

MecaWind v2406

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Calculations Prepared by:
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Date: May 02, 2023

File Location : C:\Users\Miguel\OneDrive\Documents\1.wnd

Basic Wind Parameters

Wind Load Standard	= ASCE 7-16	Exposure Category	= C
Wind Design Speed	= 170.0 mph	Risk Category	= II
Structure Type	= Building	Building Type	= Enclosed

General Wind Settings

Incl_LF	= Include ASD Load Factor of 0.6 in Pressures	= True
DynType	= Dynamic Type of Structure	= Rigid
Zg	= Altitude (Ground Elevation) above Sea Level	= 0.000 ft
Bdist	= Base Elevation of Structure	= 0.000 ft
SDB	= Simple Diaphragm Building	= False
O_Kd	= Override the Directionality Factor 'Kd'	= 0.850
MWFRSType	= MWFRS Method Selected	= Ch 27 Pt 1

Topographic Factor per Fig 26.8-1

Topo	= Topographic Feature	= None
Kzt	= Topographic Factor	= 1.000

Building Inputs

RoofType	= Building Roof Type	= Gabled	W	: Width Perp to Ridge	= 38.000 ft
L	: Length Along Ridge	= 43.000 ft	Eht	: Eave Height	= 8.000 ft
RE	: Roof Entry Method	= Ridge	Rht	: Ridge Height	= 18.000 ft
Theta	: Roof Slope	= 25.82 Deg	Par	: Is there a Parapet	= False

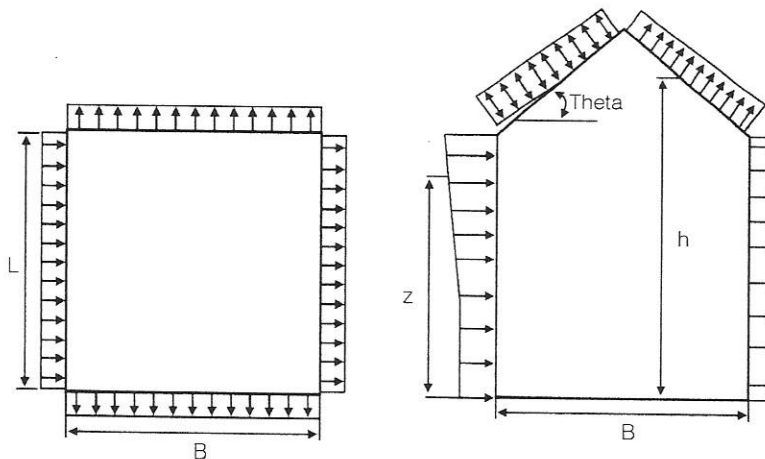
Exposure Constants per Table 26.11-1:

Alpha: Table 26.11-1 Const	= 9.500	Zg: Table 26.11-1 Const	= 900.000 ft
At: Table 26.11-1 Const	= 0.105	Bt: Table 26.11-1 Const	= 1.000
Am: Table 26.11-1 Const	= 0.154	Bm: Table 26.11-1 Const	= 0.650
C: Table 26.11-1 Const	= 0.200	Eps: Table 26.11-1 Const	= 0.200

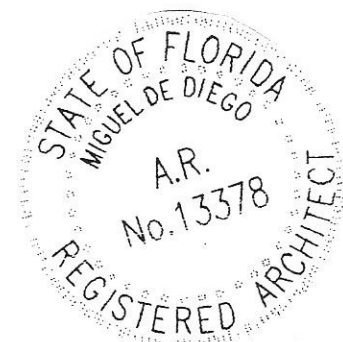
Overhang Inputs:

Std	= Overhangs on all sides are the same	= True
OHType	= Type of Roof Wall Intersections	= Overhang
OH	= Overhang of Roof Beyond Wall	= 1.670 ft

Main Wind Force Resisting System (MWFRS) Calculations per Ch 27 Part 1:



