Luckdrops

Structural Calculations

Studio+ Modular Home

Wind Calculations

Modular Home

Wind Load Calculations

References:

American Society of Civil Engineers (ASCE). "Minimum Design Loads for Buildings and Other Structures", Version 7-10.

Input data:

Basic Wind Speed (ASCE 7-10 Figure 26.5-1A)

$V = 115$ mph

Occupancy Category

II

Surface Roughness Category

C

Wind Directionality Factor (ASCE 7-10 Table 26.6-1)

$K_d = 0.85$

Exposure Category

C

Topographic Factor (ASCE 7-10 Section 26.8.2)

$K_{zt} = 1.0$

Building Length

$L_{building} = 40$ ft

Velocity Pressure Coefficient (ASCE 7-10 Table 27.3-1)

$K_z = 0.85$

Building Width

$B_{building} = 8$ ft

Gust Effect Factor (ASCE 7-10 Section 26.9.1)

$G = 0.85$

Building Height

$H_{building} = 9.5$ ft

Building length-to-width ratio

$$\frac{L_{building}}{B_{building}} = 5$$

Building height-to-length ratio

$$\frac{H_{building}}{L_{building}} = 0.2375$$

External Pressure Coefficient (Negative Roof - ASCE 7-10 Figure 27.4-1)

$GC_{p\_pos\_roof} = -0.9$

External Pressure Coefficient (Negative Roof - ASCE 7-10 Figure 27.4-1)

$GC_{p\_neg\_roof} = -0.18$

External Pressure Coefficient (Positive Wall - ASCE 7-10 Figure 27.4-1)

$GC_{p\_pos\_wall} = 0.8$

External Pressure Coefficient (Negative Wall - ASCE 7-10 Figure 27.4-1)

$GC_{p\_neg\_wall} = -0.2$

Internal Pressure Coefficient (Positive - ASCE 7-10 Figure 26.11-1)

$GC_{p\_pos} = 0.18$

Internal Pressure Coefficient (Negative - ASCE 7-10 Figure 26.11-1)

$GC_{p\_neg} = -0.18$

Results:

Velocity pressure

$q_z = 0.00256 \cdot K_z \cdot K_{zt} \cdot K_d \cdot V^2 = 24.46 \quad psf$

Roof

Positive design wind pressure

$p_{pos} = q_z \cdot \left(GC_{p\_pos\_roof} - GC_{p\_neg} \right) = -17.6119 \quad psf$

Negative design wind pressure

$p_{neg} = q_z \cdot \left(GC_{p\_neg\_roof} - GC_{p\_pos} \right) = -8.8059 \quad psf$

Use -18 psf design wind pressure for roof

Walls

Positive Design Wind Pressure

$p_{pos\_w} = q_z \cdot \left(GC_{p\_pos\_wall} - GC_{p\_neg} \right) = 23.9717 \quad psf$

Negative Design Wind Pressure

$p_{neg\_w} = q_z \cdot \left(GC_{p\_neg\_wall} - GC_{p\_pos} \right) = -9.2952 \quad psf$

Use 24 psf design positive wind pressure for walls

Use -12 psf design negative wind pressure for walls

Holddown Loads:

Area of wall

$A_{wall} = L_{building} \cdot H_{building} = 380 \quad sf$

Factored wind load on wall

$P_{wall} = A_{wall} \cdot p_{pos\_w} = 9109 \quad lbs$

Moment on leeward building bottom edge

$M_{lee} = P_{wall} \cdot \frac{H_{building}}{2} = 43269 \quad lb\text{-}ft$

Resulting tension on windward bottom edge

$T_{total} = \frac{M_{lee}}{B_{building}} = 5409 \quad lbs$

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Wind Load Calculations with Cladding Calculations

References:

American Society of Civil Engineers (ASCE). "Minimum Design Loads for Buildings and Other Structures", Version 7-10.

