# 45-DAY EXPRESS TERMS
# FOR
# PROPOSED BUILDING STANDARDS
# OF THE
# OFFICE OF STATEWIDE HEALTH PLANNING AND DEVELOPMENT (OSHPD)
# REGARDING PROPOSED CHANGES TO
# THE CALIFORNIA ADMINISTRATIVE CODE
# AND
# THE CALIFORNIA BUILDING CODE
# CALIFORNIA CODE OF REGULATIONS, TITLE 24, PART 2, VOLUMES 1 & 2

The Office of Statewide Health Planning and Development (OSHPD) proposes to adopt the 2009 edition of the International Building Code of International Code Council for codification and effectiveness in the 2010 edition of the California Building Code as presented on the following pages, including any necessary amendments. OSHPD further proposes to:

- Adopt new building standards that are not addressed by the 2009 model code proposed for adoption.
- Adopt new necessary amendments to the 2009 model code proposed for adoption.
- Relocate existing adopted and necessary amendments of the current model code into the format of the 2009 model code proposed for adoption. These amendments with editorial changes only are outside the rulemaking and are not subject to public comments. All amendments shown highlighted are existing and are not part of the rulemaking.

**LEGEND FOR EXPRESS TERMS**

1. Model code text: All International Building Code (IBC) text is shown in regular type face.
2. Existing California amendments: All such language appears in *italics.*
3. Code language being modified: All such language appears in *italics and underlined*.
4. Repealed text: Repeal of 2009 IBC language appears in ~~strikeout~~.
5. Existing deletion: IBC model code language that was deleted in the 2007 Triennial Code Adoption Cycle is shown for clarity only. This language appears in ~~strikeout and highlight~~.
6. Existing amendments in 2007 CBC, Chapter 19A: Existing amendments in Sections 1903A through 1908A of the 2007 CBC which are *underlined and italicized* appear in *underline, italics and highlight*. Deletion of existing amendments in Sections 1903A through 1908A appears in ~~*italics, strikeout, and highlight.*~~
7. Instructions: Text which are instructions only that are not amendments and will not be printed appears in blue highlight .

**Note:**
Following each chapter of the proposed regulations is a notation that cites specific statute(s) that authorizes the adoption of these regulations and statute that allows for regulations to clarify the subject matter being implemented, interpreted or made specific by the authority statute(s).

**CHAPTER 1**
**SCOPE AND ADMINISTRATION**
***DIVISION II***

**PART 1 – SCOPE AND APPLICATION**

**SECTION 101**
**GENERAL**

**101.1 Title.** These regulations shall be known as the *California Building Code* of *the State of California*, hereinafter referred to as "this code."

**…**

**101.4.6 Energy.** The provisions of the *California Energy Code, Title 24 Part 6* shall apply to all matters governing the design and construction of buildings for energy efficiency.

***Exception: [OSHPD 1, 2, & 4]*** *Not required by OSHPD.*

**SECTION 102**
**APPLICABILITY**

**102.1 General.** Where there is a conflict between a general requirement and a specific requirement, the specific requirement shall be applicable. Where, in any specific case, different sections of this code specify different materials, methods of construction or other requirements, the most restrictive shall govern.

***102.1.1 Additional Requirements. [OSHPD 1, 2, 3, & 4]*** *See ~~Chapter 1~~ Section ~~110.7~~ 1.1.7.*

**…**

**102.4 Referenced codes and standards.** The codes and standards referenced in this code shall be considered part of the requirements of this code to the prescribed extent of each such reference. Where differences occur between provisions of this code and referenced codes and standards, the provisions of this code shall apply.

***102.4.1 Code References. [OSHPD 1, 2, 3, & 4]*** *All reference to International Codes or other similar codes in referenced standards shall be replaced by equivalent provisions in the California Building Standard Codes.*

***102.4.2 Reference in Standards. [OSHPD 1, 2, 3, & 4]*** *All references listed in reference standards shall be replaced by referenced standards listed in Chapter 35 of this code, where applicable, and shall include all amendments to the reference standards in this code.*

**…**

**PART 2—ADMINISTRATION AND ENFORCEMENT**

**SECTION 103**
**DEPARTMENT OF BUILDING SAFETY**

**103.1 Creation of enforcement agency.** The Department of Building Safety is hereby created and the official in charge thereof shall be known as the *building official*.

**…**

**SECTION 104**
**DUTIES AND POWERS OF BUILDING OFFICIAL**

**104.1 General.** The *building official* is hereby authorized and directed to enforce the provisions of this code. The *building official* shall have the authority to render interpretations of this code and to adopt policies and procedures in order to clarify the application of its provisions. Such interpretations, policies and procedures shall be in compliance with the intent and purpose of this code. Such policies and procedures shall not have the effect of waiving requirements specifically provided for in this code.

**…**

**104.11 Alternative materials, design and methods of construction and equipment.** The provisions of this code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by this code, provided that any such alternative has been approved. An alternative material, design or method of construction shall be approved where the building official finds that the proposed design is satisfactory and complies with the intent of the provisions of this code, and that the material, method or work offered is, for the purpose intended, at least the equivalent of that prescribed in this code in quality, strength, effectiveness, fire resistance, durability and safety.

**104.11.1 Research reports.** Supporting data, where necessary to assist in the approval of materials or assemblies not specifically provided for in this code, shall consist of valid research reports from approved sources.

**104.11.2 Tests.** Whenever there is insufficient evidence of compliance with the provisions of this code, or evidence that a material or method does not conform to the requirements of this code, or in order to substantiate claims for alternative materials or methods, the building official shall have the authority to require tests as evidence of compliance to be made at no expense to the jurisdiction. Test methods shall be as specified in this code or by other recognized test standards. In the absence of recognized and accepted test methods, the building official shall approve the testing procedures. Tests shall be performed by an approved agency. Reports of such tests shall be retained by the building official for the period required for retention of public records.

***104.11.3 Peer Review. [OSHPD 1 & 4]*** *When peer review is required, it shall be performed pursuant to Section 3414A.*

***104.11.4 Earthquake monitoring instruments. [OSHPD 1 & 4]*** *The enforcement agency may require earthquake monitoring instruments for any building that receives approval of an alternative system for the Lateral Force Resisting System (LFRS). There shall be a sufficient number of instruments to characterize the response of the building during an earthquake and shall include at least one tri-axial free field instrument or equivalent. A proposal for instrumentation and equipment specifications shall be forwarded to the enforcement agency for review and approval. The Owner of the building shall be responsible for the implementation of the instrumentation program. Maintenance of the instrumentation and removal/processing of the records shall be the responsibility of the enforcement agency or its designated agent.*

## SECTION 105
## PERMITS

**105.1 Required.** Any owner or authorized agent who intends to construct, enlarge, alter, repair, move, demolish, or change the occupancy of a building or structure, or to erect, install, enlarge, alter, repair, remove, convert or replace any electrical, gas, mechanical or plumbing system, the installation of which is regulated by this code, or to cause any such work to be done, shall first make application to the *building official* and obtain the required *permit*.

**…**

**105.3.2 Time limitation of application.** An application for a permit for any proposed work shall be deemed to have been abandoned 180 days after the date of filing, unless such application has been pursued in good faith or a permit has been issued; except that the building official is authorized to grant one or more extensions of time for additional periods not exceeding 90 days each. The extension shall be requested in writing and justifiable cause demonstrated. *[OSHPD 1, 2, & 4] Time limitation shall be in accordance with Title 24, Part 1, Chapter 7, Section 7-129.*

…

## SECTION 106
## FLOOR AND ROOF DESIGN LOADS

**106.1 Live loads posted.** Where the live loads for which each floor or portion thereof of a commercial or industrial building is or has been designed to exceed 50 psf (2.40 kN/m2), such design live loads shall be conspicuously posted by the owner in that part of each *story* in which they apply, using durable signs. It shall be unlawful to remove or deface such notices.

> ***106.1.1*** ~~***1603A.3.1***~~ ***Snow Load Posting. [OSHPD 1, 2, 3, & 4]*** *Snow loads used in design shall be posted as for live loads.*
>
> ***106.1.2*** ~~***1603A.3.2***~~ ***Load Posting Responsibility****.* ***[OSHPD 1, 2, & 4]*** *The* ~~*hospital*~~ *owner or* ~~*hospital*~~ *governing board shall be responsible for keeping the actual load below the allowable limits.*

**106.2 Issuance of certificate of occupancy.** A certificate of occupancy required by Section 111 shall not be issued until the floor load signs, required by Section 106.1, have been installed.

**106.3 Restrictions on loading.** It shall be unlawful to place, or cause or *permit* to be placed, on any floor or roof of a building, structure or portion thereof, a load greater than is permitted by this code.

## SECTION 107
## SUBMITTAL DOCUMENTS

**107.1 General.** Submittal documents consisting of *construction documents*, statement of *special inspections*, geotechnical report and other data shall be submitted in two or more sets with each *permit* application. The *construction documents* shall be prepared by a *registered design professional* where required by the statutes of the jurisdiction in which the project is to be constructed. Where special conditions exist, the *building official* is authorized to require additional *construction documents* to be prepared by a *registered design professional*.

> **Exception:** The *building official* is authorized to waive the submission of *construction documents* and other data not required to be prepared by a *registered design professional* if it is found that the nature of the work applied for is such that review of *construction documents* is not necessary to obtain compliance with this code.

**107.2 Construction documents.** *Construction documents* shall be in accordance with Sections 107.2.1 through 107.2.5.

…

**107.3.4.2 Deferred submittals.** For the purposes of this section, deferred submittals are defined as those portions of the design that are not submitted at the time of the application and that are to be submitted to the *building official* within a specified period.

Deferral of any submittal items shall have the prior approval of the *building official*. The *registered design professional in responsible charge* shall list the deferred submittals on the *construction documents* for review by the *building official*. Documents for deferred submittal items shall be submitted to the *registered design professional in responsible charge* who shall review them and forward them to the *building official* with a notation indicating that the deferred submittal documents have been reviewed and been found to be in general conformance to the design of the building. The deferred submittal items shall not be installed until the deferred submittal documents have been *approved* by the *building official*. *[OSHPD 1, 2, & 4] Deferred submittals shall be in accordance with Title 24, Part 1, Chapter 7, Section 7-126.*

**107.4 Amended construction documents.** Work shall be installed in accordance with the *approved construction documents*, and any changes made during construction that are not in compliance with the *approved construction documents* shall be resubmitted for approval as an amended set of *construction documents*. *[OSHPD 1, 2, & 4] Change in the work ~~orders~~ shall be in accordance with Title 24, Part 1, Chapter 7, Section 7-153.*

**...**

*(All existing amendments that are not revised above shall continue without any change)*

***Notation:***
*Authority: Health and Safety Code Section 129850*
*Reference: Health and Safety Code Sections 1275, 129850 and 129790*

## CHAPTER 14
## EXTERIOR WALLS

### SECTION 1401
### GENERAL

**1401.1 Scope.** The provisions of this chapter shall establish the minimum requirements for exterior walls; *exterior wall* coverings; *exterior wall* openings; exterior windows and doors; architectural *trim*; balconies and similar projections; and bay and oriel windows.

**…**

### SECTION 1403
### PERFORMANCE REQUIREMENTS

**1403.1 General.** The provisions of this section shall apply to exterior walls, wall coverings and components thereof.

**1403.2 Weather protection.** Exterior walls shall provide the building with a weather-resistant *exterior wall envelope*. The *exterior wall envelope* shall include flashing, as described in Section 1405.4. The *exterior wall envelope* shall be designed and constructed in such a manner as to prevent the accumulation of water within the wall assembly by providing a *water-resistive barrier* behind the exterior veneer, as described in Section 1404.2, and a means for draining water that enters the assembly to the exterior. Protection against condensation in the *exterior wall* assembly shall be provided in accordance with Section 1405.4.

**Exceptions:**

1. A weather-resistant *exterior wall envelope* shall not be required over concrete or masonry walls designed in accordance with Chapters 19 and 21, respectively.

2. Compliance with the requirements for a means of drainage, and the requirements of Sections 1404.2 and 1405.4, shall not be required for an *exterior wall envelope* that has been demonstrated through testing to resist wind-driven rain, including joints, penetrations and intersections with dissimilar materials, in accordance with ASTM E 331 under the following conditions:

   2.1. *Exterior wall envelope* test assemblies shall include at least one opening, one control joint, one wall/eave interface and one wall sill. All tested openings and penetrations shall be representative of the intended end-use configuration.

   2.2. *Exterior wall envelope* test assemblies shall be at least 4 feet by 8 feet (1219 mm by 2438 mm) in size.

   2.3. *Exterior wall envelope* assemblies shall be tested at a minimum differential pressure of 6.24 pounds per square foot (psf) (0.297 kN/m2).

   2.4. *Exterior wall* envelope assemblies shall be subjected to a minimum test exposure duration of 2 hours.

   The *exterior wall envelope* design shall be considered to resist wind-driven rain where the results of testing indicate that water did not penetrate control joints in the *exterior wall* envelope, joints at the perimeter of openings or intersections of terminations with dissimilar materials.

3. Exterior insulation and finish systems (EIFS) complying with Section 1408.4.1.

~~*3. [OSHPD 1, 2, & 4]: OSHPD regulated facilities are exempt from requirements of Title 24, Part 6.*~~

**…**

**SECTION 1405**
**INSTALLATION OF WALL COVERINGS**

**1405.1 General.** *Exterior wall coverings* shall be designed and constructed in accordance with the applicable provisions of this section.

***1405.1.1 Additional requirements. [OSHPD 1, 2, and 4]*** *In addition to the requirements of Sections ~~1405.5,~~ 1405.6, 1405.7, 1405.8, 1405.9, and 1405.10, the installation of anchored or adhered veneer shall comply with applicable provisions of Section 1409. ~~1408.~~*

**…**

***SECTION 1409 ~~1408~~ [OSHPD 1, 2, AND 4]***

***ADDITIONAL REQUIREMENTS FOR ANCHORED AND ADHERED VENEER.***

***1409.1 ~~1408.1~~ General.*** *In no case shall veneer be considered as part of the backing in computing strength or deflection nor shall it be considered a part of the required thickness of the backing.*

*Veneer shall be anchored in a manner which will not allow relative movement between the veneer and the wall.*

*Anchored or adhered veneer shall not be used on overhead horizontal surfaces.*

***1409.2 ~~1408.2~~ Adhered Veneer.*** *Units of tile, masonry, stone or terra cotta which exceed 5/8 inch (16 mm) in thickness shall be applied as for anchored veneer where used over exit ways or more than 20 feet (6096 mm) in height above adjacent ground elevation.*

***1409.2.1 ~~1408.2.1~~ Bond Strength and Tests.*** *Veneer shall develop a bond to the backing in accordance with TMS 402 ~~ACI 530~~, Section 6.3.2.4.*

*Not less than two shear tests shall be performed for the adhered veneer between the units and the supporting element. At least one shear test shall be performed at each building for each 5,000 square feet (465 $m^2$) of floor area or fraction thereof.*

***~~1408.3 Inspection. All veneer shall be inspected per Section 1704A.5.1.~~***

*(All existing amendments that are not revised above shall continue without any change)*

***Notation [OSHPD]:***
*Authority: Health and Safety Code Section 129850*
*Reference: Health and Safety Code Sections 1275, 129850 and 129790*

## CHAPTER 15
## ROOF ASSEMBLIES AND ROOFTOP STRUCTURES

### SECTION 1501
### GENERAL

**1501.1 Scope.** The provisions of this chapter shall govern the design, materials, construction and quality of roof assemblies, and rooftop structures.

**...**

### SECTION 1507
### REQUIREMENTS FOR ROOF COVERINGS

**1507.1 Scope.** Roof coverings shall be applied in accordance with the applicable provisions of this section and the manufacturer's installation instructions.

**...**

**1507.3 Clay and concrete tile.** The installation of clay and concrete tile shall comply with the provisions of this section.

**...**

**1507.3.6 Fasteners.** Tile fasteners shall be corrosion resistant and not less than 11 gage, 5/16-inch (8.0 mm) head, and of sufficient length to penetrate the deck a minimum of ¾ inch (19.1 mm) or through the thickness of the deck, whichever is less. Attaching wire for clay or concrete tile shall not be smaller than 0.083 inch (2.1 mm). Perimeter fastening areas include three tile courses but not less than 36 inches (914 mm) from either side of hips or ridges and edges of eaves and gable rakes.

**1507.3.7 Attachment.** Clay and concrete roof tiles shall be fastened in accordance with Table 1507.3.7.

**TABLE 1507.3.7 - CLAY AND CONCRETE TILE ATTACHMENT [a, b, c]**

| GENERAL — CLAY OR CONCRETE ROOF TILE | | | |
|---|---|---|---|
| **Maximum basic wind speed (mph)** | **Mean roof height (feet)** | **Roof slope up to < 3:12** | **Roof slope 3:12 and over** |
| 85 | 0-60 | One fastener per tile. Flat tile without vertical laps, two fasteners per tile. | Two fasteners per tile. Only one fastener on slopes of 7:12 and less for tiles with installed weight exceeding 7.5 lbs./sq. ft. having a width no greater than 16 inches. |
| 100 | 0-40 | | |
| 100 | > 40-60 | The head of all tiles shall be nailed. The nose of all eave tiles shall be fastened with approved clips. All rake tiles shall be nailed with two nails. The nose of all ridge, hip and rake tiles shall be set in a bead of roofer's mastic. | |
| 110 | 0-60 | The fastening system shall resist the wind forces in Section 1609.5.2. | |
| 120 | 0-60 | The fastening system shall resist the wind forces in Section 1609.5.2. | |
| 130 | 0-60 | The fastening system shall resist the wind forces in Section 1609.5.2. | |
| All | > 60 | The fastening system shall resist the wind forces in Section 1609.5.2. | |

| INTERLOCKING CLAY OR CONCRETE ROOF TILE WITH PROJECTING ANCHOR LUGS[d, e] (Installations on spaced/solid sheathing with battens or spaced sheathing) | | | | |
|---|---|---|---|---|
| **Maximum basic** | **Mean roof height** | **Roof slope up to < 5:12** | **Roof slope 5:12 < 12:12** | **Roof slope 12:12 and over** |

| wind speed (mph) | (feet) | | | |
|---|---|---|---|---|
| 85 | 0-60 | Fasteners are not required. Tiles with installed weight less than 9 lbs./sq. ft. require a minimum of one fastener per tile. | One fastener per tile every other row. All perimeter tiles require one fastener. Tiles with installed weight less than 9 lbs./sq. ft. require a minimum of one fastener per tile. | One fastener required for every tile. Tiles with installed weight less than 9 lbs./sq. ft. require a minimum of one fastener per tile. |
| 100 | 0-40 | | | |
| 100 | > 40-60 | The head of all tiles shall be nailed. The nose of all eave tiles shall be fastened with approved clips. All rake tiles shall be nailed with two nails The nose of all ridge, hip and rake tiles shall be set in a bead of roofers's mastic. | | |
| 110 | 0-60 | The fastening system shall resist the wind forces in Section 1609.5.2. | | |
| 120 | 0-60 | The fastening system shall resist the wind forces in Section 1609.5.2. | | |
| 130 | 0-60 | The fastening system shall resist the wind forces in Section 1609.5.2. | | |
| All | > 60 | The fastening system shall resist the wind forces in Section 1609.5.2. | | |
| **INTERLOCKING CLAY OR CONCRETE ROOF TILE WITH PROJECTING ANCHOR LUGS (Installations on solid sheathing without battens)** | | | | |
| **Maximum basic wind speed (mph)** | **Mean roof height (feet)** | | **All roof slopes** | |
| 85 | 0-60 | One fastener per tile. | | |
| 100 | 0-40 | One fastener per tile. | | |
| 100 | > 40-60 | The head of all tiles shall be nailed. The nose of all eave tiles shall be fastened with approved clips. All rake tiles shall be nailed with two nails The nose of all ridge, hip and rake tiles shall be set in a bead of roofer's mastic. | | |
| 110 | 0-60 | The fastening system shall resist the wind forces in Section 1609.5.2. | | |
| 120 | 0-60 | The fastening system shall resist the wind forces in Section 1609.5.2. | | |
| 130 | 0-60 | The fastening system shall resist the wind forces in Section 1609.5.2. | | |
| All | > 60 | The fastening system shall resist the wind forces in Section 1609.5.2. | | |
| | | | | |

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 mile per hour = 0.447 m/s, 1 pound per square foot = 4.882 kg/m$^2$.

a. Minimum fastener size. Corrosion-resistant nails not less than No. 11 gage with $^5/_{16}$-inch head. Fasteners shall be long enough to penetrate into the sheathing 0.75 inch or through the thickness of the sheathing, whichever is less. Attaching wire for clay and concrete tile shall not be smaller than 0.083 inch.

b. Snow areas. A minimum of two fasteners per tile are required or battens and one fastener.

c. Roof slopes greater than 24:12. The nose of all tiles shall be securely fastened.

d. Horizontal battens. Battens shall be not less than 1inch by 2 inch nominal. Provisions shall be made for drainage by a minimum of $^1/_8$-inch riser at each nail or by 4-foot-long battens with at least a 0.5-inch separation between battens. Horizontal battens are required for slopes over 7:12.

e. Perimeter fastening areas include three tile courses but not less than 36 inches from either side of hips or ridges and edges of eaves and gable rakes.

**...**

***1507.3.10 Additional requirements. [OSHPD 1, 2, and 4]*** *In addition to the requirements of 1507.3.6 and 1507.3.7, the installation of clay and concrete tile roof coverings shall comply with seismic anchorage provisions of Section 1511.*

**…**

**1507.7 Slate shingles.** The installation of slate shingles shall comply with the provisions of this section.

**…**

***1507.7.8*** ~~***1507.7.7***~~ ***Additional requirements. [OSHPD 1, 2, and 4]*** *In addition to the requirements of Sections 1507.3.6 and 1507.3.7, the installation of slate shingle roof coverings shall comply with seismic anchorage provisions of Section 1511.*

**…**

***SECTION 1511 [OSHPD 1, 2, AND 4]***
***SEISMIC ANCHORAGE OF SLATE SHINGLE, CLAY AND CONCRETE TILE ROOF COVERINGS***

***1511.1 Fasteners****. Nails shall be long enough to penetrate into the sheathing 3/4 inch (19 mm). Where sheathing is less than 3/4 inch (19 mm) in thickness, nails shall be driven into supports, unless nails with ring shanks are used.*

*All fasteners shall be corrosion resistant and fabricated of copper, stainless steel, or brass, or shall have a hot dipped galvanized coating not less than 1.0 ounce of zinc per square foot (305 gm/m$^2$).*

*Nails for slate shingles and clay or concrete tile shall be copper, brass or stainless steel with gage and length per common ferrous nails.*

***1511.2 Wire.*** *Wire for attaching slate shingles and clay or concrete tile shall be copper, brass or stainless steel capable of supporting four times the weight of tile.*

*Wire supporting a single tile or shingle shall not be smaller than 1/16 inch (1.6 mm) in diameter. Continuous wire ties supporting more than one tile shall not be smaller than 0.084 inch (2 mm) in diameter.*

***1511.3 Metal strips.*** *Metal strips for attaching slate shingles and clay or concrete tile shall be copper, brass or stainless steel capable of supporting four times the weight of tile.*

***1511.4 Clay or Concrete Tiles.*** *Clay or concrete tile shall be installed in accordance with Table 1507.3.7 and as described herein.*

1. *On wood roofs or roofs of other material to which wood strips are secured, every cover or top tile when fastened with nails shall be nailed directly into 1-1/4 inches (32 mm) sound grain soft wood strips of sufficient height to support the tile.*

   *Pan or bottom tiles shall be nailed directly to the roof sheathing or to wood strips. Wood strips shall be secured to the roof by nails spaced not over 12 inches (305 mm) apart.*

2. *On concrete roofs, wires shall be secured in place by wire loops embedded into the concrete not less than 2 inches (51 mm). The wire loops shall be spaced not more than 36 inches (914 mm) on center parallel to the eaves, and spaced vertically to allow for the minimum 3 inches (76 mm) lapping of the tile.*

3. *Where continuous ties of twisted wire, interlocking wires or metal strips extending from the ridge to eave are used to attach tile, the ties shall be attached to the roof construction at the ridge, eave, and at intervals not exceeding 10 feet 0 inch (3048 mm) on center. The ties within 2 feet 0 inch (610 mm) of the rake shall be attached at intervals of 5 feet 0 inch (1524 mm).*

   *Attachment for continuous ties shall be nails, screws, staples or approved clips of the same material as the ties and shall not be subjected to withdrawal forces. Attachments for continuous ties*

*shall have an allowable working stress shear resistance of not less than twice the dead weight of the tile tributary to the attachment, but not less than 300 pounds (136 kg).*

4. *Tile with projecting anchor lugs at the bottom of the tiles shall be held in position by means of 1-inch by 2-inch (25mm by 51mm) wood stripping nailed to the roof sheathing over the underlay.*

5. *Clay or concrete tile on roofs with slopes exceeding 24 units vertical in 12 units horizontal (200% slope) shall be attached as required for veneer in Chapter 14. The nose of all tiles shall be securely fastened.*

6. *Clay or concrete tile shall have a minimum of two fasteners per tile. Tiles that are 8 inches (203 mm) in width or less are permitted to be fastened at the center of the head with one fastener per tile.*

7. *Interlocking clay or concrete tile shall have a minimum of one nail near center of head or two wire ties per tile.*

***1511.5 Slate Shingles.*** *Slate shingles on roofs with slopes exceeding 24 units vertical in 12 units horizontal (200% slope) shall be attached as required for veneer per Chapter 14.*

~~***1511.6 Alternative Design.*** *An alternative design of the fastening system used to resist seismic loads is permitted, provided that an engineering analysis or test report based on cyclic testing is provided to the enforcement agency.*~~

~~*The fastening system shall be designed to resist seismic forces per ASCE 7, Section 13.3. Testing of alternative fastening system shall comply with ASCE 7, Section 13.2.5.*~~

*(All existing amendments that are not revised above shall continue without any change)*

***Notation:***
*Authority: Health and Safety Code Section 129850*
*Reference: Health and Safety Code Sections 1275, 129850 and 129790*

## CHAPTER 16
## STRUCTURAL DESIGN

### SECTION 1601
### GENERAL

**1601.1 Scope.** The provisions of this chapter shall govern the structural design of buildings, structures and portions thereof regulated by this code.

***1601.2 References. [OSHPD 2]*** *All referenced codes and standards listed in Chapter 35 shall include all the modifications contained in this code to referenced standards. In the event of any discrepancy between this code and a referenced standard, refer to Section 101A.7.*

***1601.3 Enforcement Agency Approval. [OSHPD 2]*** *In addition to requirements of CCR Title 24, Parts 1 & 2, any aspect of project design, construction, quality assurance, or quality control programs for which this code requires approval by the design professional, are also subject to approval by the enforcement agency.*

### SECTION 1602
### DEFINITIONS AND NOTATIONS

**1602.1 Definitions.** The following words and terms shall, for the purposes of this chapter, have the meanings shown herein.

**...**

***ENFORCEMENT AGENT. [OSHPD 2]*** *That individual within the agency or organization charged with responsibility for agency or organization compliance with the requirements of this Code. Used interchangeably with Building Official or Code Official.*

**...**

### SECTION 1603
### CONSTRUCTION DOCUMENTS

**1603.1 General.** Construction documents shall show the size, section and relative locations of structural members with floor levels, column centers and offsets dimensioned. The design loads and other information pertinent to the structural design required by Sections 1603.1.1 through 1603.1.8 shall be indicated on the construction documents.

***[OSHPD 2]*** *Additional requirements are included in Section 7-115 and 7-125 of the California ~~Building Standards~~ Administration Code (Part 1, Title 24, C.C.R).*

**...**

### SECTION 1605
### LOAD COMBINATIONS

**1605.1 General.** Buildings and other structures and portions thereof shall be designed to resist the load combinations specified in Section 1605.2 or 1605.3 and Chapters 18 through 23, and the special seismic load combinations of Section 1605.4 where required by Section 12.3.3.3 or 12.10.2.1 of ASCE 7. Applicable loads shall be considered, including both earthquake and wind, in accordance with the specified load combinations. Each load combination shall also be investigated with one or more of the variable loads set to zero.

