Design Calculations For:

W B MASON PORTLAND

PORTLAND, ME

Builder: TURNER BROTHERS LLC

CO95226

STATE OF MAINE
WILLIAM C. WALSH
No. 8230
LICENSED
PROFESSIONAL ENGINEER

11-17-09

Chief Buildings
A Division of Chief Industries, Inc.
P.O. Box 2078
Grand Island, NE 68802-2078

CHIEF Chief Buildings	Design Calculations Turner Brothers, LLC Portland, ME	Job No. : CO95226 By : CH Date : 11/13/2009 Page : 1/20

		A	B
Building	:	A	B
Type	:	RFM	TBLT-1
Width	:	59'-8"	12'-7"
Length	:	114'-10"	16'-3"
Eave Height	:	16'-0"	17'- 10 3/8"
Bays	:	30'-2" 2@28'-0" 28'-8"	16'-3"
Roof Slope	:	0.375 : 12	0.375 : 12

Design Criteria

(1) - A.I.S.C.
ASD Manual of Steel Construction 9th Edition.
Including Supplement No.1

(2) - A.I.S.I.
Cold Formed Steel
NASPEC 2001 Standard

(3) - *IBC 2003*
Occupancy Category - II

MBMA : *Standard Buildings Occupancy*

Roof Live Load *20.00 psf*
(Tributary Area Reduction Allowed)

Collateral load *5.00 psf*

Ground Snow Load (P_g) *70.00 psf*
Exposure Factor (C_e) : *1.0*
Thermal Factor (C_t) : *1.0*
Importance Factor (I_s) : 1.00
Flat-Roof Snow Load (P_f) : *49.00 psf*
Minimum Roof Snow Load : *49.00 psf*

Wind Speed *94.00 mph*
Exposure Category : *B*
Importance Factor (I_w) : 1.00
Wind Pressure (q) : *13.46 psf*
Building Enclosure : *Enclosed - (GCpi = ± 0.18)*

Seismic Analysis Equivalent Lateral Force
Short response acceleration-(S_s) : *0.370* S_{DS} = *0.371*
One second response acceleration-(S_1) : *0.100* S_{D1} = *0.160*
Seismic design category : *C* Seismic site class : *D*
Seismic use group : I Importance Factor (I_E) : 1.00
Seismic resisting systems : 1
Structural Steel Systems

Roof Top Units : *N/A*

Mezzanine Loads : *N/A*

Cranes : *N/A*

Additional Loads : *N/A*

Response coefficient(s) :
R=3.00 *Cs = 0.124*

Maximum Base Shear : *19218.0 lbs*

CHIEF

3942 Old West Highway 30
P.O. Box 2078
Grand Island, NE 68802-2078
Phone (308) 389-7200

Design Calculations

Frame Notations

Job No : CO95226

By : CH

Date : 11/12/2009

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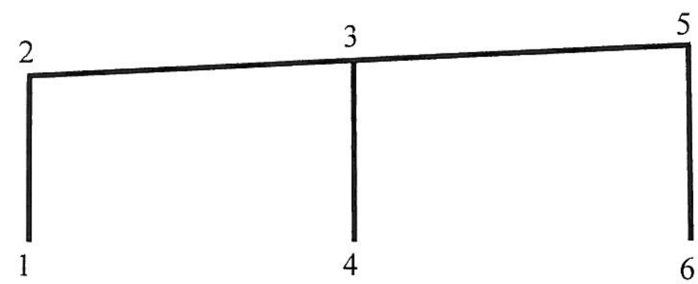
Frame Joint Notation Used in the Computer Calculation:

Building : "A"
Frames at Line J,G.5,F



SSRFM-1 Frames

CHIEF Chief Buildings	Design Calculations Panel Design	Job No: CO95226 By: CH Date: ######## Page: 31

Wall Panels

(One-Third Stress Increase is NOT Allowed.)

CS 26 Gage - 80 ksi 36 in Chief Buildings Panels
7.17 ft Panel Span
3 - Span Condition

Applied Wind Pressure	*= 14.03 psf*	*Allowable Pressure*	*= 1.000 x 24.9*	*= 24.9 psf*	*O.K.*
Interior Zone Wind Suction	*= 15.24 psf*	*Allowable Suction*	*= 1.000 x 25.9*	*= 25.9 psf*	*O.K.*
Corner Zone Wind Suction	*= 18.42 psf*	*Allowable Suction*	*= 1.000 x 25.9*	*= 25.9 psf*	*O.K.*

(Applied Loads / Allowable Loads) < 1.03 Therefore Wall Panels are O.K.

Roof Panels

Using Sliding Clips (One-Third Stress Increase is NOT Allowed.)

I- Interior Zone

MSC 24 Gage - 50 ksi 24" Chief Buildings Panels
4.50 ft Panel Span
4 - Span Condition

Uniform Live or Snow Load	*= 20.00 psf*				
Balanced or Unbalanced Snow Load	*= 49.00 psf*	*Allowable Pressure*	*= 1.000 x 93.4*	*= 93.4 psf*	*O.K.*
Interior Zone Wind Suction	*= 15.88 psf*	*Allowable Suction*	*= 1.000 x 44.9*	*= 44.9 psf*	*O.K.*

II- Sidewall (and Ridge) Edge Zone

MSC 24 Gage - 50 ksi 24" Chief Buildings Panels *(NO Clamps at SW & Ridge Edge Zones)*
3.00 ft Panel Span
4 - Span Condition

Edge Zone Wind Suction	*= 26.65 psf*	*Allowable Suction*	*= 1.000 x 53.3*	*= 53.3 psf*	*O.K.*

III- Endwall Edge Zone

MSC 24 Gage - 50 ksi 24" Chief Buildings Panels *(NO Clamps at Endwalls Edge Zones)*
4.50 ft Panel Span
4 - Span Condition

Endwall Snow & Drifted Snow	*= 49.00 psf*	*Allowable Pressure*	*= 1.000 x 93.4*	*= 93.4 psf*	*O.K.*
Edge Zone Wind Suction	*= 26.65 psf*	*Allowable Suction*	*= 1.000 x 44.9*	*= 44.9 psf*	*O.K.*

IV- Corner Zone

MSC 24 Gage - 50 ksi 24" Chief Buildings Panels *(NO Clamps at Corner Zones)*
3.00 ft Panel Span
4 - Span Condition

Corner Snow & Difted Snow	*= 49.00 psf*	*Allowable Pressure*	*= 1.000 x 206.0*	*= 206.0 psf*	*O.K.*
Corner Zone Wind Suction	*= 40.11 psf*	*Allowable Suction*	*= 1.000 x 53.3*	*= 53.3 psf*	*O.K.*

(Applied Loads / Allowable Loads) < 1.03 Therefore Roof Panels are O.K.

