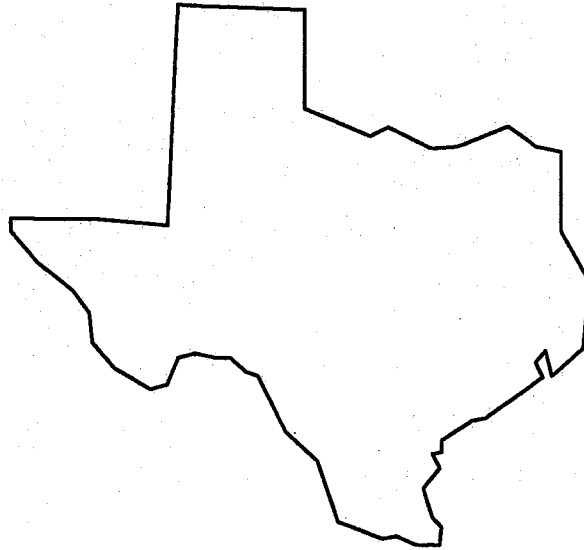


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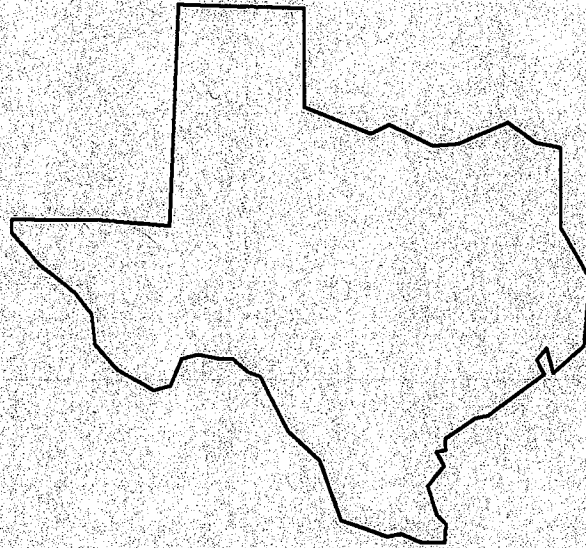
BUILDING CODE FOR WINDSTORM RESISTANT CONSTRUCTION

27 TAC §5.4008

Amendments Effective June 1, 2002

**DEVELOPED BY THE
TEXAS DEPARTMENT OF INSURANCE**

TEXAS WINDSTORM INSURANCE ASSOCIATION



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27 TAC §5.4008

Amendments Effective December 1, 2000

**DEVELOPED BY THE
TEXAS DEPARTMENT OF INSURANCE**

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Section 100

General Requirements

101 Scope

The 70th Texas Legislature passed House Bill 2012, (codified as Article 21.49 Section 6A, Texas Insurance Code), which implements certain inspection requirements for structures to be considered insurable property for windstorm and hail insurance through the *Texas Windstorm Insurance Association (T.W.I.A.)*, formerly known as the *Texas Catastrophe Property Insurance Association (T.C.P.I.A.)*. All new construction, repairs, or additions which commenced on or after January 1, 1988, shall be inspected or approved by the Texas Department of Insurance for compliance with the building specifications in the *T.W.I.A. Plan of Operation*, if the property is to be certified as insurable by the T.W.I.A. Participation in this program is not mandatory. However, property which has not been inspected and certified in accordance with the requirements of this inspection program will not be eligible for windstorm insurance through the T.W.I.A. The inspection program applies only to structures located in areas designated as a "catastrophe area" by the Commissioner of the Texas Department of Insurance. The current areas designated as a "catastrophe area" are as follows:

1. Aransas County
2. Brazoria County
3. Calhoun County
4. Cameron County
5. Chambers County
6. Galveston County
7. Jefferson County
8. Kenedy County
9. Kleberg County
10. Matagorda County
11. Nueces County
12. Refugio County
13. San Patricio County
14. Willacy County
15. Other areas as designated by the Commissioner of Insurance.

102 Building Specifications

To be certified by the Texas Department of Insurance as insurable by the T.W.I.A, structures which commence construction on or after September 1, 1998 shall be built to resist wind pressures determined from the wind load provisions of ASCE 7-93, *Minimum Design Loads for Buildings and Other Structures*. Structures built inland of the dividing line established by the Texas Department of Insurance shall be designed and constructed to resist a fastest mile basic wind speed of 95 miles per hour. Structures built seaward of the dividing line shall be designed and constructed to resist a fastest mile basic wind speed of 100 miles per hour.

All structures located in the area seaward of the dividing line established by the Texas Department of Insurance shall have exterior wall openings protected in compliance with **Section 408.5**.

Structures which will be inspected by the Texas Department of Insurance shall either be constructed to comply with the prescriptive requirements of this building code or shall have been designed by a Texas licensed professional engineer as specified in **Section 105** and **Section 107**.

Structures which will be designed or designed and inspected by a Texas licensed professional engineer shall be designed to comply with either the wind load provisions of ASCE 7-93 or the simplified wind pressures specified in **Section 103**. The engineer shall submit to the Texas Department of Insurance the documentation specified in either **Section 105** or **Section 107**. If the engineer elects to use the wind load provisions of ASCE 7-93 to determine the wind loads for the structure, then the engineer shall use an Exposure Category that adequately reflects the characteristics of the ground surface for the site at which the building is to be constructed. The Texas licensed professional engineer may inspect a building for compliance using the prescriptive requirements contained in this building code. The engineer shall submit to the Texas Department of Insurance the documentation specified in **Section 107**.

103 Simplified Wind Pressures

As an alternative to calculating the wind loads on a building using the wind load provisions of ASCE 7-93, the wind pressures presented in this section may be used. The wind pressures presented in this section were determined using the wind load provisions of ASCE 7-93. Wind pressures are presented for both the inland area and the seaward area. Wind pressures for the inland area were determined using a fastest mile basic wind speed of 95 miles per hour. Wind pressures for the seaward area were determined using a fastest mile basic wind speed of 100 miles per hour. Building Exposure Category C was used for both the inland and the seaward areas.

The wind pressures presented in this section were calculated using rectangular shaped buildings, three stories or less in height, having roof slopes less than or equal to 12:12 (45 degrees). The wall height of each story does not exceed 10 feet. If the building geometry does not fall within these limitations, the simplified wind loads presented in this section cannot be used.

Wind pressures were calculated assuming that the building is an enclosed structure. It is assumed that all glazed openings, doors, and garage doors are either designed to resist impact from windborne debris or are protected from impact by windborne debris. It is further assumed that all glazed openings, doors, and garage doors have been adequately designed to resist the wind pressures specified in this section. Buildings that can not meet this criteria are considered to be partially enclosed. Partially enclosed buildings can not be designed using the simplified wind loads presented in this section. Wind pressures for such buildings shall be determined from ASCE 7-93 directly.

The wind pressures presented in this section were determined for two categories of systems on a building; (1) the main wind-force resisting systems and (2) the structural components and cladding. The main wind-force resisting systems of a building include rigid and braced frames, roof and floor diaphragms, shearwalls, and the anchorage of roof and wall framing. These pressures shall also be used to determine overturning resistance. Components and cladding include exterior glass windows, doors and garage doors, exterior siding and brick veneer, roof and wall sheathing, roof coverings, roof trusses and rafters, exterior wall studs, purlins, and girts.

The wind pressures in this section are presented in the form of tables. Tables 103A-I contain wind pressures for inland areas and Tables 103J-R contain wind pressures for seaward areas. Tables for each area are further categorized as wind pressures for main wind-force resisting systems and wind pressures for components and cladding. The wind pressures in these tables are either positive or negative. A positive wind pressure is defined as wind pressure acting towards the surface of the building. Positive wind pressures presented in the tables are denoted by a "+" sign in front of the number unless otherwise noted. A negative wind pressure is defined as wind pressure acting away from the surface of the building. Negative wind pressures presented in the tables are denoted by a "-" sign in front of the number unless otherwise noted. Wind pressures always act perpendicular to the surface upon which they are acting.

Table 103A
Wind Pressures Inland Area
 Main Wind Force Resisting System
 Windward Wall

Windward Wall Height (ft)	Wind Pressure (psf)
0-15	+25
15-20	+26
20-25	+27
25-30	+28.5
30-40	+30
40-50	+32

Table 103B
Wind Pressures Inland Area
 Main Wind Force Resisting System
 Leeward Wall

Building Type	Wind Pressure (psf)
1 Story (Slab-on-grade; Piers)	-8
2 Story (Slab-on-grade; Piers) Or 1 Story (Pile Foundation)	-8.5
3 Story (Slab-on-grade) Or 2 Story (Pile Foundation)	-9

Table 103C
Wind Pressures Inland Area
 Main Wind Force Resisting System
 Roof (Wind Parallel to Ridge),
 Side Walls

Negative Wind Pressures (psf)

Building Type	Roof Slope		
	< 3:12	3:12 - 7:12	>7:12 - 12:12
1 Story (Slab-on-grade; Piers)	22	23	24
2 Story (Slab-on-grade; Piers) Or 1 Story (Pile Foundation)	23	25	26
3 Story (Slab-on-grade) Or 2 Story (Pile Foundation)	25	26	27

Table 103D
Wind Pressures Inland Area
 Main Wind Force Resisting System
 Roof Overhang

Building Type	Wind Pressure (psf)
1 Story (Slab-on-grade; Piers)	+21
2 Story (Slab-on-grade; Piers) Or 1 Story (Pile Foundation)	+23
3 Story (Slab-on-grade) Or 2 Story (Pile Foundation)	+24

Note: Pressure is applied to underside of windward overhang

Table 103E
Wind Pressures Inland Area
Main Wind Force Resisting System
Roof (Wind Normal to Ridge)

Loading Condition 1

Windward Side (Positive Wind Pressures (psf))

Building Type	Roof Slope								
	< 2:12	2:12	3:12	4:12	5:12	6:12	7:12	10:12	12:12
1 Story (Slab-on-grade; Piers)	-	9	10	10	10	11	13	15	17
2 Story (Slab-on-grade; Piers) Or 1 Story (Pile Foundation)	-	10	9	9	8	8	8	14	17
3 Story (Slab-on-grade) Or 2 Story (Pile Foundation)	-	-	-	-	-	-	-	15	18

Leeward Side (Negative Wind Pressures (psf))

Building Type	Roof Slope								
	< 2:12	2:12	3:12	4:12	5:12	6:12	7:12	10:12	12:12
1 Story (Slab-on-grade; Piers)	-	12	12	12	13	13	13	13	14
2 Story (Slab-on-grade; Piers) Or 1 Story (Pile Foundation)	-	13	13	13	14	14	14	14	15
3 Story (Slab-on-grade) Or 2 Story (Pile Foundation)	-	-	-	-	-	-	-	15	15

Note: A "-" indicates that the loading condition does not exist, design using Loading Condition 2 below.

