Dead Loads

Ceiling	Suspended Metal lath and Cement Plaster	15	psf
Coverings	Rigid Insulation, 1/2 - in	0.75	psf
Floor Fill	Lightweight Concrete, per inch	8	psf
Floor Finish	Ceramic or quarry tile (3/4) in. on (1/2) Mortar bed	20	psf
Frame Partitions	Wood Studs 2 x 4, plaster two sides	20	psf
Outer Walls	Masonary, Lightweight Concrete	105	pcf
***Floor Slabs**	Normal Weight Concrete Slab Thickness Slab Load	150 4 50	pcf in psf
***Girders**	Normal Weight Concrete Cross Sectional Area Girder Load	150 24 X 18 450	pcf in^2 lb/ft
***Columns**	Normal Weight Concrete Cross Sectional Area Column Load	150 24 X 24 600	pcf in^2 lb/ft

* Exact dimensions are not designed therefore dimensions are assumed.

Roof Dead Loads: Section 1 & 2

Ceiling	Suspended Metal lath and Cement Plaster	15	psf
Coverings	Rigid Insulation, 1/2 - in	0.75	psf
***Floor Slabs**	Normal Weight Concrete	150	pcf
	Slab Thickness	4	in
	Slab Load	50	psf
***Girders**	Normal Weight Concrete	150	pcf
	Cross Sectional Area	24 X 18	in^2
	Girder Load	450	lb/ft

	**Dead Load, D	65.75	psf
	** Does not include Girder weight		
	Tributary Width of Interior Girders =	25	ft
	Span =	25	ft
	Area =	625	ft^2
Wu =	Uniform Dead Roof Load for Interior Girders =	2093.75	lb/ft
	Tributary Width for Exterior Girders	12.5	
	Span =	25	ft
	Area =	312.5	ft^2
Wu =	Uniform Dead Roof Load for Exterior Girders =	1271.875	lb/ft

Floor Dead Loads

Ceiling	Suspended Metal lath and Cement Plaster	15	psf
Coverings	Rigid Insulation, 1/2 - in	0.75	psf
Floor Fill	Lightweight Concrete, per inch	8	psf
Floor Finish	Ceramic or quarry tile (3/4) in. on (1/2) Mortar bed	20	psf
Frame Partitions	Wood Studs 2 x 4, plaster two sides	20	psf
Outer Walls	Masonary, Lightweight Concrete	48	psf
***Floor Slabs**	Normal Weight Concrete	150	pcf
	Slab Thickness	4	in
	Slab Load	50	psf
***Girders**	Normal Weight Concrete	150	pcf
	Cross Sectional Area	24 X 18	in^2
	Girder Load	450	lb/ft
***Columns**	Normal Weight Concrete	150	pcf
	Cross Sectional Area	24 X 24	in^2
	Column Load	600	lb/ft

	**Total Floor Dead Load =	161.75	psf
	** Does not include Girder and Column weight		
	Tributary Width of Interior Girders	25	ft
	Span =	25	ft
	Tributary Area =	625	ft^2
Wd =	Uniform Dead Floor Load for Interior Girders =	4493.75	lb/ft
	Tributary Width for Exterior Girders =	12.5	ft
	Span =	25	ft
	Area =	312.5	ft^2
WD =	Uniform Dead Floor Load for Exterior Girders =	2471.875	lb/ft

Live Loads: Section1 & 2

Occupancy: **Business Group G**

Use	Uniform (psf)	Concentrated (lbs)
Lobbies	100	-
Movable Seats	100	-
First Floor Corridor	100	-
Elevator Machine on area of 2in X 2in	-	300
Corridors above first floor	80	2,000
Offices	50	2,000
Classrooms	40	1,000
Stairs and exits	100	-
Walkways	60	-

* Values apply to different parts of building, worst case scenario will be applied when doing the load

1ST FLOOR:

L_0 =	Unreduced Live Load =	100	psf
K_{LL} =	live load element factor =	2	
A_T =	Tributary Area =	625	ft^2
L =	$L_0\,(0.25 + \frac{15}{\sqrt{K_{LL}A_T}})$	67.42640687	psf

2nd to 5th Floor:

L_0 =	Unreduced Live Load =	100	psf
K_{LL} =	live load element factor =	2	
A_T =	Tributary Area =	625	ft^2
L =	$L_0\,(0.25 + \frac{15}{\sqrt{K_{LL}A_T}})$ =	67.42640687	psf