Allowable load values are based on 01/20/2005 to 10/01/2009 releases of "Panel Properties Tables"

Revised 01/20/2005

26 Gauge - 80 ksi - CS Wall Panel Structural Properties

Major Rib Flat Width = 0.748"
Major Rib Step Width = 0.312"
Minor Rib Flat Width = 0.747"

Major Rib Total Depth = 1.126"
Major Rib Step Depth = 0.188"
Minor Rib Depth = 0.164"

Top Flat For Bending I_x = 0.03675 in^4 / ft. S_x = 0.0447 in^3 / ft.
Top Flat For Deflection I_x = 0.03794 in^4 / ft.
Bottom Flat For Bending I_x = 0.02929 in^4 / ft. S_x = 0.0431 in^3 / ft.
Bottom Flat For Deflection I_x = 0.03288 in^4 / ft. F_y = 80.0 Ksi
Design Thickness = 0.0181 in f = 60.0 Ksi

Maximum Total Uniform Load in - psf — Pressure on **CS** - Wall Panel

No. of Spans		3'-0"	3'-6"	4'-0"	4'-6"	4'-9"	5'-0"	5'-6"	6'-0"	6'-6"	7'-0"	7'-2"	7'-6"
1	Bending	**114.1**	**87.4**	**66.9**	**52.9**	**47.4**	**42.8**	**35.4**	**29.7**	**25.3**	**21.8**	**20.8**	**19.0**
	Deflection	245.6	154.7	103.6	72.8	61.9	53.1	39.9	30.7	24.2	19.3	18.0	15.7
2	Bending	**78.6**	**67.4**	**58.9**	**50.3**	**45.2**	**40.9**	**33.8**	**28.5**	**24.3**	**20.9**	**20.0**	**18.3**
	Deflection	510.1	321.3	215.2	151.2	128.5	110.2	82.8	63.8	50.2	40.2	37.4	32.6
3	Bending	**89.3**	**76.5**	**67.0**	**59.5**	**56.3**	**50.9**	**42.1**	**35.5**	**30.3**	**26.1**	**24.9**	**22.8**
	Deflection	401.8	253.0	169.5	119.0	101.2	86.8	65.2	50.2	39.5	31.6	29.5	25.7
4	Bending	**85.9**	**73.7**	**64.5**	**57.3**	**52.6**	**47.6**	**39.4**	**33.2**	**28.3**	**24.4**	**23.3**	**21.3**
	Deflection	426.5	268.6	179.9	126.4	107.5	92.1	69.2	53.3	41.9	33.6	31.3	27.3

Maximum Total Uniform Load in - psf — Suction on **CS** - Wall Panel

No. of Spans		3'-0"	3'-6"	4'-0"	4'-6"	4'-9"	5'-0"	5'-6"	6'-0"	6'-6"	7'-0"	7'-2"	7'-6"
1	Bending	**114.6**	**84.2**	**64.5**	**51.0**	**45.7**	**41.3**	**34.1**	**28.7**	**24.4**	**21.1**	**20.1**	**18.3**
	Deflection	212.9	134.1	89.8	63.1	53.6	46.0	34.6	26.6	20.9	16.8	15.6	13.6
2	Bending	**115.5**	**85.5**	**65.8**	**52.2**	**46.9**	**42.4**	**35.1**	**29.5**	**25.2**	**21.7**	**20.7**	**18.9**
	Deflection	588.6	370.6	248.3	174.4	148.3	127.1	95.5	73.6	57.9	46.3	43.2	37.7
3	Bending	**142.6**	**105.9**	**81.7**	**64.8**	**58.3**	**52.7**	**43.7**	**36.8**	**31.4**	**27.1**	**25.9**	**23.6**
	Deflection	463.5	291.9	195.6	137.3	116.8	100.1	75.2	57.9	45.6	36.5	34.0	29.7
4	Bending	**133.7**	**99.2**	**76.4**	**60.7**	**54.5**	**49.3**	**40.8**	**34.4**	**29.3**	**25.3**	**24.2**	**22.1**
	Deflection	492.1	309.9	207.6	145.8	124.0	106.3	79.9	61.5	48.4	38.7	36.1	31.5

1- Top Values for Bending. Bottom Values for L/120 Allowable Deflection for 10 Year Map
2- For L/180 Maximum Deflection, Multiply Tabulated Values by 0.67
3- For L/240 Maximum Deflection, Multiply Tabulated Values by 0.50
4- For L/360 Maximum Deflection, Multiply Tabulated Values by 0.33
5- For Allowable Wind Loading, Multiply Bending Tabulated Values by 1.333 when code permits
6- Values based on NSPEC 2001 AISI Standard.

Revised 04/01/2008

24 Gauge - 50 ksi - 24" MSC Panel Structural Properties

Top in Compression (Stress)	I_x = 0.25465 in^4/ft.	S_x = 0.10527 in^3/ft.
Top in Compression (Deflection)	I_x = 0.25638 in^4/ft.	
Top in Tension (Stress)	I_x = 0.14407 in^4/ft.	S_x = 0.08251 in^3/ft.
Top in Tension (Deflection)	I_x = 0.17152 in^4/ft.	

F_y = 50.0 ksi

Design Thickness = 0.0223 in

f = 50.0 ksi

Maximum Total Uniform Load in - psf — Pressure or Gravity Loading

No. of Spans		SPAN 2'-0"	2'-6"	3'-0"	3'-3"	3'-6"	3'-9"	4'-0"	4'-3"	4'-6"	4'-9"	5'-0"
1	Stress	525.3	336.2	233.5	198.9	171.5	149.4	131.3	116.3	103.8	93.1	84.0
2	Stress	387.0	253.1	177.9	152.2	131.6	115.0	101.3	89.9	80.3	72.2	65.2
3	Stress	471.8	311.0	219.7	188.3	163.1	142.6	125.7	111.7	99.8	89.7	81.1
4	Stress	444.4	292.1	206.0	176.4	152.8	133.5	117.7	104.5	93.4	83.9	75.9

1- Values Listed are for Stress with a Maximum of L/360 Deflection.
2- For Allowable Wind Loading when code permits, Multiply Tabulated Values by 1.333
3- Values based on 2001 AISI Standard.