**...**

**1605.3 Load combinations using allowable stress design.**

**...**

**1605.3.2 Alternative basic load combinations.** In lieu of the basic load combinations specified in Section 1605.3.1, structures and portions thereof shall be permitted to be designed for the most critical effects resulting from the following combinations. When using these alternative basic load combinations that include wind or seismic loads, allowable stresses are permitted to be increased or load combinations reduced where permitted by the material chapter of this code or the referenced standards. For load combinations that include the counteracting effects of dead and wind loads, only two-thirds of the minimum dead load likely to be in place during a design wind event shall be used. Where wind loads are calculated in accordance with Chapter 6 of ASCE 7, the coefficient ω in the following equations shall be taken as 1.3. For other wind loads, ω shall be taken as 1. When using these alternative load combinations to evaluate sliding, overturning and soil bearing at the soil-structure interface, the reduction of foundation overturning from Section 12.13.4 in ASCE 7 shall not be used. When using these alternative basic load combinations for proportioning foundations for loadings, which include seismic loads, the vertical seismic load effect, $E_v$, in Equation 12.4-4 of ASCE 7 is permitted to be taken equal to zero.

> ~~***Exception: [OSHPD 2]*** *Intermittent connections such as inserts for anchorage of nonstructural components shall not be allowed the one-third increase in allowable stresses.*~~

***…***

**SECTION 1607**
**LIVE LOADS**

**1607.1 General.** Live loads are those loads defined in Section 1602.1.

**TABLE 1607.1 MINIMUM UNIFORMLY DISTRIBUTED LIVE LOADS, $L_0$, AND MINIMUM CONCENTRATED LIVE LOADS[g]**

| OCCUPANCY OR USE | UNIFORM (psf) | CONCENTRATED (lbs.) |
|---|---|---|
| … | … | … |
| *~~42.~~ 41. [OSHPD 2] Storage racks and wall-hung cabinets.* | *Total Loads[m]* | |

**…**

l. Roofs used for other special purposes shall be designed for appropriate loads as approved by the building official.

*m. [OSHPD 2] The minimum vertical design live load shall be as follows:*

*Paper media:*
*12-inch-deep (305 mm) shelf 33 pounds per lineal foot (482 N/m)*
*15-inch-deep (381 mm) shelf 41 pounds per lineal foot (598 N/m), or*
*33 pounds per cubic foot (5183 N/m$^3$) per total volume of the rack or cabinet, whichever is less.*
*Film media:*
*18-inch-deep (457 mm) shelf 100 pounds per lineal foot (1459 N/m), or*
*50 pounds per cubic foot (7853 N/m$^3$) per total volume of the rack or cabinet, whichever is less.*
*Other media:*
*20 pounds per cubic foot (311 N/m3) or 20 pounds per square foot (958 Pa), whichever is less, but not less than actual loads.*

...

## SECTION 1609
## WIND LOADS

**1609.1 Applications.** Buildings, structures and parts thereof shall be designed to withstand the minimum wind loads prescribed herein. Decreases in wind loads shall not be made for the effect of shielding by other structures.

...

**1609.1.1 Determination of wind loads.** Wind loads on every building or structure shall be determined in accordance with Chapter 6 of ASCE 7. The type of opening protection required, the basic wind speed and the exposure category for a site is permitted to be determined in accordance with Section 1609 or ASCE 7. Wind shall be assumed to come from any horizontal direction and wind pressures shall be assumed to act normal to the surface considered.

**Exceptions:**

1. Subject to the limitations of Section 1609.1.1.1, the provisions of SBCCI SSTD 10 shall be permitted for applicable Group R-2 and R-3 buildings.
2. Subject to the limitations of Section 1609.1.1.1, residential structures using the provisions of the AF&PA WFCM.
3. Designs using NAAMM FP 1001.
4. Designs using TIA/EIA-222 for antenna-supporting structures and antennas.
~~*5. [OSHPD 2] Exception in Section 1609.4 shall apply to ASCE 7.*~~

...

**1609.4 Exposure category.** For each wind direction considered, an exposure category that adequately reflects the characteristics of ground surface irregularities shall be determined for the site at which the building or structure is to be constructed. Account shall be taken of variations in ground surface roughness that arise from natural topography and vegetation as well as from constructed features.

> ~~***Exception: [OSHPD 2]*** *The wind design shall comply with Exposure C requirements unless the architect or structural engineer in general responsible charge can justify to the enforcement agency that the building site and surrounding terrain conform to the criteria for Exposure B. Minimum data to establish the exposure category shall be a topographic map (e.g., United States Geological Survey quadrangle maps) and aerial photographs except that for Exposure B sites located within urban areas, a vicinity map of sufficient size and scale to verify compliance may be provided.*~~

...

## SECTION 1612
## FLOOD LOADS

...

**1612.3 Establishment of flood hazard areas.** To establish flood hazard areas, the governing body shall adopt a flood hazard map and supporting data. The flood hazard map shall include, at a minimum, areas of special flood hazard as identified by the Federal Emergency Management Agency in an engineering report entitled "The Flood Insurance Study for [INSERT NAME OF JURISDICTION]," dated [INSERT DATE OF ISSUANCE], as amended or revised with the accompanying Flood Insurance Rate Map (FIRM) and Flood Boundary and Floodway Map (FBFM) and related supporting data along with any revisions thereto. The adopted flood hazard map and supporting data are hereby adopted by reference and declared to be part of this section.

***Exception: [OSHPD 2]*** *The flood hazard map shall include, at a minimum, areas of special flood hazard as identified by the Federal Emergency Management Agency's Flood Insurance Study (FIS) adopted by the local authority having jurisdiction where the project is located.*

**...**

**SECTION 1613**
**EARTHQUAKE LOADS**

**1613.1 Scope.** Every structure, and portion thereof, including nonstructural components that are permanently attached to structures and their supports and attachments, shall be designed and constructed to resist the effects of earthquake motions in accordance with ASCE 7, excluding Chapter 14 and Appendix 11A. The seismic design category for a structure is permitted to be determined in accordance with Section 1613 or ASCE 7.

**Exceptions:**

1. Detached one- and two-family dwellings, assigned to Seismic Design Category A, B or C, or located where the mapped short-period spectral response acceleration, $S_S$, is less than 0.4 g.
2. The seismic-force-resisting system of wood-frame buildings that conform to the provisions of Section 2308 are not required to be analyzed as specified in this section. *[OSHPD 2] Not permitted by OSHPD, see Section 2308.*
3. Agricultural storage structures intended only for incidental human occupancy.
4. Structures that require special consideration of their response characteristics and environment that are not addressed by this code or ASCE 7 and for which other regulations provide seismic criteria, such as vehicular bridges, electrical transmission towers, hydraulic structures, buried utility lines and their appurtenances and nuclear reactors.
*5. [OSHPD 2] Seismic Design Category shall be in accordance with ~~per~~ exception to Section 1613.5.6.*

**...**

**1613.5.1 Mapped acceleration parameters.** The parameters $S_s$ and $S_1$ shall be determined from the 0.2 and 1-second spectral response accelerations shown on Figures 1613.5(1) through 1613.5(14). Where $S_1$ is less than or equal to 0.04 and $S_s$ is less than or equal to 0.15, the structure is permitted to be assigned to Seismic Design Category A.

*Exception: [OSHPD 2] Seismic Design Category shall be in accordance with ~~per~~ exception to Section 1613.5.6.*

**...**

**1613.5.6 Determination of seismic design category.** Occupancy Category I, II or III structures located where the mapped spectral response acceleration parameter at 1-second period, $S_I$, is greater than or equal to 0.75 shall be assigned to Seismic Design Category E. Occupancy Category IV structures located where the mapped spectral response acceleration parameter at 1-second period, $S_1$, is greater than or equal to 0.75 shall be assigned to Seismic Design Category F. All other structures shall be assigned to a seismic design category based on their occupancy category and the design spectral response acceleration coefficients, $S_{DS}$ and $S_{D1}$, determined in accordance with Section 1613.5.4 or the site-specific procedures of ASCE 7. Each building and structure shall be assigned to the more severe seismic design category in accordance with Table 1613.5.6(1) or 1613.5.6(2), irrespective of the fundamental period of vibration of the structure, T.

**TABLE 1613.5.6(1) SEISMIC DESIGN CATEGORY BASED ON SHORT-PERIOD RESPONSE ACCELERATIONS**

| VALUE OF $S_{DS}$ | OCCUPANCY CATEGORY | | |
|---|---|---|---|
| | I or II | III | IV |
| $S_{DS} < 0.167g$ | A | A | A |
| $0.167g \le S_{DS} < 0.33g$ | B | B | C |
| $0.33g \le S_{DS} < 0.50g$ | C | C | D |
| $0.50g \le S_{DS}$ | D | D | D |

**TABLE 1613.5.6(2) SEISMIC DESIGN CATEGORY BASED ON 1-SECOND PERIOD RESPONSE ACCELERATION**

| VALUE OF $S_{D1}$ | OCCUPANCY CATEGORY | | |
|---|---|---|---|
| | I or II | III | IV |
| $S_{D1} < 0.067g$ | A | A | A |
| $0.067g \le S_{D1} < 0.133g$ | B | B | C |
| $0.133g \le S_{D1} < 0.20g$ | C | C | D |
| $0.20g \le S_{D1}$ | D | D | D |

***Exception: [OSHPD 2]*** *Structures not assigned to seismic design category E or F above shall be assigned to seismic design category D.*

**1613.5.6.1 Alternative seismic design category determination.** Where $S_1$ is less than 0.75, the seismic design category is permitted to be determined from Table 1613.5.6(1) alone when all of the following apply:

1. In each of the two orthogonal directions, the approximate fundamental period of the structure, $T_a$, in each of the two orthogonal directions determined in accordance with Section 12.8.2.1 of ASCE 7, is less than 0.8 $T_s$ determined in accordance with Section 11.4.5 of ASCE 7.
2. In each of the two orthogonal directions, the fundamental period of the structure used to calculate the story drift is less than $T_s$.
3. Equation 12.8-2 of ASCE 7 is used to determine the seismic response coefficient, $C_s$.
4. The diaphragms are rigid as defined in Section 12.3.1 in ASCE 7 or for diaphragms that are flexible, the distance between vertical elements of the seismic-force-resisting system does not exceed 40 feet (12 192 mm).

***Exception: [OSHPD 2]*** *Seismic design category shall be determined in accordance with ~~per~~ exception to Section 1613.5.6.*

**1613.5.6.2 Simplified design procedure.** Where the alternate simplified design procedure of ASCE 7 is used, the seismic design category shall be determined in accordance with ASCE 7.

***Exception: [OSHPD 2]*** *Seismic design category shall be determined in accordance with ~~per~~ exception to Section 1613.5.6.*

**…**

*(All existing amendments that are not revised above shall continue without any change)*

***Notation:***
*Authority: Health and Safety Code Section 129850*
*Reference: Health and Safety Code Sections 1275 and 129850*

## CHAPTER 16*A*
## STRUCTURAL DESIGN

### SECTION 1601*A*
### GENERAL

**1601*A*.1 Scope.** The provisions of this chapter shall govern the structural design of buildings, structures and portions thereof regulated by this code.

***1601A.1.1 Application.*** *The scope of application of Chapter 16A is as follows:*

1. *(Reserved for DSA).*

2. *Applications listed in Section ~~110.1~~ 1.10.1, and ~~110.4~~ 1.10.4, regulated by the Office of Statewide Health Planning and Development (OSHPD). These applications include hospitals, skilled nursing facilities, intermediate care facilities, and correctional treatment centers.*

   ***Exception: [OSHPD 2]*** *Single-story Type V skilled nursing or intermediate care facilities utilizing wood-frame or light-steel-frame construction as defined in Health and Safety Code Section 129725, which shall comply with Chapter 16 and any applicable amendments therein.*

***1601A.1.2 Amendments in this chapter.*** *OSHPD adopt this chapter and all amendments.*

***Exception:*** *Amendments adopted by only one agency appear in this chapter preceded with the appropriate acronym of the adopting agency, as follows:*

1. *(Reserved for DSA).*

2. *Office of Statewide Health Planning and Development:*

   ***[OSHPD 1]*** *- For applications listed in Section ~~110.1~~ 1.10.1.*

   ***[OSHPD 4]*** *- For applications listed in Section ~~110.4~~ 1.10.4.*

***1601A.2 References.*** *All referenced codes and standards listed in Chapter 35 shall include all the modifications contained in this code to referenced standards. In the event of any discrepancy between this code and a referenced standard, refer to Section ~~101.7~~ 1.1.7.*

***1601A.3 Enforcement Agency Approval.*** *In addition to requirements of California Code of Regulations (C.C.R.) Title 24, Parts 1 & 2, any aspect of project design, construction, quality assurance, or quality control programs for which this code requires approval by the design professional, are also subject to approval by the enforcement agency.*

### SECTION 1602A
### DEFINITIONS AND NOTATIONS

**1602*A*.1 Definitions.** The following words and terms shall, for the purposes of this chapter, have the meanings shown herein.

**...**

***ALTERNATIVE SYSTEM. [OSHPD 1 & 4]*** *Alternative materials, design and methods of construction in accordance with Section 104.11. ~~of Appendix Chapter 1,~~ Section 11.1.4 of ASCE 7 or structural design criteria as approved by the enforcement agency.*

**...**

***ENFORCEMENT AGENT.*** *That individual within the agency or organization charged with responsibility for agency or organization compliance with the requirements of this Code. Used interchangeably with Building Official and Code Official.*

**...**

***HOSPITAL BUILDING****. Any building defined in Section 129725, Health and Safety Code.*

**...**

**SECTION 1603*A***
**CONSTRUCTION DOCUMENTS**

**1603*A*.1 General.** Construction documents shall show the size, section and relative locations of structural members with floor levels, column centers and offsets dimensioned. The design loads and other information pertinent to the structural design required by Sections 1603.1.1 through 1603.1.9 shall be indicated on the *construction documents*.

***[OSHPD 1]*** *Additional requirements are included in Section 7-115 and 7-125 of the California ~~Building Standards~~ Administration Code (Part 1, Title 24, C.C.R).*

> **Exception:** *Construction documents* for buildings constructed in accordance with the *conventional light-frame construction* provisions of Section 2308 shall indicate the following structural design information:
>
> 1. Floor and roof live loads.
> 2. Ground snow load, *Pg*.
> 3. Basic wind speed (3-second gust), miles per hour (mph) (km/hr) and wind exposure.
> 4. *Seismic design category* and *site class*.
> 5. Flood design data, if located in *flood hazard areas* established in Section 1612A.3.
> 6. Design load-bearing values of soils.

**...**

**1603*A*.1.5 Earthquake design data.** The following information related to seismic loads shall be shown, regardless of whether seismic loads govern the design of the lateral-force-resisting system of the building:

1. Seismic importance factor, *I*, and occupancy category.
2. Mapped spectral response accelerations, $S_S$ and $S_1$.
3. Site class.
4. Spectral response coefficients, $S_{DS}$ and $S_{D1}$.
5. Seismic design category.
6. Basic seismic-force-resisting system(s).
7. Design base shear.
8. Seismic response coefficient(s), $C_S$.
9. Response modification factor(s), *R*.
10. Analysis procedure used.
11. *Applicable horizontal structural irregularities.*
12. *Applicable vertical structural irregularities.*

***1603A.1.5.1 Connections.*** *Connections that resist design seismic forces shall be designed and detailed on the design drawings.*

**...**

***1603A.1.10*** ***~~1604A.11~~*** **Construction Procedures.** *Where unusual erection or construction procedures are considered essential by the project-structural engineer or architect in order to accomplish the intent of the design or influence the design, such procedure shall be indicated on the construction documents. ~~plans or in the specifications.~~*

## SECTION 1604*A*
## GENERAL DESIGN REQUIREMENTS

**…**

**1604*A*.3 Serviceability.** Structural systems and members thereof shall be designed to have adequate stiffness to limit deflections and lateral drift. See Section 12.12.1 of ASCE 7 for drift limits applicable to earthquake loading.

**1604*A*.3.1 Deflections.** The deflections of structural members shall not exceed the more restrictive of the limitations of Sections 1604*A*.3.2 through *1604A.3.6* ~~*1604.3.8*~~ or that permitted by Table 1604*A*.3.

**TABLE 1604*A*.3 - DEFLECTION LIMITS[a, b, c, h, i]**

| CONSTRUCTION | *L* | *S* or *W*[f] | *D* + *L*[d,g] |
|---|---|---|---|
| Roof members:[e] | | | |
| Supporting plaster ceiling | *l*/360 | *l*/360 | *l*/240 |
| Supporting nonplaster ceiling | *l*/240 | *l*/240 | *l*/180 |
| Not supporting ceiling | *l*/180 | *l*/180 | *l*/120 |
| Floor members | *l*/360 | — | *l*/240 |
| Exterior walls and interior partitions: | | | |
| With brittle finishes | — | *l*/240 | — |
| With flexible finishes | — | *l/180* | — |
| *Veneered walls, anchored veneers and adhered veneers over 1 inch (25 mm) thick, including the mortar backing* | | ~~*l/480*~~ *Section 1405.10* | |
| Farm buildings | — | — | *l*/180 |
| Greenhouses | — | — | *l*/120 |

**…**

~~***1604A.3.7 Lateral Load Deflections.***~~

~~***1604A.3.7.1 General.*** *The deflection of structural systems designed to resist wind or seismic loads shall be such that other portions of the structure are not overstressed.*~~

~~***NOTE:*** *See ASCE 7 Section 12.12.4.*~~

***1604A.3.7*** ~~***1604A.3.7.2***~~ **Horizontal diaphragms.** *The maximum span-width ratio for any roof or floor diaphragm shall not exceed those given in Table 4.2.4 of AF & PA SDPWS* ~~*2305.2.3*~~ *or ICC-ES AC 43 unless test data and design calculations acceptable to the enforcement agency are submitted and approved for the use of other span-width ratios. Concrete diaphragm shall not exceed span-width ratios for equivalent composite floor diaphragm in ICC-ES AC 43.*

***1604A.3.8 Deflections****. Deflection criteria for materials not specified shall be developed by the project architect or structural engineer in a manner consistent with the provisions of this section and approved by the enforcement agency.*

**…**

**1604A.5 Occupancy category.** Each building and structure shall be assigned an *occupancy category* in accordance with Table 1604A.5.

**1604A.5.1 Multiple occupancies.** Where a building or structure is occupied by two or more occupancies not included in the same *occupancy category*, it shall be assigned the classification of the highest *occupancy category* corresponding to the various occupancies. Where buildings or structures have two or more portions that are structurally separated, each portion shall be separately classified. Where a separated portion of a building or structure provides required access to, required egress from or shares life safety components with another portion having a higher *occupancy category*, both portions shall be assigned to the higher *occupancy category*.

**...**

**TABLE 1604*A*.5 - OCCUPANCY CATEGORY OF BUILDINGS AND OTHER STRUCTURES**

| OCCUPANCY CATEGORY | NATURE OF OCCUPANCY |
|---|---|
| I | Buildings and other structures that represent a low hazard to human life in the event of failure, including but not limited to:<br>• Agricultural facilities.<br>• Certain temporary facilities.<br>• Minor storage facilities. |
| II | Buildings and other structures except those listed in Occupancy Categories I, III and IV |
| III | Buildings and other structures that represent a substantial hazard to human life in the event of failure, including but not limited to:<br>• Covered structures whose primary occupancy is public assembly with an occupant load greater than 300.<br>• Buildings and other structures with elementary school, secondary school or day care facilities with an occupant load greater than 250.<br>• Buildings and other structures with an occupant load greater than 500 for colleges or adult education facilities.<br>• ~~Group I-2 occupancies with an occupant load of 50 or more resident patients, but not having surgery or emergency treatment facilities.~~<br>• Group I-3 occupancies.<br>• Any other occupancy with an occupant load greater than 5,000[a].<br>• Power-generating stations, water treatment facilities for potable water, waste water treatment facilities and other public utility facilities not included in Occupancy Category IV.<br>• Buildings and other structures not included in Occupancy Category IV containing sufficient quantities of toxic or explosive substances to be dangerous to the public if released. |
| IV | Buildings and other structures designated as essential facilities, including but not limited to:<br>• ~~Group I-2 occupancies having surgery or emergency treatment facilities.~~<br>• ***[OSHPD 1 & 4]*** *Hospital Buildings as defined in C.C.R. Title 24, Part 1, Section 7-111 and all structures required for their continuous operation or ~~and~~ access/egress.*<br>• Fire, rescue, ambulance and police stations and emergency vehicle garages.<br>• Designated earthquake, hurricane or other emergency shelters. |

| | |
|---|---|
| | • Designated emergency preparedness, communication, and operation centers and other facilities required for emergency response<br>• Power-generating stations and other public utility facilities required as emergency backup facilities for Occupancy Category IV structures.<br>• Structures containing highly toxic materials as defined by Section 307 where the quantity of the material exceeds the maximum allowable quantities of Table 307.1.(2).<br>• Aviation control towers, air traffic control centers and emergency aircraft hangars.<br>• Buildings and other structures having critical national defense functions.<br>• Water treatment facilities and pump structures required to maintain water pressure for fire suppression. |

**…**

**SECTION 1605*A***
**LOAD COMBINATIONS**

**1605*A*.1 General.** Buildings and other structures and portions thereof shall be designed to resist:

1. The load combinations specified in Section 1605*A*.2, 1605*A*.3.1 or 1605*A*.3.2,
2. The load combinations specified in Chapters 18*A* through 23, and
3. The load combinations with overstrength factor specified in Section 12.4.3.2 of ASCE 7 where required by Section 12.2.5.2, 12.3.3.3 or 12.10.2.1 of ASCE 7. With the simplified procedure of ASCE 7 Section 12.14, the load combinations with overstrength factor of Section 12.14.3.2 or ASCE 7 shall be used.

Applicable loads shall be considered, including both earthquake and wind, in accordance with the specified load combinations. Each load combination shall also be investigated with one or more of the variable loads set to zero.

Where the load combinations with overstrength factor in Section 12.4.3.2 of ASCE 7 apply, they shall be used as follows:

1. The basic combinations for strength design with overstrength factor in lieu of Equations 16*A*-5 and 16*A*-7 in Section 1605*A*.2.1.
2. The basic combinations for *allowable stress design* with overstrength factor in lieu of Equations 16*A*-12, 16*A*-13 and 16*A*-15 in Section 1605*A*.3.1.
3. The basic combinations for *allowable stress design* with overstrength factor in lieu of Equations 16*A*-20 and 16*A*-21 in Section 1605*A*.3.2.

**1605*A*.1.1 Stability.** Regardless of which load combinations are used to design for strength, where overall structure stability (such as stability against overturning, sliding, or buoyancy) is being verified, use of the load combinations specified in Section 1605*A*.2 or 1605*A*.3 shall be permitted. Where the load combinations specified in Section 1605*A*.2 are used, strength reduction factors applicable to soil resistance shall be provided by a *registered design professional*. The stability of retaining walls shall be verified in accordance with Section 1807*A*.2.3. *When using allowable stress design, factor of safety for soil bearing values shall not be less than the overstrength factor of the structures supported.*

**…**

**1605*A*.3.2 Alternative basic load combinations.** In lieu of the basic load combinations specified in Section 1605*A*.3.1, structures and portions thereof shall be permitted to be designed for the most critical effects resulting from the following combinations. When using these alternatives basic load combinations that include wind or seismic loads, allowable stresses are permitted to be increased or load combinations reduced where permitted by the material chapter of this code or the referenced standards.

~~*Intermittent connections such as inserts for anchorage of nonstructural components shall not be allowed the one-third increase in allowable stresses.*~~

For load combinations that include the counteracting effects of dead and wind loads, only two-thirds of the minimum dead load likely to be in place during a design wind event shall be used. Where wind loads are calculated in accordance with Chapter 6 of ASCE 7, the coefficient ω in the following equations shall be taken as 1.3. For other wind loads, ω shall be taken as 1. When using these alternative load combinations to evaluate sliding, overturning and soil bearing at the soil-structure interface, the reduction of foundation overturning from Section 12.13.4 in ASCE 7 shall not be used. When using these alternative basic load combinations for proportioning foundations for loadings, which include seismic loads, the vertical seismic load effect, $E_v$, in Equation 12.4-4 of ASCE 7 is permitted to be taken equal to zero.

**…**

**1605A.4 Heliports and helistops.** Heliport and helistop landing areas shall be designed for the following loads, combined in accordance with Section 1605A:
1. Dead load, *D*, plus the gross weight of the helicopter, $D_h$, plus snow load, *S*.
2. Dead load, *D*, plus two single concentrated impact loads, *L*, approximately 8 feet (2438 mm) apart applied anywhere on the touchdown pad (representing each of the helicopter's two main landing gear, whether skid type or wheeled type), having a magnitude of 0.75 times the gross weight of the helicopter. Both loads acting together total 1.5 times the gross weight of the helicopter.
3. Dead load, *D*, plus a uniform live load, *L*, of 100 psf (4.79 kN/m2).

> ~~**Exception:** Landing areas designed for helicopters with gross weights not exceeding 3,000 pounds (13.34 kN) in accordance with Items 1 and 2 shall be permitted to be designed using a 40 psf (1.92 kN/m2) uniform live load in Item 3, provided the landing area is identified with a 3,000 pound (13.34 kN) weight limitation. This 40 psf (1.92 kN/m2) uniform live load shall not be reduced. The landing area weight limitation shall be indicated by the numeral "3" (kips) located in the bottom right corner of the landing area as viewed from the primary approach path. The indication for the landing area weight limitation shall be a minimum 5 feet (1524 mm) in height.~~

**SECTION 1606*A***
**DEAD LOADS**

**…**

***1606A.3 Roof Dead Loads.*** *The design dead load shall provide for the weight of at least one additional roof covering in addition to other applicable loadings if the new roof covering is permitted to be applied over the original roofing without its removal, in accordance with Section 1510.*

**…**

**SECTION 1607*A***
**LIVE LOADS**

**…**

**1607*A*.1 General.** Live loads are those loads defined in Section 1602*A*.1.

**1607*A*.2 Loads not specified.** For occupancies or uses not designated in Table 1607*A*.1, the live load shall be determined in accordance with a method approved by the building official.

**1607*A*.3 Uniform live loads.** The live loads used in the design of buildings and other structures shall be the maximum loads expected by the intended use or occupancy but shall in no case be less than the minimum uniformly distributed unit loads required by Table 1607*A*.1.

**1607*A*.4 Concentrated loads.** Floors and other similar surfaces shall be designed to support the uniformly distributed live loads prescribed in Section 1607*A*.3 or the concentrated load, in pounds (kilonewtons), given in Table 1607*A*.1, whichever produces the greater load effects. Unless otherwise specified, the indicated concentration shall be assumed to be uniformly distributed over an area 2.5 feet by 2.5 feet [6.25 square feet (0.58 $m^2$)] and shall be located so as to produce the maximum load effects in the structural members.