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h
Kh

= Mean Roof Height above grade
= $Z < 15 \text{ ft } [4.572 \text{ m}] \rightarrow (2.01 * (15/zg)^{(2/Alpha)} \{Table 26.11-1\}) = 13.000$

= 13.000
= 0.49

Kzt	= Topographic Factor is 1 since no Topographic feature specified	= 1.000
Kd	= Wind Directionality Factor Manually Specified by Designer	= 0.85
Zg	= Elevation above Sea Level	= 0.000 ft
Ke	= Ground Elevation Factor: $Ke = e^{-(0.0000362 \cdot Zg)}$ (Table 26.9-1)	= 1.000
GCPi	= Ref Table 26.13-1 for Enclosed Building	= +/-0.18
RA	= Roof Area	= 2161.85 sq ft
LF	= Load Factor based upon ASD Design	= 0.60
qh	= $(0.00256 \cdot Kh \cdot Kzt \cdot Kd \cdot Ke \cdot V^2) \cdot LF$	= 32.03 psf
qin	= For Negative Internal Pressure of Enclosed Building use $qh \cdot LF$	= 32.03 psf
qip	= For Positive Internal Pressure of Enclosed Building use $qh \cdot LF$	= 32.03 psf

Gust Factor Calculation:

Gust Factor	Category I Rigid Structures - Simplified Method	
G1	= For Rigid Structures (Nat. Freq.>1 Hz) use 0.85	= 0.85
Gust Factor	Category II Rigid Structures - Complete Analysis	
Zm	= $\text{Max}(0.6 \cdot Ht, Zmin)$	= 15.000 ft
Izm	= $Cc \cdot (33 / Zm) ^ 0.167$	= 0.228
Lzm	= $L \cdot (Zm / 33) ^ Eps$	= 427.057
B	= Structure Width Normal to Wind	= 43.000 ft
Q	= $(1 / (1 + 0.63 \cdot ((B + Ht) / Lzm)^{0.63}))^{0.5}$	= 0.922
G2	= $0.925 \cdot ((1 + 0.7 \cdot Izm \cdot 3.4 \cdot Q) / (1 + 0.7 \cdot 3.4 \cdot Izm))$	= 0.884
Gust Factor	Used in Analysis	
G	= Lessor Of G1 Or G2	= 0.850

MWFRS Wind Normal to Ridge (Ref Fig 27.3-1)

h	= Mean Roof Height Of Building	= 13.000 ft
RHt	= Ridge Height Of Roof	= 18.000 ft
B	= Horizontal Dimension Of Building Normal To Wind Direction	= 43.000 ft
L	= Horizontal Dimension Of building Parallel To Wind Direction	= 38.000 ft
L/B	= Ratio Of L/B used For Cp determination	= 0.884
h/L	= Ratio Of h/L used For Cp determination	= 0.342
Slope	= Slope of Roof	= 25.82 Deg
OH_Bot_-Y	= Overhang Coefficient Bottom Surface (Windward Only)	= 0.8, 0.8
OH_Top_+X+Y	= Overhang Coefficient Overhang +X+Y (Leeward)	= -0.6, -0.6
OH_Top_+X-Y	= Overhang Coefficient Overhang +X-Y (Windward)	= 0.263, -0.231
OH_Top_+Y	= Overhang Coefficient Top +Y (Leeward)	= -0.6, -0.6
OH_Top_-X+Y	= Overhang Coefficient Overhang -X+Y (Leeward)	= -0.6, -0.6
OH_Top_-X-Y	= Overhang Coefficient Overhang -X-Y (Windward)	= 0.263, -0.231
OH_Top_-Y	= Overhang Coefficient Top Windward Edge	= 0.263, -0.231
Roof_LW	= Roof Coefficient (Leeward)	= -0.6, -0.6
Roof_WW	= Roof Coefficient (Windward)	= 0.263, -0.231
Cp_WW	= Windward Wall Coefficient (All L/B Values)	= 0.80
Cp_LW	= Leeward Wall Coefficient using L/B	= -0.50
Cp_SW	= Side Wall Coefficient (All L/B values)	= -0.70
GCpn_WW	= Parapet Combined Net Pressure Coefficient (Windward Parapet)	= 1.50
GCpn_LW	= Parapet Combined Net Pressure Coefficient (Leeward Parapet)	= -1.00