Table 103F
Wind Pressures Inland Area
Main Wind Force Resisting System
Roof (Wind Normal to Ridge)

Loading Condition 2

Windward Side (Negative Wind Pressures (psf))

Building Type	Roof Slope								
	Flat	1:12	2:12	3:12	4:12	5:12	6:12	7:12	>7:12
1 Story (Slab-on-grade; Piers)	22	24	26.5	27	17	12.5	10.5	10	-
2 Story (Slab-on-grade; Piers) Or 1 Story (Pile Foundation)	23	25	27.5	29	26	21.5	15.5	11	-
3 Story (Slab-on-grade) Or 2 Story (Pile Foundation)	25	27.5	30	31	28.5	23	17.5	13	-

Leeward Side (Negative Wind Pressures (psf))

Building Type	Roof Slope								
	Flat	1:12	2:12	3:12	4:12	5:12	6:12	7:12	>7:12
1 Story (Slab-on-grade; Piers)	22	22	22	22	22	22	22	23	-
2 Story (Slab-on-grade; Piers) Or 1 Story (Pile Foundation)	23	23	23	24	24	24	24	25	-
3 Story (Slab-on-grade) Or 2 Story (Pile Foundation)	25	25	25	25	25	26	26	26	-

Note: A "-" indicates that the loading condition does not exist, design using Loading Condition 1 above.

Table 103G
Wind Pressures Inland Area
Components and Cladding
Roof Pressures (psf)

Building Type	Trib. Area	Roof Slope and Roof Zone (See Figure 103D for Zone Location)						
		< 3:12			3:12 - 7:12		>7:12 - 12:12	
		Zone 1	Zone 2	Zone 3	Zone 1	Zones 2+3	Zone 1	Zones 2+3
1 Story (Slab-on-grade; Piers)	10 ft ²	-31	-53	-79	-30	-62	+33; -35	+33; -40
	32 ft ²	-29	-42	-55	-28	-52	+31; -33	+31; -38
2 Story (Slab-on-grade; Piers) Or 1 Story (Pile Foundation)	10 ft ²	-32	-56	-83	-33	-70	+36; -37	+36; -43
	32 ft ²	-30	-45	-58	-31	-59	+33; -35	+33; -41
3 Story (Slab-on-grade) Or 2 Story (Pile Foundation)	10 ft ²	-36	-62	-93	-36	-75	+37; -39	+37; -45
	32 ft ²	-34	-50	-65	-33	-63	+34; -37	+34; -43

Table 103H
Wind Pressures Inland Area
Components and Cladding
Wood Stud Wall Pressures (psf)

Building Type	Trib. Area	Roof Slope and Wall Zone (See Figure 103D for Zone Location)					
		< 3:12		3:12 - 7:12		>7:12 - 12:12	
		Zone 4	Zone 5	Zone 4	Zone 5	Zone 4	Zone 5
1 Story (Slab-on-grade; Piers)	10 ft ²	-32	-42	-33	-43	-37	-48
	32 ft ²	-30	-37	-31	-38	-35	-42
2 Story (Slab-on-grade; Piers) Or 1 Story (Pile Foundation)	10 ft ²	-36	-46	-38	-48	-41	-52
	32 ft ²	-34	-41	-35	-43	-38	-46
3 Story (Slab-on-grade) Or 2 Story (Pile Foundation)	10 ft ²	-38	-49	-40	-52	-42	-54
	32 ft ²	-37	-45	-38	-46	-39	-48

Table 103I
Wind Pressures Inland Area
 Components and Cladding
 Masonry Wall Pressures (psf)

Building Type	Wall Height	Roof Slope and Wall Zone (See Figure 103D for Zone Location)					
		< 3:12		3:12 - 7:12		>7:12 - 12:12	
		Zone 4	Zone 5	Zone 4	Zone 5	Zone 4	Zone 5
1 Story (Slab-on-grade)	8 ft	-29	-34	-30	-35	-33	-38
	10 ft	-28	-32	-30	-34	-33	-37
2 Story (Slab-on-grade)	8 ft	-30	-36	-34	-40	-36	-42
	10 ft	-31	-36	-34	-39	-36	-41

Key: 8 ft wall height, tributary area = 64 sq. ft.
 10 ft wall height, tributary area = 100 sq. ft.

Table 103J
Wind Pressures Seaward Area
 Main Wind Force Resisting System
 Windward Wall

Windward Wall Height (ft)	Wind Pressure (psf)
0-15	+27
15-20	+28.5
20-25	+30
25-30	+31
30-40	+33
40-50	+35

Table 103K
Wind Pressures Seaward Area
 Main Wind Force Resisting System
 Leeward Wall

Building Type	Wind Pressure (psf)
1 Story (Slab-on-grade; Piers)	-9
2 Story (Slab-on-grade; Piers) Or 1 Story (Pile Foundation)	-9.5
3 Story (Slab-on-grade) Or 2 Story (Pile Foundation)	-10

Table 103L
Wind Pressures Seaward Area
Main Wind Force Resisting System
Roof (Wind Parallel to Ridge),
Side Walls

Negative Wind Pressures (psf)

Building Type	Roof Slope		
	< 3:12	3:12 - 7:12	>7:12 - 12:12
1 Story (Slab-on-grade; Piers)	24	25	27
2 Story (Slab-on-grade; Piers) Or 1 Story (Pile Foundation)	25	27	29
3 Story (Slab-on-grade) Or 2 Story (Pile Foundation)	27	29	30

Table 103M
Wind Pressures Seaward Area
Main Wind Force Resisting System
Roof Overhang

Building Type	Wind Pressure (psf)
1 Story (Slab-on-grade; Piers)	+24
2 Story (Slab-on-grade; Piers) Or 1 Story (Pile Foundation)	+25
3 Story (Slab-on-grade) Or 2 Story (Pile Foundation)	+26

Note: Pressure is applied to underside of windward overhang

Table 103N
Wind Pressures Seaward Area
Main Wind Force Resisting System
Roof (Wind Normal to Ridge)

Loading Condition 1**Windward Side (Positive Wind Pressures (psf))**

Building Type	Roof Slope								
	<2:12	2:12	3:12	4:12	5:12	6:12	7:12	10:12	12:12
1 Story (Slab-on-grade; Piers)	-	10	10	10	11	13	14	17	18
2 Story (Slab-on-grade; Piers) Or 1 Story (Pile Foundation)	-	10	10	10	9	9	9	16	19
3 Story (Slab-on-grade) Or 2 Story (Pile Foundation)	-	-	-	-	-	-	-	17	19

Leeward Side (Negative Wind Pressures (psf))

Building Type	Roof Slope								
	<2:12	2:12	3:12	4:12	5:12	6:12	7:12	10:12	12:12
1 Story (Slab-on-grade; Piers)	-	13	13	13	14	14	14	14	15
2 Story (Slab-on-grade; Piers) Or 1 Story (Pile Foundation)	-	14	14	14	15	15	15	15	16
3 Story (Slab-on-grade) Or 2 Story (Pile Foundation)	-	-	-	-	-	-	-	16	16

Note: A "-" indicates that the loading condition does not exist, design using Loading Condition 2 below.

Table 1030
Wind Pressures Seaward Area
Main Wind Force Resisting System
Roof (Wind Normal to Ridge)

Loading Condition 2

Windward Side (Negative Wind Pressures (psf))

Building Type	Roof Slope								
	Flat	1:12	2:12	3:12	4:12	5:12	6:12	7:12	>7:12
1 Story (Slab-on-grade; Piers)	24	27	29	29	19	15	13	10	-
2 Story (Slab-on-grade; Piers) Or 1 Story (Pile Foundation)	25	28	30	31	29	23	17	12	-
3 Story (Slab-on-grade) Or 2 Story (Pile Foundation)	27	30	33	34	31	25	19	15	-

Leeward Side (Negative Wind Pressures (psf))

Building Type	Roof Slope								
	Flat	1:12	2:12	3:12	4:12	5:12	6:12	7:12	>7:12
1 Story (Slab-on-grade; Piers)	24	24	24	24	24	24	24	25	-
2 Story (Slab-on-grade; Piers) Or 1 Story (Pile Foundation)	25	25	25	25	25	26	26	27	-
3 Story (Slab-on-grade) Or 2 Story (Pile Foundation)	27	27	27	27	28	28	28	29	-

Note: A "-" indicates that the loading condition does not exist, design using Loading Condition 1 above.

Table 103P
Wind Pressures Seaward Area
 Components and Cladding
 Roof Pressures (psf)

Building Type	Trib. Area	Roof Slope and Roof Zone (See Figure 103D for Zone Location)						
		< 3:12			3:12 - 7:12		>7:12 - 12:12	
		Zone 1	Zone 2	Zone 3	Zone 1	Zones 2+3	Zone 1	Zones 2+3
1 Story (Slab-on-grade; Piers)	10 ft ²	-34	-58	-87	-33	-69	+36; -38	+36; -42
	32 ft ²	-32	-47	-61	-30	-56	+34; -36	+34; -40
2 Story (Slab-on-grade; Piers) Or 1 Story (Pile Foundation)	10 ft ²	-36	-61	-91	-37	-78	+40; -42	+40; -44
	32 ft ²	-33	-49	-64	-33	-63	+34; -40	+34; -42
3 Story (Slab-on-grade) Or 2 Story (Pile Foundation)	10 ft ²	-40	-69	-103	-40	-83	+42; -43	+42; -46
	32 ft ²	-37	-55	-72	-37	-70	+38; -41	+38; -44

Table 103Q
Wind Pressures Seaward Area
 Components and Cladding
 Wood Stud Wall Pressures (psf)

Building Type	Trib. Area	Roof Slope and Wall Zone (See Figure 103D for Zone Location)					
		< 3:12		3:12 - 7:12		>7:12 - 12:12	
		Zone 4	Zone 5	Zone 4	Zone 5	Zone 4	Zone 5
1 Story (Slab-on-grade; Piers)	10 ft ²	-36	-46	-37	-48	-41	-52
	32 ft ²	-33	-40	-34	-41	-36	-43
2 Story (Slab-on-grade; Piers) Or 1 Story (Pile Foundation)	10 ft ²	-38	-48	-42	-54	-45	-58
	32 ft ²	-35	-43	-38	-46	-40	-48
3 Story (Slab-on-grade) Or 2 Story (Pile Foundation)	10 ft ²	-42	-54	-45	-57	-48	-59
	32 ft ²	-40	-49	-42	-51	-43	-52

Table 103R
Wind Pressures Seaward Area
Components and Cladding
Masonry Wall Pressures (psf)

Building Type	Wall Height	Roof Slope and Wall Zone (See Figure 103D for Zone Location)					
		< 3:12		3:12 - 7:12		>7:12 - 12:12	
		Zone 4	Zone 5	Zone 4	Zone 5	Zone 4	Zone 5
1 Story (Slab-on-grade)	8 ft	-32	-37	-33	-39	-36	-43
	10 ft	-31	-35	-33	-38	-36	-41
2 Story (Slab-on-grade)	8 ft	-34	-39	-38	-44	-40	-47
	10 ft	-35	-39	-38	-43	-40	-45

Key: 8 ft wall height, tributary area = 64 sq. ft.
 10 ft wall height, tributary area = 100 sq. ft.

Main Wind-Force Resisting System Pressures

Wind pressures acting against building walls are either positive or negative, depending on the wall surface being considered. Figure 103A illustrates how wind pressures act upon the walls of a building. Wind pressures acting on the windward wall of the building are always positive. As shown in Figure 103A, the magnitude of the windward wall pressure increases with building height. Wind pressures acting on the leeward wall (wall opposite the windward wall) of the building are always negative. Leeward wall pressures are constant with building height and are based on the mean roof height of the building. The total lateral wall pressure is the sum of the windward and leeward wall pressures (sum the pressures together without considering the sign).

