RESOLUTION NO. 6309

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF GARDENA, CALIFORNIA, SETTING FORTH FINDINGS FOR REQUIRED AMENDMENTS TO THE 2016 CALIFORNIA STATE BUILDING CODE RELATIVE TO LOCAL CLIMATIC, TOPOGRAPHIC, AND GEOLOGIC CONDITIONS

WHEREAS, California Health & Safety Code Section 18901 et seq. provides that the Building Standards Commission shall adopt a California Building Standards Code ("CBSC") based on specified uniform codes with input from various State Departments; and

WHEREAS, the 2016 CBSC has been adopted and is codified in Title 24 of the California Code of Regulations; and

WHEREAS, California Health & Safety Code Section 17922 provides that the Department of Housing and Community Development is to adopt the CBSC and other regulations; and

WHEREAS, the Department of Housing and Community Development has adopted the most recent version of the CBSC, as well as other regulations which are found in Title 25 of the California Code of Regulations; and

WHEREAS, California Health & Safety Code Section 17958.5 provides that a city may make changes in the provisions adopted pursuant to Health and Safety Code Section 17922 and published in the CBSC or other regulations upon specified findings; and

WHEREAS, Health and Safety Code Section 17958 provides that the City of Gardena ("City") shall adopt Ordinances and regulations imposing the same or modified or changed requirements as are contained in the regulations adopted by the State pursuant to Health and Safety Code Section 17922; and

WHEREAS, Health and Safety Code Section 17958.7 requires that the City Council, before making any modifications or changes to the CBSC, shall make an express finding that such changes or modifications are reasonably necessary because of local climatic, geologic, or topographic conditions; and

WHEREAS, the Los Angeles Basin Chapter of the International Code Council (ICC) Structural and CalGreen Committees have recommended that Southern California cities adopt amendments to the 2016 CBSC to:

A. Protect each community within the greater Los Angeles region from a vast array of fault systems capable of producing major earthquakes and/or climate systems capable of producing major winds, fire and rain related disaster, and

B. To ensure and encourage energy efficiency and sustainable practices are incorporated into building designs and constructions.

WHEREAS, the Building Official has recommended that many of the modifications proposed by the Los Angeles Basin Chapter of the International Code Council (ICC) Structural Committee and Green Building Standards Committee be made to the CBSC because they are reasonably necessary to address local conditions in the City of Gardena and that the remainder of said changes and modifications are of an administrative or procedural nature, or concern themselves with subjects not covered by the CBSC or are reasonably necessary to safeguard life and property within the City of Gardena.

NOW, THEREFORE, THE CITY COUNCIL OF THE CITY OF GARDENA, CALIFORNIA, DOES HEREBY RESOLVE, AS FOLLOWS:

SECTION 1. The provisions of Ordinance No. 1791 relating to the CBSC are restated below with the rationale and findings for each change included in italics underneath the change to the California Building Code Standards. Any change not included in this Resolution are amendments that are either administrative or procedural in nature or concern themselves with subjects not covered in the California Building Standards Code.

Section 1203.2.1 of Chapter 12 of the California Building Code is hereby deleted and a new Section 1203.2.1 is hereby added to read, as follows:

1203.2.1 Openings into attic. Exterior openings into the attic space of any building intended for human occupancy shall be protected to prevent the entry of birds, squirrels, rodents, snakes and other similar creatures. Openings for ventilation having a least dimension of 1/16 inch minimum and 1/8 inch maximum shall be permitted. Openings for ventilation having a least dimension larger than 1/8 inch shall be provided with corrosion-resistant wire cloth screening, hardware cloth or similar material with openings having a least dimension of 1/16 inch minimum and 1/8 inch maximum. Where combustion air is obtained from an attic area, it shall be in accordance with Chapter 7 of the California Mechanical Code.

RATIONALE:

Requirements preventing of the entry of birds, squirrels, rodents, snakes, and other similar creatures is not clear in the code.

FINDINGS:

Local Geological Conditions – The City of Gardena is located near county storm water systems and the wetland preserve. The creeks and wetland areas harbor birds, squirrels, rodents, snakes and other similar creatures.

Section 1203.4.1 of Chapter 12 of the California Building Code is hereby deleted and a new Section 1203.4.1 and Section 1203.4.1.1 are hereby added to read, as follows:

1203.4.1 Openings for under-floor ventilation. The minimum net area of ventilation openings shall not be less than one square foot for each 150 square feet of crawl-space area. Ventilation openings shall be covered for their height and width with any of the following materials, provided that the least dimension of the covering shall not exceed 1/8 inch:

1. Perforated sheet metal plates not less than 0.070 inch thick.
2. Expanded sheet metal plates not less than 0.047 inch thick.
3. Cast-iron grilles or gratings.
4. Extruded load-bearing vents.
5. Hardware cloth of 0.035 inch wire or heavier.
6. Corrosion-resistant wire mesh, with the least dimension not exceeding 1/8 inch.

1203.4.1.1 Openings for under-floor ventilation shall be not less than 1 1/2 square feet for each 25 linear feet of exterior wall. Openings shall be covered with corrosion resistant wire mesh with mesh openings not less than 1/16 inch nor more than 1/8 inch in any dimension.

RATIONALE:

Requirements preventing of the entry of birds, squirrels, rodents, snakes and other similar creatures is not clear in the code.

FINDINGS:

Local Geological Conditions – The City of Gardena is located near county storm water systems and the wetland preserve. The creeks and wetland areas harbor birds, squirrels, rodents, snakes and other similar creatures.

Table 1505.1 of Chapter 15 of the California Building Code is hereby amended to read, as follows:

TABLE 1505.1[a]
MINIMUM ROOF COVERING
CLASSIFICATION FOR TYPES OF CONSTRUCTION

IA	IB	IIA	IIB	IIIA	IIIB	IV	VA	VB
B	B	B	B~~C~~	B	B~~C~~	B	B	B~~C~~

RATIONALE:

Requirements for roofing materials to have a Class-B fire rating for both new roof and re-roofing applications shall be Class-B Rating This is consistent with the recommendations of the Los Angeles County Fire Department, Cal Fire and The Insurance Institute on roofing fire safety. Roofs with a Class-B fire rating have proven more effective in resisting ignition from flying embers than a "C" rating.

FINDINGS:

Local Geological Conditions – The greater Los Angeles region is a densely populated and dense industrial area. The high density can allow fire to spread quickly from roof to roof. Gardena is located in a special wind zone as defined by the California Building Code. The jurisdiction of Gardena is located in a semi-arid Mediterranean type climate. It annually experiences extended periods of high temperatures with little or no precipitation. Hot, dry (Santa Ana) winds, which may reach speeds of 85 M.P.H. or greater.

Section 1507.3.1 of Chapter 15 of the California Building Code is hereby amended to read, as follows:

1507.3.1 Roof Deck requirements. Concrete and clay tile shall be installed only over solid sheathing or spaced structural sheathing boards.

RATIONALE:

Section 1507.3.1 is amended to require concrete and clay tiles to be installed only over solid structural sheathing boards. The change is necessary because there were numerous observations of tile roofs pulling away from wood framed buildings following the 1994 Northridge Earthquake. The Structural Engineers Association of Southern California (SEAOSC), Post Northridge Earthquake committee findings indicated significant problems with tile roofs was due to inadequate design and/or construction. Therefore, the amendment is needed to minimize such occurrences in the event of future significant earthquakes.

FINDINGS:

Local Geological Conditions – The greater Los Angeles region is a densely populated area having buildings and structures constructed over and near a vast array of fault systems capable of producing major earthquakes, including but not limited to the 1994 Northridge Earthquake, the 1987 Whittier Narrows Earthquake, the 1971 San Fernando Earthquake and the 1933 Long Beach Earthquake. This amendment will reduce the failure of concrete and clay tile roofs during a significant earthquake and is in accordance with the scope and objectives of the California Building Code.

Section 1613.5.2 is added to Chapter 16 of the California Building Code to read, as follows:

1613.5.2 Structural Separation. Modify ASCE 7 Section 12.12.3 Equation 12.12-1, as follows:

$$\delta_M = \frac{C_d \delta_{max}}{I_e} \qquad \textbf{(12.12-1)}$$

RATIONALE:

The inclusion of the importance factor in this equation has the unintended consequence of reducing the minimum seismic separation distance for important facilities such as hospitals, schools, police and fire stations from adjoining structures. The proposal to omit the importance factor from Equation 12.12-1 will ensure that a safe seismic separation distance is provided. This proposed amendment is a continuation of an amendment adopted during previous code adoption cycles.

FINDINGS:

Local Geological Conditions – The greater Los Angeles region is a densely populated area having buildings and structures constructed over and near a vast array of fault systems capable of producing major earthquakes, including but not limited to the 1994 Northridge Earthquake, the 1987 Whittier Narrows Earthquake, the 1971 San Fernando Earthquake and the 1933 Long Beach Earthquake. The proposed modification to omit the importance factor in the equation ensures that a safe seismic separation distance is maintained for important facilities from adjoining structures and therefore need to be incorporated into the code to assure that new buildings and structures and additions or alterations to existing buildings or structures are designed and constructed in accordance with the scope and objectives of the California Building Code.

Section 1613.5.3 is added to Chapter 16 of the California Building Code to read, as follows:

1613.5.3 Values for Vertical Combinations. Modify ASCE 7 Section 12.2.3.1 Exception 3 as follows:

3. Detached one- and two-family dwellings up to two stories in height of light frame construction.

RATIONALE:

Observed damages to one and two-family dwellings of light frame construction after the Northridge Earthquake may have been partially attributed to vertical irregularities common to this type of occupancy and construction. In an effort to improve quality of construction and incorporate lesson learned from studies after the Northridge Earthquake, the proposed modification to ASCE 7-10 Section 12.2.3.1

Exception 3 by limiting the number of stories and height of the structure to two stories will significantly minimize the impact of vertical irregularities and concentration of inelastic behavior from mixed structural systems.

FINDINGS:

Local Geological Conditions – The greater Los Angeles region is a densely populated area having buildings and structures constructed over and near a vast array of fault systems capable of producing major earthquakes, including but not limited to the 1994 Northridge Earthquake. The proposed modification to limit mixed structural system to two stories is intended to improve quality of construction by reducing potential damages that may result from vertical irregularities of the structural system in buildings subject to high seismic load and therefore need to be incorporated into the code to assure that new buildings and structures and additions or alterations to existing buildings or structures are designed and constructed in accordance with the scope and objectives of the California Building Code.

Section 1613.5.3 is added to Chapter 16 of the California Building Code to read, as follows:

1613.5.4 Wood Diaphragms. Modify ASCE 7 Section 12.11.2.2.3, as follows:

12.11.2.2.3 Wood Diaphragms. In wood diaphragms, the continuous ties shall be in addition to the diaphragm sheathing. Anchorage shall not be accomplished by use of toe nails or nails subject to withdrawal nor shall wood ledgers or framing be used in cross-grain bending or cross-grain tension. The diaphragm sheathing shall not be considered effective as providing ties or struts required by this section. For structures assigned to Seismic Design Category D, E or F, wood diaphragms supporting concrete or masonry walls shall comply with the following:

1. The spacing of continuous ties shall not exceed 40 feet. Added chords of diaphragms may be used to form sub-diaphragms to transmit the anchorage forces to the main continuous crossties.

2. The maximum diaphragm shear used to determine the depth of the sub-diaphragm shall not exceed 75% of the maximum diaphragm shear.

RATIONALE:

A joint Structural Engineers Association of Southern California (SEAOSC), Los Angeles County and Los Angeles City Task Force investigated the performance of concrete and masonry construction with flexible wood diaphragm failures after the Northridge earthquake. It was concluded at that time that continuous ties are needed at specified spacing to control cross grain tension in the interior of the diaphragm. Additionally, there was a need to limit sub-diaphragm allowable shear loads to control combined orthogonal stresses within the diaphragm. Recognizing the importance and need to continue the recommendation made by the task force while taking into consideration the improved performances and standards for diaphragm construction today, this proposal increases the continuous tie spacing limit to 40 ft in lieu of 25 ft and to use 75% of the allowable code diaphragm shear to determine the depth of the sub-diaphragm in lieu of the 300 plf and is deemed appropriate and acceptable. Due to the frequency of this type of failure during the past significant earthquakes, various jurisdictions within the Los Angeles region have taken this additional step to prevent

roof or floor diaphragms from pulling away from concrete or masonry walls.

FINDINGS:

Local Geological Conditions – The greater Los Angeles region is a densely populated area having buildings and structures constructed over and near a vast array of fault systems capable of producing major earthquakes, including but not limited to the 1994 Northridge Earthquake. The proposed modification to require special anchorage of the diaphragm to the wall and limit the allowable shear will address special needs for concrete and masonry construction with flexible wood diaphragm and therefore need to be incorporated into the code to assure that new buildings and structures and additions or alterations to existing buildings or structures are designed and constructed in accordance with the scope and objectives of the California Building Code.

Section 1613.5.5 is added to Chapter 16 of the California Building Code to read, as follows:

1613.5.5 Maximum S_{DS} Value in Determination of C_s and E_v. Modify ASCE 7 Section 12.8.1.3, as follows:

12.8.1.3 Maximum S_{DS} Value in Determination of C_s and E_v. The value of C_s and E_v are permitted to be calculated using a value of SDS equal to 1.0 but not less than 70% of S_{DS} as defined in Section 11.4.4, provided that all of the following criteria are met:

1. The structure does not have irregularities, as defined in Section 12.3.2;

2. The structure does not exceed five stories above the lower of the base or grade plane as defined in Section 11.2, and, where present, each mezzanine level shall be considered a story for the purpose of this limit;

3. The structure has a fundamental period, T, that does not exceed 0.5 seconds, as determined using Section 12.8.2;

4. The structure meets the requirements necessary for the redundancy factor, □, to be permitted to be taken as 1.0, in accordance with Section 12.3.4.2;

5. The site soil properties are not classified as Site Classes E or F, as defined in Section 11.4.2; and

6. The structure is classified as Risk Category I or II, as defined in Section 1.5.1.

RATIONALE:

This Amendment to the California Building Code is made to be consistent with ASCE 7-16, and is further amended herein to be consistent with ASCE 7-16 Supplement 1. The modification is necessary to avoid misinterpretation on the intent of the five-story limit for which the SDS cap is applicable where there is flexible structure

above a rigid podium base. The addition of "grade plane" clarifies the intent that the base is measured from the lowest structure in those instances where there is a vertical combination of two systems. Many of such combinations of systems will not satisfy exclusion 1, in which the structure must meet the definition of "regular" based on ASCE 7 Section 12.3.2. This modification provides safe design requirements in the selection of building period to calculate seismic base shear in building design accounting for dynamic story mass distribution throughout the inelastic range of ground motion. This amendment does not prevent designing of five levels of light frame wood construction on top of a concrete podium by using the calculated SDS without the 70% cap.

FINDINGS:

Local Geological Conditions – The greater Los Angeles region is a densely populated area having buildings constructed over and near a vast array of fault systems capable of producing major earthquakes, including but not limited to the 1994 Northridge Earthquake. Currently mezzanines do not have to be considered as a floor level for Heights and Areas limits of Chapter 5 of the IBC. When applying the story height allowing SDS to be equal to 1.0, but not less than 70% of calculated SDS, the five story height limitation needs to consider mezzanines as individual floor levels due to added mass, overturning forces and variation in shear wall stiffness at the mezzanine floor levels, and therefore needs to be incorporated into the code to assure that new buildings and additions to existing buildings are designed and constructed in accordance with the scope and objectives of the California Building Code.

Section 1704.6 of Chapter 17 of the California Building Code is amended to read, as follows:

1704.6 Structural Observations. Where required by the provisions of Section 1704.6.6.1 or 1704.6.6.2, the owner or the owner's authorized agent shall employ a registered design professional structural observer to perform structural observations. Structural observation does not include or waive the responsibility for the inspections in Section 110 or the special inspections in Section 1705 or other sections of this code.

The structural observer shall be one of the following individuals:

1. The registered design professional responsible for the structural design; or

2. A registered design professional designated by the registered design professional responsible for the structural design.

Prior to the commencement of observations, the structural observer shall submit to the building official a written statement identifying the frequency and extent of structural observations.

The owner or owner's authorized agent shall coordinate and call a preconstruction meeting between the structural observer, contractors, affected subcontractors and special 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 resisting systems of the structure and to review scheduling of the required observations. A record of the meeting shall be included in the report submitted to the Building Official.

At the conclusion of the work included in the permit, the structural observer shall submit to the building official a written statement that the site visits have been made and identify any reported deficiencies that, to the best of the structural observer's knowledge, have not been resolved.

Observed deficiencies shall be reported in writing to the owner or owner's authorized agent, special inspector, contractor and the Building Official. Upon the form prescribed by the Building Official, 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.

RATIONALE:

The language in Section 1704.6 of the California Building Code permits the owner to employ any registered design professional to perform structural observations with minimum guideline. However, it is important to recognize that the registered design professional responsible for the structural design has thorough knowledge of the building he/she designed. By requiring the registered design professional responsible for the structural design or their designee who were involved with the design to observe the construction, the quality of the observation for major structural elements and connections that affect the vertical and lateral load resisting systems of the structure will greatly be increased. Additional requirements are provided to help clarify the role and duties of the structural observer and the method of reporting and correcting observed deficiencies to the building official.

FINDINGS:

Local Geological Conditions – The greater Los Angeles region is a densely populated area having buildings and structures constructed over and near a vast array of fault systems capable of producing major earthquakes, including but not limited to the 1994 Northridge Earthquake. The proposed modification to require the registered design professional in responsible charge for the structural design to observe the construction will help ensure acceptable standards of workmanship is provided and to improve the quality of the observation and therefore need to be incorporated into the code to assure that new buildings and structures and additions or alterations to existing buildings or structures are designed and constructed in accordance with the scope and objectives of the California Building Code.

Section 1704.6.1 of Chapter 16 of the California Building Code is amended to read, as follows:

1704.6.1 Structural observations for seismic resistance. Structural observations shall be provided for those structures assigned to Seismic Design Category D, E or F, where one or more of the following conditions exist:

1. The structure is classified as Risk Category III or IV in accordance with Table 1604.5.

2. The height of the structure is greater than 75 feet above the base.

3. The structure is assigned to Seismic Design Category E, is classified as Risk Category I or II in accordance with Table 1604.5, and is greater than two stories one stories above grade plane a lateral design is required for the structure or portion thereof.

4. Exception: One-story wood framed Group R-3 and Group U Occupancies less than 2,000 square feet in area, provided the adjacent grade is not steeper than 1-unit vertical in 10 units horizontal (10% sloped), assigned to Seismic Design Category D.

a. When so designated by the registered design professional responsible for the structural design.

5. When such observation is specifically required by the building official.

RATIONALE:

With the higher seismic demand placed on buildings and structures in this region, the language in Section 1704.6.1 of the California Building Code would permit many low-rise buildings and structures with complex structural elements to be constructed without the benefit of a structural observation. By requiring a registered design professional to observe the construction, the quality of the observation for major structural elements and connections that affect the vertical and lateral load resisting systems of the structure will greatly be increased. An exception is provided to permit simple structures and buildings to be excluded.

FINDINGS:

Local Geological Conditions – The greater Los Angeles region is a densely populated area having buildings and structures constructed over and near a vast array of fault systems capable of producing major earthquakes, including but not limited to the 1994 Northridge Earthquake. The proposed modification to require the registered design professional in responsible charge for the structural design to observe the construction will help ensure acceptable standards of workmanship is provided and to improve the quality of the observation and therefore need to be incorporated into the code to assure that new buildings and structures and additions or alterations to existing buildings or structures are designed and constructed in accordance with the scope and

objectives of the California Building Code.