Gust Factor Calculation: Normal to Ridge

Gust Factor	Category I Rigid Structures - Simplified Method	
G1	= For Rigid Structures (Nat. Freq.>1 Hz) use 0.85	= 0.85
Gust Factor	Category II Rigid Structures - Complete Analysis	
Zm	= $\text{Max}(0.6 \cdot Ht, Zmin)$	= 15.000 ft
Izm	= $Cc \cdot (33 / Zm) ^ 0.167$	= 0.228
Lzm	= $L \cdot (Zm / 33) ^ Eps$	= 427.057
B	= Structure Width Normal to Wind	= 43.000 ft
Q	= $(1 / (1 + 0.63 \cdot ((B + Ht) / Lzm)^{0.63}))^{0.5}$	= 0.922
G2	= $0.925 \cdot ((1 + 0.7 \cdot Izm \cdot 3.4 \cdot Q) / (1 + 0.7 \cdot 3.4 \cdot Izm))$	= 0.884
Gust Factor	Used in Analysis	
G	= Lessor Of G1 Or G2	= 0.850

Wall Wind Pressures based On Positive Internal Pressure (+GCPi) - Normal to Ridge
 All wind pressures include a load factor of 0.6

Elev	Kz	Kzt	qz	GCPi	Windward Press	Leeward Press	Side Press	Total Press	Minimum Pressure*
ft			psf		psf	psf	psf	psf	psf
8.00	0.849	1.000	32.03	0.18	16.01	-19.38	-24.82	35.39	9.60

Wall Wind Pressures based on Negative Internal Pressure (-GCPi) - Normal to Ridge
 All wind pressures include a load factor of 0.6

Elev	Kz	Kzt	qz	GCPI	Windward	Leeward	Side	Total	Minimum
ft			psf		Press	Press	Press	Press	Pressure*
-----	-----	-----	-----	-----	psf	psf	psf	psf	psf
8.00	0.849	1.000	32.03	-0.18	27.55	-7.85	-13.29	35.39	9.60

Notes Wall Pressures:

Kz = Velocity Press Exp Coeff
 qz = $0.00256 \cdot Kz \cdot Kzt \cdot Kd \cdot V^2$
 Side = $q_h \cdot G \cdot C_{p_SW} - q_{ip} \cdot +GCPI$
 Leeward = $q_h \cdot G \cdot C_{p_LW} - q_{ip} \cdot +GCPI$
 * Minimum Pressure: Para 27.1.5 no less than 9.60 psf (Incl LF) applied to Walls
 + Pressures Acting TOWARD Surface

Kzt = Topographical Factor
 GCPI = Internal Press Coefficient
 Windward = $q_z \cdot G \cdot C_{p_WW} - q_{ip} \cdot +GCPI$
 Total = Windward Press - Leeward Press
 - Pressures Acting AWAY from Surface

Roof Wind Pressures for Positive & Negative Internal Pressure (+/- GCPI) - Normal to Ridge

