

LARUCP 16-1. Section 1612.2.1 of the California Building Code is amended to read:

1612.2.1 Basic load combinations. Where Load and Resistance Factor Design (Strength Design) is used, structures and all portions thereof shall resist the most critical effects from the following combinations of factored loads:

$1.4D$	(12-1)
$1.2D + 1.6L + 0.5 (L_r \text{ or } S)$	(12-2)
$1.2D + 1.6 (L_r \text{ or } S) + (f_1 L \text{ or } 0.8 W)$	(12-3)
$1.2D + 1.3W + (f_1 L + 0.5 (L_r \text{ or } S))$	(12-4)
$1.2D + 1.0E + (f_1 L + f_2 S)$	(12-5)
$0.9D \pm (1.0E \text{ or } 1.3W)$	(12-6)
<u>$0.9D \pm (1.0\rho E_h \text{ or } 1.3W)$</u>	<u>(12-6)</u>

WHERE:

E = load effects of earthquake, or related internal moments and forces.

E_h = the earthquake load due to the base shear, V, as set forth in Section 1630.2 or the design lateral force, F_p, as set forth in Section 1632.

f₁ = 1.0 for floors in places of public assembly, for live loads in excess of 100 psf (4.9 kN/m²), and for garage live load.

= 0.5 for other live loads.

f₂ = 0.7 for roof configurations (such as saw tooth) that do not shed snow off the structure.

= 0.2 for other roof configurations.

EXCEPTIONS: 1. Factored load combinations for concrete per Section 1909.2 where load combinations do not include seismic forces.

~~2. Factored load combinations of this section multiplied by 1.1 for concrete and masonry where load combinations include seismic forces.~~

~~3. Where other factored load combinations are specifically required by the provisions of this code.~~

REASONS FOR AMENDMENT/INTERPRETATION/CLARIFICATION:

a. The amendment changes the quantity “E” in Eq. (12-6) to “ρE_h” to avoid reduction of 0.9D by E_v. The effect of vertical earthquake ground motion is adequately accounted for in Eq. (12-5). Justification is provided in SEAOC 1999 Blue Book Commentary C101.7.1 (page. 85). This is consistent with OSHPD and DSA amendments.

b. The 1.1 factor for concrete and masonry when applied, requires the amount of flexural reinforcement to increase more than the increase for shear. This increase will result in shear walls with undesirable shear-critical behavior. This may cause brittle shear failure in reinforced concrete and masonry shear walls. A corresponding adjustment is required when the Alternate Load-Factor Combination and Strength Reduction Factors in Division VIII is used. This is consistent with OSHPD and DSA amendments.

FINDINGS:

Local Geological Conditions - Results from studies after the Northridge Earthquake.

LARUCP 16-2. Section 1629.4.2 of the California Building Code is amended to read:

1629.4.2. Seismic Zone 4 near-source factor. In Seismic Zone 4, each site shall be assigned a near-source factor in accordance with Table 16-S and the Seismic Source Type set forth in Table 16-U. The value of N_a used in determining C_a need not exceed 1.1 for structures complying with all the following conditions:

1. The soil profile type is S_A , S_B , S_C or S_D .
2. $\Delta = 1.0$.
3. Except in single-story structures, Group R, Division 3 and Group U, Division 1 Occupancies, moment frame systems designated as part of the lateral-force-resisting system shall be special moment-resisting frames.
4. The ~~provisions in exceptions to Section 2213.7.5~~ Sections 9.6a and 9.6b of AISC - Seismic Part I shall not apply, except for columns in one-story buildings or columns at the top story of multistory buildings.
5. None of the following structural irregularities is present: Type 1, 4 or 5 of Table 16-L, and Type 1 or 4 of Table 16-M.

REASONS FOR AMENDMENT/INTERPRETATION/CLARIFICATION:

The amendment is needed due to local geologic conditions. The Los Angeles region is a densely populated area that has buildings constructed over and near a vast and complex network of faults that are believed to be capable of producing future earthquakes similar or greater in size than the 1994 Northridge and the 1971 Sylmar earthquakes. Design provisions developed based on detailed study of the 1994 Northridge earthquake need to be incorporated into the local building codes to assure new buildings, and additions to existing buildings, are designed and constructed in accordance with the scope and objectives of the Uniform Building Code.

FINDINGS:

Local Geological Conditions - Results from studies after the Northridge Earthquake.

LARUCP 16-3. Section 1630.8.2.2 of the California Building Code is amended to read:

1630.8.2.2 Detailing requirements in Seismic Zones 3 and 4. In Seismic Zones 3 and 4, elements supporting discontinuous systems shall meet the following detailing or member limitations:

1. Reinforced concrete or reinforced masonry elements designed primarily as axial-load members shall comply with Section 1921.4.4.5.

2. Reinforced concrete elements designed primarily as flexural members and supporting other than light-frame wood shear wall systems or light-frame steel and wood structural panel shear wall systems shall comply with Sections 1921.3.2 and 1921.3.3. Strength computations for portions of slabs designed as supporting elements shall include only those portions of the slab that comply with the requirements of these Sections.

3. Masonry elements designed primarily as axial-load carrying members shall comply with Sections 2106.1.12.4, Item 1, and 2108.2.6.2.6.

4. Masonry elements designed primarily as flexural members shall comply with Section 2108.2.6.2.5.

5. ~~Steel elements designed primarily as axial-load members shall comply with Sections 2213.5.2 and 2213.5.3.~~ Not Adopted.

6. Steel elements designed primarily as flexural members or trusses shall have bracing for both top and bottom beam flanges or chords at the location of the support of the discontinuous system and shall comply with the requirements of ~~Section 2213.7.1.3.~~ AISC-Seismic Part I, Section 9.4b.

7. Wood elements designed primarily as flexural members shall be provided with lateral bracing or solid blocking at each end of the element and at the connection location(s) of the discontinuous system.

REASONS FOR AMENDMENT/INTERPRETATION/CLARIFICATION:

- a. It is adopted in AISC-Seismic 97 Part I, Section 8.3 and applicable to all axial loaded members. Redundant.
- b. Old section no longer applicable. Replace with provision in the AISC-Seismic.

FINDINGS:

Local Geological Conditions - Results from studies after the Northridge Earthquake.

LARUCP 16-4. Section 1630.10.2 and 1630.10.3 of the California Building Code is amended to read: **(LARUCP 10.2 ONLY – 10.3 is ICBO Errata)**

1630.10.2 Calculated. Calculated story drift using Δ_M shall not exceed 0.025 times the story height for structures having a fundamental period of less than 0.57 second. For structures having a fundamental period of 0.57 second or greater, the calculated story drift shall not exceed $0.020/T^{1/3}$ times the story height.

(Note: Exceptions to remain unchanged)

1630.10.3 Limitations. The design lateral forces used to determine the calculated drift may disregard the limitations of Formula (30-6) and (30-7) and may be based on the period determined from Formula (30-10) neglecting the 30 or 40 percent limitations of Section 1630.2.2, Item 2.

REASONS FOR AMENDMENT/INTERPRETATION/CLARIFICATION:

After engineers began using the '97 UBC they found problems with applying (30-7) for the drift calculations. (30-7) applies only to Zone 4 and was added after the Northridge Earthquake to account for near fault pulses. An erratum to '97 UBC Section 1630.10.3 was issued in March 2001, 3 years following publication, that deleted (30-7) from being applied to drift calculations. However, SEAOC Seismology Committee found that the erratum actually made the drift limit to be less stringent and would allow more slender and flexible buildings than were allowed under the '94 UBC.

The proposed modification was recommended by SEAOC Seismology Committee. It effectively makes the descending branch vary with $1/T^{2/3}$ for drift coordination purposes and make the drift limitations very similar to those of the '94 UBC.

The change from 0.7 seconds to 0.5 seconds in the proposal is needed to avoid a step function in the drift limit. If 0.7 second were retained, the drift limit at T just below 0.7 seconds would have been different from the drift limit just above 0.7 seconds. With the switch to 0.5 seconds, the drift limit just below T=0.5 seconds is the same as the drift limit just above T=0.5 seconds

FINDINGS:

Local Geological Conditions - Results from studies after the Northridge Earthquake.

LARUCP 16-5*. Items 4 and 7 of Section 1633.2.9 of the California Building Code are amended to read:

4. Diaphragms supporting concrete or masonry walls shall have continuous ties or struts between diaphragm chords to distribute the anchorage forces specified in Section 1633.2.8. The spacing of continuous ties shall not exceed 25 feet (7620 mm). Added chords of subdiaphragms may be used to form subdiaphragms to transmit the anchorage forces to the main continuous crossties. The maximum allowable diaphragm shear used to determine the depth of the subdiaphragm shall not exceed 300 pounds per foot (4.38 kN/m). The maximum length-to-width ratio of the wood structural subdiaphragm shall be 2½:1.

7. In structures in Seismic Zones 3 and 4 having a plan irregularity of Type 2 in Table 16-M, diaphragm chords and drag members shall be designed considering independent movement of the projecting wings of the structure. Each of these diaphragm elements shall be designed for the more severe of the following two assumptions:

Motion of the projecting wings in the same direction.

Motion of the projecting wings in opposing directions.

EXCEPTION: This requirement may be deemed satisfied if the procedures of Section 1631 in conjunction with a three-dimensional model have been used to determine the lateral seismic forces for design.

When designing the diaphragm to comply with the requirements stated above, the return walls and fins/canopies at entrances shall be considered. Seismic compatibility with the diaphragm shall be provided by either seismically isolating the element or by attaching the element and integrating its load into the diaphragm.

REASONS FOR AMENDMENT/INTERPRETATION/CLARIFICATION:

These amendments are based on research conducted by City of L.A. and SEAOSC after the 1994 Northridge earthquake. The study of the effect of seismic force levels on tilt-up and masonry bearing wall buildings with flexible diaphragms concluded that continuous ties were required at certain spacing to control cross grain tension in the interior of a diaphragm. Additionally, subdiaphragm shear were to be limited to control combined orthogonal stresses within the diaphragm. The study also concluded that stiffness incompatibility between entrance canopies needs to be addressed.

FINDINGS:

Local Geological Conditions - Results from studies after the Northridge Earthquake.

