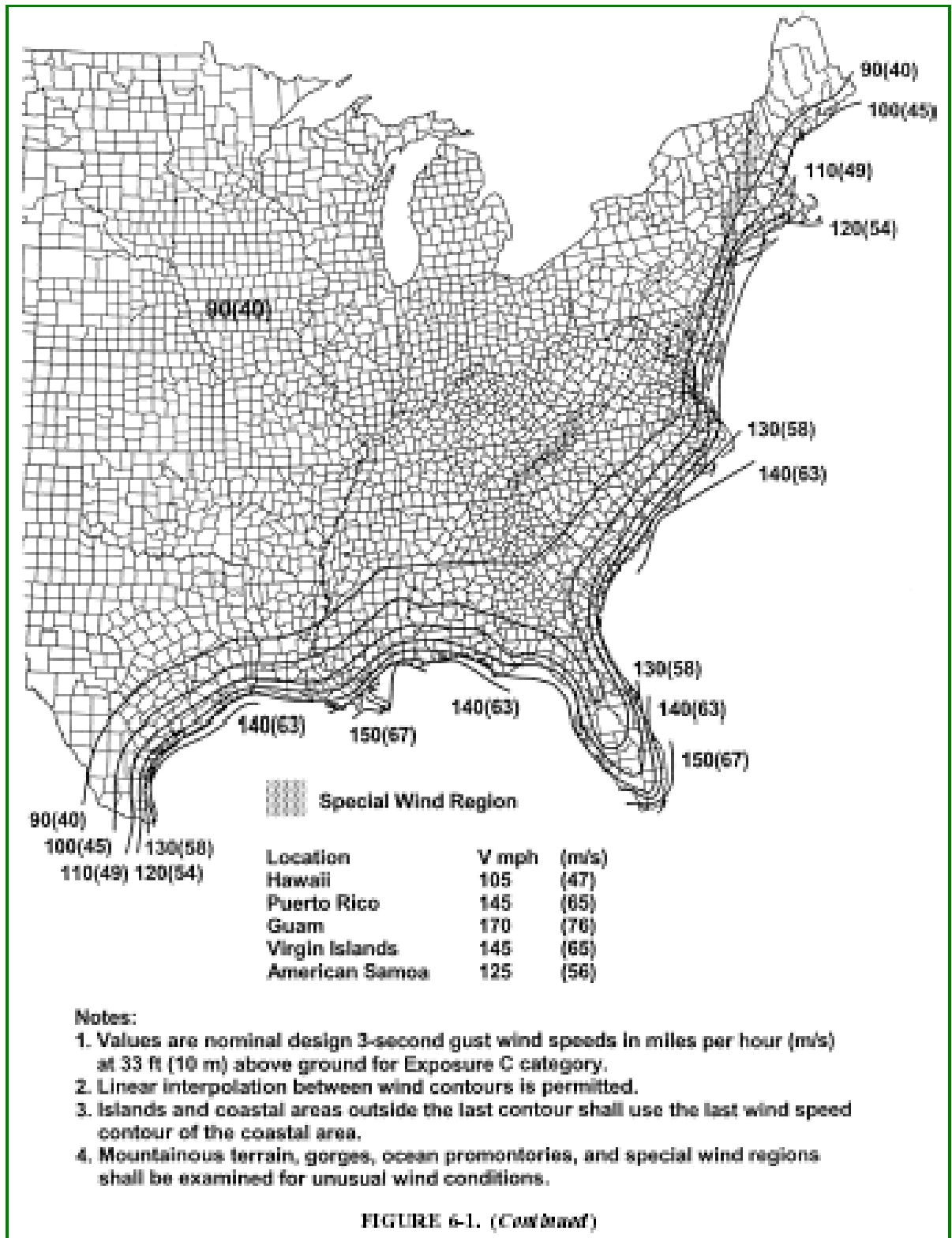
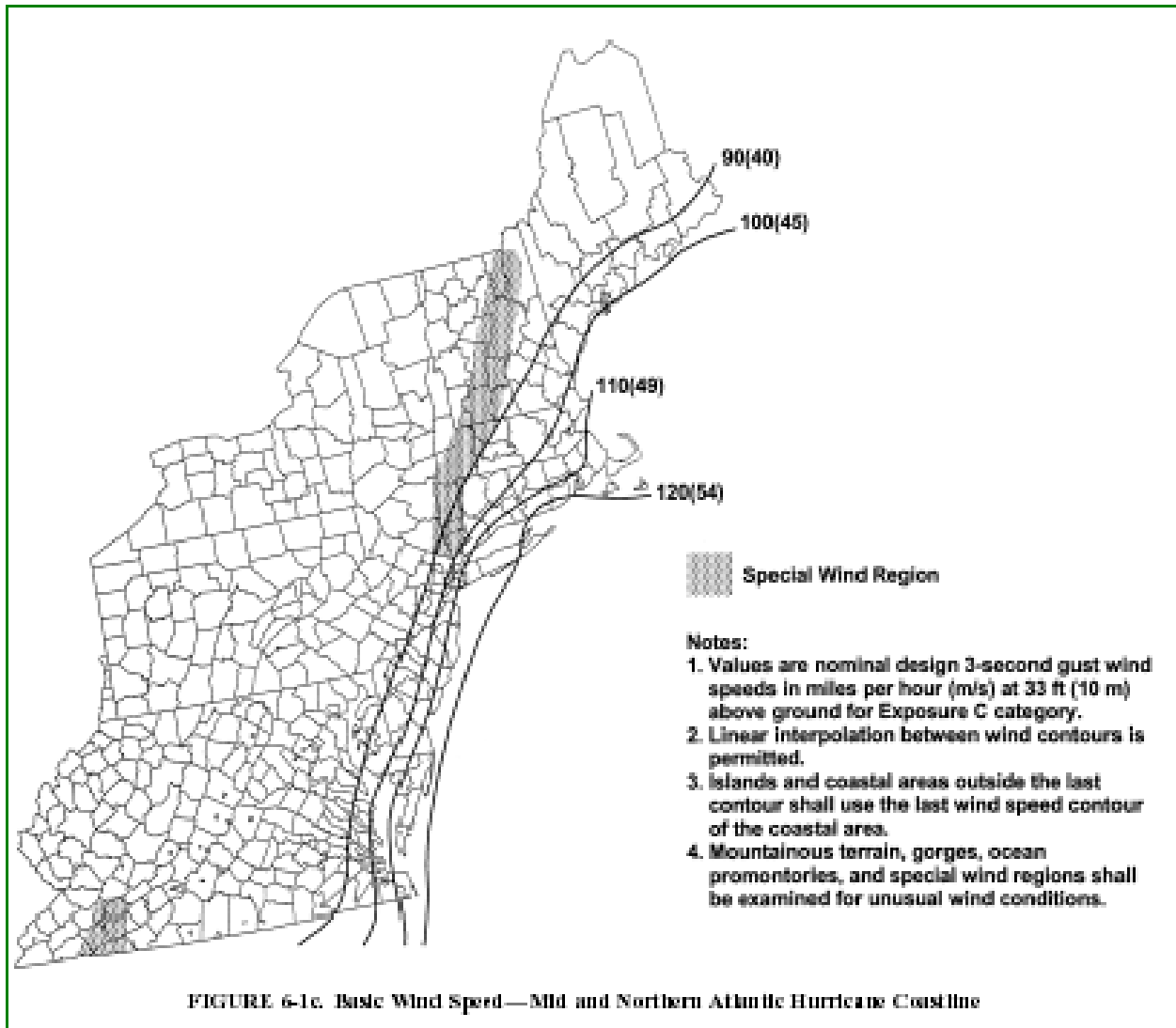


MINIMUM DESIGN LOADS FOR BUILDINGS AND OTHER STRUCTURES

TABLE 1-1. Classification of Buildings and Other Structures for Flood, Wind, Snow, and Earthquake Loads