All wind pressures include a load factor of 0.6

Roof Var	Start Dist	End Dist	Cp_min	Cp_max	GCPI	Pressure Pn_min*	Pressure Pp_min*	Pressure Pn_max	Pressure Pp_max
	ft	ft				psf	psf	psf	psf
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
OH_Bot_-Y	N/A	N/A	0.800	0.800	0.000	21.78	21.78	21.78	21.78
OH_Top_+X+Y	N/A	N/A	-0.600	-0.600	0.000	-16.34	-16.34	-16.34	-16.34
OH_Top_+X-Y	N/A	N/A	0.263	-0.231	0.000	7.16	7.16	-6.28	-6.28
OH_Top_+Y	N/A	N/A	-0.600	-0.600	0.000	-16.34	-16.34	-16.34	-16.34
OH_Top_-X+Y	N/A	N/A	-0.600	-0.600	0.000	-16.34	-16.34	-16.34	-16.34
OH_Top_-X-Y	N/A	N/A	0.263	-0.231	0.000	7.16	7.16	-6.28	-6.28
OH_Top_-Y	N/A	N/A	0.263	-0.231	0.000	7.16	7.16	-6.28	-6.28
Roof_LW	N/A	N/A	-0.600	-0.600	0.180	-10.57	-22.10	-10.57	-22.10
Roof_WW	N/A	N/A	0.263	-0.231	0.180	12.93	1.40	-0.52	-12.05

Notes Roof Pressures:

Start Dist = Start Dist from Windward Edge
 Cp_Max = Largest Coefficient Magnitude
 Pp_max = $q_h \cdot G \cdot C_{p_max} - q_{ip} \cdot (+GCPI)$
 Pp_min* = $q_h \cdot G \cdot C_{p_min} - q_{ip} \cdot (+GCPI)$
 OH = Overhang X = Dir along Ridge Y = Dir Perpendicular to Ridge Z = Vertical
 * The smaller uplift pressures due to Cp_Min can become critical when wind is combined with roof live load or snow load; load combinations are given in ASCE 7
 + Pressures Acting TOWARD Surface

End Dist = End Dist from Windward Edge
 Cp_Min = Smallest Coefficient Magnitude
 Pn_max = $q_h \cdot G \cdot C_{p_max} - q_{in} \cdot (-GCPI)$
 Pn_min* = $q_h \cdot G \cdot C_{p_min} - q_{in} \cdot (-GCPI)$
 - Pressures Acting AWAY from Surface

MWFRS Wind Parallel to Ridge (Ref Fig 27.3-1)

h	= Mean Roof Height Of Building	= 13.000 ft
RHt	= Ridge Height Of Roof	= 18.000 ft
B	= Horizontal Dimension Of Building Normal To Wind Direction	= 38.000 ft
L	= Horizontal Dimension Of building Parallel To Wind Direction	= 43.000 ft
L/B	= Ratio Of L/B used For Cp determination	= 1.132
h/L	= Ratio Of h/L used For Cp determination	= 0.302
Slope	= Slope of Roof	= 25.82 Deg
OH_Bot	= Overhang Bottom (Windward Face Only)	= 0.8, 0.8
OH_Top	= Overhang Top Coeff (0 to h/2) (0.000 ft to 1.670 ft)	= -0.18, -0.9
OH_Top	= Overhang Top Coeff (0 to h/2) (1.670 ft to 6.500 ft)	= -0.18, -0.9
OH_Top	= Overhang Top Coeff (h/2 to h) (6.500 ft to 13.000 ft)	= -0.18, -0.9
OH_Top	= Overhang Top Coeff (h to 2h) (13.000 ft to 26.000 ft)	= -0.18, -0.5
OH_Top	= Overhang Top Coeff (>2h) (>26.000 ft)	= -0.18, -0.3
OH_Top	= Overhang Top Coeff (>2h) (>44.670 ft)	= -0.18, -0.3
Roof	= Roof Coeff (0 to h/2) (1.670 ft to 6.500 ft)	= -0.18, -0.9
Roof	= Roof Coeff (h/2 to h) (6.500 ft to 13.000 ft)	= -0.18, -0.9
Roof	= Roof Coeff (h to 2h) (13.000 ft to 26.000 ft)	= -0.18, -0.5
Roof	= Roof Coeff (>2h) (>26.000 ft)	= -0.18, -0.3