Section 1705.3, section 1, of Chapter 17 of the California Building Code is amended to read, as follows:

1705.3 Concrete Construction. Special inspections and tests for concrete construction shall be performed in accordance with this section and Table 1705.3.

Exceptions: Special inspections and tests shall not be required for:

1. Isolated spread concrete footings of buildings three stories or less above grade plane that are fully supported on earth or rock, where the structural design of the footing is based on a specified compressive strength, f'c, no greater than 2,500 pounds per square inch (psi) regardless of the compressive strength specified in the construction documents or used in the footing construction.

RATIONALE:

Results from studies after the 1994 Northridge Earthquake indicated that a lot of the damage was attributed to a lack of quality control during construction resulting in poor performance of the building or structure. Therefore, the proposed amendment requires special inspection for concrete with a compressive strength greater than 2,500 pounds per square inch.

FINDINGS:

Local Geological Conditions – The greater Los Angeles region is a densely populated area having buildings and structures constructed over and near a vast array of fault systems capable of producing major earthquakes, including but not limited to the 1994 Northridge Earthquake. The proposed modification to require special inspection for concrete with a compressive strength greater than 2,500 psi to improve quality of control during construction and therefore need to be incorporated into the code to assure that new buildings and structures and additions or alterations to existing buildings or structures are designed and constructed in accordance with the scope and objectives of the California Building Code.

Exception 3 of Section 1705.12 of the California Building Code is amended to read, as follows:

3. The structure is a detached one- or two-family dwelling not exceeding two stories above grade plane, is not assigned to Seismic Design Category D, E or F and does not have any of the following horizontal or vertical irregularities in accordance with Section 12.3 of ASCE 7:

3.1 Torsional or extreme torsional irregularity.

3.2 Nonparallel systems irregularity.

3.3 Stiffness-soft story or stiffness-extreme soft story irregularity.

3.4 Discontinuity in lateral strength-weak story irregularity.

RATIONALE:

In Southern California, very few detached one- or two-family dwellings not exceeding two stories above grade plane are built as "box-type" structures. Many steel moment frames or braced frames and/or cantilevered columns within buildings can still be shown as "regular" structures by calculations. With the higher seismic demand placed on buildings and structures in this region, the language in Section 1705.12 Exception 3 of the California Building Code would permit many detached one- or two-family dwellings not exceeding two stories above grade plane with complex structural elements to be constructed without the benefit of special inspections. By requiring special inspections, the quality of major structural elements and connections that affect the vertical and lateral load resisting systems of the structure will greatly be increased. The exception should only be allowed for detached one- and two-family dwellings not exceeding two stories above grade plane assigned to Seismic Design Category A, B and C.

FINDINGS:

Local Geological Conditions – The greater Los Angeles region is a densely populated area having buildings and structures constructed over and near a vast array of fault systems capable of producing major earthquakes, including but not limited to the 1994 Northridge Earthquake. The proposed modification to require special inspections for detached one- or two-family dwellings not exceeding two stories above grade plane assigned to Seismic Design Category D, E and F will help ensure that acceptable standards of workmanship and quality of construction are provided and therefore needs to be incorporated into the code to assure that new buildings and structures and additions or alterations to existing buildings or structures are designed and constructed in accordance with the scope and objectives of the California Building Code.

Section 1807.1.4 of Chapter 18 of the California Building Code is amended to read, as follows:

1807.1.4 Permanent wood foundation systems. Permanent wood foundation systems shall not be used for structures assigned to Seismic Design Category D, E, or F.

RATIONALE:

No substantiating data has been provided to show that wood foundation systems are effective in supporting buildings and structures during a seismic event while being subject to deterioration caused by the combined detrimental effects of constant moisture in the soil and wood-destroying organisms. Wood foundation systems not properly treated and protected against deterioration, have performed very poorly and have led to slope failures. Most contractors are typically accustomed to construction in dry and temperate weather in the Southern California region and are not generally familiar with the necessary precautions and treatment of wood that makes it suitable for both seismic events and wet applications.

The proposed amendment takes the precautionary steps to reduce or eliminate potential problems that may result in using wood foundation systems that experience relatively rapid decay due to the fact that the region does not experience temperatures cold enough to destroy or retard the growth and proliferation of wood-destroying organisms.

FINDINGS:

Local Climatic and Geological Conditions – The greater Los Angeles region is a densely populated area having buildings and structures constructed over and near a vast array of fault systems capable of producing major earthquakes, including but not limited to the 1994 Northridge Earthquake. In addition, the region is within a climate system capable of producing major winds, fire and rain related disasters, including but not limited to those caused by the Santa Ana winds and El Nino (or La Nina) subtropical-like weather. This region is especially susceptible to more active termite and wood attacking insects and microorganisms. The proposed modification to prohibit the use of wood foundation systems as well as limit prescriptive design provisions in an effort to mitigate potential problems or deficiencies due to the proliferation of wood-destroying organisms and therefore needs to be incorporated into the code to assure that new buildings and structures and additions or alterations to existing buildings or structures are designed and constructed in accordance with the scope and objectives of the California Building Code.

Section 1807.1.6 of Chapter 18 of the California Building Code is amended to read, as follows:

1807.1.6 Prescriptive design of concrete and masonry foundation walls. Concrete and masonry foundation walls that are laterally supported at the top and bottom shall be permitted to be designed and constructed in accordance with this section. Prescriptive design of foundation walls shall not be used for structures assigned to Seismic Design Category D, E or F.

RATIONALE:

With the higher seismic demand placed on buildings and structures in this region, it is deemed necessary to take precautionary steps to reduce or eliminate potential problems that may result by following prescriptive design provisions that do not take into consideration the surrounding environment. Plain concrete performs poorly in withstanding the cyclic forces resulting from seismic events. In addition, no substantiating data has been provided to show that under-reinforced foundation walls are effective in resisting seismic loads and may potentially lead to a higher risk of failure. It is important that the benefit and expertise of a registered design professional be obtained to properly analyze the structure and take these issues into consideration.

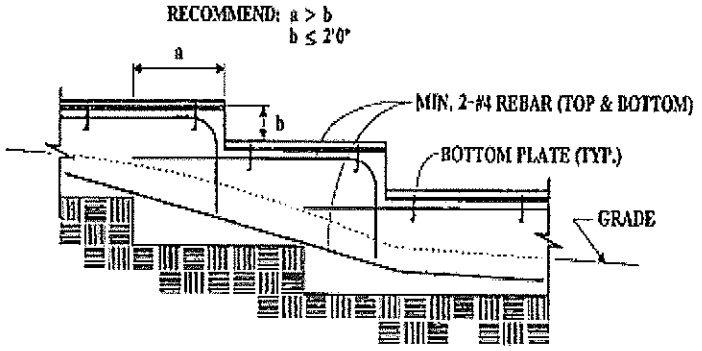
FINDINGS:

Local Geological Conditions – The greater Los Angeles region is a densely populated area having buildings and structures constructed over and near a vast array of fault systems capable of producing major earthquakes, including but not limited to the

1994 Northridge Earthquake. The proposed modification to prohibit prescriptive design provisions for foundation walls as plain concrete have performed poorly in withstanding the cyclic forces resulting from seismic events and to require the walls to be designed by a registered design professional to ensure that the proper analysis of the structure takes into account the surrounding condition and therefore need to be incorporated into the code to assure that new buildings and structures and additions or alterations to existing buildings or structures are designed and constructed in accordance with the scope and objectives of the California Building Code.

Section 1809.3 of Chapter 18 of the California Building Code is amended to read, as follows:

1809.3 Stepped footings. The top surface of footings shall be level. The bottom surface of footings shall be permitted to have a slope not exceeding one unit vertical in 10 units horizontal (10-percent slope). Footings shall be stepped where it is necessary to change the elevation of the top surface of the footing or where the surface of the ground slopes more than one unit vertical in 10 units horizontal (10-percent slope). For structures assigned to Seismic Design Category D, E or F, the stepping requirement shall also apply to the top surface of grade beams supporting walls. Footings shall be reinforced with four No. 4 bars. Two bars shall be place at the top and bottom of the footings as shown in Figure 1809.3.



STEPPED FOUNDATIONS

FIGURE 1809.3

RATIONALE:

With the higher seismic demand placed on buildings and structures in this region, precautionary steps are proposed to reduce or eliminate potential problems that may result for under reinforced footings located on sloped surfaces. Requiring minimum reinforcement for stepped footings is intended to address the problem of poor performance of plain or under-reinforced footings during a seismic event.

FINDINGS:

Local Geological Conditions – The greater Los Angeles region is a densely populated area having buildings and structures constructed over and near a vast array of fault systems capable of producing major earthquakes, including but not limited to the 1994 Northridge Earthquake. The proposed modification to require minimum

reinforcement in stepped footings is intended to improve performance of buildings and structures and therefore need to be incorporated into the code to assure that new buildings and structures and additions or alterations to existing buildings or structures are designed and constructed in accordance with the scope and objectives of the California Building Code.

Section 1809.7 and Table 1809.7 of Chapter 18 of the California Building Code are amended to read, as follows:

1809.7 Prescriptive footings for light-frame construction. Where a specific design is not provided, concrete or masonry-unit footings supporting walls of light-frame construction shall be permitted to be designed in accordance with Table 1809.7. Prescriptive footings in Table 1809.7 shall not exceed one story above grade plane for structures assigned to Seismic Design Category D, E or F.

TABLE 1809.7
PRESCRIPTIVE FOOTINGS SUPPORTING WALLS OF LIGHT-FRAME CONSTRUCTION [a, b, c, d, e]

NUMBER OF FLOORS SUPPORTED BY THE FOOTING [f]	WIDTH OF FOOTING (inches)	THICKNESS OF FOOTING (inches)
1	12	6
2	15	6
3	18	8 [g]

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm

a. Depth of footings shall be in accordance with Section 1809.4.
b. The ground under the floor shall be permitted to be excavated to the elevation of the top of the footing.
c. ~~Interior stud-bearing walls shall be permitted to be supported by isolated footings. The footing width and length shall be twice the width shown in this table, and footings shall be spaced not more than 6 feet on center.~~ Not Adopted.
d. See Section 1908 for additional requirements for concrete footings of structures assigned to Seismic Design Category C, D, E or F.
e. For thickness of foundation walls, see Section 1807.1.6.
f. Footings shall be permitted to support a roof addition to the stipulated number of floors. Footings supporting roof only shall be as required for supporting one floor.
~~g. Plain concrete footings for Group R-3 occupancies shall be permitted to be 6 inches thick.~~

RATIONALE:

No substantiating data has been provided to show that under-reinforced footings are effective in resisting seismic loads and may potentially lead to a higher risk of failure. Therefore, this proposed amendment requires minimum reinforcement in continuous footings to address the problem of poor performance of plain or under-reinforced footings during a seismic event. With the higher seismic demand placed on buildings and structures in this region, precautionary steps are proposed to reduce or eliminate potential problems that may result by following prescriptive design provisions for footing that does not take into consideration the surrounding environment. It was important that the benefit and expertise of a registered design professional be obtained to properly analyze the structure and take these issues into consideration. This amendment reflects the recommendations by the Structural Engineers Association of Southern California (SEAOSC) Task Force that investigated the poor performance observed in the 1994 Northridge Earthquake.

FINDINGS:

Local Geological Conditions – The greater Los Angeles region is a densely populated area having buildings and structures constructed over and near a vast array

of fault systems capable of producing major earthquakes, including but not limited to the 1994 Northridge Earthquake. The proposed modification to limit the use of the prescriptive design provisions and under-reinforced or plain concrete is to ensure that the proper analysis of the structure takes into account the surrounding condition and therefore need to be incorporated into the code to assure that new buildings and structures and additions or alterations to existing buildings or structures are designed and constructed in accordance with the scope and objectives of the California Building Code.

Section 1809.12 of Chapter 18 of the California Building Code is deleted and a new Section 1809.12 is added to read, as follows:

1809.12 Timber footings. Timber footings shall not be used in structures assigned to Seismic Design Category D, E or F.

RATIONALE:

No substantiating data has been provided to show that timber footings are effective in supporting buildings and structures during a seismic event, especially while being subjected to deterioration caused by the combined detrimental effects of moisture in the soil and wood-destroying organisms. Timber footings, when they are not properly treated and protected against deterioration, have performed very poorly. Most contractors are typically accustomed to construction in dry and temperate weather in the Southern California region and are not generally familiar with the necessary precautions and treatment of wood that makes it suitable for both seismic event and wet applications. The proposed amendment takes the precautionary steps to reduce or eliminate potential problems that may result by using timber footings that experience relatively rapid decay due to the face that the region does not experience temperatures cold enough to destroy or retard the growth and proliferation of wood-destroying organisms.

FINDINGS:

Local Climatic and Geological Conditions – The greater Los Angeles region is a densely populated area having buildings and structures constructed over and near a vast array of fault systems capable of producing major earthquakes, including but not limited to the 1994 Northridge Earthquake. In addition, the region is within a climate system capable of producing major winds, fire and rain related disasters, including but not limited to those caused by the Santa Ana winds and El Nino (or La Nina) subtropical-like weather. This region is especially susceptible to more active termite and wood attacking insects and microorganisms. The proposed modification to prohibit the use of timber footings in an effort to mitigate potential problems or deficiencies due to the proliferation of wood-destroying organisms and therefore need to be incorporated into the code to assure that new buildings and structures and additions or alterations to existing buildings or structures are designed and constructed in accordance with the scope and objectives of the California Building Code.

Section 1810.3.2.4 of Chapter 18 of the California Building Code is deleted and a new section 1810.3.2.4 is added to read, as follows:

1810.3.2.4 Timber. Timber foundations shall not be used in structures assigned to Seismic Design Category D, E or F.

RATIONALE:

No substantiating data has been provided to show that timber deep foundation is effective in supporting buildings and structures during a seismic event while being subject to deterioration caused by the combined detrimental effect of constant moisture in the soil and wood destroying organisms. Timber deep foundation, when they are not properly treated and protected against deterioration, has performed very poorly. Most contractors are typically accustomed to construction in dry and temperate weather in the Southern California region and are not generally familiar with the necessary precautions and treatment of wood that makes it suitable for both seismic event and wet applications. The proposed amendment takes the precautionary steps to reduce or eliminate potential problems that may result by using timber deep foundation that experience relatively rapid decay due to the face that the region does not experience temperatures cold enough to destroy or retard the growth and proliferation of wood-destroying organisms.

FINDINGS:

Local Climatic and Geological Conditions – The greater Los Angeles region is a densely populated area having buildings and structures constructed over and near a vast array of fault systems capable of producing major earthquakes, including but not limited to the 1994 Northridge Earthquake. In addition, the region is within a climate system capable of producing major winds, fire and rain related disasters, including but not limited to those caused by the Santa Ana winds and El Nino (or La Nina) subtropical-like weather. This region is especially susceptible to more active termite and wood attacking insects and microorganisms. The proposed modification to prohibit the use of timber deep foundation in an effort to mitigate potential problems or deficiencies due to the proliferation of wood-destroying organisms and therefore need to be incorporated into the code to assure that new buildings and structures and additions or alterations to existing buildings or structures are designed and constructed in accordance with the scope and objectives of the California Building Code.

Section 1905.1 of Chapter 19 of the California Building Code is amended to read, as follows:

1905.1 General. The text of ACI 318 shall be modified as indicated in Sections 1905.1.1 through 1905.1.8, and ACI 318, Section 18.7.5.

RATIONALE:

With the higher seismic demand placed on buildings and structures in this region, precautionary steps are proposed to reduce or eliminate potential problems that may result for under reinforced footings located on sloped surfaces. Requiring minimum reinforcement for stepped footings is intended to address the problem of poor performance of plain or under-reinforced footings during a seismic event.

FINDINGS:

Local Climatic and Geological Conditions – The greater Los Angeles region is a densely populated area having buildings and structures constructed over and near a vast array of fault systems capable of producing major earthquakes, including but not limited to the 1994 Northridge Earthquake. The proposed modification to require minimum reinforcement in stepped footings is intended to improve performance of buildings and structures and therefore need to be incorporated into the code to assure that new buildings or structures are designed and constructed in accordance with the scope and objectives of the California Building Code.

Section 1905.1.7 of Chapter 19 of the California Building Code is amended to read, as follows:

1905.1.7 ACI 318, Section 14.1.4. Delete ACI 318, Section 14.1.4, and replace with the following:

14.1.4 – Plain concrete in structures assigned to Seismic Design Category C, D, E or F.

14.1.4.1 – Structures assigned to Seismic Design Category C, D, E or F shall not have elements of structural plain concrete, except as follows:

a) Structural plain concrete basement, foundation or other walls below the base as defined in ASCE 7 are permitted in detached one- and two-family dwellings three stories or less in height constructed with stud-bearing walls. In dwellings assigned to Seismic Design Category D or E, the height of the wall shall not exceed 8 feet, the thickness shall not be less than 7½ inches, and the wall shall retain no more than 4 feet of unbalanced fill. Walls shall have reinforcement in accordance with 14.6.1. Concrete used for fill with a minimum cement content of two (2) sacks of Portland cement or cementious material per cubic yard.

b) Isolated footings of plain concrete supporting pedestals or columns are permitted, provided the projection of the footing beyond the face of the supported member does not exceed the footing thickness.

Exception: In detached one- and two-family dwellings three stories or less in height, the projection of the footing beyond the face of the supported member is permitted to exceed the footing thickness.

c) Plain concrete footings supporting walls are permitted provided the footings have at least two continuous longitudinal reinforcing bars. Bars shall not be smaller than No. 4 and shall have a total area of not less than 0.002 times the gross cross-sectional area of the footing. For footings that exceed 8 inches (203 mm) in thickness, a minimum of one bar shall be provided at the top and bottom of the footing. Continuity of reinforcement shall be provided at corners and intersections.

~~Exceptions:~~

~~1. In Seismic Design Categories A, B and C, Detached one- and two-family dwellings three stories or less in height and constructed with stud-bearing walls are permitted to have plain concrete footings without longitudinal reinforcement with at least two continuous longitudinal reinforcing bars not smaller than No. 4 are permitted to have a total area of less than 0.002 times the gross cross-sectional area of the footing.~~

~~2. For foundation systems consisting of a plain concrete footing and a plain concrete stemwall, a minimum of one bar shall be provided at the top of the stemwall and at the bottom of the footing.~~

3. ~~Where a slab on ground is cast monolithically with the footing, one No. 5 bar is permitted to be located at either the top of the slab or bottom of the footing.~~

RATIONALE:

This proposed amendment requires minimum reinforcement in continuous footings to address the problem of poor performance of plain or under-reinforced footings during a seismic event. This amendment reflects the recommendations by the Structural Engineers Association of Southern California (SEAOSC)Task Force that investigated the poor performance observed in 1994 Northridge Earthquake.

FINDINGS:

Local Geological Conditions – The greater Los Angeles region is a densely populated area having buildings and structures constructed over and near a vast array of fault systems capable of producing major earthquakes, including but not limited to the 1994 Northridge Earthquake. The proposed modification to require minimum reinforcement to address the problem of poor performance of plain or under-reinforced footings during a seismic event and therefore need to be incorporated into the code to assure that new buildings and structures and additions or alterations to existing buildings or structures are designed and constructed in accordance with the scope and objectives of the California Building Code.

Sections 1905.1.9 thru 1905.1.11 are added to Chapter 19 of the California Building Code to read, as follows:

1905.1.9 ACI 318, Section 18.7.5. Modify ACI 318, Section 18.7.5, by adding Section 18.7.5.7 and 18.7.5.8, as follows:

18.7.5.7 Where the calculated point of contra-flexure is not within the middle half of the member clear height, provide transverse reinforcement as specified in ACI 318 Sections 18.7.5.1, Items (a) through (c), over the full height of the member.

