wallace design collective

LEE'S SUMMIT LOGISTICS BUILDING B LOT 2
LEE'S SUMMIT, MO
PROJECT NO. 2220003

STRUCTURAL CALCULATIONS

04/22/2022

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Date	4/19/2022	Sheet No.	of
Job	Project Birkdale		
Subject	Roof Loads		

DEAD AND LIVE LOADS

ASCE 7-16 Table C3.1-1a and Table 4.3.1

ROOF LOADS

DEAD

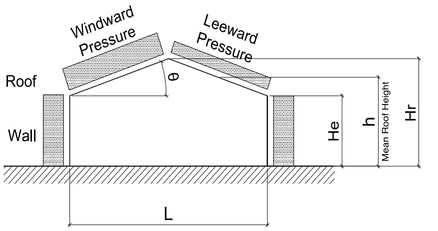
ITEM	DESCRIPTION	UNIT WEIGHT (PSF)		TOTAL
Roof Covering	EPDM Membrane	1.0	x 0.50	0.5
Insulation	Polystyrene Foam (per inch thickness)	3.5	x 0.20	0.7
Deck	Metal Deck, 22 gage, 1.5" B	1.0	x 2.00	2.0
Ceiling	None	1.0	x 0.00	0.0
HVAC	HVAC Allowance (except sprinklers)			1.5
Sprinklers	Branch Lines Only			2.0
Fire-Proofing				0.00
Waterproofing				0.00
Miscellaneous				1.50
Sub-Total				**8.2**
Secondary Frami	K-Series (30K10) joists at 6'-0" O.C.			2.0
Sub-Total				**10.2**
Primary Framing	Joist Girders (60' max. span)			1.5
Total				**11.7**

ROOF LIVE/SNOW LOADS

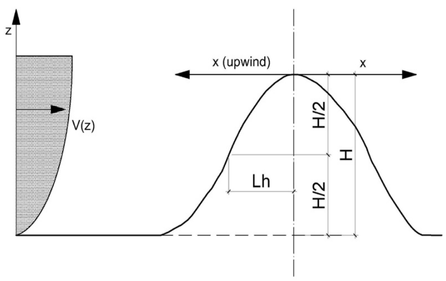
ITEM	LOAD (PSF)
Roof Live Load	**20.0**
Factored Roof Snow Load, Pf	**20.0**

Date	3/10/2022	Sheet	of
Job	2220003 Building 2		
Subject	E/W Wind TOW: 39.041ft		

WIND ANALYSIS: ANALYTICAL - ALL HEIGHTS METHOD
ASCE 7-16, Chapters 26, 27 and 30



REFER TO FIGURE 27.3-1



2-D Ridge or Axisymmetrical Hill

REFER TO FIGURE 26.8-1

1. Input

Design Parameters

Basic Wind Speed, V =	**109**	mph (Section 26.5, Fig. 1A-2D)
Exposure Category (B, C, or D) =	**C**	(Section 26.7)
Building Risk Category (I, II, III, IV) =	**II**	(Table 1.5-1)
Civil finished floor elevation (if unknown input 0) =	**0.00**	feet (Sect. 26.9, Table 26.9-1)
Eave Height, He =	**33.63**	feet
Max Building Height or Ridge Height above ground level, Hr =	**37.92**	feet
Parapet Height above ground level, Hp =	**38.50**	feet
Building Width Perpendicular to Wind, B =	**210.00**	feet (max bldg dim)
Building Width Parallel to Wind, L =	**540.00**	feet
Enclosure Classification =	**Enclosed Buildings**	(Section 26.12)
Roof Configuration =	**Gabled, Hipped or Monoslope Roofs (ø ≤ 7)**	
Angle of Plane of Roof From Horizontal, θ =	**1.20**	degrees
Is building on or near a hill, ridge, or escarpment?	**N**	(Y or N) (Section 26.8)
Height of Hill or Escarpment relative to upwind terrain, H =	**10.00**	feet (Section 26.8, Fig. 26.8-1)
Horiz. Dist. Upwind to Point Where Elevation = H/2, Lh =	**10.00**	feet (Section 26.8, Fig. 26.8-1)
Horiz. Dist. from Crest to Building Site, x =	**10.00**	feet (Section 26.8, Fig. 26.8-1)
2D Ridge, 2D Escarpment, or Axisymmetrical Hill =	**E**	(R, E, or H)
Is the building site upwind or downwind of the crest?	**DOWN**	(up, down)

2. Calculations - Main Wind Force Resisting System

Equivalent Allowable Stress Design Wind Speed, Vasd =	**84.43**	mph (IBC 2018, 1609.3.1)	
Mean roof height, h =	**33.63**	feet	
Kz, velocity pressure exposure coefficient at hz = 37.92ft =	**1.03**	Table 26.10-1	(use with qz)
Kz, velocity pressure exposure coefficient at hh = 33.63ft =	**1.00**	Table 26.10-1	(use with qh)
Kz, velocity pressure exposure coefficient at hp = 38.5ft =	**1.03**	Table 26.10-1	(use with qp)
Kzt,topographic factor at hz = 37.92ft =	**1.00**	Figure 26.8-1	(use with qz)
Kzt,topographic factor at hh = 33.63ft =	**1.00**	Figure 26.8-1	(use with qh)
Kzt,topographic factor at hp = 38.5ft =	**1.00**	Figure 26.8-1	(use with qp)
Kd, wind directionality factor =	**0.85**	Table 26.6-1	
Ke, ground elevation factor at	**1.00**	Table 26.9-1	
G, gust factor =	**0.85**	Section 26.11.4	
qz, velocity pressure at hz = 37.92ft =	**26.63**	psf (Eq. 26.10-1)	
qh, velocity pressure at hh = 33.63ft =	**25.85**	psf (Eq. 26.10-1)	
qp, velocity pressure at hp = 38.5ft =	**26.63**	psf (Eq. 26.10-1)	

Walls: P = q(GCpf-GCpi) Eqn. 27.3-1	**qz**	**GCp**	**GCpi**	**(1.0)P**	**(0.6)P**
Windward pressure	26.63	0.68		18.1 psf	10.9 psf
	qh	**GCp**	**GCpi**	**(1.0)P**	**(0.6)P**
Leeward Pressure	25.85	-0.23		-6 psf	-3.6 psf
Sidewall pressure	25.85	-0.60	0.18	-20 psf	-12 psf
Internal Pressure	25.85		0.18	4.7 psf	2.8 psf

(1.0)W = (1.0)(Windward + Leeward Pressure) =	**18.11 psf + 5.96 psf =**	**24.1 psf**
(0.6)W =(0.6)(Windward + Leeward Pressure) =	**10.86 psf + 3.58 psf =**	**14.4 psf**

Parapets: Pp =qp(GCpn) Eqn. 27.3-3	**qp**	**GCpn**	**(1.0)Pp**	**(0.6)Pp**
Windward parapet pressure	26.63	1.5	39.9 psf	24 psf
Leeward parapet pressure	26.63	-1.0	-26.6 psf	-16 psf
Windward + Leeward Pressure	26.63	2.50	**66.6 psf**	**39.9 psf**

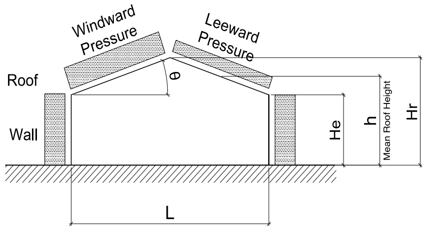
Roof Normal to Ridge (θ≥10 degrees)		**qh**	**GCp**	**GCpi**	**(1.0)P**	**(0.6)P**
Windward Pressure	case i	25.85	-0.60	0.18	**-20 psf**	**-12 psf**
	case ii	25.85	-0.15	0.18	**-8.6 psf**	**-5.2 psf**
Leeward Pressure		25.85	-0.26	0.18	**-11.2 psf**	**-6.7 psf**

Roof All Other Conditions	**qh**	**GCp**	**GCpi**	**(1.0)P**	**(0.6)P**
For 0 to h/2 = 0 ft to 16.81 ft	25.85	-0.77	0.18	**-24.4 psf**	**-14.7 psf**
h/2 to h = 16.81 ft to 33.63 ft	25.85	-0.77	0.18	**-24.4 psf**	**-14.7 psf**
h to 2h = 33.63 ft to 67.25 ft	25.85	-0.43	0.18	**-15.6 psf**	**-9.4 psf**
>2h = >67.25 ft	25.85	-0.26	0.18	**-11.2 psf**	**-6.7 psf**

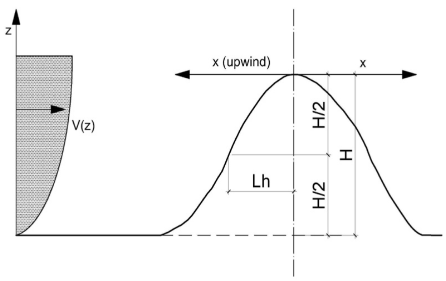
Roof Overhangs Section 27.3.3	**qh**	**GCp**	**GCpi**	**(1.0)P**	**(0.6)P**
Maximum pressures	25.85	-0.77	0.68	**-37.4 psf**	**-22.4 psf**

Date	3/10/2022	Sheet	of
Job	2220003 Building 2		
Subject	E/W Wind TOW: 42.50ft		

WIND ANALYSIS: ANALYTICAL - ALL HEIGHTS METHOD
ASCE 7-16, Chapters 26, 27 and 30



REFER TO FIGURE 27.3-1



2-D Ridge or Axisymmetrical Hill

REFER TO FIGURE 26.8-1

1. Input

Design Parameters

Basic Wind Speed, V =	**109**	mph (Section 26.5, Fig. 1A-2D)
Exposure Category (B, C, or D) =	**C**	(Section 26.7)
Building Risk Category (I, II, III, IV) =	**II**	(Table 1.5-1)
Civil finished floor elevation (if unknown input 0) =	**0.00**	feet (Sect. 26.9, Table 26.9-1)
Eave Height, He =	**33.63**	feet
Max Building Height or Ridge Height above ground level, Hr =	**37.92**	feet
Parapet Height above ground level, Hp =	**40.00**	feet
Building Width Perpendicular to Wind, B =	**210.00**	feet (max bldg dim)
Building Width Parallel to Wind, L =	**540.00**	feet
Enclosure Classification =	**Enclosed Buildings**	(Section 26.12)
Roof Configuration =	**Gabled, Hipped or Monoslope Roofs (ø ≤ 7)**	
Angle of Plane of Roof From Horizontal, θ =	**1.20**	degrees
Is building on or near a hill, ridge, or escarpment?	**N**	(Y or N) (Section 26.8)
Height of Hill or Escarpment relative to upwind terrain, H =	**10.00**	feet (Section 26.8, Fig. 26.8-1)
Horiz. Dist. Upwind to Point Where Elevation = H/2, Lh =	**10.00**	feet (Section 26.8, Fig. 26.8-1)
Horiz. Dist. from Crest to Building Site, x =	**10.00**	feet (Section 26.8, Fig. 26.8-1)
2D Ridge, 2D Escarpment, or Axisymmetrical Hill =	**E**	(R, E, or H)
Is the building site upwind or downwind of the crest?	**DOWN**	(up, down)

2. Calculations - Main Wind Force Resisting System

Equivalent Allowable Stress Design Wind Speed, Vasd =	**84.43**	mph (IBC 2018, 1609.3.1)	
Mean roof height, h =	**33.63**	feet	
Kz, velocity pressure exposure coefficient at hz = 37.92ft =	**1.03**	Table 26.10-1	(use with qz)
Kz, velocity pressure exposure coefficient at hh = 33.63ft =	**1.00**	Table 26.10-1	(use with qh)
Kz, velocity pressure exposure coefficient at hp = 40ft =	**1.04**	Table 26.10-1	(use with qp)
Kzt,topographic factor at hz = 37.92ft =	**1.00**	Figure 26.8-1	(use with qz)
Kzt,topographic factor at hh = 33.63ft =	**1.00**	Figure 26.8-1	(use with qh)
Kzt,topographic factor at hp = 40ft =	**1.00**	Figure 26.8-1	(use with qp)
Kd, wind directionality factor =	**0.85**	Table 26.6-1	
Ke, ground elevation factor at	**1.00**	Table 26.9-1	
G, gust factor =	**0.85**	Section 26.11.4	
qz, velocity pressure at hz = 37.92ft =	**26.63**	psf (Eq. 26.10-1)	
qh, velocity pressure at hh = 33.63ft =	**25.85**	psf (Eq. 26.10-1)	
qp, velocity pressure at hp = 40ft =	**26.89**	psf (Eq. 26.10-1)	

Walls: P = q(GCpf-GCpi) Eqn. 27.3-1	**qz**	**GCp**	**GCpi**	**(1.0)P**	**(0.6)P**
Windward pressure	26.63	0.68		18.1 psf	10.9 psf
	qh	**GCp**	**GCpi**	**(1.0)P**	**(0.6)P**
Leeward Pressure	25.85	-0.23		-6 psf	-3.6 psf
Sidewall pressure	25.85	-0.60	0.18	-20 psf	-12 psf
Internal Pressure	25.85		0.18	4.7 psf	2.8 psf

(1.0)W = (1.0)(Windward + Leeward Pressure) = **18.11 psf + 5.96 psf = 24.1 psf**
(0.6)W =(0.6)(Windward + Leeward Pressure) = **10.86 psf + 3.58 psf = 14.4 psf**

Parapets: Pp =qp(GCpn) Eqn. 27.3-3	**qp**	**GCpn**	**(1.0)Pp**	**(0.6)Pp**
Windward parapet pressure	26.89	1.5	40.3 psf	24.2 psf
Leeward parapet pressure	26.89	-1.0	-26.9 psf	-16.1 psf
Windward + Leeward Pressure	26.89	2.50	**67.2 psf**	**40.3 psf**

Roof Normal to Ridge (θ≥10 degrees)		**qh**	**GCp**	**GCpi**	**(1.0)P**	**(0.6)P**
Windward Pressure	case i	25.85	-0.60	0.18	**-20 psf**	**-12 psf**
	case ii	25.85	-0.15	0.18	**-8.6 psf**	**-5.2 psf**
Leeward Pressure		25.85	-0.26	0.18	**-11.2 psf**	**-6.7 psf**

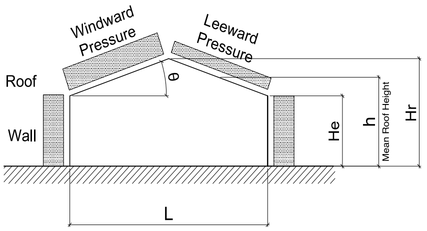
Roof All Other Conditions	**qh**	**GCp**	**GCpi**	**(1.0)P**	**(0.6)P**
For 0 to h/2 = 0 ft to 16.81 ft	25.85	-0.77	0.18	**-24.4 psf**	**-14.7 psf**
h/2 to h = 16.81 ft to 33.63 ft	25.85	-0.77	0.18	**-24.4 psf**	**-14.7 psf**
h to 2h = 33.63 ft to 67.25 ft	25.85	-0.43	0.18	**-15.6 psf**	**-9.4 psf**
>2h = >67.25 ft	25.85	-0.26	0.18	**-11.2 psf**	**-6.7 psf**

Roof Overhangs Section 27.3.3	**qh**	**GCp**	**GCpi**	**(1.0)P**	**(0.6)P**
Maximum pressures	25.85	-0.77	0.68	**-37.4 psf**	**-22.4 psf**

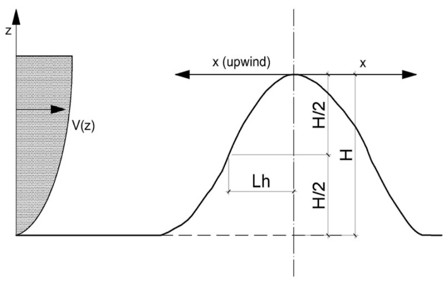
WALLACE DESIGN PROGRAM
Revised: 02/12/2019
Author: Katie Faulkner

