107 (45)	**40.505 (64)**
COL002	-7.980 (67)	-0.265 (64)	-0.958 (45)	-0.036 (64)	-11.511 (37)	-10.333 (61)
COL002	0.656 (39)	0.265 (61)	0.055 (66)	0.036 (61)	20.100 (45)	10.333 (64)
COL003	-7.938 (67)	-0.265 (64)	**-1.289 (45)**	-0.036 (64)	-19.246 (37)	-1.577 (61)

COL003	0.661 (39)	0.265 (61)	0.055 (43)	0.036 (61)	4.329 (66)	1.577 (64)
COL004	-0.093 (58)	-0.241 (61)	-0.243 (37)	-4.666 (64)	-24.612 (37)	-24.434 (61)
COL004	0.093 (1)	0.241 (64)	0.121 (63)	4.666 (61)	12.306 (37)	24.434 (64)
COL005	-2.867 (58)	-0.441 (64)	-0.649 (63)	**-4.666 (64)**	**-24.746 (40)**	-24.436 (61)
COL005	**0.933 (39)**	0.441 (61)	**1.291 (45)**	**4.666 (61)**	**48.985 (45)**	24.436 (64)
RBZ001	-1.225 (45)	**-0.573 (63)**	-0.089 (64)	-0.010 (61)	-4.718 (61)	**-48.983 (45)**
RBZ001	0.224 (63)	**0.587 (45)**	0.089 (61)	0.010 (64)	4.718 (64)	24.747 (40)

Nodal Extreme Displacements

Node	DX	DY	DZ
	in	in	in
1	-0.235 (64)	-0.007 (67)	**-0.145 (37)**
1	0.235 (61)	0.001 (39)	0.049 (63)
2	-0.353 (64)	-0.009 (67)	-0.119 (37)
2	0.353 (61)	0.001 (39)	0.057 (63)
3	**-0.375 (64)**	**-0.010 (67)**	-0.116 (37)
3	**0.375 (61)**	**0.001 (39)**	0.057 (63)
5	-NA-	-NA-	-NA-
5	-NA-	-NA-	-NA-
6	-0.170 (64)	-0.001 (58)	-0.115 (37)
6	0.170 (61)	0.000 (39)	**0.057 (63)**

Nodal Extreme Reactions

Node	FX	FY	FZ	MX	MY	MZ
	K	K	K	K-in	K-in	K-in
0	-0.263 (38)	-0.545 (39)	-0.054 (40)	-4.087 (63)	-0.036 (61)	**-40.475 (64)**
0	0.263 (41)	**8.123 (67)**	0.344 (37)	**19.107 (45)**	0.036 (64)	**40.475 (61)**
4	-0.241 (64)	0.056 (38)	-0.243 (37)	**-12.306 (37)**	**-4.666 (61)**	-12.217 (61)
4	0.241 (61)	0.093 (58)	0.121 (63)	6.123 (63)	**4.666 (64)**	12.217 (64)
5	**-0.681 (61)**	**-0.835 (39)**	**-0.770 (63)**	-NA-	-NA-	-NA-
5	**0.681 (64)**	2.960 (58)	**1.532 (37)**	-NA-	-NA-	-NA-