18.7.5.8 – At any section where the design strength, □Pn, of the column is less than the sum of the shears V_e computed in accordance with ACI 318 Sections

18.7.6.1 and 18.6.5.1 for all the beams framing into the column above the level under consideration, transverse reinforcement as specified in ACI 318 Sections 18.7.5.1 through 18.7.5.3 shall be provided. For beams framing into opposite sides of the column, the moment components are permitted to be assumed to be of opposite sign. For the determination of the design strength, □Pn, of the column, these moments are permitted to be assumed to result from the deformation of the frame in any one principal axis.

1905.1.10 ACI 318, Section 18.10.4. Modify ACI 318, Section 18.10.4, by adding Section 18.10.4.6, as follows:

18.10.4.6 – Walls and portions of walls with $P_u > 0.35P_o$ shall not be considered to contribute to the calculated shear strength of the structure for resisting earthquake-induced forces. Such walls shall conform to the requirements of ACI 318 Section 18.14.

1905.1.11 ACI 318, Section 18.12.6. Modify ACI 318, by adding Section 18.12.6.2, as follows:

18.12.6.2 Collector and boundary elements in topping slabs placed over precast floor and roof elements shall not be less than 3 inches or 6 db in thickness, where db is the diameter of the largest reinforcement in the topping slab.

RATIONALE:

This amendment is intended to carry over critical provisions for the design of concrete columns in moment frames from the legacy 1997 Uniform Building Code. Increased confinement is critical to the integrity of such columns and these modifications ensure that it is provided when certain thresholds are exceeded. In addition, this amendment carries over from the legacy 1997 Uniform Building Code a critical provision for the design of concrete shear walls. It essentially limits the use of very highly gravity-loaded walls in being included in the seismic load resisting system, since their failure could have catastrophic effect on the building. Furthermore, this amendment was incorporated in the code based on observations from the 1994 Northridge Earthquake. Rebar placed in very thin concrete topping slabs have been observed in some instances to have popped out of the slab due to insufficient concrete coverage. This modification ensures that critical boundary and collector rebars are placed in sufficiently thick topping slab to prevent buckling of such reinforcements.

FINDINGS:

Local Geological Conditions – The greater Los Angeles region is a densely populated area having buildings and structures constructed over and near a vast array of fault systems capable of producing major earthquakes, including but not limited to the 1994 Northridge Earthquake. The proposed modification to increase confinement in critical columns, limiting the use of highly gravity loaded walls, and increase concrete coverage in thin slabs will have to prevent failure of the structure and therefore need to be incorporated into the code to assure that new buildings and structures and additions or alterations to existing buildings or structures are designed and constructed in

accordance with the scope and objectives of the California Building Code.

Section 2304.10.1 of Chapter 23 of the California Building Code is amended to read, as follows:

2304.10.1 Fastener requirements. Connections for wood members shall be designed in accordance with the appropriate methodology in Section 2301.2. The number and size of fasteners connecting wood members shall not be less than that set forth in Table 2304.10.1. Staple fasteners in Table 2304.10.1 shall not be used to resist or transfer seismic forces in structures assigned to Seismic Design Category D, E or F.

Exception: Staples may be used to resist or transfer seismic forces when the allowable shear values are substantiated by cyclic testing and approved by the building official.

RATIONALE:

Due to the high geologic activities in the Southern California area and the expected higher level of performance on buildings and structures, this proposed local amendment limit the use of staple fasteners in resisting or transferring seismic forces. In September 2007, limited cyclic testing data was provided to the ICC Los Angeles Chapter Structural Code Committee showing that stapled wood structural shear panels do not exhibit the same behavior as the nailed wood structural shear panels. The test results of the stapled wood structural shear panels appeared much lower in strength and drift than the nailed wood structural shear panel test results. Therefore, the use of staples as fasteners to resist or transfer seismic forces shall not be permitted without being substantiated by cyclic testing.

FINDINGS:

Local Geological Conditions – The greater Los Angeles region is a densely populated area having buildings and structures constructed over and near a vast array of fault systems capable of producing major earthquakes, including but not limited to the 1994 Northridge Earthquake. The proposed modification to limit the use of staple fasteners to resist or transfer seismic load improve the performance of buildings and structures during a seismic event and therefore need to be incorporated into the code to assure that new buildings and structures and additions or alterations to existing buildings or structures are designed and constructed in accordance with the scope and objectives of the California Building Code.

Section 2304.12.5 of Chapter 23 of the California Building Code is amended to read, as follows:

2304.12.5 Wood used in retaining walls and cribs. Wood installed in retaining or crib walls shall be preservative treated in accordance with AWPA U1 for soil and fresh water use. Wood shall not be used retaining or crib walls for structures assigned to Seismic Design Category D, E or F.

RATIONALE:

No substantiating data has been provided to show that wood used in retaining or crib walls are effective in supporting buildings and structures during a seismic event while being subject to deterioration caused by the combined detrimental effect of constant moisture in the soil and wood-destroying organisms. Wood used in retaining or crib walls, when they are not properly treated and protected against deterioration, have performed very poorly. Most contractors are typically accustomed to construction in dry and temperate weather in the Southern California region and are not generally familiar with the necessary precautions and treatment of wood that makes it suitable for both seismic event and wet applications. The proposed amendment takes the precautionary steps to reduce or eliminate potential problems that may result by using wood in retaining or crib walls that experience relatively rapid decay due to the face that the region does not experience temperatures cold enough to destroy or retard the growth and proliferation of wood-destroying organisms.

FINDINGS:

Local Climatic and Geological Conditions – The greater Los Angeles region is a densely populated area having buildings and structures constructed over and near a vast array of fault systems capable of producing major earthquakes, including but not limited to the 1994 Northridge Earthquake. In addition, the region is within a climate system capable of producing major winds, fire and rain related disasters, including but not limited to those caused by the Santa Ana winds and El Nino (or La Nina) subtropical-like weather. This region is especially susceptible to more active termite and wood attacking insects and microorganisms. The proposed modification to prohibit the use of wood in retaining or crib walls in an effort to mitigate potential problems or deficiencies due to the proliferation of wood-destroying organisms and therefore need to be incorporated into the code to assure that new buildings and structures and additions or alterations to existing buildings or structures are designed and constructed in accordance with the scope and objectives of the California Building Code.

Section 2305.4 is added to Chapter 23 of the California Building Code to read, as follows:

2305.4 Quality of Nails. In Seismic Design Category D, E or F, mechanically driven nails used in wood structural panel shear walls shall meet the same dimensions as that required for hand-driven nails, including diameter, minimum length and minimum head diameter. Clipped head or box nails and staples are not permitted. The allowable design value for clipped head 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.

RATIONALE:

The overdriving of nails into the structural wood panel still remains a concern when pneumatic nail guns are used for wood structural panel shear wall nailing. Box nails were observed to cause massive and multiple failures of the typical 3/8-inch thick plywood during the 1994 Northridge Earthquake. The use of clipped head nails as allowed in Table A1 of AFPA SDPWS footnote referencing to ASTM F1667, continues to be restricted from being used in wood structural panel shear walls where the

minimum nail head size must be maintained in order to minimize nails from pulling through sheathing materials. Clipped or mechanically driven nails used in wood structural panel shear wall construction were found to perform much less in previous wood structural panel shear wall testing done at the University of California Irvine. The existing test results indicated that, under cyclic loading, the wood structural panel shear walls were less energy absorbent and less ductile. The panels reached ultimate load capacity and failed at substantially less lateral deflection than those using same size hand-driven nails. This amendment reflects the recommendations by the Structural Engineers Association of Southern California (SEAOSC) Task Force that investigated the poor performance observed in 1994 Northridge Earthquake.

FINDINGS:

Local Geological Conditions – The greater Los Angeles region is a densely populated area having buildings and structures constructed over and near a vast array of fault systems capable of producing major earthquakes, including but not limited to the 1994 Northridge Earthquake. The proposed modification to require mechanically driven nails to have the same dimensions as hand-driven nail will result in improved quality of construction and performance of wood structural panel shear walls and therefore need to be incorporated into the code to assure that new buildings and structures and additions or alterations to existing buildings or structures are designed and constructed in accordance with the scope and objectives of the California Building Code.

Section 2305.5 is added to Chapter 23 of the California Building Code to read, as follows:

2305.5 Hold-down connectors. In Seismic Design Category D, E or F, hold-down connectors shall be designed to resist shear wall overturning moments using approved cyclic load values or 75 percent of the allowable seismic load values that do not consider cyclic loading of the product. Connector bolts into wood framing shall require steel plate washers on the post on the opposite side of the anchorage device. Plate size shall be a minimum of 0.229 inch by 3 inches by 3 inches in size. Hold-down connectors shall be tightened to finger tight plus one half (1/2) wrench turn just prior to covering the wall framing.

RATIONALE:

ICC-ES AC 155 Acceptance Criteria for Hold-downs (Tie-Downs) Attached to Wood Members is widely used to establish allowable values for hold-down connectors in evaluation reports. AC 155 uses monotonic loading to establish allowable values. Yet, cyclic and dynamic forces imparted on buildings and structures by seismic activity cause more damage than equivalent forces that are applied in a monotonic manner. However, the engineering, regulatory and manufacturing industries have not reached consensus on the appropriate cyclic or dynamic testing protocols. This condition is expected to continue for some time. In the interim, this proposed amendment continues to limit the allowable capacity to 75% of the evaluation report value to provide an additional factor of safety for statically tested anchorage devices. Steel plate washers will reduce the additional damage that can result when hold-down connectors are fastened to wood framing members. This amendment reflects the recommendations by

the Structural Engineers Association of Southern California (SEAOSC) Task Force that investigated the poor performance observed in 1994 Northridge Earthquake.

FINDINGS:

Local Geological Conditions – The greater Los Angeles region is a densely populated area having buildings and structures constructed over and near a vast array of fault systems capable of producing major earthquakes, including but not limited to the 1994 Northridge Earthquake. The proposed modification to establish minimum performance requirements for hold-down connectors will reduce failure of wood structural panel shear walls due to excessive deflection and therefore need to be incorporated into the code to assure that new buildings and structures and additions or alterations to existing buildings or structures are designed and constructed in accordance with the scope and objectives of the California Building Code.

Section 2306.2 of Chapter 23 of the California Building Code is repealed and a new Section 2306.2 is added to read, as follows:

2306.2 Wood-frame diaphragms. Wood-frame diaphragms shall be designed and constructed in accordance with AWC SDPWS. Panels shall not be fastened to framing members with staples. Wood structural panel diaphragms used to resist seismic forces in structures assigned to Seismic Design Category D, E or F shall be applied directly to the framing members.

RATIONALE:

The Structural Engineers Association of Southern California (SEAOSC) Task Force that investigated the damages to buildings and structures during the 1994 Northridge Earthquake recommended reducing allowable shear values in wood structural panel shear walls or diaphragms that were not substantiated by cyclic testing. That recommendation was consistent with a report to the Governor from the Seismic Safety Commission of the State of California recommending that code requirements be "more thoroughly substantiated with testing." The allowable shear values for wood structural panel shear walls or diaphragms fastened with staples are based on monotonic testing and does not take into consideration that earthquake forces load shear wall or diaphragm in a repeating and fully reversible manner.

In September 2007, limited cyclic testing was conducted by a private engineering firm to determine if wood structural panels fastened with staples would exhibit the same behavior as the wood structural panels fastened with common nails. The test result revealed that wood structural panel fastened with staples appeared to be much lower in strength and stiffness than wood structural panels fastened with common nails. It was recommended that the use of staples as fasteners for wood structural panel shear walls or diaphragms not be permitted to resist seismic forces in structures assigned to Seismic Design Category D, E and F unless it can be substantiated by cyclic testing. Furthermore, the cities and county within the Los Angeles region has taken extra measures to maintain the structural integrity of the framing of shear walls and diaphragms designed for high levels of seismic forces by requiring wood sheathing be applied directly over the framing members and prohibiting the use of panels placed over

gypsum sheathing. This proposed amendment is intended to prevent the undesirable performance of nails when gypsum board softens due to cyclic earthquake displacements and the nail ultimately does not have any engagement in a solid material within the thickness of the gypsum board.

FINDINGS:

Local Geological Conditions – The greater Los Angeles region is a densely populated area having buildings and structures constructed over and near a vast array of fault systems capable of producing major earthquakes, including but not limited to the 1994 Northridge Earthquake. The proposed modification to place design and construction limits on staples as fasteners used in wood structural panel or diaphragms not substantiated with cyclic testing will help to maintain minimum quality of construction and performance standards of structures and therefore need to be incorporated into the code to assure that new buildings and structures and additions or alterations to existing buildings or structures are designed and constructed in accordance with the scope and objectives of the California Building Code.

Section 2306.3 of Chapter 23 of the California Building Code is repealed and a new Section 2306.3 is added to read, as follows:

2306.3 Wood-frame shear walls. Wood-frame shear walls shall be designed and constructed in accordance with AWC SDPWS. For structures assigned to Seismic Design Category D, E, or F, application of Tables 4.3A and 4.3B of AWC SDPWS shall include the following:

1. Wood structural panel thickness for shear walls shall not be less than 3/8 inch thick and studs shall not be spaced at more than 16 inches on center.

2. The maximum nominal unit shear capacities for 3/8 inch wood structural panels resisting seismic forces in structures assigned to Seismic Design Category D, E or F is 400 pounds per linear foot (plf).

Exception: Other nominal unit shear capacities may be permitted if such values are substantiated by cyclic testing and approved by the building official.

3. Nails shall be placed not less than 1/2 inch in from the panel edges and not less than 3/8 inch from the edge of the connecting members for shear greater than 350 plf using ASD or 500 plf using LRFD. Nails shall be placed not less than 3/8 inch from panel edges and not less than ¼ inch from the edge of the connecting members for shears of 350 plf or less using ASD or 500 plf or less using LRFD.

4. Table 4.3B application is not allowed for structures assigned to Seismic Design Category D, E, or F. For structures assigned to Seismic Design Category D, application of Table 4.3C of AWC SDPWS shall not be used below the top level in a multi-level building. Staples are not permitted in Seismic Design Category D, E or F. The allowable shear values in Tables 2306.3(1) and 2306.3(2) are permitted to be increased 40 percent for wind design. Panels complying with ANSI/APA PRP-210 shall be permitted to use design values for Plywood Siding in the AWC SDPWS.

RATIONALE:

The Structural Engineers Association of Southern California (SEAOSC) Task Force that investigated the damages to buildings and structures during the 1994 Northridge Earthquake recommended reducing allowable shear values in wood structural panel shear walls or diaphragms that were not substantiated by cyclic testing. That recommendation was consistent with a report to the Governor from the Seismic Safety Commission of the State of California recommending that code requirements be "more thoroughly substantiated with testing." The allowable shear values for wood structural panel shear walls or diaphragms fastened with stapled nails are based on monotonic testing and does not take into consideration that earthquake forces load shear wall or diaphragm in a repeating and fully reversible manner. In September 2007, limited cyclic testing was conducted by a private engineering firm to determine if wood structural panels fastened with stapled nails would exhibit the same behavior as the wood structural panels fastened with common nails. The test result revealed that wood structural panel fastened with stapled nails appeared to be much lower in strength and stiffness than wood structural panels fastened with common nails. It was recommended that the use of stapled nail as fasteners for wood structural panel shear walls or diaphragms not be permitted to resist seismic forces in structures assigned to Seismic Design Category D, E and F unless it can be substantiated by cyclic testing. Furthermore, the cities and county within the Los Angeles region has taken extra measures to maintain the structural integrity of the framing of shear walls and diaphragms designed for high levels of seismic forces by requiring wood sheathing be applied directly over the framing members and prohibiting the use of panels placed over gypsum sheathing. This proposed amendment is intended to prevent the undesirable performance of nails when gypsum board softens due to cyclic earthquake displacements and the nail ultimately does not have any engagement in a solid material within the thickness of the gypsum board.

FINDINGS:

Local Geological Conditions – The greater Los Angeles region is a densely populated area having buildings and structures constructed over and near a vast array of fault systems capable of producing major earthquakes, including but not limited to the 1994 Northridge Earthquake. The proposed modification to place design and construction limits on stapled nail fasteners used in wood structural panel shear walls or diaphragms not substantiated with cyclic testing will help to maintain minimum quality of construction and performance standards of structures and therefore need to be incorporated into the code to assure that new buildings and structures and additions or alterations to existing buildings or structures are designed and constructed in accordance with the scope and objectives of the California Building Code.

Section 2307.2 is added to the 2016 Edition of the California Building Code to read, as follows:

2307.2 Wood-frame shear walls. Wood-frame shear walls shall be designed and constructed in accordance with Section 2306.3 as applicable.

RATIONALE:

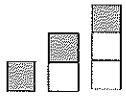
The Structural Engineers Association of Southern California (SEAOSC) Task Force that investigated the damages to buildings and structures during the 1994 Northridge Earthquake recommended reducing allowable shear values in wood structural panel shear walls or diaphragms that were not substantiated by cyclic testing. That recommendation was consistent with a report to the Governor from the Seismic Safety Commission of the State of California recommending that code requirements be "more thoroughly substantiated with testing." The allowable shear values for wood structural panel shear walls or diaphragms fastened with stapled nails are based on monotonic testing and does not take into consideration that earthquake forces load shear wall or diaphragm in a repeating and fully reversible manner. In September 2007, limited cyclic testing was conducted by a private engineering firm to determine if wood structural panels fastened with stapled nails would exhibit the same behavior as the wood structural panels fastened with common nails. The test result revealed that wood structural panel fastened with stapled nails appeared to be much lower in strength and stiffness than wood structural panels fastened with common nails. It was recommended that the use of stapled nail as fasteners for wood structural panel shear walls or diaphragms not be permitted to resist seismic forces in structures assigned to Seismic Design Category D, E and F unless it can be substantiated by cyclic testing. Furthermore, the cities and county within the Los Angeles region has taken extra measures to maintain the structural integrity of the framing of shear walls and diaphragms designed for high levels of seismic forces by requiring wood sheathing be applied directly over the framing members and prohibiting the use of panels placed over gypsum sheathing. This proposed amendment is intended to prevent the undesirable performance of nails when gypsum board softens due to cyclic earthquake displacements and the nail ultimately does not have any engagement in a solid material within the thickness of the gypsum board.

FINDINGS:

Local Geological Conditions – The greater Los Angeles region is a densely populated area having buildings and structures constructed over and near a vast array of fault systems capable of producing major earthquakes, including but not limited to the 1994 Northridge Earthquake. The proposed modification to place design and construction limits on stapled nail fasteners used in wood structural panel shear walls or diaphragms not substantiated with cyclic testing will help to maintain minimum quality of construction and performance standards of structures and therefore need to be incorporated into the code to assure that new buildings and structures and additions or alterations to existing buildings or structures are designed and constructed in accordance with the scope and objectives of the California Building Code.