Date	3/10/2022	Sheet	of
Job	2220003 Building 2		
Subject	E/W Wind TOW: 40.542ft		

WIND ANALYSIS: ANALYTICAL - ALL HEIGHTS METHOD
ASCE 7-16, Chapters 26, 27 and 30



REFER TO FIGURE 27.3-1



2-D Ridge or Axisymmetrical Hill

REFER TO FIGURE 26.8-1

1. Input

Design Parameters

Basic Wind Speed, V =	**109**	mph (Section 26.5, Fig. 1A-2D)
Exposure Category (B, C, or D) =	**C**	(Section 26.7)
Building Risk Category (I, II, III, IV) =	**II**	(Table 1.5-1)
Civil finished floor elevation (if unknown input 0) =	**0.00**	feet (Sect. 26.9, Table 26.9-1)
Eave Height, He =	**33.63**	feet
Max Building Height or Ridge Height above ground level, Hr =	**37.92**	feet
Parapet Height above ground level, Hp =	**42.00**	feet
Building Width Perpendicular to Wind, B =	**210.00**	feet (max bldg dim)
Building Width Parallel to Wind, L =	**540.00**	feet
Enclosure Classification =	**Enclosed Buildings**	(Section 26.12)
Roof Configuration =	**Gabled, Hipped or Monoslope Roofs (ø ≤ 7)**	
Angle of Plane of Roof From Horizontal, θ =	**1.20**	degrees
Is building on or near a hill, ridge, or escarpment?	**N**	(Y or N) (Section 26.8)
Height of Hill or Escarpment relative to upwind terrain, H =	**10.00**	feet (Section 26.8, Fig. 26.8-1)
Horiz. Dist. Upwind to Point Where Elevation = H/2, Lh =	**10.00**	feet (Section 26.8, Fig. 26.8-1)
Horiz. Dist. from Crest to Building Site, x =	**10.00**	feet (Section 26.8, Fig. 26.8-1)
2D Ridge, 2D Escarpment, or Axisymmetrical Hill =	**E**	(R, E, or H)
Is the building site upwind or downwind of the crest?	**DOWN**	(up, down)

2. Calculations - Main Wind Force Resisting System

Equivalent Allowable Stress Design Wind Speed, Vasd =	**84.43**	mph (IBC 2018, 1609.3.1)	
Mean roof height, h =	**33.63**	feet	
Kz, velocity pressure exposure coefficient at hz = 37.92ft =	**1.03**	Table 26.10-1	(use with qz)
Kz, velocity pressure exposure coefficient at hh = 33.63ft =	**1.00**	Table 26.10-1	(use with qh)
Kz, velocity pressure exposure coefficient at hp = 42ft =	**1.05**	Table 26.10-1	(use with qp)
Kzt,topographic factor at hz = 37.92ft =	**1.00**	Figure 26.8-1	(use with qz)
Kzt,topographic factor at hh = 33.63ft =	**1.00**	Figure 26.8-1	(use with qh)
Kzt,topographic factor at hp = 42ft =	**1.00**	Figure 26.8-1	(use with qp)
Kd, wind directionality factor =	**0.85**	Table 26.6-1	
Ke, ground elevation factor at	**1.00**	Table 26.9-1	
G, gust factor =	**0.85**	Section 26.11.4	
qz, velocity pressure at hz = 37.92ft =	**26.63**	psf (Eq. 26.10-1)	
qh, velocity pressure at hh = 33.63ft =	**25.85**	psf (Eq. 26.10-1)	
qp, velocity pressure at hp = 42ft =	**27.15**	psf (Eq. 26.10-1)	

Walls: P = q(GCpf-GCpi) Eqn. 27.3-1	**qz**	**GCp**	**GCpi**	**(1.0)P**	**(0.6)P**
Windward pressure	26.63	0.68		18.1 psf	10.9 psf
	qh	**GCp**	**GCpi**	**(1.0)P**	**(0.6)P**
Leeward Pressure	25.85	-0.23		-6 psf	-3.6 psf
Sidewall pressure	25.85	-0.60	0.18	-20 psf	-12 psf
Internal Pressure	25.85		0.18	4.7 psf	2.8 psf

(1.0)W = (1.0)(Windward + Leeward Pressure) =	**18.11 psf + 5.96 psf =**	**24.1 psf**
(0.6)W =(0.6)(Windward + Leeward Pressure) =	**10.86 psf + 3.58 psf =**	**14.4 psf**

Parapets: Pp =qp(GCpn) Eqn. 27.3-3	**qp**	**GCpn**	**(1.0)Pp**	**(0.6)Pp**
Windward parapet pressure	27.15	1.5	40.7 psf	24.4 psf
Leeward parapet pressure	27.15	-1.0	-27.1 psf	-16.3 psf
Windward + Leeward Pressure	27.15	2.50	**67.9 psf**	**40.7 psf**

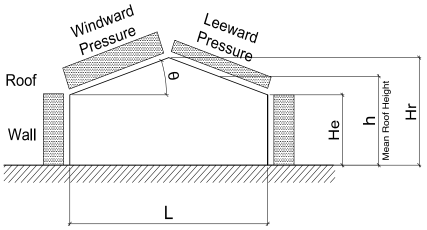
Roof Normal to Ridge (θ≥10 degrees)		**qh**	**GCp**	**GCpi**	**(1.0)P**	**(0.6)P**
Windward Pressure	case i	25.85	-0.60	0.18	**-20 psf**	**-12 psf**
	case ii	25.85	-0.15	0.18	**-8.6 psf**	**-5.2 psf**
Leeward Pressure		25.85	-0.26	0.18	**-11.2 psf**	**-6.7 psf**

Roof All Other Conditions	**qh**	**GCp**	**GCpi**	**(1.0)P**	**(0.6)P**
For 0 to h/2 = 0 ft to 16.81 ft	25.85	-0.77	0.18	**-24.4 psf**	**-14.7 psf**
h/2 to h = 16.81 ft to 33.63 ft	25.85	-0.77	0.18	**-24.4 psf**	**-14.7 psf**
h to 2h = 33.63 ft to 67.25 ft	25.85	-0.43	0.18	**-15.6 psf**	**-9.4 psf**
>2h = >67.25 ft	25.85	-0.26	0.18	**-11.2 psf**	**-6.7 psf**

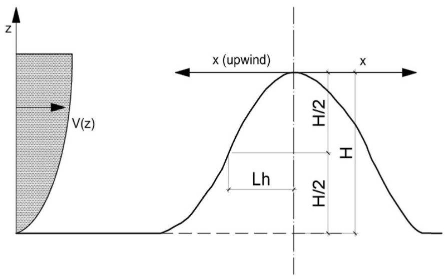
Roof Overhangs Section 27.3.3	**qh**	**GCp**	**GCpi**	**(1.0)P**	**(0.6)P**
Maximum pressures	25.85	-0.77	0.68	**-37.4 psf**	**-22.4 psf**

Date	3/10/2022	Sheet	of
Job	2220003 Building 2		
Subject	North Wind TOW: 40.542ft		

WIND ANALYSIS: ANALYTICAL - ALL HEIGHTS METHOD
ASCE 7-16, Chapters 26, 27 and 30



REFER TO FIGURE 27.3-1



2-D Ridge or Axisymmetrical Hill

REFER TO FIGURE 26.8-1

1. Input

Design Parameters

Basic Wind Speed, V =	**109**	mph (Section 26.5, Fig. 1A-2D)
Exposure Category (B, C, or D) =	**C**	(Section 26.7)
Building Risk Category (I, II, III, IV) =	**II**	(Table 1.5-1)
Civil finished floor elevation (if unknown input 0) =	**0.00**	feet (Sect. 26.9, Table 26.9-1)
Eave Height, He =	**33.63**	feet
Max Building Height or Ridge Height above ground level, Hr =	**37.92**	feet
Parapet Height above ground level, Hp =	**40.00**	feet
Building Width Perpendicular to Wind, B =	**540.00**	feet (max bldg dim)
Building Width Parallel to Wind, L =	**210.00**	feet
Enclosure Classification =	**Enclosed Buildings**	(Section 26.12)
Roof Configuration =	**Gabled, Hipped or Monoslope Roofs (ø ≤ 7)**	
Angle of Plane of Roof From Horizontal, θ =	**1.20**	degrees
Is building on or near a hill, ridge, or escarpment?	**N**	(Y or N) (Section 26.8)
Height of Hill or Escarpment relative to upwind terrain, H =	**10.00**	feet (Section 26.8, Fig. 26.8-1)
Horiz. Dist. Upwind to Point Where Elevation = H/2, Lh =	**10.00**	feet (Section 26.8, Fig. 26.8-1)
Horiz. Dist. from Crest to Building Site, x =	**10.00**	feet (Section 26.8, Fig. 26.8-1)
2D Ridge, 2D Escarpment, or Axisymmetrical Hill =	**E**	(R, E, or H)
Is the building site upwind or downwind of the crest?	**DOWN**	(up, down)

2. Calculations - Main Wind Force Resisting System

Equivalent Allowable Stress Design Wind Speed, Vasd =	**84.43**	mph (IBC 2018, 1609.3.1)	
Mean roof height, h =	**33.63**	feet	
Kz, velocity pressure exposure coefficient at hz = 37.92ft =	**1.03**	Table 26.10-1	(use with qz)
Kz, velocity pressure exposure coefficient at hh = 33.63ft =	**1.00**	Table 26.10-1	(use with qh)
Kz, velocity pressure exposure coefficient at hp = 40ft =	**1.04**	Table 26.10-1	(use with qp)
Kzt,topographic factor at hz = 37.92ft =	**1.00**	Figure 26.8-1	(use with qz)
Kzt,topographic factor at hh = 33.63ft =	**1.00**	Figure 26.8-1	(use with qh)
Kzt,topographic factor at hp = 40ft =	**1.00**	Figure 26.8-1	(use with qp)
Kd, wind directionality factor =	**0.85**	Table 26.6-1	
Ke, ground elevation factor at	**1.00**	Table 26.9-1	
G, gust factor =	**0.85**	Section 26.11.4	
qz, velocity pressure at hz = 37.92ft =	**26.63**	psf (Eq. 26.10-1)	
qh, velocity pressure at hh = 33.63ft =	**25.85**	psf (Eq. 26.10-1)	
qp, velocity pressure at hp = 40ft =	**26.89**	psf (Eq. 26.10-1)	

Walls: P = q(GCpf-GCpi) Eqn. 27.3-1	**qz**	**GCp**	**GCpi**	**(1.0)P**	**(0.6)P**
Windward pressure	26.63	0.68		18.1 psf	10.9 psf
	qh	**GCp**	**GCpi**	**(1.0)P**	**(0.6)P**
Leeward Pressure	25.85	-0.43		-11 psf	-6.6 psf
Sidewall pressure	25.85	-0.60	0.18	-20 psf	-12 psf
Internal Pressure	25.85		0.18	4.7 psf	2.8 psf

(1.0)W = (1.0)(Windward + Leeward Pressure) =	**18.11 psf + 10.99 psf =**	**29.1 psf**
(0.6)W =(0.6)(Windward + Leeward Pressure) =	**10.86 psf + 6.59 psf =**	**17.5 psf**

Parapets: Pp =qp(GCpn) Eqn. 27.3-3	**qp**	**GCpn**	**(1.0)Pp**	**(0.6)Pp**
Windward parapet pressure	26.89	1.5	40.3 psf	24.2 psf
Leeward parapet pressure	26.89	-1.0	-26.9 psf	-16.1 psf
Windward + Leeward Pressure	26.89	2.50	**67.2 psf**	**40.3 psf**

Roof Normal to Ridge (θ≥10 degrees)		**qh**	**GCp**	**GCpi**	**(1.0)P**	**(0.6)P**
Windward Pressure	case i	25.85	-0.60	0.18	**-20 psf**	**-12 psf**
	case ii	25.85	-0.15	0.18	**-8.6 psf**	**-5.2 psf**
Leeward Pressure		25.85	-0.26	0.18	**-11.2 psf**	**-6.7 psf**

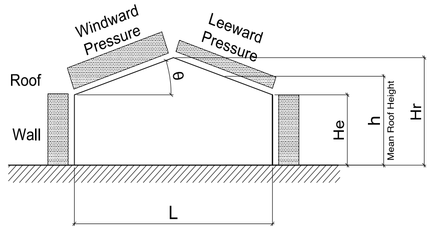
Roof All Other Conditions	**qh**	**GCp**	**GCpi**	**(1.0)P**	**(0.6)P**
For 0 to h/2 = 0 ft to 16.81 ft	25.85	-0.77	0.18	**-24.4 psf**	**-14.7 psf**
h/2 to h = 16.81 ft to 33.63 ft	25.85	-0.77	0.18	**-24.4 psf**	**-14.7 psf**
h to 2h = 33.63 ft to 67.25 ft	25.85	-0.43	0.18	**-15.6 psf**	**-9.4 psf**
>2h = >67.25 ft	25.85	-0.26	0.18	**-11.2 psf**	**-6.7 psf**

Roof Overhangs Section 27.3.3	**qh**	**GCp**	**GCpi**	**(1.0)P**	**(0.6)P**
Maximum pressures	25.85	-0.77	0.68	**-37.4 psf**	**-22.4 psf**

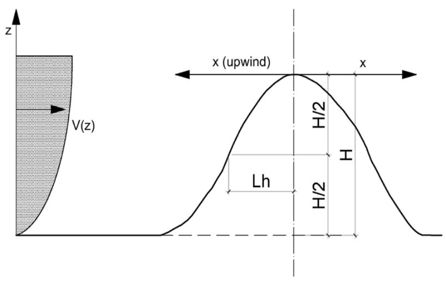
WALLACE DESIGN PROGRAM
Revised: 02/12/2019
Author: Katie Faulkner

Date	3/10/2022	Sheet	of
Job	2220003 Building 2		
Subject	North Wind TOW: 42.5ft		

WIND ANALYSIS: ANALYTICAL - ALL HEIGHTS METHOD
ASCE 7-16, Chapters 26, 27 and 30



REFER TO FIGURE 27.3-1



2-D Ridge or Axisymmetrical Hill

REFER TO FIGURE 26.8-1

1. Input

Design Parameters

Basic Wind Speed, V =	**109**	mph (Section 26.5, Fig. 1A-2D)
Exposure Category (B, C, or D) =	**C**	(Section 26.7)
Building Risk Category (I, II, III, IV) =	**II**	(Table 1.5-1)
Civil finished floor elevation (if unknown input 0) =	**0.00**	feet (Sect. 26.9, Table 26.9-1)
Eave Height, He =	**33.63**	feet
Max Building Height or Ridge Height above ground level, Hr =	**37.92**	feet
Parapet Height above ground level, Hp =	**42.00**	feet
Building Width Perpendicular to Wind, B =	**540.00**	feet (max bldg dim)
Building Width Parallel to Wind, L =	**210.00**	feet
Enclosure Classification =	**Enclosed Buildings**	(Section 26.12)
Roof Configuration =	**Gabled, Hipped or Monoslope Roofs (ø ≤ 7)**	
Angle of Plane of Roof From Horizontal, θ =	**1.20**	degrees
Is building on or near a hill, ridge, or escarpment?	**N**	(Y or N) (Section 26.8)
Height of Hill or Escarpment relative to upwind terrain, H =	**10.00**	feet (Section 26.8, Fig. 26.8-1)
Horiz. Dist. Upwind to Point Where Elevation = H/2, Lh =	**10.00**	feet (Section 26.8, Fig. 26.8-1)
Horiz. Dist. from Crest to Building Site, x =	**10.00**	feet (Section 26.8, Fig. 26.8-1)
2D Ridge, 2D Escarpment, or Axisymmetrical Hill =	**E**	(R, E, or H)
Is the building site upwind or downwind of the crest?	**DOWN**	(up, down)

2. Calculations - Main Wind Force Resisting System

Equivalent Allowable Stress Design Wind Speed, Vasd =	**84.43**	mph (IBC 2018, 1609.3.1)	
Mean roof height, h =	**33.63**	feet	
Kz, velocity pressure exposure coefficient at hz = 37.92ft =	**1.03**	Table 26.10-1	(use with qz)
Kz, velocity pressure exposure coefficient at hh = 33.63ft =	**1.00**	Table 26.10-1	(use with qh)
Kz, velocity pressure exposure coefficient at hp = 42ft =	**1.05**	Table 26.10-1	(use with qp)
Kzt,topographic factor at hz = 37.92ft =	**1.00**	Figure 26.8-1	(use with qz)
Kzt,topographic factor at hh = 33.63ft =	**1.00**	Figure 26.8-1	(use with qh)
Kzt,topographic factor at hp = 42ft =	**1.00**	Figure 26.8-1	(use with qp)
Kd, wind directionality factor =	**0.85**	Table 26.6-1	
Ke, ground elevation factor at	**1.00**	Table 26.9-1	
G, gust factor =	**0.85**	Section 26.11.4	
qz, velocity pressure at hz = 37.92ft =	**26.63**	psf (Eq. 26.10-1)	
qh, velocity pressure at hh = 33.63ft =	**25.85**	psf (Eq. 26.10-1)	
qp, velocity pressure at hp = 42ft =	**27.15**	psf (Eq. 26.10-1)	