Nature of Occupancy	Category
<p>Buildings and other structures that represent a low hazard to human life in the event of failure including, but not limited to:</p> <ul style="list-style-type: none"> • Agricultural facilities • Certain temporary facilities • Minor storage facilities 	I
<p>All buildings and other structures except those listed in Categories I, III and IV</p>	II
<p>Buildings and other structures that represent a substantial hazard to human life in the event of failure including, but not limited to:</p> <ul style="list-style-type: none"> • Buildings and other structures where more than 300 people congregate in one area • Buildings and other structures with day-care facilities with capacity greater than 150 • Buildings and other structures with elementary or secondary school facilities with capacity greater than 150 • Buildings and other structures with a capacity greater than 500 for colleges or adult education facilities • Health care facilities with a capacity of 50 or more resident patients but not having surgery or emergency treatment facilities • Jails and detention facilities • Power generating stations and other public utility facilities not included in Category IV 	III
<p>Buildings and other structures containing sufficient quantities of toxic, explosive or other hazardous substances to be dangerous to the public if released including, but not limited to:</p> <ul style="list-style-type: none"> • Petrochemical facilities • Fuel storage facilities • Manufacturing or storage facilities for hazardous chemicals • Manufacturing or storage facilities for explosives 	
<p>Buildings and other structures that are equipped with secondary containment of toxic, explosive or other hazardous substances (including, but not limited to double wall tank, dikes of sufficient size to contain a spill, or other means to contain a spill or a blast within the property boundary of the facility and prevent release of harmful quantities of contaminants to the air, soil, ground water, or surface water) or atmosphere (where appropriate) shall be eligible for classification as a Category II structure.</p>	IV
<p>In hurricane prone regions, buildings and other structures that contain toxic, explosive, or other hazardous substances and do not qualify as Category IV structures shall be eligible for classification as Category II structures for wind loads if these structures are operated in accordance with mandatory procedures that are acceptable to the authority having jurisdiction and which effectively diminish the effects of wind on critical structural elements or which alternatively protect against harmful releases during and after hurricanes.</p>	
<p>Buildings and other structures designated as essential facilities including, but not limited to:</p> <ul style="list-style-type: none"> • Hospitals and other health care facilities having surgery or emergency treatment facilities • Fire, rescue and police stations and emergency vehicle garages • Designated earthquakes, hurricanes, or other emergency shelters • Communications centers and other facilities required for emergency response • Power generating stations and other public utility facilities required in an emergency • Ancillary structures (including, but not limited to communication towers, fuel storage tanks, cooling towers, electrical substation structures, fire water storage tanks or other structures housing or supporting water or other fire-suppression material or equipment) required for operation of Category IV structures during an emergency • Aviation control towers, air traffic control centers and emergency aircraft hangars • Water storage facilities and pump structures required to maintain water pressure for fire suppression • Buildings and other structures having critical national defense functions 	

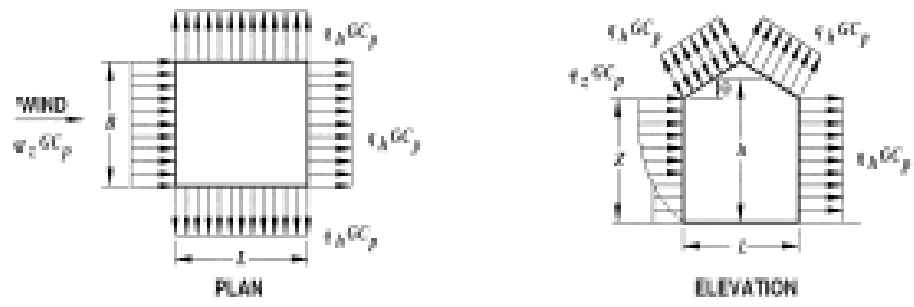




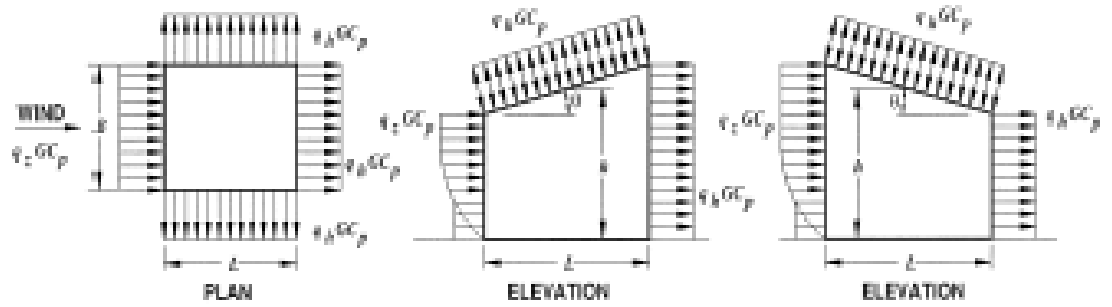
Main Wind Force Resisting System	All h
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Figure 6-3	External Pressure Coefficients, C_p
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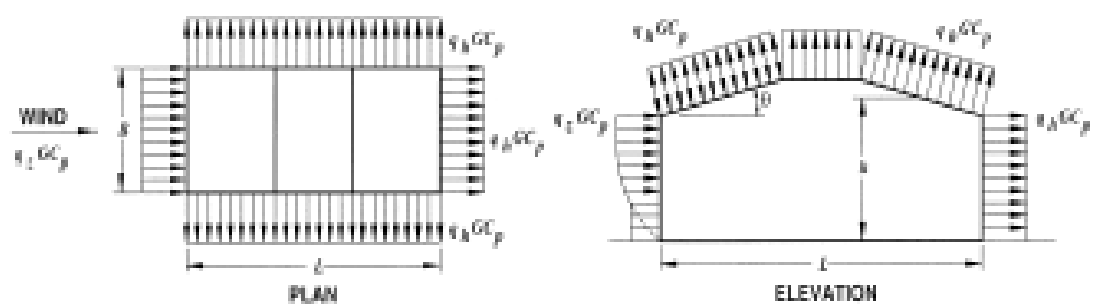
Enclosed, Partially Enclosed Buildings	Walls & Roofs
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GABLE, HIP ROOF



MONOSLOPE ROOF (NOTE 4)



MANSARD ROOF (NOTE 8)

Main Wind Force Resisting System		All h
Figure 6-3 (con't)	External Pressure Coefficients, C_p	Walls & Roofs
Enclosed, Partially Enclosed Buildings		

Wall Pressure Coefficients, C_p			
Surface	L/B	C_p	Use With
Windward Wall	All values	0.8	q_s
Leeward Wall	0-1	-0.5	q_s
	2	-0.3	
	≥ 4	-0.2	
Side Wall	All values	-0.7	q_s

Roof Pressure Coefficients, C_p , for use with q_s												
Wind Direction	Windward									Leeward		
	Angle, θ (degrees)									Angle, θ (degrees)		
	h/L	10	15	20	25	30	35	45	$\geq 60^\circ$	10	15	≥ 0
Normal to ridge for $\theta \geq 10^\circ$	≤ 0.25	-0.7	-0.5	-0.3	-0.2	-0.2	0.0*	0.4	0.0† 0	-0.3	-0.5	-0.6
	0.5	-0.9	-0.7	0.4	-0.5	-0.2	-0.2	0.4	0.0† 0	-0.5	-0.5	-0.6
	≥ 1.0	-1.3**	-1.0	-0.7	-0.5	-0.3	-0.2	0.0*	0.0† 0	-0.7	-0.6	-0.6
Normal to ridge for $\theta < 10^\circ$ and	≤ 0.5	Horiz distance from windward edge		C_p		*Value is provided for interpolation purposes. **Value can be reduced linearly with area over which it is applicable as follows						
		0 to h/2		-0.9								
		h/2 to h		-0.9								
		h to 2h		-0.5								
Parallel to ridge for all θ	≥ 1.0	0 to h/2		-1.3**		Area (sq ft)		Reduction Factor				
		> h/2		-0.7		≤ 100 (9.29 sq m)		1.0				
						200 (23.23 sq m)		0.9				
						≥ 1000 (92.9 sq m)		0.8				

Notes:

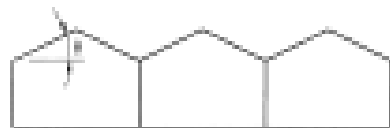
- Plus and minus signs signify pressures acting toward and away from the surfaces, respectively.
- Linear interpolation is permitted for values of L/B, h/L and θ other than shown. Interpolation shall only be carried out between values of the same sign. Where no value of the same sign is given, assume 0.0 for interpolation purposes.
- Where two values of C_p are listed, this indicates that the windward roof slope is subjected to either positive or negative pressures and the roof structure shall be designed for both conditions. Interpolation for intermediate ratios of h/L in this case shall only be carried out between C_p values of like sign.
- For monoslope roofs, entire roof surface is either a windward or leeward surface.
- For flexible buildings use appropriate G 's as determined by rational analysis.
- Refer to Table 6-8 for arched roofs.
- Notation:

- B: Horizontal dimension of building, in feet (meter), measured normal to wind direction.
- L: Horizontal dimension of building, in feet (meter), measured parallel to wind direction.
- A: Mean roof height in feet (meters), except that eave height shall be used for $\theta \leq 10$ degrees.
- z: Height above ground, in feet (meters).
- G: Gust effect factor.
- q_s, q_h : Velocity pressure, in pounds per square foot (N/m^2), evaluated at respective height.
- θ : Angle of plane of roof from horizontal, in degrees.