LARUCP 16-6*. Table 16-N of the California Building Code is amended to read:

TABLE 16-N – STRUCTURAL SYSTEMS ¹

BASIC STRUCTURAL SYSTEM ²	LATERAL-FORCE-RESISTING SYSTEM DESCRIPTION	R	Ω	HEIGHT LIMIT FOR SEISMIC ZONES 3 AND 4 (feet)
				x 304.8 for mm
1. Bearing wall system	1. Light-framed walls with shear panels			
	a. Wood structural panel walls for structures three stories or less	5.5	2.8	65
	b. All other light-framed walls	4.5	2.8	65
	2. Shear walls			
	a. Concrete	4.5	2.8	160
	b. Masonry	4.5	2.8	160
	3. Light steel-framed bearing walls with tension-only bracing	2.8	2.2	65
	4. Braced frames where bracing carries gravity load			
	a. Steel	4.4	2.2	160
	b. Concrete ³	2.8	2.2	-
c. Heavy timber	2.8	2.2	65	
2. Building frame system	1. Steel eccentrically braced frame (EBF)	7.0	2.8	240
	2. Light-framed walls with shear panels.			
	a. Wood structural panel walls for structures three stories or less	6.5	2.8	65
	b. All other light-framed walls	5.0	2.8	65
	3. Shear walls			
	a. Concrete	5.5	2.8	240
	b. Masonry	5.5	2.8	160
	4. Ordinary braced frames			
	a. Steel ⁶	5.5 5.6	2.2 2.2	35 ⁶ 160
	b. Concrete ³	5.6	2.2	-
c. Heavy timber	5.6	2.2	65	
5. Special concentrically braced frames				
a. Steel	6.4	2.2	240	
3. Moment-resisting frame system	1. Special moment-resisting frame (SMRF)			
	a. Steel	8.5	2.8	N.L.
	b. Concrete ⁴	8.5	2.8	N.L.
	2. Masonry moment-resisting wall frame (MMRWF)	6.5	2.8	160
	3. Concrete-Intermediate moment-resisting frame (IMRF) ⁵			
	a. Steel ⁶	4.5	2.8	35 ⁶
	b. Concrete ⁵	5.5	2.8	-
	4. Ordinary moment-resisting frame (OMRF)			
	a. Steel ⁶	3.5 4.5	2.8	160 - ⁶
	b. Concrete ^{7,8}	3.5	2.8	-
5. Special truss moment frames of steel (STMF)	6.5	2.8	240	
4. Dual systems	1. Shear walls			
	a. Concrete with SMRF	8.5	2.8	N.L.
	b. Concrete with steel OMRF (Not Permitted)	4.2	2.8	160
	c. Concrete with concrete IMRF ⁵	6.5	2.8	160
	d. Masonry with SMRF	5.5	2.8	160
	e. Masonry with steel OMRF (Not Permitted)	4.2	2.8	160
	f. Masonry with concrete IMRF ⁵	4.2	2.8	-
	g. Masonry with masonry MMRWF	6.0	2.8	160
	2. Steel EBF			
	a. With steel SMRF	8.5	2.8	N.L.
	b. With steel OMRF (Not Permitted)	4.2	2.8	160
	3. Ordinary braced frames (Not Permitted)			
	a. Steel with steel SMRF	6.5	2.8	N.L.
	b. Steel with steel OMRF	4.2	2.8	160
	c. Concrete with concrete SMRF ³	6.5	2.8	-
	d. Concrete with concrete IMRF ³	4.2	2.8	-
4. Special concentrically braced frames				
a. Steel with steel SMRF	7.5	2.8	N.L.	
b. Steel with steel OMRF (Not Permitted)	4.2	2.8	160	
5. Steel IMRF (Not permitted)				
5. Cantilevered column building systems	1. Cantilevered column elements	2.2	2.0	35 ⁷

6. Shear wall-frame interaction systems	1. Concrete ⁸	5.5	2.8	160
7. Undefined systems	See Section 1629.6.7 and 1629.9.2	-	-	-

N.L.– no limit

¹ See Section 1630.4 for combination of structural systems.

² Basic structural systems are defined in Section 1629.6.

³ Prohibited in Seismic Zones 3 and 4.

⁴ Includes precast concrete conforming to Section 1921.2.7.

⁵ Prohibited in Seismic Zones 3 and 4, except as permitted in Section 1634.2.

⁶ ~~Ordinary moment-resisting frames in Seismic Zone 4 meeting the requirements of Section 2214.6 may use a R-value of 8~~ In Seismic Zone 4 **steel IMRF, OMRF and Ordinary Braced Frames** are permitted as follows:

^a **Steel IMRF** are permitted for buildings 35 feet or less in height and the dead load of the roof, walls or floors not exceeding 35 psf each; or for single-story buildings 60 feet or less in height with the dead load of the roof not exceeding 15 psf each and where the moment joints of field connections are constructed of bolted end plates.

^b **Steel OMRF** are permitted for buildings 35 ft or less in height with the dead load of the roof, walls or floors not exceeding 15 psf each; or single-story buildings 60 ft or less in height with the dead load of the roof or walls not exceeding 15 psf each and where the moment joints of field connections are constructed of bolted end plates; or single-family dwellings using light frame construction with $R = 3.0$ and $\Omega_o = 2.2$.

^c **Steel Ordinary Braced Frames** are permitted for structural systems 35 ft or less in height; or penthouse structures; or single-story buildings 60 ft or less in height with the dead load of the roof or walls not exceeding 15 psf each.

⁷ Total height of the building including cantilevered columns.

⁸ Prohibited in Seismic Zones 2A, 2B, 3 and 4. See Section 1633.2.7.

REASONS FOR AMENDMENT/INTERPRETATION/CLARIFICATION:

Editorially revise/update table to make it consistent with the adoption of 1997 AISC-Seismic Provisions and the latest Supplements as well as the 2000 NEHRP. These provisions are fundamentally updated from previous editions. It has incorporated to the extent possible, most recent findings from the FEMA funded SAC Reports.

FINDINGS:

Local Geological Conditions - Results from studies after the Northridge Earthquake.

LARUCP 16-7. Chapter 16 of the California Building Code are amended by adding "Division IV – SEISMIC DESIGN PROVISIONS FOR HILLSIDE BUILDINGS" to read:

Division VI — SEISMIC DESIGN PROVISIONS FOR HILLSIDE BUILDINGS

SECTION 1666 — SEISMIC DESIGN PROVISIONS FOR HILLSIDE BUILDINGS.

1666.1 Purpose. The purpose of this Section is to establish minimum regulations for the design and construction of new buildings and additions to existing buildings when constructing such buildings on or into slopes steeper than three horizontal to one vertical. These regulations establish minimum standards for seismic force resistance to reduce the risk of injury or loss of life in the event of earthquakes.

1666.2 Scope. The provisions of this Section shall apply to the design of the lateral force resisting system for hillside buildings at and below the base level diaphragm. The design of the lateral force resisting system above the base level diaphragm shall be in accordance with the provisions for seismic and wind design as required elsewhere in this Division.

EXCEPTION: Non-habitable accessory buildings and decks not supporting or supported from the main building are exempt from these regulations.

1666.3 Definitions. For the purposes of this Section certain terms are defined as follows:

BASE LEVEL DIAPHRAGM is the floor at, or closest to, the top of the highest level of the foundation.

DIAPHRAGM ANCHORS are assemblies that connect a diaphragm to the adjacent foundation at the uphill diaphragm edge.

DOWNHILL DIRECTION is the descending direction of the slope approximately perpendicular to the slope contours.

FOUNDATION is concrete or masonry which supports a building, including footings, stem walls, retaining walls, and grade beams.

FOUNDATION EXTENDING IN THE DOWNHILL DIRECTION is a foundation running downhill and approximately perpendicular to the uphill foundation.

HILLSIDE BUILDING is any building or portion thereof constructed on or into a slope steeper than three horizontal to one vertical. If only a portion of the building is supported on or into the slope, these regulations apply to the entire building.

PRIMARY ANCHORS are diaphragm anchors designed for and providing a direct connection as described in Sections 1666.5 and 1666.7.3 between the diaphragm and the uphill foundation.

SECONDARY ANCHORS are diaphragm anchors designed for and providing a redundant diaphragm to foundation connection, as described in Sections 1666.6 and 1666.7.4.

UPHILL DIAPHRAGM EDGE is the edge of the diaphragm adjacent and closest to the highest ground level at the perimeter of the diaphragm.

UPHILL FOUNDATION is the foundation parallel and closest to the uphill diaphragm edge.

1666.4 Analysis and Design.

1666.4.1 General. Every hillside building within the scope of this Section shall be analyzed, designed, and constructed in accordance with the provisions of this Division. When the code-prescribed wind design produces greater effects, the wind design shall govern, but

detailing requirements and limitations prescribed in this and referenced sections shall be followed.

1666.4.2 Base Level Diaphragm-Downhill Direction. The following provisions shall apply to the seismic analysis and design of the connections for the base level diaphragm in the downhill direction.

1666.4.2.1 Base for Lateral Force Design Defined. For seismic forces acting in the downhill direction, the base of the building shall be the floor at or closest to the top of the highest level of the foundation.

1666.4.2.2 Base Shear. In developing the base shear for seismic design, the structural system factor (R_w) shall not exceed 4.5 for bearing wall and building frame systems. The total base shear shall include the forces tributary to the base level diaphragm including forces from the base level diaphragm.

1666.5 Base Shear Resistance-Primary Anchors.

1666.5.1 General. The base shear in the downhill direction shall be resisted through primary anchors from diaphragm struts provided in the base level diaphragm to the foundation.

1666.5.2 Location of Primary Anchors. A primary anchor and diaphragm strut shall be provided in line with each foundation extending in the downhill direction. Primary anchors and diaphragm struts shall also be provided where interior vertical lateral force resisting elements occur above and in contact with the base level diaphragm. The spacing of primary anchors and diaphragm struts or collectors shall in no case exceed 30 feet.

1666.5.3 Design of Primary Anchors and Diaphragm Struts. Primary anchors and diaphragm struts shall be designed in accordance with the requirements of Section 1666.8.

1666.5.4 Limitations. The following lateral force resisting elements shall not be designed to resist seismic forces below the base level diaphragm in the downhill direction:

1. Wood structural panel wall sheathing.
2. Cement plaster and lath
3. Gypsum wallboard
4. Tension only braced frames

Braced frames designed in accordance with the requirements of Section 2213.8 of this code may be used to transfer forces from the primary anchors and diaphragm struts to the foundation provided lateral forces do not induce flexural stresses in any member of the frame or in the diaphragm struts. Deflections of frames shall account for the variation in slope of diagonal members when the frame is not rectangular.