Walls: P = q(GCpf-GCpi) Eqn. 27.3-1	**qz**	**GCp**	**GCpi**	**(1.0)P**	**(0.6)P**
Windward pressure	26.63	0.68		18.1 psf	10.9 psf
	qh	**GCp**	**GCpi**	**(1.0)P**	**(0.6)P**
Leeward Pressure	25.85	-0.43		-11 psf	-6.6 psf
Sidewall pressure	25.85	-0.60	0.18	-20 psf	-12 psf
Internal Pressure	25.85		0.18	4.7 psf	2.8 psf

(1.0)W = (1.0)(Windward + Leeward Pressure) =	**18.11 psf + 10.99 psf =**	**29.1 psf**
(0.6)W =(0.6)(Windward + Leeward Pressure) =	**10.86 psf + 6.59 psf =**	**17.5 psf**

Parapets: Pp =qp(GCpn) Eqn. 27.3-3	**qp**	**GCpn**	**(1.0)Pp**	**(0.6)Pp**
Windward parapet pressure	27.15	1.5	40.7 psf	24.4 psf
Leeward parapet pressure	27.15	-1.0	-27.1 psf	-16.3 psf
Windward + Leeward Pressure	27.15	2.50	**67.9 psf**	**40.7 psf**

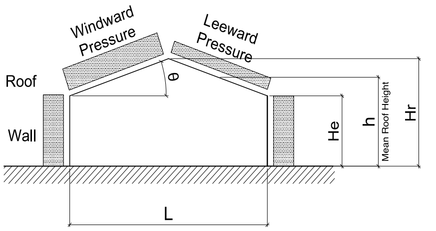
Roof Normal to Ridge (θ≥10 degrees)		**qh**	**GCp**	**GCpi**	**(1.0)P**	**(0.6)P**
Windward Pressure	case i	25.85	-0.60	0.18	**-20 psf**	**-12 psf**
	case ii	25.85	-0.15	0.18	**-8.6 psf**	**-5.2 psf**
Leeward Pressure		25.85	-0.26	0.18	**-11.2 psf**	**-6.7 psf**

Roof All Other Conditions	**qh**	**GCp**	**GCpi**	**(1.0)P**	**(0.6)P**
For 0 to h/2 = 0 ft to 16.81 ft	25.85	-0.77	0.18	**-24.4 psf**	**-14.7 psf**
h/2 to h = 16.81 ft to 33.63 ft	25.85	-0.77	0.18	**-24.4 psf**	**-14.7 psf**
h to 2h = 33.63 ft to 67.25 ft	25.85	-0.43	0.18	**-15.6 psf**	**-9.4 psf**
>2h = >67.25 ft	25.85	-0.26	0.18	**-11.2 psf**	**-6.7 psf**

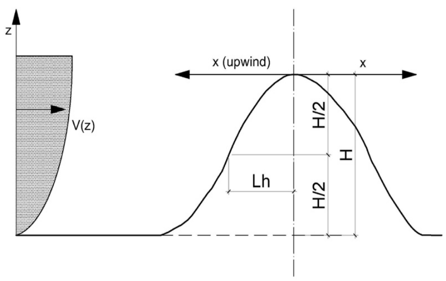
Roof Overhangs Section 27.3.3	**qh**	**GCp**	**GCpi**	**(1.0)P**	**(0.6)P**
Maximum pressures	25.85	-0.77	0.68	**-37.4 psf**	**-22.4 psf**

Date	3/10/2022	Sheet	of
Job	2220003 Building 2		
Subject	South Wind TOW: 38.980ft		

WIND ANALYSIS: ANALYTICAL - ALL HEIGHTS METHOD
ASCE 7-16, Chapters 26, 27 and 30



REFER TO FIGURE 27.3-1



2-D Ridge or Axisymmetrical Hill

REFER TO FIGURE 26.8-1

1. Input

Design Parameters

Basic Wind Speed, V =	**109**	mph (Section 26.5, Fig. 1A-2D)
Exposure Category (B, C, or D) =	**C**	(Section 26.7)
Building Risk Category (I, II, III, IV) =	**II**	(Table 1.5-1)
Civil finished floor elevation (if unknown input 0) =	**0.00**	feet (Sect. 26.9, Table 26.9-1)
Eave Height, He =	**35.27**	feet
Max Building Height or Ridge Height above ground level, Hr =	**37.92**	feet
Parapet Height above ground level, Hp =	**37.50**	feet
Building Width Perpendicular to Wind, B =	**540.00**	feet (max bldg dim)
Building Width Parallel to Wind, L =	**210.00**	feet
Enclosure Classification =	**Enclosed Buildings**	(Section 26.12)
Roof Configuration =	**Gabled, Hipped or Monoslope Roofs (ø ≤ 7)**	
Angle of Plane of Roof From Horizontal, θ =	**1.20**	degrees
Is building on or near a hill, ridge, or escarpment?	**N**	(Y or N) (Section 26.8)
Height of Hill or Escarpment relative to upwind terrain, H =	**10.00**	feet (Section 26.8, Fig. 26.8-1)
Horiz. Dist. Upwind to Point Where Elevation = H/2, Lh =	**10.00**	feet (Section 26.8, Fig. 26.8-1)
Horiz. Dist. from Crest to Building Site, x =	**10.00**	feet (Section 26.8, Fig. 26.8-1)
2D Ridge, 2D Escarpment, or Axisymmetrical Hill =	**E**	(R, E, or H)
Is the building site upwind or downwind of the crest?	**DOWN**	(up, down)

2. Calculations - Main Wind Force Resisting System

Equivalent Allowable Stress Design Wind Speed, Vasd =	**84.43**	mph (IBC 2018, 1609.3.1)	
Mean roof height, h =	**35.27**	feet	
Kz, velocity pressure exposure coefficient at hz = 37.92ft =	**1.03**	Table 26.10-1	(use with qz)
Kz, velocity pressure exposure coefficient at hh = 35.27ft =	**1.01**	Table 26.10-1	(use with qh)
Kz, velocity pressure exposure coefficient at hp = 37.5ft =	**1.03**	Table 26.10-1	(use with qp)
Kzt,topographic factor at hz = 37.92ft =	**1.00**	Figure 26.8-1	(use with qz)
Kzt,topographic factor at hh = 35.27ft =	**1.00**	Figure 26.8-1	(use with qh)
Kzt,topographic factor at hp = 37.5ft =	**1.00**	Figure 26.8-1	(use with qp)
Kd, wind directionality factor =	**0.85**	Table 26.6-1	
Ke, ground elevation factor at	**1.00**	Table 26.9-1	
G, gust factor =	**0.85**	Section 26.11.4	
qz, velocity pressure at hz = 37.92ft =	**26.63**	psf (Eq. 26.10-1)	
qh, velocity pressure at hh = 35.27ft =	**26.11**	psf (Eq. 26.10-1)	
qp, velocity pressure at hp = 37.5ft =	**26.63**	psf (Eq. 26.10-1)	

Walls: P = q(GCpf-GCpi) Eqn. 27.3-1	**qz**	**GCp**	**GCpi**	**(1.0)P**	**(0.6)P**
Windward pressure	26.63	0.68		18.1 psf	10.9 psf
	qh	**GCp**	**GCpi**	**(1.0)P**	**(0.6)P**
Leeward Pressure	26.11	-0.43		-11.1 psf	-6.7 psf
Sidewall pressure	26.11	-0.60	0.18	-20.2 psf	-12.1 psf
Internal Pressure	26.11		0.18	4.7 psf	2.8 psf

(1.0)W = (1.0)(Windward + Leeward Pressure) =	**18.11 psf + 11.1 psf =**	**29.2 psf**
(0.6)W =(0.6)(Windward + Leeward Pressure) =	**10.86 psf + 6.66 psf =**	**17.5 psf**

Parapets: Pp =qp(GCpn) Eqn. 27.3-3	**qp**	**GCpn**	**(1.0)Pp**	**(0.6)Pp**
Windward parapet pressure	26.63	1.5	39.9 psf	24 psf
Leeward parapet pressure	26.63	-1.0	-26.6 psf	-16 psf
Windward + Leeward Pressure	26.63	2.50	**66.6 psf**	**39.9 psf**

Roof Normal to Ridge (θ≥10 degrees)		**qh**	**GCp**	**GCpi**	**(1.0)P**	**(0.6)P**
Windward Pressure	case i	26.11	-0.60	0.18	**-20.2 psf**	**-12.1 psf**
	case ii	26.11	-0.15	0.18	**-8.7 psf**	**-5.2 psf**
Leeward Pressure		26.11	-0.26	0.18	**-11.4 psf**	**-6.8 psf**

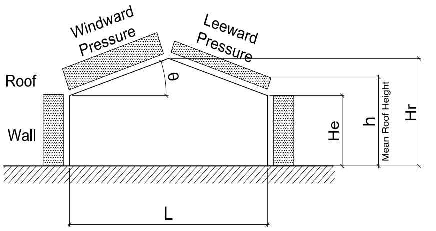
Roof All Other Conditions	**qh**	**GCp**	**GCpi**	**(1.0)P**	**(0.6)P**
For 0 to h/2 = 0 ft to 17.64 ft	26.11	-0.77	0.18	**-24.7 psf**	**-14.8 psf**
h/2 to h = 17.64 ft to 35.27 ft	26.11	-0.77	0.18	**-24.7 psf**	**-14.8 psf**
h to 2h = 35.27 ft to 70.54 ft	26.11	-0.43	0.18	**-15.8 psf**	**-9.5 psf**
>2h = >70.54 ft	26.11	-0.26	0.18	**-11.4 psf**	**-6.8 psf**

Roof Overhangs Section 27.3.3	**qh**	**GCp**	**GCpi**	**(1.0)P**	**(0.6)P**
Maximum pressures	26.11	-0.77	0.68	**-37.7 psf**	**-22.6 psf**

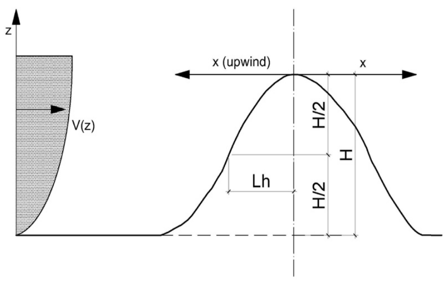
WALLACE DESIGN PROGRAM
Revised: 02/12/2019
Author: Katie Faulkner

Date	3/10/2022	Sheet	of
Job	2220003 Building 2		
Subject	South Wind TOW: 38.980ft		

WIND ANALYSIS: ANALYTICAL - ALL HEIGHTS METHOD
ASCE 7-16, Chapters 26, 27 and 30



REFER TO FIGURE 27.3-1



2-D Ridge or Axisymmetrical Hill

REFER TO FIGURE 26.8-1

1. Input

Design Parameters

Basic Wind Speed, V =	**109**	mph (Section 26.5, Fig. 1A-2D)
Exposure Category (B, C, or D) =	**C**	(Section 26.7)
Building Risk Category (I, II, III, IV) =	**II**	(Table 1.5-1)
Civil finished floor elevation (if unknown input 0) =	**0.00**	feet (Sect. 26.9, Table 26.9-1)
Eave Height, He =	**33.63**	feet
Max Building Height or Ridge Height above ground level, Hr =	**37.92**	feet
Parapet Height above ground level, Hp =	**38.50**	feet
Building Width Perpendicular to Wind, B =	**540.00**	feet (max bldg dim)
Building Width Parallel to Wind, L =	**210.00**	feet
Enclosure Classification =	**Enclosed Buildings**	(Section 26.12)
Roof Configuration =	**Gabled, Hipped or Monoslope Roofs (ø ≤ 7)**	
Angle of Plane of Roof From Horizontal, θ =	**1.20**	degrees
Is building on or near a hill, ridge, or escarpment?	**N**	(Y or N) (Section 26.8)
Height of Hill or Escarpment relative to upwind terrain, H =	**10.00**	feet (Section 26.8, Fig. 26.8-1)
Horiz. Dist. Upwind to Point Where Elevation = H/2, Lh =	**10.00**	feet (Section 26.8, Fig. 26.8-1)
Horiz. Dist. from Crest to Building Site, x =	**10.00**	feet (Section 26.8, Fig. 26.8-1)
2D Ridge, 2D Escarpment, or Axisymmetrical Hill =	**E**	(R, E, or H)
Is the building site upwind or downwind of the crest?	**DOWN**	(up, down)

2. Calculations - Main Wind Force Resisting System

Equivalent Allowable Stress Design Wind Speed, Vasd =	**84.43**	mph (IBC 2018, 1609.3.1)	
Mean roof height, h =	**33.63**	feet	
Kz, velocity pressure exposure coefficient at hz = 37.92ft =	**1.03**	Table 26.10-1	(use with qz)
Kz, velocity pressure exposure coefficient at hh = 33.63ft =	**1.00**	Table 26.10-1	(use with qh)
Kz, velocity pressure exposure coefficient at hp = 38.5ft =	**1.03**	Table 26.10-1	(use with qp)
Kzt,topographic factor at hz = 37.92ft =	**1.00**	Figure 26.8-1	(use with qz)
Kzt,topographic factor at hh = 33.63ft =	**1.00**	Figure 26.8-1	(use with qh)
Kzt,topographic factor at hp = 38.5ft =	**1.00**	Figure 26.8-1	(use with qp)
Kd, wind directionality factor =	**0.85**	Table 26.6-1	
Ke, ground elevation factor at	**1.00**	Table 26.9-1	
G, gust factor =	**0.85**	Section 26.11.4	
qz, velocity pressure at hz = 37.92ft =	**26.63**	psf (Eq. 26.10-1)	
qh, velocity pressure at hh = 33.63ft =	**25.85**	psf (Eq. 26.10-1)	
qp, velocity pressure at hp = 38.5ft =	**26.63**	psf (Eq. 26.10-1)	

Walls: P = q(GCpf-GCpi) Eqn. 27.3-1	**qz**	**GCp**	**GCpi**	**(1.0)P**	**(0.6)P**
Windward pressure	26.63	0.68		18.1 psf	10.9 psf
	qh	**GCp**	**GCpi**	**(1.0)P**	**(0.6)P**
Leeward Pressure	25.85	-0.43		-11 psf	-6.6 psf
Sidewall pressure	25.85	-0.60	0.18	-20 psf	-12 psf
Internal Pressure	25.85		0.18	4.7 psf	2.8 psf

(1.0)W = (1.0)(Windward + Leeward Pressure) =	**18.11 psf + 10.99 psf =**	**29.1 psf**
(0.6)W =(0.6)(Windward + Leeward Pressure) =	**10.86 psf + 6.59 psf =**	**17.5 psf**

Parapets: Pp =qp(GCpn) Eqn. 27.3-3	**qp**	**GCpn**	**(1.0)Pp**	**(0.6)Pp**
Windward parapet pressure	26.63	1.5	39.9 psf	24 psf
Leeward parapet pressure	26.63	-1.0	-26.6 psf	-16 psf
Windward + Leeward Pressure	26.63	2.50	**66.6 psf**	**39.9 psf**

Roof Normal to Ridge (θ≥10 degrees)		**qh**	**GCp**	**GCpi**	**(1.0)P**	**(0.6)P**
Windward Pressure	case i	25.85	-0.60	0.18	**-20 psf**	**-12 psf**
	case ii	25.85	-0.15	0.18	**-8.6 psf**	**-5.2 psf**
Leeward Pressure		25.85	-0.26	0.18	**-11.2 psf**	**-6.7 psf**

Roof All Other Conditions	**qh**	**GCp**	**GCpi**	**(1.0)P**	**(0.6)P**
For 0 to h/2 = 0 ft to 16.81 ft	25.85	-0.77	0.18	**-24.4 psf**	**-14.7 psf**
h/2 to h = 16.81 ft to 33.63 ft	25.85	-0.77	0.18	**-24.4 psf**	**-14.7 psf**
h to 2h = 33.63 ft to 67.25 ft	25.85	-0.43	0.18	**-15.6 psf**	**-9.4 psf**
>2h = >67.25 ft	25.85	-0.26	0.18	**-11.2 psf**	**-6.7 psf**

Roof Overhangs Section 27.3.3	**qh**	**GCp**	**GCpi**	**(1.0)P**	**(0.6)P**
Maximum pressures	25.85	-0.77	0.68	**-37.4 psf**	**-22.4 psf**