Nodal Reactions

Node	Result Case Name	FX	FY	FZ	MX	MY	MZ
		K	K	K	K-in	K-in	K-in
0	0.6D+0.6W »-Z Second Order	0.000	0.167	0.344	19.102	0.000	0.000
0	0.6D+0.7E »+X Second Order	-0.263	0.529	-0.000	-0.036	-0.036	40.400
0	0.6D+0.7E »+Y Second Order	0.000	-0.545	-0.000	-0.018	0.000	0.000
0	0.6D+0.7E »+Z Second Order	0.000	1.034	-0.054	-4.086	0.000	0.000
0	0.6D+0.7E »-X Second Order	0.263	0.529	-0.000	-0.036	0.036	-40.400
0	0.6D+0.7E »-Y Second Order	0.000	1.606	0.001	0.014	0.000	0.000
0	0.6D+0.7E »-Z Second Order	0.000	0.026	0.055	4.090	0.000	0.000
0	D Second Order	0.000	0.884	0.000	-0.004	0.000	0.000
0	D+0.6H Second Order	0.000	0.884	0.000	-0.004	0.000	0.000
0	D+0.6W »-Z Second Order	0.000	0.521	0.343	**19.107**	0.000	0.000
0	D+0.75(L+0.6W+Lr) »-Z Second Order	0.000	0.612	0.257	14.329	0.000	0.000
0	D+0.75(L+0.6W+S) »-Z Second Order	0.000	6.040	0.258	14.535	0.000	0.000
0	D+0.75(L+0.7E+Lr) »+X Second Order	-0.199	0.883	-0.000	-0.023	-0.028	30.645
0	D+0.75(L+0.7E+Lr) »+Y Second Order	0.000	0.069	-0.000	-0.016	0.000	0.000
0	D+0.75(L+0.7E+Lr) »+Z Second Order	0.000	1.265	-0.041	-3.096	0.000	0.000
0	D+0.75(L+0.7E+Lr) »-X Second Order	0.199	0.883	-0.000	-0.023	0.028	-30.645
0	D+0.75(L+0.7E+Lr) »-Y Second Order	0.000	1.698	0.001	0.008	0.000	0.000
0	D+0.75(L+0.7E+Lr) »-Z Second Order	0.000	0.502	0.042	3.093	0.000	0.000
0	D+0.75(L+0.7E+S) »+X Second Order	-0.195	6.312	0.004	0.094	-0.029	31.679
0	D+0.75(L+0.7E+S) »+Y Second Order	0.000	5.498	0.004	0.103	0.000	0.000
0	D+0.75(L+0.7E+S) »+Z Second Order	0.000	6.696	-0.035	-2.974	0.000	0.000
0	D+0.75(L+0.7E+S) »-X Second Order	0.195	6.312	0.004	0.094	0.029	-31.679
0	D+0.75(L+0.7E+S) »-Y Second Order	0.000	7.127	0.005	0.129	0.000	0.000