Maximum Total Uniform Load in - psf — Suction Loading

Wind Clamps	Clip Type	SPAN 1'-0"	1'-6"	2'-0"	2'-6"	3'-0"	3'-6"	4'-0"	4'-3"	4'-6"	4'-9"	5'-0"
Without Clamps	All Clips	**114.5**	106.3	98.1	89.8	81.6	73.4	**65.2**	60.7	56.3	51.8	**47.4**
	Sliding Clip	**64.54**	61.7	58.9	56.1	53.3	50.5	47.7	46.3	44.9	43.5	**42.1**
With DL Wind Clamps	Articulating	n/a	n/a	**144.5**	129.8	115.1	100.4	85.7	78.4	71.0	63.7	**56.3**
	Sliding Clip	--	--	**118.6**	108.2	97.7	87.2	76.8	71.5	66.3	61.1	**55.8**

1- Values for Suction Loading are Based on ASTM E1592-01 Test Results.
2- For Allowable Wind Loading when code permits, Multiply Tabulated Values by 1.333.
3- n/a – Test data is not available, however the lower value can be used. Bold numbers are actual test data.
4- Values are based on using Chief Articulating and Sliding clips with standard screws in 50 ksi - 16-gage material.

ROOF PANEL SELECTION AT SBU AT HIGH SIDEWALL -

	ACTUAL LOAD	ALLOWABLE LOAD
AT 3.00' PANEL SPAN	198.79	206.0
AT 3.333' " "	163.18	168.5
" 3.50' " "	143.44	152.8
" 3.75' " "	122.51	133.5
" 4.00' " "	100.14	117.7
" 4.417' " "	75.84	97.1

ROOF PANEL SELECTION AT BLDG. B SBU -

	ACTUAL LOAD	ALLOWABLE LOAD
3.167' PANEL SPAN	151.58	186.3

∴ MSC PANEL OK AT SNOW DRIFT (SBU)

$[(190.13)(4^2/2) + (207.44 - 190.13)(4/2)(4 \times 2/3)]/3.00 = 537.79$

WF PURLINS - maximum load. run as C095226WFP.DSN

	TRIB	SL	superimposed DL	COL	TOTAL
1	2.667	537.79	4.00	13.33	555.12
2	3.000	570.39	4.50	15.00	589.89 * worst case
3	3.167	547.26	4.75	15.84	567.85
4	3.417	524.68	5.13	17.08	546.89
5	3.625	483.32	5.44	18.13	506.89
6	3.875	432.77	5.81	19.38	457.89
7	4.208	372.79	6.31	21.04	400.14
8	3.458	218.16	5.19	17.3	224.65

beam wt. = 14.25 PLF

Braced same for gravity and uplift

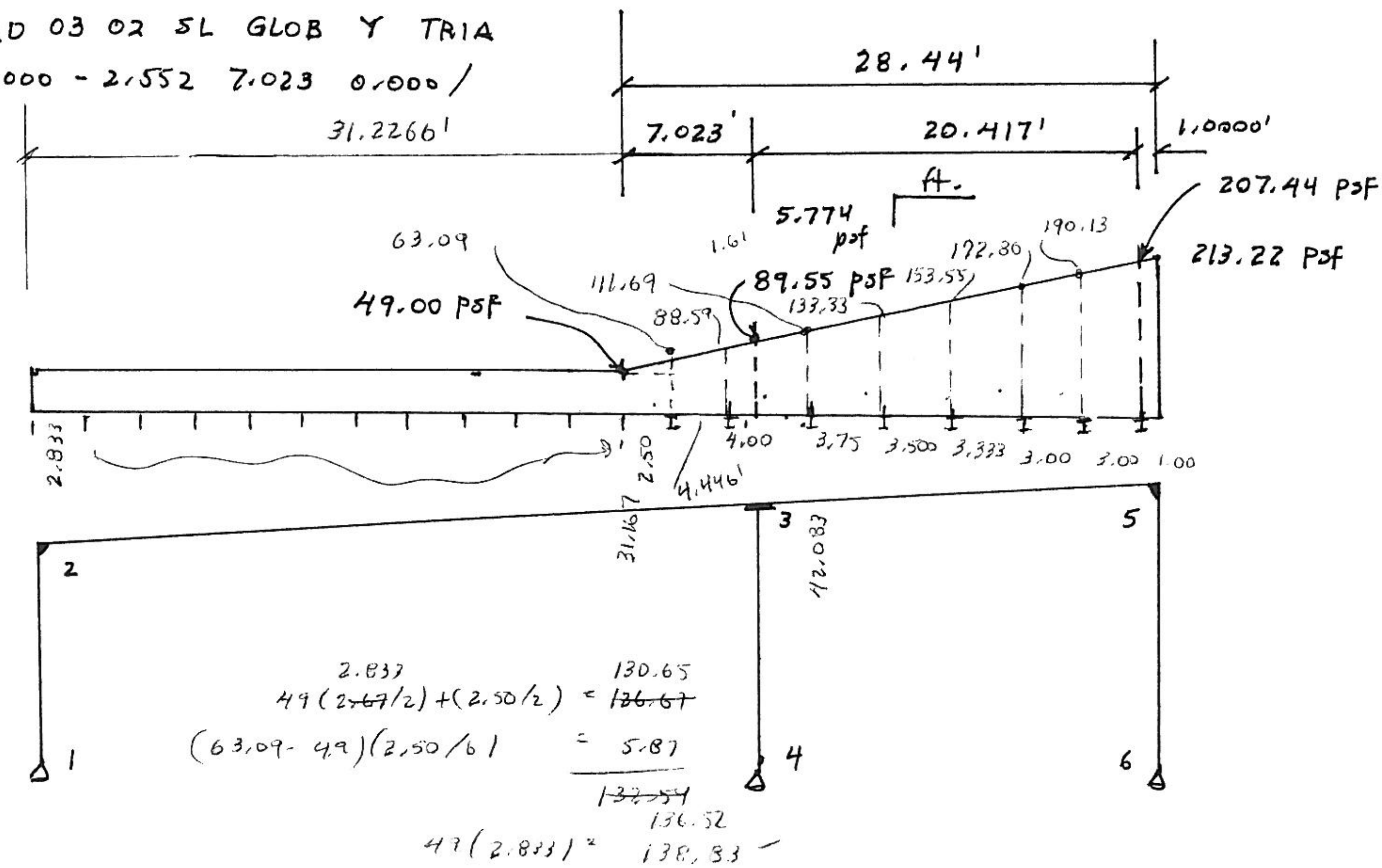
max uplift = (13.46 psf)(-1.08)(4.208') = -61.18 PLF