ATC Hazards by Location

Search Information

Address: NE Tudor Rd & NW Main St, Lee's Summit, MO 64086, USA

Coordinates: 38.9307532, -94.3853697

Elevation: 994 ft

Timestamp: 2022-01-05T13:53:22.471Z

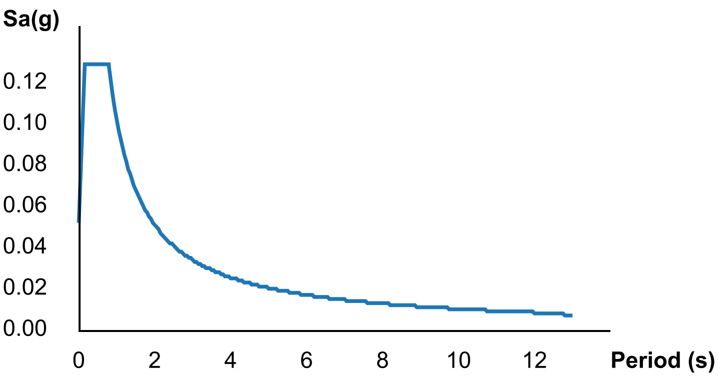
Hazard Type: Seismic

Reference Document: ASCE7-16

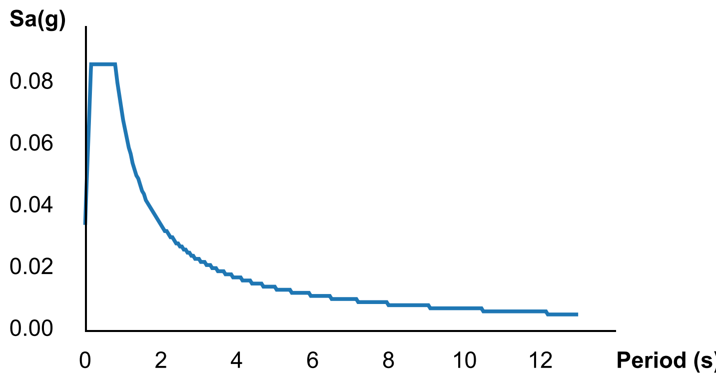
Risk Category: II

Site Class: C

MCER Horizontal Response Spectrum



Design Horizontal Response Spectrum



Basic Parameters

Name	Value	Description
S_S	0.099	MCE_R ground motion (period=0.2s)
S_1	0.068	MCE_R ground motion (period=1.0s)
S_{MS}	0.129	Site-modified spectral acceleration value
S_{M1}	0.102	Site-modified spectral acceleration value
S_{DS}	0.086	Numeric seismic design value at 0.2s SA
S_{D1}	0.068	Numeric seismic design value at 1.0s SA

Additional Information

Name	Value	Description
SDC	B	Seismic design category
F_a	1.3	Site amplification factor at 0.2s
F_v	1.5	Site amplification factor at 1.0s

CR_S	0.927	Coefficient of risk (0.2s)
CR_1	0.877	Coefficient of risk (1.0s)
PGA	0.047	MCE_G peak ground acceleration
F_{PGA}	1.3	Site amplification factor at PGA
PGA_M	0.061	Site modified peak ground acceleration
T_L	12	Long-period transition period (s)
SsRT	0.099	Probabilistic risk-targeted ground motion (0.2s)
SsUH	0.107	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
SsD	1.5	Factored deterministic acceleration value (0.2s)
S1RT	0.068	Probabilistic risk-targeted ground motion (1.0s)
S1UH	0.078	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
S1D	0.6	Factored deterministic acceleration value (1.0s)
PGAd	0.5	Factored deterministic acceleration value (PGA)

The results indicated here DO NOT reflect any state or local amendments to the values or any delineation lines made during the building code adoption process. Users should confirm any output obtained from this tool with the local Authority Having Jurisdiction before proceeding with design.

Disclaimer

Hazard loads are provided by the U.S. Geological Survey Seismic Design Web Services.

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Date	3/10/2022	Sheet No.	of
Job	2220003 Building 2		
Subject	Seismic Design Criteria		

SEISMIC LOAD SUMMARY

2018 IBC (Ch: 16) and ASCE 7-16 (Ch: 11 to 13)

1. Input

Spectral Response Acceleration for Short Periods, Ss =		**0.099**	
Spectral Response Acceleration for 1-second Periods, S1 =		**0.068**	
Risk Category =		**II**	(IBC Table 1604.5 & ASCE: Table 1-5-1)
Site Classification (A,B,C,D,E,F) =		**C**	(ASCE 7 Ch.20 Table 20.3-1)
Basic Structural System		**BEARING WALL SYSTEMS**	(Table 12.2-1)
Lateral Force Resisting System		**Ordinary Precast Shear Walls**	(Table 12.2-1)
ρx , redundancy in x-dir.=	(Redundancy is either 1.0 or 1.3)	**1.00**	(ASCE 7 Section 12.3.4)
ρy , redundancy in y-dir.=	(Redundancy is either 1.0 or 1.3)	**1.00**	(ASCE 7 Section 12.3.4)

r, =1.0 for Seismic Design Category B and C, RE: ASCE 7 Section 12.3.4.1 for additional exceptions.

Is Structure regular with a period < .5 sec?	**Yes**	(Yes or No, ASCE 7 Section 12.8.1.3)
Is Structure short period with a rigid diaphragm?	**No**	(Yes or No, ASCE 7 Section 11.6)
Is Structure short period w/ non-rigid diaphragm & vertical elements of seismic force-resisting system spaced at 40' oc	**No**	(Yes or No, ASCE 7 Section 11.6)
Does Structure have a flexible diaphragm?	**Yes**	(Yes or No, ASCE 7 Section 11.6)

(For Wall anchorage requirements per Section 12.11.2.1)

Span length of flexible diaphragm -x dir. =	**540**	feet (input 0 for rigid diaphragm)
Span length of flexible diaphragm -y-dir. =	**210**	feet

2. Determine Design Spectral Response Accelerations and Seismic Design Category, Section 11.6:

Response Modification Factor, R =	**3**	(Table 12.2-1)
Overstrength Factor, Ωo = (refer to footnote b for .5 reduction for Flexible Diaphragms)	**2**	(Table 12.2-1)
Deflection Amplification Factor, Cd =	**3**	(Table 12.2-1)
Acceleration for Short Period		
Site Coefficient, Fa =	**1.30**	(IBC Table 1613.2.3(1), ASCE 7 Table 11.4-1)
Site Adjusted Spectral Response Acceleration for Short Periods, Sms =	**0.129**	(IBC Section 1613.2.3, ASCE 7 Section 11.4.4)
Acceleration for 1-Second Period		
Site Coefficient, Fv =	**1.50**	(IBC Table 1613.2.3(2), ASCE 7 Table 11.4-2)
Site Adjusted Spectral Response Acceleration for 1-second Periods, Sm1 =	**0.102**	(IBC Section 1613.2.3, ASCE 7 Section 11.4.4)
Design Spectral Response Acceleration for Short Periods, Sds =	**0.086**	(IBC Section 1613.2.4 and ASCE 7 Section 11.4.5)
Seismic Design Category based on short period =	**A**	
Design Spectral Response Acceleration for 1-second Periods, Sd1 =	**0.068**	(IBC Section 1613.2.4 and ASCE 7 Section 11.4.5)
Seismic Design Category based on 1-second period =	**B**	
Design Response Spectrum, Ts =	**0.793**	seconds (Section 11.4.6)
Approximate Fundamental Period, Ta =	**0.500**	seconds (Section 12.8.2.1)
Fundamental Period, T, shall not exceed Ta * Cu =	**0.850**	seconds (Section 12.8.2)
Can the Seismic Design Category be based on the short period alone?	**No**	(IBC Section 1613.2.5.1, ASCE 7 Section 11.6)
Seismic Design Category =	**B**	(Most severe case except as allowed by Sect 11.6)

3. Seismic Base Shear for the Lateral Force Resisting System using the Equivalent Lateral Force Procedure, Section 12.8:

a. Calculation of Seismic Base Shear Coefficient:

Seismic Importance Factor, I_e =	**1.00**	(ASCE 7 Table 1.5-2)
Cs = (Sds/(R / I_e)) =	**0.029**	(ASCE Equation 12.8-2, Section 12.8.1.3)

	Strength (1.0E)	ASD (0.7E)
b. Seismic Base Shear, Section 12.8.1:		
V = Cs W =	**0.029 W**	**0.020 W**
c. Horizontal Seismic Load, Section 12.4.2.1=		
For the X-direction: Eh=	**0.029 W**	**0.020 W**
For the Y-direction: Eh=	**0.029 W**	**0.020 W**
d. Vertical Seismic Load Component, Section 12.4.2.2:		
Ev = 0.2 Sds D =	**0.017 D**	**0.012 D**

For structures in SDC B and for the design of foundations using ASD, Ev may be taken as zero. (Section 12.4.2.2)

	Strength (1.0E)	ASD (0.7E)
e. Find the Design Seismic Shear for the Diaphragm, Section 12.10.1.1:		
Force shall not be less than 0.2*Sds*Ie*wpx =	**0.017 W**	**0.012 W**
but need not exceed 0.4*Ie*Sds wpx =	**0.034 W**	**0.024 W**
For a one story building, Fpx =	**0.029 W**	**0.020 W**
f. For collector elements in Seismic Design Categories C through F, Section 12.10.2		
Emh = Ωo V =	**0.057 W**	**0.040 W**

Notes:

1. A building that is low rise (one or two story) building with a short period is assumed for calculation of Seismic Response Coefficient, Cs.

2. The values for design spectral response acceleration assume a regular structure of 5 stories or less with a period, $T < 0.5$ seconds
3. The values for design forces for the diaphragm assume no offsets or changes in the stiffness of the vertical components
4. Section 1613.1 of 2018 IBC excludes the detailing requirements of Chapter 14 of ASCE 7.
5. Per Section 1613.2.2 and 11.4.3, if site investigations performed per ASCE 7 Chpt 20 reveal rock conditions consistent with Site Class B, but site-specific velocity measurements are not made, Fa and Fv shall = 1.0.

Date	3/10/2022	Sheet No.	of
Job			
Subject			

SEISMIC LOAD SUMMARY

2018 IBC (Ch: 16) and ASCE 7-16 (Ch: 11 to 13)

4. Minimum Continuous Load Path, Interconnection and Connection to supports, Section 12.1.3 and 12.1.4:

	Strength (1.0E)	ASD (0.7E)	
a. Continuous Load Path and Interconnections, Section 12.1.3:			
F_p= 0.133 S_{ds} W_p or .05 W_p min. =	**0.050 Wp**	**0.035 Wp**	(Section 12.1.3)
b. Connection to Supports, Section 12.1.4 :			
F_p= .05 * dead + live reaction =	**0.050 Rd+l**	**0.035 Rd+l**	(Section 12.1.4)

5. Structural Walls and Anchorage, Section 12.11

	Strength (1.0E)	ASD (0.7E)	
a. Minimum Out-of-Plane Forces on Structural Walls, Section 12.11.1:			
F_p= 0.40 Ie Sds wp or .10 wp min =	**0.100 Wp**	**0.070 Wp**	(Section 12.11.1)

b. Minimum anchorage connection of structural walls to supporting construction, Section 12.11.2.1 and 12.11.2:

Per 12.11.2.2, the strength design force for steel elements with the exception of anchor bolts and reinforcing steel shall be increased by 1.4 times.

			Strength (1.0E)	ASD (0.7E)
For loading in the x-direction:				
k_a= 1.0+L_f/100 or max 2.0 =	**2.00**			
Fp= 0.4 S_{ds} k_a I_e W_p or .2 k_a I_e Wp min. =		For Connections at Flexible Diaphragms:	**0.400 Wp**	**0.280 Wp**
F_p * 1.4 for steel elements per 12.11.2.2.2			**0.560 Wp**	**0.392 Wp**
k_a= 1.0				
Fp= 0.4 S_{ds} k_a I_e W_p or .2 k_a I_e Wp min. =		For Connections not at Flexible Diaphragms:	**0.200 Wp**	**0.140 Wp**
Fp * 1.4 for steel elements per 12.11.2.2.2			**0.280 Wp**	**0.196 Wp**
For loading in the y-direction:				
k_a= 1.0+L_f/100 or max 2.0 =	**2.00**			
Fp= 0.4 S_{ds} k_a I_e W_p or .2 k_a I_e Wp min. =		For Connections at Flexible Diaphragms:	**0.400 Wp**	**0.280 Wp**
Fp * 1.4 for steel elements per 12.11.2.2.2			**0.560 Wp**	**0.392 Wp**
k_a= 1.0				
Fp= 0.4 S_{ds} k_a I_e W_p or .2 k_a I_e Wp min. =		For Connections not at Flexible Diaphragms:	**0.200 Wp**	**0.140 Wp**
Fp * 1.4 for steel elements per 12.11.2.2.2			**0.280 Wp**	**0.196 Wp**

The minimum wall anchorage load for concrete or masonry walls is 0.2* the wall weight or 5 psf per 1.4.4.

6. Horizontal Seismic Design Force on Nonstructural Architectural Components, Section 13.3:

	For Ip =1.0	For Ip=1.5	
Fp max = 1.6 Sds Ip Wp=	**0.137 Wp**	**0.206 Wp**	(Equation 13.3-2)
Fp min = 0.3 Sds Ip Wp=	**0.026 Wp**	**0.039 Wp**	(Equation 13.3-3)

The Seismic Design Force is based on Equation 13.3-1, with the minimum and maximum limits noted above.
Fp= 0.4 ap Sds Wp (1 + 2 z/h)/(Rp/Ip)

Seismic Design Force Summary on Architectural Components, Section 13.5:

	ap=	Rp=	Ip=	z/h=	Strength (1.0E)	ASD (0.7E)	
1. Cantilevered (Unbraced) Parapets and Chimneys	**2.50**	**2.50**	**1.00**	**1.00**	**0.103 Wp**	**0.072 Wp**	(Table 13.5-1)
2. Braced Interior Non-masonry walls and partitions							
Fp at floor=	**1.00**	**2.50**	**1.00**	**0.00**	**0.026 Wp**	**0.018 Wp**	(Table 13.5-1)
Fp at roof=	**1.00**	**2.50**	**1.00**	**1.00**	**0.041 Wp**	**0.029 Wp**	(Table 13.5-1)
Fp average at roof and floor:					**0.033 Wp**	**0.023 Wp**	
3. Braced Interior Unreinforced masonry walls and partitions							
Fp at floor=	**1.00**	**1.50**	**1.00**	**0.00**	**0.026 Wp**	**0.018 Wp**	(Table 13.5-1)
Fp at roof=	**1.00**	**1.50**	**1.00**	**1.00**	**0.069 Wp**	**0.048 Wp**	(Table 13.5-1)
Fp average at roof and floor:					**0.047 Wp**	**0.033 Wp**	
4. Cantilevered (Unbraced) Interior Nonstructural walls	**2.50**	**2.50**	**1.00**	**0.00**	**0.034 Wp**	**0.024 Wp**	(Table 13.5-1)
5. Braced Parapets and Chimneys	**1.00**	**2.50**	**1.00**	**1.00**	**0.041 Wp**	**0.029 Wp**	(Table 13.5-1)
6. Exterior Nonstructural Wall Elements							
Fp at floor=	**1.00**	**2.50**	**1.00**	**0.00**	**0.026 Wp**	**0.018 Wp**	(Table 13.5-1)
Fp at roof=	**1.00**	**2.50**	**1.00**	**1.00**	**0.041 Wp**	**0.029 Wp**	(Table 13.5-1)
Fp average at roof and floor:					**0.033 Wp**	**0.023 Wp**	
For the Body of the Wall Panel Connection:							
Fp at floor=	**1.00**	**2.50**	**1.00**	**0.00**	**0.026 Wp**	**0.018 Wp**	(Table 13.5-1)
Fp at roof=	**1.00**	**2.50**	**1.00**	**1.00**	**0.041 Wp**	**0.029 Wp**	(Table 13.5-1)
For the fasteners of the connecting system:							
Fp at floor=	**1.25**	**1.00**	**1.00**	**0.00**	**0.043 Wp**	**0.030 Wp**	(Table 13.5-1)
Fp at roof=	**1.25**	**1.00**	**1.00**	**1.00**	**0.129 Wp**	**0.090 Wp**	(Table 13.5-1)
7. Appendages and Ornamentation	**2.50**	**2.50**	**1.00**	**1.00**	**0.103 Wp**	**0.072 Wp**	(Table 13.5-1)

Notes:

1. Refer to Section 13.4.2 for additional requirements for anchors in concrete and masonry.
2. Section 1613.1 of 2018 IBC excludes the detailing requirements of Chapter 14 of ASCE 7.