Wind pressures acting on the roof of the building may be positive or negative depending on the slope of the roof and the direction of the wind hitting the building. If the wind direction is perpendicular to the roof ridge, then the roof pressures act as shown in Figure 103B (wall pressures have been removed for clarity). Wind pressures acting on the leeward side of the roof are always negative. Wind pressures acting on the windward side of the roof can be positive, negative, or both, depending on the slope of the roof. Tables 103E-F and 103N-O list wind pressures for two loading conditions that may occur on the roof for wind perpendicular to the ridge. Both loading conditions should be considered to determine the most critical load combination for design.

If the wind direction is parallel to the roof ridge, then the roof pressures act as shown in Figure 103C. Wind pressures acting over the entire roof surface and the side walls (walls parallel to wind direction) are negative.

Wind pressures acting against the underside of roof overhangs are positive, and therefore act upwards towards the lower surface of the overhang. For design, the wind pressure should only be applied to the underside of the windward overhang.

The main wind-force resisting systems of the building shall be designed for the most stringent loading condition. In no case shall the overall minimum design wind pressure for the main wind-force resisting system be less than 10 psf multiplied by the area of the building projected on a vertical plane that is normal to the wind direction.

Components and Cladding Pressures

Wind pressures for components and cladding members are a function of the location of the member on the surface of the building (referred to as 'zone' by ASCE 7-93), and the tributary area that the member covers or supports. Therefore, the designer must know the location and the size of the component being designed. Figure 103D illustrates the five zones specified by ASCE 7-93 for components and cladding wind pressures. For design purposes, the width of each zone was considered to be 4 feet. A tributary area of 32 square feet was used to develop wind pressure tables for roof rafters, trusses, and wood stud walls. A tributary area of 10 square feet was used for fasteners. Masonry walls are based on a tributary area of $H' \times H'$ where H' equals the wall height.

Zones one, two, and three of Figure 103D represent interior, perimeter edge, and corner zones, respectively, for roof wind pressures. Zones four and five represent interior and corner zones, respectively, for wall wind pressures. The magnitudes of the wind pressures are smallest at the interior zones and are largest at the corner zones.

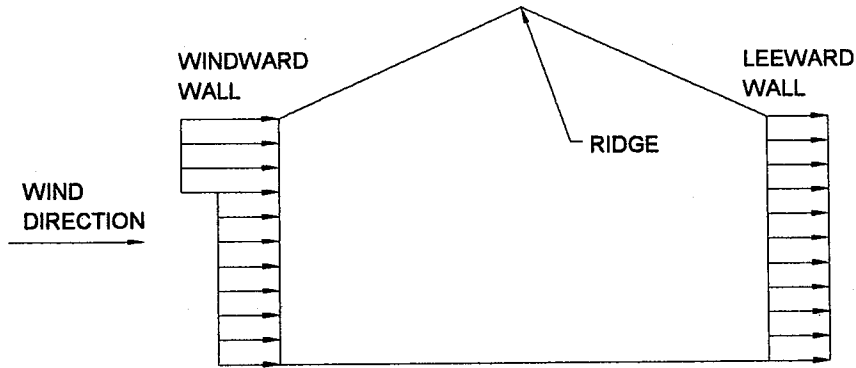


Figure 103A
Windward and Leeward Wall Pressures

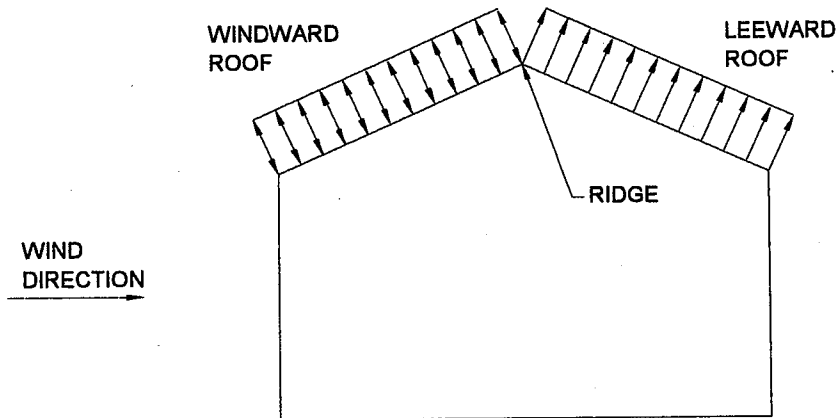


Figure 103B
Windward and Leeward Roof Pressures (Wind Normal to Ridge)

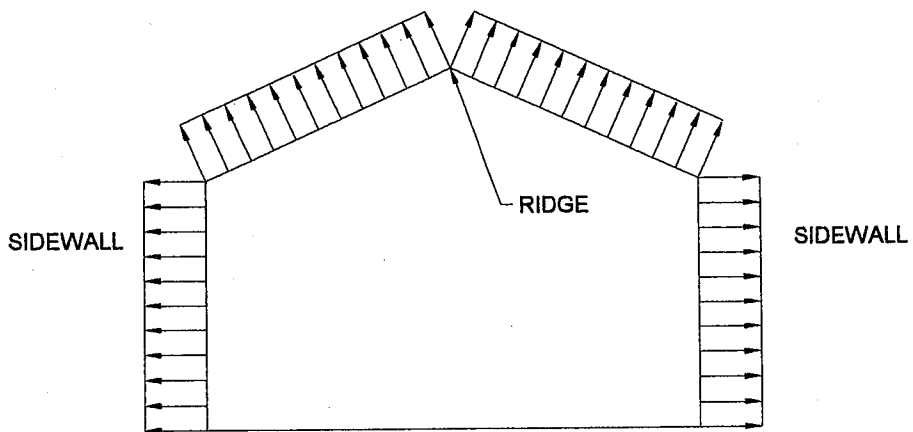


Figure 103C
Roof and Side Wall Pressures (Wind Parallel to Ridge)

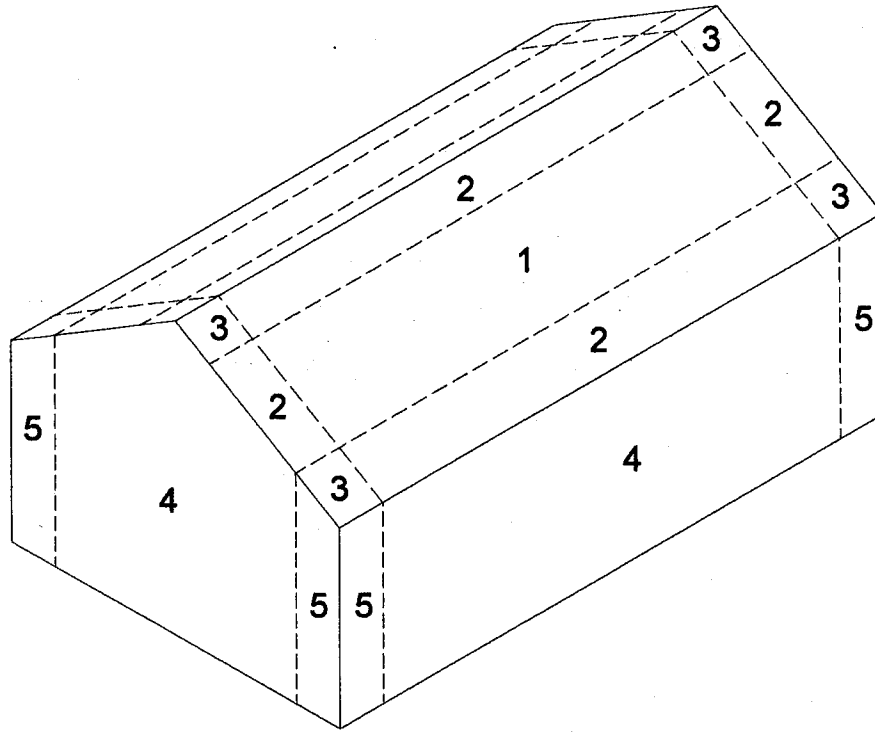


Figure 103D
Roof and Wall Wind Pressure Zones for Components and Cladding

place in section
400?

104 Purpose

The prescriptive sections of this document are intended as an aid to the builder in meeting the requirements of the building code established in the *T.W.I.A. Plan of Operation*. Specifically, they outline a method or methods which will be accepted by Texas Department of Insurance inspectors as meeting the wind load provisions of ASCE 7-93 required by this document (refer to **Section 102**). Additional methods and materials may be required to comply with requirements of other authorities having jurisdiction, such as building codes adopted by local authorities and guidelines established by the federal government for flood insurance.

At the discretion of the Texas Department of Insurance, alternate materials and methods of construction may be accepted for use as provided in this section. Any alternate material or method of construction shall be at least equivalent to that prescribed by the code and shall meet the wind load provisions of ASCE 7-93 as specified in **Sections 102 and 103**. The alternate material or method of construction shall be evaluated by the Texas Department of Insurance prior to its use. The Texas Department of Insurance reserves the right to require that some structures built using alternate materials and/or methods of construction be inspected by a Texas licensed professional engineer. For proprietary products, the Texas Department of Insurance will issue product evaluation reports to indicate that the products have been evaluated for compliance with the wind load provisions specified in this code.

Requests for the use of alternate materials and methods of construction shall be submitted to the Windstorm Section of the Texas Department of Insurance along with supporting documentation such as, but not limited to, plans, structural calculations, and complete test information. The Texas Department of Insurance will accept or reject the use of alternate materials or methods of construction. If the Texas Department of Insurance accepts the alternate, a supplement, code interpretation and/or product evaluation report will be issued for the alternate material or method of construction. If the Texas Department of Insurance does not accept the alternate, a letter will be issued to the submitting party outlining the reasons.

The code is not intended to replace the assistance of a competent design professional. Furthermore, it shall be noted that compliance with this code does not assure protection of person or property from damage of any kind. This publication only contains minimum guidelines which, when followed, will meet the wind loads prescribed in the building specifications.

105 What the Texas Department of Insurance Will Inspect

The Texas Department of Insurance will inspect all non-engineered structures. Non-engineered structures are defined as those structures which are not required to be designed by a Texas licensed professional engineer, according to the *Texas Engineering Practice Act*. These include the following:

- A. private dwellings and garages or other structures pertinent to such dwellings;
- B. private agricultural structures;
- C. other one story structures having an area less than 5000 square feet and no clear unsupported span of greater than 24 feet;
- D. one story apartments, condominiums, or townhouses with 8 or fewer units per building and two story apartments, condominiums, or townhouses with 4 or fewer units per building;
- E. a public work with a contemplated completed construction cost less than \$20,000 that does not involve structural, electrical, or mechanical engineering.
- F. a public work with a contemplated completed construction cost less than \$8,000 that involves structural, electrical, or mechanical engineering.

If desired, a Texas licensed professional engineer may inspect and certify a non-engineered structure. In this case, the Texas Department of Insurance will not have to inspect that particular structure.

The Texas Department of Insurance may inspect metal structures, or other structures that are built using materials and/or methodologies not contained in the prescriptive sections of this building code and have been designed by a Texas licensed professional engineer. The engineer shall submit a **Building Design Compliance, Form WPI-2D**, along with sealed design drawings for the structure. The Texas Department of Insurance reserves the right to request additional information and supporting calculations. The Texas Department of Insurance also reserves the right to require that some risks be inspected by a Texas licensed professional engineer rather than by its own windstorm field inspectors.