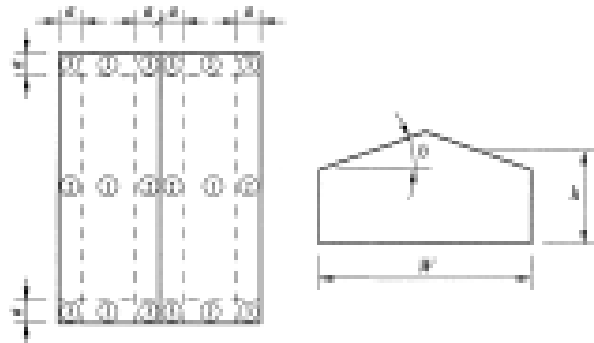
- For mansard roofs, the top horizontal surface and leeward inclined surface shall be treated as leeward surfaces from the table.

†For roof slopes greater than 80° , use $C_p = 0.8$

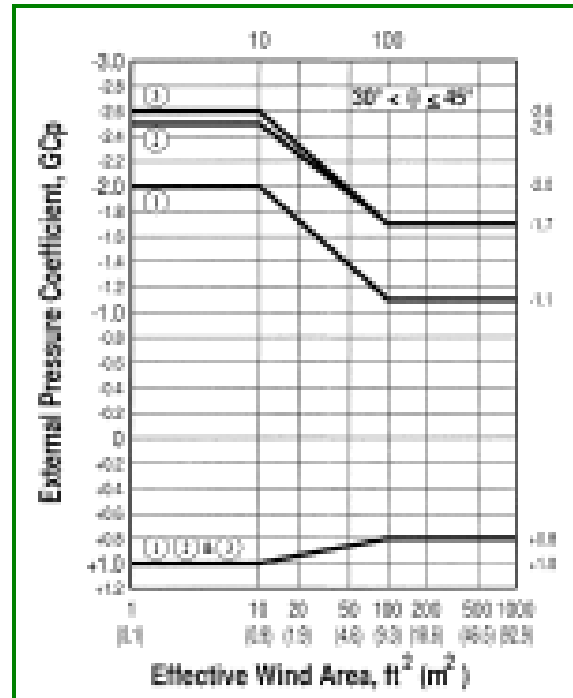
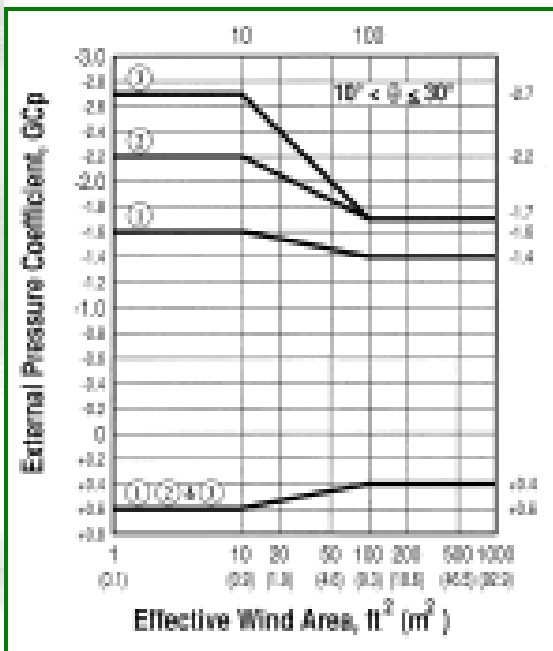
Components and Cladding		$h \leq 60$ ft.
Figure 6-6	External Pressure Coefficients, GC_p	Multispan Gable Roofs
Enclosed, Partially Enclosed Buildings		



ELEVATION OF BUILDING
(2 or More Spans)



PLAN AND ELEVATION OF
A SINGLE SPAN MODULE



Notes:

- Vertical scale denotes GC_p , to be used with q_p .
- Horizontal scale denotes effective wind area A , in square feet (square meters).
- Plus and minus signs signify pressures acting toward and away from the surfaces, respectively.
- Each component shall be designed for maximum positive and negative pressures.
- For $\theta \leq 10^\circ$, values of GC_p from Fig. 6-5B shall be used.
- Notation:
 - a : 10 percent of least horizontal dimension of a single-span module or $0.4h$, whichever is smaller, but not less than either 4 percent of least horizontal dimension of a single-span module or 3 ft (1 m).
 - h : Mean roof height, in feet (meters).
 - W : Building module width, in feet (meters).
 - θ : Angle of plane of roof from horizontal, in degrees.

Importance Factor, I (Wind Loads)

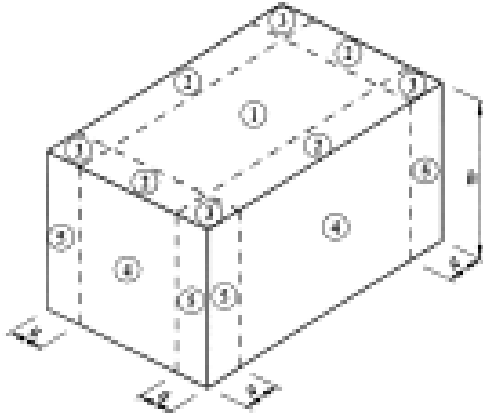
Table 6-1

Category	Non-Hurricane Prone Regions and Hurricane Prone Regions with V = 85-100 mph and Alaska	Hurricane Prone Regions with V > 100 mph
I	0.87	0.77
II	1.00	1.00
III	1.15	1.15
IV	1.15	1.15

Note:

1. The building and structure classification categories are listed in Table 1-1.

Components and Cladding		$h \leq 30$ ft.
Table 6-3A	Design Wind Pressures	Simplified Procedure Walls & Roofs
Enclosed Buildings		



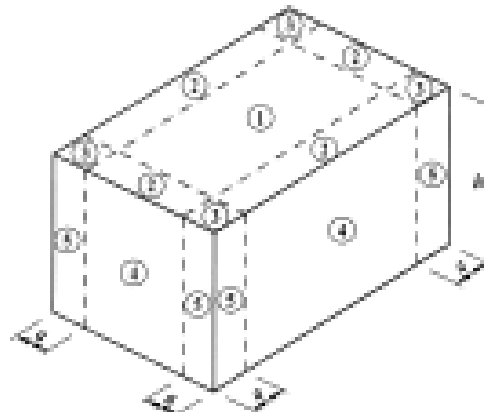
		DESIGN WIND PRESSURE (PSF)										
Location	Zone	Effective Wind Area (SF)	Basic Wind Speed V (MPH)									
			85	90	100	110	120	130	140	150	160	170
Roof	1	10	+10 -13	+10 -15	+10 -18	+10 -22	+11 -26	+12 -30	+14 -35	+16 -40	+19 -46	+21 -52
		20	+10 -13	+10 -14	+10 -18	+10 -21	+10 -25	+12 -30	+13 -34	+15 -39	+18 -45	+20 -51
		100	+10 -12	+10 -13	+10 -16	+10 -20	+10 -24	+10 -28	+11 -32	+13 -37	+15 -42	+17 -48
	2	10	+10 -22	+10 -24	+10 -30	+10 -36	+11 -43	+12 -51	+14 -59	+16 -68	+19 -77	+21 -87
		20	+10 -19	+10 -22	+10 -27	+10 -33	+10 -39	+12 -46	+13 -53	+15 -61	+18 -69	+20 -78
		100	+10 -14	+10 -16	+10 -19	+10 -24	+10 -28	+10 -33	+11 -38	+13 -44	+15 -50	+17 -56
	3	10	+10 -33	+10 -37	+10 -45	+10 -55	+11 -65	+12 -77	+14 -89	+16 -102	+19 -116	+21 -131
		20	+10 -27	+10 -30	+10 -37	+10 -45	+10 -54	+12 -63	+13 -73	+15 -84	+18 -96	+20 -108
		100	+10 -14	+10 -16	+10 -19	+10 -24	+10 -28	+10 -33	+11 -38	+13 -44	+15 -50	+17 -56
Walls	4	10	+13 -14	+15 -16	+18 -19	+22 -24	+26 -28	+30 -33	+35 -38	+40 -44	+46 -50	+52 -56
		30	+12 -13	+13 -14	+16 -18	+19 -22	+23 -26	+27 -30	+31 -35	+36 -40	+41 -46	+46 -51
		500	+10 -11	+11 -12	+13 -15	+16 -18	+19 -21	+23 -25	+26 -29	+30 -34	+34 -38	+39 -43
	5	10	+13 -17	+15 -19	+18 -24	+22 -29	+26 -35	+30 -41	+35 -47	+40 -54	+46 -62	+52 -70
		30	+12 -15	+13 -16	+16 -20	+19 -25	+23 -29	+27 -34	+31 -40	+36 -46	+41 -52	+46 -59
		500	+10 -11	+11 -12	+13 -15	+16 -18	+19 -21	+23 -25	+26 -29	+30 -34	+34 -38	+39 -43