**TABLE 1607*A*.1 - MINIMUM UNIFORMLY DISTRIBUTED LIVE LOADS AND MINIMUM CONCENTRATED LIVE LOADS[g]**

| OCCUPANCY OR USE | UNIFORM (psf) | CONCENTRATED (lbs.) |
|---|---|---|
| 1. Apartments (see residential) | — | — |
| 2. Access floor systems<br>Office use<br>Computer use | <br>50<br>100 | <br>2,000<br>2,000 |
| 3. Armories and drill rooms | 150 | — |
| 4. Assembly areas and theaters [n,p]<br>Fixed seats (fastened to floor)<br>Follow spot, projections and control rooms<br>Lobbies<br>Movable seats<br>Stages and platforms<br>Other assembly areas | 60<br>50<br>100<br>100<br>125<br>100 | — |
| 5. Balconies | Same as occupancy served[h] | — |
| 6. Bowling Alleys | 75 | — |
| 7. Catwalks | 40 | 300 |
| 8. Dance Halls and ballrooms | 100 | — |
| 9.. Dining rooms and restaurants | 100 | — |
| 10. Dwellings (see residential) | — | — |
| 11. Cornices | 60 | — |
| 12. Corridors, except as otherwise indicated | 100 | — |
| 13. Elevator machine room grating (on area of 4 in2) | — | 300 |
| 14. Finish light floor plate construction (on area of 1 in2) | —<br>— | 200 |
| 15. Fire escapes<br>On single-family dwellings only | 100<br>40 | — |
| 16. Garages (passenger vehicles only) Trucks and buses | 40 | Note a<br>See Section 1607A.6 |
| 17. Grandstands (see stadium and arena bleachers) | — | — |
| 18. Gymnasiums [p], main floors and balconies | 100 | — |
| 19. Handrails, guards and grab bars | See Section 1607A.7 | |

| | | |
|---|---|---|
| 20. Hospitals<br>*[OSHPD 1 & 4]* | | |
| Corridors above first floor | *100* | 1,000 |
| Operating rooms, laboratories | 60 | 1,000 |
| Patient rooms | 40 | 1,000 |
| *Mechanical and electrical equipment areas including open areas around equipment* | *50* | — |
| *Storage:* | | — |
| *Light* | *125* | — |
| *Heavy* | *250* | |
| *Dinning Area (Not used for assembly)* | *100* | *1000* |
| *Kitchen and serving areas* | *50* | *1000* |
| 21. Hotels (see residential) | — | — |

| OCCUPANCY OR USE | UNIFORM (psf) | CONCENTRATED (lbs.) |
|---|---|---|
| 22. Libraries[m] | | |
| Corridors above first floor | 80 | 1,000 |
| Reading rooms | 60 | 1,000 |
| Stack rooms | 150[b] | 1,000 |
| 23. Manufacturing | | |
| Heavy | 250 | 3,000 |
| Light | 125 | 2,000 |
| 24. Marquees | 75 | — |
| 25. Office buildings [m] | | |
| Corridors above first floor | 80 | 2,000 |
| File and computer rooms shall be designed for heavier loads based on anticipated occupancy | — | — |
| Lobbies and first-floor corridors | 100 | 2,000 |
| Offices | 50 | 2,000 |
| 26. Penal institutions | | |
| Cell blocks | 40 | — |
| Corridors | 100 | |
| 27. Residential | | |

| | | |
|---|---|---|
| One- and two-family dwellings | 10 | — |
| Uninhabitable attics without storage[i] | 20 | |
| Uninhabitable attics with limited storage[i, j, k] | 30<br>40 | |
| Habitable attics and sleeping areas | 40 | |
| All other areas except balconies and decks | 100 | |
| Hotels and multiple-family dwellings | | |
| Private rooms and corridors serving them | | |
| Public rooms and corridors serving them | | |
| 28. Reviewing stands, grandstands and bleachers | Note c | |
| 29. Roofs | | |
| All roof surfaces subject to maintenance workers | 5 | 300 |
| Awnings and canopies | nonreduceable | |
| Fabric construction supported by a lightweight rigid skeleton structure | 20<br>20 | |
| All other construction | | |
| Ordinary flat, pitched, and curved roofs | | |
| Primary roof members, exposed to a work floor | | |
| Single panel point of lower chord of roof trusses or any point along primary structural members supporting roofs: | Note 1<br>60<br>100 | 2,000<br>300<br>Note 1 |
| Over manufacturing, storage warehouses, | | |

| | | |
|---|---|---|
| and repair garages<br>All other occupancies<br>Roofs used for other special purposes<br>Roofs used for promenade purposes<br>Roofs used for roof gardens or assembly purposes | | |

*(continued)*

**TABLE 1607*A*.1—continued MINIMUM UNIFORMLY DISTRIBUTED LIVE LOADS AND MINIMUM CONCENTRATED LIVE LOADS[g]**

| OCCUPANCY OR USE | UNIFORM (psf) | CONCENTRATED (lbs.) |
|---|---|---|
| 30. Schools<br>Classrooms<br>Corridors above first floor<br>First-floor corridors | <br>40 [o]<br>80<br>100 | <br>1,000<br>1,000<br>1,000 |
| 31. Scuttles, skylight ribs and accessible ceilings | — | 200 |
| 32. Sidewalks, vehicular driveways and yards, subject to trucking | 250[d] | 8,000[e] |
| 33. Skating rinks | 100 | — |
| 34. Stadiums and arenas<br>Bleachers[p]<br>Fixed seats (fastened to floor) | <br>100[c]<br>60[c] | — |
| 35. Stairs and exits<br>One- and two-family dwellings<br>All other | <br>40<br>100 | Note f |
| 36. Storage warehouses (shall be designed for heavier loads if required for anticipated storage)<br>Heavy<br>Light | <br>250<br>125 | |
| 37. Stores<br>Retail<br>First floor<br>Upper floors<br>Wholesale, all floors | <br><br>100<br>75<br>125 | <br><br>1,000<br>1,000<br>1,000 |
| 38. Vehicle barriers | See Section 1607*A*.7.7.3 | |
| 39. Walkways and elevated platforms (other than exitways) | 60 | — |
| 40. Yards and terraces, | 100 | — |

| | | |
|---|---|---|
| pedestrians | | |
| *~~42~~. 41. Storage racks and wall-hung cabinets.* | *Total Loads[m]* | |

**...**

*m. The minimum vertical design live load shall be as follows:*

*Paper media:*
*12-inch-deep (305 mm) shelf 33 pounds per lineal foot (482 N/m)*
*15-inch-deep (381 mm) shelf 41 pounds per lineal foot (598 N/m), or*
*33 pounds per cubic foot (5183 N/m$^3$) per total volume of the rack or cabinet, whichever is less.*

*Film media:*
*18-inch-deep (457 mm) shelf 100 pounds per lineal foot (1459 N/m), or*
*50 pounds per cubic foot (7853 N/m$^3$) per total volume of the rack or cabinet, whichever is less.*

*Other media:*

*20 pounds per cubic foot (311 N/m$^3$) or 20 pounds per square foot (958 Pa), whichever is less, but not less than actual loads.*

**...**

**1607*A*.11.2.2 Special-purpose roofs.** Roofs used for promenade purposes, roof gardens, assembly purposes or other special purposes, and marquees, shall be designed for a minimum live load, *Lo,* as specified in Table 1607*A*.1. Such live loads are permitted to be reduced in accordance with Section 1607*A*.9. Live loads of 100 psf (4.79 kN/m2) or more at areas of roofs classified as Group A occupancies shall not be reduced.

**...**

***1607A.11.5 Uncovered open-frame roof structures.*** *Uncovered open-frame roof structures shall be designed for a vertical live load of not less than 10 pounds per square foot (0.48 kN/m$^2$) of the total area encompassed by the framework.*

**...**

**1607*A*.13 Interior walls and partitions.** Interior walls and partitions that exceed 6 feet (1829 mm) in height, including their finish materials, shall have adequate strength to resist the loads to which they are subjected but not less than a horizontal load of 5 psf (0.240 kN/m$^2$). *The 5 psf (0.24 kN/m$^2$) load need not be applied simultaneously with wind or seismic loads. The deflection of such walls under a load of 5 psf (0.24 kN/m$^2$) shall not exceed ~~1 / 240 of the span for walls with brittle finishes and 1 / 120 of the span for walls with flexible finishes~~ the limits in Table 1604A.3.*

**...**

**SECTION 1608*A***
**SNOW LOADS**

**1608*A*.2 Ground snow loads.** The ground snow loads to be used in determining the design snow loads for roofs shall be determined in accordance with ASCE 7 or Figure 1608*A*.2 for the contiguous United States ~~and Table 1608.2 for Alaska~~. Site-specific case studies shall be made in areas designated "CS" in Figure 1608*A*.2. Ground snow loads for sites at elevations above the limits indicated in Figure 1608*A*.2 and for all sites within the CS areas shall be approved. Ground snow load determination for such sites shall be based on an extreme value statistical analysis of data available in the vicinity of the site using a value with a 2-

percent annual probability of being exceeded (50-year mean recurrence interval). ~~Snow loads are zero for Hawaii, except in mountainous regions as approved by the building official.~~

~~TABLE 1608.2—GROUND SNOW LOADS, pg , FOR ALASKAN LOCATIONS~~

| ~~LOCATION~~ | ~~POUNDS PER SQUARE FOOT~~ | ~~LOCATION~~ | ~~POUNDS PER SQUARE FOOT~~ | ~~LOCATION~~ | ~~POUNDS PER SQUARE FOOT~~ |
|---|---|---|---|---|---|
| ~~Adak~~ | ~~30~~ | ~~Galena~~ | ~~60~~ | ~~Petersburg~~ | ~~150~~ |
| ~~Anchorage~~ | ~~50~~ | ~~Gulkana~~ | ~~70~~ | ~~St. Paul Islands~~ | ~~40~~ |
| ~~Angoon~~ | ~~70~~ | ~~Homer~~ | ~~40~~ | ~~Seward~~ | ~~50~~ |
| ~~Barrow~~ | ~~25~~ | ~~Juneau~~ | ~~60~~ | ~~Shemya~~ | ~~25~~ |
| ~~Barter Island~~ | ~~35~~ | ~~Kenai~~ | ~~70~~ | ~~Sitka~~ | ~~50~~ |
| ~~Bethel~~ | ~~40~~ | ~~Kodiak~~ | ~~30~~ | ~~Talkeetna~~ | ~~120~~ |
| ~~Big Delta~~ | ~~50~~ | ~~Kotzebue~~ | ~~60~~ | ~~Unalakleet~~ | ~~50~~ |
| ~~Cold Bay~~ | ~~25~~ | ~~McGrath~~ | ~~70~~ | ~~Valdez~~ | ~~160~~ |
| ~~Cordova~~ | ~~100~~ | ~~Nenana~~ | ~~80~~ | ~~Whittier~~ | ~~300~~ |
| ~~Fairbanks~~ | ~~60~~ | ~~Nome~~ | ~~70~~ | ~~Wrangell~~ | ~~60~~ |
| ~~Fort Yukon~~ | ~~60~~ | ~~Palmer~~ | ~~50~~ | ~~Yakutat~~ | ~~150~~ |

~~For SI: 1 pound per square foot = 0.0479 kN/m2.~~

**(***Figure 1608A.2 shall be identical to IBC 2009 Figure 1608.2 - Figure not shown for clarity)*

**FIGURE 1608*A*.2 - GROUND SNOW LOADS, $p_g$, FOR THE UNITED STATES (psf)**

**...**

**SECTION 1609A**
**WIND LOADS**

**...**

***1609A.1.3 Story Drift for Wind Loads****. The calculated story drift due to wind pressures shall not exceed 0.005 times the story height for buildings less than 65 feet (19,812 mm) in height or 0.004 times the story height for buildings 65 feet (19,812 mm) or greater in height.*

**...**

**1609*A*.4 Exposure category.** For each wind direction considered, an exposure category that adequately reflects the characteristics of ground surface irregularities shall be determined for the site at which the building or structure is to be constructed. Account shall be taken of variations in ground surface roughness that arise from natural topography and vegetation as well as from constructed features.

> ~~***Exception**: The wind design shall comply with Exposure C requirements unless the architect or structural engineer in general responsible charge can justify to the enforcement agency that the building site and surrounding terrain conform to the criteria for Exposure B. Minimum data to establish the exposure category shall be a topographic map (e.g., United States Geological Survey quadrangle maps) and aerial photographs except that for Exposure B sites located within urban areas, a vicinity map of sufficient size and scale to verify compliance may be provided.*~~

**…**

*(Repealed CA Amendment in Section 1609A.6 and adopted 2009 IBC, Section 1609.6).*

**…**

**1609*A*.6.2 Symbols and notations.** Coefficients and variables used in the alternate all-heights method equations are as follows:

$C_{net}$ = net-pressure coefficient based on $K_d$ [($G$) ($C_p$) – ($GC_{pi}$)], in accordance with Table 1609*A*.6.2(2).

$G$ = Gust effect factor for rigid structures in accordance with ASCE 7 Section 6.5.8.1.

*I = Importance Factor in accordance with ASCE 7 Section 6.5.5*

$K_d$ = Wind directionality factor in accordance with ASCE 7 Table 6-4.

$P_{net}$ = Design wind pressure to be used in determination of wind loads on buildings or other structures or their components and cladding, in pounds per square foot (N/m$^2$).

$q_s$ = Wind stagnation pressure in pounds per square

**…**

*(Figure 1609A BASIC WIND SPEED (3-SECOND GUST) shall be identical to IBC 2009 Figure 1609 BASIC WIND SPEED (3-SECOND GUST)- Figure not shown for clarity)*

**FIGURE 1609*A* - BASIC WIND SPEED (3-SECOND GUST)**

**…**

**SECTION 1612*A***
**FLOOD LOADS**

**…**

**1612*A*.3 Establishment of flood hazard areas.** To establish *flood hazard areas*, the applicable governing authority shall adopt a flood hazard map and supporting data. The flood hazard map shall include, at a minimum, areas of special flood hazard as identified by the Federal Emergency Management ~~Agency in an engineering report entitled "The Flood Insurance Study for [INSERT NAME OF JURISDICTION]," dated [INSERT DATE OF ISSUANCE],~~ *Agency's Flood Insurance Study (FIS) adopted by the local authority having jurisdiction where the project is located*, as amended or revised with the accompanying Flood Insurance Rate Map (FIRM) and Flood Boundary and Floodway Map (FBFM) and related supporting data along with any revisions thereto. The adopted flood hazard map and supporting data are hereby adopted by reference and declared to be part of this section.

**…**

## SECTION 1613*A*
## EARTHQUAKE LOADS

**1613*A*.1 Scope.** Every structure, and portion thereof, including nonstructural components that are permanently attached to structures and their supports and attachments, shall be designed and constructed to resist the effects of earthquake motions in accordance with ASCE 7 *with all the modifications incorporated herein*, excluding Chapter 14 and Appendix 11A. The seismic design category for a structure ~~is permitted to~~ *shall* be determined in accordance with Section 1613*A* ~~or ASCE 7~~.

**Exceptions:**

~~1. Detached one- and two-family dwellings, assigned to Seismic Design Category A, B or C, or located where the mapped short-period spectral response acceleration, SS, is less than 0.4 g.~~

~~2. The seismic-force-resisting system of wood-frame buildings that conform to the provisions of Section 2308 are not required to be analyzed as specified in this section.~~

~~3. Agricultural storage structures intended only for incidental human occupancy.~~

Structures that require special consideration of their response characteristics and environment that are not addressed by this code or ASCE 7 and for which other regulations provide seismic criteria, such as vehicular bridges, electrical transmission towers, hydraulic structures, buried utility lines and their appurtenances and nuclear reactors.

~~***1613A.1.1 Configuration.*** *When the design of a structure, due to the unusual configuration of the structure or parts of the structure, does not provide at least the same safety against earthquake damage as provided by the applicable portions of this section, when applied in the design of a similar structure of customary configuration, framing and assembly of materials, the enforcement agency shall withhold its approval.*~~

**1613*A*.2 Definitions.** The following words and terms shall, for the purposes of this section, have the meanings shown herein. *Definition provided in Section 3402A.1 and ASCE 7 Section 11.2 shall apply when appropriate in addition to terms defined in this section.*

***ACTIVE EARTHQUAKE FAULT.*** *A fault that has been the source of earthquakes or is recognized as a potential source of earthquakes, including those that have exhibited surface displacement within Holocene time (about 11,000 years) as determined by California Geological Survey (CGS) under the Alquist-Priolo Earthquake Fault Zoning, Act ~~or other,~~ those included as type A or type B faults for the U.S. Geological Survey (USGS) National Seismic Hazard Maps, and faults considered to have been active in Holocene time by an other authoritative source, Federal, State or Local Governmental Agency.*

***BASE.*** *The level at which the horizontal seismic ground motions are considered to be imparted to the structure or the level at which the structure as a dynamic vibrator is supported. This level does not necessarily coincide with the ground level.*

**DESIGN EARTHQUAKE GROUND MOTION.** The earthquake ground motion that buildings and structures are specifically proportioned to resist in Section 1613*A*.

***DISTANCE FROM AN ACTIVE EARTHQUAKE FAULT.*** *Distance measured from the nearest point of the building to the closest edge of an Alquist-Priolo Earthquake fault zone for an active fault, if such a map exists, or to the closest mapped splay of the fault.*

***HOSPITAL BUILDINGS.*** *Hospital buildings and all other medical facilities as defined in Section 1250, Health and Safety Code.*

***IRREGULAR STRUCTURE.*** *A structure designed as having one or more plan or vertical irregularities per ASCE 7 Section 12.3.*

**MAXIMUM CONSIDERED EARTHQUAKE GROUND MOTION.** The most severe earthquake effects considered by this code.

**MECHANICAL SYSTEMS.** For the purposes of determining seismic loads in ASCE 7, mechanical systems shall include plumbing systems as specified therein.

***Next Generation Attenuation (NGA).*** *Attenuation relations used for the 2008 United States Geological Survey (USGS) seismic hazards maps (for the Western United States) or their equivalent as determined by the enforcement agency.*

**ORTHOGONAL.** To be in two horizontal directions, at 90 degrees (1.57 rad) to each other.

**SEISMIC DESIGN CATEGORY.** A classification assigned to a structure based on its occupancy category and the severity of the design earthquake ground motion at the site.

**SEISMIC-FORCE-RESISTING SYSTEM.** That part of the structural system that has been considered in the design to provide the required resistance to the prescribed seismic forces.

**SITE CLASS.** A classification assigned to a site based on the types of soils present and their engineering properties as defined in Section 1613*A*.5.2.

**SITE COEFFICIENTS.** The values of $F_a$ and $F_v$ indicated in Tables 1613*A*.5.3(1) and 1613*A*.5.3(2), respectively.

~~***SOIL-STRUCTURE RESONANCE.*** *The coincidence of the natural period of a structure with a dominant frequency of the ground motion.*~~

***STRUCTURAL ELEMENTS.*** *Floor or roof diaphragms, decking, joists, slabs, beams, or girders, columns, bearing walls, retaining walls, masonry or concrete nonbearing walls exceeding one story in height, foundations, shear walls or other lateral-force-resisting members, and any other elements necessary to the vertical and lateral strength or stability of either the building as a whole or any of its parts, including connection between such elements.*

**1613*A*.3 Existing buildings.** ***[OSHPD 1 & 4]*** *Additions*, *alterations*, repairs or change of occupancy of existing buildings shall be in accordance with Chapter 34*A*.

**…**

**1613*A*.5 Seismic ground motion values.** Seismic ground motion values shall be determined in accordance with this section.

**1613A.5.1 Mapped acceleration parameters**. The parameters $S_s$ and $S_1$ shall be determined from the 0.2 and 1-second spectral response accelerations shown on Figures 1613.5(1) through 1613.5(14). ~~Where $S_1$ is less than or equal to 0.04 and $S_s$ is less than or equal to 0.15, the structure is permitted to be assigned to Seismic Design Category A.~~

*(Figures 1613.5(1) through 1613.5(14) were stricken in the CBC 2007 and will not be shown in Chapter 16A. These figures are shown in Chapter 16)*

**…**

**1613*A*.5.6 Determination of seismic design category.** Occupancy Category I, II or III structures located where the mapped spectral response acceleration parameter at 1-second period, $S_I$, is greater than or equal to 0.75 shall be assigned to Seismic Design Category E. Occupancy Category IV structures located where the mapped spectral response acceleration parameter at 1-second period, $S_1$, is greater than or equal to 0.75 shall be assigned to Seismic Design Category F. All other structures shall be assigned to *seismic design category D.* ~~a seismic design category based on their occupancy category and the design spectral response acceleration coefficients, $S_{DS}$ and $S_{D1}$, determined in accordance with Section 1613.5.4 or the site-specific procedures of ASCE 7. Each building and structure shall be assigned to the more severe seismic design category in accordance with Table 1613.5.6(1) or 1613.5.6(2), irrespective of the fundamental period of vibration of the structure, T.~~

~~**TABLE 1613.5.6(1) - SEISMIC DESIGN CATEGORY BASED ON SHORT-PERIOD RESPONSE ACCELERATIONS**~~

| ~~VALUE OF $S_{DS}$~~ | ~~OCCUPANCY CATEGORY~~ | | |
|---|---|---|---|
| | ~~I or II~~ | ~~III~~ | ~~IV~~ |
| ~~$S_{DS} < 0.167g$~~ | ~~A~~ | ~~A~~ | ~~A~~ |
| ~~$0.167g \le S_{DS} < 0.33g$~~ | ~~B~~ | ~~B~~ | ~~C~~ |
| ~~$0.33g \le S_{DS} < 0.50g$~~ | ~~C~~ | ~~C~~ | ~~D~~ |
| ~~$0.50g \le S_{DS}$~~ | ~~D~~ | ~~D~~ | ~~D~~ |

~~**TABLE 1613.5.6(2) - SEISMIC DESIGN CATEGORY BASED ON 1-SECOND PERIOD RESPONSE ACCELERATION**~~

| ~~VALUE OF $S_{D1}$~~ | ~~OCCUPANCY CATEGORY~~ | | |
|---|---|---|---|
| | ~~I or II~~ | ~~III~~ | ~~IV~~ |
| ~~$S_{D1} < 0.067g$~~ | ~~A~~ | ~~A~~ | ~~A~~ |
| ~~$0.067g \le S_{D1} < 0.133g$~~ | ~~B~~ | ~~B~~ | ~~C~~ |
| ~~$0.133g \le S_{D1} < 0.20g$~~ | ~~C~~ | ~~C~~ | ~~D~~ |
| ~~$0.20g \le S_{D1}$~~ | ~~D~~ | ~~D~~ | ~~D~~ |

**1613*A*.5.6.1Alternative seismic design category determination.** *Not permitted by OSHPD.* ~~Where $S_1$ is less than 0.75, the seismic design category is permitted to be determined from Table 1613.5.6(1) alone when all of the following apply:~~

~~1. In each of the two orthogonal directions, the approximate fundamental period of the structure, $T_a$, in each of the two orthogonal directions determined in accordance with Section 12.8.2.1 of ASCE 7, is less than 0.8 $T_s$ determined in accordance with Section 11.4.5 of ASCE 7.~~

~~2. In each of the two orthogonal directions, the fundamental period of the structure used to calculate the story drift is less than $T_s$.~~

~~3. Equation 12.8-2 of ASCE 7 is used to determine the seismic response coefficient, $C_s$.~~

~~4. The diaphragms are rigid as defined in Section 12.3.1 in ASCE 7 or for diaphragms that are flexible, the distance between vertical elements of the seismic-force-resisting system does not exceed 40 feet (12 192 mm).~~

**1613*A*.5.6.2 Simplified design procedure.** *Not permitted by OSHPD.* ~~Where the alternate simplified design procedure of ASCE 7 is used, the seismic design category shall be determined in accordance with ASCE 7.~~

**...**

**1613*A*.6.2 Additional seismic-force-resisting systems for seismically isolated structures.** Add the following exception to the end of Section 17.5.4.2 of ASCE 7:

**Exception:** For isolated structures designed in accordance with this standard, the Structural System Limitations and the Building Height Limitations in Table 12.2-1 for ordinary steel concentrically braced frames (OCBFs) as defined in Chapter 11 and ~~ordinary~~ *intermediate* moment frames ~~(OMFs)~~ *(IMFs)* as defined in Chapter 11 are permitted to be taken as 160 feet (48 768 mm) for structures assigned to Seismic Design Category D, E or F, provided that the following conditions are satisfied:

1. The value of $R_I$ as defined in Chapter 17 is taken as 1.

2. For ~~OMFs and~~ OCBFs, design is in accordance with AISC 341.

3. *For IMFs, design is in accordance with AISC 341. In addition, requirements of Section 9.3 of AISC 341 shall be satisfied.*

**...**

**1613A.6.3 Automatic sprinkler systems.** *Automatic sprinkler systems* designed and installed in accordance with NFPA 13 shall be deemed to meet the requirements of Section 13.6.8 of ASCE 7.

> ***Exception:*** *The allowable values for design of anchors, hangers, and bracings shall be determined in accordance with material chapters of this code in lieu of those in NFPA 13.*

**1613A.6.4 Autoclaved aerated concrete (AAC) masonry.** *Not permitted by OSHPD.* ~~**shear wall design coefficients and system limitations.** Add the following text at the end of Section 12.2.1 of ASCE 7:~~

~~For ordinary reinforced AAC masonry shear walls used in the seismic force resisting system of structures, the response modification factor, *R*, shall be permitted to be taken as 2, the deflection amplification factor, *Cd*, shall be permitted to be taken as 2 and the system overstrength factor, o, shall be permitted to be taken as 21/2. Ordinary reinforced AAC masonry shear walls shall not be limited in height for buildings assigned to *Seismic Design Category* B, shall be limited in height to 35 feet (48 768 mm) for buildings assigned to *Seismic Design Category* C and are not permitted for buildings assigned to *Seismic Design Categories* D, E and F.~~

~~For ordinary plain (unreinforced) AAC masonry shear walls used in the seismic force resisting system of structures, the response modification factor, *R*, shall be permitted to be taken as 11/2, the deflection amplification factor, *Cd*, shall be permitted to be taken as 11/2 and the system overstrength factor, o, shall be permitted to be taken as 21/2. Ordinary plain (unreinforced) AAC masonry shear walls shall not be limited in height for buildings assigned to *Seismic Design Category* B and are not permitted for buildings assigned to *Seismic Design Categories* C, D, E and F.~~

**...**

**1613A.6.7 Minimum distance for building separation.** All buildings and structures shall be separated from adjoining structures. Separations shall allow for the maximum inelastic response displacement ($\delta_M$). $\delta_M$ shall be determined at critical locations with consideration for both translational and torsional displacements of the structure using Equation 16A-44.

*[OSHPD 1 & 4]* $\delta_M = C_d \delta_{max}$ ~~/I~~ (Equation 16A-44)

where:

$C_d$ = Deflection amplification factor in Table 12.2-1 of ASCE 7.
$\delta_{max}$ = Maximum displacement defined in Section 12.8.4.3 of ASCE 7.
*[OSHPD 1 & 4]* ~~*I* = Importance factor in accordance with Section 11.5.1 of ASCE 7.~~

Adjacent buildings on the same property shall be separated by a distance not less than $\delta_{MT}$, determined by Equation 16A-45.

$$\delta_{MT} = \sqrt{(\delta_{M1})^2 + (\delta_{M2})^2} \qquad \text{(Equation 16A-45)}$$

where:

$\delta_{M1}$, $\delta_{M2}$ = The maximum inelastic response displacements of the adjacent buildings in accordance with Equation 16A-44.

Where a structure adjoins a property line not common to a public way, the structure shall also be set back from the property line by not less than the maximum inelastic response displacement, $\delta_M$, of that structure.