The Texas Department of Insurance can only make inspections of a structure as it is being built (or repaired). Once construction is completed, a structure can only be certified if it is inspected by a Texas licensed professional engineer.

When a structure is being moved, the following guidelines will apply:

If the structure was built outside the catastrophe areas designated by the Commissioner of Insurance and is moved into a designated catastrophe area, then the following shall apply:

- A Texas licensed professional engineer shall inspect the structure, the new foundation, and the anchorage of the structure to the new foundation.

If the structure is moved within catastrophe areas designated by the Commissioner of Insurance, then one of the following shall apply:

If the structure was built prior to 1988 and was built in accordance with a building code recognized by the TWIA or was previously insured by a licensed carrier authorized to do business in the State of Texas, then only the new foundation and the anchorage of the structure to that foundation will be required to be inspected. This inspection may be performed by either a Texas Department of Insurance inspector or by a Texas licensed professional engineer. A building code recognized by the TWIA shall be either the (Southern) Standard Building Code, as amended May 8, 1973 for construction inland of Intracoastal Waterway or the TCPIA Building Code for Windstorm Resistant Construction for construction seaward of Intracoastal Waterway. Evidence of previous insurance includes a copy of a previous policy, copies of cancelled checks or agent's records that show payments for previous policies, and a copy of the title to the structure or mortgage company records that show previous policies.

If the structure was built prior to 1988 and was not built in accordance with a building code recognized by the TWIA and has not been previously insured by a licensed carrier authorized to do business in the State of Texas, then a Texas licensed professional engineer shall inspect the structure, the new foundation, and the anchorage of the structure to the new foundation. A building code recognized by the TWIA shall be either the (Southern) Standard Building Code, as amended May 8, 1973, for construction inland of Intracoastal Waterway or the TCPIA Building Code for Windstorm Resistant Construction for construction seaward of Intracoastal Waterway. Evidence of previous insurance includes a copy of a previous policy, copies of cancelled checks or agent's records that show payments for previous policies, and a copy of the title to the structure or mortgage company records that show previous policies.

If the structure was built after 1988 and has been certified by the Texas Department of Insurance, then only the new foundation and the anchorage of the structure to that foundation will be required to be inspected. This inspection may be performed by either a Texas Department of Insurance inspector or by a Texas licensed professional engineer.

If the structure was built after 1988 and has not been certified by the Texas Department of Insurance, then a Texas licensed professional engineer shall inspect the structure, the new foundation, and the anchorage of the structure to that foundation.

The following repairs or other procedures, when done to **non-engineer** designed buildings or structures, do not require inspection by the Texas Department of Insurance for compliance for windstorm and hail insurance through the Texas Windstorm Insurance Association. The repairs and procedures are as follows:

1. Repairs to roofs less than 100 square feet (one square),
2. Repairs to gutters,
3. Decorative shutters,
4. Breakaway walls,
5. Repairs to wheelchair ramps,
6. Facia replacement,
7. Repairs to porch and balcony railings,
8. Repairs to stairways/steps,
9. Protective measures before a storm,

10. Temporary repairs after a storm,
11. Leveling and repairs to an existing slab on grade foundations, unless wall anchorage is being altered or repaired,
12. Repairs to pier and beam foundations if no more than 25 percent of the piers or beams on the structure (constructed prior to June 1, 1972) are replaced,
13. Fence repair,
14. Painting, carpeting, and refinishing, plumbing, and electrical repairs,
15. Repairs to slabs poured on the ground for patios (including slabs under homes on pilings), and
16. Replacement of light bulbs and glass covers.

106 Engineered Structures

The Texas Engineering Practice Act requires that certain structures be designed by a Texas licensed professional engineer. These structures shall also be inspected by a Texas licensed professional engineer. Engineered structures include:

- A. non-residential and non-agricultural structures:
 - 1. having an area greater than 5,000 square feet,
 - 2. having more than one story, or
 - 3. having an unsupported clear span of greater than 24 feet.
- B. a public work with a contemplated completed construction cost greater than \$20,000 that does not involve structural, electrical, or mechanical engineering.
- C. a public work with a contemplated completed construction cost greater than \$8,000 that involves structural, electrical, or mechanical engineering.
- D. apartments, condominiums, or townhouses:
 - 1. having over two stories,
 - 2. having two stories and over four units per building, or
 - 3. having one story and over eight units per building.

(A unit is defined as a group of rooms arranged as a private residence and permanently equipped for housekeeping.)

The Texas Engineering Practice Act also requires that repairs, alterations, or additions to engineered structures be designed by a Texas licensed professional engineer. Therefore, these repairs, alterations, and additions will be required to be inspected by a Texas licensed professional engineer.

107 Certification By Engineers

To be eligible for insurance through the T.W.I.A., all structures erected, altered, and/or repaired, where construction started on or after January 1, 1988, shall be inspected by either the Texas Department of Insurance or by a Texas licensed professional engineer. The Texas Department of Insurance will accept documentation for certification by a Texas licensed professional engineer on any structure. The engineer shall submit a **Building Construction Compliance, Form WPI-2**.

If the Texas Department of Insurance is to inspect a metal structure, or other structures that are built using materials and/or methodologies not contained in the prescriptive sections of this code, a Texas licensed professional engineer is required to design the structure. The engineer shall submit a **Building Design Compliance, Form WPI-2D**, along with sealed design drawings for the structure. The Texas Department of Insurance reserves the right to request additional information and supporting calculations. The Texas Department of Insurance reserves the right to require that some risks be inspected by a Texas licensed professional engineer rather than by its windstorm field inspectors.

If a structure is inspected and certified by a Texas licensed professional engineer, then no official inspection will be made by the Texas Department of Insurance, and no fees will be charged by the Texas Department of Insurance.

When a foundation is designed and inspected by a Texas licensed professional engineer, the engineer shall submit a **Building Construction Compliance, Form WPI-2**. Foundations which are designed by an engineer may either be inspected and certified by an engineer, or they may be inspected by the Texas Department of Insurance, upon submission of sealed plans.

When two or more structures are present at the same address, the certificate shall be specific about which structure was inspected. When repairs are being certified by an engineer, the certificate shall be specific about which repairs were inspected.

An **Application for Windstorm Building Inspection, Form WPI-1**, shall be submitted as soon as construction commences, indicating that the structure will be inspected and certified by an engineer.

When all inspections are complete, the engineer shall submit a **Building Construction Compliance, Form WPI-2**. The inspecting engineer shall keep on file complete structural calculations showing the loads used to design the structure and the systems used to resist those loads.

108 Inspection Procedure

The procedure to follow when requesting certification through the Windstorm Inspection Program is outlined below.

Before construction begins, the contractor or owner will notify the local Windstorm Inspection field office of the intention to erect, alter, and/or repair a structure. Notification can also be made to the main office in Austin by mailing or faxing an **Application for Windstorm Building Inspection, Form WPI-1** or letter. Notification by letter shall contain the same information required by the **Application for Windstorm Building Inspection, Form WPI-1**. Applications shall be made for all structures, whether they are to be inspected by the Texas Department of Insurance or by a Texas licensed professional engineer. A map of the structure's location should be submitted with the application for all rural structures and structures with no permanent street address. Refer to Appendix A for Windstorm Office addresses and phone numbers.

Upon receipt of the application or notice by letter, the information will be entered into the Windstorm computer system and a file number assigned. The persons marked as "Person to Contact" will be sent a letter of acknowledgment, which will advise of the assigned file number and the telephone number of the local field office to request inspections. All inspections shall be requested through the local field office. The telephone line will be staffed during normal business hours, which are 8:00 a.m. until 5:00 p.m., Monday through Friday, except on weekends, state and national holidays.

When a request for inspection is received in the local field office, the inspection will be performed within 48 hours of the requested inspection date. The 48 hour period shall not include Saturdays, Sundays, state and national holidays.

Inspections shall be conducted in accordance with this procedure to the best of the Department's ability. Building progress will not be interrupted if the inspections are not made within the prescribed time period.

A **Certificate of Compliance, Form WPI-8**, will be issued when all inspections have been approved, and all applicable fees have been paid. The following is the fee schedule effective as of the date of printing:

New Structure (1,000 square feet or greater)	\$100
New Structure (less than 1,000 square feet)	\$35
New Structure with Detached Garage	\$100
Additions (1,000 square feet or greater)	\$35
Additions (less than 1,000 square feet)	No fee
Repairs (including roof repairs and re-roofs)	No fee

The appropriate fee shall be paid before the **Certificate of Compliance, Form WPI-8**, will be issued.

A fee coupon will be sent with the letter of acknowledgment if a fee is applicable. The coupon shall be mailed back to the Texas Department of Insurance whenever making a payment. Payments shall be made by check or money order made payable to the Texas Department of Insurance. All payments shall be mailed, along with the coupon, to the following address:

Texas Department of Insurance
Division 9999
P.O. Box 149104
Austin, Texas 78714-9104

A Certificate of Compliance is automatically issued and mailed to the contacts listed on the **Application for Windstorm Building Inspection, Form WPI-1**, when all fees are paid and all inspections have been approved.

The Texas Department of Insurance does not charge a fee when inspection and certification is performed by a Texas licensed professional engineer.

109 Inspections

Under normal circumstances, four separate categories of inspections will be necessary to determine compliance with the applicable building construction requirements. Inspections shall be requested prior to the installation of any type of covering which would impede inspections. In order to inspect all fastener patterns, the number of inspections may exceed four, but a charge will not be made for the extra inspections. The four categories shall be as follows:

1. **FOUNDATION** - Inspections for slab on grade foundations shall be requested after placement of reinforcement, but prior to pouring of concrete. Inspections for pile foundations shall be requested during driving of the piles. Inspections for pier and beam foundations shall be requested prior to the installation of floor members which would impede inspection.

The following are the major items which will be examined during the foundation inspection:

- **Monolithic Slab on Grade Foundation:**
 - a. Reinforcement of slab.
 - b. Type of anchor bolts.
 - c. Placement of holddown anchors.
 - d. Dowels for masonry construction.
 - e. Offsets for masonry or masonry veneer walls (proper brick ledge).
- **Piling Foundation:**
 - a. Embedment of piles.
 - b. Size and spacing of piles.
 - c. Concrete piles properly reinforced.
 - d. Wood piles properly pressure treated.
 - e. Anchorage of beams to piles.
 - f. Size of beams.
 - g. Floor joist span, size, and spacing.
 - h. Anchorage of floor joists to beams.
 - i. Height of lowest structural member.
- **Pier and Beam Foundation:**
 - a. Proper size and depth of buried footings.
 - b. Proper size of piers.
 - c. Reinforcement of piers.
 - d. Reinforced concrete or grout fill in hollow masonry units.
 - e. Size of Beams.
 - f. Anchorage of sills or beams to piers, and piers to footings.
 - g. Floor joist span, size, and spacing.
 - h. Anchorage of floor joists to beams and/or sills.
 - i. Treatment of beams with wood preservative, where required.

2. **ROUGH FRAMING** - Framing inspections should be requested prior to the installation of any type of covering which would keep the inspector from being able to verify the required connector or fastener patterns.