1666.6 Base Shear Resistance-Secondary Anchors.

1666.6.1 General. In addition to the primary anchors required by Section 1666.5, the base shear in the downhill direction shall be resisted through secondary anchors in the uphill foundation connected to diaphragm struts in the base level diaphragm.

EXCEPTION: Secondary anchors are not required where foundations extending in the downhill direction spaced at not more than 30 feet on center extend up to and are directly connected to the base level diaphragm for at least 70% of the diaphragm depth.

1666.6.2 Secondary Anchor Capacity and Spacing. Secondary anchors at the base level diaphragm shall be designed for a minimum force equal to the base shear, including forces tributary to the base level diaphragm, but not less than 600 pounds per lineal foot. The secondary anchors shall be uniformly distributed along the uphill diaphragm edge and shall be spaced a maximum of four feet on center.

1666.6.3 Design. Secondary anchors and diaphragm struts shall be designed in accordance with Section 1666.8

1666.7 Diaphragms Below the Base Level-Downhill Direction. The following provisions shall apply to the lateral analysis and design of the connections for all diaphragms below the base level diaphragm in the downhill direction.

1666.7.1 Diaphragm Defined. For the purposes of Section 1666.7 every floor level below the base level diaphragm shall be designed as a diaphragm.

1666.7.2 Design Force. Each diaphragm below the base level diaphragm shall be designed for all tributary loads at that level using a minimum seismic force factor not less than the base shear coefficient.

1666.7.3 Design Force Resistance-Primary Anchors. The design force described above shall be resisted through primary anchors from diaphragm struts provided in each diaphragm to the foundation. Primary anchors shall be provided and designed in accordance with the requirements and limitations of Section 1666.5

1666.7.4 Design Force Resistance-Secondary Anchors.

1666.7.4.1 General. In addition to the primary anchors required above, the design force in the downhill direction shall be resisted through secondary anchors in the uphill foundation connected to diaphragm struts in each diaphragm below the base level.

EXCEPTION: Secondary anchors are not required where foundations extending in the downhill direction, spaced at not more than 30 feet on center, extend up to and are directly connected to each diaphragm below the base level for at least 70% of the diaphragm depth.

1666.7.4.2 Secondary Anchor Capacity. Secondary anchors at each diaphragm below the base level diaphragm shall be designed for a minimum force equal to the design force but not less than 300 pounds per lineal foot. The secondary anchors shall be uniformly distributed along the uphill diaphragm edge and shall be spaced a maximum of four feet on center.

1666.7.4.3 Design. Secondary anchors and diaphragm struts shall be designed in accordance with Section 1666.8.

1666.8 Primary and Secondary Anchorage and Diaphragm Strut Design. Primary and secondary anchors and diaphragm struts shall be designed in accordance with the following provisions:

- 1. Fasteners.** All bolted fasteners used to develop connections to wood members shall be provided with square plate washers at all bolt heads and nuts. Washers shall be minimum 3/16 inch thick and two inches square for one-half inch diameter bolts and 1/4 inch thick and 2-1/2 inches square for 5/8 inch diameter or larger bolts. Nuts shall be wrench tightened prior to covering.
- 2. Fastening.** The diaphragm to foundation anchorage shall not be accomplished by the use of toe nailing, nails subject to withdrawal, or wood in cross grain bending or cross grain tension.
- 3. Size of Wood Members.** Wood diaphragm struts, collectors, and other wood members connected to primary anchors shall not be less than nominal 3 by members. The effects of eccentricity on wood members shall be evaluated as required per Item 9 below.
- 4. Design.** Primary and secondary anchorage, including diaphragm struts, splices, and collectors shall be designed for 125% of the tributary force.
- 5. Allowable Stress Increase.** The one-third allowable stress increase permitted under Section 1612.3.2 shall not be taken when the working (allowable) stress design method is used.
- 6. Seismic Load Factor.** The seismic load factor shall be 1.7 for steel and concrete anchorage when the strength design method is used.
- 7. Primary Anchors.** The load path for primary anchors and diaphragm struts shall be fully developed into the diaphragm and into the foundation. The foundation must be shown to be adequate to resist the concentrated loads from the primary anchors.
- 8. Secondary Anchors.** The load path for secondary anchors and diaphragm struts shall be fully developed in the diaphragm but need not be developed beyond the connection to the foundation.
- 9. Symmetry.** All lateral force foundation anchorage and diaphragm strut connections shall be symmetrical. Eccentric connections may be permitted when demonstrated by calculation or tests that all components of force have been provided for in the structural analysis or tests.
- 10. Wood Ledgers.** Wood ledgers shall not be used to resist cross-grain bending or cross-grain tension.

1666.9 Lateral Force Resisting Elements Normal to the Downhill Direction.

1666.9.1 General. In the direction normal to the downhill direction, seismic force resisting elements shall be designed in accordance with the requirements of Section 1666.9.

1666.9.2 Base Shear. In developing the base shear for seismic design, the structural system factor (R_w) shall not exceed 4.5 for bearing wall and building frame systems.

1666.9.3 Vertical Distribution of Seismic Forces. For seismic forces acting normal to the downhill direction the distribution of seismic forces over the height of the building using Section 1630.5 shall be determined using the height measured from the top of the lowest level of the building foundation.

1666.9.4 Drift Limitations. The story drift below the base level diaphragm shall not exceed 0.005 times the story height. The total drift from the base level diaphragm to the top of the foundation shall not exceed 3/4 inch. Where the story height or the height from the base level diaphragm to the top of the foundation varies because of a stepped footing or story offset, the height shall be measured from the average height of the top of the foundation. The story drift shall not be reduced by the effect of horizontal diaphragm stiffness.

Where code-prescribed wind forces govern the design of the lateral force resisting system normal to the downhill direction, the drift limitation shall be 0.0025 for the story drift and the total drift from the base level diaphragm to the top of the foundation may exceed 3/4 inch when approved by the Department. In no case, however, shall the drift limitations for seismic forces be exceeded.

1666.9.5 Distribution of Lateral Forces.

1666.9.5.1 General. The design lateral force shall be distributed to lateral force resisting elements of varying heights in accordance with the stiffness of each individual element.

1666.9.5.2 Wood Structural Panel Sheathed Walls. The stiffness of a stepped wood structural panel shear wall may be determined by dividing the wall into adjacent rectangular elements, subject to the same top of wall deflection. Deflections of shear walls may be estimated by U.B.C. Standards Section 25.923 or other equivalent methods. Sheathing and fastening requirements for the stiffest section shall be used for the entire wall. Each section of wall shall be anchored for shear and uplift at each step. The minimum horizontal length of a step shall be eight feet and the maximum vertical height of a step shall be two feet, eight inches

1666.9.5.3 Reinforced Concrete or Masonry Shear Walls. Reinforced concrete or masonry shear walls shall have forces distributed in proportion to the rigidity of each section of the wall.

1666.9.6 Limitations. The following lateral force resisting elements shall not be designed to resist lateral forces below the base level diaphragm in the direction normal to the downhill direction:

1. Cement plaster and lath
2. Gypsum wallboard
3. Tension only braced frames.

Braced frames designed in accordance with the requirements of Section 2213.8 of this code may be designed as lateral force resisting elements in the direction normal to the downhill direction provided lateral forces do not induce flexural stresses in any member of the frame. Deflections of frames shall account for the variation in slope of diagonal members when the frame is not rectangular.

1666.10 Specific Design Provisions.

1666.10.1 Footings and Grade Beams. All footings and grade beams shall comply with the following:

1. Grade beams shall extend at least 12 inches below the lowest adjacent grade and provide a minimum 24-inch distance horizontally from the bottom outside face of the grade beam to the face of the descending slope.
2. Continuous footings shall be reinforced with at least two No. 4 reinforcing bars at the top and two No. 4 reinforcing bars at the bottom.
3. All main footing and grade beam reinforcement steel shall be bent into the intersecting footing and fully developed around each corner and intersection.
4. All concrete stem walls shall extend from the foundation and reinforced as required for concrete or masonry walls.

1666.10.2 Protection Against Decay and Termites. All wood to earth separation shall comply with the following:

1. Where a footing or grade beam extends across a descending slope, the stem wall, grade beam, or footing shall extend up to a minimum 18 inches above the highest adjacent grade.

EXCEPTION: At paved garage and doorway entrances to the building, the stem wall need only extend to the finished concrete slab, provided the wood framing is protected with a moisture proof barrier.

2. Wood ledgers supporting a vertical load of more than 100 pounds per lineal foot and located within 48 inches of adjacent grade are prohibited. Galvanized steel ledgers and anchor bolts, with or without wood nailers, or treated or decay resistant sill plates supported on a concrete or masonry seat, may be used.

1666.10.3 Sill Plates. All sill plates and anchorage shall comply with the following:

1. All wood framed walls, including nonbearing walls, when resting on a footing, foundation, or grade beam stem wall, shall be supported on wood sill plates bearing on a level surface.
2. Power driven fasteners shall not be used to anchor sill plates except at interior nonbearing walls not designed as shear walls.

1666.10.4 Column Base Plate Anchorage. The base of isolated wood posts (not framed into a stud wall) supporting a vertical load of 4000 pounds or more and the base plate for a steel column shall comply with the following:

1. When the post or column is supported on a pedestal extending above the top of a footing or grade beam, the pedestal shall be designed and reinforced as required for concrete or masonry columns. The pedestal shall be reinforced with a minimum of four No. 4 bars extending to the bottom of the footing or grade beam. The top of exterior pedestals shall be sloped for positive drainage.
2. The base plate anchor bolts or the embedded portion of the post base, and the vertical reinforcing bars for the pedestal, shall be confined with two No. 4 or three No. 3 ties within

the top five inches of the concrete or masonry pedestal. The base plate anchor bolts shall be embedded a minimum of 20 bolt diameters into the concrete or masonry pedestal. The base plate anchor bolts and post bases shall be galvanized and each anchor bolt shall have at least two galvanized nuts above the base plate.

1666.10.5 Steel Beam to Column Supports. All steel beam to column supports shall be positively braced in each direction. Steel beams shall have stiffener plates installed on each side of the beam web at the column. The stiffener plates shall be welded to each beam flange and the beam web. Each brace connection or structural member shall consist of at least two 5/8 inch diameter machine bolts.

REASON FOR AMENDMENT:

A joint LA City, LA County and SEAOSC task force investigated the performance of hillside building failures after the Northridge earthquake. Numerous hillside failures resulted in loss of life and millions of dollars in damage. These criteria were developed to minimize the damage to these structures and have been in use by the City of LA one year.