Metric Conversion: 1 PSF = 47.9 pascals 1 SF = 0.0929 SM 1 MPH = 0.447 M/S

Notes:

- Design wind pressures above represent the net pressure (sum of external and internal pressures) applied normal to all surfaces.
- Values shown are for exposure B. For other exposures, multiply values shown by the following factor: exposure C: 1.40 and exposure D: 1.66.
- Linear interpolation between values of tributary area is permissible.
- Values shown are for an importance factor $I = 1.0$. For other values of I , multiply values shown by I .
- Plus and minus signs signify pressure acting toward and away from the exterior surface, respectively.
- All component and cladding elements shall be designed for both positive and negative pressures shown in the table.
- Notation:
 - a : 10 percent of least horizontal dimension or 0.4 h , whichever is smaller, but not less than 4% of least horizontal dimension or 3 ft.
 - h : Mean roof height in feet (meters).

Components and Cladding		$h \leq 50$ ft.
Table 6-3B	Net Pressure Coefficients	Simplified Procedure Walls & Roofs
Partially Enclosed Buildings		



DESIGN WIND PRESSURE (PSF)			Basic Wind Speed V (MPH)										
Location	Zone	Effective Wind Area (SF)	Basic Wind Speed V (MPH)										
			85	90	100	110	120	130	140	150	160	170	
Roof	1	10	+10 -17	+10 -19	+13 -24	+16 -29	+19 -34	+22 -40	+25 -46	+29 -53	+33 -60	+37 -68	
		20	+10 -17	+10 -19	+12 -23	+15 -28	+18 -33	+21 -39	+24 -45	+28 -52	+32 -59	+36 -67	
		100	+10 -16	+9 -18	+11 -22	+14 -27	+16 -32	+19 -37	+22 -43	+26 -50	+29 -57	+33 -64	
	2	10	+10 -26	+10 -29	+13 -36	+16 -43	+19 -52	+22 -60	+25 -70	+29 -81	+33 -92	+37 -105	
		20	+10 -24	+10 -26	+12 -33	+15 -39	+18 -47	+21 -55	+24 -64	+28 -73	+32 -83	+36 -94	
		100	+10 -18	+10 -20	+11 -25	+14 -30	+16 -36	+19 -42	+22 -49	+26 -57	+29 -64	+33 -73	
	3	10	+10 -37	+10 -41	+13 -51	+16 -62	+19 -73	+22 -86	+25 -100	+29 -115	+33 -133	+37 -147	
		20	+10 -31	+10 -35	+12 -43	+15 -52	+18 -62	+21 -73	+24 -84	+28 -97	+32 -110	+36 -125	
		100	+10 -18	+10 -20	+11 -25	+14 -30	+16 -36	+19 -42	+22 -49	+26 -57	+29 -64	+33 -73	
Walls	4	10	+17 -18	+19 -20	+24 -25	+29 -30	+34 -36	+40 -42	+46 -49	+53 -57	+60 -64	+68 -73	
		50	+16 -17	+18 -19	+22 -23	+26 -28	+31 -34	+37 -40	+42 -46	+49 -53	+55 -60	+63 -68	
		500	+14 -15	+15 -17	+19 -21	+23 -25	+27 -30	+32 -35	+37 -40	+43 -46	+49 -53	+55 -59	
	5	10	+17 -21	+19 -24	+24 -30	+29 -36	+34 -43	+40 -50	+46 -58	+53 -67	+60 -76	+68 -86	
		50	+16 -19	+18 -21	+22 -26	+26 -31	+31 -37	+37 -44	+42 -51	+49 -58	+55 -66	+63 -75	
		500	+14 -15	+15 -17	+19 -21	+23 -25	+27 -30	+32 -35	+37 -40	+43 -46	+49 -53	+55 -59	

Metric Conversion: 1 PSF = 47.9 pascals 1 SF = 0.0929 SM 1 MPH = 0.447 M/S

Notes:

- Design wind pressures above represent the net pressure (sum of external and internal pressures) applied normal to all surfaces.
- Values shown are for exposure B. For other exposures, multiply values shown by the following factor: exposure C: 1.40 and exposure D: 1.66.
- Linear interpolation between values of tributary area is permissible.
- Values shown are for an importance factor $I = 1.0$. For other values of I , multiply values shown by I .
- Plus and minus signs signify pressure acting toward and away from the exterior surface, respectively.
- All component and cladding elements shall be designed for both positive and negative pressures shown in the table.
- Notation:
 - a : 10 percent of least horizontal dimension or 0.4 h , whichever is smaller, but not less than 4% of least horizontal dimension or 3 ft.
 - h : Mean roof height in feet (meters).