max. strut load = 2.77k WIND .7(9.08k) = 6.36k SEISMIC

BEAM OK BY INSPECTION

LDCN 105.2 DL 105.2 COL -52.5 SEI 75. LL *DL+.75(LL-.7SEI)/
LDCN 54.8 DL 70.0 SEI *.6 DL+SEISMIC LEFT*0.7/
LDCN 54.8 DL -70.0 SEI *.6 DL+SEISMIC RIGHT*0.7/
LDCN 100. DL 100. COL 20. SL 70.0 SEI *DL+ 20% SL+SEI LEFT*0.7/
LDCN 100. DL 100. COL 20. SL -70.0 SEI *DL+ 20% SL+SEI RIGHT*0.7/
LOADS/ 0.000 5.994 0.500
LOAD 05 06 SL GLOB Y CONC 0.000 -~~9.754~~ ~~0.417~~ /
LOAD 05 03 SL GLOB Y TRIA ~~0.667~~ -~~4.324~~ ~~26.269~~ / 0.000 -2.552 /
LOAD 02 01 SEI GLOB X CONC 0.000 2.416 / -5.912
LOAD 05 06 SEI GLOB X CONC 0.000 2.416 /
LOAD 02 03 WLE MEMB Y UNIF 0.000 0.146 11.933
LOAD 05 03 WE2 MEMB Y UNIF 0.000 -0.146 11.933
LOAD 02 03 WLL MEMB Y UNIF 28.333 -0.123 /
LOAD 02 03 WL2 MEMB Y UNIF 28.333 -0.123 /
LOAD 03 05 WLL MEMB Y UNIF 0.000 -0.123 /
LOAD 03 05 WL2 MEMB Y UNIF 0.000 -0.123 /
END/

LOAD 03 02 SL GLOB Y TRIA
0.000 -2.552 7.023 0.000 /



$\left(\frac{213.22 + 207.44}{2}\right)(1.00)(28.50) = 5994^{\#} = 5.994^{k} \qquad e = 0.500'$

$(207.44 - 49)(28.50) = 4515$ PLF $= 4.515$ KLF

$(89.55 - 49)(28.50) = 1156$ PLF $= 1.156$ KLF

Chief Buildings	Snow Load Design IBC 2003 (ASCE 7-02)	Job No.: CO95226 By : CH Date : 11/12/2009 Page : 8 /

Building : *A*

Location : *SW -C- Ht. Change with Existing Building*

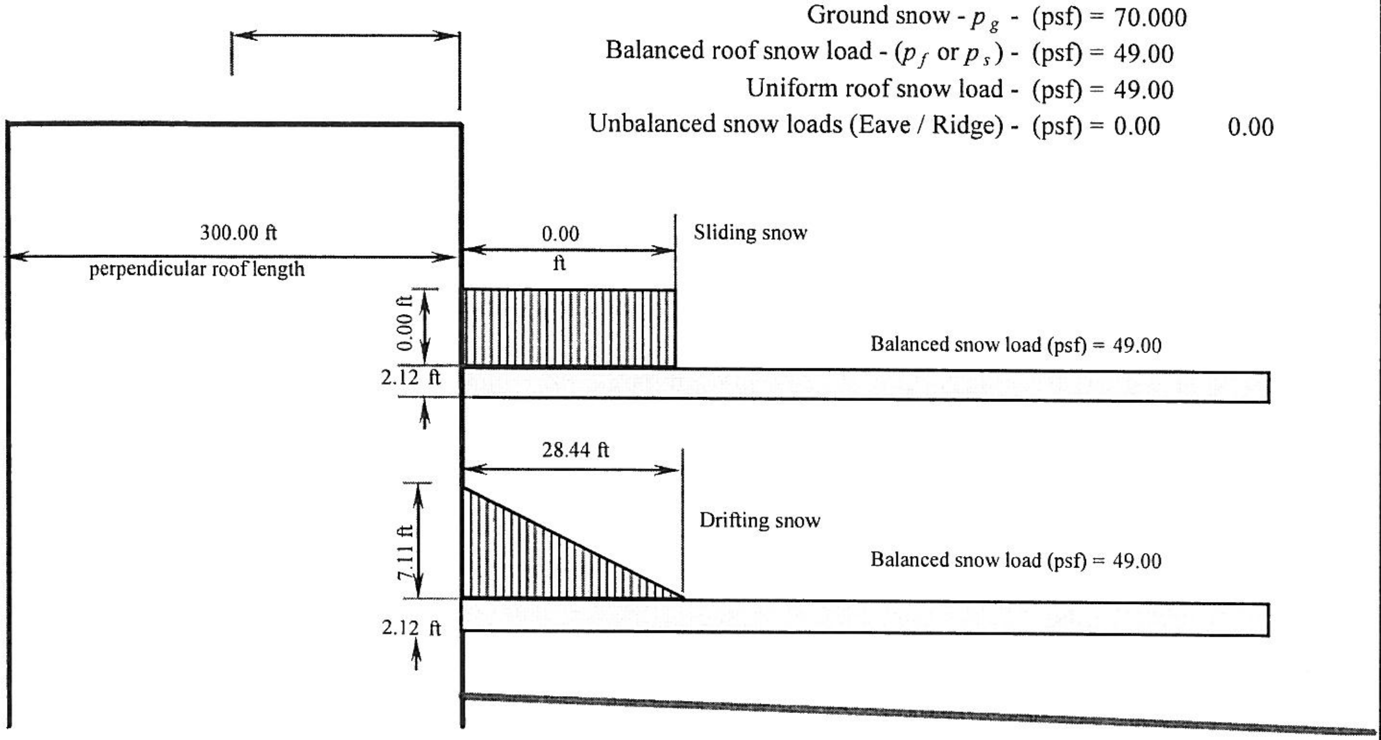
Roof live load - L_r - (psf) = 20.00

Ground snow - p_g - (psf) = 70.000

Balanced roof snow load - (p_f or p_s) - (psf) = 49.00

Uniform roof snow load - (psf) = 49.00

Unbalanced snow loads (Eave / Ridge) - (psf) = 0.00 0.00



Snow Drift Loads

Upper Roof Slippery Surface

Upper roof Importance factor - I_s = 1

Upper roof exposure factor - C_e = 1.000

Upper roof thermal factor - C_t = 1.000

Upper roof height (ft) = 28.833

Upper (leeward) roof length (ft) - lu = 300.000

Perpendicular slope (in : 12) = 0.000 0.000 deg.