FINDINGS:

Local Geological Conditions - Results from studies after the Northridge Earthquake.

LARUCP 17-1. Section 1701.5, items 5.2 and 11 of the California Building Code are amended to read as follows:

5.2 ~~Special moment~~ **Lateral force resisting frames.** During the welding of ~~special moment-~~ lateral force resisting steel frames. In addition to Item 5.1 requirements, nondestructive testing as required by Section 1703 of this code.

11. **Piling, drilled piers, and caissons and connecting grade beams.** During driving and testing of piles and construction of cast-in-place drilled piles or caissons and connecting grade beams. See Items 1 and 4 for concrete and reinforcing steel inspection.

REASONS FOR AMENDMENT/INTERPRETATION/CLARIFICATION:

Item 5.2: AISC-Seismic Part I, which is adopted by the LARUCP, requires nondestructive testing for welded joints that are subject to net tensile forces in moment frames and braced frames. This amendment reconciles Section 1701.5 with AISC-Seismic for consistency.

Item 11: The grade beams in the pile- or caisson-supported foundation system are designed to act like concrete beams and not like footings. Section 1701.5 item 1 requires concrete beams to have special inspection, but exempts the footings in R-3 or U-1 occupancies. This amendment clarifies that the grade beams that connect piles or caissons are not exempt, though they are part of the foundation system. This amendment is for clarification purpose only. It does not change the intent of the code provisions.

FINDINGS:

Local Geological Conditions - Results from studies after the Northridge Earthquake.

LARUCP 17-2. Section 1702 of the California Building Code is amended to read as follows:

SECTION 1702 -- STRUCTURAL OBSERVATION

Structural observation shall be provided in Seismic Zone 3 or 4 when one of the following conditions exists:

1. The structure is defined in Table 16-K as Occupancy Category I, II or III,
2. The structure is required to comply with Section 403
3. The structure is in Seismic Zone 4 ~~As set forth in Table 16-S is greater than one,~~ and a lateral design is required for the entire structure.

- EXCEPTION:** One- and two-story wood framed Group R, Division 3 and Group U Occupancies less than 1500 square feet, and one- and two-story Groups B, F, M and S Occupancies ~~and commercial or industrial occupancies~~ with an occupant load less than 10 provided the adjacent grade is not steeper than 1 unit vertical in 10 units horizontal (10% sloped).
4. When so designated by the architect or engineer of record, or
 5. When such observation is specifically required by the building official.

The owner shall employ the engineer or architect responsible for the structural design, or another engineer or architect designated by the engineer or architect responsible for the structural design to perform structural observation as defined in Section 220.

The owner or owner's representative shall coordinate and call a preconstruction meeting between the engineer or architect responsible for the structural design, structural observer, contractor, affected subcontractors and deputy inspectors. The structural observer shall preside over the meeting. The purpose of the meeting shall be to identify the major structural elements and connections that affect the vertical and lateral load systems of the structure and to review scheduling of the required observations. A record of the meeting shall be included in the first report submitted to the building official.

Observed deficiencies shall be reported in writing to the owner's representative, special inspector, contractor and the building official. Upon the form prescribed by the building official, the The structural observer shall submit to the building official a written statement at each significant construction stage stating that the site visits have been made and identifying any reported deficiencies which, to the best of the structural observer's knowledge, have not been resolved. A final report by the structural observer which states that all observed deficiencies have been resolved is required before acceptance of the work by the building official.

Reason for amendment:

FINDINGS:

Local Geological Conditions - Results from studies after the Northridge Earthquake.

LARUCP 17-3. Section 1703 of the California Building Code is amended to read as follows:

SECTION 1703 NONDESTRUCTIVE TESTING

In Seismic Zones 3 and 4, welded fully restrained connections between the primary members of ~~ordinary moment frames and special~~ moment-resisting frames, which are subject to net tensile forces as part of the lateral force resisting system shall be tested by nondestructive methods in accordance with AISC-Seismic Part I Section 16 for compliance with approved standards and job specifications. This testing shall be a part of the special inspection requirements of Section 1701.5. A program for this testing shall be established by the person responsible for structural design and as shown on plans and specifications.

As a minimum... *(no changes to the remainder of the Section)*

REASON FOR AMENDMENT:

AISC-Seismic Part I, which is adopted by the LARUCP, requires nondestructive testing for welded joints that are subject to net tensile forces in moment frames and braced frames. This amendment reconciles Section 1703 with AISC-Seismic for consistency.

FINDINGS:

Local Geological Conditions - Results from studies after the Northridge Earthquake.

LARUCP 18-1. Section 1806.1 of the California Building Code is amended to read as follows:

1806.1 General. Footing and foundations other than treated wood piles shall be constructed of masonry or concrete, ~~or treated wood in conformance with Division II~~ shall be supported on native undisturbed materials or approved certified fill, and shall extend below the frost line. Footings of concrete and masonry shall be of solid material. Foundations supporting wood shall extend at least 6 inches (152 mm) above the adjacent finish grade. Footings shall have a minimum depth as indicated in Table 18-I-C, unless another depth is recommended by a foundation investigation.

EXCEPTION: Accessory buildings not used for human occupancy and less than 120 square feet in area may be supported on treated wood mud sills.

The provisions of this section do not apply to building and foundation systems in those areas subject to scour and water pressure by wind and wave action. Buildings and foundations subject to such loads shall be designed in accordance with approved national standards. See Section 3302 for subsoil preparation and wood form removal.

REASONS FOR AMENDMENT:

Wood foundations have proven to be ineffective in supporting structures and buildings due to deterioration caused by presence of water in the soil as well as other material detrimental to wood foundations. Retaining walls have performed very poorly and have led to slope failures.

FINDINGS:

Due to local climatic conditions of Southern California, this region is especially susceptible to more active termite activity and wood attacking insects and microorganisms.

LARUCP 18-2. Section 1806.6.1 of the California Building Code is amended to read as follows:

1806.6.1 Additional requirements in Seismic Zones 3 and 4.

The following additional requirements shall apply in Seismic Zones 3 and 4.

1. Sill bolt diameter and spacing for three-story raised wood floor buildings shall be specifically designed.
2. Steel Plate washers a of minimum ~~2 inch by 2 inch by 3/16 inch (51 mm by 51 mm by 4.8 mm)~~ thick size and thickness as specified in Table 23-II-L shall be used on each bolt.

REASONS FOR AMENDMENT/INTERPRETATION/CLARIFICATION:

The Northridge E.Q. disclosed many errors in design, inspection and construction of buildings. One area of great concern was the lack of tolerances used in drilling holes and placing sill bolting. Properly sized and placed plate washers help greatly in reducing sill splitting. The amendment is needed due to local geologic conditions.

FINDINGS:

Local Geological Conditions - Results from studies after the Northridge Earthquake.

LARUCP 19-1. Section 1928.1.2.3 of the California Building Code is amended to read as follows:

1928.1.2.3 Basic combinations. When permitted by Section 1928.1, structures, components and foundations shall be designed so that their design strength exceeds the effects of the factored loads in the following combinations:

1. $1.4D$
2. $1.2D + 1.6L + 0.5(L_r \text{ or } S \text{ or } R)$
3. $1.2D + 1.6(L_r \text{ or } S \text{ or } R) + (0.5L \text{ or } 0.8W)$
4. $1.2D + 1.3W + 0.5L + 0.5(L_r \text{ or } S \text{ or } R)$
5. $1.2D + 1.0\rho E_h - 5E + (0.5L \text{ or } 0.2S)$
6. $0.9D - (1.3W \text{ or } 1.0\rho E_h - 5)$

EXCEPTIONS: 1. The load factor on L in combinations 3, 4 and 5 shall equal 1.0 for garages, areas occupied and places of public assembly, and all areas where the live load is greater than 100 lb./ft.² (pounds-force per square foot) (4.79 kPa).

2. Each relevant strength limit state shall be considered. The most unfavorable effect may occur when one or more of the contributing loads are not acting.

REASONS FOR AMENDMENT/INTERPRETATION/CLARIFICATION:

To correct errors caused by 1997 UBC adoption process of using various editions of the ACI vs. ASCE 7. It was reported in various papers and consensus reached. The latest national standards such as ACI 318-99, ASCE 7-98 and NEHRP 2000 have since corrected this inadvertent editorial error. This change is associated with change in Sections 1612.2.1. The earthquake load factor was adjusted to 1.0 to be consistent with Chapter 16 where the earthquake force is at the strength design level.

FINDINGS:

Local Geological Conditions - Results from studies after the Northridge Earthquake.

LARUCP 21-1. Section 2104.6.2 of the California Building Code is amended to read as follows:

2104.6.2 Construction requirements. Reinforcement shall be placed prior to grouting. Bolts shall be accurately set with templates or by approved equivalent means and held in place to prevent dislocation during grouting.

Segregation of the grout materials and damage to the masonry shall be avoided during the grouting process.

Grout shall be consolidated by mechanical vibration during placement before loss of plasticity in a manner to fill the grout space. Grout pours greater than 12 inches (300 mm) in height shall be reconsolidated by mechanical vibration to minimize voids due to water loss. Grout pours 12 inches (300 mm) or less in height shall be mechanically vibrated or puddled.

In one-story buildings having wood-frame exterior walls, foundations not over 24 inches (600 mm) high measured from the top of the footing may be constructed of hollow-masonry units laid in running bond without mortared head joints. Any standard shape unit may be used, provided the masonry units permit horizontal flow of grout to adjacent units. Grout shall be solidly poured to the full height in one lift and shall be puddled or mechanically vibrated.

In nonstructural elements which do not exceed 8 feet (2440 mm) in height above the highest point of lateral support, ~~including fireplaces and residential chimneys~~, mortar of pouring consistency may be substituted for grout when the masonry is constructed and grouted in pours of 12 inches (300 mm) or less in height.

In multiwythe grouted masonry, vertical barriers of masonry shall be built across the grout space the entire height of the grout pour and spaced not more than 30 feet (9144 mm) horizontally. The grouting of any section of wall between barriers shall be completed in one day with no interruption longer than one hour.

REASONS FOR AMENDMENT/INTERPRETATION/CLARIFICATION:

Fireplaces and chimneys should not be considered as non-structural elements. Significant damage to fireplaces and chimneys were experienced during the Northridge earthquake. As a result of the Northridge earthquake, masonry walls greater than 3 ½ feet in height were required to have permits.