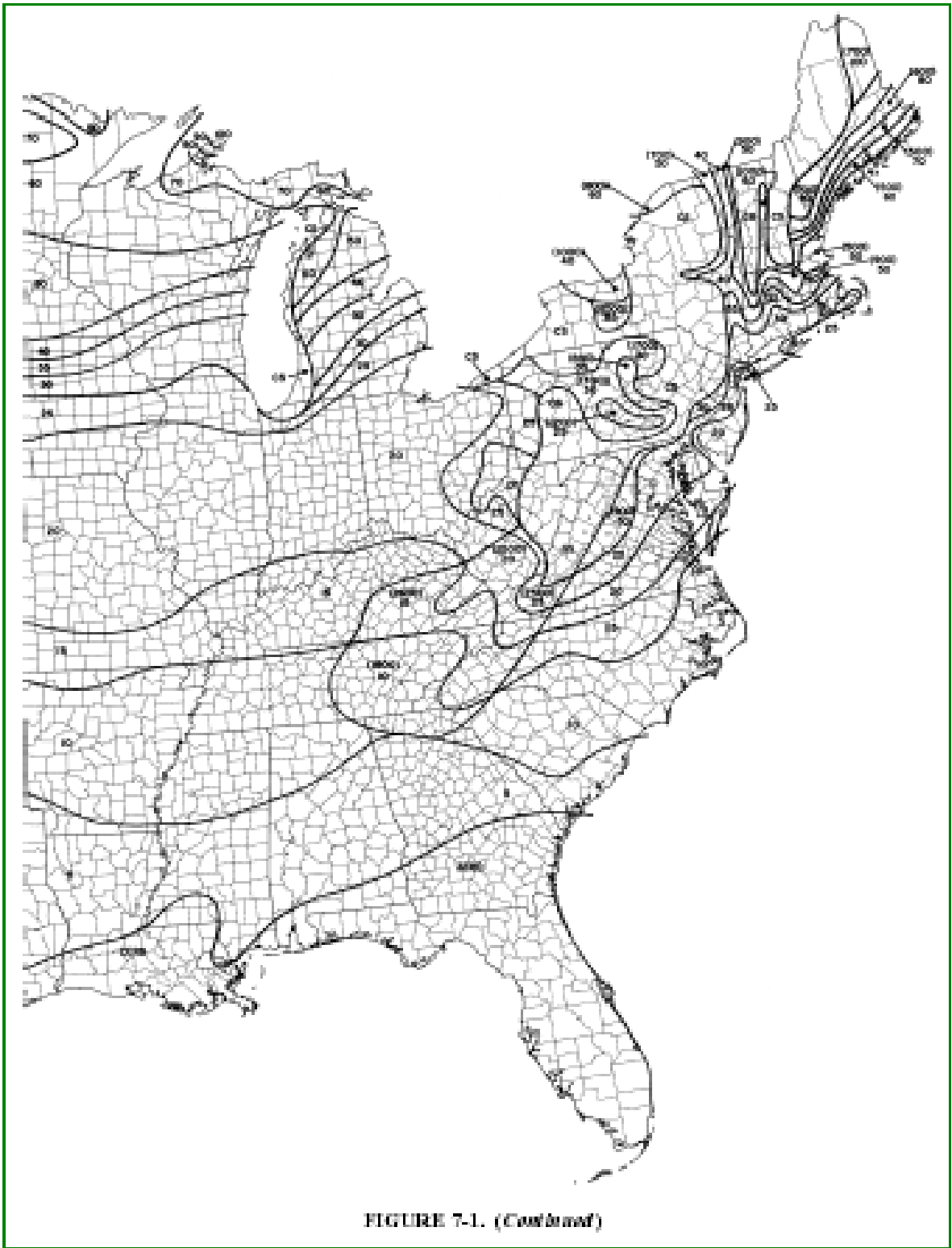


FIGURE 7-1. (Continued)

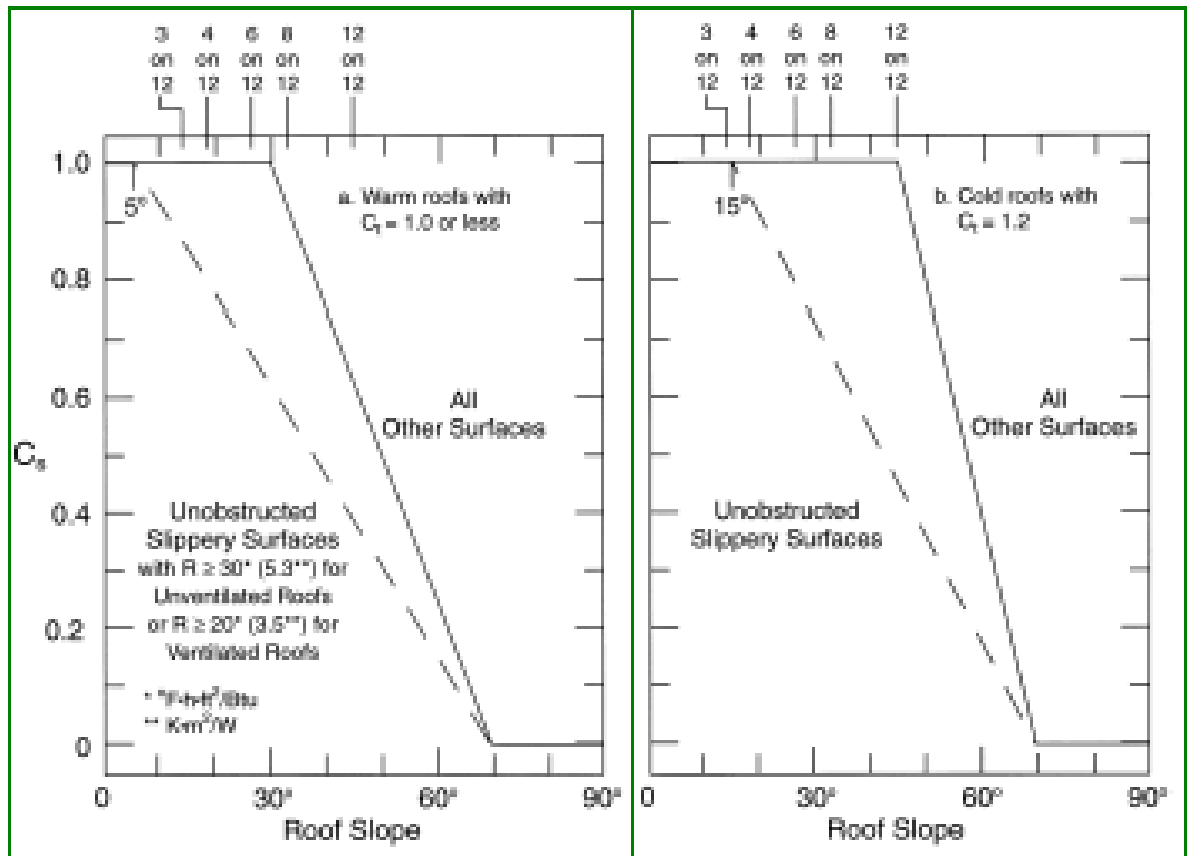


FIGURE 7-2. Graphs for Determining Roof Slope Factor C_s for Warm and Cold Roofs

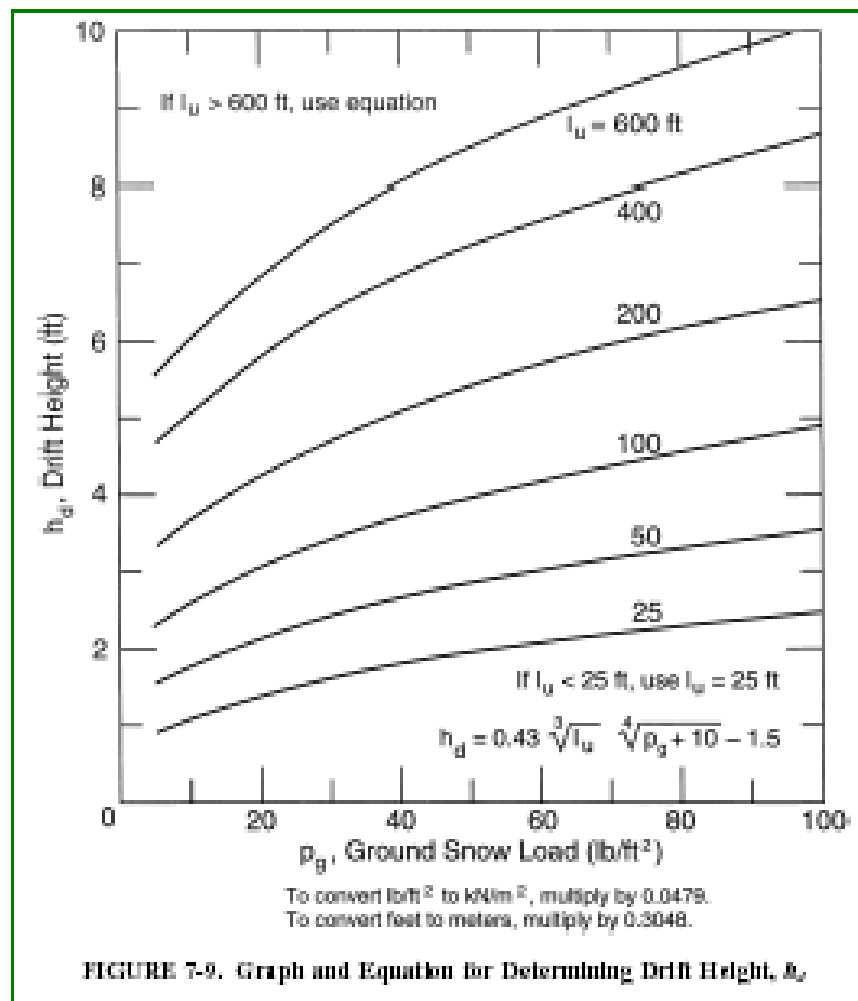
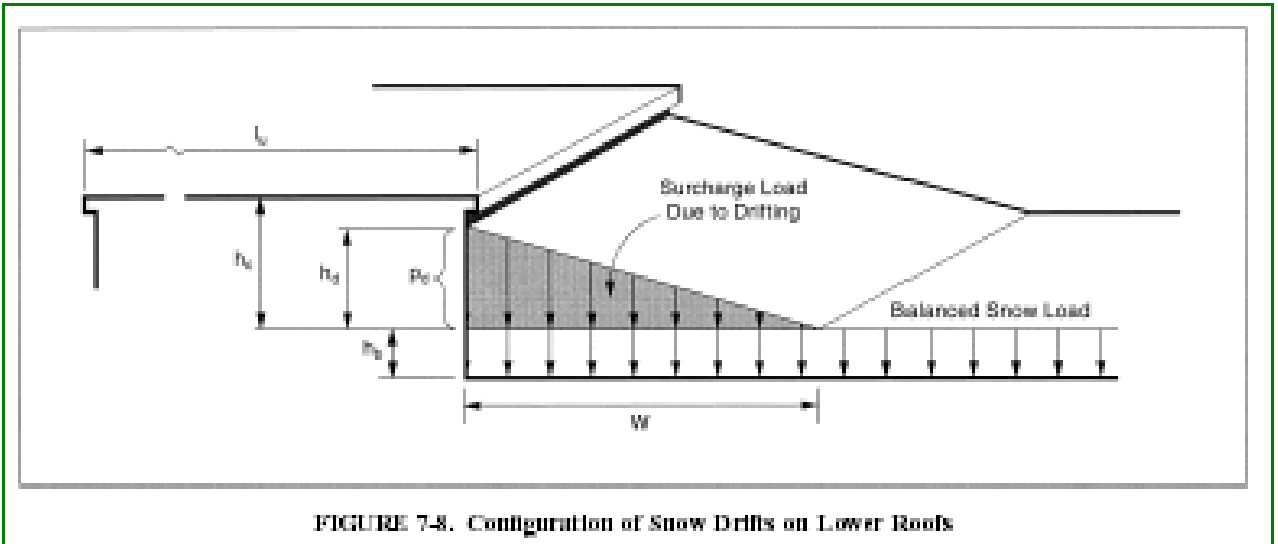