Date	3/10/2022	Sheet No.	of
Job			
Subject			

SEISMIC LOAD SUMMARY

2018 IBC (Ch: 16) and ASCE 7-16 (Ch: 11 to 13)

Table 11.4-1 and IBC 1613.2.3(1)
Site Coefficient, Fa

Site	Mapped Spectral Response Acceleration at Short Periods (Ss)						Distance
Class	Ss<=0.25	0.5	0.75	1	1.25	Ss>=1.5	Value
A	0.80	0.80	0.80	0.80	0.80	0.80	0.80
B	0.90	0.90	0.90	0.90	0.90	0.90	0.90
C	1.30	1.30	1.20	1.20	1.20	1.20	1.30
D	1.60	1.40	1.20	1.10	1.00	1.00	1.60
E	2.40	1.70	1.30	1.20	1.20	1.20	2.40
F	---	---	---	---	---	---	---

Minimum of 1.2 per Section 11.4.4 considered. Exceptions per Section 11.4.8 included.

Table 11.4-2 and IBC 1613.2.3(2)
Site Coefficient, Fv

Site	Mapped Spectral Response Acceleration at 1 Second Period (S1)						Distance
Class	S1<=0.1	0.2	0.3	0.4	0.5	S1>=0.6	Value
A	0.80	0.80	0.80	0.80	0.80	0.80	0.80
B	0.80	0.80	0.80	0.80	0.80	0.80	0.80
C	1.50	1.50	1.50	1.50	1.50	1.40	1.50
D	2.40	2.20	2.00	1.90	1.80	1.70	2.40
E	4.20	3.30	2.80	2.40	2.20	2.00	4.20
F	---	---	---	---	---	---	---

IBC Table 1613.2.5(1) and 11.6-1
eismic Design Category based on Short Period Response Acceleratic

Value of	Occupancy Category			Design	
Sds	I or II	III	IV	Category	Category
Sds <= 0.167	A	A	A	A	A
0.167 <= Sds < 0.33	B	B	C	B	
0.33 <= Sds < 0.5	C	C	D	C	
0.5 <= Sds	D	D	D	D	
S1 >= 0.75	E	E	F	E	

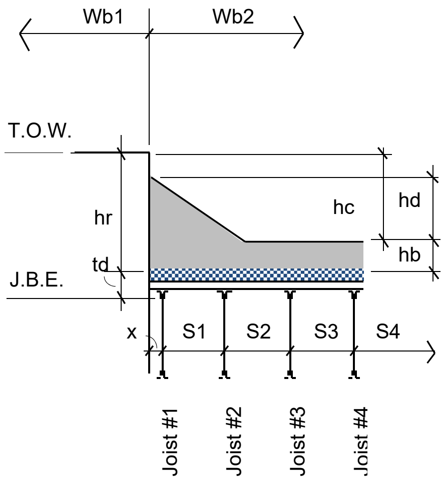
Table 1613.2.5(2) and 11.6-2
Seismic Design Category Based on 1-Second Period Response Acceleration

Value of	Occupancy Category			Design	
Sd1	I or II	III	IV	Category	Category
Sd1 <= 0.067	A	A	A	A	B
0.067 <= Sd1 < 0.133	B	B	C	B	
0.133 <= Sd1 < 0.2	C	C	D	C	
0.2 <= Sd1	D	D	D	D	
S1 >= 0.75	E	E	F	E	

Date	3/10/2022	Sheet No.	of
Project	2220003		
Subject	Snow Drift East/West - 4.93ft Parapet		

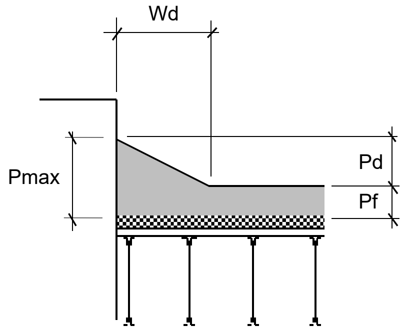
FLAT ROOF SNOW DRIFT - Joists Parallel to Wall

ASCE 7-16



Configuration

Note: For projections, input width of projection for Wb1 and input maximum of leeward and windward drift length for Wb2. For parapets, input the parapet width as Wb1.



Snow Drift

1. **Input**

Dead Load =	**10**	psf
Roof Live Load =	**20**	psf
Pg, Ground Snow Load =	**20**	psf
Drift for parapet, projection, or upper roof?	**P**	(P), (PR) or (U)
Risk Categoy (I, II, III, or IV) =	**II**	Table 1.5-1
Ce, Exposure Factor =	**1.0**	Table 7.3-1
Ct, Thermal Factor =	**1.0**	Table 7.3-2
Use Pg minimum for drift calc's (Pf = Pg)?	**N**	(Y or N)

Geometry

T.O.W., Top of Parapet Elevation =	**40.00**	feet
J.B.E., Joist Bearing Elevation =	**34.42**	feet
td, Thickness of Joist, Deck, and Insulation =	**4.00**	inches
Wb1, length of upper roof =	**0.80**	feet
Wb2, length of lower roof =	**540.00**	feet
x, Joist #1 dist. from wall =	**6.00**	feet
S1, First Joist Spacing =	**6.00**	feet
S2, Second Joist Spacing =	**6.00**	feet
S3, Third Joist Spacing =	**6.00**	feet
S4, Fourth Joist Spacing =	**6.00**	feet
S5, Fifth Joist Spacing =	**6.00**	feet

2. **Balanced Snow Load Check**

Is, Importance Factor =	**1.0**	Table 1.5-2
Pf = 0.7 Ce Ct Is Pg =	**14.00**	psf (7.3-1)
Pm = Is Pg =	**20.00**	psf (7.3.4)
Rain on snow surcharge =	**5.00**	psf (7.10)
Pmin =	**20.00**	psf

3. **Drifted Snow Load Check**

Pf = 0.7 Ce Ct Is Pg =	**14.00**	psf (7.3-1)
D = 0.13 Pg + 14.0 ≤ 30 pcf =	**16.60**	pcf (7.7-1)
hb = Pf/D =	**0.84**	feet
Wb =	**540.00**	feet
hd = 0.75[0.43 Wb2^1/3 (Pg+10)^1/4-1.5] Is^1	**5.01**	feet (Fig. 7.6-1)
hd + hb =	**5.85**	feet
hr =	**5.25**	feet
hc = hr - hb =	**4.40**	feet
Wd = 4 hd or 4 [hd^2/hc] ≤ 8 hc =	**22.79**	feet
Pmax = D (hd + hb) ≤ D hr =	**87.09**	psf
Pd =D hd ≤ D hc =	**73.09**	psf

4. **Uniform Load Summary**

Drifted Snow Load

	Snow	Total	
w, wall	**246.8**	**276.8**	plf *
w, Joist #1	**407.1**	**467.1**	plf *
w, Joist #2	**291.6**	**351.6**	plf *
w, Joist #3	**176.1**	**236.1**	plf *
w, Joist #4	**101.2**	**161.2**	plf
w, Joist #5	**84.0**	**144.0**	plf

Balanced Load Check

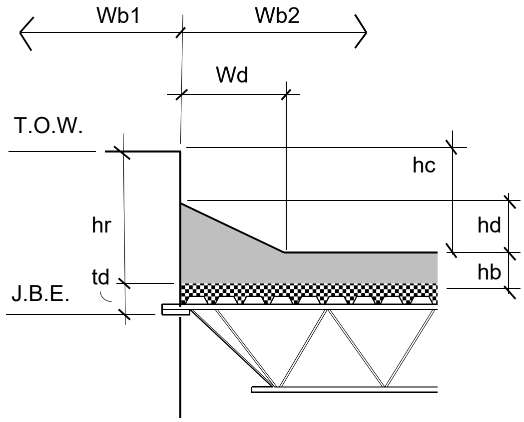
	Pmin (20 psf)	Total	
w, wall	**60.0**	**90.0**	plf
w, Joist #1	**120.0**	**180.0**	plf
w, Joist #2	**120.0**	**180.0**	plf
w, Joist #3	**120.0**	**180.0**	plf
w, Joist #4	**120.0**	**180.0**	plf *
w, Joist #5	**120.0**	**180.0**	plf *

* indicates controlling load (drifted vs. undrifted)

WALLACE DESIGN PROGRAM
Revised 05/20/19, Carrie Johnson

Date	3/10/2022	Sheet No.	of
Project	2220003		
Subject	North Drift 40'-0"		

FLAT ROOF SNOW DRIFT - Joists Perpendicular to Wall
ASCE 7-16



Configuration

Note: For projections, input width of projection for Wb1 and input maximum of leeward and windward drift length for Wb2. For parapets, input the parapet width as Wb1.

1. **Input**

Dead Load =	**10**	psf
Roof Live Load =	**20**	psf
Pg, Ground Snow Load =	**20**	psf
Drift for parapet, projection, or upper roof?	**P**	(P), (PR) or (U)
Risk Category (I, II, III, or IV) =	**II**	Table 1.5-1
Ce, Exposure Factor =	**1.00**	Table 7.3-1
Ct, Thermal Factor =	**1.00**	Table 7.3-2
Use Pg minimum for drift calc's (Pf = Pg)?	**N**	(Y or N)

Geometry

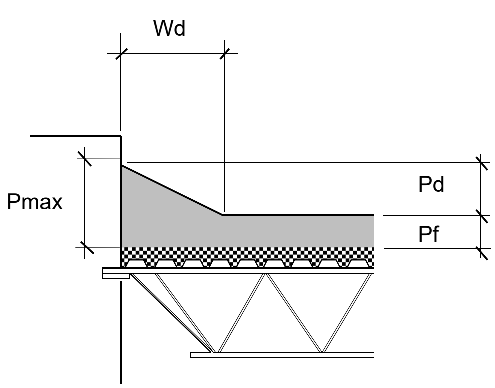
T.O.W., Top of Parapet Elevation =	**40.00**	feet
J.B.E., Joist Bearing Elevation =	**37.58**	feet
td, Thickness of Joist, Deck, and Insulation =	**4.00**	inches
Wb1, length of upper roof =	**0.67**	feet
Wb2, length of lower roof =	**210.00**	feet
S, Joist Spacing =	**6.00**	feet
L, Joist Span =	**50.00**	feet

2. **Balanced Snow Load Check**

Is, Importance Factor =	**1.00**	Table 1.5-2
Pf = 0.7 Ce Ct Is Pg =	**14.00**	psf (7.3-1)
Pm = Is Pg =	**20.00**	psf (7.3.4)
Rain on snow surcharge =	**5.00**	psf (7.10)
Pmin =	**20.00**	psf

3. **Drifted Snow Load Check**

Pf = 0.7 Ce Ct Is Pg =	**14.00**	psf
D = 0.13 Pg + 14.0 ≤ 30 pcf =	**16.60**	pcf
hb = Pf/D =	**0.84**	ft
Wb =	**210.00**	ft
hd = 0.75[0.43 Wb2^1/3 (Pg+10)^1/4-1.5] Is^2	**3.35**	ft
hd + hb =	**4.20**	ft
hr =	**2.09**	ft
hc = hr - hb =	**1.24**	ft
Wd = 4 hd or 4 [hd^2/hc] ≤ 8 hc =	**9.95**	ft
Pmax = D (hd + hb) ≤ D hr =	**34.64**	psf
Pd =D hd ≤ D hc =	**20.64**	psf



Snow Drift

4. **Uniform Load Summary**

Drifted Snow Load

	Snow	Total	
R left =	**2675.0**	**4175.0**	lbs
R right =	**2140.8**	**3640.8**	lbs
M max =	**27280.8**	**46026.7**	ft-lbs
w base =	**84.0**	**144.0**	plf
w drift =	**123.8**	**183.8**	plf
w equiv =	**107.0**	**167.0**	plf

Load Without Drift

	Live	Total	
w (Live = 20 psf) =	**120.0**	**180.0**	plf *

1
* indicates controlling load (drifted vs. undrifted)

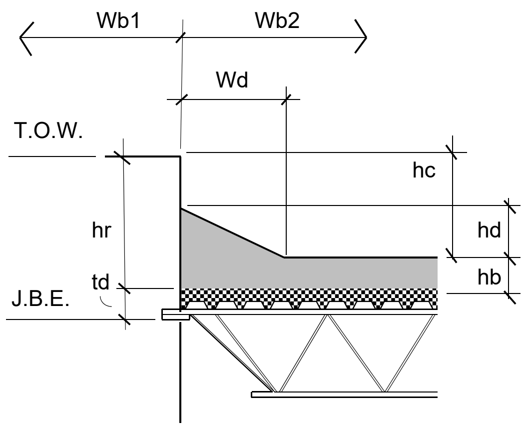
WALLACE DESIGN PROGRAM

Revised 05/20/19, Carrie Johnson

Date	3/10/2022	Sheet No.	of
Project	2220003		
Subject	North Drift 40.542ft wall		

FLAT ROOF SNOW DRIFT - Joists Perpendicular to Wall

ASCE 7-16



Configuration

Note: For projections, input width of projection for Wb1 and input maximum of leeward and windward drift length for Wb2. For parapets, input the parapet width as Wb1.

1. **Input**

Dead Load =	**10**	psf
Roof Live Load =	**20**	psf
Pg, Ground Snow Load =	**20**	psf
Drift for parapet, projection, or upper roof?	**P**	(P), (PR) or (U)
Risk Category (I, II, III, or IV) =	**II**	Table 1.5-1
Ce, Exposure Factor =	**1.00**	Table 7.3-1
Ct, Thermal Factor =	**1.00**	Table 7.3-2
Use Pg minimum for drift calc's (Pf = Pg)?	**N**	(Y or N)

Geometry

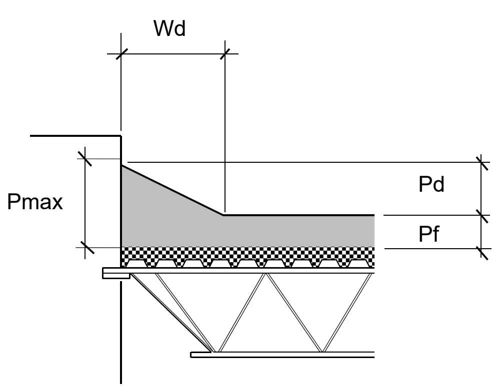
T.O.W., Top of Parapet Elevation =	**42.00**	feet
J.B.E., Joist Bearing Elevation =	**37.58**	feet
td, Thickness of Joist, Deck, and Insulation =	**4.00**	inches
Wb1, length of upper roof =	**0.67**	feet
Wb2, length of lower roof =	**210.00**	feet
S, Joist Spacing =	**6.00**	feet
L, Joist Span =	**50.00**	feet

2. **Balanced Snow Load Check**

Is, Importance Factor =	**1.00**	Table 1.5-2
Pf = 0.7 Ce Ct Is Pg =	**14.00**	psf (7.3-1)
Pm = Is Pg =	**20.00**	psf (7.3.4)
Rain on snow surcharge =	**5.00**	psf (7.10)
Pmin =	**20.00**	psf

3. **Drifted Snow Load Check**

Pf = 0.7 Ce Ct Is Pg =	**14.00**	psf
D = 0.13 Pg + 14.0 ≤ 30 pcf =	**16.60**	pcf
hb = Pf/D =	**0.84**	ft
Wb =	**210.00**	ft
hd = 0.75[0.43 Wb2^1/3 (Pg+10)^1/4-1.5] Is^2	**3.35**	ft
hd + hb =	**4.20**	ft
hr =	**4.09**	ft
hc = hr - hb =	**3.24**	ft
Wd = 4 hd or 4 [hd^2/hc] ≤ 8 hc =	**13.87**	ft
Pmax = D (hd + hb) ≤ D hr =	**67.84**	psf
Pd =D hd ≤ D hc =	**53.84**	psf



Snow Drift

4. **Uniform Load Summary**

Drifted Snow Load

	Snow	Total	
R left =	**4132.8**	**5632.8**	lbs
R right =	**2307.1**	**3807.1**	lbs
M max =	**31682.3**	**50325.9**	ft-lbs
w base =	**84.0**	**144.0**	plf
w drift =	**323.0**	**383.0**	plf
w equiv =	**165.3**	**225.3**	plf *

Load Without Drift

	Live	Total	
w (Live = 20 psf) =	**120.0**	**180.0**	plf

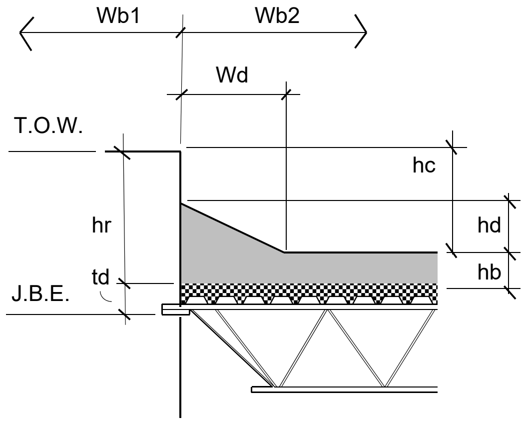
1

* indicates controlling load (drifted vs. undrifted)

WALLACE DESIGN PROGRAM
Revised 05/20/19, Carrie Johnson

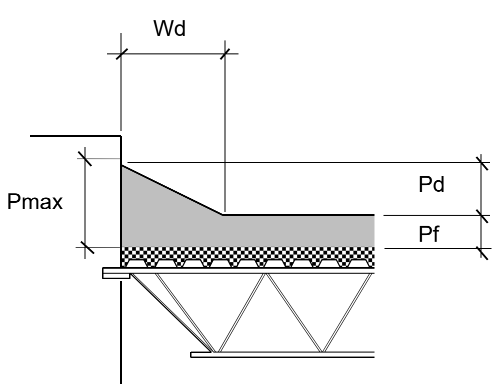
Date	3/10/2022	Sheet No.	of
Project	2220003		
Subject	South Drift 37.542ft wall		

FLAT ROOF SNOW DRIFT - Joists Perpendicular to Wall
ASCE 7-16



Configuration

Note: For projections, input width of projection for Wb1 and input maximum of leeward and windward drift length for Wb2. For parapets, input the parapet width as Wb1.