**Exceptions:**

~~1.~~ Smaller separations or property line setbacks shall be permitted when justified by rational analyses.
~~2. Buildings and structures assigned to the *Seismic Design Category* A, B or C.~~

**...**

~~**1613.6.8 HVAC Ductwork with *Ip* = 1.5.** Seismic supports are not required for HVAC duct work with *Ip* = 1.5 if either of the following conditions is met for the full length of each duct run:~~

~~1. HVAC ducts are suspended from hangers 12 inches (305 mm) or less in length with hangers detailed to avoid significant bending of the hangers and their attachments, or~~

~~2. HVACducts have a cross-sectional area of less than 6 square feet (0.557 m2).~~

~~**1613.7 General.** The text of ASCE 7 shall be modified as indicated in Section 1613.7.1.~~

~~**1613.7.1 ASCE7, Section 11.7.5.** Modify ASCE7, Section 11.7.5 to read as follows:~~
~~**11.7.5 Anchorage of walls.** Walls shall be anchored to the roof and all floors and members that provide lateral support for thewall or that are supported by thewall. The anchorage shall provide a direct connection between the walls and the roof or floor construction. The connections shall be capable of resisting the forces specified in Section 11.7.3 applied horizontally, substituted for *E* in load combinations of Section 2.3 or 2.4.~~

**...**

***SECTION ~~1614A~~ 1615A***
***MODIFICATIONS TO ASCE 7***

***1615A.1 ~~1614A.1~~ General.*** *The text of ASCE 7 shall be modified as indicated in Sections 1615A.1.1 ~~1614A.1.1~~ through 1615A.1.38 ~~1614A.1.31~~.*

***1615A.1.1 ~~1614A.1.1~~ ASCE 7, Section 11.1.*** *Modify ASCE 7 Section 11.1 by adding Section 11.1.5 as follows:*

***11.1.5 Structural Design Criteria. ~~Requirements.~~*** *~~Prior to implementation of the non-linear design procedures~~ Where ASCE 7 requires design review in Chapters 16, 17, and 18, the ground motion, analysis and design methods, material assumptions and acceptance criteria proposed by the engineer shall be submitted to the enforcement agency in the form of structural design criteria for approval.*

*~~The analysis and design basis, conclusion and design decisions shall be reviewed and accepted by the enforcement agent.~~*

*[OSHPD 1 & 4] Peer review requirements in Section 3414A shall apply to design reviews required by ASCE 7 Chapters 17 and 18.*

***1615A.1.2 [OSHPD 1 & 4] ~~1614A.1.2~~ ASCE 7, Section 11.4.7.*** *~~Replace~~ Modify ASCE 7 Section 11.4.7 ~~as~~ by adding the following~~s~~:*

***~~11.4.7 Site-specific ground motion procedures.~~*** *~~The site-specific ground motion procedure set forth in ASCE 7 Section 21 as modified in Section 1802A.6 of this code are permitted to be used to determine ground motion for any structure.~~*

*~~Unless otherwise approved, the site-specific procedure per ASCE 7 Section 21 as modified by Section 1802A.6 of this code shall be used where any of the following conditions apply:~~*

*~~1) A site response analysis shall be performed per Section 21.1 and a ground motion hazard analysis shall be performed in accordance with Section 21.2 for the following structures:~~*

*~~a) Structure located in Type E soils and mapped MCE spectral acceleration at short~~*

~~*periods ($S_s$) exceeds 2.0g.*~~

~~*b) Structures located in Type F soils.*~~

~~***Exception:***~~

~~*1) Where $S_s$ is less than 0.20g, use of Type E soil profile shall be permitted.*~~

~~*2) Where exception to Section 20.3.1 is applicable except for base isolated buildings.*~~

~~*2) A ground motion hazard analysis shall be performed in accordance with Section 21.2 when:*~~

~~*a) A time history response analysis of the building is performed as part of the design.*~~

~~*b) The building site is located within 10 kilometers of an active fault.*~~

~~*c) For seismically isolated structures and for structures with damping systems.*~~

*For buildings assigned to Seismic Design Category F, or when required by the building official, a ground motion hazard analysis shall be performed in accordance with ASCE 7 Chapter 21 as modified by Section 1803A.6.*

***1615A.1.3*** ~~***1614A.1.3***~~ ***ASCE 7, Table 12.2 -1.*** *Modify ASCE 7 Table 12.2-1 as follows:*

***A. BEARING WALL SYSTEMS***

*5. Intermediate Precast Shear Walls – Not permitted by OSHPD.*

*14. Light-framed walls with shear panels of all other materials – Not permitted by OSHPD.*

***B. BUILDING FRAME SYSTEMS***

*2. Steel eccentrically braced frames, non-moment-resisting connections at columns away from links - Not permitted by OSHPD.*

*4. Ordinary steel concentrically braced frames – Not permitted by OSHPD.*

*9. Intermediate Precast Shear Walls – Not permitted by OSHPD.*

*24. Light-framed walls with shear panels of all other materials – Not permitted by OSHPD.*

*25. Buckling-restrained braced frames, non-moment-resisting beam-column connections – Not permitted by OSHPD.*

*27. Special steel plate shear wall – Not permitted by OSHPD.*

***C. MOMENT RESISTING FRAME SYSTEMS***

*2. Special steel truss moment frames – Not permitted by OSHPD.*

*3. Intermediate steel moment frames – Not permitted by OSHPD.*

*4. Ordinary steel moment frames – Not permitted by OSHPD.*

***Exception:***

*1) Systems listed in this section can be used as an alternative system when pre-approved by the enforcement agency.*

*2) Rooftop or other supported structures not exceeding two stories in height and 10 percent of the total structure weight can use the systems in this section when designed as components per ASCE 7 Chapter 13.*

*3) Systems listed in this section can be used for seismically isolated buildings when permitted by Section 1613A.6.2.*

***1615A.1.4*** ***~~1614A.1.4~~*** ***ASCE 7, Section 12.2.3.1.*** *Modify ASCE 7 Section 12.2.3.1 by adding the following additional requirement~~s~~ for a two stage equivalent lateral force procedure or modal response spectrum procedure:*

*e. Where design of elements of the upper portion is governed by special seismic load combinations, the special loads shall be considered in the design of the lower portion~~s~~.*

*~~f. The detailing requirements required for the lateral system of the upper portion shall be used for structural components common to the structural system of lower portion.~~*

*~~g. If separate models are used to design the upper and lower portions, the model boundary conditions of the upper portion shall be compatible with actual strength and stiffness of the supporting elements of the lower portion.~~*

*~~h. Both flexible upper portion and rigid lower portion considered separately can be classified as being regular.~~*

***~~Exception~~****~~: When dynamic analysis is used regularity requirements in item # h above need not apply.~~*

***1615A.1.5*** ***~~1614A.1.5~~*** ***ASCE 7, Section 12.3.3.*** *Modify first sentence of ASCE 7 Section 12.3.3.1 as follows:*

***12.3.3.1 Prohibited Horizontal and Vertical Irregularities for Seismic Design Categories D through F.*** *Structures assigned to Seismic Design Category D, E, or F having horizontal structural irregularity Type 1b of Table 12.3-1 or vertical structural irregularities Type 1b, 5a or 5b of Table 12.3-2 shall not be permitted.*

***1615A.1.6*** ***~~1614A.1.6~~*** ***ASCE 7, Section 12.7.2.*** *Modify ASCE 7 Section 12.7.2 by adding item 5 to read as follows:*

*5. Where buildings provide lateral support for walls retaining earth, and the exterior grades on opposite sides of the building differ by more than 6 feet (1829 mm), the load combination of the seismic increment of earth pressure due to earthquake acting on the higher side, as determined by a Geotechnical engineer qualified in soils engineering plus the difference in earth pressures shall be added to the lateral forces provided in this section.*

***1615A.1.7*** ***~~1614A.1.8~~*** ***ASCE 7, Section 12.8.7.*** *Modify ASCE 7 Section 12.8.7 by replacing equation 12.8-16 as follows*

$$\theta = \frac{P_x \Delta I}{V_x h_{sx} C_d} \qquad (12.8\text{-}16)$$

***1615A.1.8*** ***~~1614A.1.9~~*** ***ASCE 7, Section 12.9.4.*** *Replace ASCE 7 Section 12.9.4 as follows:*

***12.9.4 Scaling Design Values of Combined Response.*** *Modal base shear shall not be less than the base shear calculated using the equivalent lateral force procedure of section 12.8.*

***1615A.1.9*** ***~~1614A.1.7~~*** *~~Reserved.~~* ***ASCE 7, Section 12.10.2.1.*** *Modify ASCE 7 Section 12.10.2.1 by the following:*

*The value of $\Omega_0 Q_E$ used in load combinations with overstrength factors in ASCE 7-05 Section 12.4.3.2 for design of collector elements, splices and their connections to resisting elements may be taken as the largest of the following:*

1) *$\Omega_0 F_x$ (where $F_x$ is given by ASCE 7-05 Eq.12.8-11).*
2) *$\Omega_0 F_{px}$ (where $F_{px}$ is given by ASCE 7-05 Eq. 12.10-1 ignoring the $0.2S_{DS}Iw_{px}$ minimum).*
3) *$0.2S_{DS}Iw_{px}$ (Minimum value from Section 12.10.1.1).*

***1615A.1.10*** ***~~1614A.1.10~~*** ***ASCE 7, Section 12.13.1.*** *Modify ASCE 7 section 12.13.1 by adding Section 12.13.1.1 as follows:*

***12.13.1.1 Foundations and superstructure-to-foundation connections.*** *The foundation shall be capable of transmitting the design base shear and the overturning forces from the structure into the supporting soil. Stability against overturning and sliding shall be in accordance with Section 1605A.1.1.*

*In addition, the foundation and the connection of the superstructure elements to the foundation shall have the strength to resist, in addition to gravity loads, the lesser of the following seismic loads:*

1. *The strength of the superstructure elements.*

2. *The maximum forces that would occur in the fully yielded structural system.*

3. *Forces from the Load Combinations with overstrength factor in accordance with ~~per~~ ASCE 7 Section 12.4.3.2.*

***EXCEPTIONS:***

1. *~~Where structures are designed using R ≤ 2.5 such as for inverted pendulum-type structures.~~ Where reference standards specify the use of higher design loads.*

2. *When it can be demonstrated that inelastic deformation of the foundation and superstructure-to-foundation connection will not result in a weak story or cause collapse of the structure.*

3. *Where basic structural system consists of light framed walls with shear panels.*

*Where the computation of the seismic overturning moment is by the equivalent lateral-force method or the modal analysis method, reduction in overturning moment permitted by section 12.13.4 of ASCE 7 may be used.*

*Where moment resistance is assumed at the base of the superstructure elements, the rotation and flexural deformation of the foundation as well as deformation of the superstructure-to-foundation connection shall be considered in the drift and deformation compatibility analyses.*

***~~Exception:~~*** *~~The seismic loads defined above need not be considered for friction and passive resistance. Ultimate soil pressure can be used when considering load combinations with the seismic loads defined above.~~*

***1615A.1.11 ASCE 7, Section 13.1.3. [OSHPD 1 & 4]*** *Modify ASCE 7 Section 13.1.3 by the following:*

*For position retention, the design of supports and attachments for all nonstructural components shall have a component importance factor, $I_p$, equal to 1.5.*

***1615A.1.12 ASCE 7, Section 13.1.4.*** *Replace ASCE 7 Section 13.1.4 with the following:*

***13.1.4 Exemptions.*** *The following nonstructural components are exempt from the requirements of this section:*

*1. Furniture (except storage cabinets as noted in Table 13.5-1).*
*2. Temporary or moveable equipment.*

***Exceptions:***

*a) Equipment shall be anchored if it is permanently attached to the building utility services such as electricity, gas, or water. For the purposes of this requirement, "permanently attached" shall include all electrical connections except three-prong plugs for duplex receptacles.*

*b) The enforcement agency shall be permitted to require temporary attachments for movable equipment which is usually stationed in one place and heavier than 400 pounds, when they are not in use for a period longer than 8 hours at a time.*

*3. Architectural, mechanical and electrical components in Seismic Design Categories D, E, or F where all of the following apply:*

*a. The component is positively attached to the structure;*
*b. Flexible connections are provided between the component and associated ductwork, piping, and conduit; and either:*

*i. The component weighs 400 pounds (1780 N) or less and has a center of mass located 4 feet (1.22 m) or less above the adjacent floor or roof level that directly support the component;*

***Exception:*** *Special Certification Requirements for Designated Seismic Systems in accordance with Section 13.2.2 shall apply.*

*or*

*ii. The component weighs 20 pounds (89 N) or less or, in the case of a distributed system, 5 lb/ft (73 N/m) or less.*

***Exception:*** *The enforcement agency shall be permitted to require attachments for equipment with hazardous contents to be shown on construction documents irrespective of weight.*

***1615A.1.13*** ~~***1614A.1.11***~~ ***ASCE 7, Section 13.3.2.*** *Modify ASCE 7 Section 13.3.2 by the following:*

*The seismic relative displacements to be used in design of displacement sensitive nonstructural components is $D_p I$ instead of $D_p$, where $D_p$ is given by equations 13.3-5 to 13.3-8 and I is the building importance factor given in Section 11.5.*

***1615A.1.14*** ***ASCE 7, Section 13.4.*** *Replace ASCE 7 Sections 13.4.1 and 13.4.2 with the following:*

***13.4.1 Design Force in the Attachment.*** *The force in the attachment shall be determined based on the prescribed forces and displacements for the component as determined in Sections 13.3.1 and 13.3.2 except that $R_p$ shall not be taken as larger than 6.*

***13.4.2 Anchors in Concrete or Masonry.***

***13.4.2.1 Anchors in Concrete.*** *Anchors in concrete used for component anchorage shall be designed in accordance with Appendix D of ACI 318.*

***13.4.2.2 Anchors in Masonry.*** *Anchors in masonry used for component anchorage shall be designed in accordance with ACI 530. Anchors shall be designed to be governed by the tensile or shear strength of a ductile steel element.*

***EXCEPTION:*** *Anchors shall be permitted to be designed so that the attachment that the anchor is connecting to the structure undergoes ductile yielding at a load level corresponding to anchor forces not greater than their design strength, or the minimum design strength of the anchors shall be at least 2.5 times the factored forces transmitted by the attachment.*

***13.4.2.3 Post-installed Anchors in Concrete and Masonry.*** *Post-installed anchors shall fulfill the requirements of 13.4.2.1 or 13.4.2.2. Post-installed anchors in concrete used for component anchorage shall be pre-qualified for seismic applications in accordance with ACI 355.2, ICC-ES AC193 or ICC-ES AC308. Post-installed anchors in masonry used for component anchorage shall be pre-qualified for seismic applications in accordance with ICC-ES AC01, AC58 or AC106.*

***Exceptions:***

1) *Adhesive anchors shall not be permitted in overhead applications or application with sustained (continuous) tension load that can lead to creep.*
2) *Anchors pre-qualified for seismic applications need not be governed by the steel strength of a ductile steel element.*

***1615A.1.15 ASCE 7, Section 13.4.5.*** *Replace ASCE 7 Section 13.4.5 with the following:*

*13.4.5 Power Actuated Fasteners. Power actuated fasteners in concrete or steel shall not be used for sustained tension loads or for brace applications in Seismic Design Categories D, E, or F unless approved for seismic loading. Power actuated fasteners in masonry shall not be permitted unless approved for seismic loading.*

***Exception:*** *Power actuated fasteners in concrete used for support of acoustical tile or lay-in panel suspended ceiling applications and distributed systems where the service load on any individual fastener does not exceed 90 lb (400 N). Power actuated fasteners in steel where the service load on any individual fastener does not exceed 250 lb (1,112 N).*

***1615A.1.16 ASCE 7, Section 13.5.6.*** *Replace ASCE 7, Section 13.5.6 with the following:*

***13.5.6 Suspended Ceilings.*** *Suspended ceilings shall be in accordance with this section.*

***13.5.6.1 Seismic Forces.*** *The weight of the ceiling, $W_p$, shall include the ceiling grid; ceiling tiles or panels; light fixtures if attached to, clipped to, or laterally supported by the ceiling grid; and other components that are laterally supported by the ceiling. $W_p$ shall be taken as not less than 4 psf (19 N/m$^2$).*

*The seismic force, $F_p$, shall be transmitted through the ceiling attachments to the building structural elements or the ceiling-structure boundary.*

***13.5.6.2 Seismic Design Requirements****. Suspended acoustical tile or lay-in panel ceilings shall be designed in accordance with ASTM E 580 Section 5.2.8.8 and the requirements of Sections 13.5.6.2.1 and 13.5.6.2.2, or be designed in accordance with Section 13.2.1.1, or be seismically qualified in accordance with Sections 13.2.5 or 13.2.6.*

***13.5.6.2.1. Industry Standard Construction for Acoustical Tile or Lay-In Panel Ceilings.*** *Acoustical tile or lay-in panel ceilings in Seismic Design Categories D, E, and F shall be designed and installed in accordance with ASTM C635, ASTM C636, and ASTM E 580, Section 5 - Seismic Design Categories D, E, and F as modified by Section 13.5.6.2.2.*

***13.5.6.2.2 Modification to ASTM E 580.*** *Modify ASTM E 580 by the following:*

~~***1614.1.12 ASCE 7, Section 13.5.6.2.*** *Modify ASCE 7, Section 13.5.6.2 by adding Section 13.5.6.2.3 as follows:*~~

~~*13.5.6.2.3 Additional Requirements.*~~

1. ***Exitways***. *Lay-in ceiling assemblies in exitways of hospitals shall be installed with a main runner or cross runner surrounding all sides of each piece of tile, board or panel and each light fixture or grille. A cross runner that supports another cross runner shall be considered as a main runner for the purpose of structural classification. Splices or intersections of such runners shall be attached with through connectors such as pop rivets, screws, pins, plates with end tabs or other approved connectors.*

2. ***Corridors and Lobbies.*** *Expansion joints shall be provided in the ceiling at intersections of corridors and at junctions of corridors and lobbies or other similar areas.*

3. ***Lay-in panels.*** *Metal panels and panels weighing more than 1/2 pounds per square foot (24 N/m$^2$) other than acoustical tiles shall be positively attached to the ceiling suspension runners.*

~~4. **Grid members, connectors, and expansion devices.** The allowable load-carrying capacity as determined by test shall not exceed one third of the mean ultimate test value based on tests of no fewer than three identical specimens. Rational analysis can be substituted for test where permitted by ASCE 7 and the enforcement agency.~~

~~5. **Vertical hangers.** Each vertical hanger shall be attached to the ceiling suspension member and to the support above with a minimum of three tight twists in 1-1/2 inches.~~

4. ***Lateral force bracing.*** *Lateral force bracing is required for all ceiling areas except that they shall be permitted to be omitted in rooms with floor areas up to 144 square feet when perimeter support in accordance with ASTM E 580 Sections 5.2.2 and 5.2.3 are provided and perimeter walls are designed to carry the ceiling lateral forces.*

~~6a. **[OSHPD 1 & 4]** Substantiating design calculations or test reports shall be provided for all lateral force bracing, their connections, and anchorages. Lateral forces must comply with the seismic force requirements of ASCE 7, Chapter 13. Horizontal restraint points shall not be placed more than 8 feet X 12 feet (2438 mm X 3658 mm) on centers. Horizontal restraint wires shall be No. 12 gage minimum and secured to main runners with four tight twists in 1-1/2 inches.~~

5. ~~7.~~ ***Ceiling fixtures.*** *Fixtures installed in acoustical tile or lay-in panel ceilings shall be mounted in a manner that will not compromise ceiling performance.*

*All recessed or drop-in light fixtures and grilles shall be supported directly from the fixture housing to the structure above with a minimum of two 12 gage wires located at diagonally opposite corners. Leveling and positioning of fixtures may be provided by the ceiling grid. Fixture support wires may be slightly loose to allow the fixture to seat in the grid system. Fixtures shall not be supported from main runners or cross runners if the weight of the fixtures causes the total dead load to exceed the deflection capability of the ceiling suspension system.*

*Fixtures shall not be installed so that the main runners or cross runners will be eccentrically loaded.*

*Surface-mounted fixtures shall be attached to the main runner with at least two positive clamping devices made of material with a minimum of 14 gage. Rotational spring catches do not comply. A 12 gage suspension wire shall be attached to each clamping device and to the structure above.*

~~**8. Mechanical services.** Terminals and services weighing no more than 20 pounds (9 kg) shall have two no. 12 gage hangers from the terminal or service to the structure above. These wires may be slack.~~

~~9. **Lighting fixtures.** All lighting fixtures shall be positively attached to the suspended ceiling system. The attachment device shall have a capacity of 100 percent of the lighting fixture weight acting in any direction.~~

~~Lighting fixtures weighing 56 pounds (25 kg) or more shall be supported directly from the structure above by approved hangers. In such cases the slack wires required by item # 7 above may be omitted.~~

6. ~~10.~~ **Partitions.** *Where the suspended ceiling system is required to provide lateral support for the permanent or relocatable partitions, the connection of the partition to the ceiling system, the ceiling system members and their connections, and the lateral force bracing shall be designed to support the reaction force of the partition from prescribed loads applied perpendicular to the face of the partition.* ~~These partition reaction forces shall be in addition to the loads described in item #6 above.~~ *Partition connectors, the suspended ceiling system and the lateral-force bracing shall all be engineered to suit the individual partition application and shall be shown or defined in the drawings or specifications.*

~~11. **Construction Documents:** The construction documents shall include detailing and specifications for suspended ceiling members, connections, support systems, light fixture and mechanical fixture attachments, partition supports and seismic bracing.~~

***1615A.1.17 ASCE 7, Section 13.5.7. [OSHPD 1 & 4]*** *Modify ASCE 7 Section 13.5.7 by the following:*

*All access floors shall be special access floors in accordance with Section 13.5.7.2.*

***1615A.1.18*** *Reserved.*

***1615A.1.19*** *Reserved.*

***1615A.1.20 ASCE 7, Section 13.6.5.*** *Modify ASCE 7, Section 13.6.5 by deleting Item # 6 in Section 13.6.5.5 and adding Section 13.6.5.6 as follows:*

***13.6.5.6 Conduit, Cable Tray, and Other Electrical Distribution Systems (Raceways).*** *Raceways shall be designed for seismic forces and seismic relative displacements as required in Section 13.3. Conduit greater than 2.5 inches (64 mm) trade size and attached to panels, cabinets or other equipment subject to seismic relative displacement of Section 13.3.2, shall be provided with flexible connections or designed for seismic forces and seismic relative displacements as required in Section 13.3.*

***EXCEPTIONS:***

1. *Design for the seismic forces and relative displacements of Section 13.3 shall not be required for raceways where either:*

   a. *Trapeze assemblies are used to support raceways and the total weight of the raceway supported by trapeze assemblies is less than 10 lb/ft (146 N/m), or*
   b. *The raceway is supported by hangers and each hanger in the raceway run is 12 in. (305 mm) or less in length from the raceway support point to the supporting structure. Where rod hangers are used with a diameter greater than 3/8 inch, they shall be equipped with swivels to prevent inelastic bending in the rod.*

2. *Design for the seismic forces and relative displacements of Section 13.3 shall not be required for conduit, regardless of the value of $I_p$, where the conduit is less than 2.5 in. (64 mm) trade size.*

***1615A.1.21 ASCE 7, Section 13.6.7.*** *Replace ASCE 7, Section 13.6.7 with the following:*

***13.6.7 Ductwork.*** *HVAC and other ductwork shall be designed for seismic forces and seismic relative displacements as required in Section 13.3. Design for the displacements across seismic joints shall be required for ductwork with $I_p$ = 1.5 without consideration of the exceptions below.*

***EXCEPTIONS:***

*The following exceptions pertain to ductwork not designed to carry toxic, highly toxic, or flammable gases or used for smoke control:*

*1. Design for the seismic forces and relative displacements of Section 13.3 shall not be required for ductwork where either:*

*a. Trapeze assemblies are used to support ductwork and the total weight of the ductwork supported by trapeze assemblies is less than 10 lb/ft (146 N/m); or*

*b. The ductwork is supported by hangers and each hanger in the duct run is 12 in. (305 mm) or less in length from the duct support point to the supporting structure. Where rod hangers are used with a diameter greater than 3/8 inch, they shall be equipped with swivels to prevent inelastic bending in the rod.*

*2. Design for the seismic forces and relative displacements of Section 13.3 shall not be required where provisions are made to avoid impact with larger ducts or mechanical components or to protect the ducts in the event of such impact; and HVAC ducts have a cross-sectional area of 6 $ft^2$ (0.557 $m^2$) or less, or weigh 10 lb/ft (146 N/m) or less.*

*HVAC duct systems fabricated and installed in accordance with standards approved by the authority having jurisdiction shall be deemed to meet the lateral bracing requirements of this section.*

*Components that are installed in-line with the duct system and have an operating weight greater than 75 lb (334 N), such as fans, heat exchangers, and humidifiers, shall be supported and laterally braced independent of the duct system and such braces shall meet the force requirements of Section 13.3.1. Appurtenances such as dampers, louvers, and diffusers shall be positively attached with mechanical fasteners. Unbraced piping attached to in-line equipment shall be provided with adequate flexibility to accommodate the seismic relative displacements of Section 13.3.2.*

***1615A.1.22 ASCE 7, Section 13.6.8.*** *Replace ASCE 7, Section 13.6.8 with the following:*

***13.6.8 Piping Systems.*** *Unless otherwise noted in this section, piping systems shall be designed for the seismic forces and seismic relative displacements of Section 13.3. ASME pressure piping systems shall satisfy the requirements of Section 13.6.8.1. Fire protection sprinkler piping shall satisfy the requirements of Section 13.6.8.2. Elevator system piping shall satisfy the requirements of Section 13.6.10.*

*Where other applicable material standards or recognized design bases are not used, piping design including consideration of service loads shall be based on the following allowable stresses:*

*a. For piping constructed with ductile materials (e.g., steel, aluminum, or copper), 90 percent of the minimum specified yield strength.*

*b. For threaded connections in piping constructed with ductile materials, 70 percent of the minimum specified yield strength.*

*c. For piping constructed with nonductile materials (e.g., cast iron, or ceramics), 10 percent of the material minimum specified tensile strength.*

*d. For threaded connections in piping constructed with nonductile materials, 8 percent of the material minimum specified tensile strength.*

*Piping not detailed to accommodate the seismic relative displacements at connections to other components shall be provided with connections having sufficient flexibility to avoid failure of the connection between the components.*

***13.6.8.1 ASME Pressure Piping Systems.*** *Pressure piping systems, including their supports, designed and constructed in accordance with ASME B31 shall be deemed to meet the force, displacement, and other requirements of this section. In lieu of specific force and displacement*

*requirements provided in ASME B31, the force and displacement requirements of Section 13.3 shall be used.*

***13.6.8.2 Fire Protection Sprinkler Piping Systems.*** *Fire protection sprinkler piping designed and constructed in accordance with NFPA 13 shall be deemed to meet the force and displacement requirements of this section. The exceptions of Section 13.6.8.3 shall not apply.*

> ***Exception:*** *Pipe hangers, bracing, and anchor capacities shall be determined in accordance with material chapters of the California Building Code, 2010 in lieu of using those in NFPA 13. The force and displacement requirements of Section 13.3 or those in the NFPA 13 may be used for design.*

***13.6.8.3 Exceptions.*** *Design of piping systems and attachments for the seismic forces and relative displacements of Section 13.3 shall not be required where one of the following conditions apply:*

1. *Trapeze assemblies are used to support piping whereby no single pipe exceeds the limits set forth in 3a. or b. below and the total weight of the piping supported by the trapeze assemblies is less than 10 lb/ft (146 N/m).*

2. *The piping is supported by hangers and each hanger in the piping run is 12 in. (305 mm) or less in length from the top of the pipe to the supporting structure. Where pipes are supported on a trapeze, the trapeze shall be supported by hangers having a length of 12 in. (305 mm) or less. Where rod hangers are used with a diameter greater than 3/8 inch, they shall be equipped with swivels to prevent inelastic bending in the rod.*

3. *Piping having an $R_p$ in Table 13.6-1 of 4.5 or greater is used and provisions are made to avoid impact with other structural or nonstructural components or to protect the piping in the event of such impact and where the following size requirements are satisfied:*

   *a. For Seismic Design Categories D, E, or F and values of $I_p$ greater than one, the nominal pipe size shall be 1 inch (25 mm) or less.*
   *b. For Seismic Design Categories D, E, or F, where $I_p$ = 1.0 the nominal pipe size shall be 3 inches (80 mm) or less.*

*The exceptions above shall not apply to elevator piping.*

***13.6.8.4 Other Piping Systems.*** *Piping not designed and constructed in accordance with ASME B31 or NFPA 13 shall comply with the requirements of Section 13.6.11.*

~~***1614A.1.13 ASCE 7, Section 13.6.1.*** *Modify ASCE 7 Section 13.6.1 by adding Sections 13.6.1.1 & 13.6.1.2 as followings:*~~

~~*13.6.1.1* ***HVAC Ductwork, Plumbing/Piping and Conduit Systems.*** *Ductwork shall be constructed in accordance with provisions contained in Part 4, Title 24, California Mechanical Code. Where possible, pipes, conduit, and their connections shall be constructed of ductile materials (copper, ductile iron, steel or aluminum and brazed, welded or screwed connections). Pipes, conduits and their connections, constructed of nonductile materials (e.g., cast iron, no-hub pipe and plastic), shall have the brace spacing reduced to satisfy requirements of ASCE 7 Section 13 and not to exceed one-half of the spacing allowed for ductile materials.*~~

~~*13.6.1.2* ***Trapeze Assemblies.*** *All trapeze assemblies supporting pipes, ducts and conduit shall be braced to resist the forces and relative displacements per ASCE 7 Chapter 13, considering the total weight of the elements on the trapeze.*~~

~~*Pipes, ducts and conduit supported by a trapeze where none of those elements would individually be braced need not be braced if connections to the pipe/conduit/ductwork or directional changes do not restrict the movement of the trapeze. If this flexibility is not provided, bracing will be required when the aggregate weight of the pipes and conduit exceed 10 pounds/feet (146 N/m). The weight shall be determined assuming all pipes and conduit are filled with water.*~~

~~***1614A.1.14 ASCE 7, Section 13.6.7.*** *Modify ASCE 7 Section 13.6.7 by the following:*~~

~~*Requirements of this section shall also apply for Ip = 1.5.*~~

***1615A.1.23*** ~~***1614A.1.15***~~ ***ASCE 7, Section 13.6.10.1.*** *Modify ASCE 7 Section 13.6.10.1 by adding Section 13.6.10.1.1 as follows:*

***13.6.10.1.1 Elevators guide rail support.*** *The design of guide rail support-bracket fastenings and the supporting structural framing shall use the weight of the counterweight or maximum weight of the car plus not less* ~~*more*~~ *than 40 percent of its rated load. The seismic forces shall be assumed to be distributed one third to the top guiding members and two thirds to the bottom guiding members of cars and counterweights, unless other substantiating data are provided. In addition to the requirements of ASCE 7 Section 13.6.10.1, the minimum seismic forces shall be 0.5g acting in any horizontal direction.*