Table 2308.6.1 of the 2016 Edition of the California Building Code is amended to Read, as follows:

TABLE 2308.6.1[a]
WALL BRACING REQUIREMENTS

SEISMIC DESIGN CATEGORY	STORY CONDITION (SEE SECTION 2308.2)	MAXIMUM SPACING OF BRACED WALL LINES	BRACED PANEL LOCATION, SPACING (O.C.) AND MINIMUM PERCENTAGE (X)			MAXIMUM DISTANCE OF BRACED WALL PANELS FROM EACH END OF BRACED WALL LINE
			Bracing method[b]			
			LIB	DWB, WSP	SFB, PBS, PCP, HPS, GB[c,d]	
A and B		35′- 0″	Each end and ≤ 25′- 0″ o.c.	Each end and ≤ 25′- 0″ o.c.	Each end and ≤ 25′- 0″ o.c.	12′- 6″
		35′- 0″	Each end and ≤ 25′- 0″ o.c.	Each end and ≤ 25′- 0″ o.c.	Each end and ≤ 25′- 0″ o.c.	12′- 6″
		35′- 0″	NP	Each end and ≤ 25′- 0″ o.c.	Each end and ≤ 25′- 0″ o.c.	12′- 6″
C		35′- 0″	NP	Each end and ≤ 25′- 0″ o.c.	Each end and ≤ 25′- 0″ o.c.	12′- 6″
		35′- 0″	NP	Each end and ≤ 25′- 0″ o.c. (minimum 25% of wall length)[e]	Each end and ≤ 25′- 0″ o.c. (minimum 25% of wall length)[e]	12′- 6″
D and E[f, g, h]		25′- 0″	NP	$S_{DS} < 0.50$: Each end and ≤ 25′- 0″ o.c. (minimum 21% of wall length)[e]	$S_{DS} < 0.50$: Each end and ≤ 25′- 0″ o.c. (minimum 43% of wall length)[e]	8′- 0″
				$0.5 \le S_{DS} < 0.75$: Each end and ≤ 25′- 0″ o.c. (minimum 32% of wall length)[e]	$0.5 \le S_{DS} < 0.75$: Each end and ≤ 25′- 0″ o.c. (minimum 59% of wall length)[e]	
				$0.75 \le S_{DS} \le 1.00$: Each end and ≤ 25′- 0″ o.c. (minimum 37% of wall length)[e]	$0.75 \le S_{DS} \le 1.00$: Each end and ≤ 25′- 0″ o.c. (minimum 75% of wall length)	
				$S_{DS} > 1.00$: Each end and ≤ 25′- 0″ o.c. (minimum 48% of wall length)[e]	$S_{DS} > 1.00$: Each end and ≤ 25′- 0″ o.c. (minimum 100% of wall length)[e]	

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

NP = Not Permitted.

a. This table specifies minimum requirements for braced wall panels along interior or exterior braced wall lines.

b. See Section 2308.6.3 for full description of bracing methods.

c. For Method GB, gypsum wallboard applied to framing supports that are spaced at 16 inches on center.

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

e. Percentage shown represents the minimum amount of bracing required along the building length (or wall length if the structure has an irregular shape).

f. DWB, SFB, PBS, and HPS wall braces are not permitted in Seismic Design Catergories D or E.

g. Minimum length of panel bracing of one face of the wall for WSP sheathing shall be at least 4'-0" long or both faces of the wall for GB or PCP sheathing shall be at least 8'-0" long; h/w ratio shall not exceed 2:1. Wall framing to which sheathing used for bracing is applied shall be nominal 2 inch wide factual 1 1/2 inch (38 mm) or larger members and spaced a maximum of 16 inches on center. Braced wall panel construction types shall not be mixed within a braced wall line.

h. WSP sheathing shall be a minimum of 15/32" thick nailed with 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.

RATIONALE:

This proposed amendment specifies minimum sheathing thickness and nail size and spacing so as to provide a uniform standard of construction for designers and buildings to follow. This is intended to improve the performance level of buildings and structures that are subject to the higher seismic demands placed on buildings or structure in this region. This proposed amendment reflects the recommendations by the Structural Engineers Association of Southern California (SEAOSC) Task Force that investigated the poor performance observed in 1994 Northridge Earthquake.

FINDINGS:

Local Geological Conditions – The greater Los Angeles region is a densely populated area having buildings and structures constructed over and near a vast array of fault systems capable of producing major earthquakes, including but not limited to the 1994 Northridge Earthquake. Conventional framing does not address the need for a continuous load path, critical shear transfer mechanisms, connection-ties, irregular and flexible portions of complex shaped structures. The proposed modification to provide specific detailing requirements will improve the performance of buildings and structures and therefore needs to be incorporated into the code to assure that new buildings and additions to existing buildings are designed and constructed in accordance with the scope and objectives of the California Building Code.

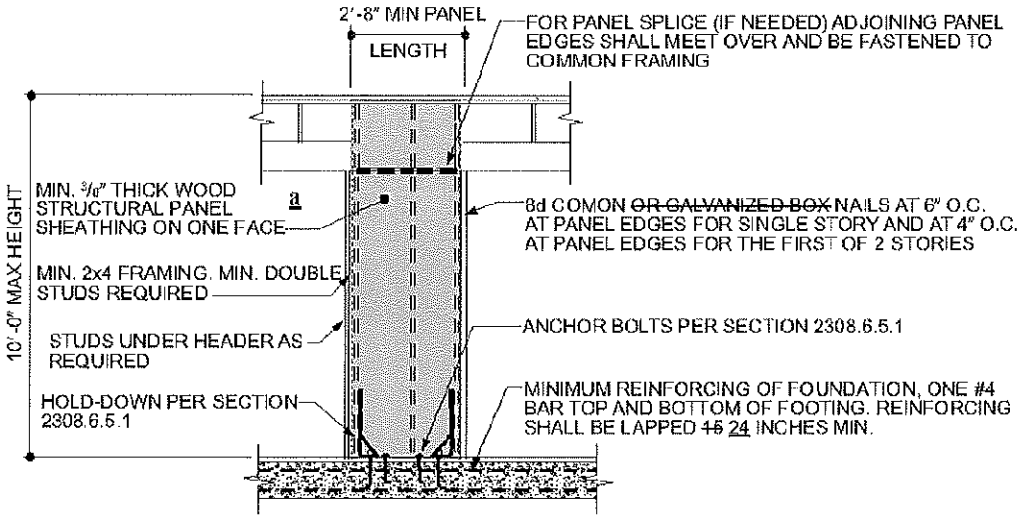
Section 2308.6.5, Figure 2308.6.5.1, and Figure 2308.6.5.2 of the 2016 Edition of the California Building Code are repealed and new Section 2308.6.5, Figure 2308.6.5 and Figure 2308.6.5.2 are added to read, as follows:

2308.6.5 Alternative bracing. An alternate braced wall (ABW) or a portal frame with hold-downs (PFH) described in this section is permitted to substitute for a 48-inch (1219 mm) braced wall panel of Method DWB, WSP, SFB, PBS, PCP or HPS. For Method GB, each 96-inch section (applied to one face) or 48-inch section (applied to both faces) or portion thereof required by Table 2308.6.1 is permitted to be replaced by one panel constructed in accordance with Method ABW or PFH.

2308.6.5.1 Alternate braced wall (ABW). An ABW shall be constructed in accordance with this section and Figure 2308.6.5.1. In one-story buildings, each panel shall have a length of not less than 2 feet 8 inches and a height of not more than 10 feet Each panel shall be sheathed on one face with 3/8-inch minimum-thickness wood structural panel sheathing nailed with 8d common or galvanized box nails in accordance with Table 2304.10.1 and blocked at wood structural panel edges. For structures assigned to Seismic Design Category D or E, each panel shall be sheathed on one face with 15/32-inch-minimum-thickness wood structural panel sheathing nailed with 8d common nails spaced 3 inches on panel edges, 3 inches at intermediate supports. Two anchor bolts installed in accordance with Section 2308.3.1 shall be provided in each panel. Anchor bolts shall be placed at each panel outside quarter points. Each panel end stud shall have a hold-down device fastened to the foundation, capable of providing an approved uplift capacity of not less than 1,800 pounds. The hold-down device shall be installed in accordance with the manufacturer's recommendations. The ABW shall be supported directly on a foundation or on floor

framing supported directly on a foundation that 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. Where the continuous foundation is required to have a depth greater than 12 inches a minimum 12-inch by 12-inch continuous footing or turned-down slab edge is permitted at door openings in the braced wall line. This continuous footing or turned-down slab edge shall be reinforced with not less than one No. 4 bar top and bottom. This reinforcement shall be lapped ~~15~~ 24 inches with the reinforcement required in the continuous foundation located directly under the braced wall line. Where the ABW is installed at the first story of two-story buildings, the wood structural panel sheathing shall be provided on both faces, three anchor bolts shall be placed at one-quarter points and tie-down device uplift capacity shall be not less than 3,000 pounds

2308.6.5.2 Portal frame with hold-downs (PFH). A PFH shall be constructed in accordance with this section and Figure 2308.6.5.2. The adjacent door or window opening shall have a full-length header. In one-story buildings, each panel shall have a length of not less than 16 inches and a height of not more than 10 feet. Each panel shall be sheathed on one face with a single layer of 3/8-inch minimum-thickness wood structural panel sheathing nailed with 8d common or galvanized box nails in accordance with Figure 2308.6.5.2. For structures assigned to Seismic Design Category D or E, each panel shall be sheathed on one face with 15/32-inch minimum thickness wood structural panel sheathing nailed with 8d common nails spaced 3 inches on panel edges, 3 inches at intermediate supports and in accordance with Figure 2308.6.5.2. The wood structural panel sheathing shall extend up over the solid sawn or glued-laminated header and shall be nailed in accordance with Figure 2308.6.5.2. A built-up header consisting of at least two 2-inch by 12-inch boards, fastened in accordance with Item 24 of Table 2304.10.1 shall be permitted to be used. A spacer, if used, shall be placed on the side of the built-up beam opposite the wood structural panel sheathing. The header shall extend between the inside faces of the first full-length outer studs of each panel. The clear span of the header between the inner studs of each panel shall be not less than 6 feet and not more than 18 feet in length. A strap with an uplift capacity of not less than 1,000 pounds shall fasten the header to the inner studs opposite the sheathing. One anchor bolt not less than 5/8 inch diameter and installed in accordance with Section 2308.3.1 shall be provided in the center of each sill plate. The studs at each end of the panel shall have a hold-down device fastened to the foundation with an uplift capacity of not less than 3,500 pounds.

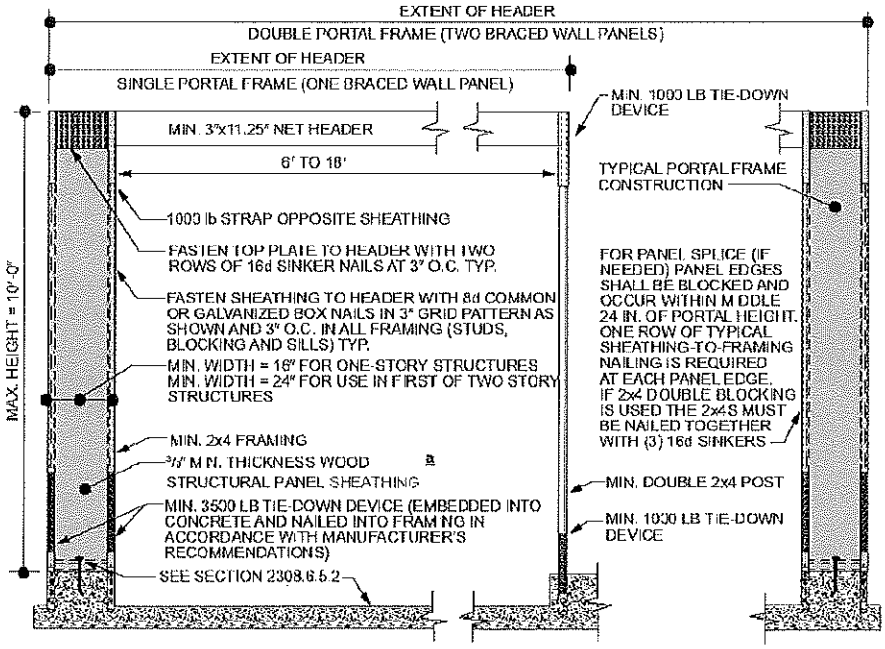


For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

a. For structures assigned to Seismic Design Category D or E, sheathed on one face with 15/32-inch-minimum-thickness (11.9 mm) wood structural panel sheathing.

FIGURE 2308.6.5.1
ALTERNATE BRACED WALL PANEL (ABW)

Where a panel is located on one side of the opening, the header shall extend between the inside face of the first full-length stud of the panel and the bearing studs at the other end of the opening. A strap with an uplift capacity of not less than 1,000 pounds shall fasten the header to the bearing studs. The bearing studs shall also have a hold-down device fastened to the foundation with an uplift capacity of not less than 1,000 pounds. The hold-down devices shall be an embedded strap type, installed in accordance with the manufacturer's recommendations. The PFH panels shall be supported directly on a foundation that 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. Where the continuous foundation is required to have a depth greater than 12 inches, a minimum 12- inch by 12-inch continuous footing or turned-down slab edge is permitted at door openings in the braced wall line. This continuous footing or turned-down slab edge shall be reinforced with not less than one No. 4 bar top and bottom. This reinforcement shall be lapped not less than 15 24 inches with the reinforcement required in the continuous foundation located directly under the braced wall line. Where a PFH is installed at the first story of two-story buildings, each panel shall have a length of not less than 24 inches.



For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 pound = 4.448 N.

a. For structures assigned to Seismic Design Category D or E, sheathed on one face with 15/32-inch-minimum-thickness (11.9 mm) wood structural panel sheathing.

FIGURE 2308.6.5.2
PORTAL FRAME WITH HOLD-DOWNS (PFH)

RATIONALE:

3/8" thick, 3 ply-plywood shear walls experienced many failures during the Northridge Earthquake. Box nails were observed to cause massive and multiple failures of the typical 3/8" thick 3-ply plywood during the Northridge Earthquake. This proposed amendment specifies minimum sheathing thickness, nail size and spacing so as to provide a uniform standard of construction for designers and buildings to follow. This is intended to improve the performance level of buildings and structures that are subject to the higher seismic demands and reduce and limit potential damages to property. This proposed amendment reflects the recommendations by the Structural Engineers Association of Southern California (SEAOSC) Task Force that investigated the poor performance observed in 1994 Northridge Earthquake.

FINDINGS:

Local Geological Conditions – The greater Los Angeles region is a densely populated area having buildings and structures constructed over and near a vast array of fault systems capable of producing major earthquakes, including but not limited to the 1994 Northridge Earthquake. The proposed modification requiring minimum sheathing thickness and nailing type and size will help to maintain minimum quality of construction and performance standards of structures and therefore needs to be incorporated into the code to assure that new buildings and additions to existing buildings are designed and constructed in accordance with the scope and objectives of the California Building Code.

Section 2308.6.8.1 of Chapter 23 of the California Building Code is amended to read, as follows:

2308.6.8.1 Foundation requirements. Braced wall lines shall be supported by continuous foundations. [Exception deleted.]

For structures in Seismic Design Categories D and E, exterior braced wall panels shall be in the same plane vertically with the foundation or the portion of the structure containing the offset shall be designed in accordance with accepted engineering practice and Section 2308.1.1. [Exceptions deleted.]

RATIONALE:

With the higher seismic demand placed on buildings and structures in this region, interior walls can easily be called upon to resist over half of the seismic loading imposed on simple buildings or structures.

Without a continuous foundation to support the braced wall line, seismic loads would be transferred through other elements such as non-structural concrete slab floors, wood floors, etc. Requiring interior braced walls be supported by continuous foundations is intended to reduce or eliminate the poor performance of buildings or structures.

FINDINGS:

Local Geological Conditions – The greater Los Angeles region is a densely populated area having buildings and structures constructed over and near a vast array of fault systems capable of producing major earthquakes, including but not limited to the 1994 Northridge Earthquake. Conventional framing does not address the need for a continuous load path, critical shear transfer mechanisms, connection-ties, irregular and flexible portions of complex shaped structures. The proposed modification to require continuous footings under braced wall lines will improve performance of buildings or structure during a seismic event and therefore need to be incorporated into the code to assure that new buildings and additions to existing buildings are designed and constructed in accordance with the scope and objectives of the California Building Code.

Section R301.1.3.2 of Chapter 3 of the California Residential Code is amended to read, as follows:

R301.1.3.2 Woodframe structures greater than two-stories. The building official shall require construction documents to be approved and stamped by a California licensed architect or engineer for all dwellings of wood frame construction more than two stories and basement in height. Notwithstanding other sections of law, the law establishing these provisions is found in Business and Professions Code Section 5537 and 6737.1.

RATIONALE:

After the 1994 Northridge Earthquake, the Wood Frame Construction Task Force recommended that the quality of wood frame construction need to be greatly improved. One such recommendation identified by the Task Force is to improve the quality and organization of structural plans prepared by the engineer or architect so that plan examiners, building inspectors, contractors and special inspectors may logically follow and construct the presentation of the seismic force-resisting systems in the construction documents. For buildings or structures located in Seismic Design Category D_0, D_1, D_2 or E that are subject to a greater level of seismic forces, the requirement to have a California licensed architect or engineer prepare the construction documents is intended to minimize or reduce structural deficiencies that may cause excessive damage or injuries in wood frame buildings. Structural deficiencies such as plan and vertical irregularities, improper shear transfer of the seismic force-resisting system, missed details or connections important to the structural system, and the improper application of the prescriptive requirements of the California Residential Code can be readily addressed by a registered design professional.

FINDINGS:

Local Geological Conditions – The greater Los Angeles region is a densely populated area having buildings and structures constructed over and near a vast array of fault systems capable of producing major earthquakes, including but not limited to the 1994 Northridge Earthquake. The proposed modification to require construction documents for wood frame construction greater than one story in height or with a basement to be approved and stamped by a California licensed architect or engineer is intended to assure that both the structural design and prescriptive requirement of the code are properly utilized and presented and therefore need to be incorporated into the code to assure that new buildings and structures, and additions or alterations to existing buildings or structures are designed and constructed in accordance with the scope and objectives of the California Residential Code.

Table R301.2(1) of Chapter 3 of the California Residential Code is amended to read, as follows; all footnotes are deleted:

TABLE R301.2(1)
CLIMATIC AND GEOGRAPHIC DESIGN CRITERIA

GROUND SNOW LOAD	WIND DESIGN		SEISMIC DESIGN CATEGORY[f]	*amended*			*Amended*	*Amended*	*Amended*	AIR FREEZING INDEX[i]	MEAN ANNUAL TEMP[j]
	Speed[d] (mph)	Topographic effects[k]		Weathering[a]	Frost line Depth[b]	Termite[c]					
Zero	85	No	D_2 or E	Negligible	12-24"	Very Heavy	43	No	See Exhibit B	0	60

Items 1, 3 and 5 of Section R301.2.2.2.5 of Chapter 3 of the California Residential Code are amended to read, as follows:

1. Where exterior shear wall lines or braced wall panels are not in one plane vertically from the foundation to the uppermost story in which they are required. [Exceptions deleted.]

3. When the end of a braced wall panel occurs over an opening in the wall below. [Exceptions deleted]

5. Where portions of a floor level are vertically offset. [Exceptions deleted]

RATIONALE:

With the higher seismic demand placed on buildings and structures in this region, precautionary steps are proposed to reduce or eliminate potential problems that may result by limiting the type of irregular conditions specified in the California Residential Code. Such limitations are intended to reduce the potential structural damage expected in the event of an earthquake. The cities and county of the Los Angeles region has taken extra measures to maintain the structural integrity of the framing of the shear walls and all associated elements when designed for high levels of seismic loads.

FINDINGS:

Local Geological Conditions – The greater Los Angeles region is a densely populated area having buildings and structures constructed over and near a vast array of fault systems capable of producing major earthquakes, including but not limited to the 1994 Northridge Earthquake. The proposed amendment limits the type of irregular conditions within buildings that may lead to higher structural damage during a seismic event and therefore needs to be incorporated into the code to assure that new buildings and structures and additions or alterations to existing buildings or structures are designed and constructed in accordance with the scope and objectives of the California Residential Code and consistent with the requirements in the ASCE 7-10.