Perpendicular slope Length (ft) = 300.000

Balanced roof snow load (psf) - p_{fu} = 49.000

Lower Roof

Lower roof height - (ft) = 17.87

(windward) roof length (ft) - lu = 59.67

Roof slope (in : 12) = 0.38

Roof slope (Degrees) = 1.79

Balanced roof snow load - (psf) - (p_f or p_s) = 49.000

Snow density - (pcf) $\gamma = 0.13 P_g + 14 = \gamma$ = 23.100

Height difference (ft) - h_r = 10.968

Lower roof balanced snow height (ft) = (p_f or p_s)/γ = h_b = 2.121

Clear height above balanced snow (ft) = $h_r - h_b$ = h_c = 8.847

h_c/h_b = 4.171 > 0.2 & Drift loads are required to be applied

Leeward drift $h_d = 0.43 \sqrt[3]{l_u} \sqrt[4]{p_g + 10} - 1.5$ = 7.109

Since hd <or= hc, Drift height (ft) = hd = 7.109

Total snow & drift = γ (hd+ h_b) = p_t = 213.216

Since hd < or equal hc, w (ft) = 4 hd = 28.436

windward drift $h_d = 0.75\,(0.43 \sqrt[3]{l_u} \sqrt[4]{p_g + 10} - 1.5)$ = 2.644

Since hd <or= hc, Drift height (ft) = hd = 2.644

Total snow & drift = γ (hd + h_b) = p_t = 110.074

Since hd < or equal hc, w (ft) = 4 hd = 10.576

Leewards drift controls with

p_t =	**213.22**	psf
w =	**28.44**	ft

CHIEF Chief Buildings	Snow Load Design IBC 2003 (ASCE 7-02)	Job No.: CO95226 By : CH Date : 11/12/2009 Page : 9 /

Building : A

Roof Live Load - L_r = 20.00 psf
Specified Uniform Roof Snow = N/A
Ground Snow Load - p_g = 70.00 psf
Importance Factor - I_s = 1.00
Exposure Factor - C_e = 1.00
Thermal Factor - C_t = 1.00
Slope Factor - C_s = 1.00
Unobstructed & Slippery Surface (Y or N) : Y
Ventilated Roof (Y or N) : N
Insulation R value (F.h.ft^2/Btu) = < 20

Roof width (ft) = 59.67
Roof length (ft) = 114.83
Single Slope roof (Y or N) : Y
Leeward side Roof Slope (in : 12) = 0.375 1.79 Degrees
Front roof edge to ridge distance (ft) = 59.67

Minimum roof snow :

if	p_g < 20.0 psf	Minimum p_f > p_g x I_s
if	p_g > 20.0 psf	Minimum p_f >20. x I_s

Since the roof slope is less than 15 degrees
The monoslope roof is clasified as low-slope & min. roof snow does apply

Min. roof snow load p_f min.= 20.00 psf

Flat or sloped roof snow :

$p_f = 0.7\, C_e\, C_t\, I_s\, p_g$ & $p_s = C_s\, p_f$

Balanced snow load - Pf = 49.00 psf

Since ground snow >20 psf
Rain-on-snow surcharge load need not be considered

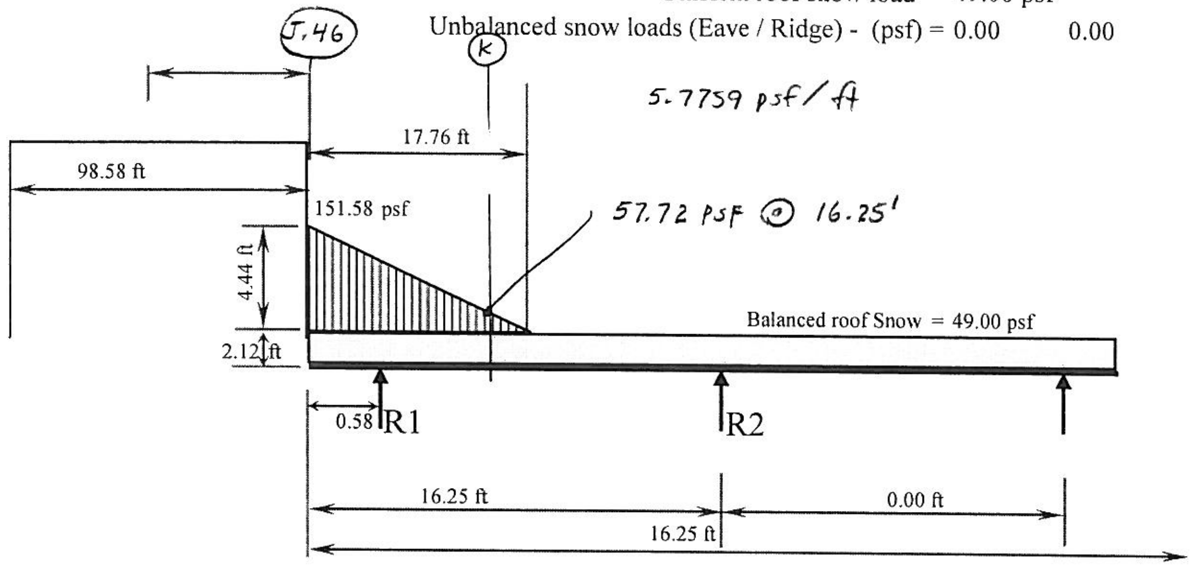
Rain-on-Snow surcharge load = 0.00 psf
Total balanced & rain-on-snow loads = 49.00 psf

Uniform roof snow load = 49.00 psf

Chief Buildings	Snow Load Design IBC 2003 (ASCE 7-02)	Job No.: CO95226 By: CH Date: 11/14/2009 Page: 10/

Building : B
Location : Ht. Change with the Existing Building

Roof live load - L_r = 20.00 psf
Ground snow - p_g = 70.00 psf
Balanced roof snow load - (p_f or p_s) = 49.00 psf
Uniform roof snow load = 49.00 psf
Unbalanced snow loads (Eave / Ridge) - (psf) = 0.00 0.00



Snow Drift Loads

Upper Roof Slippery Surface

Upper roof Importance factor - I_s = 1.000
Upper roof exposure factor - C_e = 1.000
Upper roof thermal factor - C_t = 1.000
Upper roof height (ft) = 32.940
Upper (leeward) roof length (ft) - *lu* = 98.58
Perpendicular slope (in : 12) = 0.000 0.000 deg.
Perpendicular slope Length (ft) = 98.583
Balanced roof snow load (psf) - p_{fu} = 49.000

Lower Roof

Lower roof height - (ft) = 20.198
(windward) roof length (ft) - *lu* = 16.25
**Use lu =25' for drift calculation
Lower roof width - (ft) = 12.58
1st Bay span (ft) = 16.250
2nd Bay span (ft) = 0.000
Left support inset (ft) = 0.583
Balanced roof snow load - (psf) - (p_f or p_s) = 49.000

Snow density - (pcf) $\gamma = 0.13\,P_g + 14 = \gamma$ = 23.100
Height difference (ft) - h_r = 12.742
Lower roof balanced snow height (ft) = (p_f or p_s)/γ = h_b = 2.121
Clear height above balanced snow (ft) = $h_r - h_b$ = h_c = 10.621
h_c/h_b = 5.007 > 0.2 & Drift loads are required to be applied