***1615A.1.24*** ~~***1614A.1.16***~~ ***ASCE 7, Section 13.6.10.4.*** *Replace ASCE 7, Section 13.6.10.4 as follows:*

***13.6.10.4 Retainer plates.*** *Retainer plates are required at the top and bottom of the car and counterweight, except where safety devices acceptable to the enforcement agency are provided which meet all requirements of the retainer plates, including full engagement of the machined portion of the rail. The design of the car, cab stabilizers, counterweight guide rails and counterweight frames for seismic forces shall be based on the following requirements:*

1. *The seismic force shall be computed per the requirements of ASCE 7 13.6.10.1. The minimum horizontal acceleration shall be 0.5g for all buildings.*

2. *$W_p$ shall equal the weight of the counterweight or the maximum weight of the car plus not less than 40 percent of its rated load.*

3. *With the car or counterweight located in the most adverse position, the stress in the rail shall not exceed the limitations specified in these regulations, nor shall the deflection of the rail relative to its supports exceed the deflection listed below:*

| *RAIL SIZE (weight per foot of length, pounds)* | *WIDTH OF MACHINED SURFACE (inches)* | *ALLOWABLE RAIL DEFLECTION (inches)* |
|---|---|---|
| *8* | *1 ¼* | *0.20* |
| *11* | *1 ½* | *0.30* |
| *12* | *1 ¾* | *0.40* |
| *15* | *1 31/32* | *0.50* |
| *18 ½* | *1 31/32* | *0.50* |
| *22 ½* | *2* | *0.50* |
| *30* | *2 ¼* | *0.50* |

*For SI: 1 inch = 25 mm, 1 foot = 305 mm.*

*NOTE: Deflection limitations are given to maintain a consistent factor of safety against disengagement of retainer plates from the guide rails during an earthquake.*

4. *Where guide rails are continuous over supports and rail joints are within 2 feet (610 mm) of their supporting brackets, a simple span may be assumed.*

5. *The use of spreader brackets is allowed.*

6. *Cab stabilizers and counterweight frames shall be designed to withstand computed lateral load with a minimum horizontal acceleration of 0.5g.*

~~***1614A.1.17*** *Reserved.*~~

***1615A.1.25 ASCE 7, Section 16.1.3.2.*** *Modify ASCE 7 Section 16.1.3.2 by the following:*

*Where next generation attenuation relations are used in accordance with Section 1803A.6.2, each pair of motions shall be scaled such that in the period range from 0.2T to 1.5T, the average of the SRSS spectra from all horizontal component pairs does not fall below the corresponding ordinate of the design response spectrum determined using NGA relations.*

*At sites within 3.1 miles (5 km) of an active fault that controls the hazard, each pair of components shall be rotated to the fault-normal and fault-parallel direction of the causative fault, and shall be scaled so that average of the fault-normal components is not less than the Maximum Considered Earthquake (MCE) response spectrum determined using NGA relations for each period range from 0.2T and 1.5T.*

***1615A.1.26 ASCE 7, Section 16.1.4.*** *Modify ASCE 7 Section 16.1.4 by the following:*

*For each ground motion analyzed the individual response parameters shall be multiplied by the following scalar quantities:*

*a. Force response parameters shall be multiplied by I/R, where I is the importance factor determined in accordance with Section 11.5.1 and R is the Response Modification Coefficient selected in accordance with Section 12.2.1.*
*b. Drift quantities shall be multiplied by $C_d/R$, where $C_d$ is the deflection amplification factor specified in Table 12.2-1.*

*The distribution of horizontal shear shall be in accordance Section 12.8.4.*

***1615A.1.27 ASCE 7, Section 16.2.4.*** *Modify ASCE 7 Section 16.2.4 by the following:*

*a) Where site is located within 3.1 miles (5 km) of an active fault at least seven ground motions shall be analyzed and response parameters shall be based on larger of the average of the maximum response with ground motions applied as follows:*

1. *Each of the ground motions shall have their maximum component at the fundamental period aligned in one direction.*

2. *Each of the ground motion's maximum component shall be rotated orthogonal to the previous analysis direction.*

*b) Where site is located more than 5 km from an active fault at least 10 ground motions shall be analyzed. The ground motions shall be applied such that one-half shall have their maximum component aligned in one direction and the other half aligned in the orthogonal direction. The average of the maximum response of all the analyses shall be used for design.*

***1615A.1.28 ASCE 7, Section 16.2.4.2 [OSHPD 1 & 4]*** *Modify ASCE 7 Section 16.2.4.2 by the following:*

*Acceptance criteria for elements subjected to deformation beyond their linear range of response shall be based on ASCE 41 for Immediate Occupancy (IO) at Design Earthquake (DE) and Life Safety (LS) at Maximum Considered Earthquake (MCE). For LS acceptance criteria at MCE, primary components shall be within the acceptance criteria for primary components and secondary components shall be within the acceptance criteria for secondary components.*

***1615A.1.29*** ***~~1614A.1.18~~*** ***ASCE 7, Section 17.2.1.*** *Modify ASCE 7, Section 17.2.1 by adding the following:*

*The importance factor, $I_p$, for parts and portions of a seismic-isolated building shall be the same as that required for a fixed-base building of the same occupancy category.*

***1615A.1.30*** ***~~1614A.1.19~~*** ***ASCE 7 Section 17.2.4.7.*** *Modify ASCE 7, Section 17.2.4.7 by adding the following:*

*The effects of uplift and / or rocking shall be explicitly accounted for in the analysis and in the testing of the isolator units.*

***~~1614A.1.20~~*** ***~~ASCE 7, Section 17.2.4.8.~~*** *~~Modify ASCE 7, Section 17.2.4.8 by adding the following:~~*

*~~f. Inspection and replacement programs shall be submitted to enforcement agency for approval with the plans and specifications and shall be a condition of occupancy for the structure.~~*

*~~g. After every significant seismic event, the owner shall retain a structural engineer to make an inspection of the structural system. The inspection shall consist of viewing the performance of the building, reviewing the strong motion records, and a visual examination of the isolators and their connections for deterioration, offset or physical damage. A report for each inspection, including conclusions on the continuing adequacy of the structural system, shall be submitted as required to the enforcement agency.~~*

***~~1614A.1.21~~*** ***~~ASCE 7, Section 17.2.4.9.~~*** *~~Modify ASCE 7, Section 17.2.4.9 by adding the following:~~*

*~~The quality control testing program shall include provisions for both prototype and production isolator units. Quality control testing program shall be subject to pre-approval by the enforcement agency.~~*

***~~1614A.1.22~~*** ***~~ASCE 7, Section 17.2.4.8.~~*** *~~Modify ASCE 7, section 17.2.4.8 by adding section 17.2.4.10 as follows:~~*

***~~17.2.4.10 Instrumentation~~****~~. A proposal for instrumentation and equipment specifications shall be forwarded to the enforcement agency for approval.~~*

*~~There shall be sufficient numbers of instruments to characterize the response of the building during an earthquake. Motion measuring instruments shall be located within the building and at levels immediately above and below the isolators. The owner of the building is responsible for the implementation of the instrumentation program. Maintenance of the instrumentation and removal and processing of the records shall be the responsibility of the enforcement agency or its designated agent.~~*

***1615A.1.31*** ***~~1614A.1.23~~*** ***ASCE 7, Section 17.2.5.2.*** *Modify ASCE 7, Section 17.2.5.2 by adding the following:*

*The separation requirements for the building above the isolation system and adjacent buildings shall be the sum of the factored displacements for each building. The factors to be used in determining separations shall be:*

1. *For seismically isolated buildings, the ~~elastic~~ deformation resulting from the ~~dynamic~~ analyses using the Maximum Considered Earthquake unmodified by $R_I$.*

2. *For fixed based buildings, $C_d$ times the elastic deformations resulting from an equivalent static analysis using the seismic base shear computed via ASCE 7, Section 12.8.*

***~~1614A.1.24~~*** ***~~ASCE 7, Section 17.3.1.~~*** *~~Modify ASCE 7, Section 17.3.1 by the adding following:.~~*

*~~Site-specific ground motion spectra of the design-basis earthquake and the maximum considered earthquake, developed in accordance with Section 1802A.6 and ASCE 7, shall be used for design and analysis of all seismic-isolated structures when required by Section 1614A.1.2 or ASCE 7.~~*

***1615A.1.32*** ***~~1614A.1.25~~*** ***ASCE 7, Section 17.3.2.*** *~~Modify~~ Replace ASCE 7, Section 17.3.2 ~~by~~ with the following:*

***17.3.2 Ground Motion Histories.*** *Where response history procedures are used, ground motions shall consist of pairs of appropriate horizontal ground motion acceleration components developed in accordance with Section 16.1.3.2 except that 0.2T and 1.5T shall be replaced by 0.5 $T_D$ and 1.25$T_M$, respectively, where $T_D$ and $T_M$ are defined in Section 17.5.3.*

~~*The SRSS of the time history components shall be equal to or greater than the 5 percent damped design spectra between 0.5TD and 1.25TM (where TD and TM are defined in ASCE 7 Section 17.5.3).*~~

~~*The duration of the time histories shall be consistent with the magnitude and source characteristics of the design earthquake (or maximum considered earthquake).*~~

***1615A.1.33*** ~~***1614A.1.26***~~ ***ASCE 7, Section 17.4.***~~***1.***~~ *Modify ASCE 7, Section 17.4.2* ~~*.1*~~ *by adding the following:*

~~*Equivalent Lateral Force Procedure of Section 17.5 shall be used to establish minimum criteria only, and not be used for design purposes unless these minimum requirements exceed computed force and displacement calculated values from the dynamic analysis.*~~

***17.4.2.1 Linear Procedure.*** *Linear procedures shall be limited to structures located at sites where mapped value of $S_1$ is less than 0.6g.*

~~***1614A.1.27 ASCE 7, Section 17.4.2.1.*** *Modify ASCE 7, Section 17.4.2.1 by adding the following.*~~

~~*3. The isolation system has force-deflection properties that are independent of the rate of loading.*~~

~~*4. The isolation system has force-deflection properties that are independent of the vertical load or bilateral load imposed on the isolators.*~~

~~***1614A.1.28 ASCE 7, Section 17.4.*** *Modify ASCE 7, Section 17.4.by adding section 17.4.3 as follows:*~~

~~***17.4.3 Period Separation****. In each principal direction, the fundamental period, T of the superstructure, computed in accordance with ASCE 7 Section 12.8.2, assuming that the structure is fixed at the isolation interface, shall not exceed the isolated-structure period, $T_M$.*~~

***1615A.1.34*** ~~***1614A.1.29***~~ ***ASCE 7, Section*** *17.6* ~~*17.7*~~ *Modify ASCE 7, Section 17.6* ~~*17.7*~~ *by* ~~*adding section 17.7.1 as follows:*~~ *the following:*

~~*17.7.1 Design Review. The design review shall be the responsibility of the enforcement agency. The enforcement agency may at its discretion require the owner of the facility to retain an independent team to review and report per Section 17.7. The team shall serve in an advisory capacity to provide technical evaluations to the enforcement agency. The members of the independent team shall be approved by the enforcement agency.*~~

***17.6.1.1 Minimum Seismic Force****. For the response spectrum and linear response history procedures, $V_b$ and $V_s$, shall not be taken less than those calculated in accordance with Equations 17.5-7 and 17.5-8.*

~~***1614A.1.30 ASCE 7, Section 18.2.4.*** *Modify ASCE 7, Section 18.2.4, second sentence as follows:*~~

~~*Regardless of the analysis method used, the peak dynamic response of the structure and elements of the damping system shall be confirmed by using the nonlinear response history procedure.*~~

~~***1614A.1.31 ASCE 7, Section 18.9.2.*** *Modify ASCE 7, Section 18.9.2 by adding the following:*~~

~~***Required Tests of Energy Dissipation Devices - Production Tests.*** *Production testing and associated acceptance criteria shall be as approved by the enforcement agent.*~~

***1615A.1.35 ASCE 7, Section 18.3.1.*** *Modify ASCE 7, Section 18.3.1 by replacing the third paragraph with the following:*

*If the calculated force in an element of the seismic force resisting system does not exceed 1.5 times its nominal strength for the Maximum Considered Earthquake (MCE) nor its nominal strength for the Design Earthquake (DE), the element is permitted to be modeled as linear.*

***1615A.1.36 ASCE 7, Section 21.4.*** *Replace ASCE 7, Section 21.4 with the following:*

***21.4 Design Acceleration Parameters.*** *Where the site-specific procedure is used to determine the design ground motion in accordance with Section 21.3, the parameter $S_{DS}$ shall be taken as the spectral acceleration, $S_a$, obtained from the site-specific spectra at a period of 0.2 sec, except that it shall not be taken less than 90 percent of the peak spectral acceleration, $S_a$, at any period larger than 0.2 second. The parameter $S_{D1}$ shall be taken as the greater of the spectral acceleration, $S_a$, at a period of 1 sec or two times the spectral acceleration, Sa, at a period of 2 sec.*

*For use with the Equivalent Lateral Force Procedure, the site specific spectral acceleration, $S_a$ at T shall be permitted to replace $S_{D1}/T$ in Equation 12.8-3 and $S_{D1}T_L/T^2$ in Equation 12.8-4. The parameter $S_{DS}$ calculated per this section shall be permitted to be used in Equations 12.8-2 and 12.8-5. The mapped value of $S_1$ shall be used in Equation 12.8-6. The parameters $S_{MS}$ and $S_{M1}$ shall be taken as 1.5 times $S_{DS}$ and $S_{D1}$, respectively. The values so obtained shall not be less than 80 percent of the values determined in accordance with Section 11.4.3 for $S_{MS}$ and $S_{M1}$ and Section 11.4.4 for $S_{DS}$ and $S_{D1}$.*

***1615A.1.37 Earthquake Motion Measuring Instrumentation and Monitoring. [OSHPD 1 & 4]*** *Modify ASCE 7 by the following:*

***Scope:*** *For buildings with a Seismic Isolation System, a Damping System or a Lateral Force Resisting System (LFRS) not listed in ASCE 7 Table 12.2-1, earthquake motion measuring instrumentation and monitoring shall be required.*

***Instrumentation:*** *There shall be a sufficient number of instruments to characterize the response of the building during an earthquake and shall include at least one tri-axial free field instrument or equivalent. A proposal for instrumentation and equipment specifications shall be forwarded to the enforcement agency for review and approval. The owner of the building shall be responsible for the implementation of the instrumentation program. Maintenance of the instrumentation and removal /processing of the records shall be the responsibility of the enforcement agency.*

***Monitoring:*** *After every significant seismic events, where the ground shaking acceleration at the site exceeds 0.3g, or the acceleration at any monitored building level exceeds 0.8g, as measured by the seismic monitoring system in the building, the owner shall retain a structural engineer to make an inspection of the structural system. The inspection shall include viewing the performance of the building, reviewing the strong motion records, and a visual examination of the isolators, dampers, and their connections for deterioration, offset or physical damage. A report for each inspection, including conclusions on the continuing adequacy of the structural system, shall be submitted to the enforcement agency.*

***1615A.1.38 Operational Nonstructural Performance Level Requirements. [OSHPD 1 & 4]*** *New buildings designed and constructed to this code shall be deemed to satisfy Operational Nonstructural Performance Level when:*

1. *The facility has on-site supplies of water and holding tanks for wastewater, sufficient for 72 hours of emergency operations, which are integrated into the building plumbing systems. As an alternative, hook-ups to allow for the use of transportable sources of water and sanitary waste water disposal shall be permitted.*

2. *An on-site emergency system as defined within Part 3, Title 24 is incorporated into the building electrical system for critical care areas. Additionally, the system shall provide for radiological service and an onsite fuel supply for 72 hours of acute care operation.*

*(All existing amendments that are not revised above shall continue without any change)*

**NOTATION:**

- *Authority: Health and Safety Code Section 130005(g) & 130021*
- *Reference: Health and Safety Code Section 1275, 129790, 129850 & 130005(g)*

## CHAPTER 17
## STRUCTURAL TESTS AND SPECIAL INSPECTIONS

### SECTION 1701
### GENERAL

**1701.1 Scope.** The provisions of this chapter shall govern the quality, workmanship and requirements for materials covered. Materials of construction and tests shall conform to the applicable standards listed in this code.

**...**

### SECTION 1704
### SPECIAL INSPECTIONS

**...**

**1704.1.1 Statement of special inspections.** The permit applicant shall submit a statement of special inspections prepared by the registered design professional in responsible charge in accordance with Section 106.1, as a condition for permit issuance. This statement shall be in accordance with Section 1705*A*.

**Exceptions:**

1. A statement of special inspections is not required for structures designed and constructed in accordance with the conventional construction provisions of Section 2308. *[OSHPD 2] Not permitted by OSHPD.*

2. The statement of special inspections is permitted to be prepared by a qualified person approved by the building official for construction not designed by a registered design professional.

**...**

~~***1704.4.2 [OSHPD 2] Placing Record****. A record shall be kept on the site of the time and date of placing the concrete in each portion of the structure. Such record shall be kept until the completion of the structure and shall be open to the inspection of the enforcement agency.*~~

**...**

***1704.6.2 [OSHPD 2] Manufactured Trusses and Assemblies.*** *The fabrication of trusses and other assemblages constructed using wood and metal members, or using light metal plate connectors, shall be continuously inspected by a qualified inspector approved by the enforcement agency. The inspector shall furnish the architect, structural engineer and the enforcement agency with a report that the lumber species, grades and moisture content; type of glue, temperature and gluing procedure; type of metal members and metal plate connectors; and the workmanship conform in every material respect with the duly approved plans and specifications. Each inspected truss shall be stamped by the inspector with an identifying mark.*

**...**

*(All existing amendments that are not revised above shall continue without any change)*

***Notation:***
*Authority: Health and Safety Code Section 129850*
*Reference: Health and Safety Code Sections 1275, 129850 and 129790*

## CHAPTER 17*A*
## STRUCTURAL TESTS AND SPECIAL INSPECTIONS

### SECTION 1701*A*
### GENERAL

**1701*A*.1 Scope.** The provisions of this chapter shall govern the quality, workmanship and requirements for materials covered. Materials of construction and tests shall conform to the applicable standards listed in this code.

***1701A.1.1 Application.*** *The scope of application of Chapter 17A is as follows:*

*1. (Reserved for DSA).*

*2. Structures regulated by the Office of Statewide Health Planning and Development (OSHPD), which include those applications listed in Section ~~110.1~~ 1.10.1, and ~~110.4~~ 1.10.4. These applications include hospitals, skilled nursing facilities, intermediate care facilities and correctional treatment centers.*

***Exception: [OSHPD 2]*** *Single-story Type V skilled nursing or intermediate care facilities utilizing wood-frame or light-steel-frame construction as defined in Health and Safety Code Section 129725, which shall comply with Chapter 17 and any applicable amendments therein.*

***1701A.1.2 Amendments in this chapter.*** *OSHPD adopt this chapter and all amendments.*

***Exception:*** *Amendments adopted by only one agency appear in this chapter preceded with the appropriate acronym of the adopting agency, as follows:*

*1. (Reserved for DSA).*

*2. Office of Statewide Health Planning and Development:*

***[OSHPD 1]*** *- For applications listed in Section ~~110.1~~ 1.10.1.*

***[OSHPD 4]*** *- For applications listed in Section ~~110.4~~ 1.10.4.*

**...**

***1701A.4 Special inspectors. [OSHPD 1 and 4]*** *In addition to the inspector(s) of record required by Title 24, Part 1, Section 7-144, the owner shall employ one or more special inspectors who shall provide inspections during construction on the types of work listed under Chapters 17A, 18A, 19A, 20, 21A, 22A, 23, 25, 34A, and noted in the ~~special~~ ~~t~~ Test, ~~i~~ Inspection, and ~~o~~ Observation (TIO) program ~~plan~~ required by Sections 7-141, 7-145 and 7-149 of Title 24, Part 1, of the California ~~Building Standards~~ Administrative Code. Test, Inspection, and Observation (TIO) program shall satisfy requirements of Section 1704A.1.1.*

**...**

### SECTION 1704*A*
### SPECIAL INSPECTIONS

**1704*A*.1 General.** Where application is made for construction as described in this section, the owner ~~or the registered design professional in responsible charge acting as the owner's agent~~ shall employ one or more *approved agencies* to perform inspections during construction on the types of work listed under Section 1704. These inspections are in addition to the inspections identified in Section 110.

The special inspector shall be a qualified person who shall demonstrate competence, to the satisfaction of the *building official*, for the inspection of the particular type of construction or operation requiring *special inspection*. The *registered design professional in responsible charge* and engineers of record involved in the

design of the project are permitted to act as the *approved agency* and their personnel are permitted to act as the special inspector for the work designed by them, provided those personnel meet the qualification requirements of this section to the satisfaction of the *building official*. The special inspector shall provide written documentation to the building official demonstrating their competence and relevant experience or training. Experience or training shall be considered relevant when the documented experience or training is related in complexity to the same type of *special inspection* activities for projects of similar complexity and material qualities. These qualifications are in addition to qualifications specified in other sections of this code.

**Exceptions:**

1. Special inspections are not required for work of a minor nature or as warranted by conditions in the jurisdiction as *approved* by the *building official*.
2. Special inspections are not required for building components unless the design involves the practice of professional engineering or architecture as defined by applicable state statutes and regulations governing the professional registration and certification of engineers or architects.
3. Unless otherwise required by the *building official*, special inspections are not required for Group U occupancies that are accessory to a residential occupancy including, but not limited to, those listed in Section 312.1.

**1704*A*.1.1 Statement of special inspections.** The applicant shall submit a statement of special inspections prepared by the *registered design professional* in responsible charge in accordance with Section 107.1 as a condition for issuance. This statement shall be in accordance with Section 1705*A*.

**Exceptions:**

~~1. A statement of special inspections is not required for structures designed and constructed in accordance with the conventional construction provisions of Section 2308.~~
~~2.~~ The statement of special inspections is permitted to be prepared by a qualified person *approved* by the *building official* for construction not designed by a *registered design professional*.

**1704*A*.1.2 Report requirement.** *The inspector(s) of record and special* inspectors shall keep records of inspections. The *inspector of record and* special inspector shall furnish inspection reports to the *building official*, and to the *registered design professional in responsible charge as required by Title 24, Part 1*. Reports shall indicate that work inspected was or was not completed in conformance to *approved construction documents as required by Title 24 Parts 1 and 2*. Discrepancies shall be brought to the immediate attention of the contractor for correction. If they are not corrected, the discrepancies shall be brought to the attention of the *building official* and to the *registered design professional in responsible charge* prior to the completion of that phase of the work. A final report documenting required special inspections and correction of any discrepancies noted in the inspections shall be submitted at a point in time agreed upon prior to the start of work by the applicant and the *building official*.

**1704*A*.2 Inspection of fabricators.** Where fabrication of structural load-bearing members and assemblies is being performed on the premises of a fabricator's shop, *special inspection* of the fabricated items shall be required by this section and as required elsewhere in this code.

**1704.2.1 Fabrication and implementation procedures.** The special inspector shall verify that the fabricator maintains detailed fabrication and quality control procedures that provide a basis for inspection control of the workmanship and the fabricator's ability to conform to *approved construction documents* and referenced standards. The special inspector shall review the procedures for completeness and adequacy relative to the code requirements for the fabricator's scope of work.

~~**Exception:** *Special inspections* as required by Section 1704*A*.2 shall not be required where the fabricator is *approved* in accordance with Section 1704*A*.2.2 *except as required by Sections 1704A.3, 1704A.4, and 1704A.6.*~~

~~**1704*A*.2.2 Fabricator approval.** *Special inspections* required by Section 1704*A* are not required where the work is done on the premises of a fabricator registered and *approved* to perform such work without *special inspection*. Approval shall be based upon review of the fabricator's written~~

~~procedural and quality control manuals and periodic auditing of fabrication practices by an *approved special inspection* agency. At completion of fabrication, the *approved* fabricator shall submit a *certificate of compliance* to the *building official* stating that the work was performed in accordance with the *approved construction documents*.~~

**1704*A*.3 Steel construction.** The *special inspections* for steel elements of buildings and structures shall be as required by Section 1704*A*.3 and Table 1704*A*.3.

**Exceptions:**

1. *Special inspection* of the steel fabrication process shall not be required where the fabricator does not perform any welding, thermal cutting or heating operation of any kind as part of the fabrication process. In such cases, the fabricator shall be required to submit a detailed procedure for material control that demonstrates the fabricator's ability to maintain suitable records and procedures such that, at any time during the fabrication process, the material specification, grade and mill test reports for the main stress-carrying elements are capable of being determined.

2. The special inspector need not be continuously present during welding of the following items, provided the materials, welding procedures and qualifications of welders are verified prior to the start of the work; periodic inspections are made of the work in progress and a visual inspection of all welds is made prior to completion or prior to shipment of shop welding.

2.1. Single-pass fillet welds not exceeding 5/16 inch (7.9 mm) in size.
2.2. Floor and roof deck welding.
2.3. Welded studs when used for structural diaphragm.
2.4. Welded sheet steel for cold-formed steel members.
2.5. Welding of stairs and railing systems.

**...**

**1704*A*.3.1 Welding.** Welding inspection and welding inspector qualification shall be in accordance with this section.

**1704*A*.3.1.1 Structural steel.** Welding inspection and welding inspector qualification for structural steel shall be in accordance with AWS D1.1.

**1704*A*.3.1.2 Cold-formed steel.** Welding inspection and welding inspector qualification for cold-formed steel floor and roof decks shall be in accordance with AWS D1.3.

**1704*A*.3.1.3 Reinforcing steel.** Welding inspection and welding inspector qualification for reinforcing steel shall be in accordance with AWS D1.4 and ACI 318.

***1704A.3.1.4*** ***~~1704A.3.1.1~~*** ***Inspection of Structural Welding.*** *Inspection of all shop and field welding operations~~, including the installation of automatic end-welded stud shear connectors~~ shall be made by a qualified welding inspector approved by the enforcement agency. ~~Such inspector shall be a person trained and thoroughly experienced in inspecting welding operations. The inspector's ability to distinguish between sound and unsound welding shall be reliably established~~. The minimum requirements for a qualified welding inspector shall be as those for an AWS certified welding inspector (CWI), as defined in the provisions of the AWS QC1. All welding inspectors shall be as approved by the enforcement agency.*

~~*The ability of each welder to produce sound welds of all types required by the work shall be established by welder qualification satisfactory to the enforcement agency.*~~

~~*Welding inspection of structural welding shall conform to the requirements of AWS D1.1, except as modified by this section.*~~

~~*Welding inspection of cold-formed steel members shall conform to the requirements of AWS D1.3.*~~

*The welding inspector shall make a systematic daily record of all welds. This record shall include in addition to other required records:*

*1. Identification marks of welders.*

*2. List of defective welds.*

*3. Manner of correction of defects.*

*The welding inspector shall check the material, ~~equipment,~~ details of construction and procedure, as well as workmanship of the welds. ~~The inspector shall also check the ability of the welder.~~ The inspector shall verify that the installation ~~procedure for automatic~~ of end-welded stud shear connectors is in accordance with the requirements of AWS D1.1 and the approved plans and specifications. The inspector shall furnish the architect, structural engineer, and the enforcement agency with a verified report that the welding is proper and has been done in conformity with AWS D1.1, D1.8, and the approved plans and specifications. ~~The inspector shall use all means necessary to determine the quality of the weld. The inspector may use gamma ray, magnaflux, trepanning, sonics or any other aid to visual inspection which the inspector may deem necessary to be assured of the adequacy of the welding.~~*

**1704A.3.2 Details.** The special inspector shall perform an inspection of the steel frame to verify compliance with the details shown on the *approved construction documents*, such as bracing, stiffening, member locations and proper application of joint details at each connection.

***~~1704A.3.2.1 Inspection of Shop Fabrication.~~*** *~~Inspection of shop fabrication shall be required for significant structural detailed connection and fabrication work as directed by the enforcement agency. This inspection shall be made by a qualified inspector approved by the enforcement agency. The inspector shall furnish the architect, structural engineer, and the enforcement agency with a report that the materials and workmanship conform to the approved plans and specifications.~~*

***1704A.3.2.1 ~~1704A.3.2.2~~ Steel Joist and Joist Girder Inspection.*** *Special inspection is required during the manufacture and welding of steel joists or joist girders. The special inspector shall verify that proper quality control procedures and tests have been employed for all materials and the manufacturing process, and shall perform visual inspection of the finished product. The special inspector shall place a distinguishing mark, and/or tag with this distinguishing mark, on each inspected joist or joist girder. This mark or tag shall remain on the joist or joist girder throughout the job site receiving and erection process.*

***1704A.3.2.2 ~~1704A.3.2.3~~ Light-Framed Steel Truss Inspection.*** *The manufacture of cold-formed light framed steel trusses shall be continuously inspected by a qualified special inspector approved by the enforcement agency. The special inspector shall verify conformance of materials and manufacture with approved plans and specifications. The special inspector shall place a distinguishing mark, and/or tag with this distinguishing mark, on each inspected truss. This mark or tag shall remain on the truss throughout the job site receiving and erection process.*

**1704*A*.3.3 High-strength bolts.** Installation of high-strength bolts shall be inspected in accordance with AISC 360.

**…**

**1704*A*.4 Concrete construction.** The special inspections and verifications for concrete construction shall be as required by this section and Table 1704*A*.4.