FINDINGS:

Local Geological Conditions - Results from studies after the Northridge Earthquake.

LARUCP 22-1. Section 2204 of the California Building Code is amended to read as follows:

SECTION 2204—DESIGN METHODS

Design shall be by one of the following methods.

2204.1 Load and Resistance Factor Design. Steel design based on load and resistance factor design methods shall resist the factored load combinations of Section 1612.2 in accordance with the applicable requirements of Section 2205. ~~Seismic design of structures, where required, shall comply with Division IV for structures designed in accordance with Division II (LRFD).~~

2204.2 Allowable Stress Design. Steel design based on allowable stress design methods shall resist the factored load combinations of Section 1612.3 in accordance with the applicable requirements of Section 2205. ~~Seismic design of structures, where required, shall comply with Division V for structures designed in accordance with Division III (ASD).~~

REASONS FOR AMENDMENT/INTERPRETATION/CLARIFICATION:

Editorially revise/update table to make it consistent with the adoption of 1997 AISC-Seismic Provisions and the latest Supplements. These provisions are fundamentally updated from previous editions. It has incorporated to the extent possible, most recent findings from the FEMA funded SAC Reports.

FINDINGS:

Local Geological Conditions - Results from studies after the Northridge Earthquake.

LARUCP 22-2. Section 2205.3 of the California Building Code is amended to read as follows:

2205.3 Seismic Design Provisions for Structural Steel. Steel structural elements that resist seismic forces shall, in addition to the requirements of Section 2205.2 be designed in accordance with Division IV ~~or V~~.

LARUCP 22-3. Divisions IV and V of Chapter 22 of the California Building Code are deleted in their entirety.

Div. IV. Division IV of Chapter 22 of the California Building Code is added to read as follows:

Division IV — SEISMIC PROVISIONS FOR STRUCTURAL STEEL BUILDINGS

Based on Seismic Provisions for Structural Steel Buildings, of the American Institute of Steel Construction. Parts I and III, dated April 15, 1997 and Supplement No. 2, dated November 10, 2000.

2210 — ADOPTION

Except for the modifications as set forth in Sections 2211 and 2212 of this division and the requirements of the Building Code, the seismic design, fabrication, and erection of structural steel shall be in accordance with Part I (LRFD) and Part III (ASD) of the *Seismic Provisions for Structural Steel Buildings, dated April 15, 1997 and Supplement No. 2, dated November 10, 2000*, published by the American Institute of Steel Construction, 1 East Wacker Drive, Suite 3100, Chicago, IL 60601, as if set out at length herein and hereinafter referred to as AISC-Seismic.

Where other codes, standards, or specifications are referred to in ~~this specification~~ AISC-Seismic, they are ~~to be considered as only an indication of an acceptable methods or materials that can be used with the approval of the~~ when approved by the Building Official.

2211 – DESIGN METHODS

When the load combinations from Section 1612.2 for LRFD are used, structural steel buildings shall be designed in accordance with Chapter 22 Division II (AISC-LRFD) and Part I of AISC-Seismic as modified by this Division.

When the load combinations from Section 1612.3 for ASD are used, structural steel buildings shall be designed in accordance with Chapter 22 Division III (AISC-ASD) and Part III of AISC-Seismic as modified by this Division.

SECTION 2212 – AMENDMENTS

The AISC-Seismic adopted by this Division apply to the seismic design of structural steel members except as modified by this Section.

The following terms that appear in AISC-Seismic shall be taken as indicated in the ~~1997 Uniform~~ 2001 California Building Code.

AISC-Seismic

~~1997 Uniform~~ 2001 California Building Code

Seismic Force Resisting System	Lateral Force Resisting System
Design Earthquake	Design Basis Ground Motion
Load Combinations Eqs. (4-1) and (4-2)	Chapter 16 Eqs. (12-17) and (12-18) respectively
LRFD Specification Section Eqs. (A4-1) through (A4-6)	Chapter 16 Eqs. (12-1) through (12-6) respectively
$\Sigma_o Q_E$	E_m

The AISC Seismic Provisions is modified as follows:

1. Revise Part I, Section 1 of the AISC Seismic Provisions as follows:

1. SCOPE

These provisions are intended for the design and construction of structural steel members and connections in the Seismic Force Resisting Systems in buildings for which the design forces resulting from earthquake motions have been determined on the basis of various levels of energy dissipation in the inelastic range of response. These provisions shall apply to buildings in Seismic Zone 2 with an importance factor I greater than one, in Seismic Zone 3 and 4 or when required by the Engineer of Record.

These provisions shall be applied in conjunction with, Chapter 22, Division II, hereinafter referred to as the LRFD Specification. All members and connections in the Lateral Force Resisting System shall have a design strength as provided in the LRFD Specification to resist load combinations 12-1 through 12-6 (in Chapter 16) and shall meet the requirements in these provisions.

Part I includes a Glossary, which is specifically applicable to this Part, and Appendix S.

2. Revise Part I, Sec. 4.1. of the AISC Seismic Provisions is revised as follows:

4.1 Loads and Load Combinations

The loads and load combinations shall be those in ~~LRFD Specification Section A4.1~~ Section 1612.2 except as modified throughout these provisions.

REASONS FOR AMENDMENT/INTERPRETATION/CLARIFICATION:

Editorially revise/update table to make it consistent with the adoption of 1997 AISC-Seismic Provisions and the latest Supplements. These provisions are fundamentally updated from previous editions. It has incorporated to the extent possible, most recent findings from the FEMA funded SAC Reports.

FINDINGS:

Local Geological Conditions - Results from studies after the Northridge Earthquake.

LARUCP 23-1. Section 2307 of the California Building Code is amended to read as follows:

2307 -- WOOD SUPPORTING MASONRY OR CONCRETE

Wood members shall not be used to permanently support the dead load of any masonry or concrete.

- EXCEPTIONS:**
1. Masonry or concrete nonstructural floor or roof surfacing not more than 4 inches (102 mm) thick may be supported by wood members.
 2. Any structure may rest upon wood piles constructed in accordance with the requirements of Chapter 18.
 3. ~~Veneer of brick, concrete or stone applied as specified in Section 1403.6.2 may be supported by approved treated wood foundations when the maximum height of veneer does not exceed 30 feet (9144 mm) above the foundations. Such Veneer used as an interior wall finish may also be supported on wood floors that are designed to support the additional load and designed to limit the deflection and shrinkage to 1/600 of the span of the supporting members.~~
 4. Glass block masonry having an installed weight of 20 pounds per square foot (97.6 kg/m²) or less and installed with the provisions of Section 2109.5. When glass block is supported on wood floors, the floors shall be designed to limit deflection and shrinkage to 1/600 of the span of the supporting members and the allowable stresses for the framing members shall be reduced in accordance with Division III, Part I.

See Division II, Part II for wood members resisting horizontal forces contributed by masonry or concrete.

FINDINGS:

Local Geological Conditions - Results from studies after the Northridge Earthquake.

LARUCP 23-2. Section 2315.1 of the California Building Code is amended to read as follows:

2315.1 General. ~~Particleboard vertical diaphragms and~~ Lumber and wood structural panel horizontal and vertical diaphragms may be used to resist horizontal forces in horizontal and vertical distributing or resisting elements, provided the deflection in the plane of the diaphragm, as determined by calculations, tests or analogies drawn therefrom, does not exceed the permissible deflection of attached distributing or resisting elements. See UBC Standard 23-2 for a method of calculating the deflection of a blocked wood structural panel diaphragm.

Permissible deflection shall be that deflection up to which the diaphragm and any attached distributing or resisting element will maintain its structural integrity under assumed load conditions, i.e., continue to support assumed loads without danger to occupants of the structure.

Connections and anchorages capable of resisting the design forces shall be provided between the diaphragms and the resisting elements. Openings in diaphragms that materially affect their strength shall be fully detailed on the plans and shall have their edges adequately reinforced to transfer all shearing stresses.

Size and shape of each horizontal diaphragm and shear wall shall be limited as set forth in Table 23-II-G. The height of a shear wall shall be defined as:

1. The maximum clear height from foundation to bottom of diaphragm framing above, or
2. The maximum clear height from top of diaphragm to bottom of diaphragm framing above.

The width of a shear wall shall be defined as the width of sheathing. See figure 23-II-1, Section (a).

Where shear walls with openings are designed for force transfer around the openings, the limitations of Table 23-II-G shall apply to the overall shear wall including openings and to each wall pier at the side of an opening. The height of a wall pier shall be defined as the clear height of the pier at the side of an opening. The width of a wall pier shall be defined as the sheathed width of the pier at the side of an opening. Design for force transfer shall be based on a rational analysis. Detailing of boundary members around the opening shall be provided in accordance with Section 2315. See figure 23-II-1, Section (b). Vertical diaphragms shall also meet the story drift limitations of Section 1630.10.2 of this code.

In all buildings in Seismic Zone 4, lumber, and wood structural panel diaphragms shall not be considered as transmitting lateral forces by rotation.

EXCEPTION: One-story, attached or detached residential garages or similar Group U, Division 1 woodframed structures with a maximum depth normal to the open side of 25 feet (7260 mm) and a maximum width of 25 feet (7260 mm) provided the diaphragm is not constructed of straight sheathing.

~~In buildings of wood frame construction where rotation is provided for, the depth of the diaphragm normal to the open side shall not exceed 25 feet (7260 mm) or two thirds the diaphragm width, whichever is the smaller depth. Straight sheathing shall not be permitted to resist shears in diaphragms acting in rotation.~~

~~EXCEPTIONS: 1. One story, wood framed structures with the depth normal to the open side not greater than 25 feet (7260 mm) may have a depth equal to the width.
2. Where calculations show that the diaphragm deflections can be tolerated, the depth normal to the open end may be increased to a depth-to-width ratio not greater than 1½:1 for diagonal sheathing or 2:1 for special diagonal sheathed or wood structural panel or particleboard diaphragms.~~

In masonry or concrete buildings, lumber or wood structural diaphragms shall not be considered as transmitting lateral forces by rotation.

Diaphragm sheathing nails or other approved sheathing connectors shall be driven flush but shall not fracture the surface of the sheathing.

Cantilevered diaphragms are permitted for two story buildings. The length of the overhang shall not exceed 15 percent of the overall building dimension measured in the same direction nor one-fourth the width of the diaphragm, where the width is the dimension of the diaphragm perpendicular to the overhang.

FINDINGS:

Local Geological Conditions - Results from studies after the Northridge Earthquake.