Input data:

Basic Wind Speed (ASCE 7-10 Figure 26.5-1A)

$V = 115$ mph

Occupancy Category

II

Surface Roughness Category

C

Wind Directionality Factor (ASCE 7-10 Table 26.6-1)

$K_d = 0.85$

Exposure Category

C

Topographic Factor (ASCE 7-10 Section 26.8.2)

$K_{zt} = 1.0$

Gust Effect Factor (ASCE 7-10 Section 26.9.1)

$G = 0.85$

Components and Cladding Loading (ASCE 7-10 Table 30.7-2; use 115 MPH and 15 ft height):

Zone 1 - Positive

$GC_{p\_cc\_pos1} = 0$

Zone 1 - Negative

$GC_{p\_cc\_neg1} = -38.6$

Zone 2 - Positive

$GC_{p\_cc\_pos2} = 0$

Zone 2 - Negative

$GC_{p\_cc\_neg2} = -60.6$

Zone 3 - Positive

$GC_{p\_cc\_pos3} = 0$

Zone 3 - Negative

$GC_{p\_cc\_neg3} = -82.6$

Zone 4 - Positive

$GC_{p\_cc\_pos4} = 26.4$

Zone 4 - Negative

$GC_{p\_cc\_neg4} = -26.4$

Zone 5 - Positive

$GC_{p\_cc\_pos5} = 26.4$

Zone 5 - Negative

$GC_{p\_cc\_neg5} = -48.4$

Reduction Factor A - 10 SF

$RF_{A\_10} = 1.0$

Reduction Factor A - 100 SF

$RF_{A\_100} = 1.0$

Reduction Factor A - 500 SF

$RF_{A\_500} = 1.0$

Reduction Factor B - 10 SF

$RF_{B\_10} = 1.0$

Reduction Factor B - 100 SF

$RF_{B\_100} = 0.94$

Reduction Factor B - 500 SF

$RF_{B\_500} = 0.9$

Reduction Factor C - 10 SF

$RF_{C\_10} = 1.0$

Reduction Factor C - 100 SF

$RF_{C\_100} = 0.88$

Reduction Factor C - 500 SF

$RF_{C\_500} = 0.8$

Reduction Factor D - 10 SF

$RF_{D\_10} = 1.0$

Reduction Factor D - 100 SF

$RF_{D\_100} = 0.82$

Reduction Factor D - 500 SF

$RF_{D\_500} = 0.7$

Reduction Factor E - 10 SF

$RF_{E\_10} = 1.0$

Reduction Factor E - 100 SF

$RF_{E\_100} = 0.76$

Reduction Factor E - 500 SF

$RF_{E\_500} = 0.6$

Exposure Adjustment Factor

$EAF = 1$

Components and Cladding Zone 1 Negative

Zone 1 - 10 SF Negative

$p_{pos} = GC_{p\_cc\_neg1} \cdot RF_{D\_10} \cdot EAF \cdot K_{zt} = -38.6$ psf

Zone 1 - 100 SF Negative

$p_{pos} = GC_{p\_cc\_neg1} \cdot RF_{D\_100} \cdot EAF \cdot K_{zt} = -31.7$ psf

Zone 1 - 500 SF Negative

$p_{pos} = GC_{p\_cc\_neg1} \cdot RF_{D\_500} \cdot EAF \cdot K_{zt} = -27$ psf

Components and Cladding Zone 2 Negative

Zone 2 - 10 SF Negative

$p_{pos} = GC_{p\_cc\_neg2} \cdot RF_{D\_10} \cdot EAF \cdot K_{zt} = -60.6$ psf

Zone 2 - 100 SF Negative

$p_{pos} = GC_{p\_cc\_neg2} \cdot RF_{D\_100} \cdot EAF \cdot K_{zt} = -49.7$ psf

Zone 2 - 500 SF Negative

$p_{pos} = GC_{p\_cc\_neg2} \cdot RF_{D\_500} \cdot EAF \cdot K_{zt} = -42.4$ psf

Components and Cladding Zone 3 Negative

Zone 3 - 10 SF Negative

$p_{pos} = GC_{p\_cc\_neg3} \cdot RF_{D\_10} \cdot EAF \cdot K_{zt} = -82.6$ psf

Zone 3 - 100 SF Negative

$p_{pos} = GC_{p\_cc\_neg3} \cdot RF_{D\_100} \cdot EAF \cdot K_{zt} = -67.7$ psf

Zone 3 - 500 SF Negative

$p_{pos} = GC_{p\_cc\_neg3} \cdot RF_{D\_500} \cdot EAF \cdot K_{zt} = -57.8$ psf