~~**Exception:** *Special inspections* 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.~~

~~2. Continuous concrete footings supporting walls of buildings three stories or less above *grade plane* that are fully supported on earth or rock where:~~

~~2.1. The footings support walls of light frame construction;~~

~~2.2. The footings are designed in accordance with Table 1809.7; or~~

~~2.3. 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) (17.2 Mpa), regardless of the compressive strength specified in the *construction documents* or used in the footing construction.~~

~~3. Nonstructural concrete slabs supported directly on the ground, including prestressed slabs on grade, where the effective prestress in the concrete is less than 150 psi (1.03 Mpa).~~

~~4. Concrete foundation walls constructed in accordance with Table 1807.1.6.2.~~

~~5. Concrete patios, driveways and sidewalks, on grade.~~

**...**

~~***1704A.4.2*** **Inspection of Welded Reinforcing Bars.** *Inspection of all shop and field structural welding operations shall be made by a qualified welding inspector approved by the enforcement agency. Such inspector shall be trained and thoroughly experienced in inspecting reinforcing bar welding operations. The inspector's ability to distinguish between sound and unsound welding shall be reliably established.*~~

~~*The welding inspector shall make a systematic record of all welds. This record shall include:*~~

~~*1. Identification marks of welders.*~~

~~*2. List of defective welds.*~~

~~*3. Manner of correction of defects.*~~

~~*The welding inspector shall check the material, equipment, details of construction, and procedures as well as the welds. The inspector shall also check the ability of the welder. The welding inspector shall furnish the architect, structural engineer and the enforcement agency with a verified report that the welding which is required to be inspected is proper and has been done in conformity with the approved plans and specifications. The welding inspector shall use all means necessary to determine the quality of the weld. The inspector may use gamma ray, magnaflux, trepanning, sonics or any other aid to visual inspection which the inspector may deem necessary to assure the adequacy of the welding.*~~

***1704A.4.2*** ~~***1704A.4.3***~~ **Batch Plant Inspection.** *Except as provided under Section 1704A.4.3 ~~1704A.4.4~~, the quality and quantity of materials used in transit-mixed concrete and in batched aggregates shall be continuously inspected at the location where materials are measured by an approved special inspector.*

***1704A.4.3*** ~~***1704A.4.4***~~ **Waiver of continuous batch plant inspection.** *Continuous ~~B~~ batch plant inspection may be waived by the registered design professional, subject to approval by the enforcement agency under either of the following conditions:*

1. *The concrete plant complies fully with the requirements of ASTM C 94, Sections 8 and 9, and has a current certificate from the National Ready Mixed Concrete Association or another agency acceptable to the enforcement agency. The certification shall indicate that the plant has automatic batching and recording capabilities.*

2. *For ~~one-story wood-frame or one~~ single -story light-framed ~~-steel~~ buildings and isolated ~~mat-type~~ foundations supporting equipment only, where the specified compressive strength $f_c$ of the concrete delivered to the jobsite is 3,500 psi (24.13 MPa) and where the $f'_c$ used in design is not greater than ~~2,500 psi (17.24 MPa)~~ 3,000 psi (20.68 MPa).*

*When continuous batch plant inspection is waived, the following periodic inspection requirements shall apply and shall be described in the ~~contract specifications~~ construction documents:*

1. ~~Approved inspector~~ Qualified technician of the testing laboratory shall check the first batch~~ing~~ at the start of the day. ~~work and furnish mix proportions to the licensed weighmaster.~~

2. Licensed weighmaster to positively identify materials as to quantity and certify to each load by a batch ticket.

3. Batch ~~T~~ tickets, including material quantities and weights shall accompany the load, shall be transmitted to the inspector of record by a truck driver with load identified thereon. ~~Inspector will not accept t~~ The load shall not be placed without a ~~load~~ batch ticket identifying the mix. ~~and~~ The inspector will keep a daily record of placements, identifying each truck, its load, ~~and~~ time of receipt, and approximate location of deposit in the structure and will transmit a copy of the daily record to the enforcement agency.

~~4. At the end of the project, the weighmaster shall furnish an affidavit to the enforcement agency certifying that all concrete furnished conforms in every particular to proportions established by mix designs.~~

**1704A.4.4 ~~1704A.4.5~~ Inspection of Prestressed Concrete.**

**1.** In addition to the general inspection required for concrete work, all plant fabrication of prestressed concrete members or tensioning of posttensioned members constructed at the site shall be continuously inspected by an inspector specially approved for this purpose by the enforcement agency.

~~2 To be eligible for approval, the inspector shall be examined as to his or her knowledge and experience in prestressed concrete construction.~~

2. ~~3~~ The prestressed concrete plant fabrication inspector shall check the materials, equipment, tensioning procedure and construction of the prestressed members and prepare daily written reports. The inspector shall make a verified report identifying the members by mark and shall include such pertinent data as lot numbers of tendons used, tendon jacking forces, age and strength of concrete at time of tendon release and such other information that may be required.

3. ~~4~~ The inspector of prestressed members posttensioned at the site shall check the condition of the prestressing tendons, anchorage assemblies and concrete in the area of the anchorage, the tensioning equipment and the tensioning procedure and prepare daily written reports. The inspector shall make a verified report of the prestressing operation identifying the members or tendons by mark and including such pertinent data as the initial cable slack, net elongation of tendons, jacking force developed, and such other information as may be required.

4. ~~5~~ The verified reports of construction shall show that of the inspector's own personal knowledge, the work covered by the report has been performed and materials used and installed in every material respect in compliance with the duly approved plans and specifications for plant fabrication inspection. The verified report shall be accompanied by test reports required for materials used. For site posttensioning inspections the verified report shall be accompanied by copies of calibration charts, certified by an approved testing laboratory, showing the relationship between gage readings and force applied by the jacks used in the prestressing procedure

**1704A.4.5 ~~1704A.4.6~~ Concrete Pre-Placement Inspection.** Concrete shall not be placed until the forms and reinforcement have been inspected, all preparations for the placement have been completed, and the preparations have been checked by the inspector of Record. ~~and Special Inspector, all subject to the observation of the structural engineer or architect.~~

**1704A.4.6 ~~1704A.4.7~~ Placing Record**. A record shall be kept on the site of the time and date of placing the concrete in each portion of the structure. Such record shall be kept until the completion of the structure and shall be open to the inspection of the enforcement agency.

**…**

**TABLE 1704*A*.4**
**REQUIRED VERIFICATION AND INSPECTION OF CONCRETE CONSTRUCTION**

| VERIFICATION AND INSPECTION | Continuous | Periodic | Referenced[a] Standard | ~~IBC~~ *CBC* Reference |
|---|---|---|---|---|
| .... | .... | .... | .... | .... |
| ~~*12. Post-Installed Anchors.*~~ | ~~X~~ | — | — | — |

...

**1704*A*.5 Masonry construction.** Masonry construction shall be inspected and verified in accordance with the requirements of Sections 1704*A*.5.1 through 1704*A*.5.2, depending on the *occupancy category* of the building or structure.

~~**Exception:** *Special inspections* shall not be required for:~~

~~1. Empirically designed masonry, glass unit masonry or masonry veneer designed by Section 2109, 2110 or Chapter 14, respectively, or by Chapter 5, 7 or 6 of TMS 402/ACI 530/ASCE 5, respectively, when they are part of structures classified as *Occupancy Category* I, II or III in accordance with Section 1604.5.~~

~~2. Masonry foundation walls constructed in accordance with Table 1807.1.6.3(1), 1807.1.6.3(2), 1807.1.6.3(3) or 1807.1.6.3(4).~~

~~3. Masonry fireplaces, masonry heaters or masonry chimneys installed or constructed in accordance with Section 2111, 2112 or 2113, respectively.~~

**1704*A*.5.1 ~~Empirically designed masonry, g~~ *G*lass unit masonry and masonry veneer in Occupancy Category IV.** The minimum *special inspection* program for ~~empirically designed masonry,~~ glass unit masonry or masonry veneer designed by Section ~~2109, 2110 or~~ Chapter *21A or* 14, ~~respectively,~~ or by Chapter ~~5, 7 or~~ 6 of TMS 402/ACI 530/ASCE 5, ~~respectively,~~ in structures classified as *Occupancy Category* IV, in accordance with Section 1604*A*.5, shall comply with Table 1704*A*.5.1.

**TABLE 1704A.5.1**
**LEVEL 1 REQUIRED VERIFICATION AND INSPECTION OF MASONRY CONSTRUCTION**

| VERIFICATION AND INSPECTION | FREQUENCY OF INSPECTION | | REFERENCE FOR CRITERIA | | |
|---|---|---|---|---|---|
| | Continuous | Periodic | ~~IBC~~ *CBC* section | TMS 402/ACI 530/ASCE 5/[a] | TMS 602/ACI 530.1/ASCE 6[a] |
| ... | ... | ... | ... | ... | ... |
| ~~*7. Post-Installed Anchors.*~~ | ~~X~~ | — | *1615A.1.14* | — | — |

...

**1704*A*.5.3 Engineered masonry in Occupancy Category IV.** The minimum *special inspection* program for masonry designed by Section 2107*A* or 2108*A* or by chapters other than Chapter ~~5,~~ 6 ~~or 7~~ of TMS402/ACI 530/ASCE 5 in structures classified as *Occupancy Category* IV, in accordance with Section 1604*A*.5, shall comply with Table 1704*A*.5.3.

**TABLE 1704A.5.3**
**LEVEL 2 REQUIRED VERIFICATION AND INSPECTION OF MASONRY CONSTRUCTION**

| VERIFICATION AND INSPECTION | FREQUENCY OF INSPECTION | | REFERENCE FOR CRITERIA | | |
|---|---|---|---|---|---|
| | Continuous | Periodic | ~~IBC~~ *CBC* | TMS 402/ACI | TMS 602/ACI |

| | | | section | 530/ASCE 5/[a] | 530.1/ASCE 6[a] |
|---|---|---|---|---|---|
| … | … | … | … | … | … |
| ~~5.~~ 7. Post-Installed Anchors. | X | — | 1615A.1.14 | — | — |

…

**1704*A*.6 Wood construction.** *Special inspections* of the fabrication process of prefabricated wood structural elements and assemblies shall be in accordance with Section 1704.2 *except as modified in this section*. *Special inspections* of site *and shop* -built assemblies shall be in accordance with this section.

**1704*A*.6.1 High-load diaphragms.** High-load diaphragms designed in accordance with Table 2306.2.1(2) shall be installed with *special inspections* as indicated in Section 1704.1. The special inspector shall inspect the wood structural panel sheathing to ascertain whether it is of the grade and thickness shown on the *approved* building plans. Additionally, the special inspector must verify the nominal size of framing members at adjoining panel edges, the nail or staple diameter and length, the number of fastener lines and that the spacing between fasteners in each line and at edge margins agrees with the *approved* building plans.

**1704*A*.6.2 Metal-plate-connected wood trusses spanning 60 feet or greater.** Where a truss clear span is 60 feet (18288 mm) or greater, the special inspector shall verify that the temporary installation restraint/bracing and the permanent individual truss member restraint/bracing are installed in accordance with the *approved* truss submittal package.

***1704A.6.3*** ~~***1704A.6.2***~~ ***Wood Structural Elements and Assemblies.*** *Special inspection of wood structural elements and assemblies is required, as specified in this section, to ensure conformance with approved drawings and specifications, and applicable standards.*

*The special inspector shall furnish a verified report to the design professional in general responsible charge of construction observation, the structural engineer, and the enforcement agency, in accordance with Title 24, Part 1 and this chapter. The verified report shall list all inspected members or trusses, and shall indicate whether or not the inspected members or trusses conform with applicable standards and the approved drawings and specifications. Any non-conforming items shall be indicated on the verified report.*

***1704A.6.3.1*** ~~***1704A.6.2.1***~~ ***Structural Glued - Laminated Timber.*** *Manufacture of all structural glued laminated timber shall be continuously inspected by a qualified special inspector approved by the enforcement agency.*

*The special inspector shall verify that proper quality control procedures and tests have been employed for all materials and the manufacturing process, and shall perform visual inspection of the finished product. Each inspected member shall be stamped by the special inspector with an identification mark.*

***Exception:*** *Special Inspection is not required for non-custom members of 5-1/8 inch maximum width and 18 inch maximum depth, and with a maximum clear span of 32 feet, manufactured and marked in accordance with ANSI/AITC A 190.1 Section 6.1.1 for non-custom members.*

***1704A.6.3.2*** ~~***1704A.6.2.2***~~ ***Manufactured open web trusses.*** *The manufacture of open web trusses shall be continuously inspected by a qualified special inspector approved by the enforcement agency.*

*The special inspector shall verify that proper quality control procedures and tests have been employed for all materials and the manufacturing process, and shall perform visual inspection of the finished product. Each inspected truss shall be stamped with an identification mark by the special inspector.*

***1704A.6.4*** ~~***1704A.6.3***~~ **Timber Connectors.** *The installation of all split ring and shear plate timber connectors, and timber rivets shall be continuously inspected by a qualified inspector approved by the enforcement agency. The inspector shall furnish the architect, structural engineer and the enforcement agency with a report duly verified by him that the materials, timber connectors and workmanship conform to the approved plans and specifications.*

**1704*A*.7 Soils.** *Special inspections* for existing site soil conditions, fill placement and load-bearing requirements shall be as required by this section and Table 1704*A*.7. The *approved* geotechnical report, and the *construction documents* prepared by the *registered design professional*s shall be used to determine compliance. During fill placement, the special inspector shall determine that proper materials and procedures are used in accordance with the provisions of the *approved* geotechnical report.

**Exception:** Where Section 1803*A* does not require reporting of materials and procedures for fill placement, the special inspector shall verify that the in-place dry density of the compacted fill is not less than 90 percent of the maximum dry density at optimum moisture content determined in accordance with ASTM D 1557.

**...**

***1704A.7.1 Soil Fill.*** *All fills used to support the foundations of any building or structure shall be* ~~*placed under the direction of a geotechnical engineer, and the placement of the fill shall be*~~ *continuously inspected by the geotechnical engineer or his or her qualified representative. It shall be the responsibility of* ~~*such*~~ *the geotechnical engineer to* ~~*see that the procedures used in placing*~~ *verify that fills meet the requirements of the specifications and to coordinate all fill inspection and testing during the construction involving such fills.*

*The duties of the geotechnical engineer or his or her qualified representative shall include, but need not be limited to, the observation of cleared areas and benches prepared to receive fill; observation of the removal of all unsuitable soils and other materials; the approval of soils to be used as fill material; the inspection of placement and compaction of fill materials; the testing of the* ~~*completed*~~ *fills; and the inspection or review of geotechnical drainage devices where required by the soils investigation, buttress fills or other similar protective measures.*

*A verified report shall be submitted to the enforcement agency by the geotechnical engineer. The report shall indicate that all the tests required by the construction documents* ~~*plans and specifications*~~ *were completed and that the tested materials were in compliance with the construction documents.* ~~*plans and specifications and the recommendations of the soils investigation report.*~~

**1704*A*.8 Driven deep foundations.** *Special inspections* shall be performed during installation and testing of driven deep foundation elements as required by Table 1704*A*.8. The *approved* geotechnical report, and the *construction documents* prepared by the *registered design professional*s, shall be used to determine compliance.

**...**

***1704A.8.1*** ~~***Pile***~~ ***Driven deep foundations Observation.*** *The installation of driven deep foundations* ~~*piles*~~ *shall be continuously observed by a qualified representative of the geotechnical engineer responsible for that portion of the project.* ~~*The representatives of the geotechnical engineer shall be examined by the enforcement agency to determine his / her knowledge and experience in pile- driving operations. The enforcement agency shall approve or reject the representatives based on this examination and his / her qualification record.*~~

*The representative of the geotechnical engineer shall make a report of the deep foundation* ~~*pile*~~*-driving operation giving such pertinent data as the physical characteristics of the deep foundation* ~~*pile*~~*-driving equipment, identifying marks for each deep foundation* ~~*pile*~~*, the total depth of embedment for each deep foundation* ~~*pile*~~*; and when the allowable deep foundation* ~~*pile*~~ *loads are determined by a dynamic load formula, the design formula used, and the permanent penetration under the last 10 blows. One copy of the report shall be sent to the enforcement agency.*

**1704*A*.9 Cast-in-place deep foundations.** *Special inspections* shall be performed during installation and testing of cast-in-place deep foundation elements as required by Table 1704*A*.9. The *approved* geotechnical report, and the *construction documents* prepared by the *registered design professionals*, shall be used to determine compliance.

> ~~***1704A.9.1 Pier* Observation.** *The belled base of each pier shall be inspected by a qualified representative of the geotechnical engineer to verify the bell size and foundation soil classification. The sloped sides of the belled bases shall be limited to a slope of 2 units vertical to 1 unit horizontal (200% slope) unless reinforced as for a concrete spread footing.*~~

**…**

**1704*A*.10 Helical pile foundations.** *Special inspections* shall be performed continuously during installation of helical pile foundations. The information recorded shall include installation equipment used, pile dimensions, tip elevations, final depth, final installation torque and other pertinent installation data as required by the *registered design professional in responsible charge*. The *approved* geotechnical report and the documents prepared by the *registered design professional* shall be used to determine compliance.

**1704*A*.11 Vertical masonry foundation elements.** *Special inspection* shall be performed in accordance with Section 1704.5 for vertical masonry foundation elements.

**…**

***1704A.17*** ~~***1704A.15***~~ **Shotcrete.** *All shotcrete work shall be continuously inspected during placing by an inspector specially approved for that purpose by the enforcement agency. The special shotcrete inspector shall check the materials, placing equipment, details of construction and construction procedure. The inspector shall furnish a verified report that of his or her own personal knowledge the work covered by the report has been performed and materials used and installed in every material respect in compliance with the duly approved plans and specifications.*

> ***1704A.17.1*** ~~***1704A.15.1***~~ **Visual examination for structural soundness of in-place shotcrete.** *Completed shotcrete work shall be checked visually for reinforcing bar embedment, voids, rock pockets, sand streaks and similar deficiencies by examining a minimum of three 3-inch (76 mm) cores taken from three areas chosen by the design engineer which represent the worst congestion of reinforcing bars occurring in the project. Extra reinforcing bars may be added to noncongested areas and cores may be taken from these areas. The cores shall be examined by the special inspector and a report submitted to the enforcement agency prior to final approval of the shotcrete.*
>
> > ***Exception:*** *Shotcrete work fully supported on earth, minor repairs, and when, in the opinion of the enforcement agency, no special hazard exists.*

~~***1704A.16* Reinforced gypsum concrete.** *All gypsum concrete work shall be continuously inspected when mixed and placed.*~~

**SECTION 1705*A***
**STATEMENT OF SPECIAL INSPECTIONS**

**…**

**1705*A*.3 Seismic resistance.** The statement of special inspections shall include seismic requirements for cases covered in Sections 1705*A*.3.1 through 1705*A*.3.5.

> ~~**Exception:** Seismic requirements are permitted to be excluded from the statement of special inspections for structures designed and constructed in accordance with the following:~~
>
> ~~1. The structure consists of light-frame construction; the design spectral response acceleration at short periods, *SDS*, as determined in Section 1613.5.4, does not exceed 0.5g; and the height of the structure does not exceed 35 feet (10 668 mm) above *grade plane*; or~~
>
> ~~2. The structure is constructed using a reinforced masonry structural system or reinforced concrete~~

~~structural system; the design spectral response acceleration at short periods, *SDS*, as determined in Section 1613.5.4, does not exceed 0.5g, and the height of the structure does not exceed 25 feet (7620 mm) above *grade plane*; or~~

~~3. Detached one- or two-family dwellings not exceeding two *stories above grade plane*, provided the structure does not have any of the following plan or vertical irregularities in accordance with Section 12.3.2 of ASCE 7:~~

~~3.1. Torsional irregularity.~~
~~3.2. Nonparallel systems.~~
~~3.3. Stiffness irregularity—extreme soft story and soft *story*.~~
~~3.4. Discontinuity in capacity—weak story.~~

...

**SECTION 1707*A***
**SPECIAL INSPECTIONS FOR SEISMIC RESISTANCE**

...

**1707*A*.3 Structural wood.** Continuous special inspection is required during field gluing operations of elements of the seismic-force-resisting system. Periodic special inspection is required for nailing, bolting, anchoring and other fastening of components within the seismic-force-resisting system, including wood shear walls, wood diaphragms, drag struts, braces, shear panels and hold-downs.

~~**Exception:** *Special inspection* is not required for wood shearwalls, shear panels and diaphragms, including nailing, bolting, anchoring and other fastening to other components of the seismic force-resisting system, where the fastener spacing of the sheathing is more than 4 inches (102 mm) on center (o.c.).~~

**1707*A*.4 Cold-formed steel light-frame construction.** Periodic special inspection is required during welding operations of elements of the seismic-force-resisting system. Periodic special inspection is required for screw attachment, bolting, anchoring and other fastening of components within the seismic-force-resisting system, including shear walls, braces, diaphragms, collectors (drag struts) and hold-downs.

~~**Exception:** *Special inspection* is not required for cold-formed steel light frame shear walls, braces, diaphragms, collectors (drag struts) and hold-downs where either of the following apply:~~

~~1. The sheathing is gypsum board or fiberboard.~~
~~2. The sheathing is wood structural panel or steel sheets on only one side of the shear wall, shear panel or diaphragm assembly and the fastener spacing of the sheathing is more than 4 inches (102 mm) on center (o.c.).~~

...

**1707A.6 Architectural components.** Periodic *special inspection* during the erection and fastening of exterior cladding, interior and exterior nonbearing walls and interior and exterior veneer in structures assigned to *Seismic Design Category* D, E or F.

~~**Exceptions:**~~

~~1. *Special inspection* is not required for exterior cladding, interior and exterior nonbearing walls and interior and exterior veneer 30 feet (9144 mm) or less in height above grade or walking surface.~~

~~2. Special inspection is not required for exterior cladding and interior and exterior veneer weighing 5 psf (24.5 N/m2) or less.~~

~~3. *Special inspection* is not required for interior nonbearing walls weighing 15 psf (73.5 N/m2) or less.~~

...

**1707A.9 Seismic isolation and *damping* systems.** Periodic special inspection is required during the fabrication and installation of isolator units and *damping devices.* ~~energy dissipation devices that are part of the seismic isolation system.~~ *Continuous special inspection is required for prototype and production testing of isolator units and damping devices*. ~~*and energy dissipation devices that are part of the seismic isolation system.*~~

**SECTION 1708*A***
**STRUCTURAL TESTING FOR SEISMIC RESISTANCE**

**1708*A*.1 Testing and qualification for seismic resistance.** The testing and qualification specified in Sections 1708*A*.2 through 1708.5, unless exempted from *special inspections* by the exceptions of Section 1704*A*.1, or 1705*A*.3.1 are required as follows:

1. The seismic-force-resisting systems in structures assigned to *Seismic Design Category* ~~C,~~ D, E or F, as determined in Section 1613*A* shall meet the requirements of Sections 1708*A*.2 and 1708*A*.3, as applicable.

2. Designated seismic systems in structures assigned to *Seismic Design Category* ~~C,~~ D, E or F subject to the special certification requirements of ASCE 7 Section 13.2.2 are required to be tested in accordance with Section 1708*A*.4.

3. Architectural, mechanical and electrical components in structures assigned to *Seismic Design Category* ~~C,~~ D, E or F ~~with an $I_p = 1.0$~~ are required to be tested in accordance with Section 1708*A*.4 where the general design requirements of ASCE 7 Section 13.2.1, Item 2 for manufacturer's certification are satisfied by testing.

4. The seismic isolation system in seismically isolated structures *and damping devices* shall meet the testing requirements of Section 1708*A*.5.

...

**1708*A*.3 Structural steel.** Testing for structural steel shall be in accordance with the quality assurance plan requirements of AISC 341.

**Exception~~s~~:**

~~1. Testing for structural steel in structures assigned to *Seismic Design Category* C that are not specifically detailed for seismic resistance, with a response modification coefficient, *R*, of 3 or less, excluding cantilever column systems.~~
~~2.~~ For ordinary moment frames, ultrasonic and magnetic particle testing of complete joint penetration groove welds are only required for demand critical welds.

**1708*A*.4 Seismic certification of nonstructural components.** The *registered design professional* shall state the applicable seismic certification requirements for nonstructural components and designated seismic systems on the *construction documents*.

1. The manufacturer of each designated seismic system components subject to the provisions of ASCE 7 Section 13.2.2 shall test or analyze the component and its mounting system or anchorage and submit a *certificate of compliance* for review and acceptance by the registered design professional responsible for the design of the designated seismic system and for approval by the *building official*. Certification shall be based on an actual test on a shake table, by three-dimensional shock tests, by an analytical method using dynamic characteristics and forces, by the use of experience data (i.e., historical data demonstrating acceptable seismic performance) or by more rigorous analysis providing for equivalent safety.

*[OSHPD 1 & 4] Active parts or energized components shall be certified exclusively on the basis of approved shake table testing in accordance with ASCE 7 Section 13.2.5 or experience data in accordance with ASCE 7 Section 13.2.6 unless it can be shown that the component is inherently rugged by comparison with similar seismically certified components.*

*Unless specified otherwise in the test standard, a minimum of two tests are required. Where a range of products are tested, the two tests can be on different size products as required by design changes in the internal structures.*

> *Exception: When a single product (and not a product line with more than one product with variations) is certified and manufacturing process is ISO 9000 certified, one dynamic test shall be permitted.*

*For a multi-component system, where active parts or energized components are certified by tests or experience data, connecting elements, attachments, and supports can be justified by supporting analysis.*

*Special seismic certification in accordance with ASCE 7 Section 13.2.2 shall be required for the following systems, equipment, and components, unless specified otherwise by the enforcement agency:*

1. *Emergency and standby power systems including generators, turbines, fuel tanks, and automatic transfer switches.*
2. *Elevator equipment (excluding elevator cabs).*
3. *Components with hazardous contents (excluding pipes, ducts, and underground tanks).*
4. *Smoke control fans.*
5. *Exhaust fans.*
6. *Switchgear.*
7. *Motor control centers.*
8. *X-Ray machines in fluoroscopy rooms.*
9. *CT (Computerized Tomography) Scanners.*
10. *Air conditioning units.*
11. *Air handling units.*
12. *Chillers.*
13. *Cooling Towers (excluding Cooling Towers designed as nonbuilding structures).*
14. *Transformers.*
15. *Electrical substations.*
16. *UPS (Inverters) and associated batteries.*
17. *Distribution panels including electrical panel boards,*
18. *Control panels including fire alarm, fire suppression, preaction, and auxiliary or remote power supplies.*

***Exceptions:***

1. *Equipment and components installed in nonconforming buildings, unless the equipment or component provides a service/system or utility to conforming buildings, or building is designated as SPC 3 or higher.*
2. *Equipment and components weighing not more than 20 lbs. supported directly on structures (and not mounted on other equipment or components) with supports and attachments in accordance with ASCE 7 Chapter 13 as modified by Section 1615A.*

2. Manufacturer's certification of compliance for the general design requirements of ASCE 7 Section 13.2.1 shall be based on analysis, testing or experience data.

**1708*A*.5 Seismically isolated structures *and structures with damping devices*.** For required system tests, see Sections 17.8 *and 18.9* of ASCE 7.

*Prototype and production testing and associated acceptance criteria for isolator units and damping devices shall be subject to preapproval by the building official. Testing exemption for similar units shall require approval by the building official.*

**…**

**SECTION 1710*A***
**STRUCTURAL OBSERVATIONS**

**1710*A*.1 General.** Where required by the provisions of Section 1710*A*.2 or 1710*A*.3, the owner shall employ a *registered design professional* to perform structural observations as defined in Section 1702*A*. 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. At the conclusion of the work included in the , the structural observer shall submit to the building official a written statement that the site visits have been made and identify any reported deficiencies which, to the best of the structural observer's knowledge, have not been resolved.