TABLE 7-1. Ground Snow Loads, p_g , for Alaskan Locations

Location	p_g		Location	p_g		Location	p_g	
	lb/ft ²	(kN/m ²)		lb/ft ²	(kN/m ²)		lb/ft ²	(kN/m ²)
Adak	30	(1.4)	Colerna	60	(2.9)	Petersburg	150	(7.2)
Anchorage	50	(2.4)	Cookham	70	(3.4)	St. Paul Islands	40	(1.9)
Angoon	70	(3.4)	Homer	40	(1.9)	Seward	50	(2.4)
Barrow	25	(1.2)	Juneau	60	(2.9)	Shemya	25	(1.2)
Barter Island	35	(1.7)	Kenai	70	(3.4)	Sitka	50	(2.4)
Bethel	40	(1.9)	Kodiak	30	(1.4)	Talkeetna	120	(5.8)
Big Delta	50	(2.4)	Kotzebue	60	(2.9)	Umanakleet	50	(2.4)
Cold Bay	25	(1.2)	McGrath	70	(3.4)	Valdez	160	(7.7)
Cordova	100	(4.8)	Nenana	80	(3.8)	Whittier	300	(14.4)
Fairbanks	60	(2.9)	Nome	70	(3.4)	Wrangell	60	(2.9)
Fort Yukon	60	(2.9)	Palmar	50	(2.4)	Yukutat	150	(7.2)

TABLE 7-2. Exposure Factor, C_e

Terrain Category	Exposure of Roof ¹		
	Fully Exposed	Partially Exposed	Sheltered
A (see Section 6.5.3)	NA	1.1	1.3
B (see Section 6.5.3)	0.9	1.0	1.2
C (see Section 6.5.3)	0.9	1.0	1.1
D (see Section 6.5.3)	0.8	0.9	1.0
Above the treeline in windswept mountainous areas.	0.7	0.8	NA
In Alaska, in areas where trees do not exist within a 2-mile (3-km) radius of the site.	0.7	0.8	NA

Notes: The terrain category and roof exposure condition chosen shall be representative of the anticipated conditions during the life of the structure. An exposure factor shall be determined for each roof of a structure.

¹Definitions:

Partially Exposed: All roofs except as indicated below.

Fully Exposed: Roofs exposed on all sides with no shelter² afforded by terrain, higher structures or trees. Roofs that contain several large pieces of mechanical equipment, parapets which extend above the height of the balanced snow load (A_0), or other obstructions are not in this category.

Sheltered: Roofs located tight in among corridors that qualify as obstructions.

²Obstructions within a distance of $10h$, provide "shelter," where h is the height of the obstruction above the roof level. If the only obstructions are a few deciduous trees which are leafless in winter, the "fully exposed" category shall be used except for terrain Category "A." Note that these are heights above the roof. Heights used to establish the Terrain Category in Section 6.5.3 are heights above the ground.

TABLE 7-3. Thermal Factor, C_t

Thermal Condition ¹	C_t
All structures except as indicated below.	1.0
Structures kept just above freezing and others with cold, ventilated roofs in which the thermal resistance (R -value) between the ventilated space and the heated space exceeds $25^{\circ}\text{F}\cdot\text{h}\cdot\text{ft}^2/\text{Btu}$ ($4.4\text{ K}\cdot\text{m}^2/\text{W}$).	1.1
Unheated structures and structures intentionally kept below freezing.	1.2
Continuously heated greenhouses ² with a roof having a thermal resistance (R -value) less than $2.0^{\circ}\text{F}\cdot\text{h}\cdot\text{ft}^2/\text{Btu}$ ($0.4\text{ K}\cdot\text{m}^2/\text{W}$).	0.85

¹These conditions shall be representative of the anticipated conditions during winters for the life of the structure.

²Green houses with a constantly maintained interior temperature of 50°F (10°C) or more at any point 3 ft above the floor level during winters and having either a maintenance attendant on duty at all times or a temperature alarm system to provide warning in the event of a heating failure.

TABLE 7-4. Importance Factor, I , (Snow Loads)

Category ¹	I
I	0.8
II	1.0
III	1.1
IV	1.2

¹See Section 1.3 and Table 1-1.

TABLE C3-1. Minimum Design Dead Loads* (English Units)

Component	Load (psf)	Component	Load (psf)	Component	Load (psf)
CEILING		FLOOR FILL		Clay brick wythes	
Acoustical Fiber Board	1	Cinder concrete, per inch	9	4 in.	39
Gypsum board (per mm thickness)	0.55	Lightweight concrete, per inch	8	8 in.	79
Mechanical duct allowance	4	Sand, per inch	8	12 in.	115
Plaster on tile or concrete	5	Stone concrete, per inch	12	16 in.	155
Plaster on wood lath	8	FLOORS AND FLOOR FINISHES			
Suspended steel channel system	2	Asphalt block (2-in.), 1/2-in. mortar	30	Hollow concrete masonry unit wythes	
Suspended metal lath and cement plaster	15	Cement finish (1-in.) on stone-concrete fill	32	Wythe thickness (in inches)	4 6 8 10 12
Suspended metal lath and gypsum plaster	10	Ceramic or quarry tile (3/4-in.) on 1/2-in. mortar bed	16	Density of unit (16.49 kN/m ³)	
Wood furring suspension system	2.5	Ceramic or quarry tile (3/4-in.) on 1-in. mortar bed	23	No grout	22 24 31 37 43
COVERINGS, ROOF, AND WALL		Concrete fill finish (per inch thickness)	12	48" o.c.	29 38 47 55
Asbestos-cement shingles	4	Hardwood flooring, 7/7-in.	4	40" o.c. grout	30 40 49 57
Asphalt shingles	2	Linoleum or asphalt tile, 1/4-in.	1	32" o.c. spacing	32 42 52 61
Cement tile	16	Marble and mortar on stone-concrete fill	33	24" o.c.	34 46 57 67
Clay tile (for mortar add 10 psf)		Slate (per mm thickness)	15	16" o.c.	40 53 66 79
Book tile, 2-in.	12	Solid flat tile on 1-in. mortar base	23	Full grout	55 75 95 115
Book tile, 3-in.	20	Subflooring, 3/4-in.	3		
Ludowici	10	Terrazzo (1-1/2-in.) directly on slab	19	Density of unit (125 psf):	
Roman	12	Terrazzo (1-in.) on stone-concrete fill	32	No grout	26 28 36 44 50
Spanish	19	Terrazzo (1-in.), 2-in. stone concrete	32	48" o.c.	33 44 54 62
Composition:		Wood block (3-in.) on mastic, no fill	10	40" o.c. grout	34 45 56 65
Three-ply ready roofing	1	Wood block (3-in.) on 1/2-in. mortar base	16	32" o.c. spacing	36 47 58 68
Four-ply felt and gravel	5.5	FLOORS, WOOD-JOIST (NO PLASTER)			
Five-ply felt and gravel	6	DOUBLE WOOD FLOOR		16" o.c.	39 51 63 75
					44 59 73 87