Section R301.2.2.3.8 is added to Chapter 3 of the California Residential Code to read, as follows:

R301.2.2.3.8 Anchorage of Mechanical, Electrical, or Plumbing Components and Equipment. Mechanical, electrical, or plumbing components and equipment shall be anchored to the structure. Anchorage of the components and equipment shall be designed to resist loads in accordance with the California Building Code and ASCE 7, except where the component is positively attached to the structure and flexible connections are provided between the component and associated ductwork, piping, and conduit; and either:

1. The component weighs 400 lb or less and has a center of mass located 4 ft or less above the supporting structure; or

2. The component weighs 20 lb or less or, in the case of a distributed system, 5 lb/ft or less.

RATIONALE:

There is no limitation for weight of mechanical and plumbing fixtures and equipment in the California Residential Code. Requirements from ASCE 7 and the California Building Code would permit equipment weighing up to 400 lbs. when mounted at 4 feet or less above the floor or attic level without engineering design. Where equipment exceeds this requirement, it is the intent of this proposed amendment that a registered design professional be required to analyze if the floor support is adequate and structurally sound.

FINDINGS:

Local Geological Conditions – The greater Los Angeles region is a densely populated area having buildings and structures constructed over and near a vast array of fault systems capable of producing major earthquakes, including but not limited to the 1994 Northridge Earthquake. The proposed modification to limit the equipment weight is intended to reduce injuries, save lives, and minimize structural damages and therefore needs to be incorporated into the code to assure that new buildings and structures and additions or alterations to existing buildings or structures are designed and constructed in accordance with the scope and objectives of the California Residential Code.

Section R403.1.2 of Chapter 4 of the California Residential Code is amended to read, as follows:

R403.1.2 Continuous footing in Seismic Design Categories D_0, D_1 and D_2 and E. Exterior walls of buildings located in Seismic Design Categories D_0, D_1 and D_2 and E shall be supported by continuous solid or fully grouted masonry or concrete footings. Other footing materials or systems shall be designed in accordance with accepted engineering practice. All required interior braced wall panels in buildings located in Seismic Design Categories D_0, D_1 and D_2 and E with plan dimensions greater than 50 feet shall be supported by continuous solid or fully grouted masonry or concrete footings in accordance with Section R403.1.3.4, except for two-story buildings in Seismic Design Category D2 and E, in which all braced wall panels, interior and exterior, shall be supported on continuous foundations. [Exceptions deleted.]

RATIONALE:

With the higher seismic demand placed on buildings and structures in this region, precautionary steps are proposed to reduce or eliminate potential problems that may result by limiting the type of irregular conditions specified in the California Residential Code. Such limitations are intended to reduce the potential structural damage expected in the event of an earthquake. The cities and county of the Los Angeles region have taken extra measures to maintain the structural integrity of the framing of the shear walls and all associated elements when designed for high levels of seismic loads.

FINDINGS:

Local Geological Conditions – The greater Los Angeles region is a densely populated area having buildings and structures constructed over and near a vast array

of fault systems capable of producing major earthquakes, including but not limited to the 1994 Northridge Earthquake. The amendment limits the type of irregular conditions within buildings that may lead to higher structural damage during a seismic event and therefore needs to be incorporated into the code to assure that new buildings and structures and additions or alterations to existing buildings or structures are designed and constructed in accordance with the scope and objectives of the California Residential Code and consistent with the requirements in the ASCE 7-10.

Section R403.1.3 of Chapter 4 of the California Residential Code is modified by deleting the exception for masonry stem walls:

RATIONALE:

With the higher seismic demand placed on buildings and structures in this region, precautionary steps are proposed to reduce or eliminate potential problems that may result for under-reinforced. Requiring reinforcement is intended to address the problem of poor performance of no reinforced Stemwalls during a seismic event. Without reinforcement the wall lines, seismic loads would be transferred through other elements such as non-structural concrete slab floors, wood floors, etc.

FINDINGS:

Local Geological Conditions – The greater Los Angeles region is a densely populated area having buildings and structures constructed over and near a vast array of fault systems capable of producing major earthquakes, including but not limited to the 1994 Northridge Earthquake. The proposed modification to require continuous footings under braced wall lines, require reinforcement in one- and two-family dwelling, and minimum reinforcement in stepped footings will improve performance of buildings or structure during a seismic event and minimize potential problems or deficiencies and therefore need to be incorporated into the code to assure that new buildings and additions to existing buildings are designed and constructed in accordance with the scope and objectives of the California Residential Code.

Section R403.1.5 of Chapter 4 of the California Residential Code is amended to read, as follows:

R403.1.5 Slope. The top surface of footings shall be level. The bottom surface of footings shall not have a slope exceeding one unit vertical in 10 units horizontal (10-percent slope). Footings shall be stepped where it is necessary to change the elevation of the top surface of the footings or where the slope of the bottom surface of the footings will exceed one unit vertical in 10 units horizontal (10-percent slope). For structures located in Seismic Design Categories D_0, D_1 and D_2 and E, stepped footings shall be reinforced with four No. 4 rebars minimum. Two bars shall be place at the top and bottom of the footings as shown in Figure R403.1.5.

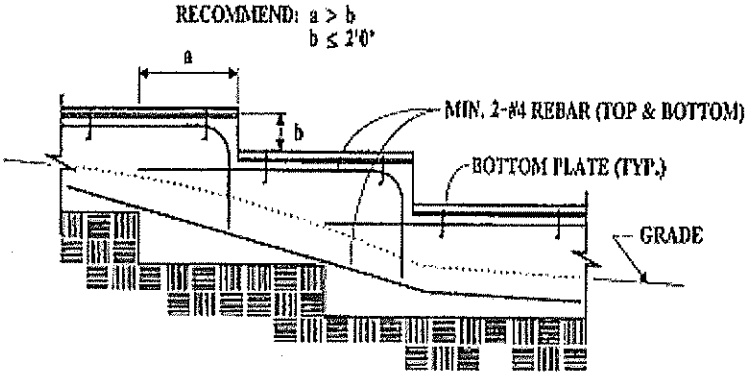


FIGURE R403.1.5
STEPPED FOOTING

RATIONALE:

With the higher seismic demand placed on buildings and structures in this region, precautionary steps are proposed to reduce or eliminate potential problems that may result for under-reinforced footings located on sloped surfaces. Requiring minimum reinforcement for stepped footings is intended to address the problem of poor performance of plain or under-reinforced footings during a seismic event. Furthermore, interior walls can easily be called upon to resist over half of the seismic loading imposed on simple buildings or structures. Without a continuous foundation to support the braced wall line, seismic loads would be transferred through other elements such as non-structural concrete slab floors, wood floors, etc. Requiring interior braced walls be supported by continuous foundations is intended to reduce or eliminate the poor performance of buildings or structures.

FINDINGS:

Local Geological Conditions – The greater Los Angeles region is a densely populated area having buildings and structures constructed over and near a vast array of fault systems capable of producing major earthquakes, including but not limited to the 1994 Northridge Earthquake. The proposed modification to require continuous footings under braced wall lines, require reinforcement in one- and two-family dwelling, and minimum reinforcement in stepped footings will improve performance of buildings or structure during a seismic event and minimize potential problems or deficiencies and therefore need to be incorporated into the code to assure that new buildings and additions to existing buildings are designed and constructed in accordance with the scope and objectives of the California Residential Code.

Section R404.2 of Chapter 4 of the California Residential Code and all subsections thereto are deleted.

RATIONALE:

No substantiating data has been provided to show that wood foundation wall is

effective in supporting buildings and structures during a seismic event while being subject to deterioration caused by the combined detrimental effect of constant moisture in the soil and wood-destroying organisms. Wood foundation walls, when they are not properly treated and protected against deterioration, have performed very poorly and have led to slope failures. Most contractors are typically accustomed to construction in dry and temperate weather in the Southern California region and are not generally familiar with the necessary precautions and treatment of wood that makes it suitable for both seismic event and wet applications. The proposed amendment takes the precautionary steps to reduce or eliminate potential problems that may result in using wood foundation walls that experience relatively rapid decay due to the fact that the region does not experience temperatures cold enough to destroy or retard the growth and proliferation of wood-destroying organisms.

FINDINGS:

Local Climatic and Geological Conditions – The greater Los Angeles region is a densely populated area having buildings and structures constructed over and near a vast array of fault systems capable of producing major earthquakes, including but not limited to the 1994 Northridge Earthquake. In addition, the region is within a climate system capable of producing major winds, fire and rain related disasters, including but not limited to those caused by the Santa Ana winds and El Nino (or La Nina) subtropical-like weather. This region is especially susceptible to more active termite and wood attacking insects and microorganisms. The proposed modification to prohibit the use of wood foundation wall in an effort to mitigate potential problems or deficiencies due to the proliferation of wood-destroying organisms and therefore need to be incorporated into the code to assure that new buildings and structures and additions or alterations to existing buildings or structures are designed and constructed in accordance with the scope and objectives of the California Residential Code.

Section R408.2 of Chapter 4 of the California Residential Code is amended to read, as follows; the exception remains:

R408.2 Openings for under-floor ventilation. The minimum net area of ventilation openings shall not be less than one square foot for each 150 square feet of under-floor area. One ventilation opening shall be within three feet of each corner of the building. Ventilation openings shall be covered for their height and width with any of the following materials provided that the least dimension of the covering shall not exceed 1/8 inch:

1. Perforated sheet metal plates not less than 0.070 inch thick.
2. Expanded sheet metal plates not less than 0.047 inch thick.
3. Cast-iron grill or grating.
4. Extruded load-bearing brick vents.
5. Hardware cloth of 0.035 inch wire or heavier.
6. Corrosion-resistant wire mesh, with the least dimension not exceeding 1/8 inch

RATIONALE:

Sufficient sub floor ventilation is necessary to prevent mold, mildew and dry rotted floors. Based on the atmospheric conditions and current construction methods and techniques this is not being accomplished in Gardena.

FINDINGS:

Local Climatic and Geological Conditions – Insufficient ventilation exists under floors in the local area causing mold, mildew and dry rotted floors. The exception decreases the code required ventilation.

Section R501.1 of Chapter 5 of the California Residential Code is amended to read, as follows:

R501.1 Application. The provisions of this chapter shall control the design and construction of the floors for buildings, including the floors of attic spaces used to house mechanical or plumbing fixtures and equipment. Mechanical or plumbing fixtures and equipment shall be attached (or anchored) to the structure in accordance with Section R301.2.2.3.8.

RATIONALE:

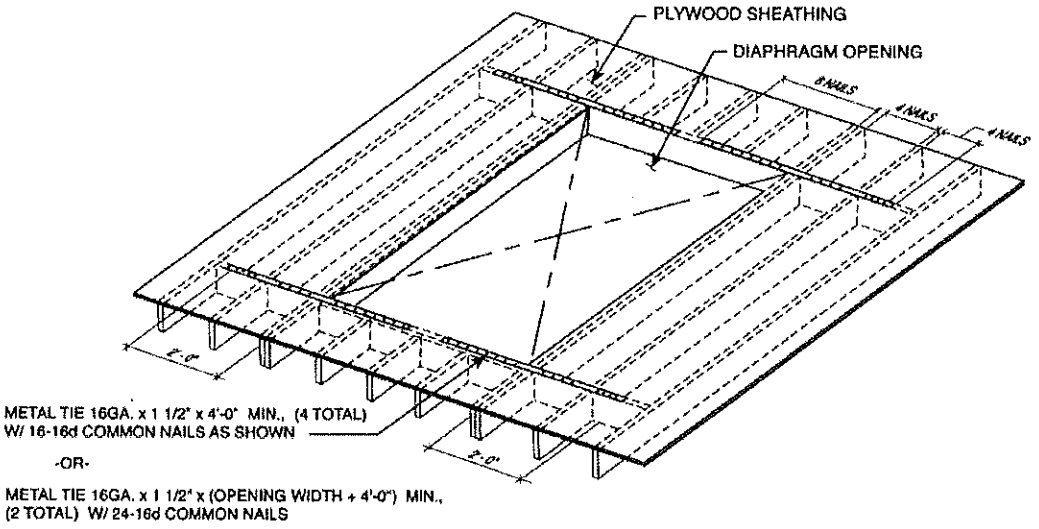
There is no limitation for weight of mechanical and plumbing fixtures and equipment in the California Residential Code. Requirements from ASCE 7 and the California Building Code would permit equipment weighing up to 400 lbs. when mounted at 4 feet or less above the floor or attic level without engineering design. Where equipment exceeds this requirement, it is the intent of this proposed amendment that a registered design professional is required to analyze if the floor support is adequate and structurally sound.

FINDINGS:

Local Geological Conditions – The greater Los Angeles region is a densely populated area having buildings and structures constructed over and near a vast array of fault systems capable of producing major earthquakes, including but not limited to the 1994 Northridge Earthquake. The proposed modification to limit the equipment weight is intended to reduce injuries, save lives, and minimize structural damages and therefore needs to be incorporated into the code to assure that new buildings and structures and additions or alterations to existing buildings or structures are designed and constructed in accordance with the scope and objectives of the California Residential Code.

Section R503.2.4 and Figure R503.2.4 are added to Chapter 5 of the 2016 Edition of the California Residential Code to read, as follows:

R503.2.4 Openings in horizontal diaphragms. Openings in horizontal diaphragms with a dimension perpendicular to the joist that is greater than 4 feet shall be constructed in accordance with Figure R503.2.4.



For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

a. Blockings shall be provided beyond headers

b. Metal ties not less than 0.058 inch (16 galvanized gage)] by 1.5 inches wide with eight 16d common nails on each side of the header-joist intersection. The metal ties shall have a minimum yield of 33,000 psi.

c. Openings in diaphragms shall be further limited in accordance with Section R301.2.2.2.5.

FIGURE R503.2.4
OPENINGS IN HORIZONTAL DIAPHRAGMS

RATIONALE:

Section R502.10 of the Code does not provide any prescriptive criteria to limit the maximum floor opening size nor does Section R503 provide any details to address the issue of shear transfer near larger floor openings. With the higher seismic demand placed on buildings and structures in this region, it is important to ensure that a complete load path is provided to reduce or eliminate potential damages caused by seismic forces. Requiring blocking with metal ties around larger floor openings and limiting opening size is consistent with the requirements of Section R301.2.2.2.5.

FINDINGS:

Local Geological Conditions – The greater Los Angeles region is a densely populated area having buildings and structures constructed over and near a vast array of fault systems capable of producing major earthquakes, including but not limited to the 1994 Northridge Earthquake. The proposed modification to require specific detailing at large floor openings is intended to address the poor performance of floor diaphragms with openings and limit or reduce property damages during a seismic event and therefore needs to be incorporated into the code to assure that new buildings and structures and additions or alterations to existing buildings or structures are designed and constructed in accordance with the scope and objectives of the California Residential Code.

Lines 35 and 36 of Table R602.3(1) of Chapter 6 of the California Residential Code are amended by adding a reference to new footnote i to read, as follows:

TABLE 602.3(1)
FASTENING SCHEDULE—continued

ITEM	DESCRIPTION OF BUILDING ELEMENTS	NUMBER AND TYPE OF FASTENER[a, b, c]	SPACING AND LOCATION
	Floor		
24	2″ subfloor to joist or girder	3-16d box (3½″ × 0.135″); or 2-16d common (3½″ × 0.162″)	Blind and face nail
25	2″ planks (plank & beam—floor & roof)	3-16d box (3½″ × 0.135″); or 2-16d common (3½″ × 0.162″)	At each bearing, face nail
26	Band or rim joist to joist	3-16d common (3½″ × 0.162″) 4-10 box (3″ × 0.128″), or 4-3″ × 0.131″ nails;	End nail
27	Built-up girders and beams, 2-inch lumber layers	20d common (4″ × 0.192″); or	Nail each layer as follows: 32″ o.c. at top and bottom and staggered.
		10d box (3″ × 0.128″); or 3″ × 0.131″ nails	24″ o.c. face nail at top and bottom staggered on opposite sides
		And: 2-20d common (4″ × 0.192″); or 3-10d box (3″ × 0.128″); or 3-3″ × 0.131″ nails	Face nail at ends and at each splice
28	Ledger strip supporting joists or rafters	4-16d box (3½″ × 0.135″); or 3-16d common (3½″ × 0.162″); or 4-10d box (3″ × 0.128″); or 4-3″ × 0.131″ nails	At each joist or rafter, face nail
29	Bridging to joist	2-10d (3″ × 0.128″)	Each end, toe nail

ITEM	DESCRIPTION OF BUILDING ELEMENTS	NUMBER AND TYPE OF FASTENER[a, b, c]	SPACING OF FASTENERS	
			Edges (inches)[h]	Intermediate supports[c, e] (inches)
	Wood structural panels, subfloor, roof and interior wall sheathing to framing and particleboard wall sheathing to framing [see Table R602.3(3) for wood structural panel *exterior* wall sheathing to wall framing]			
30	⅜″ – ½″	6d common (2″ × 0.113″) nail (subfloor, wall)[i] 8d common (2½″ × 0.131″) nail (roof)	6	12[f]
31	19/32″ – 1″	8d common nail (2½″ × 0.131″)	6	12[f]
32	1⅛″ – 1¼″	10d common (3″ × 0.148″) nail;	6	12
	Other wall sheathing[g]			
33	½″ structural cellulosic fiberboard sheathing	1½″ galvanized roofing nail, 7/16″ head diameter,	3	6
34	25/32″ structural cellulosic fiberboard sheathing	1¾″ galvanized roofing nail, 7/16″ head diameter,	3	6
35[i]	½″ gypsum sheathing[d]	1½″ galvanized roofing nail; staple galvanized, 1½″ long; 1¼″ screws, Type W or S	7	7
36[i]	⅝″ gypsum sheathing[d]	1¾″ galvanized roofing nail; staple galvanized, 1⅝″ long; 1⅝″ screws, Type W or S	7	7
	Wood structural panels, combination subfloor underlayment to framing			
37	¾″ and less	6d deformed (2″ × 0.120″) nail; or 8d common (2½″ × 0.131″) nail	6	12
38	⅞″ – 1″	8d common (2½″ × 0.131″) nail; or 8d deformed (2½″ × 0.120″) nail	6	12
39	1⅛″ – 1¼″	10d common (3″ × 0.148″) nail; or 8d deformed (2½″ × 0.120″) nail	6	12

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mile per hour = 0.447 m/s; 1 ksi = 6.895 MPa.

TABLE R602.3(1)—continued
FASTENING SCHEDULE

a. Nails are smooth-common, box or deformed shanks except where otherwise stated. Nails used for framing and sheathing connections shall have minimum average bending yield strengths as shown: 80 ksi for shank diameter of 0.192 inch (20d common nail), 90 ksi for shank diameters larger than 0.142 inch but not larger than 0.177 inch, and 100 ksi for shank diameters of 0.142 inch or less.
b. Staples are 16 gage wire and have a minimum $^{7}/_{16}$-inch on diameter crown width.
c. Nails shall be spaced at not more than 6 inches on center at all supports where spans are 48 inches or greater.
d. Four-foot by 8-foot or 4-foot by 9-foot panels shall be applied vertically.
e. Spacing of fasteners not included in this table shall be based on Table R602.3(2).
f. Where the ultimate design wind speed is 130 mph or less, nails for attaching wood structural panel roof sheathing to gable end wall framing shall be spaced 6 inches on center. Where the ultimate design wind speed is greater than 130 mph, nails for attaching panel roof sheathing to intermediate supports shall be spaced 6 inches on center for minimum 48-inch distance from ridges, eaves and gable end walls; and 4 inches on center to gable end wall framing.
g. Gypsum sheathing shall conform to ASTM C 1396 and shall be installed in accordance with GA 253. Fiberboard sheathing shall conform to ASTM C 208.
h. Spacing of fasteners on floor sheathing panel edges applies to panel edges supported by framing members and required blocking and at floor perimeters only. Spacing of fasteners on roof sheathing panel edges applies to panel edges supported by framing members and required blocking. Blocking of roof or floor sheathing panel edges perpendicular to the framing members need not be provided except as required by other provisions of this code. Floor perimeter shall be supported by framing members or solid blocking.
i. Where a rafter is fastened to an adjacent parallel ceiling joist in accordance with this schedule, provide two toe nails on one side of the rafter and toe nails from the ceiling joist to top plate in accordance with this schedule. The toe nail on the opposite side of the rafter shall not be required.
j. Use of staples in braced wall panels shall be prohibited in Seismic Design Category D_0, D_1, or D_2.

i. Use of staples in braced walls shall be prohibited in Seismic Design Category D_0, D_1 or D_2.