Leeward drift $h_d = 0.43\sqrt[3]{l_u}\ \sqrt[4]{p_g+10} - 1.5$ = 4.441 ft
Since hd <or= hc, Drift height (ft) = hd = 4.441 ft
Total snow & drift = $\gamma\ (h_d + h_b) = p_t$ = 151.581 ft
Since hd < or equal hc, w (ft) = 4 hd = 17.763 ft

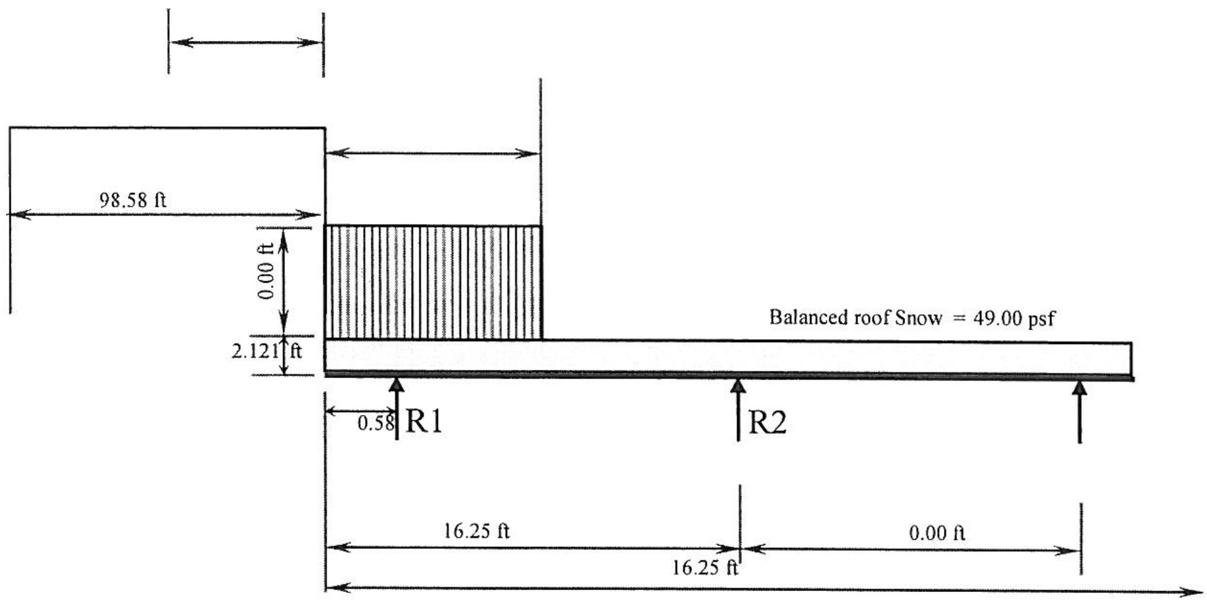
windward drift $h_d = 0.75\,(0.43\sqrt[3]{l_u}\ \sqrt[4]{p_g+10} - 1.5)$ = 1.695 ft
Since hd <or= hc, Drift height (ft) = hd = 1.695 ft
Total snow & drift = $\gamma\ (hd + h_b) = p_t$ = 88.159 ft
Since hd < or equal hc, w (ft) = 4 hd = 6.781 ft

Leewards drift controls with

p_t =	**151.58**	psf
w =	**17.76**	ft

CHIEF Chief Buildings	Snow Load Design IBC 2003 (ASCE 7-02)	Job No.: CO95226 By: CH Date: 11/14/2009 Page: 11/

Building : B
Location : Ht. Change with the Existing Building



Sliding Snow Load

$$S_L = 0.4\ p_f\ W_u \le \gamma\ h_c\ w$$

Clear height above balanced snow - h_c = 10.62 ft
Snow density - (pcf) γ = 23.10 pcf — $\gamma\ h_c\ w$ = 3680.10 plf
Sliding snow width - w = 15.00 ft

Upper roof balanced snow load - p_f = 49.00 psf
Upper roof perpendicular slope Length - W_u = 98.58 ft
$0.4\ p_f\ W_u$ = 1932.23 plf — $< \gamma\ h_c\ w$
Uniform sliding Snow load = S_L / 15 = 1932.23 / 15

Slippery upper roof & Slope is equal or less than (1/4 : 12) - Sliding snow should not be considered

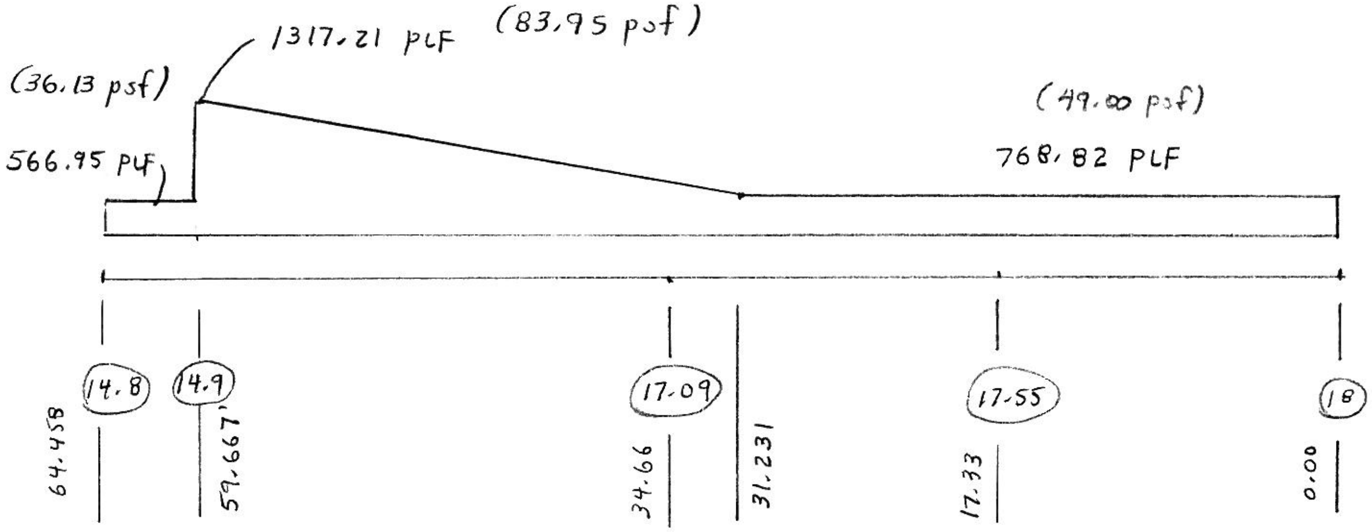
Sliding Snow load = 0.00 psf (To be added to the lower roof balanced snow)

p_t =	**49.00**	psf
w =	**0.00**	ft

**Loads to Framing structure (K/LF) :	**(R1) at Line J.46		**(R2) at Line K	
Uniform roof live load	0.17		0.16	
Uniform roof snow load	0.41		0.38	
Unbalanced snow loads (Eave / Ridge)	0.00	0.00	0.00	0.00
Balanced & drifted snow load	**1.01**		**0.69**	
Balanced & sliding snow load	0.41		0.38	