Copper or tin	1		12-in.	16-in.	24-in.	Full Grout	59	81	102	123	
Corrugated asbestos-cement roofing	4	Joist sizes	spacing	spacing	spacing	Density of Unit (21.21 kN/m ³)					
Deck, metal, 20 gage	2.5	(in.):	(lb/ft ²)	(lb/ft ²)	(lb/ft ²)	No grout	29	30	39	47	54
Deck, metal, 18 gage	3	2 × 6	6	5	5	48" o.c.	36	47	57	66	
Decking, 2-in. wood (Douglas fir)	5	2 × 8	6	6	5	40" o.c. grout	37	48	59	69	
Decking, 3-in. (Douglas fir)	8	2 × 10	7	6	6	32" o.c. spacing	38	50	62	72	
Fiberboard, 1/2-in.	0.75	2 × 12	8	7	6	24" o.c.	41	54	67	78	
Gypsum sheathing, 1/2-in.	2	FRAME PARTITIONS				16" o.c.	46	61	76	90	
Insulation, roof boards (per in. thickness)		Movable steel partitions				4	Full grout	62	83	105	127
Cellular glass	0.7	Wood or steel studs, 1/2-in. gypsum board each side				8					
Fibrous glass	1.1	Wood studs, 2 × 4, unplastered				4					
Fiberboard	1.5	Wood studs, 2 × 4, plastered one side				12	Solid concrete masonry unit wythes (incl. concrete brick):				
Perlite	0.8	Wood studs, 2 × 4, plastered two sides				20	Wythe thickness (in mm)				
Polystyrene foam	0.2	FRAME WALLS					Density of unit (105 pcf):				
Urethane foam with skin	0.5	Exterior stud walls:					Density of unit (125 pcf):				
Plywood (per 1/8-in. thickness)	0.4	2 × 4 @ 16-in., 5/8-in. gypsum, insulated, 3/8-in. siding				11	Density of unit (135 pcf):				
Rigid insulation, 1/2-in.	0.75	2 × 6 @ 16-in., 5/8-in. gypsum, insulated, 3/8-in. siding				12					
Skylight, metal frame, 3/8-in. wire glass	8	Exterior stud walls with brick veneer				48					
Slate, 3/16-in.	7	Windows, glass, frame and sash				8					
Slate, 1/4-in.	10										
Waterproofing membranes:											
Bituminous, gravel-covered	5.5										
Bituminous, smooth surface	1.5										
Liquid applied	1										
Single-ply, sheet	0.7										
Wood sheathing (per in. thickness)	3										
Wood shingles	3										

*Weights of masonry include mortar but not plaster. For plaster, add 5 lb/ft² for each face plastered. Values given represent averages. In some cases there is a considerable range of weight for the same construction.

TABLE C3-1. Minimum Design Dead Loads* (Standard International Units)

Component	Load (kN/m ²)	Component	Load (kN/m ²)	Component	Load (kN/m ²)
CEILING		FLOOR FILL		Clay brick wythes:	
Acoustical Fiber Board	0.05	Cinder concrete, per mm	0.017	102 mm	1.87
Gypsum board (per mm thickness)	0.008	Lightweight concrete, per mm	0.015	203 mm	3.78
Mechanical duct allowance	0.19	Sand, per mm	0.015	305 mm	5.51
Plaster on tile or concrete	0.24	Stone concrete, per mm	0.023	406 mm	7.42
Plaster on wood lath	0.38	FLOORS AND FLOOR FINISHES			
Suspended steel channel system	0.10	Asphalt block (51 mm), 13 mm mortar	1.44	Hollow concrete masonry unit wythes:	
		Cement finish (25 mm) on stone-concrete fill	1.53	Wythe thickness (in mm)	102 152 203 254 305
Suspended metal lath and cement plaster	0.72	Ceramic or quarry tile (19 mm) on 13 mm mortar bed	0.77	Density of unit (16.49 kN/m ³)	
Suspended metal lath and gypsum plaster	0.48	Ceramic or quarry tile (19 mm) on 25 mm mortar bed	1.10	No grout	1.05 1.29 1.68 2.01 2.35
Wood furring suspension system	0.12	Concrete fill finish (per mm thickness)	0.023	1,219 mm	1.48 1.92 2.35 2.78
COVERINGS, ROOF, AND WALL		Hardwood flooring, 22 mm	0.19	1,016 mm grout	1.58 2.06 2.54 3.02
Asbestos-cement shingles	0.19	Linoleum or asphalt tile, 6 mm	0.05	813 mm spacing	1.63 2.15 2.68 3.16
Asphalt shingles	0.10	Marble and mortar on stone-concrete fill	1.58	610 mm	1.77 2.35 2.92 3.45
Cement tile	0.77	Slate (per mm thickness)	0.028	406 mm	2.01 2.68 3.35 4.02
Clay tile (for mortar add 0.48kN/m ²)		Solid flat tile on 25 mm mortar base	1.10	Full grout	2.73 3.69 4.69 5.70
Book tile, 51 mm	0.57	Subflooring, 19 mm	0.14		
Book tile, 76 mm	0.96	Terrazzo (38 mm) directly on slab	0.91	Density of unit (125 pcf):	
Ludowici	0.48	Terrazzo (25 mm) on stone-concrete fill	1.53	No grout	1.25 1.34 1.72 2.11 2.39
Roman	0.57	Terrazzo (25 mm), 51 mm stone concrete	1.53	1,219 mm	1.58 2.11 2.59 2.97
Spanish	0.91	Wood block (76 mm) on mastic, no fill	0.48	1,016 mm grout	1.63 2.15 2.68 3.11
Composition:		Wood block (76 mm) on 13 mm mortar base	0.77	813 mm spacing	1.72 2.25 2.78 3.26
Three-ply ready roofing	0.05	FLOORS, WOOD-JOIST (NO PLASTER)			
Four-ply felt and gravel	0.26	DOUBLE WOOD FLOOR			
Five-ply felt and gravel	0.29	305 mm	406 mm	610 mm	406 mm
Copper or tin	0.05	spacing	spacing	spacing	Full Grout
Corrugated asbestos-cement roofing	0.19	(mm)	(kN/m ²)	(kN/m ²)	Density of unit (21.21 kN/m ³)
Deck, metal, 20 gage	0.12	51 × 152	0.29	0.24	0.24
Deck, metal, 18 gage	0.14	51 × 203	0.29	0.29	0.24
Decking, 51 mm wood (Douglas fir)	0.24	51 × 254	0.34	0.29	0.29
Decking, 76 mm wood (Douglas fir)	0.38	51 × 305	0.38	0.34	0.29
Fiberboard, 13 mm	0.04				
					No grout
					1,219 mm
					1,016 mm grout
					813 mm spacing

Gypsum sheathing, 13 mm	0.10	FRAME PARTITIONS	610 mm	1.96	2.82	3.50	4.12
Insulation, roof boards (per mm thickness)		Movable steel partitions	406 mm	2.25	3.16	3.93	4.69
Cellular glass	0.0013	Wood or steel studs, 13 mm gypsum board each side	Full Grout	3.06	4.17	5.27	6.37
Fibrous glass	0.0021	Wood studs, 51 × 102, unplastered		0.19			
Fiberboard	0.0028	Wood studs, 51 × 102, plastered one side	0.57	Solid concrete masonry unit wythes (incl. concrete brick):			
Perlite	0.0015	Wood studs, 51 × 102, plastered two sides	0.96	Wythe thickness (in mm)			
Polystyrene foam	0.0004	FRAME WALLS		Density of unit (16.49	1.53	2.35	3.21
				kN/m ³):			4.02
Urethane foam with skin	0.0009	Exterior stud walls:		Density of unit (19.64	1.82	2.82	3.78
				kN/m ³):			4.79
Plywood (per mm thickness)	0.006	51 mm × 102 mm @ 406 mm, 16 mm gypsum, insulated, 10 mm siding	0.53	Density of unit (21.21	1.96	3.02	4.12
Rigid insulation, 13 mm	0.04	51 mm × 152 mm @ 406 mm, 16 mm gypsum, insulated, 10 mm siding	0.57	kN/m ³):			5.17
Skylight, metal frame, 10 mm wire glass	0.38	Exterior stud walls with brick veneer	2.30				6.27
Slate, 5 mm	0.34	Windows, glass, frame and sash	0.38				
Slate, 6 mm	0.48						
Waterproofing membranes:							
Bituminous, gravel-covered	0.26						
Bituminous, smooth surface	0.07						
Liquid applied	0.05						
Single-ply, sheet	0.03						
Wood sheathing (per mm thickness)	0.0057						
Wood shingles	0.14						

*Weights of masonry include mortar but not plaster. For plaster, add 0.24 kN/m² for each face plastered. Values given represent averages. In some cases there is a considerable range of weight for the same construction.