0	D+0.75(L+0.7E+S) »-Z Second Order	0.000	5.930	0.044	3.211	0.000	0.000
0	D+0.75L+0.75S Second Order	0.000	6.313	0.004	0.116	0.000	0.000
0	D+0.7E »+X Second Order	-0.263	0.883	-0.000	-0.038	-0.036	**40.475**
0	D+0.7E »+Y Second Order	0.000	-0.192	-0.000	-0.020	0.000	0.000
0	D+0.7E »+Z Second Order	0.000	1.387	-0.054	-4.087	0.000	0.000
0	D+0.7E »-X Second Order	0.263	0.883	-0.000	-0.038	0.036	**-40.475**
0	D+0.7E »-Y Second Order	0.000	1.960	0.001	0.012	0.000	0.000
0	D+0.7E »-Z Second Order	0.000	0.380	0.055	4.088	0.000	0.000
0	D+S Second Order	0.000	**8.123**	0.006	0.158	0.000	0.000
4	0.6D+0.6W »-Z Second Order	0.000	0.056	-0.243	**-12.306**	0.000	0.000
4	0.6D+0.7E »+X Second Order	0.241	0.056	0.000	0.035	-4.652	-12.201
4	0.6D+0.7E »+Y Second Order	0.000	0.056	-0.000	-0.012	0.000	0.000
4	0.6D+0.7E »+Z Second Order	0.000	0.056	0.120	6.102	0.000	0.000
4	0.6D+0.7E »-X Second Order	-0.241	0.056	0.000	0.035	4.652	12.201
4	0.6D+0.7E »-Y Second Order	0.000	0.056	0.001	0.069	0.000	0.000
4	0.6D+0.7E »-Z Second Order	0.000	0.056	-0.119	-6.051	0.000	0.000
4	D Second Order	0.000	0.093	0.001	0.047	0.000	0.000
4	D+0.6H Second Order	0.000	0.093	0.001	0.047	0.000	0.000
4	D+0.6W »-Z Second Order	0.000	0.093	-0.243	-12.292	0.000	0.000
4	D+0.75(L+0.6W+Lr) »-Z Second Order	0.000	0.093	-0.182	-9.207	0.000	0.000
4	D+0.75(L+0.6W+S) »-Z Second Order	0.000	0.093	-0.177	-8.975	0.000	0.000
4	D+0.75(L+0.7E+Lr) »+X Second Order	0.183	0.093	0.001	0.051	-3.533	-9.250
4	D+0.75(L+0.7E+Lr) »+Y Second Order	0.000	0.093	0.000	0.017	0.000	0.000
4	D+0.75(L+0.7E+Lr) »+Z Second Order	0.000	0.093	0.092	4.648	0.000	0.000
4	D+0.75(L+0.7E+Lr) »-X Second Order	-0.183	0.093	0.001	0.051	3.533	9.250
4	D+0.75(L+0.7E+Lr) »-Y Second Order	0.000	0.093	0.002	0.078	0.000	0.000
4	D+0.75(L+0.7E+Lr) »-Z Second Order	0.000	0.093	-0.090	-4.556	0.000	0.000
4	D+0.75(L+0.7E+S) »+X Second Order	0.187	0.093	0.007	0.346	-3.736	-9.459
4	D+0.75(L+0.7E+S) »+Y Second Order	0.000	0.093	0.006	0.310	0.000	0.000
4	D+0.75(L+0.7E+S) »+Z Second Order	0.000	0.093	0.098	4.971	0.000	0.000
4	D+0.75(L+0.7E+S) »-X Second Order	-0.187	0.093	0.007	0.346	3.736	9.459
4	D+0.75(L+0.7E+S) »-Y Second Order	0.000	0.093	0.007	0.374	0.000	0.000
4	D+0.75(L+0.7E+S) »-Z Second Order	0.000	0.093	-0.085	-4.290	0.000	0.000
4	D+0.75L+0.75S Second Order	0.000	0.093	0.007	0.342	0.000	0.000
4	D+0.7E »+X Second Order	0.241	0.093	0.001	0.054	**-4.666**	-12.217
4	D+0.7E »+Y Second Order	0.000	0.093	0.000	0.007	0.000	0.000
4	D+0.7E »+Z Second Order	0.000	0.093	0.121	6.123	0.000	0.000
4	D+0.7E »-X Second Order	-0.241	0.093	0.001	0.054	**4.666**	12.217
4	D+0.7E »-Y Second Order	0.000	0.093	0.002	0.088	0.000	0.000
4	D+0.7E »-Z Second Order	0.000	0.093	-0.119	-6.034	0.000	0.000
4	D+S Second Order	0.000	0.093	0.009	0.441	0.000	0.000
5	0.6D+0.6W »-Z Second Order	0.000	0.608	**1.532**	-NA-	-NA-	-NA-
5	0.6D+0.7E »+X Second Order	-0.681	0.246	-0.000	-NA-	-NA-	-NA-
5	0.6D+0.7E »+Y Second Order	0.000	**-0.835**	0.001	-NA-	-NA-	-NA-
5	0.6D+0.7E »+Z Second Order	0.000	-0.258	-0.769	-NA-	-NA-	-NA-
5	0.6D+0.7E »-X Second Order	0.681	0.246	-0.000	-NA-	-NA-	-NA-
5	0.6D+0.7E »-Y Second Order	0.000	1.325	-0.002	-NA-	-NA-	-NA-
5	0.6D+0.7E »-Z Second Order	0.000	0.749	0.767	-NA-	-NA-	-NA-
5	D Second Order	0.000	0.408	-0.001	-NA-	-NA-	-NA-
5	D+0.6H Second Order	0.000	0.408	-0.001	-NA-	-NA-	-NA-
5	D+0.6W »-Z Second Order	0.000	0.771	1.532	-NA-	-NA-	-NA-
5	D+0.75(L+0.6W+Lr) »-Z Second Order	0.000	0.680	1.149	-NA-	-NA-	-NA-
5	D+0.75(L+0.6W+S) »-Z Second Order	0.000	2.415	1.144	-NA-	-NA-	-NA-
5	D+0.75(L+0.7E+Lr) »+X Second Order	-0.516	0.409	-0.001	-NA-	-NA-	-NA-
5	D+0.75(L+0.7E+Lr) »+Y Second Order	0.000	-0.410	-0.000	-NA-	-NA-	-NA-
5	D+0.75(L+0.7E+Lr) »+Z Second Order	0.000	0.027	-0.583	-NA-	-NA-	-NA-
5	D+0.75(L+0.7E+Lr) »-X Second Order	0.516	0.409	-0.001	-NA-	-NA-	-NA-
5	D+0.75(L+0.7E+Lr) »-Y Second Order	0.000	1.226	-0.002	-NA-	-NA-	-NA-
5	D+0.75(L+0.7E+Lr) »-Z Second Order	0.000	0.790	0.580	-NA-	-NA-	-NA-
5	D+0.75(L+0.7E+S) »+X Second Order	-0.524	2.142	-0.011	-NA-	-NA-	-NA-
5	D+0.75(L+0.7E+S) »+Y Second Order	0.000	1.324	-0.010	-NA-	-NA-	-NA-