LARUCP 23-3. Section 2315.3.3 of the California Building Code is amended to read as follows:

2315.3.3 Wood structural panel diaphragms. Horizontal and vertical diaphragms sheathed with wood structural panels may be used to resist horizontal forces not exceeding those set forth in Table 23-II-H for horizontal diaphragms and Table 23-II-I-1 for vertical diaphragms, ~~or may be calculated by principles of mechanics without limitation by using values of nail strength and wood structural panel shear values as specified elsewhere in this code.~~ Wood structural panels for horizontal diaphragms shall be as set forth in Tables 23-II-E-1 and 23-II-E-2 for corresponding joist spacing and loads. Wood structural panels in shear walls shall be at least ~~5/16~~ 3/8 inch (~~7.9~~ 9.5 mm) thick and for studs spaced no more than 16 inches (406 mm) on center and 3/8 inch (9.5 mm) thick where studs are spaced 24 inches (610 mm) on center.

Maximum spans for wood structural panel subfloor underlayment shall be as set forth in Table 23-II-F-1. Wood structural panels used for horizontal and vertical diaphragms shall conform to UBC Standard 23-2 or 23-3.

All boundary members shall be proportioned and spliced where necessary to transmit direct stresses. Framing members shall be at least 2-inch (51 mm) nominal in the dimension to which the wood structural panel is attached. In general, panel edges shall bear on the framing members and butt along their center lines. Nails shall be placed not less than ~~3/8~~ 1/2 inch (~~9.5~~ 12.7 mm) in from the panel edges and not less than 3/8 inch (9.5 mm) from the edge of the connecting members for shear greater than 300 pounds per foot (4.38kN/m). Nails shall be placed not less than 3/8 inch (9.5 mm) from panel edges and not less than 1/4 inch (6.4 mm) from the edge of the connecting members for shears of 300 pounds per foot or less. Nails shall be spaced not more than 6 inches (152 mm) on center along panel edge bearings, and shall be firmly driven into the framing members. No unblocked panels less than 12 inches (305 mm) wide shall be used.

Diaphragms with panel edges supported in accordance with Tables 23-II-E-1, 23-II-E-2 and 23-II-F-1 shall not be considered as blocked diaphragms unless blocking or other means of shear transfer is provided.

FINDINGS:

Local Geological Conditions - Results from studies after the Northridge Earthquake.

LARUCP 23-4. Section 2315.5.5 of the California Building Code is hereby deleted and replaced with the phrase "Not adopted."

FINDINGS:

Local Geological Conditions - Results from studies after the Northridge Earthquake.

LARUCP 23-5. Section 2315.5.6 of the California Building Code is amended to read as follows:

2315.5.6 Hold-down connectors. Hold-down connectors shall be designed to resist shear wall overturning moments using approved cyclic load values or 75 percent of the allowable earthquake load values that do not consider cyclic loading of the product. Connector bolts into wood framing require steel plate washers in accordance with Table 23-II-L. Hold-downs shall be re-tightened just prior to covering the wall framing.

FINDINGS:

Local Geological Conditions - Results from studies after the Northridge Earthquake.

LARUCP 23-6. Section 2315.5.7 of the California Building Code is amended to read as follows:

2315.5.7 Shear Wall Displacement Analysis. Wood structural panel shear walls shall meet the story drift limitation of Section 1630.10 of this Code. Conformance to the story drift limitation shall be determined by approved testing or calculation or analogies drawn therefrom and not the use of an aspect ratio. Calculated deflection shall be determined according to U.B.C. Standard 23-2, Section 23.223 "Calculation of Shear Wall Deflection," and shall be increased 25 percent to account for inelastic action and repetitive loading. Contribution to the deflection from the anchor or tie down slippage shall also be included. The slippage contribution shall include the vertical elongation of the metal, the vertical slippage of the fasteners and compression or shrinkage of the wood elements. The total vertical slippage shall be multiplied by the aspect ratio and added to the total horizontal deflection.

FINDINGS:

Local Geological Conditions - Results from studies after the Northridge Earthquake.

LARUCP 23-7. Section 2315.5.8 of the California Building Code is amended to read as follows:

2315.5.8 Quality of Nails. Mechanically driven nails used in shear wall panel construction shall meet the same tolerances as that required for hand-driven nails. The allowable design value for clipped nails in existing construction may be taken at no more than the nail-head-area ratio of that of the same size hand-driven nails.

FINDINGS:

Local Geological Conditions - Results from studies after the Northridge Earthquake.

LARUCP 23-8. Section 2315.6 of the California Building Code is amended to read as follows:

2315.6 Not adopted. Fiberboard Sheathing Diaphragms. ~~Wood stud walls sheathed with fiberboard sheathing may be used to resist horizontal forces not exceeding those set forth in Division 111, Part IV. The fiberboard sheathing, 4 feet by 8 feet (1219 mm by 2438 mm), shall be applied vertically to wood studs not less than 2-inch (51 mm) nominal in thickness spaced 16 inches (406 mm) on center. Nailing shown in Table 23-11-J shall be provided at the perimeter of the sheathing board and at intermediate studs. Blocking not less than 2-inch (51 mm) nominal in thickness shall be provided at horizontal joints when wall height exceeds length of sheathing panel, and sheathing shall be fastened to the blocking with nails sized as shown in Table 23-11-J spaced 3 inches (76 mm) on centers each side of joint. Nails shall be spaced not less than 3/8 inch (9.5 mm) from edges and ends of sheathing. Marginal studs of shear walls or shear-resisting elements shall be adequately anchored at top and bottom and designed to resist all forces. The maximum height-width ratio shall be 1 1/2: 1.~~

FINDINGS:

Local Geological Conditions - Results from studies after the Northridge Earthquake.

LARUCP 23-9. Chapter 23 of the California Building Code is amended by adding Table 23-II-L to read as follows:

Table 23-II-L MINIMUM SIZE STEEL PLATE WASHERS

Bolt Size	Plate Size
x 25.4 for mm	x 25.4 for mm
1/2 in	3/16" x 2" x 2"
5/8 in	1/4" x 2-1/2" x 2-1/2"
3/4 in	5/16" x 2-3/4" x 2-3/4"
7/8 in	5/16" x 3" x 3"
1 in	3/8" x 3-1/2" x 3-1/2"

FINDINGS:

Local Geological Conditions - Results from studies after the Northridge Earthquake.

LARUCP 23-10*. Table 23-II-I-1 of the California Building Code is amended to read as follows: **(Note: Footnote 4 in the Seismic table were struck-outs)**

TABLE 23-II-I-1 ALLOWABLE SHEAR FOR WIND OR SEISMIC FORCES IN POUNDS PER FOOT FOR WOOD STRUCTURAL PANEL SHEAR WALLS WITH FRAMING OF DOUGLAS FIR-LARCH OR SOUTHERN PINE^{1, 2, 3}

PANEL GRADE	MINIMUM NOMINAL PANEL THICKNESS (inches)	MINIMUM NAIL PENETRATION IN FRAMING (inches)	ALLOWABLE SHEAR SEISMIC FORCES ^{3, 6, 7}				ALLOWABLE SHEAR WIND FORCES PANELS APPLIED OVER 2 INCH (13 mm) OR 5/8 INCH (16 mm) GYPSUM SHEATHING DIRECTLY TO FRAMING					
			PANELS APPLIED DIRECTLY TO FRAMING									
			NAIL SIZE (Common or Galvanized Box) ⁵	Nail Spacing at Plywood Panel Edges (In.)				NAIL SIZE (Common or Galvanized Box) ⁵	Nail Spacing at Plywood Panel Edges (In.)			
				x 25.4 for mm					x 25.4 for mm			
6	4	3		2	6	4	3		2			
x 25.4 for mm			x 0.0146 for N/mm				x 0.0146 for N/mm					
STRUCTURAL I	5/16	1 1/4	6d	200 <u>150</u>	300 <u>200</u>	390 <u>200</u>	540 <u>200</u>	8d <u>6d</u>	200	300	390	510
	3/8	1 1/2	8d	230 <u>175</u>	360 <u>200</u>	460 <u>200</u>	640 <u>200</u>	4d <u>8d</u>	230 <u>175</u>	360 <u>200</u>	460 <u>200</u>	640 <u>200</u>
	7/16			255 <u>190</u>	395 <u>295</u>	505 <u>380</u>	670 <u>500</u>		255 <u>190</u>	395 <u>295</u>	505 <u>380</u>	670 <u>500</u>
	15/32			280 <u>210</u>	430 <u>320</u>	550 <u>410</u>	730 <u>550</u>		280 <u>210</u>	430 <u>320</u>	550 <u>410</u>	730 <u>550</u>
	15/32	1 5/8	10d	340 <u>255</u>	540 <u>380</u>	665 <u>500</u>	870 <u>650</u>	10d	340 <u>255</u>	540 <u>380</u>	665 <u>500</u>	870 <u>650</u>
C-D, C-C Sheathing, plywood panel siding and other grades covered in U.B.C. Standard 23-2 or 23-3	5/16	1 1/4	6d	180 <u>130</u>	270 <u>200</u>	350 <u>200</u>	450 <u>200</u>	8d <u>6d</u>	180 <u>130</u>	270 <u>200</u>	350 <u>200</u>	450 <u>200</u>
	3/8			200 <u>150</u>	300 <u>200</u>	390 <u>200</u>	540 <u>200</u>		200 <u>150</u>	300 <u>200</u>	390 <u>200</u>	540 <u>200</u>
	3/8			220 <u>165</u>	320 <u>200</u>	440 <u>200</u>	530 <u>200</u>		220 <u>165</u>	320 <u>200</u>	440 <u>200</u>	530 <u>200</u>
	7/16	1 1/2	8d	240 <u>180</u>	350 <u>260</u>	450 <u>335</u>	585 <u>435</u>	4d <u>8d</u>	240 <u>180</u>	350 <u>260</u>	450 <u>335</u>	585 <u>435</u>
	15/32			260 <u>200</u>	380 <u>285</u>	490 <u>370</u>	640 <u>480</u>		260 <u>200</u>	380 <u>285</u>	490 <u>370</u>	640 <u>480</u>
	15/32			310 <u>230</u>	460 <u>345</u>	600 <u>450</u>	770 <u>580</u>		310 <u>230</u>	460 <u>345</u>	600 <u>450</u>	770 <u>580</u>
	19/32	1 5/8	10d	340 <u>255</u>	540 <u>380</u>	665 <u>500</u>	870 <u>650</u>	10d	340 <u>255</u>	540 <u>380</u>	665 <u>500</u>	870 <u>650</u>
			NAIL SIZE (Galvanized Casing)					NAIL SIZE (Galvanized Casing)				
Plywood panel siding in grades covered in U.B.C. Standard 23-2	5/16	1 1/4	6d	440 <u>100</u>	240 <u>150</u>	275 <u>200</u>	360 <u>200</u>	8d <u>6d</u>	140 <u>100</u>	210 <u>150</u>	275 <u>200</u>	360 <u>200</u>
	3/8	1 1/2	8d	460 <u>120</u>	240 <u>180</u>	340 <u>200</u>	440 <u>200</u>	4d <u>8d</u>	160 <u>120</u>	240 <u>180</u>	340 <u>200</u>	440 <u>200</u>