Components and Cladding Zone 1 Positive

Zone 1 - 10 SF Positive

$$p_{pos} = GC_{p\_cc\_pos1} \cdot RF_{B\_10} \cdot EAF \cdot K_{zt} = 0 \quad psf$$

Zone 1 - 100 SF Positive

$$p_{pos} = GC_{p\_cc\_pos1} \cdot RF_{B\_100} \cdot EAF \cdot K_{zt} = 0 \quad psf$$

Zone 1 - 500 SF Positive

$$p_{pos} = GC_{p\_cc\_pos1} \cdot RF_{B\_500} \cdot EAF \cdot K_{zt} = 0 \quad psf$$

Components and Cladding Zone 2 Positive

Zone 2 - 10 SF Positive

$$p_{pos} = GC_{p\_cc\_pos2} \cdot RF_{B\_10} \cdot EAF \cdot K_{zt} = 0 \quad psf$$

Zone 2 - 100 SF Positive

$$p_{pos} = GC_{p\_cc\_pos2} \cdot RF_{B\_100} \cdot EAF \cdot K_{zt} = 0 \quad psf$$

Zone 2 - 500 SF Positive

$$p_{pos} = GC_{p\_cc\_pos2} \cdot RF_{B\_500} \cdot EAF \cdot K_{zt} = 0 \quad psf$$

Components and Cladding Zone 3 Positive

Zone 3 - 10 SF Positive

$$p_{pos} = GC_{p\_cc\_pos3} \cdot RF_{B\_10} \cdot EAF \cdot K_{zt} = 0 \quad psf$$

Zone 3 - 100 SF Positive

$$p_{pos} = GC_{p\_cc\_pos3} \cdot RF_{B\_100} \cdot EAF \cdot K_{zt} = 0 \quad psf$$

Zone 3 - 500 SF Positive

$$p_{pos} = GC_{p\_cc\_pos3} \cdot RF_{B\_500} \cdot EAF \cdot K_{zt} = 0 \quad psf$$

Components and Cladding Zone 4 Negative

Zone 4 - 10 SF Negative

$$p_{pos} = GC_{p\_cc\_neg4} \cdot RF_{C\_10} \cdot EAF \cdot K_{zt} = -26.4 \quad psf$$

Zone 4 - 100 SF Negative

$$p_{pos} = GC_{p\_cc\_neg4} \cdot RF_{C\_100} \cdot EAF \cdot K_{zt} = -23.2 \quad psf$$

Zone 4 - 500 SF Negative

$$p_{pos} = GC_{p\_cc\_neg4} \cdot RF_{C\_500} \cdot EAF \cdot K_{zt} = -21.1 \quad psf$$

Components and Cladding Zone 5 Negative

Zone 5 - 10 SF Negative

$$p_{pos} = GC_{p\_cc\_neg5} \cdot RF_{E\_10} \cdot EAF \cdot K_{zt} = -48.4 \quad psf$$

Zone 5 - 100 SF Negative

$$p_{pos} = GC_{p\_cc\_neg5} \cdot RF_{E\_100} \cdot EAF \cdot K_{zt} = -36.8 \quad psf$$

Zone 5 - 500 SF Negative

$$p_{pos} = GC_{p\_cc\_neg5} \cdot RF_{E\_500} \cdot EAF \cdot K_{zt} = -29 \quad psf$$

Components and Cladding Wall Positive

Zones 4&5 - 10 SF Positive

$$p_{pos} = GC_{p\_cc\_pos4} \cdot RF_{D\_10} \cdot EAF \cdot K_{zt} = 26.4 \quad psf$$

Zones 4&5 - 100 SF Positive

$$p_{pos} = GC_{p\_cc\_pos4} \cdot RF_{D\_100} \cdot EAF \cdot K_{zt} = 21.6 \quad psf$$

Zones 4&5 - 500 SF Positive

$$p_{pos} = GC_{p\_cc\_pos4} \cdot RF_{D\_500} \cdot EAF \cdot K_{zt} = 18.5 \quad psf$$

Snow Calculations

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Snow Load Calculations

References:

American Society of Civil Engineers (ASCE). "Minimum Design Loads for Buildings and Other Structures", Version 7-10.