5	D+0.75(L+0.7E+S) »+Z Second Order	0.000	1.759	-0.595	-NA-	-NA-	-NA-
5	D+0.75(L+0.7E+S) »-X Second Order	0.524	2.142	-0.011	-NA-	-NA-	-NA-
5	D+0.75(L+0.7E+S) »-Y Second Order	0.000	2.960	-0.012	-NA-	-NA-	-NA-
5	D+0.75(L+0.7E+S) »-Z Second Order	0.000	2.525	0.573	-NA-	-NA-	-NA-
5	D+0.75L+0.75S Second Order	0.000	2.142	-0.011	-NA-	-NA-	-NA-
5	D+0.7E »+X Second Order	**-0.681**	0.409	-0.001	-NA-	-NA-	-NA-
5	D+0.7E »+Y Second Order	0.000	-0.672	0.000	-NA-	-NA-	-NA-
5	D+0.7E »+Z Second Order	0.000	-0.095	**-0.770**	-NA-	-NA-	-NA-
5	D+0.7E »-X Second Order	**0.681**	0.409	-0.001	-NA-	-NA-	-NA-
5	D+0.7E »-Y Second Order	0.000	1.489	-0.003	-NA-	-NA-	-NA-
5	D+0.7E »-Z Second Order	0.000	0.912	0.767	-NA-	-NA-	-NA-
5	D+S Second Order	0.000	2.720	-0.014	-NA-	-NA-	-NA-

CMP PORTLAND SVC BLDG
TRUCK BAY ADDITION

EARTHQUAKE
IBC 2009
ASCE 7-10

SITE CLASS "D" TABLE 1613.5.2 IBC p. 341

FIGURE 1613.5(1) IBC p. 349 $S_S = 0.25$ SITE CLASS B ✓

FIGURE 1613.5(2) IBC p. 351 $S_1 = 0.08$ SITE CLASS B ✓

TABLE 1613.5.3(1) $S_S = 0.25$ $F_a = 1.6$ IBC p. 341 CLASS "D"

TABLE 1613.5.3(2) $S_1 = 0.08$ $F_V = 2.4$ IBC p. 341 CLASS "D"

EQUATION 16-36 IBC p. 340

$$S_{MS} = F_a S_S = 1.6(0.25) = 0.4$$

EQUATION 16-37 IBC p. 340

$$S_{M1} = F_V S_1 = (2.4)(0.08) = 0.192$$

EQUATION 16-38 IBC p. 342

$$S_{DS} = \tfrac{2}{3} S_{MS} = \tfrac{2}{3}(0.4) = 0.267$$

EQUATION 16-39 IBC p. 342

$$S_{D1} = \tfrac{2}{3} S_{M1} = \tfrac{2}{3}(0.192) = 0.128$$

SITE CLASSIFICATION SITE CLASS "D"