Cp_WW	= Windward Wall Coefficient (All L/B Values)	= 0.80
Cp_LW	= Leeward Wall Coefficient using L/B	= -0.47
Cp_SW	= Side Wall Coefficient (All L/B values)	= -0.70
GCpn_WW	= Parapet Combined Net Pressure Coefficient (Windward Parapet)	= 1.50
GCpn_LW	= Parapet Combined Net Pressure Coefficient (Leeward Parapet)	= -1.00

Gust Factor Calculation: Parallel to Ridge

Gust Factor Category I Rigid Structures - Simplified Method
 G1 = For Rigid Structures (Nat. Freq.>1 Hz) use 0.85 = 0.85
 Gust Factor Category II Rigid Structures - Complete Analysis
 Zm = Max(0.6 * Ht, Zmin) = 15.000 ft
 Izm = Cc * (33 / Zm) ^ 0.167 = 0.228
 Lzm = L * (Zm / 33) ^ Eps = 427.057
 B = Structure Width Normal to Wind = 38.000 ft
 Q = (1 / (1 + 0.63 * ((B + Ht) / Lzm)^0.63))^0.5 = 0.926
 G2 = 0.925 * ((1 + 0.7 * Izm * 3.4 * Q) / (1 + 0.7 * 3.4 * Izm)) = 0.886
 Gust Factor Used in Analysis
 G = Lessor Of G1 Or G2 = 0.850

Wall Wind Pressures based On Positive Internal Pressure (+GCPi) - Parallel to Ridge
 All wind pressures include a load factor of 0.6

Elev	Kz	Kzt	qz	GCPi	Windward Press	Leeward Press	Side Press	Total Press	Minimum Pressure*
ft			psf		psf	psf	psf	psf	psf
18.00	0.882	1.000	33.28	0.18	16.87	-18.66	-24.82	35.53	9.60
13.00	0.849	1.000	32.03	0.18	16.01	-18.66	-24.82	34.68	9.60
8.00	0.849	1.000	32.03	0.18	16.01	-18.66	-24.82	34.68	9.60

Wall Wind Pressures based on Negative Internal Pressure (-GCPi) - Parallel to Ridge
 All wind pressures include a load factor of 0.6

Elev	Kz	Kzt	qz	GCPi	Windward Press	Leeward Press	Side Press	Total Press	Minimum Pressure*
ft			psf		psf	psf	psf	psf	psf
18.00	0.882	1.000	33.28	-0.18	28.40	-7.13	-13.29	35.53	9.60
13.00	0.849	1.000	32.03	-0.18	27.55	-7.13	-13.29	34.68	9.60
8.00	0.849	1.000	32.03	-0.18	27.55	-7.13	-13.29	34.68	9.60

Notes Wall Pressures:

Kz = Velocity Press Exp Coeff
 qz = 0.00256 * Kz * Kzt * Kd * V^2
 Side = qh * G * Cp_SW - qip * +GCPi
 Leeward = qh * G * Cp_LW - qip * +GCPi
 * Minimum Pressure: Para 27.1.5 no less than 9.60 psf (Incl LF) applied to Walls
 + Pressures Acting TOWARD Surface
 Kzt = Topographical Factor
 GCPi = Internal Press Coefficient
 Windward = qz * G * Cp_WW - qip * +GCPi
 Total = Windward Press - Leeward Press
 - Pressures Acting AWAY from Surface

Roof Wind Pressures for Positive & Negative Internal Pressure (+/- GCPi) - Parallel to Ridge
 All wind pressures include a load factor of 0.6