Snow Drift

1. **Input**

Dead Load =	**10**	psf
Roof Live Load =	**20**	psf
Pg, Ground Snow Load =	**20**	psf
Drift for parapet, projection, or upper roof?	**P**	(P), (PR) or (U)
Risk Category (I, II, III, or IV) =	**II**	Table 1.5-1
Ce, Exposure Factor =	**1.00**	Table 7.3-1
Ct, Thermal Factor =	**1.00**	Table 7.3-2
Use Pg minimum for drift calc's (Pf = Pg)?	**N**	(Y or N)

Geometry

T.O.W., Top of Parapet Elevation =	**37.50**	feet
J.B.E., Joist Bearing Elevation =	**34.42**	feet
td, Thickness of Joist, Deck, and Insulation =	**4.00**	inches
Wb1, length of upper roof =	**0.67**	feet
Wb2, length of lower roof =	**210.00**	feet
S, Joist Spacing =	**6.00**	feet
L, Joist Span =	**50.00**	feet

2. **Balanced Snow Load Check**

Is, Importance Factor =	**1.00**	Table 1.5-2
Pf = 0.7 Ce Ct Is Pg =	**14.00**	psf (7.3-1)
Pm = Is Pg =	**20.00**	psf (7.3.4)
Rain on snow surcharge =	**5.00**	psf (7.10)
Pmin =	**20.00**	psf

3. **Drifted Snow Load Check**

Pf = 0.7 Ce Ct Is Pg =	**14.00**	psf
D = 0.13 Pg + 14.0 ≤ 30 pcf =	**16.60**	pcf
hb = Pf/D =	**0.84**	ft
Wb =	**210.00**	ft
hd = 0.75[0.43 Wb2^1/3 (Pg+10)^1/4-1.5] Is^2	**3.35**	ft
hd + hb =	**4.20**	ft
hr =	**2.75**	ft
hc = hr - hb =	**1.90**	ft
Wd = 4 hd or 4 [hd^2/hc] ≤ 8 hc =	**15.23**	ft
Pmax = D (hd + hb) ≤ D hr =	**45.59**	psf
Pd =D hd ≤ D hc =	**31.59**	psf

4. **Uniform Load Summary**

Drifted Snow Load

	Snow	Total	
R left =	**3396.7**	**4896.7**	lbs
R right =	**2246.5**	**3746.5**	lbs
M max =	**30040.2**	**48737.0**	ft-lbs
w base =	**84.0**	**144.0**	plf
w drift =	**189.6**	**249.6**	plf
w equiv =	**135.9**	**195.9**	plf *

Load Without Drift

	Live	Total	
w (Live = 20 psf) =	**120.0**	**180.0**	plf

1
* indicates controlling load (drifted vs. undrifted)

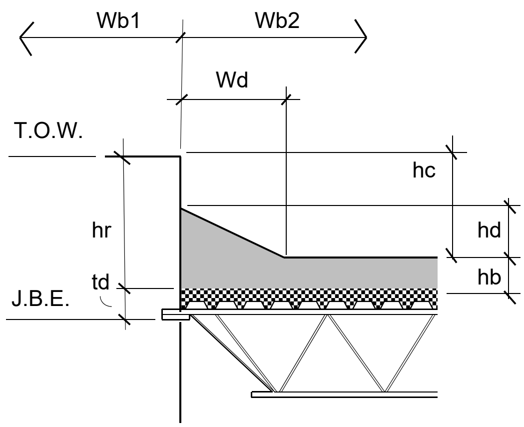
WALLACE DESIGN PROGRAM

Revised 05/20/19, Carrie Johnson

Date	3/10/2022	Sheet No.	of
Project	2220003		
Subject	South Drift 37.542ft wall		

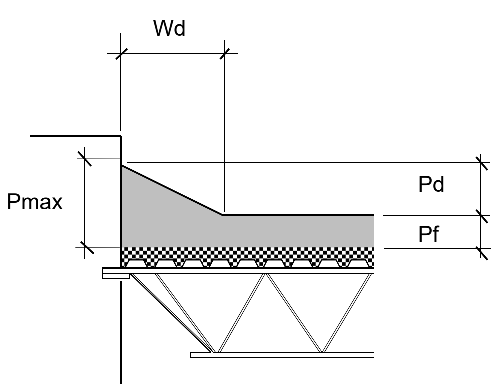
FLAT ROOF SNOW DRIFT - Joists Perpendicular to Wall

ASCE 7-16



Configuration

Note: For projections, input width of projection for Wb1 and input maximum of leeward and windward drift length for Wb2. For parapets, input the parapet width as Wb1.



Snow Drift

1. **Input**

Dead Load =	**10**	psf
Roof Live Load =	**20**	psf
Pg, Ground Snow Load =	**20**	psf
Drift for parapet, projection, or upper roof?	**P**	(P), (PR) or (U)
Risk Category (I, II, III, or IV) =	**II**	Table 1.5-1
Ce, Exposure Factor =	**1.00**	Table 7.3-1
Ct, Thermal Factor =	**1.00**	Table 7.3-2
Use Pg minimum for drift calc's (Pf = Pg)?	**N**	(Y or N)

Geometry

T.O.W., Top of Parapet Elevation =	**37.50**	feet
J.B.E., Joist Bearing Elevation =	**33.29**	feet
td, Thickness of Joist, Deck, and Insulation =	**4.00**	inches
Wb1, length of upper roof =	**0.67**	feet
Wb2, length of lower roof =	**210.00**	feet
S, Joist Spacing =	**6.00**	feet
L, Joist Span =	**60.00**	feet

2. **Balanced Snow Load Check**

Is, Importance Factor =	**1.00**	Table 1.5-2
Pf = 0.7 Ce Ct Is Pg =	**14.00**	psf (7.3-1)
Pm = Is Pg =	**20.00**	psf (7.3.4)
Rain on snow surcharge =	**5.00**	psf (7.10)
Pmin =	**20.00**	psf

3. **Drifted Snow Load Check**

Pf = 0.7 Ce Ct Is Pg =	**14.00**	psf
D = 0.13 Pg + 14.0 ≤ 30 pcf =	**16.60**	pcf
hb = Pf/D =	**0.84**	ft
Wb =	**210.00**	ft
hd = 0.75[0.43 Wb2^1/3 (Pg+10)^1/4-1.5] Is^2	**3.35**	ft
hd + hb =	**4.20**	ft
hr =	**3.88**	ft
hc = hr - hb =	**3.03**	ft
Wd = 4 hd or 4 [hd^2/hc] ≤ 8 hc =	**14.83**	ft
Pmax = D (hd + hb) ≤ D hr =	**64.35**	psf
Pd =D hd ≤ D hc =	**50.35**	psf

4. **Uniform Load Summary**

Drifted Snow Load

	Snow	Total	
R left =	**4575.4**	**6375.4**	lbs
R right =	**2704.5**	**4504.5**	lbs
M max =	**43538.1**	**70453.6**	ft-lbs
w base =	**84.0**	**144.0**	plf
w drift =	**302.1**	**362.1**	plf
w equiv =	**152.5**	**212.5**	plf *

Load Without Drift

	Live	Total	
w (Live = 20 psf) =	**120.0**	**180.0**	plf

1

* indicates controlling load (drifted vs. undrifted)

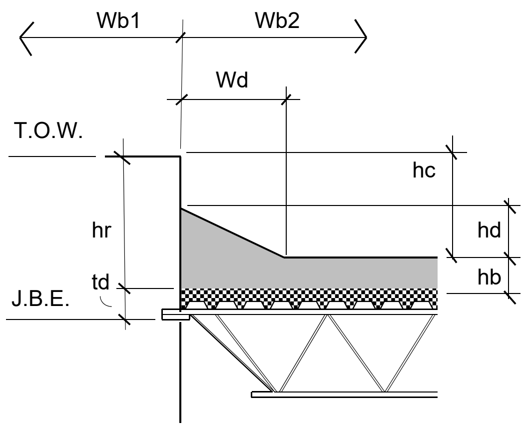
WALLACE DESIGN PROGRAM

Revised 05/20/19, Carrie Johnson

Date	3/10/2022	Sheet No.	of
Project	2220003		
Subject	South Drift 38.98ft wall		

FLAT ROOF SNOW DRIFT - Joists Perpendicular to Wall

ASCE 7-16



Configuration

Note: For projections, input width of projection for Wb1 and input maximum of leeward and windward drift length for Wb2. For parapets, input the parapet width as Wb1.

1. **Input**

Dead Load =	**10**	psf
Roof Live Load =	**20**	psf
Pg, Ground Snow Load =	**20**	psf
Drift for parapet, projection, or upper roof?	**P**	(P), (PR) or (U)
Risk Category (I, II, III, or IV) =	**II**	Table 1.5-1
Ce, Exposure Factor =	**1.00**	Table 7.3-1
Ct, Thermal Factor =	**1.00**	Table 7.3-2
Use Pg minimum for drift calc's (Pf = Pg)?	**N**	(Y or N)

Geometry

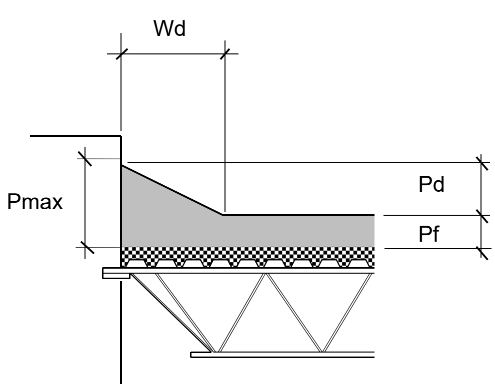
T.O.W., Top of Parapet Elevation =	**38.50**	feet
J.B.E., Joist Bearing Elevation =	**34.42**	feet
td, Thickness of Joist, Deck, and Insulation =	**4.00**	inches
Wb1, length of upper roof =	**0.67**	feet
Wb2, length of lower roof =	**210.00**	feet
S, Joist Spacing =	**6.00**	feet
L, Joist Span =	**50.00**	feet

2. **Balanced Snow Load Check**

Is, Importance Factor =	**1.00**	Table 1.5-2
Pf = 0.7 Ce Ct Is Pg =	**14.00**	psf (7.3-1)
Pm = Is Pg =	**20.00**	psf (7.3.4)
Rain on snow surcharge =	**5.00**	psf (7.10)
Pmin =	**20.00**	psf

3. **Drifted Snow Load Check**

Pf = 0.7 Ce Ct Is Pg =	**14.00**	psf
D = 0.13 Pg + 14.0 ≤ 30 pcf =	**16.60**	pcf
hb = Pf/D =	**0.84**	ft
Wb =	**210.00**	ft
hd = 0.75[0.43 Wb2^1/3 (Pg+10)^1/4-1.5] Is^2	**3.35**	ft
hd + hb =	**4.20**	ft
hr =	**3.75**	ft
hc = hr - hb =	**2.90**	ft
Wd = 4 hd or 4 [hd^2/hc] ≤ 8 hc =	**15.49**	ft
Pmax = D (hd + hb) ≤ D hr =	**62.19**	psf
Pd =D hd ≤ D hc =	**48.19**	psf



Snow Drift

4. **Uniform Load Summary**

Drifted Snow Load

	Snow	Total	
R left =	**4108.5**	**5608.5**	lbs
R right =	**2331.3**	**3831.3**	lbs
M max =	**32351.8**	**50969.1**	ft-lbs
w base =	**84.0**	**144.0**	plf
w drift =	**289.2**	**349.2**	plf
w equiv =	**164.3**	**224.3**	plf *

Load Without Drift

	Live	Total	
w (Live = 20 psf) =	**120.0**	**180.0**	plf

1

* indicates controlling load (drifted vs. undrifted)

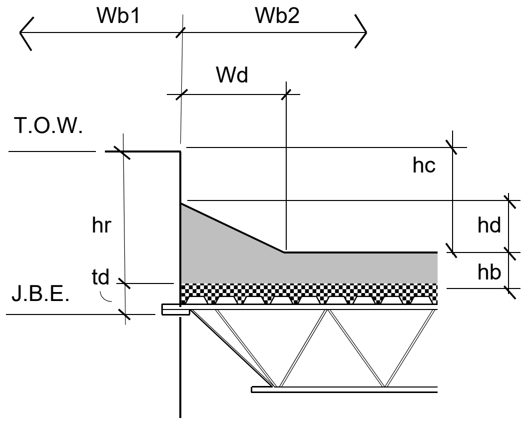
WALLACE DESIGN PROGRAM

Revised 05/20/19, Carrie Johnson

Date	3/10/2022	Sheet No.	of
Project	2220003		
Subject	South Drift 38.98ft wall		

FLAT ROOF SNOW DRIFT - Joists Perpendicular to Wall

ASCE 7-16



Configuration

Note: For projections, input width of projection for Wb1 and input maximum of leeward and windward drift length for Wb2. For parapets, input the parapet width as Wb1.