** Reactions calculated for simple span roof joists or purlins

SNOW LOADS AT EW B -



ADDL due to SB4

SB4 at 14.9 (213.22 psf - 49 psf)(30.167 - 16.25) = 2285.45 PLF

2285.45 PLF $\left(\frac{30.167 - 16.25}{2}\right)$ / (30.167 - 1.167) = 548.39 PLF

uniform snow =

49 psf (30.167')^2/2 (30.167 - 1.167) = 768.82 PLF

TRIB = (30.167')^2/2 (30.167 - 1.167) = 15.69'

W16/80H/WB original size.

---

corner post at K; 14.8

P = 13.8^k

Wy = (.01346 ksf)(1.086)(29.792'/2) = 0.218 k/ft

Vy = (.218 k/ft)(15.02'/2) = 1.64^k

My = (.218^{k}/ft)(15.02')^2/8 = 6.15$^{k\text{-}ft}$ on COF 12.30$^{k\text{-}ft}$ on section

Lx = Ly = Lb = 15.02'

C095266CP2.SEC

use W10/80E/WB

Outside flange	Inside Flange	Depth	Web thickness	
8.0 x 0.313	8.0 x 0.313	10.00	0.188	9th ed. AISC-ASD

Area	Ix	Iy	Sxo	Sxi	Sy	rx	ry	rTo	rTi
6.76	130.22	26.67	26.04	26.04	6.67	4.39	1.99	2.18	2.18

FOR O.S. FLANGE HOLES			FOR I.S. FLANGE HOLES			
Dia.	Sxo	Sxi	Dia.	Sxo	Sxi	Fu
0.563	23.83	25.77	0.563	25.77	23.83	70.00

Lx	Ly	Lbo	Lbi	Kx	Ky	Cb	Cmx	Cmy	Fy	E
15.02	15.02	15.02	15.02	1.00	1.00	1.00	1.00	1.00	55.0	29000.

LOAD DESCRIPTION	AXIAL LOAD	MAJOR AXIS MOMENT	MINOR AXIS MOMENT	ALLOWABLE STRESS INCREASE	QS	QA
DL + SL +WLE	13.8	0.0	12.3	No	1.000	1.000

Actual Stresses				Allowable Stresses			
fa	fbx	fbt	fby	Fa	Fbx	Fbt	Fby
2.04	0.00	0.00	22.14	17.39	23.21	33.00	33.02

COMBINED STRESS CHECK BY AISC (H1-3) : 0.117 + 0.000 + 0.670 = 0.788

COMBINED STRESS CHECK AT TENSION FLANGE : 0.608

Shear = 2.0 Kips -- Shear Stress = 1.07 ksi -- Allow Shear Stress = 22.00 ksi

BUILDING DATA
BLDG CODE : IBC2003 EXP B SS
RFM 59.67 X 114.83 X 16;17.86
ROOF PITCH: 0.38/12

SNOW LOAD : 49.00 PSF
LIVE LOAD : 20.00 PSF
WIND LOAD : 13.46 PSF
COLLATERAL LOAD : 5.00 PSF

SW A WEIGHT = 3.0 PSF   EW B WEIGHT = 3.0 PSF
SW C WEIGHT = 0.0 PSF   EW D WEIGHT = 3.0 PSF
INCLUDE 20.0% OF ROOF SNOW IN SEISMIC WEIGHT
SEISMIC CODE: INTERNATIONAL BUILDING CODE
Ss= 37.0% S1= 10.0%   R = 3.00 (SW A) R = 3.00 (SW C)
R = 3.00 (FRAMES)   R = 3.00 (EW B) R = 3.00 (EW D)
Seismic Use Group= I   Seismic Design Category = C   I = 1.00
Seismic Site Class= D   Fa = 1.504 Fv= 2.400   SDS = 0.371   SD1 = 0.160
Tot Bldg Wt = 149940. Lbs. Longitudinal Cs= 0.124   Base Shear = 18542. Lbs.

**** LONGITUDINAL DIRECTION ****

TOTAL ROOF WEIGHT = 138346. LBS
ENDWALL B WEIGHT = 1515. LBS
ENDWALL D WEIGHT = 1515. LBS
WT FOR ROOF DIAPHRAGM = 141377. LBS

DIAPHRAGM SHEAR=Vd=Cs*W = 17483. LBS
EQUIVILENT ASD DIAPHRAGM SHEAR LOAD = 12238. LBS
WIND DIAPHRAGM SHEAR = 5643. LBS
**** SEISMIC CONTROLS ROOF BRACING ****

WT FOR SW A BRACING = 73416. LBS
WT FOR SW C BRACING = 70726. LBS
Rho VALUES: SIDEWALL (A) Rho=1.0000   Omega = 3.0
SIDEWALL (C) Rho=1.0000   Omega = 3.0
SEISMIC TO PF SW (A)=Rho*Cs*W = 9079. LBS
SEISMIC TO PF SW (C)=Rho*Cs*W = 8746. LBS
WIND SHEAR SW (A) = 2770. LBS
WIND SHEAR SW (C) = 2873. LBS
**** SEISMIC CONTROLS SW (A) BRACING ****
**** SEISMIC CONTROLS SW (C) BRACING ****

**** LATERAL DIRECTION ****

TOTAL ROOF WEIGHT = 1204.8 PLF
SIDEWALL A WEIGHT = 24.0 PLF
SIDEWALL C WEIGHT = 0.1 PLF
WT FOR INTERIOR FRAMES = 1228.8 PLF
SEISMIC SHEAR TO FRAMES = Cs*W = 152.0 PLF
50 YEAR LATERAL WIND SHEAR = 86.4 PLF
**** SEISMIC CONTROLS LATERAL LOAD ON FRAMES ****

P-DELTA CHECK:
LIMIT SEISMIC FRAME DEFLECTION TO .1*H*V/WT = H/116 (V = 106.4 PLF)
OR INCREASE SEISMIC FORCE TO ACCOUNT FOR P-DELTA.
NOTE: Seismic deflection limit is for combinations with 0.7*E
INCREASED SEISMIC LOAD FOR P-DELTA BY 17.6 PLF
BASED ON 10 YEAR WIND DEFLECTION OF H/100. (V = 64.8 PLF)
AND AMPLIFIED SEISMIC DEFLECTION OF H/143. (V =118.7 PLF)