The following are the major items which will be examined during the rough framing inspection:

- **Floor Framing:**
 - a. Floor joist span, size, and spacing.
 - b. Floor decking type and application.
- **Wood Stud Wall Framing:**
 - a. Spacing of sole plate anchors in exterior and interior walls.
 - b. Proper size of washers.
 - c. Sole plate pressure treated.
 - d. Grade and seasoning (moisture content) of lumber.
 - e. Size and spacing of studs.
 - f. Anchorage provided by framing anchors.
 - g. Anchorage of studs to plates (top and bottom).
 - h. Construction and anchorage of headers.
 - i. Installation and location of lateral wall bracing.
 - j. Bracing of fireplace chimney.
 - k. Anchorage of second story to the first story.
 - l. Anchorage of beams, if required.
- **Masonry Walls:**
 - a. Size and spacing of vertical reinforcement.
 - b. Size and placement of bond beam reinforcement.
 - c. Length of shearwalls.
 - d. Construction and span of lintels.
 - e. Masonry wall connections.
- **Ceiling Framing:**
 - a. Bracing of gable endwall, if required.
- **Roof Framing:**
 - a. Roof joists or rafters (spans, sizes, and spacing).
 - b. Bracing and anchoring of roof joists and rafters.
 - c. Installation of collar ties.
 - d. Anchorage of rafters and joists to top plate.
 - e. Roof truss design, construction, installation, and anchorage.

- f. Roof decking type and application.
 - g. Fastening of roofing underlayment.
- **Miscellaneous:**
 - a. Construction of awnings, overhangs and porches.
 - b. Installation and design of windows.
 - c. Installation and design of doors and garage doors.
3. **FINAL FRAMING** - The final framing inspection should be requested prior to installation of insulation and concealment of fastener patterns of exterior coverings and roof coverings. Re-roofing inspections will also fall into this category.

The following are the major items which will be examined during the final framing inspection:

- a. Knee braces installed, if required by design.
 - b. Attachments to foundation below flood level.
 - c. Alterations in structural members.
 - d. Type and fastening of wall sheathing or other exterior wall finish.
 - e. Type and spacing of masonry anchors.
 - f. Application of roof covering.
 - g. Installation of roof vents.
 - h. Venting of attic space.
 - i. Installation or presence of window protection, if required.
 - j. Installation of gypsum sheathing board, if gypsum diaphragms are required.
4. **MECHANICAL INSPECTION** - The mechanical inspection should be requested when all outside mechanical equipment has been anchored, particularly air conditioner condensers. This inspection may be performed at the time of the final framing inspection if the outside mechanical equipment is secured at that time.

The major item which will be examined during the mechanical equipment inspection is anchorage of exterior air conditioner equipment. However, anchorage of any other exterior equipment, such as floodlights, turbine vents, propane tanks, swimming pool filters, water cooling towers, and satellite dishes will also be inspected.

If you have any questions concerning the timing of inspections, or concerning the following construction guidelines, you are encouraged to contact the nearest field office. All necessary forms are available at the field offices, and some city building departments.

Upon completion of any inspection, the inspector will leave the **Field Form, Form WPI-7**, at the job site. The **Field Form** indicates whether an inspection was approved or not, and lists all deficiencies if the structure does not pass the inspection.

Section 200

Basic Definitions, Assumptions, and Limitations of the Prescriptive Code

201 Applicability

201.1 General

Except as provided under **Section 201.2**, the prescriptive requirements presented in this building code provide wind resistant designs for buildings of conventional wood-framed construction and conventional masonry construction. The prescriptive requirements presented in this building code satisfy the wind load provisions of ASCE 7-93 *Minimum Design Loads for Buildings and Other Structures* subject to the limitations in building geometry, building materials, and design specifications set forth in this document.

The prescriptive construction requirements presented in this building code are directed primarily towards the design of a building to resist wind loads. The prescriptive requirements presented in this building code do not address earthquake loads, flood loads, or gravity loads (other than those specified in **Section 208** of this document). A Texas licensed professional engineer shall design buildings that do not fall within the limitations of building geometry, building materials, design loads, and design specifications of this document.

201.2 Historic Structures

Repairs, alterations and additions necessary for the preservation, restoration, rehabilitation or continued use of a historic structure may be made without conformance to the requirements of this building code. In order for a historic structure to be exempted from this building code, at least one of the following conditions shall apply to the structure:

- A. The structure is listed or is eligible for listing on the National Register of Historic places.
- B. The structure is a Recorded Texas Historic Landmark (RTHL).
- C. The structure has been specifically designated by official action of a legally constituted municipal or county authority as having special historical or architectural significance, is at least 50 years old and is subject to the municipal or county requirements relative to construction, alteration, or repair of the structure, in order to maintain its historical designation.

Any repairs, alterations and additions necessary for the preservation, restoration, rehabilitation or continued use of the structure should be made to comply with the provisions of this building code whenever possible without violating any of the requirements necessary to maintain its historical designation.

202 Construction Types

Defined below are the three types of building construction covered by the prescriptive requirements of this building code.

- **Wood Frame Construction** is defined in this building code as structures which have a frame of dimensional lumber, regardless of the exterior covering material.
- **Masonry Construction** is defined in this building code as structures built of concrete masonry units laid up unit by unit and set in mortar to form a wall which supports roof, floor, and lateral loads.
- **Miscellaneous Construction** is defined in this building code as structures which do not fall into one of the above two construction types. Miscellaneous construction includes, but is not limited to, metal construction, post frame construction, covered patios, boat houses, docks, piers, decks, and pump or well houses.

203 Additions

Any increase in area (square footage) of a structure is considered to be an addition. When additions are made to an existing structure, the addition and all parts of the existing structure which become exposed or are connected to the addition, shall comply with the building specifications specified in this building code.

204 Repairs and Alterations

204.1 Repairs

Any reconstruction/restoration as a result of the deterioration or damage to a structure is considered a repair unless specifically excluded in **Section 105**.

All repairs to loadbearing structural members, both interior and exterior, shall comply with the building specifications specified in this building code.

204.2 Alterations

Any modification which physically changes the exterior portion of a structure without increasing the square footage area of the structure is considered an alteration. All alterations, because of their direct exposure to the wind, shall comply with the specifications of this building code unless specifically excluded in **Section 105**.

205 Roofing and Re-roofing

All roofing and re-roofing shall comply with the building specifications specified in this building code.
Note: Repairs to roofs less than 100 square feet in area do not require an inspection by the Texas Department of Insurance. See **Section 105**.

206 General Building Nomenclature

Figure 206 illustrates a three dimensional exploded view of a one story, rectangular, wood frame, gable end structure on a monolithic slab on grade foundation. Various components of the structure have been labeled and defined. General building terms associated with Figure 206 are defined below.

- **Building Length (L)** - the longer dimension of a rectangular building. If the building geometry consists of several rectangular shapes, then the building length shall be the longer perimeter dimension that inscribes the building. See **Section 207** for examples of inscribed building shapes and limitations on building lengths.
- **Building Width (W)** - the shorter dimension of a rectangular building. If the building geometry consists of several rectangular shapes, then the building width shall be the shorter perimeter dimension that inscribes the building. See **Section 207** for examples of inscribed building shapes and limitations on building widths.
- **Endwall** - the exterior wall of a building perpendicular to the roof ridge and parallel to the roof rafters or trusses in a gable end building.
- **Sidewall** - the exterior wall of a building parallel to the roof ridge and perpendicular to the roof rafters or trusses in a gable end building.
- **Ridge** - the horizontal line formed by the joining of the top edges of two sloping roof surfaces.
- **Wall Height** - the vertical distance measured between the top of floor and the surface of the ceiling hat is directly attached to the roof or floor framing system.

The remainder of the building components labeled in Figure 206 are defined in the Glossary in Appendix B.

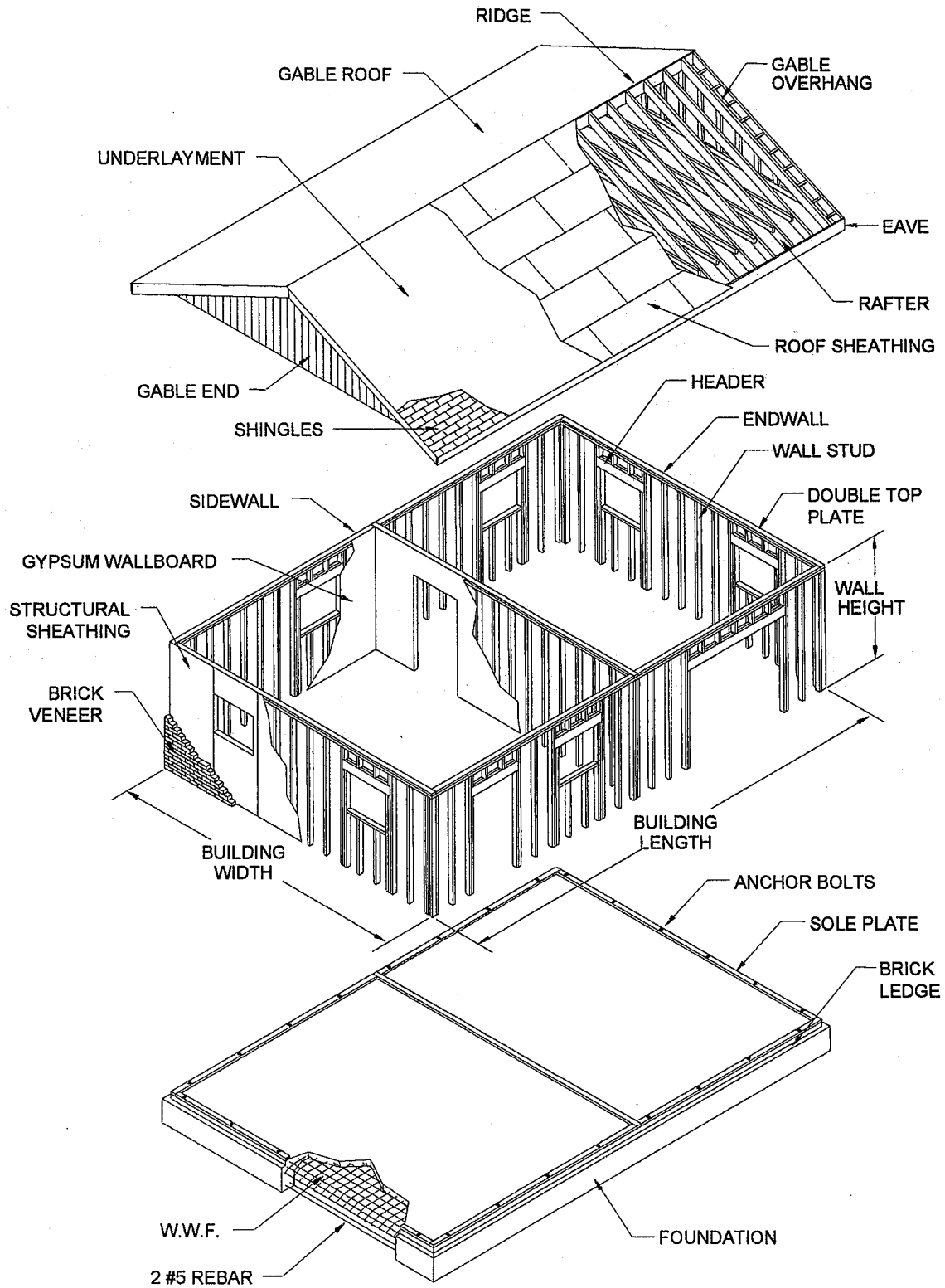


Figure 206
Three Dimensional View of One Story Wood Framed House

207 Limitations of the Prescriptive Code

207.1 Building Dimensions

207.1.1 Building Height

- The building height for wood frame construction not on piles or piers shall not exceed 3 stories or 33 feet measured from the average grade to the average roof elevation (mean roof height). The wall height of each story shall not exceed 10 feet. Refer to Figures 207.1.1A-C.
- The building height for structures on piles shall not exceed 2 stories or 33 feet measured from the average grade to the average roof elevation (mean roof height). The wall height of each story shall not exceed 10 feet. Refer to Figures 207.1.1 A-B.
- The building height for masonry construction and wood frame construction on piers shall not exceed 2 stories. The wall height of each story shall not exceed 10 feet. Refer to Figures 207.1.1 A-B.
- The eave height of post frame construction shall not exceed 16 feet.