Input data:

Ground snow load

$p_g = 100$ psf

Importance Factor

$I = 1.0$

Thermal factor

$C_t = 1.0$

Exposure factor

$C_e = 1.2$

Roof slope factor

$C_s = 1.0$

Snow loads:

Flat roof snow load

$p_f = p_g \cdot 0.7 \cdot I \cdot C_t \cdot C_e = 84$ psf

Density of snow

$\gamma_s = 0.13 \cdot p_g + 14 = 27$ pcf

Depth of snow

$$d_{snow} = \frac{p_f}{\gamma_s} \cdot 12 = 37.33 \text{ inches}$$

Seismic Calculations

Modular Calcs

Seismic Calculations

References:

American Society of Civil Engineers(ASCE). "Minimum Design Loads for Buildings and Other Structures", Version 7-10

Input data:

Occupancy Category

II

Site Class

D

1 second mapped acceleration parameter

$S_1 = 0.553$

Short period mapped acceleration parameter

$S_s = 1.433$

1 second site coefficient

$F_v = 1.5$

Short period site coefficient

$F_a = 1$

Short period MCE acceleration parameter

$S_{MS} = F_a \cdot S_s = 1.433$

1 second MCE acceleration parameter

$S_{M1} = F_v \cdot S_1 = 0.8295$

Short period design acceleration parameter

$S_{DS} = \frac{2}{3} \cdot S_{MS} = 0.9553$

1 second design acceleration parameter

$S_{D1} = \frac{2}{3} \cdot S_{M1} = 0.553$

Seismic Design Category

D

Building Type: Steel ordinary concentrically braced frame

Response modification coefficient

$R = 3.25$

System overstrength factor

$\Omega_0 = 2.0$

Deflection amplification factor

$C_d = 3.25$

Importance factor

$I_e = 1$

Seismic Response Coefficient

$$C_s = \frac{S_{DS}}{\left(\frac{R}{I_e}\right)} = 0.2939$$

Seismic Weight Calcs

Seismic Weight

$W_{seismic} = 9150 = 9150$ lbs

Seismic Base Shear

$V = C_s \cdot W_{seismic} = 2690$ lbs

Member Calculations

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Loading Calculations

==========

ROOF

Dead Load - Roof: $DL_{roof} = 10$ psf

Live Load - Roof: $LL_{roof} = 20$ psf

Wind Load - Roof: $WL_{roof} = 18$ psf

Snow Load - Roof: $SL_{roof} = 84$ psf

Load #1: $p_1 = 1.4 \cdot DL_{roof} = 14$ psf

Dead Load - Wall: $DL_{wall} = 10$ psf

Load #2: $p_2 = 1.2 \cdot DL_{roof} + 1.6 \cdot LL_{roof} + 0.5 \cdot SL_{roof} = 86$ psf

Load #3: $p_3 = 1.2 \cdot DL_{roof} + 1.6 \cdot SL_{roof} + LL_{roof} = 166.4$ psf

Load #4: $p_4 = 1.0 \cdot DL_{roof} + 1 \cdot WL_{roof} + 0.5 \cdot SL_{roof} = 70$ psf

Load #5: $p_5 = 1.2 \cdot DL_{roof} + LL_{roof} + 0.2 \cdot SL_{roof} = 48.8$ psf