RATIONALE:

The Structural Engineers Association of Southern California (SEAOSC) Task Force that investigated the damages to buildings and structures during the 1994 Northridge Earthquake recommended reducing allowable shear values in wood structural panel shear walls or diaphragms that were not substantiated by cyclic testing. That recommendation was consistent with a report to the Governor from the Seismic Safety Commission of the State of California recommending that code requirements be "more thoroughly substantiated with testing." The allowable shear values for wood structural panel shear walls or diaphragms fastened with staples are based on monotonic testing and does not take into consideration that earthquake forces load shear wall or diaphragm in a repeating and fully reversible manner. In September 2007, limited cyclic testing was conducted by a private engineering firm to determine if wood structural panels fastened with staples would exhibit the same behavior as the wood structural panels fastened with common nails. The test result revealed that wood structural panel fastened with staples appeared to be much lower in strength and stiffness than wood structural panels fastened with common nails. It was recommended that the use of staples as fasteners for wood structural panel shear walls or diaphragms not be permitted to resist seismic forces in structures assigned to Seismic Design Category D0, D1 and D2 and E unless it can be substantiated by cyclic testing.

FINDINGS:

Local Geological Conditions – The greater Los Angeles region is a densely populated area having buildings and structures constructed over and near a vast array of fault systems capable of producing major earthquakes, including but not limited to the 1994 Northridge Earthquake. The proposed modification to place design and construction limits on staples as fasteners used in wood structural panel or diaphragms not substantiated with cyclic testing will help to maintain minimum quality of construction and performance standards of structures and therefore need to be incorporated into the code to assure that new buildings and structures and additions or alterations to existing buildings or structures are designed and constructed in accordance with the scope and objectives of the California Residential Code.

Footnote "b" of Table R602.3(2) of Chapter 6 of the California Residential Code is amended to read, as follows:

b. Staples shall have a minimum crown width of 7/16-inch on diameter except as noted. Use of staples in roof, floor, subfloor, and braced wall panels shall be prohibited in Seismic Design Category D_0, D_1 and D_2 and E.

RATIONALE:

The Structural Engineers Association of Southern California (SEAOSC) Task Force that investigated the damages to buildings and structures during the 1994 Northridge Earthquake recommended reducing allowable shear values in wood structural panel shear walls or diaphragms that were not substantiated by cyclic testing. That recommendation was consistent with a report to the Governor from the Seismic Safety Commission of the State of California recommending that code requirements be "more thoroughly substantiated with testing." The allowable shear values for wood structural panel shear walls or diaphragms fastened with staples are based on monotonic testing and does not take into consideration that earthquake forces load shear wall or diaphragm in a repeating and fully reversible manner. In September 2007, limited cyclic testing was conducted by a private engineering firm to determine if wood structural panels fastened with staples would exhibit the same behavior as the wood structural panels fastened with common nails. The test result revealed that wood structural panel fastened with staples appeared to be much lower in strength and stiffness than wood structural panels fastened with common nails. It was recommended that the use of staples as fasteners for wood structural panel shear walls or diaphragms not be permitted to resist seismic forces in structures assigned to Seismic Design Category D0, D1 and D2 unless it can be substantiated by cyclic testing.

FINDINGS:

Local Geological Conditions – The greater Los Angeles region is a densely populated area having buildings and structures constructed over and near a vast array of fault systems capable of producing major earthquakes, including but not limited to the 1994 Northridge Earthquake. The proposed modification to place design and construction limits on staples as fasteners used in wood structural panel or diaphragms not substantiated with cyclic testing will help to maintain minimum quality of construction and performance standards of structures and therefore need to be incorporated into the code to assure that new buildings and structures and additions or alterations to existing buildings or structures are designed and constructed in accordance with the scope and objectives of the California Residential Code.

Table R602.10.3(3) of Chapter 6 of the California Residential Code is amended to read, as follows:

TABLE R602.10.3(3)
BRACING REQUIREMENTS BASED ON SEISMIC DESIGN CATEGORY

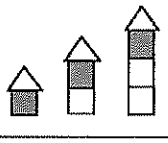
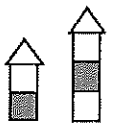
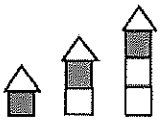
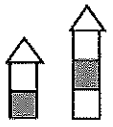
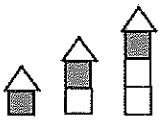
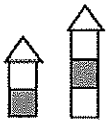
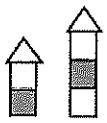
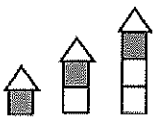
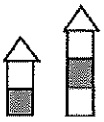
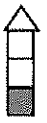
• SOIL CLASS D[b] • WALL HEIGHT = 10 FEET • 10 PSF FLOOR DEAD LOAD • 15 PSF ROOF/CEILING DEAD LOAD • BRACED WALL LINE SPACING ≤ 25 FEET			MINIMUM TOTAL LENGTH (FEET) OF BRACED WALL PANELS REQUIRED ALONG EACH BRACED WALL LINE[a]				
Seismic Design Category	Story Location	Braced Wall Line Length (feet)[c]	Method LIB[d]	Method GB[f]	Methods DWB, SFB, PBS, PCP, HPS, CS-SFB[e,f]	Method WSP	Methods CS-WSP, CS-G
C (townhouses only)		10	2.5	2.5	2.5	1.6	1.4
		20	5.0	5.0	5.0	3.2	2.7
		30	7.5	7.5	7.5	4.8	4.1
		40	10.0	10.0	10.0	6.4	5.4
		50	12.5	12.5	12.5	8.0	6.8
		10	NP	4.5	4.5	3.0	2.6
		20	NP	9.0	9.0	6.0	5.1
		30	NP	13.5	13.5	9.0	7.7
		40	NP	18.0	18.0	12.0	10.2
		50	NP	22.5	22.5	15.0	12.8
		10	NP	6.0	6.0	4.5	3.8
		20	NP	12.0	12.0	9.0	7.7
		30	NP	18.0	18.0	13.5	11.5
		40	NP	24.0	24.0	18.0	15.3
		50	NP	30.0	30.0	22.5	19.1
D_0		10	NP	~~2.8~~ 5.6	~~2.8~~ 5.6	1.8	1.6
		20	NP	~~5.5~~ 11.0	~~5.5~~ 11.0	3.6	3.1
		30	NP	~~8.3~~ 16.6	~~8.3~~ 16.6	5.4	4.6
		40	NP	~~11.0~~ 22.0	~~11.0~~ 22.0	7.2	6.1
		50	NP	~~13.8~~ 27.6	~~13.8~~ 27.6	9.0	7.7
		10	NP	~~5.3~~ NP	~~5.3~~ NP	3.8	3.2
		20	NP	~~10.5~~ NP	~~10.5~~ NP	7.5	6.4
		30	NP	~~15.8~~ NP	~~15.8~~ NP	11.3	9.6
		40	NP	~~21.0~~ NP	~~21.0~~ NP	15.0	12.8
		50	NP	~~26.3~~ NP	~~26.3~~ NP	18.8	16.0
		10	NP	~~7.3~~ NP	~~7.3~~ NP	5.3	4.5
		20	NP	~~14.5~~ NP	~~14.5~~ NP	10.5	9.0
		30	NP	~~21.8~~ NP	~~21.8~~ NP	15.8	13.4
		40	NP	~~29.0~~ NP	~~29.0~~ NP	21.0	17.9
		50	NP	~~36.3~~ NP	~~36.3~~ NP	26.3	22.3

TABLE R602.10.3(3)—continued
BRACING REQUIREMENTS BASED ON SEISMIC DESIGN CATEGORY

• SOIL CLASS D[b] • WALL HEIGHT = 10 FEET • 10 PSF FLOOR DEAD LOAD • 15 PSF ROOF/CEILING DEAD LOAD • BRACED WALL LINE SPACING ≤ 25 FEET			MINIMUM TOTAL LENGTH (FEET) OF BRACED WALL PANELS REQUIRED ALONG EACH BRACED WALL LINE[a]				
Seismic Design Category	Story Location	Braced Wall Line Length (feet)[c]	Method LIB[d]	Method GB[f]	Methods DWB, SFB, PBS, PCP, HPS, CS-SFB[e,f]	Method WSP	Methods CS-WSP, CS-G
D_1		10	NP	~~3.0~~ 6.0	~~3.0~~ 6.0	2.0	1.7
		20	NP	~~6.0~~ 12.0	~~6.0~~ 12.0	4.0	3.4
		30	NP	~~9.0~~ 18.0	~~9.0~~ 18.0	6.0	5.1
		40	NP	~~12.0~~ 24.0	~~12.0~~ 24.0	8.0	6.8
		50	NP	~~15.0~~ 30.0	~~15.0~~ 30.0	10.0	8.5
		10	NP	~~6.0~~ NP	~~6.0~~ NP	4.5	3.8
		20	NP	~~12.0~~ NP	~~12.0~~ NP	9.0	7.7
		30	NP	~~18.0~~ NP	~~18.0~~ NP	13.5	11.5
		40	NP	~~24.0~~ NP	~~24.0~~ NP	18.0	15.3
		50	NP	~~30.0~~ NP	~~30.0~~ NP	22.5	19.1
		10	NP	~~8.5~~ NP	~~8.5~~ NP	6.0	5.1
		20	NP	~~17.0~~ NP	~~17.0~~ NP	12.0	10.2
		30	NP	~~25.5~~ NP	~~25.5~~ NP	18.0	15.3
		40	NP	~~34.0~~ NP	~~34.0~~ NP	24.0	20.4
		50	NP	~~42.5~~ NP	~~42.5~~ NP	30.0	25.5

D_1		10	NP	~~6.0~~ NP	~~6.0~~ NP	4.5	3.8
		20	NP	~~12.0~~ NP	~~12.0~~ NP	9.0	7.7
		30	NP	~~18.0~~ NP	~~18.0~~ NP	13.5	11.5
		40	NP	~~24.0~~ NP	~~24.0~~ NP	18.0	15.3
		50	NP	~~30.0~~ NP	~~30.0~~ NP	22.5	19.1
		10	NP	~~8.5~~ NP	~~8.5~~ NP	6.0	5.1
		20	NP	~~17.0~~ NP	~~17.0~~ NP	12.0	10.2
		30	NP	~~25.5~~ NP	~~25.5~~ NP	18.0	15.3
		40	NP	~~34.0~~ NP	~~34.0~~ NP	24.0	20.4
		50	NP	~~42.5~~ NP	~~42.5~~ NP	30.0	25.5
D_2		10	NP	~~4.0~~ 8.0	~~4.0~~ 8.0	2.5	2.1
		20	NP	~~8.0~~ 16.0	~~8.0~~ 16.0	5.0	4.3
		30	NP	~~12.0~~ 24.0	~~12.0~~ 24.0	7.5	6.4
		40	NP	~~16.0~~ 32.0	~~16.0~~ 32.0	10.0	8.5
		50	NP	~~20.0~~ 40.0	~~20.0~~ 40.0	12.5	10.6
		10	NP	~~7.5~~ NP	~~7.5~~ NP	5.5	4.7
		20	NP	~~15.0~~ NP	~~15.0~~ NP	11.0	9.4
		30	NP	~~22.5~~ NP	~~22.5~~ NP	16.5	14.0
		40	NP	~~30.0~~ NP	~~30.0~~ NP	22.0	18.7
		50	NP	~~37.5~~ NP	~~37.5~~ NP	27.5	23.4
		10	NP	NP	NP	NP	NP
		20	NP	NP	NP	NP	NP
		30	NP	NP	NP	NP	NP
		40	NP	NP	NP	NP	NP
		50	NP	NP	NP	NP	NP
	Cripple wall below one- or two-story dwelling	10	NP	NP	NP	7.5	6.4
		20	NP	NP	NP	15.0	12.8
		30	NP	NP	NP	22.5	19.1
		40	NP	NP	NP	30.0	25.5
		50	NP	NP	NP	37.5	31.9

a. Linear interpolation shall be permitted.

b. Wall bracing lengths are based on a soil site class "D." Interpolation of bracing length between the S_{DS} values associated with the seismic design categories shall be permitted when a site-specific S_{DS} value is determined in accordance with Section 1613.3 of the *International Building Code*.

c. Where the braced wall line length is greater than 50 feet, braced wall lines shall be permitted to be divided into shorter segments having lengths of 50 feet or less, and the amount of bracing within each segment shall be in accordance with this table.

d. Method LIB shall have gypsum board fastened to not less than one side with nails or screws in accordance with Table R602.3(1) for exterior sheathing or Table R702.3.5 for interior gypsum board. Spacing of fasteners at panel edges shall not exceed 8 inches.

e. Method CS-SFB does not apply in Seismic Design Categories D_0, D_1 and D_2.

f. Methods GB and PCP braced wall panel h/w ratio shall not exceed 1:1 in SDC D_0, D_1 or D_2. Methods DWB, SFB, PBS, and HPS are not permitted in SDC D_0, D_1 or D_2.

RATIONALE:

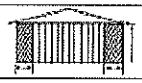
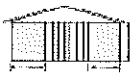
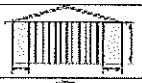
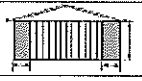
Due to the high geologic activities in the Southern California area and the expected higher level of performance on buildings and structures, this proposed local amendment increase the length and limits the location where shear walls sheathed with lath, plaster or gypsum board are used in multi-level buildings. In addition, shear walls sheathed with other materials are prohibited in Seismic Design Category D0, D1 and D2 and E to be consistent with the design limitation for similar shear walls found in the California Building Code. The poor performance of such shear walls in the 1994 Northridge Earthquake was investigated by the Structural Engineers Association of Southern California (SEAOSC) Task Force and formed the basis for this proposed amendment. Considering that shear walls sheathed with lath, plaster or gypsum board are less ductile than steel moment frames or wood structural panel shear walls, the cities and county of the Los Angeles region has taken the necessary measures to limit the potential structural damage that may be caused by the use of such walls at the lower level of multi-level building that are subject to higher levels of seismic loads.

FINDINGS:

Local Geological Conditions – The greater Los Angeles region is a densely populated area having buildings and structures constructed over and near a vast array of fault systems capable of producing major earthquakes, including but not limited to the 1994 Northridge Earthquake. The proposed modification to increase the length and limit the location where shear walls sheathed with lath, plaster or gypsum board are used will help to ensure that multi-level building will reach its performance objective in resisting higher levels of seismic loads and therefore need to be incorporated into the code to assure that new buildings and structures and additions or alterations to existing buildings or structures are designed and constructed in accordance with the scope and objectives of the California Residential Code.

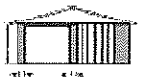
Table R602.10.4 of Chapter 6 of the California Residential Code is amended to read, as follows:

TABLE R602.10.4
BRACING METHODS [f]

METHODS, MATERIAL		MINIMUM THICKNESS	FIGURE	CONNECTION CRITERIA*	
				Fasteners	Spacing
Intermittent Bracing Method	**LIB** Let-in-bracing	1 × 4 wood or approved metal straps at 45° to 60° angles for maximum 16" stud spacing		Wood: 2-8d common nails or 3-8d ($2^1/_2$" long x 0.113" dia.) nails	Wood: per stud and top and bottom plates
				Metal strap: per manufacturer	Metal: per manufacturer
	DWB Diagonal wood boards	$^3/_4$"(1" nominal) for maximum 24" stud spacing		2-8d ($2^1/_2$" long × 0.113" dia.) nails or 2 - $1^3/_4$" long staples	Per stud
	WSP Wood structural panel (See Section R604)	~~$^1/_2$"~~ $^{15}/_{32}$"	8d common (2 1/2"x0.131) nails ~~Exterior sheathing per Table R602.3(3)~~ 6" edge distance to panel edge		6" edges 12" field
			8d common (2 1/2"x0.131) nails ~~Interior sheathing per Table R602.3(1) or R602.3(2)~~ 3/8" edge distance to panel edge		~~Varies by fastener~~ 6" edges 12" field
	BV-WSP[i] Wood Structural Panels with Stone or Masonry Veneer (See Section R602.10.6.5)	$^7/_{16}$"	See Figure R602.10.6.5	8d common ($2^1/_2$" × 0.131) nails	4" at panel edges 12" at intermediate supports 4" at braced wall panel end posts
	SFB Structural fiberboard sheathing	$^1/_2$" or $^{25}/_{32}$" for maximum 16" stud spacing		$1^1/_2$" long × 0.12" dia. (for $^1/_2$" thick sheathing) $1^3/_4$" long × 0.12" dia. (for $^{25}/_{32}$" thick sheathing) galvanized roofing nails or 8d common ($2^1/_2$" long × 0.131" dia.) nails	3" edges 6" field
	GB Gypsum board	$^1/_2$"		Nails or screws per Table R602.3(1) for exterior locations	For all braced wall panel locations: 7" edges (including top and bottom plates) 7" field
				Nails or screws per Table R702.3.5 for interior locations	
	PBS Particleboard sheathing (See Section R605)	$^3/_8$" or $^1/_2$" for maximum 16" stud spacing		For $^3/_8$", 6d common (2" long × 0.113" dia.) nails For $^1/_2$", 8d common ($2^1/_2$" long × 0.131" dia.) nails	3" edges 6" field
	PCP Portland cement plaster	See Section R703.6 for maximum 16" stud spacing		$1^1/_2$" long, 11 gage, $^7/_{16}$" dia. head nails or $^7/_8$" long, 16 gage staples [g]	6" o.c. on all framing members
	HPS Hardboard panel siding	$^7/_{16}$" for maximum 16" stud spacing		0.092" dia., 0.225" dia. head nails with length to accommodate $1^1/_2$" penetration into studs	4" edges 8" field
	ABW Alternate braced wall	$^3/_8$"		See Section R602.10.6.1	See Section R602.10.6.1

(continued)

TABLE R602.10.4—continued
BRACING METHODS [1]

	METHODS, MATERIAL	MINIMUM THICKNESS	FIGURE	CONNECTION CRITERIA[2]	
				Fasteners	Spacing
Intermittent Bracing Methods	**PFH** Portal frame with hold-downs	3/8"		See Section R602.10.6.2	See Section R602.10.6.2
	PFG Portal frame at garage	7/16"		See Section R602.10.6.3	See Section R602.10.6.3
Continuous Sheathing Methods	**CS-WSP** Continuously sheathed wood structural panel	~~3/8"~~ 15/32"	8d common (2 1/2"x0.131") nails 3/8" edge distance to panel edge	~~Exterior sheathing per Table R602.3(3)~~	6" edges 12" field
			8d common (2 1/2"x0.131") nails 3/8" edge distance to panel edge	~~Interior sheathing per Table R602.3(1) or R602.3(2)~~	~~Varies by fastener~~ 6" edges 12" field
	CS-G[3,4] Continuously sheathed wood structural panel adjacent to garage openings	~~3/8"~~ 15/32"		See Method CS-WSP	See Method CS-WSP
	CS-PF Continuously sheathed portal frame	~~7/16"~~ 15/32"		See Section R602.10.6.4	See Section R602.10.6.4
	CS-SFB[4] Continuously sheathed structural fiberboard	1/2" or 25/32" for maximum 16" stud spacing		1 1/2" long × 0.12" dia. (for 1/2" thick sheathing) 1 3/4" long × 0.12" dia. (for 25/32" thick sheathing) galvanized roofing nails or 8d common (2 1/2" long × 0.131" dia.) nails	3" edges 6" field

For SI: 1 inch = 25.4 mm, 1 foot = 305 mm, 1 degree = 0.0175 rad, 1 pound per square foot = 47.8 N/m², 1 mile per hour = 0.447 m/s.

a. Adhesive attachment of wall sheathing, including Method GB, shall not be permitted in Seismic Design Categories C, D_0, D_1 and D_2.

b. Applies to panels next to garage door opening where supporting gable end wall or roof load only. Shall only be used on one wall of the garage. In Seismic Design Categories D_0, D_1 and D_2, roof covering dead load shall not exceed 3 psf.

c. Garage openings adjacent to a Method CS-G panel shall be provided with a header in accordance with Table R602.5(1). A full-height clear opening shall not be permitted adjacent to a Method CS-G panel.

d. Method CS-SFB does not apply in Seismic Design Categories D_0, D_1 and D_2.

e. Method applies to detached one- and two-family dwellings in Seismic Design Categories D_0 through D_2 only.

f. Methods GB and PCP braced wall panel h/w ratio shall not exceed 1:1 in SDC D_0, D_1, or D_2. Methods LIB, DWB, SFB, PBS, HPS, and PFG are not permitted in SDC D_0, D_1, or D_2.

g. Use of staples in braced wall panels shall be prohibited in SDC D_0, D_1, or D_2.