207.1.2 Floor Plan Dimensions

- The rectangular dimensions of the building shall not exceed the limitations shown in Tables 207.1.2A-B. The minimum dimension of the building shall not be less than the mean roof height.
- For houses on piles, the rectangular dimensions of the building shall not exceed 40 feet.
- For post frame construction, the length of the building shall not exceed 3.5 times its width.

**Table 207.1.2A
Building Dimension Limitations
One-Story Slab-On-Grade**

Building Width (ft)	Building Length (ft)	
	Inland	Seaward
6	24	24
8	32	32
10	40	40
12	45	41
14	48	44
16	53	48
18	58	53
20	62	57
22	66	60
24	70	64
26	73	67
28	77	70
30	80	73
32	80	74
34	80	75
36	80	76
38	80	77
40-80	69 ¹	63 ²

Notes: ¹ If the maximum roof span does not exceed 36 feet, then the building length may be increased to 80 feet.

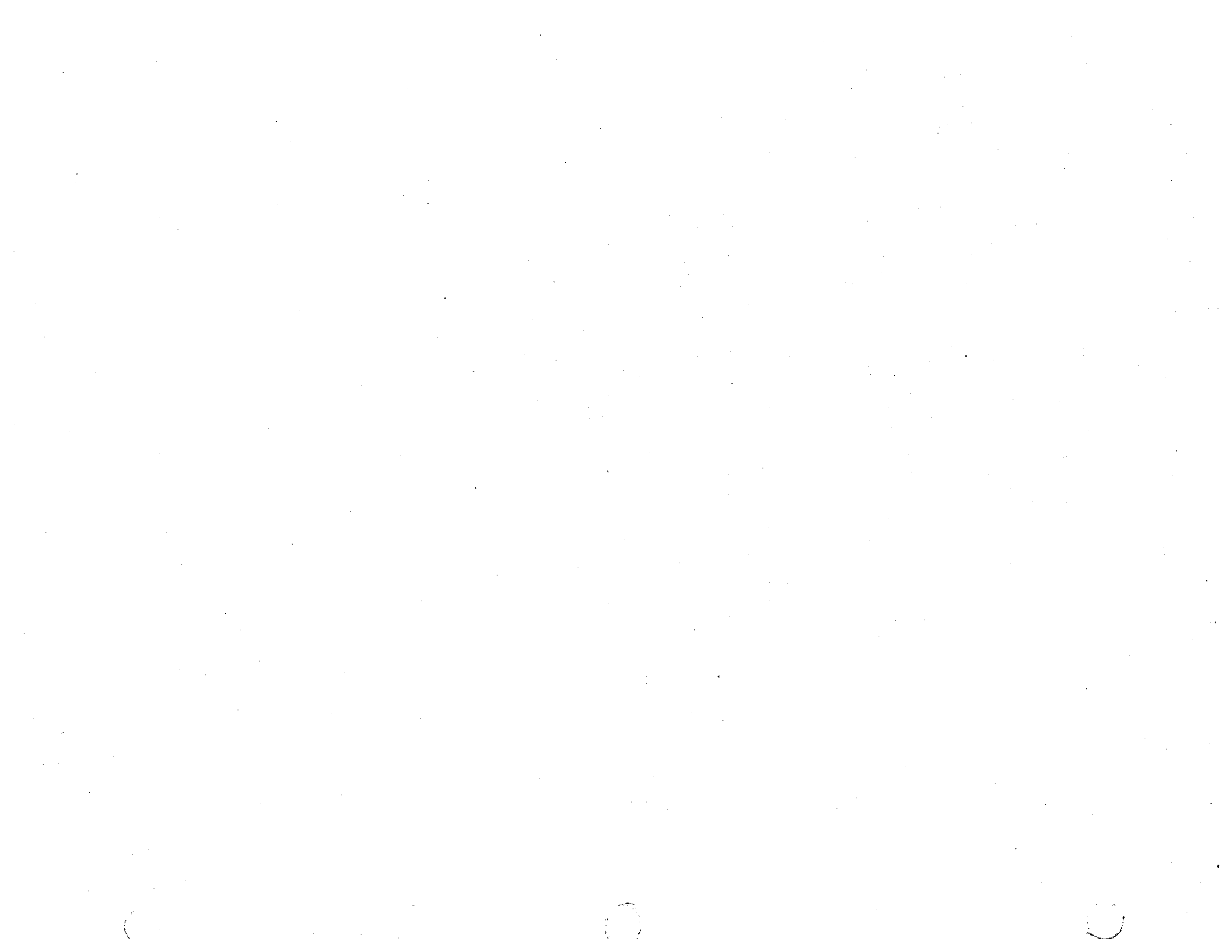
² If the maximum roof span does not exceed 36 feet, then the building length may be increased to 76 feet.

**Table 207.1.2B
Building Dimension Limitations
All Other Cases**

Building Width (ft)	Building Length (ft)	
	Inland	Seaward
6	14	12
8	18	16
10	23	21
12	27	25
14	32	29
16	36	33
18	41	37
20	45	42
22	50	46
24	54	50
26	59	54
28	64	58
30	68	62
32	73	67
34	77	71
36	80	75
38	80	77
40-80	66 ¹	60 ²

Notes: ¹ If the maximum roof span does not exceed 36 feet, then the building length may be increased to 80 feet.

² If the maximum roof span does not exceed 36 feet, then the building length may be increased to 75 feet.