Load #6: $p_6 = 0.9 \cdot DL_{roof} + 1.0 \cdot WL_{roof} = 27$ psf

Load #7: $p_7 = 0.9 \cdot DL_{roof} = 9$ psf

FLOOR

Dead Load - Floor: $DL_{floor} = 10$ psf

Live Load - Floor: $LL_{floor} = 40$ psf

Floor load: $p_{fl} = 1.2 \cdot DL_{floor} + 1.6 \cdot LL_{floor} = 76$ psf

Ceiling - Bending

Contributory width

$L_{cont\_r} = 4$ ft

Height of wall above

$H_{wall\_a} = 0$ ft

Weight of wall above

$p_{wl} = H_{wall\_a} \cdot DL_{wall} = 0$ $\frac{lbs}{ft}$

Contributory floor width

$L_{cont} = 0$ ft

Loaded Span

$L_{span\_b} = 8$ ft

Bending resistance factor

$\varphi_b = 0.9$

Uniform load

$w = \frac{00 + p_{wl} + p_3 \cdot L_{cont\_r}}{12} = 55.4667$ $\frac{lbs}{in}$

Length in inches

$L_{in} = L_{span\_b} \cdot 12 = 96$ in

Maximum moment

$M_{MAX} = 1 \cdot \frac{(w) \cdot L_{in}^2}{12} = 42598$ lb-in

Maximum shear

$V_{MAX} = 1 \cdot \frac{w \cdot L_{in}}{2} = 2662$ lb

Bending design stress

$F_b = 50000$ psi

Section Modulus over 4 foot width

$S_{beam} = 1.49$ in^3

Minimum modulus of elasticity

$E = 29000000$ psi

Moment of inertia over 4 foot width

$I = 1.26 = 1.26$ in^4

Allowable deflection

$\Delta_{allow} = \frac{\left(L_{span\_b}\right) \cdot 12}{360} = 0.2667$ in

Induced bending stress

$f_b = \frac{M_{MAX}}{S_{beam} \cdot \varphi_b} = 31766$ psi

OK

Calculated deflection

$\Delta_{MAX} = \frac{1 \cdot (w) \cdot \left(L_{in}\right)^2}{384 \cdot E \cdot I} = 3.6431 \cdot 10^{-5}$ in **OK**

Wall - Axial

Axial design stress

$F_a = 50000$ psi

Section Area

$A_{beam} = 0.763 \frac{in^2}{ft}$

Axial resistance factor

$\varphi_a = 0.9$

Axial load per linear foot

$P_{load} = w \cdot 12 = 665.6$ plf

Induced axial stress

$f_{applied} = \frac{P_{load}}{A_{beam} \cdot \varphi_a} = 969.3$ psi **OK**

Wall - Bending

Loaded Span

$L_{span\_b} = 9.5$ ft

Bending resistance factor

$\varphi_b = 0.9$

Wind pressure on wall

$P_{wall} = 24$ psf

Uniform load

$w = \frac{P_{wall}}{12} = 2 \frac{lbs}{in}$

Length in inches

$L_{in} = L_{span\_b} \cdot 12 = 114$ in

Maximum moment

$M_{MAX} = 1 \cdot \frac{(w) \cdot L_{in}^2}{12} = 2166$ lb - in

Maximum shear

$V_{MAX} = 1 \cdot \frac{w \cdot L_{in}}{2} = 114$ lb

Bending design stress

$F_b = 50000$ psi

Section Modulus

$S_{beam} = 0.33 \ in^3$

Minimum modulus of elasticity

$E = 29000000$ psi

Moment of inertia

$I = 0.266 = 0.266 \ in^4$

Allowable deflection

$\Delta_{allow} = \frac{\left(L_{span\_b}\right) \cdot 12}{360} = 0.3167$ in

Induced bending stress

$f_b = \frac{M_{MAX}}{S_{beam} \cdot \varphi_b} = 7293$ psi

OK

Calculated deflection

$\Delta_{MAX} = \frac{1 \cdot (w) \cdot \left(L_{in}\right)^2}{384 \cdot E \cdot I} = 8.7746 \cdot 10^{-6}$ in **OK**

Wall - Shear

Maximum shear

$$V_{MAX} = 1 \cdot \frac{w \cdot L_{in}}{2} = 114 \text{ lb}$$

Shear design stress

$F_v = 50000$ psi

Shear resistance factor

$\varphi_v = 0.75$

Induced shear stress

$$f_v = \frac{V_{MAX}}{A_{beam} \cdot \varphi_v} = 199 \text{ psi}$$ OK

Calculated deflection

$$\Delta_{MAX} = \frac{1 \cdot (w) \cdot \left(L_{in}\right)^2}{384 \cdot E \cdot I} = 8.7746 \cdot 10^{-6} \text{ in}$$ OK

Header Checks

Member Uniform Loads

Load Case	Member	Direction	Offset ft	End Offset ft	Force lb/ft	Moment ft-lb/ft
D	BmX001	Force Y	0.000	3.000	-40.000	-NA-
Lr	BmX001	Force Y	0.000	3.000	-80.000	-NA-
S	BmX001	Force Y	0.000	3.000	-336.000	-NA-