1. Input

Dead Load =	**10**	psf
Roof Live Load =	**20**	psf
Pg, Ground Snow Load =	**20**	psf
Drift for parapet, projection, or upper roof?	**P**	(P), (PR) or (U)
Risk Category (I, II, III, or IV) =	**II**	Table 1.5-1
Ce, Exposure Factor =	**1.00**	Table 7.3-1
Ct, Thermal Factor =	**1.00**	Table 7.3-2
Use Pg minimum for drift calc's (Pf = Pg)?	**N**	(Y or N)

Geometry

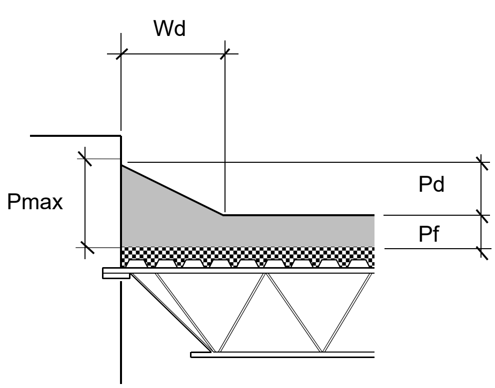
T.O.W., Top of Parapet Elevation =	**38.50**	feet
J.B.E., Joist Bearing Elevation =	**33.29**	feet
td, Thickness of Joist, Deck, and Insulation =	**4.00**	inches
Wb1, length of upper roof =	**0.67**	feet
Wb2, length of lower roof =	**210.00**	feet
S, Joist Spacing =	**6.00**	feet
L, Joist Span =	**50.00**	feet

2. Balanced Snow Load Check

Is, Importance Factor =	**1.00**	Table 1.5-2
Pf = 0.7 Ce Ct Is Pg =	**14.00**	psf (7.3-1)
Pm = Is Pg =	**20.00**	psf (7.3.4)
Rain on snow surcharge =	**5.00**	psf (7.10)
Pmin =	**20.00**	psf

3. Drifted Snow Load Check

Pf = 0.7 Ce Ct Is Pg =	**14.00**	psf
D = 0.13 Pg + 14.0 ≤ 30 pcf =	**16.60**	pcf
hb = Pf/D =	**0.84**	ft
Wb =	**210.00**	ft
hd = 0.75[0.43 Wb2^1/3 (Pg+10)^1/4-1.5] Is^2	**3.35**	ft
hd + hb =	**4.20**	ft
hr =	**4.88**	ft
hc = hr - hb =	**4.03**	ft
Wd = 4 hd or 4 [hd^2/hc] ≤ 8 hc =	**13.41**	ft
Pmax = D (hd + hb) ≤ D hr =	**69.66**	psf
Pd =D hd ≤ D hc =	**55.66**	psf



Snow Drift

4. Uniform Load Summary

Drifted Snow Load

	Snow	Total	
R left =	**4139.6**	**5639.6**	lbs
R right =	**2300.3**	**3800.3**	lbs
M max =	**31496.0**	**50146.5**	ft-lbs
w base =	**84.0**	**144.0**	plf
w drift =	**334.0**	**394.0**	plf
w equiv =	**165.6**	**225.6**	plf *

Load Without Drift

	Live	Total	
w (Live = 20 psf) =	**120.0**	**180.0**	plf

1

* indicates controlling load (drifted vs. undrifted)

BUILDING GEOMETRY

Building Width $W := 540\ ft$

Building Depth $D := 210\ ft + 10\ in$

	North Elevation	South Elevation
Bottom of Deck	$BOD_N := 37\ ft + 11\ in$	$BOD_S := 33\ ft + 7.5\ in$
Bottom of Wall	$BOW_N := 0\ ft$	$BOW_S := -4\ ft$
Top of Wall (Max)	$TOW_{N\_MAX} := 42\ ft$	$TOW_{S\_MAX} := 38.5\ ft$

	East Elevation	West Elevation
Bottom of Deck - Eave	$BOD_{EE} := BOD_S$	$BOD_{WE} := BOD_S$
Bottom of Deck - Ridge	$BOD_{ER} := BOD_N$	$BOD_{WR} := BOD_N$
Bottom of Wall	$BOW_E := 0\ ft$	$BOW_W := 0\ ft$
Top of Wall (Max)	$TOW_{E\_MAX} := 42\ ft$	$TOW_{W\_MAX} := 42\ ft$

MWFRS - NORTH/SOUTH

ROOF REACTIONS (1.0W, LRFD)

FOR NORTH WALL $w_w := 29.1\ psf$ $w_p := 67.9\ psf$

Typical Wall $parapet := 40\ ft - BOD_N = 2.08\ ft$

$$R_{N\_typ} := w_w \cdot \frac{(BOD_N - BOW_N)}{2} + w_p \cdot parapet = 693.15\ plf$$

Max. Parapet $parapet := TOW_{N\_MAX} - BOD_N = 4.08\ ft$

$$R_{N\_max} := w_w \cdot \frac{(BOD_N - BOW_N)}{2} + w_p \cdot parapet = 828.95\ plf$$

FOR SOUTH WALL $w_w := 29.1\ psf$ $w_p := 66.6\ psf$

Typical Wall $parapet := 37.5\ ft - BOD_S = 3.88\ ft$

$$R_{S\_typ} := w_w \cdot \frac{(BOD_S - BOW_S)}{2} + w_p \cdot parapet = 805.52\ plf$$

Corner Wall $parapet := TOW_{S\_MAX} - BOD_S = 4.88\ ft$

$$R_{S\_typ} := w_w \cdot \frac{(BOD_S - 0\ ft)}{2} + w_p \cdot parapet = 813.92\ plf$$

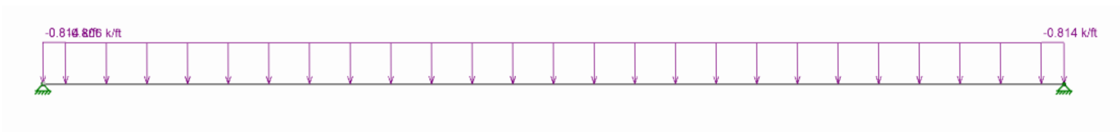
SOUTH EXPOSURE CONTROLS ROOF REACTION

wallace
design
collective

Date 03/10/2022
Job 2220003 Building 2
Subject MWFRS Analysis

DIAPHRAGM FORCES

GRID A-L



Reactions	$R_{u1} := 217.7\ \textbf{kip}$	(LRFD)	$R_{u2} := 217.7\ \textbf{kip}$	(LRFD)
	$R_1 := 0.6 \cdot R_{u1} = 130.62\ \textbf{kip}$	(ASD)	$R_2 := 0.6 \cdot R_{u2} = 130.62\ \textbf{kip}$	(ASD)
	$M_{u1} := 29379.3\ \textbf{kip} \cdot \textbf{ft}$	(LRFD)	$M_1 := 17627.6\ \textbf{kip} \cdot \textbf{ft}$	(ASD)
Chord Force	$P_{u1} := \dfrac{M_{u1}}{D} = 139.35\ \textbf{kip}$	(LRFD)	$P_1 := 0.6 \cdot P_{u1} = 83.61\ \textbf{kip}$	(ASD)

DIAPHRAGM SHEAR

Grid A	$v_u := \dfrac{R_{u1}}{D} = 1032.57\ \textbf{plf}$	(LRFD)	$v := \dfrac{R_1}{D} = 619.54\ \textbf{plf}$	(ASD)
Grid L	$v_u := \dfrac{R_{u2}}{D} = 1032.57\ \textbf{plf}$	(LRFD)	$v := \dfrac{R_2}{D} = 619.54\ \textbf{plf}$	(ASD)

MWFRS - EAST/WEST

ROOF REACTIONS (1.0W, LRFD)

$w_w := 24.1\ \mathbf{psf} \qquad w_p := 67.9\ \mathbf{psf}$

Roof Slope $\quad m := \dfrac{BOD_{ER} - BOD_{EE}}{D} = 0.02 \qquad \theta := \operatorname{atan}(m) = 1.17\ \mathbf{deg}$

EVALUATE STEPPED WALL PRESSURES FROM EAVE END

Typical Wall $\quad TOW_{typ} := 40\ \mathbf{ft}$

Wall Panel 1 $\quad L_1 := 54\ \mathbf{ft} + 10\ \mathbf{in} \qquad H := 38.5\ \mathbf{ft}$

Start $\quad BOD_i := BOD_{EE}$

$$R_i := w_w \cdot \frac{(BOD_i - BOW_E)}{2} + w_p \cdot (H - BOD_i) = 736.19\ \mathbf{plf}$$

End $\quad BOD_j := 34.75\ \mathbf{ft}$

$$R_j := w_w \cdot \frac{(BOD_j - BOW_E)}{2} + w_p \cdot (H - BOD_j) = 673.36\ \mathbf{plf}$$

Wall Panel 2 $\quad L_2 := 96\ \mathbf{ft} \qquad H := TOW_{typ} = 40\ \mathbf{ft}$

Start $\quad BOD_i := 34.75\ \mathbf{ft}$

$$R_i := w_w \cdot \frac{(BOD_i - BOW_E)}{2} + w_p \cdot (H - BOD_i) = 775.21\ \mathbf{plf}$$

End $\quad BOD_j := 34.75\ \mathbf{ft} + m \cdot L_2 = 36.7\ \mathbf{ft}$

$$R_j := w_w \cdot \frac{(BOD_j - BOW_E)}{2} + w_p \cdot (H - BOD_j) = 666.07\ \mathbf{plf}$$

Wall Panel 3 $\quad L_3 := 60\ \mathbf{ft} \qquad H := TOW_{E\_MAX} = 42\ \mathbf{ft}$

Start $\quad BOD_i := 34.75\ \mathbf{ft} + m \cdot L_2 = 36.7\ \mathbf{ft}$

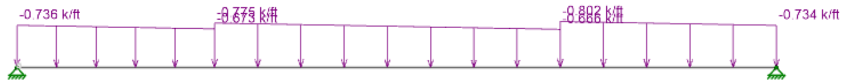
$$R_i := w_w \cdot \frac{(BOD_i - BOW_E)}{2} + w_p \cdot (H - BOD_i) = 801.87\ \mathbf{plf}$$

End $\quad BOD_j := BOD_{ER} = 37.92\ \mathbf{ft}$

$$R_j := w_w \cdot \frac{(BOD_j - BOW_E)}{2} + w_p \cdot (H - BOD_j) = 734.15\ \mathbf{plf}$$

DIAPHRAGM FORCES

GRID 1-5



Reactions	$R_{u1} := 76.2\ \mathbf{kip}$	(LRFD)	$R_{u2} := 77.7\ \mathbf{kip}$	(LRFD)
	$R_1 := 0.6 \cdot R_{u1} = 45.72\ \mathbf{kip}$	(ASD)	$R_2 := 0.6 \cdot R_{u2} = 46.62\ \mathbf{kip}$	(ASD)
	$M_{u1} := 4033.8\ \mathbf{kip} \cdot \mathbf{ft}$	(LRFD)	$M_1 := 0.6 \cdot M_{u1} = 2420.28\ \mathbf{kip} \cdot \mathbf{ft}$	(ASD)
Chord Force	$P_{u1} := \frac{M_{u1}}{W} = 7.47\ \mathbf{kip}$	(LRFD)	$P_1 := 0.6 \cdot P_{u1} = 4.48\ \mathbf{kip}$	(ASD)

DIAPHRAGM SHEAR

Grid 1	$v_u := \frac{R_{u2}}{W} = 143.89\ \mathbf{plf}$	(LRFD)	$v := \frac{R_2}{W} = 86.33\ \mathbf{plf}$	(ASD)
Grid 5	$v_u := \frac{R_{u1}}{W} = 141.11\ \mathbf{plf}$	(LRFD)	$v := \frac{R_1}{W} = 84.67\ \mathbf{plf}$	(ASD)

CHECK FOR TOTAL SEISMIC FORCE

SDC C by ASCE 7-10, Intermediate Precast Shear Walls required

1.0E = 0.029W $C_s := 0.029$ *(LRFD)*

0.7E = 0.020W $C_s := 0.020$ *(ASD)*

ASSUME PRECAST CONCRETE WALL $t := 9.25\ \mathbf{in}$

$w_w := 150\ \mathbf{pcf} \cdot t = 115.63\ \mathbf{psf}$

	Average Wall Height	Average Tributary
NORTH ELEVATION	$h_N := 41.16\ \mathbf{ft}$	$t_N := 21.97\ \mathbf{ft}$
SOUTH ELEVATION	$h_S := 41.37\ \mathbf{ft}$	$t_S := 22.65\ \mathbf{ft}$
EAST/WEST ELEVATION	$h_{EW} := 40.18\ \mathbf{ft}$	$t_{EW} := 22.3\ \mathbf{ft}$

FOR NORTH-SOUTH SEISMIC DIRECTION

Total Weight $W_{NS} := 12\ \mathbf{psf} \cdot W \cdot D + w_w \cdot W \cdot \left(t_N + t_S\right) = 4152.16\ \mathbf{kip}$

$V := C_s \cdot W_{NS} = 83.04\ \mathbf{kip}$ $w := \dfrac{V}{W} = 153.78\ \mathbf{plf}$

Diaphragm Forces
Grid (A) + (L) $R := w \cdot \dfrac{W}{2} = 41.52\ \mathbf{kip}$ $v := \dfrac{R}{D} = 196.94\ \mathbf{plf}$

Chord Force $M := \dfrac{w \cdot W^2}{8} = 5605.42\ \mathbf{kip} \cdot \mathbf{ft}$ $P := \dfrac{M}{D} = 26.59\ \mathbf{kip}$

WIND CONTROLS DESIGN FOR NORTH-SOUTH DIRECTION

FOR EAST-WEST SEISMIC DIRECTION

Total Weight $W_{EW} := 12\ \mathbf{psf} \cdot W \cdot D + w_w \cdot D \cdot 2 \cdot t_{EW} = 2453.44\ \mathbf{kip}$

$V := C_s \cdot W_{EW} = 49.07\ \mathbf{kip}$ $w := \dfrac{V}{D} = 232.74\ \mathbf{plf}$

Diaphragm Forces
Grid (1) + (5) $R := w \cdot \dfrac{D}{2} = 24.53\ \mathbf{kip}$ $v := \dfrac{R}{W} = 45.43\ \mathbf{plf}$

Chord Force $M := \dfrac{w \cdot D^2}{8} = 1293.17\ \mathbf{kip} \cdot \mathbf{ft}$ $P := \dfrac{M}{W} = 2.39\ \mathbf{kip}$

WIND CONTROLS DESIGN FOR EAST-WEST DIRECTION

DIAPHRAGM CHORD

Maximum Force $P_u := 139.35\ kip$ from MWFRS (North/South)

$P := 83.61\ kip$

Tension $P_n = F_y \cdot A_g$ $F_y := 36\ ksi$ for A36 angle

$\Omega := 1.67$

$$A_{req} := \frac{P \cdot \Omega}{F_y} = 3.879\ in^2$$

Compression L = 6'-0" max. Refer to AISC Table 4-11

Try L6x6x3/8 $\frac{P_n}{\Omega} = 72.2\ kip < P$

Select L6x6x7/16 $\frac{P_n}{\Omega} = 88.1\ kip > P$ *OK*

Splice Check (2) 1/2x 5 Plate

$$A := \frac{1}{2}\ in \cdot 5\ in \cdot 2 = 5\ in^2$$ $A > A_{req}$

For 1/4 fillet weld

$$L_{req} := \frac{P}{0.928\ ksi \cdot 4\ in \cdot 2} = 11.262\ in$$

Provide 12 in weld (min.)

OR Utilize square weld to splice angles as
$F_{Exx} > Fy$ in lieu of splice plates

DIAPHRAGM CHORD

Maximum Force $P_u := 7.47\ \mathbf{kip}$ from MWFRS (East/West)

$P := 4.48\ \mathbf{kip}$

Tension $P_n = F_y \cdot A_g$ $F_y := 36\ \mathbf{ksi}$ for A36 angle

$\Omega := 1.67$

$$A_{req} := \frac{P \cdot \Omega}{F_y} = 0.208\ \mathbf{in}^2$$

Compression L = 4'-0" by maximum embed spacing
Refer to AISC Table 4-12

Try L4x4x3/8 $\frac{P_n}{\Omega} = 29.6\ kip > P$ *OK*

Splice Check 3/8 x 3 Plate

$A := \frac{3}{8}\ \mathbf{in} \cdot 3\ \mathbf{in} = 1.125\ \mathbf{in}^2$ $A > A_{req}$ *OK*

For 3/16 fillet weld

$$L_{req} := \frac{P}{0.928\ \mathbf{ksi} \cdot 3\ \mathbf{in} \cdot 2} = 0.805\ \mathbf{in}$$

Provide 3 in weld (min.)

WALL PANEL ANCHORAGE

Concrete Wall Thickness

$t := 9.25\ in$

$w_T := 150\ pcf \cdot t = 115.625\ psf$

$P := \max\left(0.2 \cdot w_T, 5\ psf\right) = 23.125\ psf$

Wind Wall Pressure

$A_T := 500\ ft^2$

$w_{wall} := 23.3\ psf$

$w_{parapets} := 51.3\ psf$

Lateral Loads

$w_{wind} := 0.6 \cdot 829\ plf = 497.4\ plf$ from North elevation max parapet

$w_{seismic} := 233\ plf$ from East/West elevation

Gravity Loads

$w_{deck} := 287\ plf$ Joist Parallel

$w_{joist} := \dfrac{6.8\ kip}{6\ ft} = 1133.333\ plf$ Joist Perpendicular

JOIST BEARING CONDITION

Max. Joist Spacing $s := 6\ ft$

Max. Diaphragm Shear $R_{dia} := 86.33\ plf \cdot s = 0.518\ kip$

Anchorage of Walls $R_{anchor} := w_{wind} \cdot s = 2.984\ kip$

Check standard seat weld (1/8" fillet x 2" long ea. side)

$R_{tot} := R_{dia} + R_{anchor} = 3.502\ kip$

$R_{n\Omega} := 0.928\ ksi \cdot 2\ in \cdot 2\ in \cdot 2 = 7.424\ kip$ $\dfrac{R_n}{\Omega} > R_{tot}$ *OK*

JOIST PARALLEL CONDITION

ANCHORAGE EMBED AT 4'-0"o.c. MAX - CHECK L4x4x3/8

$w_{grav} := w_{deck} = 287\ plf$

$w_{axial} := 619.54\ plf$ *ANGLE IS ADEQUATE*

$w_{anchor} := 801.87\ plf$ max.