Roof Live Loads: Section 1&2

Occupancy: **Business Group G**

Use	Uniform (psf)	Concentrated (lbs)
Elevator Machine on area of 2in X 2in	-	300
Roof	20	-

L_0 =	Minimum Uniform Live Load =	20	psf
A_T =	Tributary Area =	625	ft^2
R_1 =	Reduction Factor =	0.6	
F =	Inches of rise per foot for a sloped roof =	0	in/ft
R_2 =	Reduction Factor =	1	
L_r =	.Reduced Roof Live Load = $L_0 R_1 R_2$	12	psf
L_r	Check for L_r min. 12	psf	

Tributary Width Interior Girders =	25	ft
Tributary Width Exterior Girders =	12.5	ft

WLR =	Uniform Roof Live Load for Interior Girders =	300	lb/ft
WLR =	Uniform Roof Live Load for Exterior Girders =	150	lb/ft

* Values apply to different parts of building, worst case scenario will be applied when doing the load

Atrium Live Loads

Use	Uniform (psf)	Concentrated (lbs)
Elevator Machine on area of 2in X 2in	-	300
Walkways	60	-

Flood Loads

According to FEMA Flood Map the area of 78249 is under Zone X: Areas determined to be outside the 0.2 % annual chance floodplain.
Based on the lack of risk, the flood loads are not necessary for this structure.

Snow Loads: Section 1 & 2

p_f	Snow load on flat roof $p_f = 0.7 * C_e C_t I_s p_g$	3.15 psf
C_e	Exposure Factor	0.9
C_t	Thermal Factor	1
I_s	Importance Factor * Category II	1
p_g	Ground snow load	5 psf
p_m	Minimum roof snow load for low-slope roof $p_m = I_s p_g$	5 psf
S	Snow Load	5 psf

Tributary Width Interior Girders =	25 ft
Tributary Width Exterior Girders =	12.5 ft

Ws = Uniform Roof Live Load for Interior Girders = 125 lb/ft

Ws = Uniform Roof Live Load for Exterior Girders = 62.5 lb/ft

Snow Loads: Atrium

C_s	Slope Factor	0.6
	Roof Slope	30°
p_f	Snow Load on Flat Roof	5 psf
p_s	Sloped Roof Snow Load	3 psf
C_t	Therman Factor	1

ps = Cs * pf =	3 psf
S = Snow Load =	5 psf

Rain Loads

i	Design Rainfall Intensity	4.25	(in./h)
A1	Roof Area 1	20000	ft^2
A2	Roof Area 2	5000	ft^2
Q1	Flow Rate 1	884	gal/min
Q2	Flow Rate 2	221	gal/min
d_h	Hydraulic Head 1	4.07	in
d_h	Hydraulic Head 2	2.19	in
d_s	Static Head 1	2	in
d_s	Static Head 2	2	in
R1	Rain Load on Roof Area 1	31.564	psf
R2	Rain Load on Roof Area 2	21.788	psf

Roof Area 1 used a 8in diameter drain.
Roof Area 2 used an 6in diameter drain.

Tributary Width Interior Girders = 25 ft
Tributary Width Exterior Girders = 12.5 ft

WR1 = Uniform Rain Load for Interior Girders = 789.1 lb/ft
WR1 = Uniform Rain Load for Exterior Girders 394.55 lb/ft

WR2 = Uniform Rain Load for Interior Girders = 544.7 lb/ft
WR2 = Uniform Rain Load for Exterior Girders 272.35 lb/ft

Flat Roof 1

Parameters:

1st Floor Height	16	ft
2nd Floor Height	12	ft
3rd Floor Height	12	ft
4th Floor Height	12	ft
5th Floor Height	12	ft
Angle of Roof, θ	30	°
Risk Category	III	
Structure Type	Building	
Surface Roughness	B	
Exposure Category	C	
Class Building	2	
Enclosure classification	Enclosed	
Length parallel to wind, L	50	ft
Length perpendicular to wind, B	100	ft

Factors:

Wind Speed, *V*	120	mph
Directionality Factor, *kd*	0.85	
TopographicFactor, *Kzt*	1	
mean height, *h*	67.61	ft
Wind Loads - Walls, ph	50.87	psf
Wind Pressure at Roof:		
Zone 1	0	psf
Zone 2	0	psf
Zone 3	-40.1	psf
Zone 4	-35.8	psf
Zone 5	-29.3	psf

Flat Roof 1 Wind 2

Parameters:

1st Floor Height	16	ft
2nd Floor Height	12	ft
3rd Floor Height	12	ft
4th Floor Height	12	ft
5th Floor Height	12	ft
Angle of Roof, θ	30	°
Risk Category	III	
Structure Type	Building	
Surface Roughness	B	
Exposure Category	C	
Class Building	2	
Enclosure classification	Enclosed	
Length parallel to wind, L	100	ft
Length perpendicular to wind, B	50	ft

Factors:

Wind Speed, *V*	120	mph
Directionality Factor, *kd*	0.85	
TopographicFactor, *Kzt*	1	
mean height, *h*	67.61	ft
Wind Loads - Walls, ph	50.87	psf
Wind Pressure at Roof:		
Zone 1	0	psf
Zone 2	0	psf
Zone 3	-40.1	psf
Zone 4	-35.8	psf
Zone 5	-29.3	psf

Atrium 2

Parameters:

1st Floor Height	16	ft
2nd Floor Height	12	ft
3rd Floor Height	12	ft
4th Floor Height	12	ft
5th Floor Height	12	ft
Angle of Roof, θ	30	°
Risk Category	III	
Structure Type	Building	
Surface Roughness	B	
Exposure Category	C	
Class Building	2	
Enclosure classification	Enclosed	
Length parallel to wind, L	50	ft
Length perpendicular to wind, B	100	ft

Factors:

Wind Speed, *V*	120	mph
Directionality Factor, *kd*	0.85	
TopographicFactor, *Kzt*	1	
mean height, *h*	67.61	ft
Wind Loads - Walls, ph	0	psf
Wind Pressure at Roof:	-	
Zone 1	-19.2	psf
Zone 2	-24.6	psf
Zone 3	-37.8	psf
Zone 4	-33.7	psf
Zone 5	-27.6	psf

Atrium 2

Parameters:

1st Floor Height	16	ft
2nd Floor Height	12	ft
3rd Floor Height	12	ft
4th Floor Height	12	ft
5th Floor Height	12	ft
Angle of Roof, θ	30	°
Risk Category	III	
Structure Type	Building	
Surface Roughness	B	
Exposure Category	C	
Class Building	2	
Enclosure classification	Enclosed	
Length parallel to wind, L	100	ft
Length perpendicular to wind, B	50	ft

Factors:

Wind Speed, *V*	120	mph
Directionality Factor, *kd*	0.85	
TopographicFactor, *Kzt*	1	
mean height, *h*	67.61	ft
Wind Loads - Walls, ph	50.87	psf
Wind Pressure at Roof:	-	
Zone 1	-19.2	psf
Zone 2	-24.6	psf
Zone 3	-37.8	psf
Zone 4	-33.7	psf
Zone 5	-27.6	psf

Flat Roof 2

Parameters:

1st Floor Height	16	ft
2nd Floor Height	12	ft
3rd Floor Height	12	ft
4th Floor Height	12	ft
5th Floor Height	12	ft
Angle of Roof, θ	30	°
Risk Category	III	
Structure Type	Building	
Surface Roughness	B	
Exposure Category	C	
Class Building	2	
Enclosure classification	Enclosed	
Length parallel to wind, L	200	ft
Length perpendicular to wind, B	100	ft

Factors:

Wind Speed, *V*	120	mph
Directionality Factor, *kd*	0.85	
TopographicFactor, *Kzt*	1	
mean height, *h*	67.61	ft
Wind Loads - Walls, ph	0	psf
Wind Pressure at Roof:	-	
Zone 1	0	psf
Zone 2	0	psf
Zone 3	-37.8	psf
Zone 4	-33.7	psf
Zone 5	-27.6	psf

Flat Roof 2

Parameters:

1st Floor Height	16	ft
2nd Floor Height	12	ft
3rd Floor Height	12	ft
4th Floor Height	12	ft
5th Floor Height	12	ft
Angle of Roof, θ	30	°
Risk Category	III	
Structure Type	Building	
Surface Roughness	B	
Exposure Category	C	
Class Building	2	
Enclosure classification	Enclosed	
Length parallel to wind, L	100	ft
Length perpendicular to wind, B	200	ft

Factors:

Wind Speed, *V*	120	mph
Directionality Factor, *kd*	0.85	
TopographicFactor, *Kzt*	1	
mean height, *h*	67.61	ft
Wind Loads - Walls, ph	50.9	psf
Wind Pressure at Roof:	-	
Zone 1	0	psf
Zone 2	0	psf
Zone 3	-37.8	psf
Zone 4	-33.7	psf
Zone 5	-27.6	psf