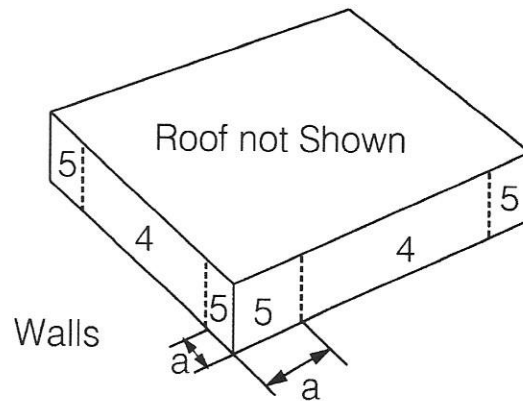
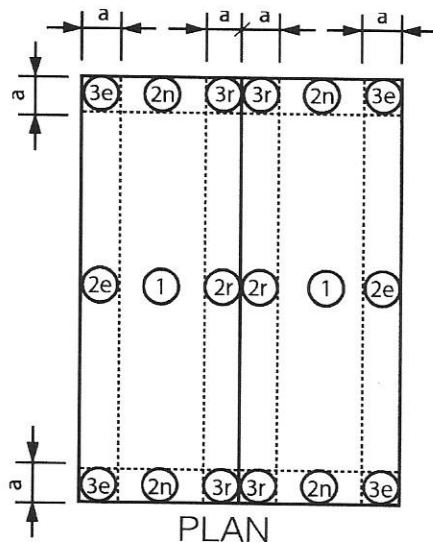
Roof Var	Start Dist	End Dist	Cp_min	Cp_max	GCPi	Pressure Pn_min*	Pressure Pp_min*	Pressure Pn_max	Pressure Pp_max
	ft	ft				psf	psf	psf	psf
OH_Bot	N/A	N/A	0.800	0.800	0.000	21.78	21.78	21.78	21.78
OH_Bot	N/A	N/A	0.800	0.800	0.000	21.78	21.78	21.78	21.78
OH_Top (-X+Y)	0.000	1.670	-0.180	-0.900	0.000	-4.90	-4.90	-24.50	-24.50
OH_Top (-X-Y)	0.000	1.670	-0.180	-0.900	0.000	-4.90	-4.90	-24.50	-24.50
OH_Top (-Y)	1.670	6.500	-0.180	-0.900	0.000	-4.90	-4.90	-24.50	-24.50
OH_Top (+Y)	1.670	6.500	-0.180	-0.900	0.000	-4.90	-4.90	-24.50	-24.50
OH_Top (-Y)	6.500	13.000	-0.180	-0.900	0.000	-4.90	-4.90	-24.50	-24.50
OH_Top (+Y)	6.500	13.000	-0.180	-0.900	0.000	-4.90	-4.90	-24.50	-24.50
OH_Top (-Y)	13.000	26.000	-0.180	-0.500	0.000	-4.90	-4.90	-13.61	-13.61
OH_Top (+Y)	13.000	26.000	-0.180	-0.500	0.000	-4.90	-4.90	-13.61	-13.61
OH_Top (-Y)	26.000	44.670	-0.180	-0.300	0.000	-4.90	-4.90	-8.17	-8.17
OH_Top (+Y)	26.000	44.670	-0.180	-0.300	0.000	-4.90	-4.90	-8.17	-8.17
OH_Top (+X+Y)	44.670	46.340	-0.180	-0.300	0.000	-4.90	-4.90	-8.17	-8.17
OH_Top (+X-Y)	44.670	46.340	-0.180	-0.300	0.000	-4.90	-4.90	-8.17	-8.17
Roof (+Y)	1.670	6.500	-0.180	-0.900	0.180	0.86	-10.67	-18.74	-30.27
Roof (-Y)	1.670	6.500	-0.180	-0.900	0.180	0.86	-10.67	-18.74	-30.27
Roof (+Y)	6.500	13.000	-0.180	-0.900	0.180	0.86	-10.67	-18.74	-30.27
Roof (-Y)	6.500	13.000	-0.180	-0.900	0.180	0.86	-10.67	-18.74	-30.27
Roof (+Y)	13.000	26.000	-0.180	-0.500	0.180	0.86	-10.67	-7.85	-19.38
Roof (-Y)	13.000	26.000	-0.180	-0.500	0.180	0.86	-10.67	-7.85	-19.38
Roof (+Y)	26.000	44.670	-0.180	-0.300	0.180	0.86	-10.67	-2.40	-13.00