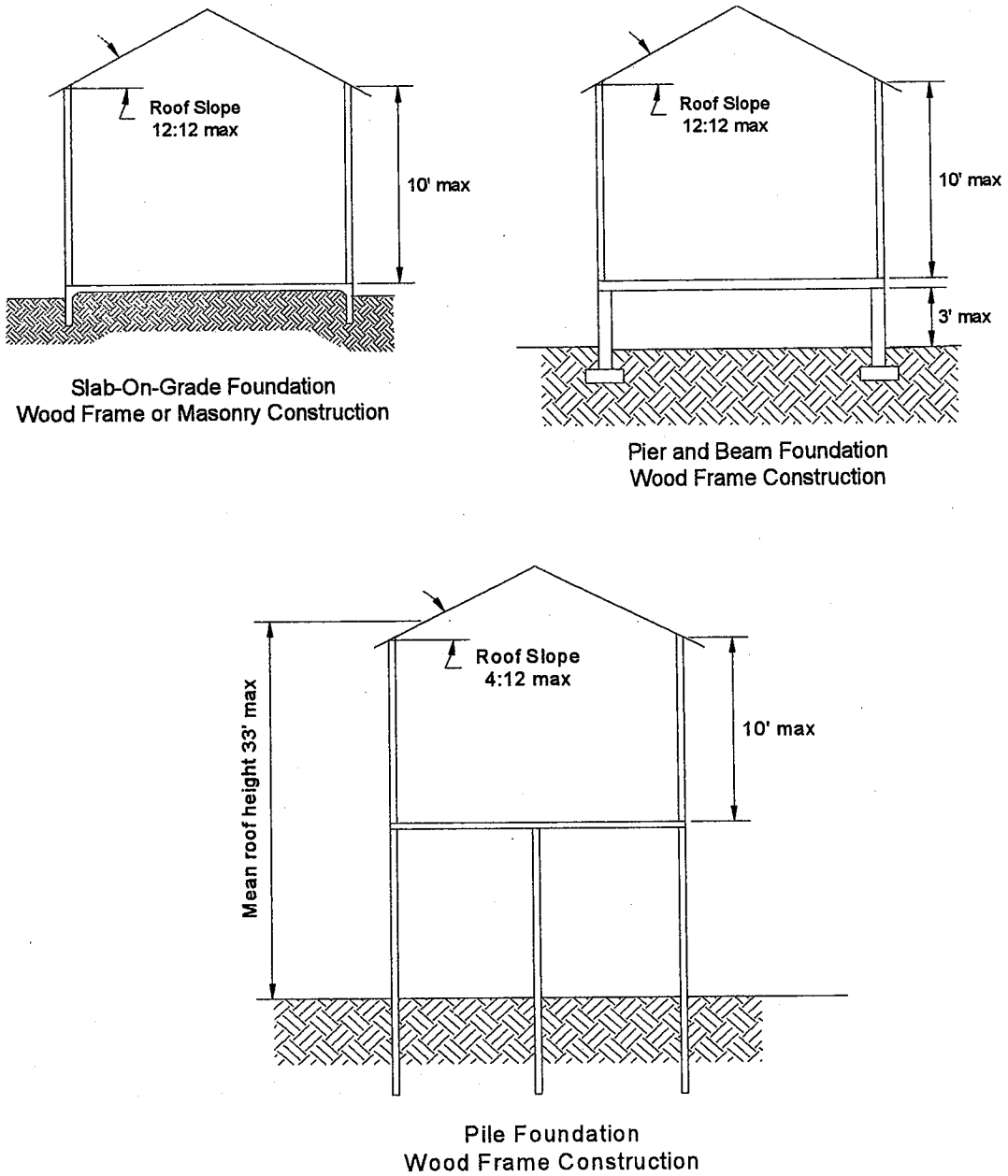


Figure 207.1.1A
One-Story Building Geometry

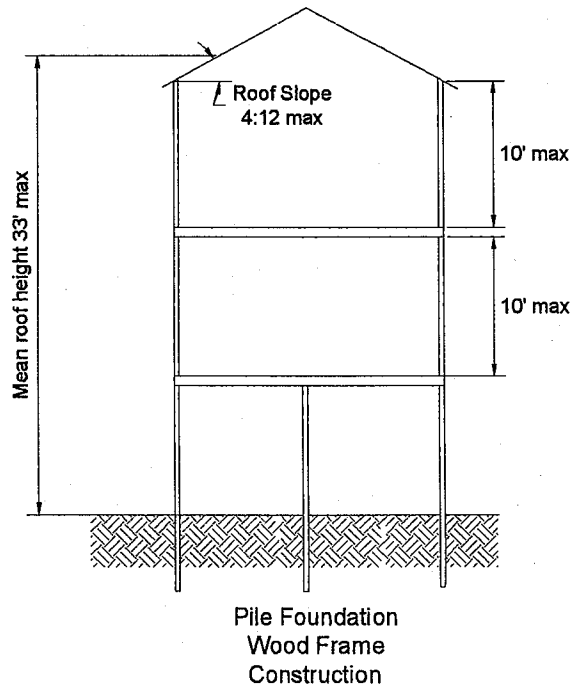
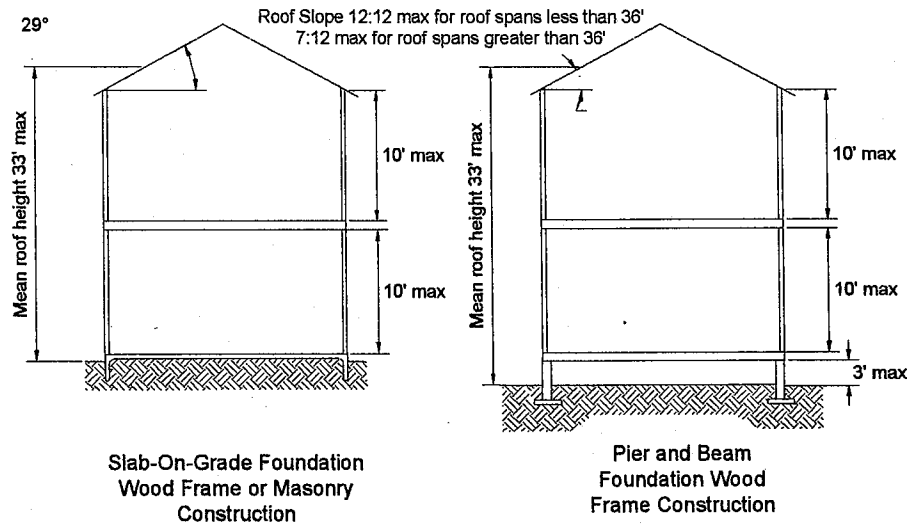
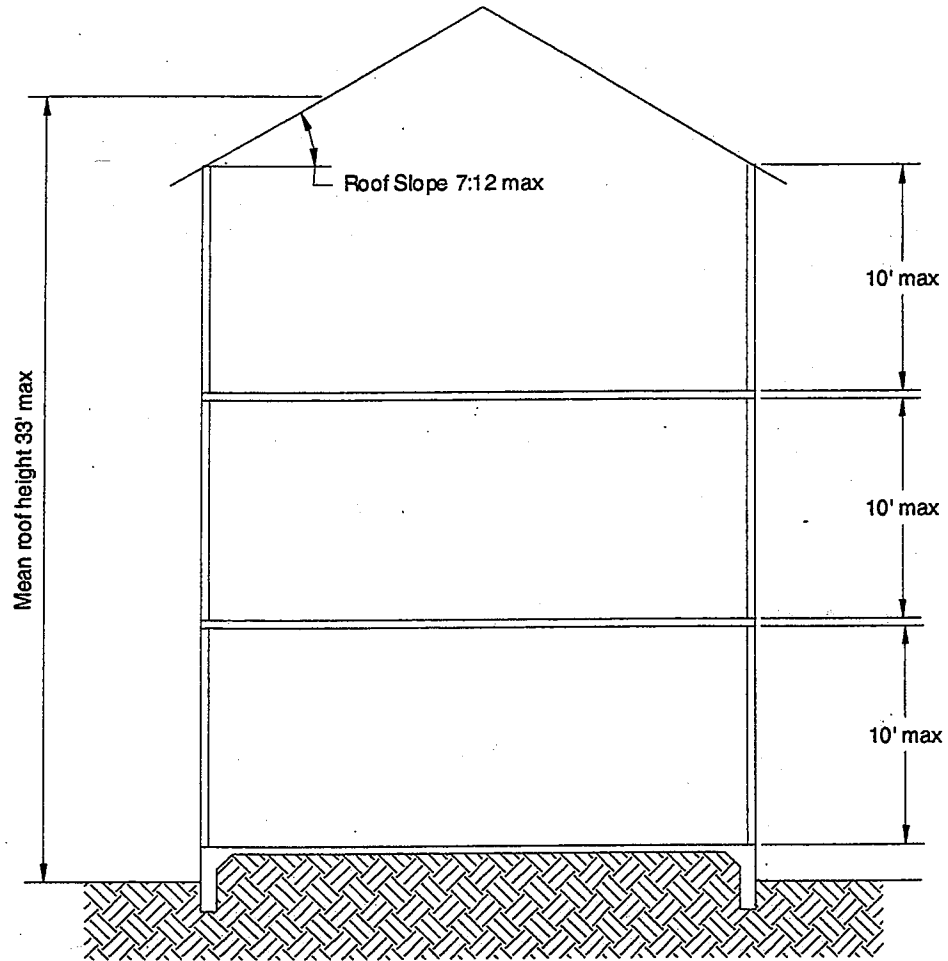


Figure 207.1.1B
Two-Story Building Geometry



Slab-On-Grade Foundation
Wood Frame Construction

Figure 207.1.1C
Three-Story Building Geometry

207.1.3 Roof Slope

- For wood frame construction that is not supported on piles, the roof slope shall not exceed 12:12 for one- and two-story buildings and 7:12 for three-story buildings. Refer to Figures 207.1.1A-C. NOTE: For two-story structures with a roof span greater than 36 feet, the roof slope shall not exceed 7:12.
- The roof slope for post frame construction shall not exceed 5:12.
- For buildings on piles, the roof slope shall not exceed 4:12. Refer to Figures 207.1.1A-B.
- For masonry construction, the roof slope shall not exceed 12:12 for one- and two-story buildings. Refer to Figures 207.1.1A-B. NOTE: For two-story structures with a roof span greater than 36 feet, the roof slope shall not exceed 7:12.

207.2 Floor Systems

- Clear spans of floor framing members shall not exceed 26 feet.
- The spacing of floor framing members shall not exceed 24 inches on center.

207.3 Wall Systems

- Loadbearing walls shall not exceed 10 feet in height.
- Non-loadbearing walls shall not exceed 20 feet in height.
- Wall stud spacing shall not exceed 16 inches on center for 2x4 studs and 24 inches on center for 2x6 studs.
- For building geometries that consist of several rectangular shapes, the structure shall be considered a rectangular structure with perimeter dimensions that inscribe the structure. Refer to Figure 207.3. The inscribed dimensions shall be used for determining the shearwall lengths required along each side of the building.

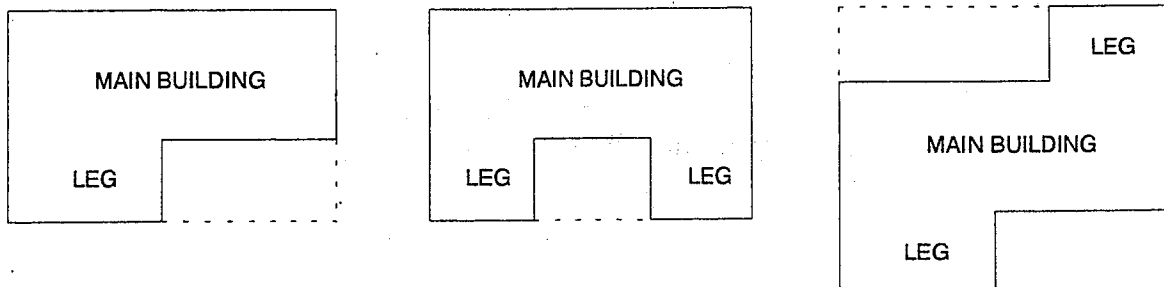


Figure 207.3
Nonrectangular Buildings Inscribed in One Rectangle

207.4 Roof Systems

- Spans of rafters (the horizontal projection) shall not exceed 26 feet. Refer to Figure 207.4A.
- The total roof span shall not exceed 48 feet. Refer to Figures 207.4B, 207.4D and 306.1.1B for illustrations of roof span. NOTE: For three-story structures, the maximum roof span shall not exceed 36 feet.
- The overhang at the eave shall not exceed 24 inches. Refer to Figure 207.4C.
- At gable endwalls, the overhang shall not exceed 24 inches if outlookers are used. Refer to Figures 306.3.2B, 306.3.2D, and 306.3.3B.
- At gable endwalls, the overhang shall not exceed 16 inches if lookout blocks are used. Refer to Figures 306.3.1B and 306.3.1D.