¹ All panel edges backed with 2-inch (51 mm) nominal or wider thicker framing. Panels installed either horizontally or vertically. Space nails at 6 inches (152 mm) on center along intermediate framing members for 3/8-inch (9.5 mm) and 7/16-inch (11 mm) panels installed on studs spaced 24 inches (610 mm) on center and 12 inches (305 mm) on center for other conditions and panel thicknesses. These values are for short-time loads due to wind or earthquake and must be reduced 25 percent for normal loading. Allowable shear values for nails in framing members of other species set forth in Division III, Part III, shall be calculated for all other grades by multiplying the shear capacities for nails in STRUCTURAL I by the following factors: 0.82 for species with specific gravity greater than or equal to 0.42 but less than 0.49, and 0.65 for species with a specific gravity of less than 0.42.

- ² Where panels are applied on both faces of a wall and nail spacing is less than 6 inches (152 mm) on center on either side, panel joints shall be offset to fall on different framing members or framing shall be 3-inch (76 mm) nominal or thicker and nails on each side shall be staggered.
- ³ In Seismic Zones 3 and 4, where allowable shear values exceed ~~300~~ ~~350~~ pounds per foot (~~5.11~~ ~~4.38~~ N/mm) foundation sill plates and all framing members receiving edge nailing from abutting panels shall not be less than a single 3-inch (76 mm) nominal member and foundation sill plates shall not be less than a single 3-inch (76 mm) nominal member. In shear walls where total wall design shear does not exceed ~~600~~ ~~450~~ pounds per foot (~~8.76~~ ~~6.94~~ N/mm), a single 2-inch (51 mm) nominal sill plate may be used, provided anchor bolts are designed for a load capacity of 50 percent or less of the allowable capacity and bolts have a minimum of 2-inch-by-2-inch-by-3/16-inch (51 mm by 51 mm by 5 mm) thick plate washers. Plywood joint and sill plate nailing shall be staggered.
- ⁴ The values for 3/8-inch (9.5 mm) and 7/16-inch (11 mm) panels applied direct to framing may be increased to values shown for 15/32-inch (12 mm) panels, provided studs are spaced a maximum of 16 inches (406 mm) on center or panels are applied with long dimension across studs. ***(Editing Note: this footnote does not apply to earthquake)***
- ⁵ Galvanized nails shall be hot-dipped or tumbled.
- ⁶ The maximum allowable shear for three-ply plywood resisting seismic forces is 200 pounds per foot (2.92 kN/m).
- ⁷ Framing at adjoining panel edges shall be 3-inch (76 mm) nominal or thicker and nails shall be staggered where nails are spaced 2 inches (51 mm) on center.

REASONS FOR AMENDMENT/INTERPRETATION/CLARIFICATION:

The allowable shear values for wood structural panel shear walls are based on monotonic testing from the 1950's. Earthquakes load shear walls in a repeating fully reversible manner. The City of Los Angeles/SEAOSC Task Force investigated, documented damages, and reviewed recent test reports. The proposed amendment is consistent with the Task Force recommendations. In addition, the report to the Governor from the Seismic Safety Commission of the State of California recommends that code requirements be "more thoroughly substantiated with testing" (page 31). The proposed amendment is consistent with testing conducted with cyclic testing and accounts for anticipated construction problems with thin shear walls panels.

FINDINGS:

Local Geological Conditions - Results from studies after the Northridge Earthquake.

LARUCP 23-11. Section 2320.1 of the California Building Code is amended to read as follows:

2320.1 General. The requirements in this section are intended for conventional light-frame construction. Other methods may be used provided a satisfactory design is submitted showing compliance with other provisions of this code.

Only the following occupancies may be constructed in accordance with this division:

1. ~~One-, two- or three-story buildings housing Group R Occupancies. Cripple walls shall be considered as a story.~~
2. One-story Occupancy Category 4 buildings, as defined in Table 16-K, when constructed on a slab-on-grade floor.
3. Group U Occupancies.
4. ~~Top-story walls and roofs of Occupancy Category 4 buildings not exceeding two stories of wood framing. (Not Adopted)~~
5. For all occupancies interior nonload-bearing partitions, ceilings and curtain walls in all occupancies 8 feet (2438 mm) or higher shall be laterally braced at the top at 8 feet (2438 m) maximum on center.

When total loads exceed those specified in Tables 23-IV-J-1, 23-IV-J-3, 23-IV-R-1, 23-IV-R-2, 23-IV-R-3, 23-IV-R-4, 23-IV-R-7, and 23-IV-R-8, 23-IV-R-9, 23-IV-R-10, 23-IV-R-11, 23-IV-R-12; 23-VII-R-1, 23-VII-R-3, 23-VII-R-7, 23-VII-R-9, 23-VIII-A, 23-VIII-B, 23-VIII-C, 23-VIII-D, an engineering system shall be provided for the gravity load system.

Other approved repetitive wood members may be used in lieu of solid-sawn lumber in conventional construction provided these members comply with the provisions of this code.

FINDINGS:

Local Geological Conditions - Results from studies after the Northridge Earthquake.

LARUCP 23-12. Section 2320.5.1 of the California Building Code is amended to read as follows:

2320.5.1. Braced wall lines. Buildings shall be provided with exterior and interior braced wall lines. Spacing shall not exceed 25 feet (7620mm) on center in both the longitudinal and transverse directions in each story.

~~**EXCEPTION:** In one- and two-story Group R, Division 3 buildings, interior braced wall line spacing may be increased to not more than 34 feet (10,363 mm) on center in order to accommodate one single room per dwelling unit not exceeding 900 square feet (83.61 m²). The building official may require additional walls to contain braced panels when this exception is used.~~

FINDINGS:

Local Geological Conditions - Results from studies after the Northridge Earthquake.

LARUCP 23-13. Section 2320.5.3 of the California Building Code is amended to read as follows:

2320.5.3. Veneer. Anchored masonry and stone wall veneer shall not exceed 5 inches (127 mm) in thickness, shall conform to the requirements of Chapter 14 and shall not extend more than 5 feet (1219 mm) above the first story finish floor.

FINDINGS:

Local Geological Conditions - Results from studies after the Northridge Earthquake.

LARUCP 23-14. Section 2320.5.6 of the California Building Code is amended to read as follows:

2320.5.6. Interior braced wall support. Interior braced wall lines shall be supported on continuous foundations. ~~In one-story buildings, interior braced wall lines shall be supported on continuous foundations at intervals not exceeding 50 feet, (15240 mm). In buildings more than one story in height, all interior braced wall panels shall be supported on continuous foundations.~~

~~EXCEPTION: Two-story buildings may have interior braced wall lines supported on continuous foundations at intervals not exceeding 50 feet (15240 mm) provided:~~

- ~~1. Cripple wall height does not exceed 4 feet (1219 mm)~~
- ~~2. First floor wall panels are supported on doubled floor joist, continuous blocking or floor beams.~~
- ~~3. Distance between bracing lines does not exceed twice the building width parallel to the braced wall line.~~

FINDINGS:

Local Geological Conditions - Results from studies after the Northridge Earthquake.

LARUCP 23-15. Section 2320.9.2 of the California Building Code is amended to read as follows:

2320.9.2. Wood structural panels. Where used as structural subflooring, wood structural panels shall be as set forth in Tables 23-II-E-1 and 23-II-E-2. Wood structural panel combination subfloor underlayment shall have maximum spans as set forth in Table 23-II-F-1.

~~When wood structural panel floors are glued to joists with an adhesive in accordance with the adhesive manufacturer's directions, fasteners may be spaced a maximum of 12 inches (305 mm) on center on all supports.~~

FINDINGS:

Local Geological Conditions - Results from studies after the Northridge Earthquake.

LARUCP 23-16. Section 2320.11.3 of the California Building Code is amended to read as follows:

2320.11.3 Bracing. Braced wall lines shall consist of braced wall panels which meet the requirements for location, type and amount of bracing specified in Table 23-IV-C-1 and are in line or offset from each other by not more than 4 feet (1219 mm). Braced wall panels shall start at not more than 8 feet (2438 mm) from each end of a braced wall line. All braced wall panels shall be clearly indicated on the plans. Construction of braced wall panels shall be by one of the following methods:

- ~~1. Nominal 1 inch by 4 inch (25 mm by 102 mm) continuous diagonal braces let into top and bottom plates and intervening studs, placed at an angle not more than 60 degrees or less than 45 degrees from the horizontal, and attached to the framing in conformance with Table 23-II-B-4. (Not Adopted)~~
- ~~2. Wood boards of 5/8 inch (16 mm) net minimum thickness applied diagonally on studs spaced not over 24 inches (610 mm) on center. (Not Adopted)~~
- ~~3. Wood structural panel sheathing of a thickness not less than 5/16 1/2 inch (7.9 11.9 mm) nominal of structural I grade for a maximum 16-inch (406 mm) stud spacing and not less than 3/8 inch (9.5 mm) for 24 inch (610 mm) stud spacing in accordance with Tables 23-II-A-1 and 23-IV-D-1. Nailing shall be minimum 8d common placed 3/8 inches from panel edges and spaced not more than 6 inches on center, and 12 inches on center along intermediate framing members.~~
- ~~4. Fiberboard sheathing 4-foot by 8-foot (1219 mm by 2438 mm) panels not less than 1/2 inch (13 mm) thick applied vertically on studs spaced not over 16 inches (406 mm) on center when installed in accordance with Section 2315.6 and Table 23-II-J. (Not Adopted)~~
- ~~5. Gypsum board [sheathing 1/2 inch (13 mm) thick by 4 feet (1219 mm) wide, wallboard or veneer base] on studs spaced not over 24 inches (610 mm) on center and nailed at 7 inches (178 mm) on center with nails as required by Table 25-I. (Not Adopted)~~
- ~~6. Particleboard wall sheathing panels where installed in accordance with Table 23-IV-D-2. (Not Adopted)~~
- ~~7. Portland cement plaster on studs spaced 16 inches (406 mm) on center installed in accordance with Table 25-I.~~
- ~~8. Hardboard panel siding when installed in accordance with Section 2310.6 and Table 23-II-G. (Not Adopted)~~

~~Method 1 is not permitted in Seismic Zones 2B, 3 and 4. For cripple wall bracing, see Section 2320.11.5 For Methods 2, 3, 4, 6, 7 and 8, each braced panel must be at least 48 inches (1219 mm) in length, covering three stud spaces where studs are spaced 16 inches (406 mm) apart and covering two stud spaces where studs are spaced 24 inches (610 mm) apart and have a height-to-length ratio not exceeding 2 to 1~~

~~For Method 5, each braced wall panel must be at least 96 inches (2438 mm) in length when applied to one face of a braced wall panel and 48 inches (1219 mm) when applied to both~~

faces. For Method 7 each braced wall panel must be at least 96 inches (2438 mm) in length and have a height-to-length ratio not exceeding 1 to 1.