*** ENDWALL BRACING DESIGN ***

```
 LATERAL WEIGHT EW B =    20767.1 LBS.
 LATERAL WEIGHT EW D =    19845.4 LBS.

:-BRACING DESIGN AT ENDWALL B
-----------------------------
NUMERICAL COEFFICIENT, R =3.000
                   FOR EW B: Cs = 0.124
      SEISMIC SHEAR EW (B) = V = Cs*W =     2568.1 LBS.
        EQUIV. FORCE @ EW (B) = 0.7*V =     1797.7 LBS.
                 WIND FORCE AT EW (B) =     1832.3 LBS.
VIND CONTROLS ENDWALL B BRACING
                   EQUIV. FORCE PER X =     1832.3 LBS.
BRACING IN SPACE  2
     REACTIONS: H=  1.8 K   V=  1.8 K
     USE 0.625 DIAMETER ROD

X-BRACING DESIGN AT ENDWALL D
-----------------------------
NUMERICAL COEFFICIENT, R =3.000
                   FOR EW D: Cs = 0.124
      SEISMIC SHEAR EW (D) = V = Cs*W =     2454.1 LBS.
        EQUIV. FORCE @ EW (D) = 0.7*V =     1717.9 LBS.
                 WIND FORCE AT EW (D) =     1767.5 LBS.
WIND CONTROLS ENDWALL D BRACING
                   EQUIV. FORCE PER X =     1767.5 LBS.
BRACING IN SPACE  2
     REACTIONS: H=  1.8 K   V=  1.7 K
     USE 0.625 DIAMETER ROD
```

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 BUILDING DATA                                        SNOW LOAD : 49.00 PSF
   BLDG CODE : IBC2003 EXP B SS                        LIVE LOAD : 20.00 PSF
   RF 12.58 X 16.25 X 17.86;18.26                      WIND LOAD : 13.46 PSF
   ROOF PITCH:  0.38/12                          COLLATERAL LOAD :  5.00 PSF
------------------------------------------------------------------------------------
SW A WEIGHT =    0.0 PSF       EW B WEIGHT =    3.0 PSF
SW C WEIGHT =    3.0 PSF       EW D WEIGHT =    0.0 PSF
:NCLUDE  20.0% OF ROOF SNOW IN SEISMIC WEIGHT
SEISMIC CODE: INTERNATIONAL BUILDING CODE
Ss= 37.0% S1= 10.0%     R = 3.00 (SW A)  R = 3.00 (SW C)
   R = 3.00 (FRAMES)    R = 3.00 (EW B)  R = 3.00 (EW D)
Seismic Use Group= I     Seismic Design Category = C     I = 1.00
Seismic Site Class= D     Fa = 1.504  Fv= 2.400   SDS = 0.371   SD1 = 0.160
Tot Bldg Wt =    5468. Lbs.  Longitudinal Cs= 0.124   Base Shear =     676. Lbs.

**** LONGITUDINAL DIRECTION ****

    TOTAL ROOF WEIGHT =      4005. LBS
     ENDWALL B WEIGHT =       284. LBS
     ENDWALL D WEIGHT =         1. LBS
WT FOR ROOF DIAPHRAGM =      4290. LBS

                  DIAPHRAGM SHEAR=Vd=Cs*W =       530. LBS
       EQUIVILENT ASD DIAPHRAGM SHEAR LOAD =      371. LBS
                     WIND DIAPHRAGM SHEAR =      1306. LBS
W > 0.7*E THEREFORE WIND CONTROLS ROOF BRACING

WT FOR SW A BRACING =     4291. LBS
WT FOR SW C BRACING =      445. LBS
                      SEISMIC TO SW A = Cs*W=      531. LBS
                      SEISMIC TO SW C = Cs*W=       55. LBS
                          WIND SHEAR SW (A) =     1306. LBS
                          WIND SHEAR SW (C) =        0. LBS
W > 0.7*E THEREFORE WIND CONTROLS SW (A) BRACING
**** SEISMIC CONTROLS SW (C) BRACING ****
```

**** LATERAL DIRECTION ****

TOTAL ROOF WEIGHT = 246.4 PLF
SIDEWALL A WEIGHT = 0.1 PLF
SIDEWALL C WEIGHT = 22.9 PLF
50 YEAR LATERAL WIND SHEAR = 72.5 PLF

*** ENDWALL BRACING DESIGN ***

LATERAL WEIGHT EW B = 2551.7 LBS.
LATERAL WEIGHT EW D = 2111.2 LBS.

PANEL DIAPHRAGM DESIGN AT ENDWALL B

NUMERICAL COEFFICIENT, R = 3.000
FOR EW B: Cs = 0.124
SEISMIC SHEAR EW (B) = V = Cs*W = 315.6 LBS.
EQUIV. FORCE @ EW (B) = 1.25*0.7*V = 276.1 LBS.
WIND FORCE AT EW (B) = 850.0 LBS.
WIND CONTROLS ENDWALL B DIAPHRAGM
LINEAL FEET OF PANEL REQUIRED = 11.34 FEET

PANEL DIAPHRAGM DESIGN AT ENDWALL D

NUMERICAL COEFFICIENT, R = 3.000
FOR EW D: Cs = 0.124
SEISMIC SHEAR EW (D) = V = Cs*W = 261.1 LBS.
EQUIV. FORCE @ EW (D) = 1.25*0.7*V = 228.4 LBS.
WIND FORCE AT EW (D) = 828.8 LBS.
WIND CONTROLS ENDWALL D DIAPHRAGM
LINEAL FEET OF PANEL REQUIRED = 11.06 FEET

INPUT DATA FOR HEADER NO.: 1

```
GROSS WIND LOAD (PSF).............................:  18.65
GIRT SIZE ........................................:    816
GIRT AND HEADER SPACING FROM BOTTOM TO TOP (FT).:    3.50    5.50
                                                 :    5.59    0.00
DISTANCE FROM END OF HEADER TO FIRST JAMB (FT)..:    5.02
FIRST OPENING WIDTH (FT).........................:    8.00
DISTANCE BETWEEN OPENINGS (FT)...................:    0.00
SECOND OPENING WIDTH (FT)........................:    0.00
DISTANCE FROM LAST JAMB TO END OF HEADER (FT)...:    5.00
ALLOWABLE DEFLECTION (10 YEAR WIND) ............: L/  67
```

OUTPUT:

```
HEADER SPAN (FT)......:  18.02
HEADER UNITY CHECK ...:  0.861
NO. SAG ANGLES........:  0
USE C 816 HEADER

USE C 816 JAMBS
JAMB UNITY CHECK ...:  0.176
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