**1710*A*.2 Structural observations for seismic resistance.** *Observation of the construction shall be provided by the architect or engineer in ~~general~~ responsible charge as set forth in Title 24, Part 1.*

~~Structural observations shall be provided for those structures assigned to *Seismic Design Category* D, E or F, as determined in Section 1613, where one or more of the following conditions exist:~~

~~1. The structure is classified as *Occupancy Category* III or IV in accordance with Table 1604.5.~~
~~2. The height of the structure is greater than 75 feet (22 860 mm) above the base.~~
~~3. The structure is assigned to *Seismic Design Category* E, is classified as *Occupancy Category* I or II in accordance with Table 1604.5, and is greater than two *stories above grade plane*.~~
~~4. When so designated by the *registered design professional* responsible for the structural design.~~
~~5. When such observation is specifically required by the *building official*.~~

**1710*A*.3 Structural observations for wind requirements**. *Observation of the construction shall be provided by the architect or engineer in ~~general~~ responsible charge as set forth in Title 24, Part 1.*

~~Structural observations shall be provided for those structures sited where the basic wind speed exceeds 110 mph (49 m/sec) determined from Figure 1609, where one or more of the following conditions exist:~~

~~1. The structure is classified as *Occupancy Category* III or IV in accordance with Table 1604.5.~~
~~2. The *building height* of the structure is greater than 75 feet (22 860 mm).~~
~~3. When so designated by the *registered design professional* responsible for the structural design.~~

**…**

*(All existing amendments that are not revised above shall continue without any change)*

***Notation:***
*Authority: Health and Safety Code Section 129850*
*Reference: Health and Safety Code Sections 1275, 129850 and 129790*

## CHAPTER 18
## SOILS AND FOUNDATIONS

### SECTION 1801
### GENERAL

**1801.1 Scope.** The provisions of this chapter shall apply to building and foundation systems.

**1801.2 Design basis.** Allowable bearing pressures, allowable stresses and design formulas provided in this chapter shall be used with the *allowable stress design* load combinations specified in Section 1605.3. The quality and design of materials used structurally in excavations and foundations shall comply with the requirements specified in Chapters 16, 19, 21, 22 and 23 of this code. Excavations and fills shall also comply with Chapter 33.

**…**

### SECTION 1803
### GEOTECHNICAL INVESTIGATIONS

**1803.1 General.** Geotechnical investigations shall be conducted in accordance with Section 1803.2 and reported in accordance with Section 1803.6. Where required by the *building official* or where geotechnical investigations involve in-situ testing, laboratory testing or engineering calculations, such investigations shall be conducted by a *registered design professional*.

**1803.2 Investigations required.** Geotechnical investigations shall be conducted in accordance with Sections 1803.3 through 1803.5.

> **Exception:** The *building official* shall be permitted to waive the requirement for a geotechnical investigation where satisfactory data from adjacent areas is available that demonstrates an investigation is not necessary for any of the conditions in Sections 1803.5.1 through 1803.5.6 and Sections 1803.5.10 and 1803.5.11.
>
> ***[OSHPD 2]*** *Geotechnical reports are not required for one-story, wood-frame and light-steel-frame buildings of Type V construction and 4,000 square feet (371 $m^2$) or less in floor area, not located within Earthquake Fault Zones or Seismic Hazard Zones as shown in the most recently published maps from the California Geological Survey (CGS). Allowable foundation and lateral soil pressure values may be determined from Table 1804.2.*

**…**

**1803.6 Reporting.** Where geotechnical investigations are required, a written report of the investigations shall be submitted to the *building official* by the owner or authorized agent at the time of *permit* application. This geotechnical report shall include, but need not be limited to, the following information:

1. A plot showing the location of the soil investigations.
2. A complete record of the soil boring and penetration test logs and soil samples.
3. A record of the soil profile.
4. Elevation of the water table, if encountered.
5. Recommendations for foundation type and design criteria, including but not limited to: bearing capacity of natural or compacted soil; provisions to mitigate the effects of expansive soils; mitigation of the effects of liquefaction, differential settlement and varying soil strength; and the effects of adjacent loads.
6. Expected total and differential settlement.
7. Deep foundation information in accordance with Section 1803.5.5.
8. Special design and construction provisions for foundations of structures founded on expansive soils, as necessary.
9. Compacted fill material properties and testing in accordance with Section 1803.5.8.
10. Controlled low-strength material properties and testing in accordance with Section 1803.5.9.

*11.~~10.~~ [OSHPD 2] The report shall consider the effects of seismic hazard <u>in accordance with</u> ~~per~~ Section 1803.7. ~~1802A.7 & 1802A.8.~~*

...

***1803.7*** ***~~1802.7~~*** ***Engineering geologic reports. [OSHPD 2]***

***1803.7.1*** ***~~1802.7.1~~*** *Geologic and earthquake engineering reports shall be required for all proposed construction.*

> ***EXCEPTIONS:*** *1. Reports are not required for one-story, wood-frame and light-steel-frame buildings of Type V construction and 4,000 square feet (371m$^2$) or less in floor area, not located within Earthquake Fault Zones or Seismic Hazard Zones as shown in the most recently published maps from the California Geological Survey (CGS); nonstructural, associated structural or ~~nonrequired~~ voluntary structural alterations and incidental structural additions or alterations, and structural repairs for other than earthquake damage (See Section 3402A.1 for definitions of terms in this section).*
>
> *2. A previous report for a specific site may be resubmitted, provided that a reevaluation is made and the report is found to be currently appropriate.*

***1803.7.2*** ***~~1802.7.2~~*** *The purpose of the engineering geologic report shall be to identify geologic and seismic conditions that may require project mitigations. The reports shall contain data which provide an assessment of the nature of the site and potential for earthquake damage based on appropriate investigations of the regional and site geology, project foundation conditions and the potential seismic shaking at the site. The report shall be prepared by a California-certified engineering geologist in consultation with a California-registered geotechnical engineer.*

*The preparation of the engineering geologic report shall consider the most recent CGS Note 48; Checklist for the Review of Engineering Geology and Seismology Reports for California Public School, Hospitals, and Essential Services Buildings.. In addition, the most recent version of CGS Special Publication 42, Fault Rupture Hazard Zones in California, shall be considered for project sites proposed within an Alquist-Priolo Earthquake Fault Zone. The most recent version of CGS Special Publication 117, Guidelines for Evaluating and Mitigating Seismic Hazards in California, shall be considered for project sites proposed within a Seismic Hazard Zone. All conclusions shall be fully supported by satisfactory data and analysis.*

*In addition to requirements in Sections 1803.5.11 and 1803.5.12, ~~T~~ the report shall include, but shall not be limited to, the following:*

> *1. Geologic investigation.*
>
> *2. Evaluation of the known active and potentially active faults, both regional and local.*
>
> *3. Ground-motion parameters, as required by Section 1613 and ASCE 7.*
>
> *~~4. Evaluation of slope stability at or near the site.~~*
>
> *~~5. The liquefaction and settlement potential of the earth materials in the foundation.~~*

***~~1802.8 Geotechnical and Supplemental Ground-response Reports. [OSHPD 2]~~***

***~~1802.8.1 Geotechnical report.~~*** *~~The geotechnical report shall provide completed evaluations of the foundation conditions of the site and the potential geologic / seismic hazards affecting the site. The geotechnical report shall include, but shall not be limited to, site-specific evaluations of design criteria related to the nature and extent of foundation materials, groundwater conditions, liquefaction potential, settlement potential and slope stability. The report shall contain the results of the analyses of problem areas identified in the engineering geologic report. The geotechnical report shall incorporate estimates of the characteristics of site ground motion provided in the engineering geologic report.~~*

*~~The geotechnical report shall be prepared by a geotechnical engineer registered in the state of California with the advice of the certified engineering geologist and other technical experts, as necessary. The approved engineering geologic report shall be submitted with or as part of the geotechnical report.~~*

~~***1802.8.2 Supplemental ground-response report.*** *If site-specific ground-motion procedures, as set forth in ASCE 7 Chapter 21, or ground-motion time-history analysis, as set forth in ASCE 7 Chapter 16 or Section 17.3, are used for design, then a supplemental ground-response report may be required. All conclusions and ground-motion parameters shall be fully supported by satisfactory data and analysis.*~~

~~*180A.8.2.1 The ground-motion element shall be prepared by a registered geotechnical engineer or geophysicist (depending on the scope of the element), or engineering geologist licensed in the state of California, and having professional specialization in earthquake analyses. The ground-motion element shall present a detailed characterization of earthquake ground motions for the site, which incorporates data given in the geotechnical report. The level of ground motion considered by the ground-motion element shall be as described in ASCE 7 Chapter 21. The characterization of ground motion in the ground-motion element shall be given, according to the requirements of the analysis, in terms of:*~~

~~*1. Elastic structural response spectra.*~~

~~*2. Time-history plot of predicted ground motion at the site.*~~

~~*3. Other analyses in conformance with accepted engineering and seismological practice.*~~

~~*1802A.8.2.2 The advanced geotechnical element shall contain the results of dynamic geotechnical analyses specified by the approved geotechnical report. Where site response analysis, as set forth in ASCE 7 Section 21.1, is required, the response model shall be fully explained. The input data and assumptions shall be fully documented, and the surface ground motions recommended for design shall be clearly identified.*~~

~~*The supplemental ground-response report shall be submitted to the Office of Statewide Health Planning and Development for review and approval. The review shall determine whether the ground-motion response evaluations of the site are adequately represented. The enforcement agency, under consultation with its advisors, may require additional information, analysis or clarification of potential ground-response issues reported in the supplemental ground-response report for the proposed building site.*~~

**...**

**1810.3.1.5 Helical piles.** Helical piles shall be designed and manufactured in accordance with accepted engineering practice to resist all stresses induced by installation into the ground and service loads.

***1810.3.1.5.1 Helical Piles Seismic Requirements. [OSHPD 2]*** *For structures assigned to Seismic Design Category D, E or F, capacities of helical piles shall be determined in accordance with Section 1810.3.3 by at least two project specific pre-production tests for each soil profile, size and depth of helical pile. At least two percent of all production piles shall be proof tested to design ultimate strength determined by using load combinations in Section 1605.2.1.*

*Helical piles shall satisfy corrosion resistance requirements of ICC-ES AC 358. In addition, all helical pile materials that are subject to corrosion shall include at least 1/16" corrosion allowance.*

*Helical piles shall not be considered as carrying any horizontal loads.*

**...**

**1810.3.10.4 Seismic reinforcement.** For structures assigned to *Seismic Design Category* C, a permanent steel casing shall be provided from the top of the micropile down to the point of zero curvature. For structures assigned to *Seismic Design Category* D, E or F, the micropile shall be considered as an alternative system in accordance with Section 104.11.

The alternative system design, supporting documentation and test data shall be submitted to the *building official* for review and approval.

**1810.3.10.4.1 *Seismic Requirements*.** ***[OSHPD 2]*** *For structures assigned to Seismic Design Category D, E or F, a permanent steel casing having a minimum thickness of 3/8" shall be provided from the top of the micropile down to a minimum of 120 percent of the point of zero curvature. Capacity of micropiles shall be determined in accordance with Section 1810.3.3 by at least two project specific pre-production tests for each soil profile, size and depth of micropile. At least two percent of all production piles shall be proof tested to design ultimate strength determined by using load combinations in Section 1605.2.1.*

*Steel casing length in soil shall be considered as unbonded and shall not be considered as contributing to friction. Casing shall provide confinement at least equivalent to hoop reinforcing required by ACI 318 Section 21.12.4.*

*Reinforcement shall have Class 1 corrosion protection in accordance with PTI Recommendations for Prestressed Rock and Soil Anchors. Steel casing design shall include at least 1/16" corrosion allowance.*

*Micropiles shall not be considered as carrying any horizontal loads.*

**...**

*(All existing amendments that are not revised above shall continue without any change)*

***Notation:***
*Authority: Health and Safety Code Section 129850*
*Reference: Health and Safety Code Sections 1275 and 129850*

## CHAPTER 18*A*
## SOILS AND FOUNDATIONS

*This chapter has been revised in its entirety; there will be no marginal markings.*

### SECTION 1801*A*
### GENERAL

**1801*A*.1 Scope.** The provisions of this chapter shall apply to building and foundation systems.

*Refer to Appendix J: Grading, for requirements governing grading, excavation and earthwork construction, including fills and embankments.*

***1801A.1.1 Application.*** *The scope of application of Chapter 18A is as follows:*

1. *(Reserved for DSA).*

2. *Applications listed in Section ~~110.1~~ 1.10.1, and ~~110.4~~ 1.10.4 regulated by the Office of Statewide Health Planning and Development (OSHPD).These applications include hospitals, skilled nursing facilities, intermediate care facilities, and correctional treatment centers.*

   ***Exception: [OSHPD 2]*** *Single-story Type V skilled nursing or intermediate care facilities utilizing wood-frame or light-steel-frame construction as defined in Health and Safety Code Section 129725, which shall comply with Chapter 18 and any applicable amendments therein.*

***1801A.1.2 Amendments in this chapter.*** *OSHPD adopt this chapter and all amendments.*

***Exception:*** *Amendments adopted by only one agency appear in this chapter preceded with the appropriate acronym of the adopting agency, as follows:*

1. *(Reserved for DSA).*

2. *Office of Statewide Health Planning and Development:*

   ***[OSHPD 1]*** *- For applications listed in Section ~~110.1~~ 1.10.1.*
   ***[OSHPD 4]*** *- For applications listed in Section ~~110.4~~ 1.10.4.*

**1801*A*.2 Design basis.** Allowable bearing pressures, allowable stresses and design formulas provided in this chapter shall be used with the *allowable stress design* load combinations specified in Section 1605*A*.3. The quality and design of materials used structurally in excavations and foundations shall comply with the requirements specified in Chapters 16*A*, 19*A*, 21*A*, 22*A* and 23 of this code. Excavations and fills shall also comply with Chapter 33.

**...**

### SECTION 1802*A*
### DEFINITIONS

**...**

~~***1802A.2.8 High Sulfate Soils.*** *In areas subject to high sulfate soils, an evaluation of the impact on the durability of concrete foundations shall be considered.*~~

**...**

### SECTION 1803*A*
### GEOTECHNICAL INVESTIGATIONS

**1803*A*.1 General.** Geotechnical investigations shall be conducted in accordance with Section 1803*A*.2 and reported in accordance with Section ~~1803.6~~ *1803A.7*. ~~Where required by the *building official* or where geotechnical investigations involve in-situ testing, laboratory testing or engineering calculations, such investigations shall be conducted by a *registered design professional*.~~ *The classification and investigation of the soil shall be made under the responsible charge of a California registered geotechnical engineer. All recommendations contained in geotechnical and engineering geology reports shall be subject to the approval of the enforcement agency.* ~~*in consultation with the California Geological Survey (CGS).*~~ *All reports shall be prepared and signed by a registered geotechnical engineer and an engineering geologist where applicable.*

**1803*A*.2 Investigations required.** Geotechnical investigations shall be conducted in accordance with Sections 1803*A*.3 through ~~1803*A*.5~~ *1803A.6*.

> **Exception:** ~~The *building official* shall be permitted to waive the requirement for a geotechnical investigation where satisfactory data from adjacent areas is available that demonstrates an investigation is not necessary for any of the conditions in Sections 1803.5.1 through 1803.5.6 and Sections 1803.5.10 and 1803.5.11.~~ *Geotechnical reports are not required for one-story, wood-frame and light-steel-frame buildings of Type II or Type V construction and 4,000 square feet (371 $m^2$) or less in floor area, not located within Earthquake Fault Zones or Seismic Hazard Zones as shown in the most recently published maps from the California Geological Survey (CGS). Allowable foundation and lateral soil pressure values may be determined from Table 1806A.2.* ~~*1804A.2.*~~

**…**

**1803*A*.3 Basis of investigation.** Soil classification shall be based on observation and any necessary tests of the materials disclosed by borings, test pits or other subsurface exploration made in appropriate locations. Additional studies shall be made as necessary to evaluate slope stability, soil strength, position and adequacy of load-bearing soils, the effect of moisture variation on soil-bearing capacity, compressibility, liquefaction and expansiveness.

> **1803*A*.3.1 Scope of investigation.** The scope of the geotechnical investigation including the number and types of borings or soundings, the equipment used to drill or sample, the in-situ testing equipment and the laboratory testing program shall be determined by a *registered design professional*.
>
> *There shall not be less than one boring or exploration shaft for each 5,000 square feet (465 $m^2$) of building area at the foundation level with a minimum of two provided for any one building. A boring may be considered to reflect subsurface conditions relevant to more than one building, subject to the approval of the enforcement agency.*
>
> *Borings shall be of sufficient size to permit visual examination of the soil in place or, in lieu thereof, cores shall be taken.*
>
> *Borings shall be of sufficient depth and size to adequately characterize sub-surface conditions.*

**…**

**1803*A*.5.4 Ground-water table.** A subsurface soil investigation shall be performed to determine whether the existing ground-water table is above or within 5 feet (1524 mm) below the elevation of the lowest floor level where such floor is located below the finished ground level adjacent to the foundation.

> ~~**Exception:** A subsurface soil investigation to determine the location of the ground-water table shall not be required where waterproofing is provided in accordance with Section 1805.~~

**…**

***1803A.6*** ~~***1802A.6***~~ ***Site data.***

> ***1803A.6.1*** ~~***1802A.6.1***~~ ***Engineering geologic reports.***

***1803A.6.1.1*** ~~***1802A.6.1.1***~~ *Geologic and earthquake engineering reports shall be required for all proposed construction.*

***EXCEPTIONS:***

1. *Reports are not required for one-story, wood-frame and light-steel-frame buildings of Type II or Type V construction and 4,000 square feet (371m$^2$) or less in floor area, not located within Earthquake Fault Zones or Seismic Hazard Zones as shown in the most recently published maps from the California Geological Survey (CGS); nonstructural, associated structural or ~~nonrequired~~ voluntary structural alterations, and incidental structural additions or alterations, and structural repairs for other than earthquake damage.*

2. *A previous report for a specific site may be resubmitted, provided that a reevaluation is made and the report is found to be currently appropriate.*

***1803A.6.1.2*** ~~***1802A.6.1.2***~~ *The purpose of the engineering geologic report shall be to identify geologic and seismic conditions that may require project mitigations. The reports shall contain data which provide an assessment of the nature of the site and potential for earthquake damage based on appropriate investigations of the regional and site geology, project foundation conditions and the potential seismic shaking at the site. The report shall be prepared by a California-certified engineering geologist in consultation with a California-registered geotechnical engineer.*

*The preparation of the engineering geologic report shall consider the most recent CGS Note 48: Checklist for the Review of Engineering Geology and Seismology Reports for California Public School, Hospitals, and Essential Services Buildings. In addition, the most recent version of CGS Special Publication 42, Fault Rupture Hazard Zones in California, shall be considered for project sites proposed within an Alquist-Priolo Earthquake Fault Zone. The most recent version of CGS Special Publication 117, Guidelines for Evaluating and Mitigating Seismic Hazards in California, shall be considered for project sites proposed within a Seismic Hazard Zone. All conclusions shall be ~~fully~~ supported by satisfactory data and analysis.*

*In addition to requirements in Sections 1803A.5.11 and 1803A.5.12, ~~T~~ the report shall include, but shall not be limited to, the following:*

1. *Geologic investigation.*

2. *Evaluation of the known active and potentially active faults, both regional and local.*

3. *Ground-motion parameters, as required by Section 1613A, 1615A, ~~1614A~~ & ASCE 7.*

~~*4. Evaluation of slope stability at or near the site.*~~

~~*5. The liquefaction and settlement potential of the earth materials in the foundation.*~~

***1803A.6.2*** ~~***1802A.6.2***~~ **Supplemental ground-response report.** *If site-specific ground-motion procedures, as set forth in ASCE 7 Chapter 21, or ground-motion ~~time~~ response history analysis, as set forth in ASCE 7 Chapter 16, Section 17.3 or Section 18.2.3, are used for design, then a supplemental ground-response report may be required. All conclusions and ground-motion parameters shall be ~~fully~~ supported by ~~satisfactory~~ data and analysis.*

*The three Next Generation Attenuation (NGA) relations used for the 2008 USGS seismic hazards maps for Western United States (WUS) shall be utilized to determine the site-specific ground motion. When supported by data and analysis, other NGA relations, that were not used for the 2008 USGS maps, shall be permitted as additions or substitutions. No fewer than three NGA relations shall be utilized.*

*Site-specific Probabilistic Site Hazard Analyses (PSHA) for hospital buildings that incorporate the NGA relations shall use the maximum rotated component of ground motion.*

*Site-specific Deterministic Site Hazard Analyses (DSHA) for hospital buildings that incorporate the NGA relations shall use the 84th percentile of the maximum rotated component of ground motion.*

***1803A.6.2.1*** ~~***1802A.6.2.1***~~ *The ground-motion element shall be prepared by a registered geotechnical engineer or geophysicist (depending on the scope of the element), or engineering geologist licensed in the state of California, and having professional specialization in earthquake analyses. The ground-motion element shall present a detailed characterization of earthquake ground motions for the site, which incorporates data given in the geotechnical report. The level of ground motion considered by the ground-motion element shall be as described in ASCE 7 Chapter 21. The characterization of ground motion in the ground-motion element shall be given, according to the requirements of the analysis, in terms of:*

*1. Elastic structural response spectra.*

*2. Time-history plot of predicted ground motion at the site.*

*3. Other analyses in conformance with accepted engineering and seismological practice.*

***1803A.6.2.2*** ~~***1802A.6.2.2***~~ *The advanced geotechnical element shall contain the results of dynamic geotechnical analyses specified by the approved geotechnical report. Where site response analysis, as set forth in ASCE 7 Section 21.1, is required, the response model shall be fully explained. The input data and assumptions shall be fully documented, and the surface ground motions recommended for design shall be clearly identified.*

*The supplemental ground-response report shall be submitted to the enforcement agency for review and approval. The review shall determine whether the ground-motion response evaluations of the site are adequately represented. The enforcement agency,* ~~*after consultation with its advisors,*~~ *may require additional information, analysis or clarification of potential ground-response issues reported in the supplemental ground-response report for the proposed building site.*

***1803A.7*** ~~**1803.6**~~ ***Geotechnical*** **Reporting.** Where geotechnical investigations are required, a written report of the investigations shall be submitted to the *building official* by the owner or authorized agent at the time of *permit* application. *The geotechnical report shall provide completed evaluations of the foundation conditions of the site and the potential geologic/seismic hazards affecting the site. The geotechnical report shall include, but shall not be limited to, site-specific evaluations of design criteria related to the nature and extent of foundation materials, groundwater conditions, liquefaction potential, settlement potential and slope stability. The report shall contain the results of the analyses of problem areas identified in the engineering geologic report. The geotechnical report shall incorporate estimates of the characteristics of site ground motion provided in the engineering geologic report.* This geotechnical report shall include, but need not be limited to, the following information:

1. A plot showing the location of the soil investigations.
2. A complete record of the soil boring and penetration test logs and soil samples.
3. A record of the soil profile.
4. Elevation of the water table, if encountered. *Historic high ground water elevations shall be addressed in the report to adequately evaluate liquefaction and settlement potential.*
5. Recommendations for foundation type and design criteria, including but not limited to: bearing capacity of natural or compacted soil; provisions to mitigate the effects of expansive soils; mitigation of the effects of liquefaction, differential settlement and varying soil strength; and the effects of adjacent loads.
6. Expected total and differential settlement.
7. Deep foundation information in accordance with Section 1803*A*.5.5.
8. Special design and construction provisions for foundations of structures founded on expansive soils, as necessary.
9. Compacted fill material properties and testing in accordance with Section 1803*A*.5.8.
10. Controlled low-strength material properties and testing in accordance with Section 1803*A*.5.9.
11. *The report shall consider the effects of stepped footings addressed in Section 1809A.3.* ~~*1805A.1.*~~
12. *The report shall consider the effects of seismic hazards in accordance with* ~~*per*~~ *Section 1803A.6.* ~~*1802A.6.*~~

…

## SECTION 1805*A*
## DAMPPROOFING AND WATERPROOFING

**1805*A*.1 General.** Walls or portions thereof that retain earth and enclose interior spaces and floors below grade shall be waterproofed and dampproofed in accordance with this section, with the exception of those spaces containing groups other than residential and institutional where such omission is not detrimental to the building or occupancy.

Ventilation for crawl spaces shall comply with Section 1203.4.

…

**1805A.2 Dampproofing.** Where hydrostatic pressure will not occur as determined by Section 1803*A*.5.4, floors and walls ~~for other than wood foundation systems~~ shall be dampproofed in accordance with this section. ~~Wood foundation systems shall be constructed in accordance with AF&PA PWF.~~

…

## SECTION 1807*A*
## FOUNDATION WALLS, RETAINING WALLS AND EMBEDDED POSTS AND POLES

**1807A.1 Foundation walls.** Foundation walls shall be designed and constructed in accordance with Sections 1807*A*.1.1 through 1807*A*.1.6. Foundation walls shall be supported by foundations designed in accordance with Section 1808.

**1807*A*.1.1 Design lateral soil loads.** Foundation walls shall be designed for the lateral soil loads ~~set forth in Section 1610*A*.~~ *determined by a geotechnical investigation in accordance with Section 1803A.*

**1807*A*.1.2 Unbalanced backfill height.** Unbalanced backfill height is the difference in height between the exterior finish ground level and the lower of the top of the concrete footing that supports the foundation wall or the interior finish ground level. Where an interior concrete slab on grade is provided and is in contact with the interior surface of the foundation wall, the unbalanced backfill height shall be permitted to be measured from the exterior finish ground level to the top of the interior concrete slab.

**1807*A*.1.3 Rubble stone foundation walls.** *Not permitted by OSHPD.* ~~Foundation walls of rough or random rubble stone shall not be less than 16 inches (406 mm) thick. Rubble stone shall not be used for foundation walls of structures assigned to *Seismic Design Category* C, D, E or F.~~

**1807*A*.1.4 Permanent wood foundation systems.** *Not permitted by OSHPD.* ~~Permanent wood foundation systems shall be designed and installed in accordance with AF&PAPWF. Lumber and plywood shall be treated in accordance with AWPA U1 (Commodity Specification A, Use Category 4B and Section 5.2) and shall be identified in accordance with Section 2303*A*.1.8.1.~~

**1807*A*.1.5 Concrete and masonry foundation walls.** Concrete and masonry foundation walls shall be designed in accordance with Chapter 19*A* or 21*A*, as applicable.