Roof (-Y) 26.000 44.670 -0.180 -0.300 0.180 0.86 -10.67 -2.40 -13.93

Notes Roof Pressures:

Start Dist = Start Dist from Windward Edge End Dist = End Dist from Windward Edge
 Cp_Max = Largest Coefficient Magnitude Cp_Min = Smallest Coefficient Magnitude
 Pp_max = $qh * G * Cp_max - qip * (+GCpi)$ Pn_max = $qh * G * Cp_max - qin * (-GCpi)$
 Pp_min^* = $qh * G * Cp_min - qip * (+GCpi)$ Pn_min^* = $qh * G * Cp_min - qin * (-GCpi)$
 OH = Overhang X = Dir along Ridge Y = Dir Perpendicular to Ridge Z = Vertical
 * The smaller uplift pressures due to Cp_Min can become critical when wind is combined with roof live load or snow load; load combinations are given in ASCE 7
 + Pressures Acting TOWARD Surface - Pressures Acting AWAY from Surface

Components and Cladding (C&C) Calculations per Ch 30 Part 1:



h/W = Ratio of mean roof height to building width = 0.342
 h/L = Ratio of mean roof height to building length = 0.302
 h = Mean Roof Height above grade = 13.000 ft
 Kh = $Z < 15$ ft [4.572 m] --> $(2.01 * (15/zg)^{(2/\alpha)})$ {Table 26.10-1} = 0.849
 Kzt = Topographic Factor is 1 since no Topographic feature specified = 1.000
 Kd = Wind Directionality Factor Manually Specified by Designer = 0.85
 $GCpi$ = Ref Table 26.13-1 for Enclosed Building = +/-0.18
 LF = Load Factor based upon ASD Design = 0.60
 qh = $(0.00256 * Kh * Kzt * Kd * Ke * V^2) * LF$ = 32.03 psf
 LHD = Least Horizontal Dimension: Min(B, L) = 38.000 ft
 $a1$ = Min($0.1 * LHD$, $0.4 * h$) = 3.800 ft
 a = Max($a1$, $0.04 * LHD$, 3 ft [0.9 m]) = 3.800 ft
 h/B = Ratio of mean roof height to least hor dim: h / B = 0.342

Wind Pressures for C&C Ch 30 Pt 1 All wind pressures include a load factor of 0.6

Description	Zone	Width ft	Span ft	Area sq ft	1/3 Rule	Ref Fig	GCp Max	GCp Min	p Max psf	p Min psf
1	4	4.410	4.250	18.74	No	30.3-1	0.952	-1.052	36.25	-39.46
2	4	3.080	4.250	13.09	No	30.3-1	0.979	-1.079	37.13	-40.34
A	5	3.000	6.670	20.01	No	30.3-1	0.947	-1.294	36.09	-47.20
ROOF ZONE 1	1	2.000	10.000	33.33	Yes	30.3-2C	0.412	-1.368	18.97	-49.58
ROOF ZONE 2	2e	2.000	10.000	33.33	Yes	30.3-2C	0.412	-1.368	18.97	-49.58
ROOF ZONE 3	3e	2.000	10.000	33.33	Yes	30.3-2C	0.412	-1.922	18.97	-67.33

Area = Span Length x Effective Width
 1/3 Rule = Effective width need not be less than 1/3 of the span length
 GCp = External Pressure Coefficients taken from Figures 30.3-1 through 30.3-7
 p = Wind Pressure: $qh * (GCp - GCpi)$ [Eqn 30.3-1]*
 Per Para 30.2.2 the Minimum Pressure for C&C is 9.60 psf [0.460 kPa] Include LF

DRC

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