RATIONALE:

3/8" thick 3 ply-plywood shear walls experienced many failures during the Northridge Earthquake. Box nails were observed to cause massive and multiple failures of the typical 3/8" thick 3-ply plywood during the Northridge Earthquake. This proposed amendment specifies minimum sheathing thickness, nail size and spacing so as to provide a uniform standard of construction for designers and buildings to follow. This is intended to improve the performance level of buildings and structures that are subject to the higher seismic demands and reduce and limit potential damages to property. This proposed amendment reflects the recommendations by the Structural Engineers Association of Southern California (SEAOSC)Task Force that investigated the poor performance observed in 1994 Northridge Earthquake. In September 2007, limited cyclic testing was conducted by a private engineering firm to determine if wood structural panels fastened with staples would exhibit the same behavior as the wood structural panels fastened with common nails. The test result revealed that wood

structural panel fastened with staples appeared to be much lower in strength and stiffness than wood structural panels fastened with common nails. It was recommended that the use of staples as fasteners for wood structural panel shear walls or diaphragms not be permitted to resist seismic forces in structures assigned to Seismic Design Category D0, D1 and D2 and E unless it can be substantiated by cyclic testing.

FINDINGS:

Local Geological Conditions – The greater Los Angeles region is a densely populated area having buildings and structures constructed over and near a vast array of fault systems capable of producing major earthquakes, including but not limited to the 1994 Northridge Earthquake. The proposed modification to place design and construction limits on stapled nail fasteners used in wood structural panel shear walls not substantiated with cyclic testing and requiring minimum sheathing thickness and nailing type and size will help to maintain minimum quality of construction and performance standards of structures and therefore need to be incorporated into the code to assure that new buildings and additions to existing buildings are designed and constructed in accordance with the scope and objectives of the California Residential Code.

Figure R602.10.6.1 of Chapter 6 of the California Residential Code is amended to read, as follows:

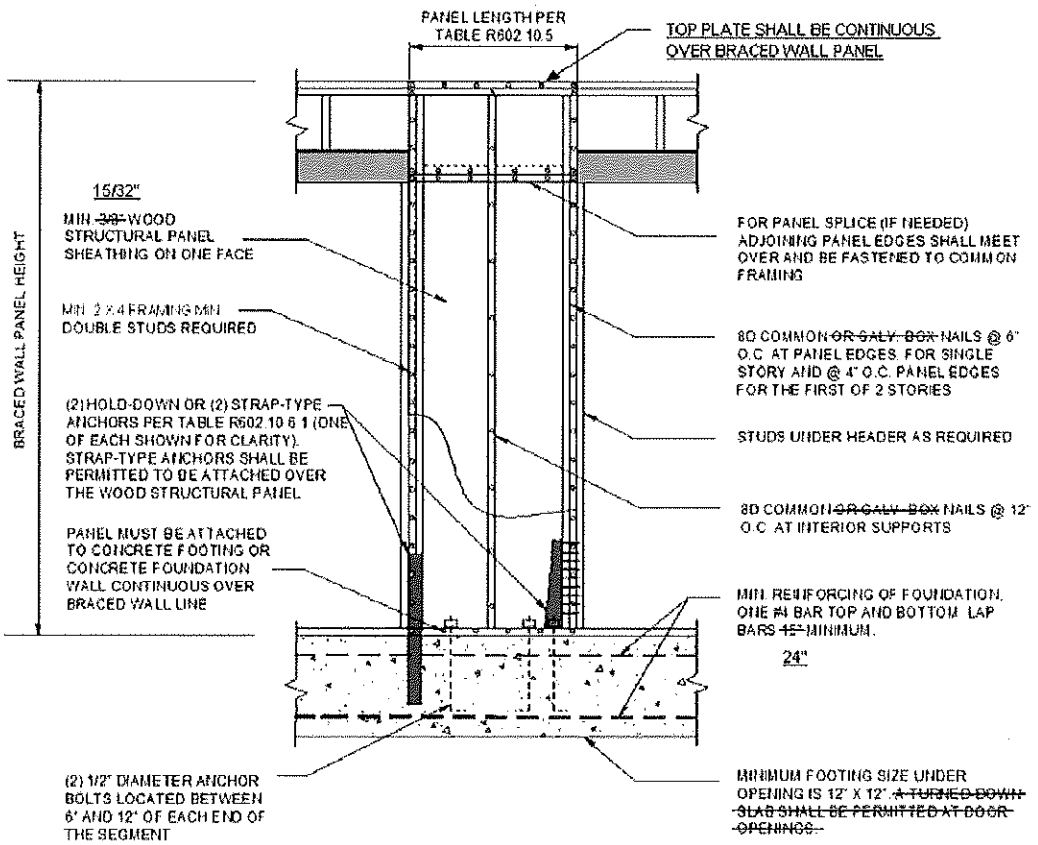


FIGURE R602.10.6.1
METHOD ABW—ALTERNATE BRACED WALL PANEL

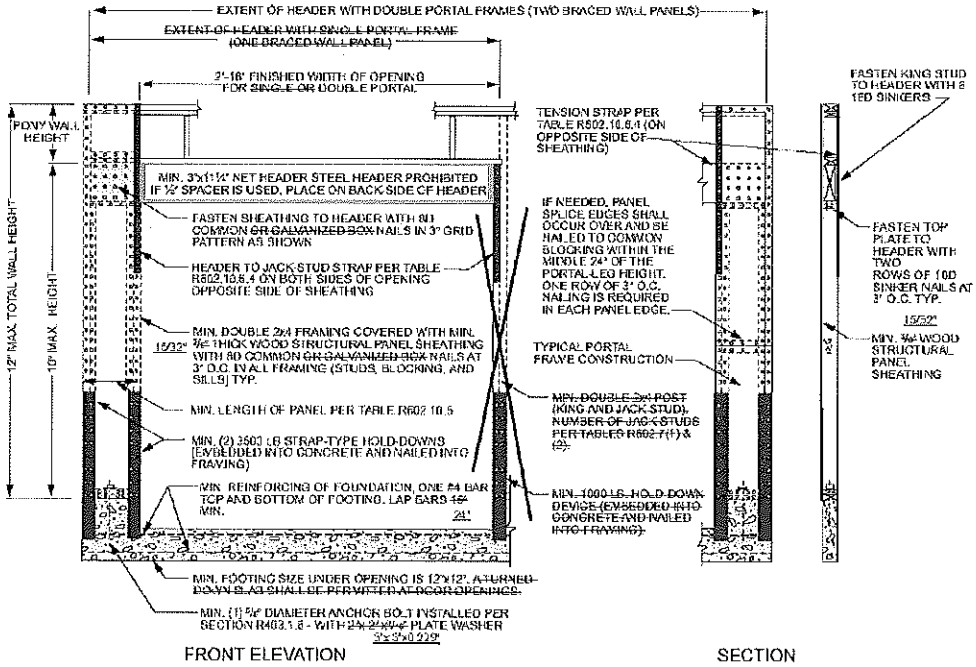
RATIONALE:

3/8" thick 3 ply-plywood shear walls experienced many failures during the Northridge Earthquake. Box nails were observed to cause massive and multiple failures of the typical 3/8" thick 3-ply plywood during the Northridge Earthquake. This proposed amendment specifies minimum sheathing thickness, nail size and spacing so as to provide a uniform standard of construction for designers and buildings to follow. This is intended to improve the performance level of buildings and structures that are subject to the higher seismic demands and reduce and limit potential damages to property. This proposed amendment reflects the recommendations by the Structural Engineers Association of Southern California (SEAOSC)Task Force that investigated the poor performance observed in 1994 Northridge Earthquake.

FINDINGS:

Local Geological Conditions – The greater Los Angeles region is a densely populated area having buildings and structures constructed over and near a vast array of fault systems capable of producing major earthquakes, including but not limited to the 1994 Northridge Earthquake. The proposed modification requiring minimum sheathing thickness and nailing type and size will help to maintain minimum quality of construction and performance standards of structures and therefore need to be incorporated into the code to assure that new buildings and additions to existing buildings are designed and constructed in accordance with the scope

Figure R602.10.6.2 of Chapter 6 of the California Residential Code is amended to read. as follows:



For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

FIGURE R602.10.6.2
METHOD PFH—PORTAL FRAME WITH HOLD-DOWNS
AT DETACHED GARAGE DOOR OPENINGS

RATIONALE:

It was observed by the Structural Engineer Association of Southern California (SEAOSC) and the Los Angeles City Task Force that high aspect ratio shear walls experienced many failures during the 1994 Northridge Earthquake. This proposed amendment provides a uniform standard of construction for designers and buildings to follow. This is intended to improve the performance level of buildings and structures that are subject to the higher seismic demands and reduce and limit potential damages to property.

FINDINGS:

Local Geological Conditions – The greater Los Angeles region is a densely populated area having buildings and structures constructed over and near a vast array of fault systems capable of producing major earthquakes, including but not limited to the 1994 Northridge Earthquake. The proposed modification ensures that the structural integrity with respect to "maximum shear wall aspect ratios" is maintained, therefore need to be incorporated into the code to assure that new buildings and additions to existing buildings are designed and constructed in accordance with the scope and objectives of the California Residential Code.

Table R602.10.5 of Chapter 6 of the California Residential Code is amended to read, as follows:

TABLE R602.10.5
MINIMUM LENGTH OF BRACED WALL PANELS

METHOD (See Table R602.10.4)		MINIMUM LENGTH[a] (inches)					CONTRIBUTING LENGTH (inches)
		Wall Height					
		8 feet	9 feet	10 feet	11 feet	12 feet	
DWB, WSP, SFB, PBS, PCP, HPS, BV-WSP		48	48	48	53	58	Actual[b]
GB		48	48	48	53	58	Double sided = Actual Single sided = 0.5 × Actual
LIB		55	62	69	NP	NP	Actual[b]
ABW	SDC A, B and C, ultimate design wind speed < 140 mph	28	32	34	38	42	48
	SDC D_0, D_1 and D_2, ultimate design wind speed < 140 mph	32	32	34	NP	NP	
PFH	Supporting roof only	~~16~~ 24	~~16~~ 24	~~16~~ 24	~~18[c]~~ 24[c]	~~20[c]~~ 24[c]	48
	Supporting one story and roof	24	24	24	27[c]	29[c]	48
PFG		24	27	30	33[d]	36[d]	1.5 × Actual[b]
CS-G		24	27	30	33	36	Actual[b]
CS-PF	SDC A, B and C	16	18	20	22[e]	24[e]	1.5 × Actual[b]
	SDC D_0, D_1 and D_2	~~16~~ 24	~~18~~ 24	~~20~~ 24	~~22[e]~~ 24[e]	24[e]	Actual[b]

	Adjacent clear opening height (inches)						
CS-WSP, CS-SFB	≤ 64	24	27	30	33	36	Actual[b]
	68	26	27	30	33	36	
	72	27	27	30	33	36	
	76	30	29	30	33	36	
	80	32	30	30	33	36	
	84	35	32	32	33	36	
	88	38	35	33	33	36	
	92	43	37	35	35	36	
	96	48	41	38	36	36	
	100	—	44	40	38	38	
	104	—	49	43	40	39	
	108	—	54	46	43	41	
	112	—	—	50	45	43	
	116	—	—	55	48	45	
	120	—	—	60	52	48	
	124	—	—	—	56	51	
	128	—	—	—	61	54	
	132	—	—	—	66	58	
	136	—	—	—	—	62	
	140	—	—	—	—	66	
	144	—	—	—	—	72	

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mile per hour = 0.447 m/s.
NP = Not Permitted.
a. Linear interpolation shall be permitted.
b. Use the actual length where it is greater than or equal to the minimum length.
c. Maximum header height for PFH is 10 feet in accordance with Figure R602.10.6.2, but wall height shall be permitted to be increased to 12 feet with pony wall.
d. Maximum opening height for PFG is 10 feet in accordance with Figure R602.10.6.3, but wall height shall be permitted to be increased to 12 feet with pony wall.
e. Maximum opening height for CS-PF is 10 feet in accordance with Figure R602.10.6.4, but wall height shall be permitted to be increased to 12 feet with pony wall.

RATIONALE:

It was observed by the Structural Engineer Association of Southern California (SEAOSC) and the Los Angeles City Task Force that high aspect ratio shear walls experienced many failures during the 1994 Northridge Earthquake. This proposed amendment provides a uniform standard of construction for designers and buildings to follow. This is intended to improve the performance level of buildings and structures that are subject to the higher seismic demands and reduce and limit potential damages to property.

FINDINGS:

Local Geological Conditions – The greater Los Angeles region is a densely populated area having buildings and structures constructed over and near a vast array of fault systems capable of producing major earthquakes, including but not limited to the 1994 Northridge Earthquake. The proposed modification ensures that the structural integrity with respect to "maximum shear wall aspect ratios" is maintained, therefore need to be incorporated into the code to assure that new buildings and additions to existing buildings are designed and constructed in accordance with the scope and objectives of the California Residential Code.

Section R602.10.2.3 of Chapter 6 of the California Residential Code is amended to read, as follows:

R602.10.2.3 Minimum number of braced wall panels. Braced wall lines with a length of 16 feet or less shall have a minimum of two braced wall panels of any length or one braced wall panel equal to 48 inches or more. Braced wall lines greater than 16 feet shall have a minimum of two braced wall panels. No braced wall panel shall be less than 48 inches in length in Seismic Design Category D_0, D_1 and D_2 and E.

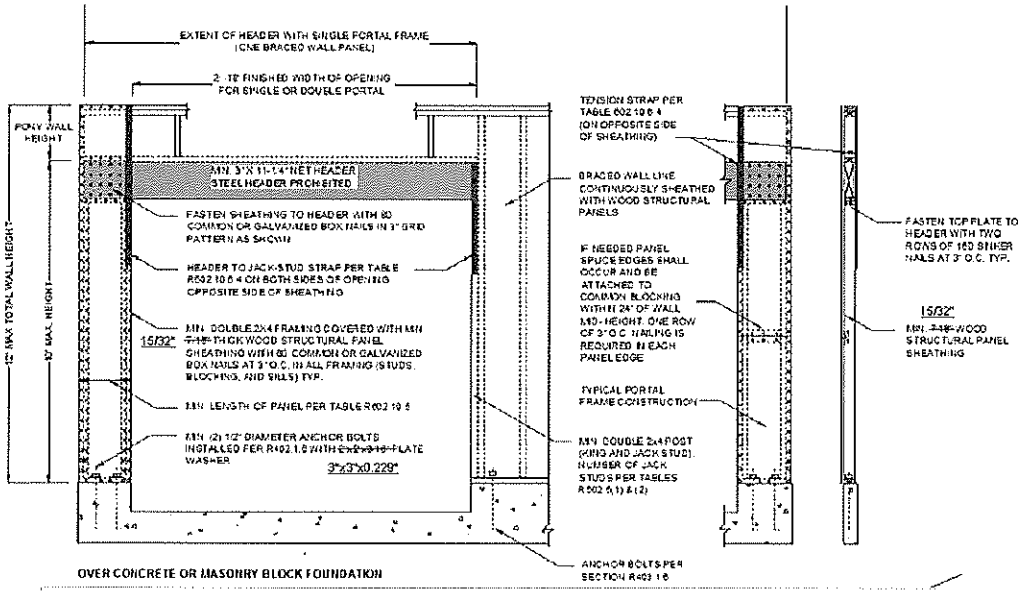
RATIONALE:

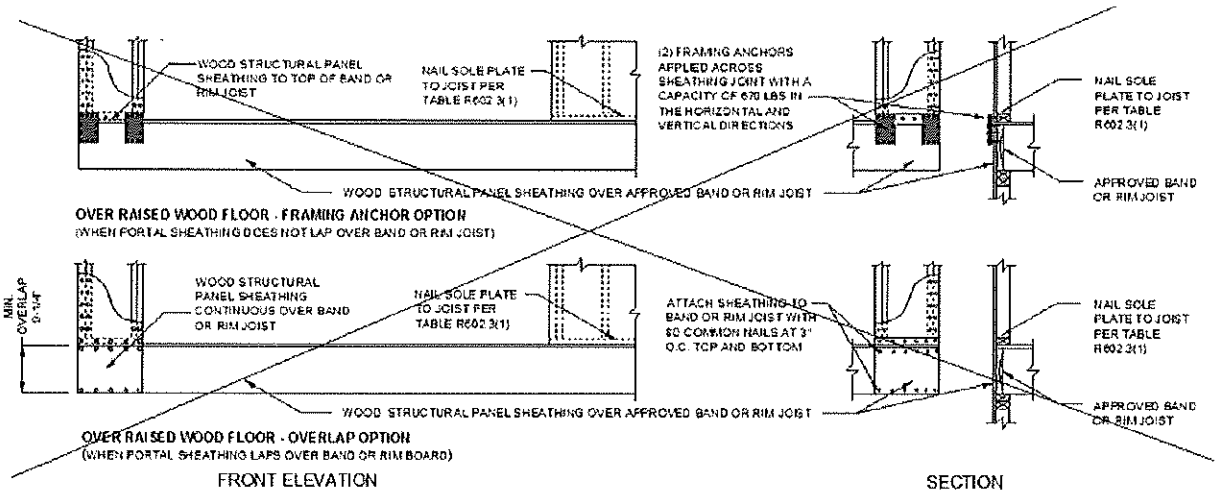
Plywood shear walls with high aspect ratio experienced many failures during the Northridge Earthquake. This proposed amendment specifies a minimum braced wall length to meet an aspect ratio consistent with other sections of the Residential Code as to provide a uniform standard of construction for designers and buildings to follow. This is intended to improve the performance level of buildings and structures that are subject to the higher seismic demands and reduce and limit potential damages to property. This proposed amendment reflects the recommendations by the Structural Engineers Association of Southern California (SEAOSC) Task Force that investigated the poor performance observed in 1994 Northridge Earthquake.