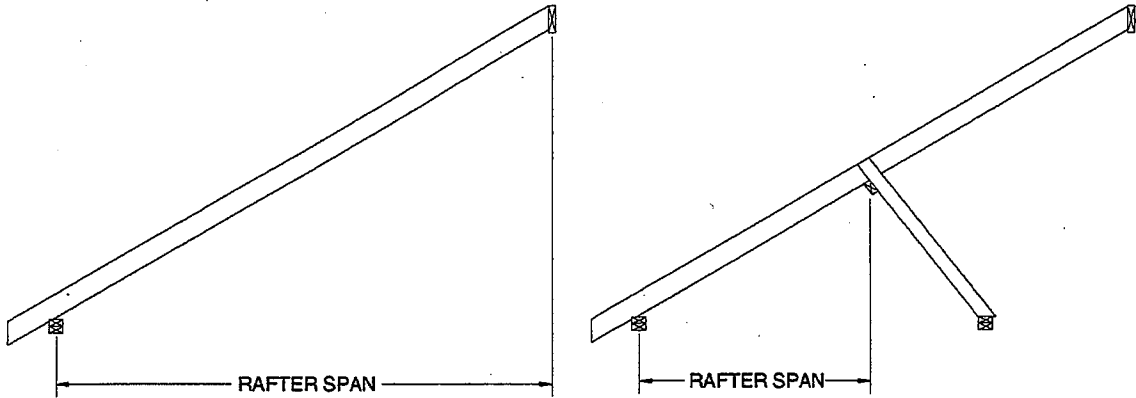


Figure 207.4A
Definition of Rafter Span

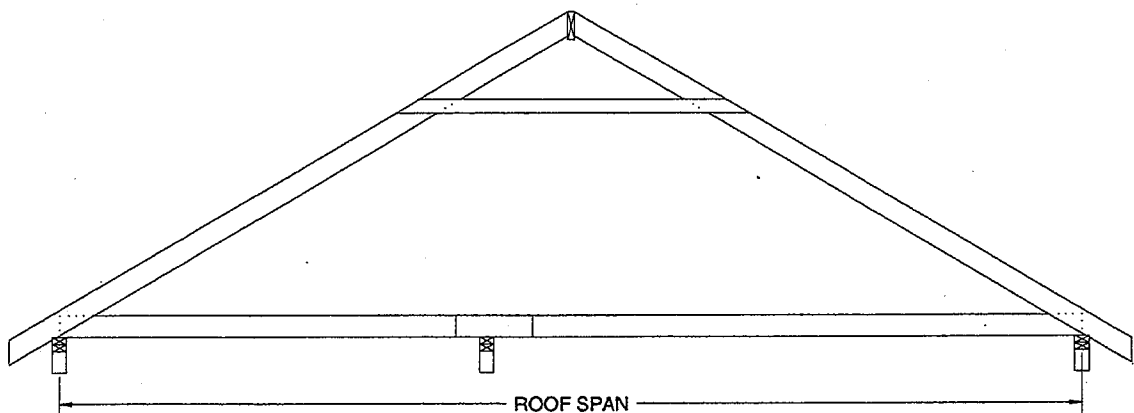


Figure 207.4B
Definition of Roof Span

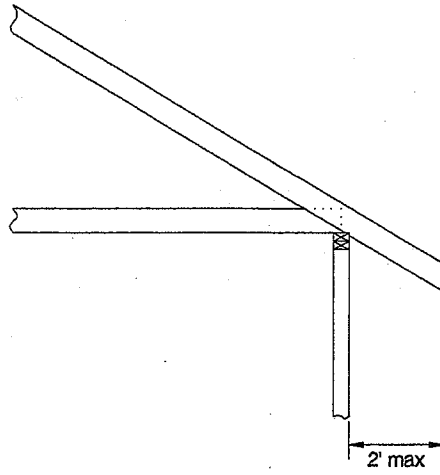
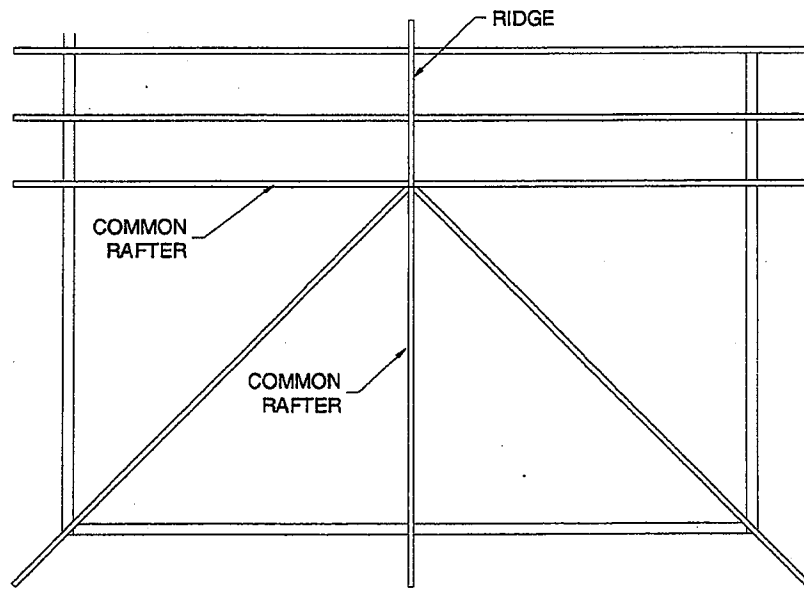


Figure 207.4C
Rafter Overhang Limit



NOTE: ROOF SPAN FOR HIP ROOFS IS TWICE THE COMMON RAFTER SPAN

Figure 207.4D
Definition of Roof Span for Hip Roof

208 Design Loads

208.1 Wind Loads

The wind loads used to develop the prescriptive requirements contained in this building code are based on the wind load provisions of ASCE 7-93 *Minimum Design Loads for Buildings and Other Structures*. A thorough presentation of the wind loads used in this building code is presented in **Section 103**.

208.2 Dead Loads

The dead loads used to develop the prescriptive requirements contained in this building code were taken from the dead load provisions of ASCE 7-93 *Minimum Design Loads for Buildings and Other Structures*. The following dead loads and assumptions concerning dead loads were used:

- The total weight of the roofing materials, ceiling, insulation, framing members, and miscellaneous construction supported directly by the rafters did not exceed 20 psf.
- For the determination of resistance to uplift and overturning of the structure, the total weight of the roofing materials, ceiling, insulation, framing members, and miscellaneous construction supported by the rafters did not exceed 10 psf.
- The total weight of exterior walls was 11 psf for wood-framed walls and 50 psf for masonry walls.
- The total floor dead load was 15 psf.
- Overturning resistance was based on two-thirds of the building dead load.

208.3 Live Loads

The live loads used to develop the prescriptive requirements contained in this building code were taken from the live load provisions of ASCE 7-93 *Minimum Design Loads for Buildings and Other Structures*. The following live loads were used:

- The roof live load was 20 psf with the normal reduction permitted for large tributary areas.
- The floor live load was 40 psf.

209 Roof, Floor, Ceiling, and Wall Systems

- Roof and floor systems are designed as diaphragms. The diaphragms receive lateral wind loads from the exterior walls and transfer those loads to exterior shearwalls. The diaphragms are designed to receive loads from wind blown in any direction. Ceiling diaphragms are required when platform wall framing is used instead of balloon wall framing at gable endwalls.
- Exterior walls are designed to resist wind loads and to transfer those loads to the roof, floor, and ceiling diaphragms. Portions of the exterior walls are designed as shearwalls to transfer the lateral loads from the horizontal diaphragms down to the foundation. Exterior and, when required, interior walls are designed to resist uplift loads received by the roof. The uplift loads are transferred through the walls to the foundation along a continuous load path using straps, framing connectors, and sheathing materials.

210 Design Specifications and Allowable Stresses

210.1 Concrete Design

The design specifications and allowable stresses used to design reinforced concrete in this building code were based on the provisions of ACI 318-89, *Building Code Requirements for Reinforced Concrete*. The compressive strength of concrete used was 2500 psi. Grade 40 steel was used for reinforcement.

210.2 Masonry Design

The design specifications and allowable stresses used to design masonry in this building code were based on the provisions of ACI 530-92/ASCE 5-92/TMS 402-92, *Building Code Requirements for Masonry Structures* and ACI 530.1-92/ASCE 6-92/TMS 602-92, *Specifications for Masonry Structures*. The compressive strength of masonry used was 1500 psi. Grade 40 steel was used for reinforcement.

210.3 Wood Design

The design specifications and allowable stresses used to design wood members were based on ANSI/NFoPA *National Design Specification for Wood Construction*, 1991. A load duration factor of 1.6 was used for load combinations including wind.

211 Materials

211.1 Lumber

- All lumber shall be identified by the grade mark of a lumber grading or inspection bureau or agency approved by the American Lumber Standards Committee. See Appendix C.
- Finger-jointed lumber and end-jointed lumber is permitted. The lumber shall be identified by the grade mark of a lumber grading or inspection bureau or agency approved by the American Lumber Standards Committee. See Appendix C.
- Pressure treated wood products shall also be identified by the grade mark of an agency accredited by the American Lumber Standards Committee. See Appendix C.
- All lumber members 2 inches or less in thickness, except pressure treated wood products, shall contain not more than 19 percent moisture content at the time of permanent incorporation into a building or structure. Permanent incorporation occurs when lumber is cut to size and nailed in place.
- If framing is found to have a moisture content higher than 19 percent at the time of the first framing inspection, that structure will not be approved by Texas Department of Insurance inspectors. The structure will be required to be inspected by a Texas licensed professional engineer to determine what corrective actions have to be taken.
- Standard and utility grade lumber shall not be used for the following members: rafters, exterior wall studs, load-carrying braces, and joists.

211.2 Structural Panels

211.2.1 Plywood

- Plywood shall meet the provisions of U.S. Department of Commerce Voluntary Product Standard 1 (PS 1) *Construction and Industrial Plywood* or U.S. Department of Commerce Voluntary Product Standard 2 (PS 2) *Performance Standard for Wood-Based Structural-Use Panels*.

211.2.2 Oriented-Strand Board

- Oriented-strand board shall meet the provisions of U.S. Department of Commerce Voluntary Product Standard 2 (PS 2) *Performance Standard for Wood-Based Structural-Use Panels*.

211.2.3 Structural Panel Siding

- Structural panel siding shall meet the provisions of U.S. Department of Commerce Voluntary Product Standard 1 (PS 1) *Construction and Industrial Plywood* or shall be evaluated by the Texas Department of Insurance.

211.3 Gypsum

- Gypsum wallboard shall meet the provision of ASTM C36 *Specification for Gypsum Wallboard*.

211.4 Fasteners

211.4.1 Nails

- All nails shall be corrosion resistant in accordance with one of the following: hot-dip galvanized or electrogalvanized in accordance with ASTM A 641 *Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire, Supplementary Requirements, Class 1*; mechanically deposited zinc coatings applied in accordance with ASTM B 695 *Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel, Class 40*; or stainless steel. Where specified, aluminum nails will also be accepted.
- All hand driven and pneumatic nails required by this code shall comply with either Federal Specification FF-N-105B *Wire, Cut and Wrought Nails, Staples, and Spikes* or ASTM F 1667 *Standard Specification for Driven Fasteners: Nails, Spikes, and Staples*. Appendix D lists specifications for several of the fasteners specified in the code.
- The code provides nailing requirements for both hand driven and pneumatic gun nails for many framing connections. Where nails are not specified in the prescriptive portions of this code, nails shall be provided in accordance with the fastening schedule provided in Appendix I.
- For application of structural panels, roof coverings, and exterior coverings, nails shall be properly driven. See Figure 211.4.1 for an illustration of properly and improperly driven nails.

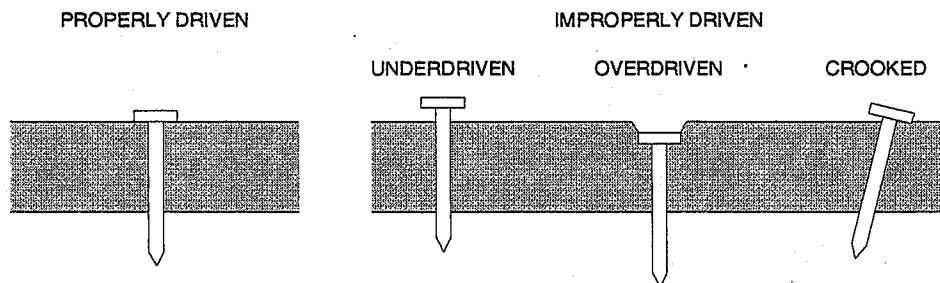


Figure 211.4.1
Properly and Improperly Driven Nails

211.4.2 Bolts

- All bolts, including nuts and washers, shall be corrosion resistant in accordance with one of the following: steel hot dipped galvanized after fabrication in accordance with ASTM A 123 *Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products* or ASTM A 153 *Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware*; electrodeposited coatings of iron and steel in accordance with ASTM B 633 *Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel, SC 3*; mechanically deposited zinc coatings applied in accordance with ASTM B 695 *Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel, Class 40*; or stainless steel.
- All bolts required by this code shall comply with ANSI/ASME B18.2.1 *Square and Hex Bolts and Screws*.

211.4.3 Lag Screws

- All lag screws or lag bolts, including washers, shall be either hot dipped, electrically or mechanically galvanized, or stainless steel.
- All lag screws or lag bolts required by this code shall comply with ANSI/ASME B18.2.1 *Square and Hex Bolts and Screws*.

211.4.4 Other Fasteners

- All other fasteners not included above shall be either hot dipped, electrically or mechanically galvanized, or stainless steel.
- Hand driven or pneumatically driven staples will not be allowed.

211.5 Metal Connectors

- Metal connectors shall be approved by the Texas Department of Insurance or listed by one or more of the model code evaluation services.
- Metal connectors shall be corrosion resistant in accordance with one of the following: galvanized steel having a zinc coating with a minimum coating designation of G60 in accordance with ASTM A 653 *Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process*; steel hot dipped galvanized after fabrication to a minimum coating thickness of 1 ounce per square foot in accordance with ASTM A 123 *Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products* or ASTM A 153 *Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware* or stainless steel.
- Metal connectors shall be installed in accordance with the manufacturer's installation instructions.