SEISMIC CATEGORY OCCUPANCY CATEGORY IV ✓

TABLE 1613.5.6(1) IBC p. 343 $S_{DS} = 0.267$ OCCUPANCY IV SEISMIC DESIGN CATEGORY "C"

TABLE 1613.5.6(2) IBC p. 343 $S_{D1} = 0.128$ OCCUPANCY IV SEISMIC DESIGN CATEGORY "C"

ASCE 7-10

11.4.5 DESIGN RESPONSE SPECTRUM

Equation 11.4.5 p. 66 ASCE 7-10

$$S_a = S_{DS}\left(0.4 + 0.6\frac{T}{T_0}\right)$$

$$T_0 = 0.2\,\frac{S_{D1}}{S_{DS}} = 0.2\left(\frac{0.128}{0.267}\right) = 0.0959$$

$$T_S = S_{D1}/S_{DS} = \left(\frac{0.128}{0.267}\right) = 0.4794 \checkmark$$

S_a @ 0

$$= S_{DS}\left(0.4 + 0.6\left(\frac{0}{T_0}\right)\right) = 0.4(0.267) = 0.1068$$

T	S_a
0	0.1068
0.48 T_S	0.267
1_S	0.128
2S	0.064

@ T_S $S_a = S_{DS} = 0.267$

see 0.2 $S_a = \frac{S_{D1}}{T} = \frac{0.128}{0.2}$

se 1_S $= \frac{S_{D1}}{T} = 0.128$

se 2S $\frac{S_{D1}}{T} = \frac{.128}{2} = 0.064$

IMPORTANCE FACTOR ASCE 7-10
TABLE 1.5-2 $I_e = 1.50$ CATEGORY IV pg 5 ✓

BASIC SEISMIC FORCE RESISTING SYSTEM
MOMENT FRAME IN "X" DIRECTION

TABLE 12.2.1 p.75 C.4.
SEISMIC DESIGN CATEGORY "C"

RESPONSE MODIFICATION COEFFICIENT: $R = 3\frac{1}{2}$
OVERSTRENGTH FACTOR $\Omega_0 = 3$
DEFLECTION AMPLIFICATION FACTOR = 3

SEISMIC DESIGN CATEGORY C BUILDING HEIGHT LIMIT h_n = NL

EQUIVALENT LATERAL FORCE PROCEDURE:
12.8-1 SEISMIC BASE SHEAR

$$V = C_s W$$

$R = 3.5$
$I = 1.5$
$S_{DS} = 0.267$

$$C_s = \frac{0.267}{\left(\frac{3.5}{1.5}\right)} = 0.114$$

$W =$

DEAD LOAD = 10PSF × 6.83'×160' (ROOF) = 10,928#
= 20PSF × 3.25'×160' (TOPWALL) = 10,400#

0.20 SNOW LOAD = 0.20×110PSF×6.83'×160' = 24,042#

45,370#

BASE SHEAR = 0.114 (45,370#) = 5172#

TOTAL OF 26 COLUMNS SHEAR/COLUMN = 5172#/26 = 199#/COL.

ALTERNATE LOOK @ COLUMNS AS FIXED BASE CANTILEVERED:
TABLE 12.2.1 p. 77 G.2
RESPONSE MODIFICATION COEFFICIENT R = 1.25
OVERSTRENGTH FACTOR Ω_0 = 1.25
DEFLECTION AMPLIFICATION FACTOR Cd = 1.25

SEISMIC DESIGN CATEGORY "C" BUILDING HEIGHT LIMIT h_n = 35'

$V = C_s W$

R = 1.25
I = 1.5
S_{DS} = 0.267

$$C_s = \frac{0.267}{\left(\frac{1.25}{1.5}\right)} = 0.32$$

W = 45,370#

BASE SHEAR V = 0.32(45,370#) = 14,519#

TOTAL 26 COLUMNS SHEAR/COLUM = 14,519#/26 = 558#