Design Group Results

Design Group: Steel_Beam X_G01 per AISC LRFD (2010)

Designed As: L2x2x3/16, Material: \Steel\ASTM A36

Strong Deflection Check

Member Name	Result Case	Offset ft	Demand dy in	Capacity dy in	Code Ref.	Unity Check	Details
BmX001	Snow	1.500	-0.007	0.100	IBC 1604.3.1	0.07 OK	

Combined Check

Member Name	Result Case	Offset ft	Code Ref.	Unity Check	Details
BmX001	1.2D+1.6S+.5L+Lpa	3.000	H2-1 principal	1.09 OK	Cb = 1.000 , Lb = 3.000 ft

Strong Flexure Check

Member Name	Result Case	Offset ft	Demand Mz lb-ft	Capacity Mz lb-ft	Code Ref.	Unity Check	Details
BmX001	1.2D+1.6S+.5L+Lpa	3.000	-312.112	550.753	F10-3 principal	0.57 OK	Lb = 3.000 ft, Cb = 1.000

Weak Flexure Check

Member Name	Result Case	Offset ft	Demand My lb-ft	Capacity My lb-ft	Code Ref.	Unity Check	Details
BmX001	1.2D+1.6S+.5L+Lpa	3.000	312.112	550.753	F10-3 principal	0.57 OK	

Weak Shear Check

Member Name	Result Case	Offset ft	Demand Vz lb	Capacity Vz lb	Code Ref.	Unity Check	Details
BmX001	1.2D+1.6S+.5L+Lpa	3.000	-882.786	7290.000	G2-1	0.12 OK	

Member Uniform Loads

Load Case	Member	Direction	Offset	End Offset	Force	Moment
			ft	ft	lb/ft	ft-lb/ft
D	BmX001	Force Y	0.000	4.000	-40.000	-NA-
Lr	BmX001	Force Y	0.000	4.000	-80.000	-NA-
S	BmX001	Force Y	0.000	4.000	-336.000	-NA-

Design Group Results

Design Group: Steel_Beam X_G01 per AISC LRFD (2010)

Designed As: L3x3x3/16, Material: \Steel\ASTM A36

Strong Deflection Check

Member Name	Result Case	Offset ft	Demand dy in	Capacity dy in	Code Ref.	Unity Check	Details
BmX001	Snow	2.000	-0.006	0.133	IBC 1604.3.1	0.05 OK	

Combined Check

Member Name	Result Case	Offset ft	Code Ref.	Unity Check	Details
BmX001	1.2D+1.6S+.5L+Lpa	0.000	H2-1 principal	0.87 OK	Cb = 1.000 , Lb = 4.000 ft

Strong Flexure Check

Member Name	Result Case	Offset ft	Demand Mz lb-ft	Capacity Mz lb-ft	Code Ref.	Unity Check	Details
BmX001	1.2D+1.6S+.5L+Lpa	0.000	-556.312	1272.114	F10-7 principal	0.44 OK	Lb = 4.000 ft, Cb = 1.000

Weak Flexure Check

Member Name	Result Case	Offset ft	Demand My lb-ft	Capacity My lb-ft	Code Ref.	Unity Check	Details
BmX001	1.2D+1.6S+.5L+Lpa	0.000	556.312	1272.114	F10-7 principal	0.44 OK	

Weak Shear Check

Member Name	Result Case	Offset ft	Demand Vz lb	Capacity Vz lb	Code Ref.	Unity Check	Details
BmX001	1.2D+1.6S+.5L+Lpa	4.000	-1180.115	10935.000	G2-1	0.11 OK	

Member Uniform Loads

Load Case	Member	Direction	Offset	End Offset	Force	Moment
			ft	ft	lb/ft	ft-lb/ft
D	BmX001	Force Y	0.000	6.000	-40.000	-NA-
Lr	BmX001	Force Y	0.000	6.000	-80.000	-NA-
S	BmX001	Force Y	0.000	6.000	-336.000	-NA-

Design Group Results

Design Group: Steel_Beam X_G01 per AISC LRFD (2010)