TABLE C3-2. Minimum Densities for Design Loads from Materials (English Units)

Material	Load (lb/ft ³)	Material	Load (lb/ft ³)
Aluminum	170	Lead	710
Bituminous products		Lime	
Asphaltum	81	Hydrated, loose	32
Graphite	135	Hydrated, compacted	45
Paraffin	56	Masonry, Ashlar Stone	
Petroleum, crude	55	Granite	165
Petroleum, refined	50	Limestone, crystalline	165
Petroleum, kerosene	46	Limestone, oolitic	135
Petroleum, gasoline	42	Marble	173
Pitch	69	Sandstone	144
Tar	75	Masonry, Brick	
Brass	526	Hard (low absorption)	130
Bronze	552	Medium (medium absorption)	115
Cast-stone masonry (concrete, stone, sand)	144	Soft (high absorption)	100
Cement, portland, loose	90	Masonry, Concrete ¹	
Ceramic tile	150	Lightweight units	105
Charcoal	12	Medium weight units	125
Cinder fill	57	Normal weight units	135
Cinders, dry, in bulk	45	Masonry Grout	140
Coal		Masonry, Rubble Stone	
Anthracite, piled	52	Granite	153
Bituminous, piled	47	Limestone, crystalline	147
Lignite, piled	47	Limestone, oolitic	138
Peat, dry, piled	23	Marble	156
Concrete, plain		Sandstone	137
Cinder	108	Mortar, cement or lime	130
Expanded-slag aggregate	100	Particleboard	45
Haydite (burned-clay aggregate)	90	Plywood	36
Slag	132	Riprap (Not submerged)	
Stone (including gravel)	144	Limestone	83
Vermiculite and perlite aggregate, nonload-bearing	25-30	Sandstone	90
Other light aggregate, load-bearing	70-105	Sand	
Concrete, Reinforced		Clean and dry	90
Cinder	111	River, dry	106
Slag	138	Slag	
Stone (including gravel)	150	Bank	70
Copper	556	Bank screenings	108
Cork, compressed	14	Machine	96
Earth (not submerged)		Sand	52
Clay, dry	63	Slate	172
Clay, damp	110	Steel, cold-drawn	492
Clay and gravel, dry	100	Stone, Quarried, Piled	
Silt, moist, loose	78	Basalt, granite, gneiss	96
Silt, moist, packed	96	Limestone, marble, quartz	95
Silt, flowing	108	Sandstone	82
Sand and gravel, dry, loose	100	Shale	92
Sand and gravel, dry, packed	110	Gneiss, hornblende	107
Sand and gravel, wet	120	Terra Cotta, Architectural	
Earth (submerged)		Voile filled	120
Clay	80	Voile unfilled	72
Soil	70	Tin	450
River mud	90	Water	

TABLE C3-2. Minimum Densities for Design Loads from Materials (English Units) (Continued)

Material	Load (lb/ft ³)	Material	Load (lb/ft ³)
Sand or gravel	60	Trash	62
Sand or gravel and clay	65	Sea	64
Glass	160	Wood, Seasoned	
Gravel, dry	104	Ash, commercial white	41
Gypsum, loose	70	Cypress, southern	34
Gypsum, wallboard	50	Fir, Douglas, coast region	34
Ice	57	Hem fir	28
Iron		Oak, commercial red and white	47
Cast	450	Pine, southern yellow	37
Wrought	480	Redwood	28
		Spruce, red, white, and Sitka	29
		Western hemlock	32
		Zinc, rolled sheet	449

¹Tabulated values apply to solid masonry and to the solid portion of hollow masonry

TABLE C3-3. Minimum Densities for Design Loads from Materials (Standard International Units)

Material	Load (kN/m ³)	Material	Load (kN/m ³)
Aluminum	26.7	Lead	111.5
Bituminous products		Lint	
Asphaltum	12.7	Hydrated, loose	5.0
Graphite	21.2	Hydrated, compacted	7.1
Paraffin	8.8	Masonry, Ashlar Stone	
Petroleum, crude	8.6	Granite	25.9
Petroleum, refined	7.9	Limestone, crystalline	25.9
Petroleum, benzine	7.2	Limestone, oolitic	21.2
Petroleum, gasoline	6.6	Marble	27.2
Pitch	10.8	Sandstone	22.6
Tar	11.8	Masonry, Brick	
Brass	82.6	Hard (low absorption)	20.4
Bronze	86.7	Medium (medium absorption)	18.1
Cast-stone masonry (concrete, stone, sand)	22.6	Soft (high absorption)	15.7
Cement, portland, loose	14.1	Masonry, Concrete ¹	
Ceramic tile	23.6	Lightweight units	16.5
Charcoal	1.9	Medium weight units	19.6
Cinder fill	9.0	Normal weight units	21.2
Cinders, dry, in bulk	7.1	Masonry Grout	22.0
Coal		Masonry, Rubble Stone	
Anthracite, piled	8.2	Granite	24.0
Bituminous, piled	7.4	Limestone, crystalline	23.1
Lignite, piled	7.4	Limestone, oolitic	21.7
Peat, dry, piled	3.6	Marble	24.3
Concrete, plain		Sandstone	21.5
Cinder	17.0	Mortar, cement or lime	20.4
Expanded-slag aggregate	15.7	Particleboard	7.1
Hazardite (burned-clay aggregate)	14.1	Plywood	5.7
Slag	20.7	Riprap (Not submerged)	

TABLE C3-2. Minimum Densities for Design Loads from Materials (Standard International Units)
(Continued)

Material	Load (kN/m ³)	Material	Load (kN/m ³)
Stone (including gravel)	22.6	Limestone	13.0
Vermiculite and perlite aggregate, nonload-bearing	3.9–7.9	Sandstone	14.1
Other light aggregate, load-bearing	11.0–16.5	Sand	
Concrete, Reinforced		Clean and dry	14.1
Cinder	17.4	River, dry	16.7
Slag	21.7	Slag	
Stone (including gravel)	23.6	Bark	11.0
Copper	87.3	Bark screenings	17.0
Cork, compressed	2.2	Machine	15.1
Earth (not submerged)		Sand	8.2
Clay, dry	9.9	Slate	27.0
Clay, damp	17.3	Steel, cold-drawn	77.3
Clay and gravel, dry	15.7	Stone, Quarried, Filled	
Silt, moist, loose	12.3	Basalt, granite, gneiss	15.1
Silt, moist, packed	15.1	Limestone, marble, quartz	14.9
Silt, flowing	17.0	Sandstone	12.9
Sand and gravel, dry, loose	15.7	Shale	14.5
Sand and gravel, dry, packed	17.3	Gneiss, hornblende	16.8
Sand and gravel, wet	18.9	Terra Cotta, Architectural	
Earth (submerged)		Voids filled	18.9
Clay	12.6	Voids unfilled	11.3
Soil	11.0	Tin	72.1
River mud	14.1	Water	
Sand or gravel	9.4	Fresh	9.7
Sand or gravel and clay	10.2	Sea	10.1
Glass	25.1	Wood, Seasoned	
Gravel, dry	16.3	Ash, commercial white	6.4
Gypsum, loose	11.0	Cypress, southern	5.3
Gypsum, wallboard	7.9	Fir, Douglas, coast region	5.3
Ice	9.0	Hem. fir	4.4
Iron		Oak, commercial reds and whites	7.4
Cast	70.7	Pine, southern yellow	5.8
Wrought	75.4	Redwood	4.4
		Spruce, wd, white, and Sitka	4.5
		Western hemlock	5.0
		Zinc, rolled sheet	70.5

¹Tabulated values apply to solid masonry and to the solid portion of hollow masonry.