All vertical joints of panel sheathing shall occur over studs. Horizontal joints shall occur over blocking equal in size to the studding except where waived by the installation requirements for the specific sheathing materials.

Braced wall panel construction types shall not be mixed within a braced wall line.

Braced wall panel sole plates shall be nailed to the floor framing and top plates shall be connected to the framing above in accordance with Table 23-II-B-1. Sills shall be bolted to the foundation or slab in accordance with Section 1806.6 of this code. Where joists are perpendicular to braced wall lines above, blocking shall be provided under and in line with the braced wall panels. All braced wall panels shall extend to the roof sheathing and shall be attached to parallel roof rafters or blocking above with framing clips (18 gauge minimum) spaced at maximum 24 inches (6096 mm) on center with four 8d nails per leg (total eight 8d nails per clip). Braced wall panels shall be laterally braced at each top corner and at maximum 24 inch (6096 mm) intervals along the top plate of discontinuous vertical framing.

FINDINGS:

Local Geological Conditions - Results from studies after the Northridge Earthquake.

LARUCP 23-17. Section 2320.11.4 of the California Building Code is amended to read as follows:

2320.11.4. Alternate braced wall panels. For one story Group U, Division 1, occupancies a Any braced wall panel required by Section 2320.11.3 may be replaced by an alternate braced wall panel constructed in accordance with the following:

1. In one-story buildings, each panel shall have a length of not less than 2 feet 8 inches (813 mm) and a height of not more than 10 feet (3048 mm). Each panel shall be sheathed on one face with ~~3/8~~ 1/2-inch-nominal minimum-thickness (~~9.5~~ 12.7 mm) plywood sheathing nailed with 8d common or galvanized box nails in accordance with Table 23-II-B-1 and blocked at all plywood edges. Two anchor bolts installed in accordance with Section 1806.6 shall be provided in each panel. Anchor bolts shall be placed at panel quarter points. Each panel end stud shall have a tie-down device fastened to the foundation, capable of providing an approved uplift capacity of not less than 1,800 pounds (816.5 kg). The tie-down device shall be installed in accordance with the manufacturer's recommendations. The panels shall be supported directly on a foundation or on floor framing supported directly on a foundation which is continuous across the entire length of the braced wall line. This foundation shall be reinforced with not less than one No. 4 bar top and bottom, or

2. ~~In the first story of two-story buildings, each braced wall panel shall be in accordance with Section 2320.11.4, Item 1, except that the plywood sheathing shall be provided on both faces, three anchor bolts shall be placed at one-fifth points, and tie-down devices uplift capacity shall not be less than 3,000 pounds (1360.8 kg).~~ Braced wall panels required by Section 2320.5.1 may be eliminated when all of the following requirements are met:

- a. Detached or attached garage is no more than 25 feet in depth or length.
- b. The roof and three enclosing walls are solid sheathed with 1/2 inch nominal thickness wood structural panels with 8d common nails placed 3/8 inches from panel edges and spaced not more than 6 inches on center along all panel edges and 12 inches on center along intermediate framing members. Wall openings for doors or windows are permitted provided a minimum 4 foot wide wood structural braced panel with minimum height to length ratio of 2 to 1 is provided at each end of the wall line and that the wall line be sheathed for 50% of its length.

FINDINGS:

Local Geological Conditions - Results from studies after the Northridge Earthquake.

LARUCP 23-18. Table 23-IV-C-1 of the California Building Code is amended to read as follows:

TABLE 23-IV-C-1- BRACED WALL PANELS¹

SEISMIC ZONE	CONDITION	CONSTRUCTION METHOD ^{2,3}								BRACED PANEL LOCATION AND LENGTH ⁴
		1	2	3	4	5	6	7	8	
0, 1 and 2A	One Story Top of Two or Three Story	X	X	X	X	X	X	X	X	Each end and not more than 25 feet (7620 mm) of center
	First Story of Two Story or Second Story of Three Story	X	X	X	X	X	X	X	X	
	First Story of Three Story		X	X	X	X ⁵	X	X	X	
2B, 3 and 4	One story, Top of Two Story of Three Story		X	X	X	X	X	X ⁶	X	Each end and not more than 25 feet (7620 mm) on center
	First Story of Two Story or Second of Three Story		X	X	X	X ⁵	X	X ⁶	X	Each end and not more than 25 feet (7620 mm) on center but not less than 25% of building length ⁷
	First Story of three story		X	X	X	X ⁵	X	X ⁶	X	Each end and not more than 25 feet (7620 mm) on center but not less than 40% of building length ⁷
4	<u>One Story</u>			X				X ⁶		<u>Each end and not more than 25 feet (7620 mm) on center but not less than 25% of building length for method 3 and 50% for method 7.</u>

¹ This table specifies minimum requirements for braced panels which form interior or exterior braced wall lines.

² See Section 2320.11.3 for full description.

³ See Section 2320.11.4 for alternate braced panel requirement.

⁴ Building length is the dimension parallel to the braced wall length.

⁵ Gypsum wallboard applied to supports at 16 inches (406 mm) on center.

⁶ Not permitted for bracing cripple walls in Seismic Zone 4. See Section 2320.11.5.

⁷ The required lengths shall be doubled for gypsum board applied to only one face of a braced wall panel.

FINDING:

Local Geological Conditions - Results from studies after the Northridge Earthquake.

LARUCP 25-1 Section 2513.4 of the California Building Code is amended to read as follows:

2513.4 Height-to-Length Ratio. The maximum allowable height-to-length ratio for the construction in this Section shall be 2 to 1. Wall sections having height-to-length ratios in excess of 1-1/2 to 1 shall be blocked. All shear walls designed to resist seismic loads in Seismic Zone 4 shall have a maximum allowable height-to-length ratio of 1 to 1.

FINDINGS:

Local Geological Conditions - Results from studies after the Northridge Earthquake.

LARUCP 25-2

Table 25-I of the California Building Code is amended to read as follows:

TABLE 25-I -- ALLOWABLE SHEAR FOR WIND OR SEISMIC FORCES IN POUNDS PER FOOT FOR VERTICAL DIAPHRAGMS OF LATH AND PLASTER OR GYPSUM BOARD FRAME WALL ASSEMBLIES¹

TYPE OF MATERIAL	THICKNESS OF MATERIAL	WALL CONSTRUCTION	NAIL SPACING ² MAXIMUM (inches) x 25.4 for mm	SHEAR VALUE		MINIMUM NAIL SIZE ^{3,4} x 25.4 for mm	
	x 25.4 for mm x 304.8 for mm			X 14.6 for N/m			
				Seismic ⁴	Wind		
1. Expanded metal, or woven wire lath and portland cement plaster	7/8"	Unblocked	6	480 <u>90</u>	180	No. 11 gage, 1 1/2" long, 7/16" head, with 1/4" thick furring No. 16 gage staple, 7/8" legs, for wind loads only.	
2. Gypsum lath	3/8" lath and 1/2" plaster	Unblocked	5	400 <u>30</u>	100	No. 13 gage, 1 1/8" long, 19/64" head, plasterboard blued nail	
3. Gypsum sheathing board	1/2" x 2' x 8'	Unblocked	4	75 <u>30</u>	75	No. 11 gage, 1 3/4" long, 7/16" head, diamond-point, galvanized	
	1/2" x 4'	Blocked	4	175 <u>30</u>	175		
	1/2" x 4'	Unblocked	7	400 <u>30</u>	100		
4. Gypsum wallboard or veneer base	1/2"	Unblocked	7	400 <u>30</u>	100	5d cooler (0.086" dia., 1 5/8" long, 15/64" head) or wallboard (0.086" dia., 1 5/8" long, 9/32" head)	
			4	425 <u>30</u>	125		
		Blocked	7	425 <u>30</u>	125		
			4	450 <u>30</u>	150		
	5/8"	Unblocked	7	415 <u>30</u>	115	6d cooler (0.092" dia., 1 7/8" long, 1/4" head) or wallboard (0.0915" dia., 1 7/8" long, 19/64" head)	
			4	445 <u>30</u>	145		
			Blocked	7	445 <u>30</u>		145
				4	475 <u>30</u>		175
		Blocked Two ply	Base ply: 9 Face ply: 7	250 <u>30</u>	250		Base ply -6d cooler (0.092" dia., 1 7/8" long, 1/4" head) or wallboard (0.0915" dia., 1 7/8" long, 19/64" head) Face ply - 8d cooler (0.113" dia., 2 3/8" long, 9/32" head) or wallboard (0.113" dia., 2 3/8" long, 3/8" head)

¹ These vertical diaphragms shall not be used to resist loads imposed by masonry or concrete construction. See Section 2513.2. Values shown are for short-term loading due to wind or due to seismic loading. Values shown must be reduced 25 percent for normal loading. ~~The values shown in Items 2, 3 and 4 shall be reduced 50 percent for loading due to earthquake in Seismic Zones 3 and 4.~~

² Applies to nailing at all studs, top and bottom plates, and blocking.

³ Alternate nails may be used if their dimensions are not less than the specified dimensions.

⁴ This construction shall not be used below the top level of wood construction in a multi-level building.

FINDINGS:

Local Geological Conditions - Results from studies after the Northridge Earthquake