Designed As: HSS2-1/4x2-1/4x1/8, Material: \Steel\ASTM A500 Grade B (Fy = 46ksi)

Strong Deflection Check

Member Name	Result Case	Offset ft	Demand dy in	Capacity dy in	Code Ref.	Unity Check	Details
BmX001	Snow	3.000	-0.067	0.200	IBC 1604.3.1	0.34 OK	

Combined Check

Member Name	Result Case	Offset ft	Code Ref.	Unity Check	Details
BmX001	1.2D+1.6S+.5L+Lpa	6.000	H1-1b	0.96 OK	Cb = 1.000 , Lb = 6.000 ft

Strong Flexure Check

Member Name	Result Case	Offset ft	Demand Mz lb-ft	Capacity Mz lb-ft	Code Ref.	Unity Check	Details
BmX001	1.2D+1.6S+.5L+Lpa	6.000	-1250.539	2604.750	F7-1	0.48 OK	Lb = 6.000 ft, Cb = 1.000

Weak Flexure Check

Member Name	Result Case	Offset ft	Demand My lb-ft	Capacity My lb-ft	Code Ref.	Unity Check	Details
BmX001	1.2D+1.6S+.5L+Lpa	6.000	1250.539	2604.750	F7-1	0.48 OK	

Strong Shear Check

Member Name	Result Case	Offset ft	Demand Vy lb	Capacity Vy lb	Code Ref.	Unity Check	Details
BmX001	1.2D+1.6S+.5L+Lpa	6.000	-1250.539	10292.503	G2-1	0.12 OK	

Weak Shear Check

Member Name	Result Case	Offset ft	Demand Vz lb	Capacity Vz lb	Code Ref.	Unity Check	Details
BmX001	1.2D+1.6S+.5L+Lpa	6.000	1250.539	10292.503	G2-1	0.12 OK	

Energy Check

Conditioned Floor Area 320

Component Performance, R occupancies

	Code Target Values Area	Code Target Values UA	Proposed Design Area	Proposed Design UA
Doors U = 0.300	100	30	100	28
Overhead Glazing U = 0.500	0	0	0	0
Vertical Glazing U = 0.300	36	11	36	10
Flat/Vaulted Ceilings U = 0.026	320	8	320	12
Wall (above grade) U = 0.056	1,064	60	1,064	44
Floors U = 0.029	320	9	320	9
Slab on Grade F = 0.540	0	0	0	0
Below Grade Wall U = 0.042	0	0	0	0
Below Grade Slab F = 0.570	0	0	0	0
Target UA Total		118	Proposed UA Total	103
Target Credits from Table 406.2		1.5	Proposed Credits from Table 406.2	1.5

Qualifies, please check for complete Component Descriptic

If the Proposed UA ≤ the Target UA, and the Proposed Credits from Table 406.2 are ≥ those required in Section R406.2, then the home meets the 2015 WSEC.

Exterior Doors

Plan ID	Component Description	Ref.	Door U	Qt.	Width Feet	Width Inch	Height Feet	Height Inch	Area	UA
D2	Alsplast Outswing Door, Ideal 2000	Custom	0.28	3	3	0	6	8	60	17
D1	Alsplast Outswing Door, Ideal 2000	Custom	0.28	1	6	0	6	8	40	11
		0	0.00						0	0
		0	0.00						0	0
		0	0.00						0	0
		0	0.00						0	0
		0	0.00						0	0
								Sum of Area and UA	100	28

Overhead Glazing:

Plan ID	Component Description	Ref.	Glazing U	Qt.	Width Feet	Width Inch	Height Feet	Height Inch	Area	UA
		0	0.00						0	0
		0	0.00						0	0
		0	0.00						0	0
		0	0.00						0	0
		0	0.00						0	0
								Sum of Area and UA	0	0