FINDINGS:

Local Geological Conditions – The greater Los Angeles region is a densely populated area having buildings and structures constructed over and near a vast array of fault systems capable of producing major earthquakes, including but not limited to the 1994 Northridge Earthquake. The proposed modification reduces the aspect ratio help to maintain minimum quality of construction and performance standards of structures and therefore need to be incorporated into the code to assure that new buildings and additions to existing buildings are designed and constructed in accordance with the scope and objectives of the California Residential Code.

Figure R602.10.6.4 of Chapter 6 of the California Residential Code is amended to read, as follows:





or SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

FIGURE R602.10.6.4
METHOD CS-PF-CONTINUOUSLY SHEATHED PORTAL FRAME PANEL CONSTRUCTION

RATIONALE:

3/8" thick 3 ply-plywood shear walls experienced many failures during the Northridge Earthquake. Box nails were observed to cause massive and multiple failures of the typical 3/8" thick 3-ply plywood during the Northridge Earthquake. This proposed amendment specifies minimum sheathing thickness, nail size and spacing so as to provide a uniform standard of construction for designers and buildings to follow. This is intended to improve the performance level of buildings and structures that are subject to the higher seismic demands and reduce and limit potential damages to property. This proposed amendment reflects the recommendations by the Structural Engineers Association of Southern California (SEAOSC)Task Force that investigated the poor performance observed in 1994 Northridge Earthquake.

FINDINGS:

Local Geological Conditions – The greater Los Angeles region is a densely populated area having buildings and structures constructed over and near a vast array of fault systems capable of producing major earthquakes, including but not limited to the 1994 Northridge Earthquake. The proposed modification requiring minimum sheathing thickness and nailing type and size will help to maintain minimum quality of construction and performance standards of structures and therefore need to be incorporated into the code to assure that new buildings and additions to existing buildings are designed and constructed in accordance with the scope and objectives of the California Residential Code.

Section R606.4.4 of Chapter 6 of the California Residential Code is amended to read, as follows:

R606.4.4 Parapet walls. Unreinforced solid masonry parapet walls shall not be used.

RATIONALE:

The use of unreinforced masonry parapets in Seismic Design Category D0, D1 and D2 and E is unsafe.

FINDINGS:

Local Geological Conditions – The greater Los Angeles region is a densely populated area having buildings and structures constructed over and near a vast array of fault systems capable of producing major earthquakes, including but not limited to the 1994 Northridge Earthquake. The proposed modification to not allow the use of unreinforced masonry is intended to prevent non-ductile failures and sudden structural collapses and therefore needs to be incorporated into the code to assure that new buildings and structures and additions or alterations to existing buildings or structures are designed and constructed in accordance with the scope and objectives of the California Residential Code.

Section R606.12.2.2.3 of Chapter 6 of the California Residential Code is amended to read, as follows:

R606.12.2.2.3 Reinforcement requirements for masonry elements. Masonry elements listed in Section R606.12.2.2.2 shall be reinforced in either the horizontal or vertical direction as shown in Figure R606.11(3) and in accordance with the following:

1. Horizontal reinforcement. Horizontal joint reinforcement shall consist of at least one No. 4 bar spaced not more than 48 inches. Horizontal reinforcement shall be provided within 16 inches of the top and bottom of these masonry elements.

2. Vertical reinforcement. Vertical reinforcement shall consist of at least one No. 4 bar spaced not more than 48 inches, Vertical reinforcement shall be within 8 inches of the ends of masonry walls.

RATIONALE:

Reinforcement using longitudinal wires for buildings and structures located in high seismic areas are deficient and not as ductile as deformed rebar. Having vertical reinforcement closer to the ends of masonry walls help to improve the seismic performance of masonry buildings and structures.

FINDINGS:

Local Geological Conditions – The greater Los Angeles region is a densely populated area having buildings and structures constructed over and near a vast array of fault systems capable of producing major earthquakes, including but not limited to the 1994 Northridge Earthquake. The proposed modification to increase reinforcements will ensure that the ductility requirements for buildings in high seismic region meet the intent of the code and limit potential property damages and therefore need to be incorporated into the code to assure that new buildings and structures and additions or alterations to existing buildings or structures are designed and constructed in accordance with the scope and objectives of the California Residential Code.

Exception of Section R602.3.2 and Table R602.3.2 of Chapter 6 of the California Residential Code is amended to read, as follows:

In Seismic Design Category D_0, D_1 and D_2 and E, a single top plate shall not be used.

RATIONALE:

To be consistent with seismic zones in Gardena

FINDINGS:

Local Geological Conditions – The greater Los Angeles region is a densely populated area having buildings and structures constructed over and near a vast array of fault systems capable of producing major earthquakes, including but not limited to the 1994 Northridge Earthquake. The proposed modification to increase reinforcements will ensure that ductility requirements for buildings in a high seismic region meet the intent of the code and limit potential property damages and therefore needs to be incorporated into the code to assure that new buildings and structures and additions or alterations to existing buildings or structures are designed and constructed in accordance with the scope and objectives of the California Residential Code.

Table R602.3.2 of Chapter 6 of the California Residential Code is deleted.

RATIONALE:

The cities and county of the Los Angeles region have taken extra measures to maintain the structural integrity of the framing of the shear wall system for buildings and structures subject to high seismic loads by eliminating single top plate construction. The performance of modern day braced wall panel construction is directly related to an adequate load path extending from the roof diaphragm to the foundation system. A single top plate is likely to be over nailed due to the nailing requirements at a rafter, stud, top plate splice, and braced wall panel edge in a single location. In addition, notching on a single top plate for plumbing, ventilation and electrical wiring may reduce the load transfer capacity of the plate without proper detailing. Majority of buildings and structures designed and built per the California Residential Code with a single top plate may not need structural observation and special inspections. The potential construction mistakes mentioned above could not be caught and corrected by knowledgeable engineers and inspectors, and could jeopardize structural performance of buildings and structures located in high seismic areas.

FINDINGS:

Local Geological Conditions – The greater Los Angeles region is a densely populated area having buildings and structures constructed over and near a vast array of fault systems capable of producing major earthquakes, including but not limited to the 1994 Northridge Earthquake. The proposed modification to eliminate the usage of a single top plate will help to maintain minimum quality of construction and performance standards of structures and therefore need to be incorporated into the code to assure that new buildings and structures and additions or alterations to existing buildings or structures are designed and constructed in accordance with the scope and objectives of the California Residential Code.

Section R803.2.4 is added to Chapter 8 of the California Residential Code to read, as follows:

R803.2.4 Openings in horizontal diaphragms. Openings in horizontal diaphragms shall conform with Section R503.2.4.

RATIONALE:

Section R802 of the Code does not provide any prescriptive criteria to limit the maximum roof opening size nor does Section R803 provide any details to address the issue of shear transfer near larger roof openings. With the higher seismic demand placed on buildings and structures in this region, it is important to ensure that a complete load path is provided to reduce or eliminate potential damages caused by seismic forces. Requiring blocking with metal ties around larger roof openings and limiting opening size is consistent with the requirements of Section R301.2.2.2.5.

FINDINGS:

Local Geological Conditions – The greater Los Angeles region is a densely populated area having buildings and structures constructed over and near a vast array of fault systems capable of producing major earthquakes, including but not limited to the 1994 Northridge Earthquake. The proposed modification to require specific detailing at large roof openings is intended to address the poor performance of roof diaphragms with openings and limit or reduce property damages during a seismic event and therefore needs to be incorporated into the code to assure that new buildings and structures and additions or alterations to existing buildings or structures are designed and constructed in accordance with the scope and objectives of the California Residential Code.

Section R806.1 of Chapter 8 of the California Residential Code to read, as follows:

R806.1 Ventilation required. Enclosed attics and enclosed rafter spaces formed where ceilings are applied directly to the underside of roof rafters shall have cross ventilation for each separate space by ventilating openings protected against the entrance of rain or snow. Ventilation openings shall have a least dimension of 1/16 inch minimum and 1/8 inch maximum. Ventilation openings having a least dimension larger than 1/4 inch shall be provided with corrosion resistant wire cloth screening, hardware cloth or similar non-combustible material with openings having a least dimension of 1/16 inch minimum and 1/8 inch maximum. Openings in roof framing members shall conform to the requirements of Section R802.7. Required openings shall open directly to the outside air.

RATIONALE:

Requirements preventing of the entry of birds, squirrels, rodents, snakes and other similar creatures is not clear in the code.

FINDINGS:

Local Geological Conditions – The City of Gardena is located near county storm water systems and the wetland preserve. The creeks and wetland areas harbor birds, squirrels, rodents, snakes and other similar creatures.

Section R902.1 of Chapter 9 of the California Residential Code is amended to read, as follows:

R902.1 Roofing covering materials. Roofs shall be covered with materials as set forth in Sections R904 and R905. A minimum Class B minimum roofing shall be installed for all new structures, additions and replacement roofing. Class B minimum roofing required by this section to be listed shall be tested in accordance with UL 790 or ASTM E 108. Where less than 50 percent of the roof covering is replaced within any one-year period, the new roof covering may be Class B minimum.

RATIONALE:

Requirements for roofing materials to have a Class-B fire rating for both new roof and re-roofing applications shall be Class-B Rating This is consistent with the recommendations of the Los Angeles County Fire Department, Cal Fire and The Insurance Institute on roofing fire safety. Roofs with a Class-B fire rating have proven more effective in resisting ignition from flying embers than a "C" rating.

FINDINGS:

Local Geological Conditions – The greater Los Angeles region is a densely populated and dense industrial area. The high density can allow fire to spread quickly from roof to roof. Gardena is located in a special wind zone as defined by the California Building Code. The jurisdiction of Gardena is located in a semi-arid Mediterranean type climate. It annually experiences extended periods of high temperatures with little or no precipitation. Hot, dry (Santa Ana) winds, which may reach speeds of 85 M.P.H. or greater.

CHAPTER 10 CHIMNEYS AND FIREPLACES of the 2016 Edition of the California Residential Code is deleted and a new Chapter 10 is added to read, as follows:

In accordance with SCAQMD's Rule 445:

Beginning March 9, 2009, permanent indoor and outdoor wood-burning devices (such as fireplaces and stoves) cannot be installed in *new developments*. However, open-hearth fireplaces with gas or alcohol fuel based log sets or other popular design features that do not use wood -- such as flames in river rock or broken glass -- are allowed.

As of September 2008, permanent indoor and outdoor wood-burning devices can only be sold or installed in existing homes and businesses if it meets one of these cleaner options:

Dedicated gaseous-fueled fireplace;

U.S. EPA certified fireplace insert or stove;

Pellet-fueled wood-burning heater; or

Masonry heater (not an open-hearth wood-burning fireplace).

RATIONALE:

The South Coast Air Quality Management District has the local authority to regulate the Clean Air Act including toxic and hazardous air emissions, and these regulations are enforced to control the ambient air quality standards. The SCAQMD Adopted March 7, 2008, RULE 445 entitled WOOD-BURNING DEVICES.

FINDINGS:

Local Geological Conditions – The greater Los Angeles region is regulated by the South Coast Air Quality Management District and we need make the requirements consistent.

Section AJ104 of APPENDIX J (EXISTING BUILDINGS AND STRUCTURES) of the California Residential Code is amended to read, as follows:

AJ104 Replacement windows. When replacing an existing window, the replacement window shall comply with the requirements of CRC section R310 and the 2016 CA Energy Code.

RATIONALE:

Emergency rescue and escape Window codes need to be consistent.

The dimensional criteria of the opening are intended to permit fire service personnel (in full protective clothing with breathing apparatus) to enter, as well as permit occupants to escape.

FINDINGS:

Due to the fire danger and the density of housing at this time fire personnel must have proper access to sleeping rooms. This section AJ104 of the code is not adopted by the state, Applicants are referring to this section. To be consistent with other sections of the code, we are referring them to R310.

Section A0103.3 of APPENDIX O of the California Residential Code is amended to read, as follows:

A0103.3 Vehicular gates or other barriers across required fire apparatus access roads. The installation of gates or other barriers across a

RATIONALE:

Emergency access codes need to be consistent. The dimensional criteria of the opening are intended to permit fire service equipment to enter the property and the change creates a consistency with other sections of the CBSC and a cross-reference to the 2016 California Fire Code Section 503.6, which has been adopted by reference through the adoption of the Los Angeles County Fire Code.

FINDINGS:
No statutory findings are required as this is a change to an Appendix

The definition of "Swimming Pool" in Section AV100.1 of APPENDIX V of the California Residential Code is amended to read, as follows:

SWIMMING POOL. Any structure intended for swimming or recreation bathing that contains water over 18 inches deep. This includes in-ground, above-ground and on-ground swimming pools, hot tubs, and spas.

RATIONALE:
The city does not regulate portable devices.

FINDINGS:
No statutory findings are required as this is a change to an Appendix chapter

Section AV100.3 is hereby amended by adding a section 6, as follows:

6. If such lot or premises upon which such pool is located is vacant or unoccupied, all gates or doors opening into the area where such pool is located shall be kept securely locked at all times during such vacancy or non-occupancy, whether such pool is empty or filled.

RATIONALE:
Life safety, as child drownings remain an issue in vacant and unoccupied premises.

FINDINGS:
No statutory findings are required as this is a change to an Appendix Chapter.

Amendment of Part 11, California Green Building Standards Code

Section A4.106.5, Table A4.106.5.1(1), Table A4.106.5.1(2), Table A4.106.5.1(3), and Table A4.106.5.1(4) of the California Green Building Standards Code are amended to read, as follows:

A4.106.5 Cool roof for reduction of heat island effect. Roofing materials for buildings in Gardena shall comply with this section:

Exceptions:

1. Roof constructions that have a thermal mass over the roof membrane including areas of vegetated (green) roofs, weighing at least 25 lbs/sf.

2. Roof areas covered by building integrated solar photovoltaic panels and building integrated solar thermal panels.

TABLE A4.106.5.1(1)
TIER 1 – LOW-RISE RESIDENTIAL

ROOF SLOPE	~~CLIMATE ZONE~~	MINIMUM 3-YEAR AGED SOLAR REFLECTANCE	THERMAL EMITTANCE	SRI
≤ 2:12	~~13 & 15~~	0.63	0.75	75
> 2:12	~~10 15~~	0.20	0.75	16

TABLE A4.106.5.1(2)
TIER 2 – LOW-RISE RESIDENTIAL

ROOF SLOPE	~~CLIMATE ZONE~~	MINIMUM 3-YEAR AGED SOLAR REFLECTANCE	THERMAL EMITTANCE	SRI
≤ 2:12	~~2, 4, 6 15~~	~~0.65~~0.68	85	~~78~~82
> 2:12	~~2, 4, 6 15~~	~~0.23~~0.28	85	~~20~~27

TABLE A4.106.5.1(3)
TIER 1 – HIGH-RISE RESIDENTIAL BUILDINGS, HOTELS, AND MOTELS

ROOF SLOPE	~~CLIMATE ZONE~~	MINIMUM 3-YEAR AGED SOLAR REFLECTANCE	THERMAL EMITTANCE	SRI
≤ 2:12	~~9, 10, 11, 13, 14, 15~~	~~0.55~~0.63	0.75	~~64~~75
> 2:12	~~2 15~~	0.20	0.75	16

TABLE A4.106.5.1(4)
TIER 2 – HIGH-RISE RESIDENTIAL BUILDINGS, HOTELS, AND MOTELS

ROOF SLOPE	~~CLIMATE ZONE~~	MINIMUM 3-YEAR AGED SOLAR REFLECTANCE	THERMAL EMITTANCE	SRI
≤ 2:12	~~2 15~~	~~0.65~~0.68	~~0.75~~0.85	~~78~~82
> 2:12	~~2 15~~	~~0.23~~0.28	~~0.75~~0.85	~~20~~27

RATIONALE:

Tables A4.106.5.1.1, A4.106.5.1.2, A4.106.5.1.3 and A4.106.5.1.4 are indicating new values for Cool roof rating. These new values for cool roof rating are higher than the standards being proposed by the California Energy Commission and have been shown to be cost-effective through studies previously conducted. Research has shown that the greater Los Angeles region suffers from heat island with the temperature having increased as the region became more urban. The higher temperatures are closely related to air pollution. Additionally, raising temperatures increase the overall and peak energy consumption for cooling creating additional air pollution from the increased power production.

FINDINGS:

Local Environmental Condition – This amendment is necessary on the basis of a local environmental condition. The City of Gardena is a densely populated area where a large percentage of building stocks are existing residential buildings. Existing dwellings have been estimated to account for up to 40% of greenhouse gas emissions. This amendment offset this impact on the communities by requiring addition or alteration to existing dwellings to comply with the CALGreen Code. Any dwellings that require a permit to be issued will be required to comply with only those sections that are relevant to the scope of work and thereby begin to contribute to improving the environment. This amendment established more restrictive green building standards for improving the environment and therefore need to be incorporated into the code to assure that new buildings and structures and additions or alterations to existing buildings or structures are designed and constructed in accordance with the scope and objectives of the California Green Building Standards Code.

Section A4.303.4 of the California Green Building Standards Code is amended to read, as follows:

A4.303.4 Non-water supplied urinals. Non-water supplied urinals are installed throughout the scope of the permit or comply with Sections 1101.1 thru 1101.8 of the California Civil Code, whichever is the most restrictive. Where approved, hybrid urinals, as defined in Chapter 2, shall be considered waterless urinals.

RATIONALE:

Hybrid toilets are not clearly defined by the code. Non-water supplied urinals are allowed in some codes in CA and not in others. To be consistent Hybrid urinals are to be considered Non-water supplied urinals.

FINDINGS:

No findings are required as this is a change to an Appendix Chapter

Section A4.407.1 of the California Green Building Standards Code is amended to read, as follows:

A4.407.1 Drainage around foundations. Install foundation and landscape drains which discharge to a dry well, sump, bioswale or other approved on-site location except when not required by other state codes.

RATIONALE:

To comply with the Federal and State Clean Water Acts, water retention and filtering onsite is now required. Based on Guidelines from the LA County Stormwater districts the best method or keeping the Streams, rivers and beaches clean is onsite retention and filtering. Best Management practices are the best way to keep the streams, rivers and beaches clean.

FINDINGS:

No findings are required as this is a change to an Appendix Chapter.

SECTION 2. The General Services Department shall file copies of Resolution No. 6309 and Ordinance No. 1791 with the California Building Standards Commission, as required by Health and Safety Code Section 17958.7.

SECTION 3. The City Clerk shall certify to the passage and adoption of this resolution; shall cause the same to be entered among the original resolutions of said City; and shall make a minute of the passage and adoption thereof in the records of the proceedings of the City Council of said City in the minutes of the meeting at which the same is passed and adopted.

SECTION 4. This resolution shall be effective immediately.

Passed, approved, and adopted this 27th day of March, 2018.

TASHA CERDA, Mayor

ATTEST:

MINA SEMENZA, City Clerk

APPROVED AS TO FORM:

PETER L. WALLIN, City Attorney

STATE OF CALIFORNIA)
COUNTY OF LOS ANGELES) SS:
CITY OF GARDENA)

I, MINA SEMENZA, City Clerk of the City of Gardena, do hereby certify that the whole number of members of the City Council of said City is five; that the foregoing Resolution, being **Resolution No. 6309** duly passed and adopted by the City Council of said City of Gardena, approved and signed by the Mayor of said City, and attested by the City Clerk, all at a regular meeting of said City Council held on the **27th** day of **March, 2018,** and that the same was so passed and adopted by the following roll call vote:

AYES: MAYOR PRO TEM MEDINA, COUNCIL MEMBERS KASKANIAN, HENDERSON, AND TANAKA AND MAYOR CERDA

NOES: NONE

ABSENT: NONE

Becky Romero
for City Clerk of the City of Gardena, California

(SEAL)