Check attachment to embed for 3/16 fillet

$P_{grav} := w_{grav} \cdot 4\ ft = 1.148\ kip$ $P_{anchor} := w_{anchor} \cdot 4\ ft = 3.207\ kip$

$P_{axial} := w_{axial} \cdot 4\ ft = 2.478\ kip$ $P_{moment} := \dfrac{P_{grav} \cdot 3\ in}{4\ in} + \dfrac{P_{anchor} \cdot 3\ in}{4\ in} = 3.267\ kip$

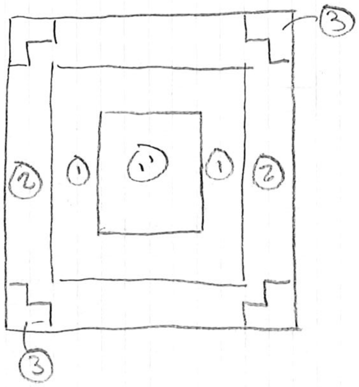
$P_{tot} := P_{grav} + P_{axial} + P_{anchor} + P_{moment} = 10.1\ kip$

$L_{req} := \dfrac{P_{tot}}{0.928\ ksi \cdot 3\ in} = 3.628\ in$ *USE 4in MIN. WELD* wallace design collective

Date 3/10/22 Sheet No. of

Job 2220003

Subject UPLIFT DIAGRAMS



$a_{min} = 13.5'$

$h_{MAX} = 37.92'$

ROOF DECK

$A_T = 10\,ft^2$ DL = 3psf

	0.6W	0.6W-0.6D
ZONE 1'	16.8 psf	15.0 psf
ZONE 1	29.2 psf	27.4 psf
ZONE 2	38.5 psf	36.7 psf
ZONE 3	52.4 psf	50.6 psf
POSITIVE	9.6 psf	—

ROOF JOISTS

DL - 10psf

A_T MAX $(6' \cdot 50', \frac{(50')^2}{3}) = 833\,ft^2$

CONSERVATIVELY USE C&C

	0.6W	0.6W-0.6D
ZONE 1'	9.6 psf	3.6 psf
ZONE 1	18.3 psf	12.3 psf
ZONE 2	24.5 psf	18.5 psf
ZONE 3	24.5 psf	18.5 psf
POSITIVE	9.6 psf	—

ROOF GIRDERS

DL - 12psf

A_T MAX $(54'\text{-}0'' \times 50', \frac{(54ft)^2}{3}) = 2700\,ft^2 > 700\,ft^2$

	0.6W	0.6W-0.6D
0 TO 16.8'	14.7 psf	7.5 psf
16.8 TO 33.6'	14.7 psf	7.5 psf
33.6' TO 67.3'	9.4 psf	2.2 psf
> 67.3'	6.7 psf	NO UPLIFT

Date 3/3/2022 Sheet No. 2 of

Job 2220003 BUILDING II

Subject ROOF STRUCTURE

TYP. ROOF JOISTS

SPACING 6'-0"

w_{DL} = 10 PSF , 11.5 PSF (FOR L > 50')

w_{LL} = 20 PSF

w_{TL} = (10+20)(6'-0") = 180 PLF , 189 PLF (FOR L > 50')

w_{u} = [1.2(10) + 1.6(20)] 6.0' = 264 PLF , 274.8 PLF (FOR L > 50')

JOIST REACTIONS

L = 60' V = wL/2 = 5.67 K ASD , 8.244 K LRFD

L = 50' V = wL/2 = 4.50 K ASD , 6.600 K LRFD

TYP. GIRDER POINT LOADS (ASD)

END BAY NORTH P = 50' [180 PLF] = 9.00 KIPS

END BAY SOUTH P = 60' [189 PLF] = 11.340 KIPS

TYP. BAY MIDDLE P = 50' [180 PLF] = 9.00 KIPS

AT SP1 P = 5087.7 LBS + 50/2 [180 PLF] = 9.59 KIPS , 14.740 KIPS LRFD

AT SP2 P = 4983.4 LBS + 50/2 [180 PLF] = 9.483 KIPS , 14.573 KIPS LRFD

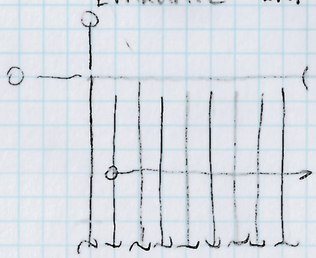
Date 3/3/2022 Sheet No. 6 of

Job 2220003 BUILDING II

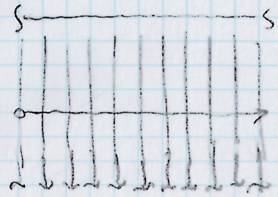
Subject ROOF STRUCTURE

FOR CORNER BAY GIRDER

EVALUATE EA. JOIST DUE TO DRIFT



SP1
84'
JOISTS 1 - 14



SP1

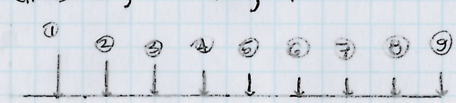
COMBINE ⊥ + // SNOW

	R_L (K)	R_R (K)	R_{u_L} (K)	R_{u_R} (K)
SP1	1.998	0.288	3.1968	0.461
SP2	1.524	0.150	2.438	0.240

GRID 1 - 2	$R_{S_{//}}$ (K)	$R_{S_{u//}}$ (K)	$R_{S_{TOT_L}}$ (K)	$R_{S_{TOT_R}}$ (K)	R_{u_L} (K)	R_{u_R} (K)
w_1	11.077	17.125	13.075	11.365	20.322	17.586
w_2	9.210	14.136	11.208	9.498	17.333	14.597
w_3	7.343	11.148	9.341	7.631	14.345	11.609
w_4	5.475	8.160	7.473	5.763	11.357	8.621
w_5+	4.800	7.080	6.798	5.088	9.518	7.32
GRID 4 - 5						
w_1	10.101	15.330	11.605	10.251	17.763	15.57
w_2	7.860	11.748	9.384	8.010	14.186	11.983
w_3+	5.760	8.496	7.284	5.910	10.934	8.736

CHECK JOIST GIRDERS

GRID 2 ; A-B , K-L



54 FT

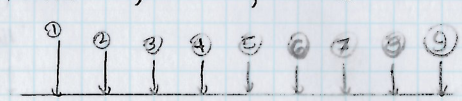
2A 58.490 K ASD, 93.586K LRFD

2B 53.977K ASD, 86.363K LRFD

JOISTS	ASD	LRFD
1 :	11.365K + 9.858 K = 21.223K	17.586 K + 15.172 = 32.758
2	9.498K + 7.990 K = 17.488K	14.597 K + 12.184 = 26.781
3	7.631K + 6.123 K = 13.754K	11.609 K + 9.196 = 20.805
4	5.763K + 4.800 K = 10.563K	8.621 K + 7.080 = 15.701K
5-9	5.088 K + 4.800 K = 9.888K	7.320 K + 7.080 = 14.40K

JOISTS	ASD	LRFD
1 :	10.251 + 9.858 = 20.109K	15.57 + 15.172 = 30.742K
2	8.010 + 7.990 = 16.09K	11.983 + 12.184 = 24.167
3	5.910 + 6.123 = 12.033K	8.736 + 9.196 = 17.932K
4-9	5.910 + 4.800 = 10.710K	8.736 + 7.080 = 15.816K

GRID 4 ; A-B , K-L



54 FT

4A 56.261K ASD, 90.018K LRFD

4B 56.231K ASD, 89.969K LRFD

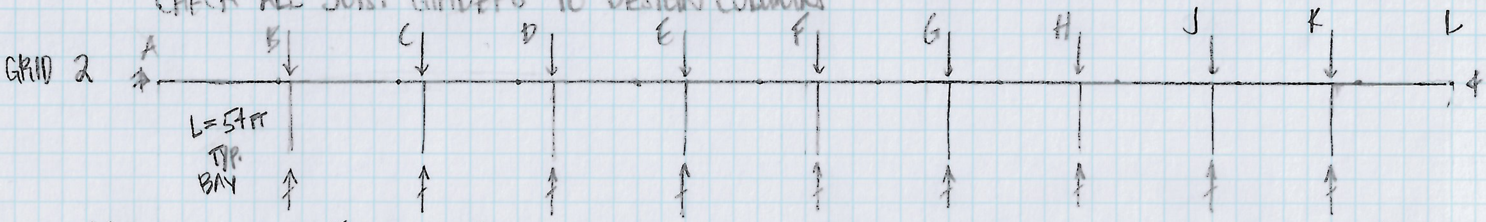
Date 3/3/2022 Sheet No. 7 of

Job 2220003 BUILDING II

Subject ROOF STRUCTURE & COLUMN DESIGN

CHECK ALL JOIST GIRDERS TO DESIGN COLUMNS

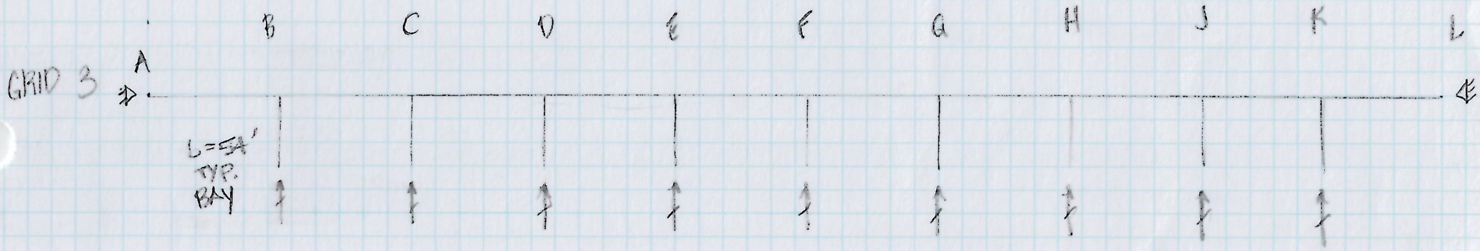
GRID 2



ASD 53.977k ASD + 9.59k(4.75) = 99.53k | 9.59(9) = 86.31k | 86.31k | 86.31k | 86.31k | 86.31k | 86.31k | 86.31k | 99.53k

LRFD 86.363k + 14.740(4.75) = 156.378k | 14.740(9) = 132.66k | 132.66k | 132.66k | 132.66k | 132.66k | 132.66k | 132.66k | 156.378k

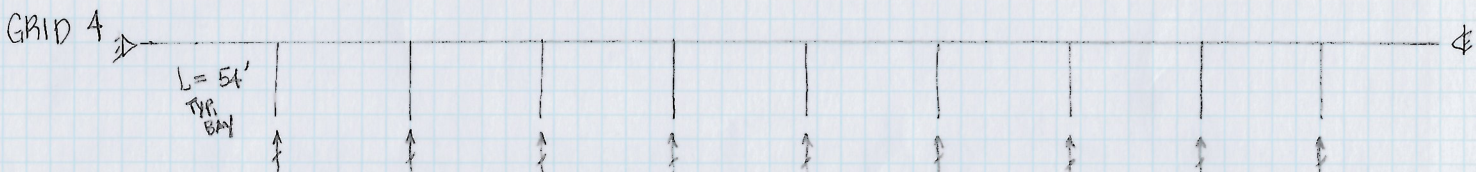
GRID 3



ASD 51.424k + 9.00k(4.75) = 94.174k | 9.00·9 = 81.0k | 81.00k | 81.00k | 81.00k | 81.00k | 81.00k | 81.00k | 94.174k

LRFD 82.278k + 13.200k(4.75) = 144.978k | 13.200(9) = 118.8k | 118.8k | 118.8k | 118.8k | 118.8k | 118.8k | 118.8k | 118.8k

GRID 4



ASD 52.231k + 9.483(4.75) = 97.275k | 9.483k x (9) = 88.047k | 88.047k | 88.047k | 88.047k | 88.047k | 88.047k | 88.047k | 97.275k

LRFD 89.969k + 14.573(4.75) = 159.19075k | 131.157k 14.573(9) = 131.157k | 131.157k | 131.157k | 131.157k | 131.157k | 131.157k | 159.191k

Date 3/3/2022 Sheet No. 8 of

Job 2220003 BUILDING II

Subject COLUMN DESIGN

COLUMNS : GRID B/K ; 2-4

KL : 38.458' MAX

MAX LOAD : 97.275K (ASD)

HSS 10 x 10 x 5/16 P_n/Ω = 121.25 K OK , 40.4 LB/FT

2 38 → 124
40 → 112

6^K PER FT

TYPICAL COLUMNS:

KL = 38.458' MAX

MAX LOAD: 88.047 K (ASD)

HSS10 x 10 x 1/4 P_n/Ω = 99.73 K OK , 32.6 LB/FT

→ INCREASE TO HSS12x12x1/4 FOR LIGHTER SECTION
P_n/Ω = 156 KIPS

DESIGN CRITERIA

Max. Allowable Bearing Capacity $q_{a.max} := 2500\ psf$

Concrete Strength $f'_c := 3000\ psi$

TYPICAL SPREAD FOOTING

Minimum Column Load $P_{min} := min\left(P_c, P_e, P_t\right) = 88\ kip$

Maximum Column Load $P_{max} := \max\left(P_c, P_e, P_t\right) = 101\ kip$

$$\frac{P}{A} \le q_{a.max} \qquad A_{req.min} := \frac{P_{min}}{q_{a.max}} = 35.154\ ft^2 \qquad B_{min} := \sqrt{A_{req.min}} = 5.929\ ft$$

$$A_{req} \ge \frac{P}{q_{a.max}} \qquad A_{req.max} := \frac{P_{max}}{q_{a.max}} = 40.415\ ft^2 \qquad B_{max} := \sqrt{A_{req.max}} = 6.357\ ft$$

Select 6'-0"x6'-0"x1'-6" footing w/ (6)-#6 bottom bars ea. way

TYPICAL WALL FOOTING

Assumed precast wall thickness $t := 9.25\ in$

$w_w := 150\ pcf \cdot t = 115.625\ psf$

Maximum Wall Height $H_{max} := 42\ ft + 6\ in$ $\quad w_{w.max} := w_w \cdot H_{max} = 4914\ plf$

Minimum Wall Height $H_{min} := 39\ ft + 6\ in$ $\quad w_{w.min} := w_w \cdot H_{min} = 4567\ plf$

Joist Perpindicular $R_{typ} := 5.5\ kip$ $\quad w_{j.typ} := \dfrac{R_{typ}}{6\ ft} = 916.667\ plf$

Joist Parallel $w := 182\ plf$ $\quad w_{j.ll} := 98\ plf$

Max Wall Height	Joist Perpindicular	$w := w_{w.max} + w_{j.typ} = 5831\ plf$	$B_{min} := w \cdot q_{a.max}{}^{-1} = 2.332\ ft$
	Joist Parallel	$w := w_{w.max} + w_{j.ll} = 5012\ plf$	$B_{min} := w \cdot q_{a.max}{}^{-1} = 2.005\ ft$
Min Wall Height	Joist Perpindicular	$w := w_{w.min} + w_{j.typ} = 5484\ plf$	$B_{min} := w \cdot q_{a.max}{}^{-1} = 2.194\ ft$
	Joist Parallel	$w := w_{w.min} + w_{j.ll} = 4665\ plf$	$B_{min} := w \cdot q_{a.max}{}^{-1} = 1.866\ ft$

Provide 3'-0" typical strip footing with (3)-#5 T&B longitudinal bars

FOUNDATION AT JOIST GIRDER/WALL LOCATION

*Assume the cont. wall footing has no reserve capacity

Max. Joist Girder Reaction at Wall $P := 60.2\ kip$

$$A_{req} := \frac{P}{q_{a.max}} = 24.08\ ft^2$$

$$A_{req} = B^2 - 3 \cdot B$$

$B := 3\ ft$ min.

$$\mathbf{B} := \mathbf{root}\left(B^2 - 3\ ft \cdot B - A_{req}, B\right) = 6.631\ ft$$

Provide 7'-0" ftg at joist/wall intersection at corners

Typ. Joist Girder Reaction at Wall $P := 57.9\ kip$

$$A_{req} := \frac{P}{q_{a.max}} = 23.16\ ft^2$$

$$A_{req} = B^2 - 3 \cdot B$$

$B := 3\ ft$ min.

$$\mathbf{B} := \mathbf{root}\left(B^2 - 3\ ft \cdot B - A_{req}, B\right) = 6.541\ ft$$

Provide 7'-0" ftg at typical joist/wall intersection