Vertical Glazing

Plan ID	Component Description	Ref.	Glazing U	Qt.	Width Feet	Width Inch	Height Feet	Height Inch	Area	UA
W1	Aluplast Ideal 2000 fixed window	Custom	0.28	2	3	0	4	0	24	7
W2	Aluplast Ideal 2000 tilt and turn	Custom	0.28	1	2	0	4	0	8	2
W3	Aluplast Ideal 2000 awning window	Custom	0.28	1	2	6	1	6	4	1
		0	0.00						0	0
		0	0.00						0	0
		0	0.00						0	0
		0	0.00						0	0
		0	0.00						0	0
		0	0.00						0	0
		0	0.00						0	0
		0	0.00						0	0
		0	0.00						0	0
		0	0.00						0	0
		0	0.00						0	0
		0	0.00						0	0
		0	0.00						0	0
		0	0.00						0	0
		0	0.00						0	0
		0	0.00						0	0
		0	0.00						0	0
		0	0.00						0	0
		0	0.00						0	0
		0	0.00						0	0
		0	0.00						0	0
		0	0.00						0	0
		0	0.00						0	0
		0	0.00						0	0
		0	0.00						0	0
		0	0.00						0	0
		0	0.00						0	0
		0	0.00						0	0
		0	0.00						0	0
		0	0.00						0	0
		0	0.00						0	0
		0	0.00						0	0
		0	0.00						0	0
		0	0.00						0	0
		0	0.00						0	0
		0	0.00						0	0
		0	0.00						0	0
		0	0.00						0	0
		0	0.00						0	0
		0	0.00						0	0
		0	0.00						0	0
		0	0.00						0	0
		0	0.00						0	0
		0	0.00						0	0
		0	0.00						0	0
		0	0.00						0	0
		0	0.00						0	0
		0	0.00						0	0
		0	0.00						0	0
		0	0.00						0	0

Sum of Area and UA	36	10
Glazing Area Weighted U		0.280

Plan ID	Component Description	Attic Ref.	U	Area	UA
1	6 inches polyurethane	Custom	0.038	320	12
		0	0.000		0
		0	0.000		0
		0	0.000		0
			Sum of Area and UA	320	12

Walls (Above Grade)

Plan ID	Component Description	Wall Ref.	U	Net Area	UA
	4 inches polyurethane	Custom	0.041	380	16
	4 inches polyurethane	Custom	0.041	380	16
	4 inches polyurethane	Custom	0.041	152	6
	4 inches polyurethane	Custom	0.041	152	6
			Sum of Area and UA	1,064	44

Floor (over crawl or exterior)

Plan ID	Component Description	Floor Ref.	U	Area	UA
	6 inches polyurethane	Custom	0.029	320	9
		0	0.000		0
		0	0.000		0
		0	0.000		0
			Sum of Area and UA	320	9

Slab on Grade (less than 2 feet below grade)

Plan ID	Component Description	Slab Ref.	F	Slab Length	UA
		0	0.000		0
		0	0.000		0
		0	0.000		0
		0	0.000		0
			Sum of Area and UA	0	0

Below Grade Walls and Slabs

Plan ID	Component Description	Wall Ref.	Wall U	Wall Area	Wall UA	Slab F	Slab Length	Slab UA
		0	0.000		0.0	0.000		0
		0	0.000		0.0	0.000		0
		0	0.000		0.0	0.000		0
		0	0.000		0.0	0.000		0
			Sum of Area, Length and UA	0	0.0		0	0

Table R406.2 Summary

Opt.	Description	Credit(s)			
1a	Efficient Building Envelope 1a	0.5			
1b	Efficient Building Envelope 1b	1.0			
1c	Efficient Building Envelope 1c	2.0			
1d	Efficient Building Envelope 1d	0.5			
2a	Air Leakage Control and Efficient Ventilation 2a	0.5			
2b	Air Leakage Control and Efficient Ventilation 2b	1.0			
2c	Air Leakage Control and Efficient Ventilation 2c	1.5			
3a	High Efficiency HVAC 3a	1.0			
3b	High Efficiency HVAC 3b	1.0			✓ 1.0
3c	High Efficiency HVAC 3c	1.5			
3d	High Efficiency HVAC 3d	1.0			
4	High Efficiency HVAC Distribution System	1.0			
5a	Efficient Water Heating 5a	0.5			✓ 0.5
5b	Efficient Water Heating 5b	1.0			
5c	Efficient Water Heating 5c	1.5			
5d	Efficient Water heating 5d	0.5			
6	Renewable Electric Energy	0.5		kWh	
Total Credits					1.5

*Please refer to Table R406.2 for complete option descriptions

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