> ~~**Exception:** Concrete and masonry foundation walls shall be permitted to be designed and constructed in accordance with Section 1807.1.6.~~

~~**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.~~

~~**1807.1.6.1 Foundation wall thickness.** The thickness of prescriptively designed foundation walls shall not be less than the thickness of the wall supported, except that foundation walls of at least 8-inch (203 mm)~~

~~nominal width shall be permitted to support brick veneered frame walls and 10-inch wide (254 mm) cavity walls provided the requirements of Section 1807.1.6.2 or 1807.1.6.3 are met.~~

~~**1807.1.6.2 Concrete foundation walls**. Concrete foundation walls shall comply with the following:~~

~~1. The thickness shall comply with the requirements of Table 1807.1.6.2.~~
~~2. The size and spacing of vertical reinforcement shown in Table 1807.1.6.2 is based on the use of reinforcement with a minimum yield strength of 60,000 psi (414 Mpa). Vertical reinforcement with a minimum yield strength of 40,000 psi (276 Mpa) or 50,000 psi (345 Mpa) shall be permitted, provided the same size bar is used and the spacing shown in the table is reduced by multiplying the spacing by 0.67 or 0.83, respectively.~~

~~**TABLE 1807.1.6.2**~~
~~**CONCRETE FOUNDATION WALLSb, c**~~

~~(Table not shown for clarity)~~

~~3. Vertical reinforcement, when required, shall be placed nearest the inside face of the wall a distance, *d*, from the outside face (soil face) of the wall. The distance, *d*, is equal to the wall thickness,~~
~~*t*, minus 1.25 inches (32 mm) plus one-half the bar diameter, *db*, [ *d = t* – (1.25 + *db* / 2) ]. The reinforcement shall be placed within a tolerance of ± 3/8 inch (9.5 mm) where *d* is less than or equal to 8 inches~~
~~(203 mm)or ± 1/2 inch (12.7 mm)where *d* is greater than 8 inches (203 mm).~~
~~4. In lieu of the reinforcement shown in Table 1807.1.6.2, smaller reinforcing bar sizes with closer spacings that provide an equivalent cross-sectional area of reinforcement per unit length shall be permitted.~~
~~5. Concrete cover for reinforcement measured from the inside face of the wall shall not be less than ¾ inch (19.1 mm). Concrete cover for reinforcement measured from the outside face of the wall shall not be less than 11/2 inches (38 mm) for No. 5 bars and smaller, and not less than 2 inches (51 mm) for larger bars.~~
~~6. Concrete shall have a specified compressive strength, *fc'*, of not less than 2,500 psi (17.2 MPa).~~
~~7. The unfactored axial load per linear foot of wall shall not exceed 1.2 *t fc'* where *t* is the specified wall thickness in inches.~~

~~**1807.1.6.2.1 Seismic requirements.** Based on the *seismic design category* assigned to the structure in accordance with Section 1613, concrete foundation walls designed using Table 1807.1.6.2 shall be subject to the following limitations:~~

~~1. *Seismic Design Categories* A and B. No additional seismic requirements, except provide reinforcement around openings in accordance with Section 1909.6.3.~~
~~2. *Seismic Design Categories* C, D, E and F. Tables shall not be used except as allowed for plain concrete members in Section 1908.1.8.~~

~~**1807.1.6.3 Masonry foundation walls**. Masonry foundation walls shall comply with the following:~~

~~1. The thickness shall comply with the requirements of Table 1807.1.6.3(1) for plain masonry walls or Table 1807.1.6.3(2), 1807.1.6.3(3) or 1807.1.6.3(4) for masonry walls with reinforcement.~~
~~2. Vertical reinforcement shall have a minimum yield strength of 60,000 psi (414 Mpa).~~
~~3. The specified location of the reinforcement shall equal or exceed the effective depth distance, *d*, noted in Tables 1807.1.6.3(2), 1807.1.6.3(3) and 1807.1.6.3(4) and shall be measured from the face of the exterior (soil) side of the wall to the center of the vertical reinforcement. The reinforcement shall be placed within the tolerances specified in TMS 602/ACI 530.1/ASCE 6, Article 3.3.B.8 of the specified location.~~

~~**TABLE 1807.1.6.3(1)**~~
~~**PLAIN MASONRY FOUNDATION WALLSa,b,c**~~

~~(Table not shown for clarity)~~

~~4. Grout shall comply with Section 2103.12.~~
~~5. Concrete masonry units shall comply with ASTM C 90.~~
~~6. Clay masonry units shall comply with ASTM C 652 for hollow brick, except compliance with ASTM C 62 or ASTM C 216 shall be permitted where solid masonry units are installed in accordance with Table 1807.1.6.3(1) for plain masonry.~~
~~7. Masonry units shall be laid in running bond and installed with Type Mor S mortar in accordance with Section 2103.8.~~
~~8. The unfactored axial load per linear foot of wall shall not exceed 1.2 *t f'm* where *t* is the specified wall thickness in inches and *f'm* is the specified compressive strength of masonry in pounds per square inch.~~
~~9. At least 4 inches (102 mm) of solid masonry shall be provided at girder supports at the top of hollow masonry unit foundation walls.~~
~~10. Corbeling of masonry shall be in accordance with Section 2104.2. Where an 8-inch (203 mm) wall is corbeled, the top corbel shall not extend~~

~~**TABLE 1807.1.6.3(2)**~~
~~**8-INCH MASONRY FOUNDATION WALLS WITH REINFORCEMENT WHERE d _ 5 INCHESa,b,c**~~

~~(Table not shown for clarity)~~

~~higher than the bottom of the floor framing and shall be a full course of headers at least 6 inches (152 mm) in length or the top course bed joint shall be tied to the vertical wall projection. The tie shall be W2.8 (4.8 mm) and spaced at a maximum horizontal distance of 36 inches (914 mm). The hollow space behind the corbelled masonry shall be filled with mortar or grout.~~

~~**1807.1.6.3.1 Alternative foundation wall reinforcement.** In lieu of the reinforcement provisions for masonry foundation walls in Table 1807.1.6.3(2), 1807.1.6.3(3) or 1807.1.6.3(4), alternative reinforcing bar sizes and spacings having an equivalent cross-sectional area of reinforcement per linear foot (mm) of wall shall be permitted to be used, provided the spacing of reinforcement does not exceed 72 inches (1829 mm) and reinforcing bar sizes do not exceed No. 11.~~

~~**1807.1.6.3.2 Seismic requirements.** Based on the *seismic design category* assigned to the structure in accordance with Section 1613, masonry foundation walls designed using Tables 1807.1.6.3(1) through 1807.1.6.3(4) shall be subject to the following limitations:~~

~~1. *Seismic Design Categories* A and B. No additional seismic requirements.~~
~~2. *Seismic Design Category* C. A design using Tables 1807.1.6.3(1) through 1807.1.6.3(4) is~~

~~**TABLE 1807.1.6.3(3)**~~
~~**10-INCH MASONRY FOUNDATION WALLS WITH REINFORCEMENT WHERE d _ 6.75 INCHES a, b, c**~~

~~(Table not shown for clarity)~~

~~subject to the seismic requirements of Section 1.17.4.3 of TMS 402/ACI 530/ASCE 5.~~
~~3. *Seismic Design Category* D. A design using Tables 1807.1.6.3(2) through 1807.1.6.3(4) is subject to the seismic requirements of Section 1.17.4.4 of TMS 402/ACI 530/ASCE 5.~~
~~4. *Seismic Design Categories* E and F. A design using Tables 1807.1.6.3(2) through 1807.1.6.3(4) is subject to the seismic requirements of Section 1.17.4.5 of TMS 402/ACI 530/ASCE 5.~~

~~**TABLE 1807.1.6.3(4)**~~
~~**12-INCH MASONRY FOUNDATION WALLS WITH REINFORCEMENT WHERE d _ 8.75 INCHESa,b,c**~~

~~(Table not shown for clarity)~~

**1807*A*.2 Retaining walls.** Retaining walls shall be designed in accordance with Sections 1807*A*.2.1 through 1807*A*.2.3. *Freestanding cantilever walls shall be design in accordance with Section 1807A.2.4.*

**1807*A*.2.1 General.** Retaining walls shall be designed to ensure stability against overturning, sliding, excessive foundation pressure and water uplift. Where a keyway is extended below the wall base with the intent to engage passive pressure and enhance sliding stability, lateral soil pressures on both sides of the keyway shall be considered in the sliding analysis.

**1807*A*.2.2 Design lateral soil loads.** Retaining walls shall be designed for the lateral soil loads ~~set forth in Section 1610.~~ *determined by a geotechnical investigation in accordance with Section 1803A.*

~~*Retaining walls higher than 12 feet (3658 mm), as measured from the top of the foundation, shall be designed to resist the additional earth pressure caused by seismic ground shaking.*~~

~~*The resultant of the vertical loads and lateral pressures using load combination of section 1605A.3 acting on the wall and its base shall pass through the middle half of the bottom of the footing.*~~

~~*Retaining walls shall be restrained against sliding by friction of the base against the earth, by passive resistance of the soil or by a combination of the two. When used, keys may be assumed to lower the plane of frictional resistance and depth of passive resistance to the level of the bottom of the key. Passive resistance pressures shall be assumed to act on a vertical plane located at the toe of the footing. Overturning shall be computed about the bottom of the spread footing. Passive resistance on the face of the wall may be included in computing resistance to overturning. Frictional resistance on the face of the wall may be included in computing resistance to overturning, except when lateral loads include seismic forces.*~~

~~*Gravity-type retaining walls utilizing precast concrete units may be used as an alternative to the conventional cantilever retaining systems only after they have been accepted by the enforcement agency.*~~

**1807*A*.2.3 Safety factor.** Retaining walls shall be designed to resist the lateral action of soil to produce sliding and overturning with a minimum safety factor of 1.5 in each case. The load combinations of Section 1605*A* shall not apply to this requirement. Instead, design shall be based on 0.7 times nominal earthquake loads, 1.0 times other *nominal loads*, and investigation with one or more of the variable loads set to zero. The safety factor against lateral sliding shall be taken as the available soil resistance at the base of the retaining wall foundation divided by the net lateral force applied to the retaining wall.

> **Exception:** Where earthquake loads are included, the minimum safety factor for retaining wall sliding and overturning shall be 1.1.

***1807A.2.4*** ~~***1806A.2***~~ ***Freestanding Cantilever Walls.*** *A stability check against the possibility of overturning shall be performed for isolated spread footings which support freestanding cantilever walls. The stability check shall be made by dividing $R_p$ used for the wall by 2.0. The allowable soil pressure may be doubled for this evaluation.*

> ***EXCEPTION:*** *For overturning about the principal axis of rectangular footings with symmetrical vertical loading and the design lateral force applied, a triangular or trapezoidal soil pressure distribution which covers the full width of the footing will meet the stability requirement.*

**…**

**SECTION 1808*A***
**FOUNDATIONS**

**1808*A*.1 General.** Foundations shall be designed and constructed in accordance with Sections 1808*A*.2 through 1808.9. Shallow foundations shall also satisfy the requirements of Section 1809. Deep foundations shall also satisfy the requirements of Section 1810*A*.

**1808*A*.2 Design for capacity and settlement.** Foundations shall be so designed that the allowable bearing capacity of the soil is not exceeded, and that differential settlement is minimized. Foundations in areas with expansive soils shall be designed in accordance with the provisions of Section 1808*A*.6.

*The enforcing agency may require an analysis of foundation ~~at footing and grade beam~~ elements to determine subgrade deformations in order to evaluate their effect on the superstructure, including story drift. ~~values in Chapter 16A.~~*

**...**

**1808*A*.8.5 Forming of concrete.** Concrete foundations are permitted to be cast against the earth where, in the opinion of the *building official*, soil conditions do not require formwork. Where formwork is required, it shall be in accordance with Chapter 6 of ACI 318.

~~*The horizontal dimensions of unformed concrete footings shall be increased 1 inch (25 mm) at every vertical surface at which concrete is placed directly against the soil.*~~

**...**

**1808*A*.8.6 Seismic requirements.** See Section 1908*A* for additional requirements for foundations of structures assigned to *Seismic Design Category* ~~C,~~ D, E or F.

For structures assigned to *Seismic Design Category* D, E or F, provisions of ACI 318, Sections 21.12.1 through 21.12.4, shall apply where not in conflict with the provisions of Sections 1808*A* through 1810*A*.

> ~~**Exceptions:**~~
>
> ~~1. Detached one- and two family dwellings of light frame construction and two stories or less above *grade plane* are not required to comply with the provisions of ACI 318, Sections 21.12.1 through 21.12.4.~~
> ~~2. Section 21.12.4.4(a) of ACI 318 shall not apply.~~

**...**

**1808*A*.8 Concrete foundations.** The design, materials and construction of concrete foundations shall comply with Sections1808A.8.1 through 1808*A*.8.6 and the provisions of Chapter 19*A*.

> ~~Exception: Where concrete footings supporting walls of light-frame construction are designed in accordance with Table 1809.7, a specific design in accordance with Chapter 19 is not required.~~

**...**

**TABLE 1808*A*.8.1**
**MINIMUM SPECIFIED COMPRESSIVE STRENGTH $f'_c$ OF CONCRETE OR GROUT**

| FOUNDATION ELEMENT OR CONDITION | SPECIFIED COMPRESSIVE STRENGTH, $f'_c$ |
|---|---|
| ~~1. Foundations for structures assigned to Seismic Design Category A, B or C~~ | ~~2,500 psi~~ |
| ~~2a. Foundations for Group R or U occupancies of light-frame construction, two stories or less in height, assigned to Seismic Design Category D, E or F~~ | ~~2,500 psi~~ |
| ~~2b~~ 1.Foundations for other structures assigned to Seismic Design Category D, E or F | 3,000 psi |
| ~~3~~ 2. Precast nonprestressed driven piles | 4,000 psi |
| ~~4~~ 3. Socketed drilled shafts | 4,000 psi |

| | |
|---|---|
| ~~5~~ 4. Micropiles | 4,000 psi |
| ~~6~~ 5. Precast prestressed driven piles | 5,000 psi |

For SI: 1 pound per square inch = 0.00689MPa.

**…**

**SECTION 1809*A***
**SHALLOW FOUNDATIONS**

**1809*A*.1 General.** Shallow foundations shall be designed and constructed in accordance with Sections 1809*A*.2 through 1809*A*.13.

**1809*A*.2 Supporting soils.** Shallowfoundations shall be built on undisturbed soil, compacted fill material or controlled low-strength material (CLSM). Compacted fill material shall be placed in accordance with Section 1804*A*.5. CLSM shall be placed in accordance with Section 1804*A*.6.

**1809*A*.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).

*Individual steps in continuous footings shall not exceed 18 inches (457 mm) in height and the slope of a series of such steps shall not exceed 1 unit vertical to 2 units horizontal (50% slope) unless otherwise recommended by a geotechnical ~~soils~~ report. The steps shall be detailed on the drawings. The local effects due to the discontinuity of the steps shall be considered in the design of the foundation.*

**…**

**1809*A*.7 Prescriptive footings for light-frame construction.** *Not permitted by OSHPD .* ~~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.~~

~~**TABLE 1809.7**~~
~~**PRESCRIPTIVE FOOTINGS SUPPORTING WALLS OFLIGHT-FRAME CONSTRUCTIONa,b,c,d,e**~~

~~(Table not shown for clarity)~~

**1809*A*.8 Plain concrete footings.** *Not permitted by OSHPD.* ~~The edge thickness of plain concrete footings supporting walls of other than light-frame construction shall not be less than 8 inches (203 mm) where placed on soil or rock.~~

> ~~**Exception:** For plain concrete footings supporting Group R-3 occupancies, the edge thickness is permitted to be 6 inches (152 mm), provided that the footing does not extend beyond a distance greater than the thickness of the footing on either side of the supported wall.~~

**1809*A*.9 Masonry-unit footings.** *Not permitted by OSHPD.* ~~The design, materials and construction of masonry-unit footings shall comply with Sections 1809.9.1 and 1809.9.2, and the provisions of Chapter 21.~~

> ~~**Exception:** Where a specific design is not provided, masonry unit footings supporting walls of light-frame construction shall be permitted to be designed in accordance with Table 1809.7.~~

~~**1809.9.1 Dimensions.** Mansonry unit footings shall be laid in Type M or S mortar complying with Section 2103.8 and the depth shall not be less than twice the projection beyond the wall, pier or column. The width shall not be less than 8 inches (203 mm) wider than the wall supported thereon.~~

~~**1809.9.2 Offsets.** The maximum offset of each course in brick foundation walls stepped up from the footings shall be 11/2 inches (38 mm) where laid in single courses, and 3 inches (76 mm) where laid in double courses.~~

**1809*A*.10** *Reserved.* ~~**Pier and curtain wall foundations.** Except in *Seismic Design Categories* D, E and F, pier and curtain wall foundations shall be permitted to be used to support light frame construction not more than two *stories above grade plane*, provided the following requirements are met:~~

~~1. All load-bearing walls shall be placed on continuous concrete footings bonded integrally with the *exterior wall* footings.~~
~~2. The minimum actual thickness of a load-bearing masonry wall shall not be less than 4 inches (102 mm) nominal or 35/8 inches (92 mm) actual thickness, and shall be bonded integrally with piers spaced 6 feet (1829 mm) on center (o.c.).~~
~~3. Piers shall be constructed in accordance with Chapter 21 and the following:~~
~~3.1. The unsupported height of the masonry piers shall not exceed 10 times their least dimension.~~
~~3.2. Where structural clay tile or hollow concrete masonry units are used for piers supporting beams and girders, the cellular spaces shall be filled solidly with concrete or Type M or S mortar.~~

~~**Exception:** Unfilled hollow piers shall be permitted where the unsupported height of the pier is not more than four times its least dimension.~~

~~3.3. Hollow piers shall be capped with 4 inches (102 mm) of solid masonry or concrete or the cavities of the top course shall be filled with concrete or grout.~~
~~4. The maximum height of a 4 inch (102 mm) load bearing masonry foundation wall supporting wood frame walls and floors shall not be more than 4 feet (1219 mm) in height.~~
~~5. The unbalanced fill for 4-inch (102 mm) foundation walls shall not exceed 24 inches (610 mm) for solid masonry, nor 12 inches (305 mm) for hollow masonry.~~

**1809*A*.11 Steel grillage footings.** Grillage footings of structural steel shapes shall be separated with *approved* steel spacers and be entirely encased in concrete with at least 6 inches (152 mm) on the bottom and at least 4 inches (102 mm) at all other points. The spaces between the shapes shall be completely filled with concrete or cement grout.

**1809*A*.12 Timber footings.** *Not permitted by OSHPD.* ~~Timber footings shall be permitted for buildings of Type V construction and as otherwise *approved* by the *building official*. Such footings shall be treated in accordance with AWPA U1 (Commodity Specification A, Use Category 4B). Treated timbers are not required where placed entirely below permanent water level, or where used as capping for wood piles that project above the water level over submerged or marsh lands. The compressive stresses perpendicular to grain in untreated timber footings supported upon treated piles shall not exceed 70 percent of the allowable stresses for the species and grade of timber as specified in the AF&PA NDS.~~
**…**

***1809A.14*** ~~***1805A.4.7***~~ ***Pipes and Trenches.*** *Unless otherwise recommended by the soils report, open or backfilled trenches parallel with a footing shall not be below a plane having a downward slope of 1 unit vertical to 2 units horizontal (50% slope) from a line 9 inches (229 mm) above the bottom edge of the footing, and not closer than 18 inches (457 mm) from the face of such footing.*

*Where pipes cross under footings, the footings shall be specially designed. Pipe sleeves shall be provided where pipes cross through footings or footing walls and sleeve clearances shall provide for possible footing settlement, but not less than 1 inch (25 mm) all around pipe.*

***Exception:*** *Alternate trench locations and pipe clearances shall be permitted when approved by registered design professional in responsible charge and the enforcement agent.*

...

## SECTION 1810*A*
## DEEP FOUNDATIONS

**1810*A*.1 General.** Deep foundations shall be analyzed, designed, detailed and installed in accordance with Sections 1810*A*.1 through 1810*A*.4.

...

**1810*A*.2.4 Lateral loads.** The moments, shears and lateral deflections used for design of deep foundation elements shall be established considering the nonlinear interaction of the shaft and soil, as determined by a *registered design professional*. Where the ratio of the depth of embedment of the element to its least horizontal dimension is less than or equal to six, it shall be permitted to assume the element is rigid.

~~***1808A.2.23.2.4 Deformation.*** *Piles and piers used to support lateral loads from structures shall be designed with due consideration to the deformation of the piles, piers, pile caps and connecting grade beams.*~~

**1810.2.4.1 Seismic Design Categories D through F.** For structures assigned to *Seismic Design Category* D, E or F, deep foundation elements on *Site Class* E or F sites, as determined in Section 1613*A*.5.2, shall be designed and constructed to withstand maximum imposed curvatures from earthquake ground motions and structure response. Curvatures shall include free-field soil strains modified for soil-foundation-structure interaction coupled with foundation element deformations associated with earthquake loads imparted to the foundation by the structure.

...

**1810*A*.3.1.5 Helical piles.** Helical piles shall be designed and manufactured in accordance with accepted engineering practice to resist all stresses induced by installation into the ground and service loads.

***1810A.3.1.5.1 Helical Piles Seismic Requirements.*** *For structures assigned to Seismic Design Category D, E or F, capacities of helical piles shall be determined in accordance with Section 1810A.3.3 by at least two project specific pre-production tests for each soil profile, size and depth of helical pile. At least two percent of all production piles shall be proof tested to the load determined in accordance with Section 1615A.1.10.*

*Helical piles shall satisfy corrosion resistance requirements of ICC-ES AC 358. In addition, all helical pile materials that are subject to corrosion shall include at least 1/16" corrosion allowance.*

*Helical piles shall not be considered as carrying any horizontal loads.*

...

**1810*A*.3.2 Materials.** The materials used in deep foundation elements shall satisfy the requirements of Sections 1810*A*.3.2.1 through 1810*A*.3.2.8, as applicable.

...

~~**1810.3.2.1.2 ACI 318 Equation (10-5).** Where this chapter requires detailing of concrete deep foundation elements in accordance with Section 21.6.4.4 of ACI 318, compliance with Equation (10-5) of ACI 318 shall not be required.~~

...

**1810*A*.3.2.4 Timber.** *Not permitted by OSHPD.* ~~Timber deep foundation elements shall be designed as piles or poles in accordance with AF&PA NDS. Round timber elements shall conform to ASTM D 25. Sawn timber elements shall conform to DOC PS 20.~~

> ~~**1810.3.2.4.1 Preservative treatment.** Timber deep foundation elements used to support permanent structures shall be treated in accordance with this section unless it is established that the tops of the untreated timber elements will be below the lowest ground water level assumed to exist during the life of the structure. Preservative and minimum final retention shall be in accordance with AWPA U1 (Commodity Specification E, Use Category 4C) for round timber elements and AWPA U1 (Commodity Specification A, Use Category 4B) for sawn timber elements. Preservative-treated timber elements shall be subject to a quality control program administered by an *approved agency*. Element cutoffs shall be treated in accordance with AWPA M4.~~
>
> **…**

**1810*A*.3.8.3 Precast prestressed piles.** Precast prestressed concrete piles shall comply with the requirements of Sections 1810*A*.3.8.3.1 through 1810*A*.3.8.3.3.

> **…**
>
> **1810*A*.3.8.3.2 Seismic reinforcement in Seismic Design Category C.** *Not permitted by OSHPD.* ~~For structures assigned to *Seismic Design Category* C in accordance with Section 1613, precast prestressed piles shall have transverse reinforcement in accordance with this section. The volumetric ratio of spiral reinforcement shall not be less than the amount required by the following formula for the upper 20 feet (6096 mm) of the pile.~~
>
> ~~$\rho_s = 0.12 f'_c / f_{yh}$ **(Equation 18-5)**~~
>
> ~~where:~~
>
> ~~$f'_c$ = Specified compressive strength of concrete, psi (MPa).~~
>
> ~~$f_{yh}$ = Yield strength of spiral reinforcement ≤ 85,000 psi (586 MPa).~~
>
> ~~$\rho_s$ = Spiral reinforcement index (vol. spiral/vol. core).~~
>
> ~~At least one-half the volumetric ratio required by Equation 18-5 shall be provided below the upper 20 feet (6096 mm) of the pile.~~
>
> **1810*A*.3.8.3.3 Seismic reinforcement in Seismic Design Categories D through F.** For structures assigned to *Seismic Design Category* D, E or F in accordance with Section 1613*A*, precast prestressed piles shall have transverse reinforcement in accordance with the following:
>
> **…**
>
> ~~This required amount of spiral reinforcement is permitted to be obtained by providing an inner and outer spiral.~~
>
> **…**
>
> **1810*A*.3.9.4.2.1 Site Classes A through D.** For Site Class A, B, C or D sites, transverse confinement reinforcement shall be provided in the element in accordance with Sections 21.6.4.2, 21.6.4.3 and 21.6.4.4 of ACI 318 within three times the least element dimension of the bottom of the pile cap. A transverse spiral reinforcement ratio of not less than one-half of that required in Section 21.6.4.4(a) of ACI 318 shall be permitted *for concrete deep foundation elements.*

...

**1810*A*.3.10 Micropiles.** Micropiles shall be designed and detailed in accordance with Sections 1810*A*.3.10.1 through 1810*A*.3.10.4.

...

**1810*A*.3.10.2 Materials.** Reinforcement shall consist of deformed reinforcing bars in accordance with ASTM A 615 Grade 60 or 75 or ASTM A 722 Grade 150.

The steel pipe or tube shall have a minimum wall thickness of 3/16 inch (4.8 mm). Splices shall comply with Section 1810*A*.3.6. The steel pipe or tube shall have a minimum yield strength of 45,000 psi (310 MPa) and a minimum elongation of 15 percent as shown by mill certifications or two coupon test samples per 40,000 pounds (18 160 kg) of pipe or tube.

...

**1810*A*.3.10.4** ~~**Seismic reinforcement.** For structures assigned to *Seismic Design Category* C, a permanent steel casing shall be provided from the top of the micropile down to the point of zero curvature. For structures assigned to *Seismic Design Category* D, E or F, the micropile shall be considered as an alternative system in accordance with Section 104.11. The alternative system design, supporting documentation and test data shall be submitted to the *building official* for review and approval.~~

***Seismic requirements****. For structures assigned to Seismic Design Category D, E, or F, a permanent steel casing having a minimum thickness of 3/8" shall be provided from the top of the micropile down to a minimum of 120 percent of the point of zero curvature. Capacity of micropiles shall be determined in accordance with Section 1810A.3.3 by at least two project specific pre-production tests for each soil profile, size and depth of micropile. At least two percent of all production piles shall be proof tested to the load determined in accordance with Section 1615A.1.10.*

*Steel casing length in soil shall be considered as unbonded and shall not be considered as contributing to friction. Casing shall provide confinement at least equivalent to hoop reinforcing required by ACI 318 Section 21.12.4.*

*Reinforcement shall have Class 1 corrosion protection in accordance with PTI Recommendations for Prestressed Rock and Soil Anchors. Steel casing design shall include at least 1/16" corrosion allowance.*

*Micropiles shall not be considered as carrying any horizontal loads.*

...

**1810*A*.4 Installation.** Deep foundations shall be installed in accordance with Section 1810*A*.4. Where a single deep foundation element comprises two or more sections of different materials or different types spliced together, each section shall satisfy the applicable conditions of installation.

**1810*A*.4.1 Structural integrity.** Deep foundation elements shall be installed in such a manner and sequence as to prevent distortion or damage that may adversely affect the structural integrity of adjacent structures or of foundation elements being installed or already in place and as to avoid compacting the surrounding soil to the extent that other foundation elements cannot be installed properly.

...

**1810*A*.4.1.5 Defective timber piles.** *Not permitted by OSHPD.* ~~Any substantial sudden increase in rate of penetration of a timber pile shall be investigated for possible damage. If the sudden increase in rate of penetration cannot be correlated to soil strata, the pile shall be removed for inspection or rejected.~~

**...**

**1810*A*.4.7 Enlarged base cast-in-place elements.** Enlarged bases for cast-in-place deep foundation elements formed by compacting concrete or by driving a precast base shall be formed in or driven into granular soils. Such elements shall be constructed in the same manner as successful prototype test elements driven for the project. Shafts extending through peat or other organic soil shall be encased in a permanent steel casing. Where a cased shaft is used, the shaft shall be adequately reinforced to resist column action or the annular space around the shaft shall be filled sufficiently to reestablish lateral support by the soil. Where heave occurs, the element shall be replaced unless it is demonstrated that the element is undamaged and capable of carrying twice its design load. ~~*Enlarged base piles shall be considered as an alternative system.*~~

**...**

***SECTION 1811A ~~1813A~~***
***PRESTRESSED ROCK AND SOIL FOUNDATION ANCHORS***

***1811A.1*** ~~***1813A.1***~~ ***General.*** *The requirements of this section address the use of vertical rock and soil anchors in resisting seismic or wind overturning forces resulting in tension on shallow foundations.*

***1813A.2*** ~~***1813A.2***~~ ***Adoption.*** *Except for the modifications as set forth in Sections 1811A.3 ~~1813A.3~~ and 1811A.4 ~~1813A.4~~, all Prestressed Rock and Soil Foundation Anchors shall be designed in accordance with PTI Recommendations for Prestressed Rock and Soil Anchors.*

***1811A.3*** ~~***1813A.3***~~ ***Geotechnical Requirements****. Geotechnical report for the Prestressed Rock & Soil Foundation Anchors shall address the following:*

1. *Minimum diameter and minimum spacing for the anchors including consideration of group effects.*

2. *Maximum unbonded length and minimum bonded length of the tendon.*

3. *Maximum recommended anchor tension capacity based upon the soil or rock strength / grout bond and anchor depth / spacing.*

4. *Allowable bond stress at the ground / grout interface and applicable factor of safety for ultimate bond stress.*

5. *Anchor axial tension stiffness recommendations at the anticipated anchor axial tension displacements, when required for structural analysis.*

6. *Minimum grout pressure for installation and post-grout pressure.*

7. *Class I Corrosion Protection is required for all permanent anchors. Geotechnical report shall specify the corrosion protection recommendations for temporary anchors.*

8. *Performance test shall be at a minimum of 1.6 times the design loads. There shall be a minimum of two preproduction test anchors. Preproduction test anchors shall be tested to ultimate load or 0.80 times the specified minimum tensile strength of the tendon. A Creep test is required for all prestressed anchors with greater than 10 kips of lock-off prestressing load.*

9. *Lock-off prestressing load requirements.*

10. *Acceptable Drilling methods.*

11. *Geotechnical observation and monitoring requirements.*

***1811A.4*** ***~~1813A.4~~*** **Structural Requirements**.

1. *Tendons shall be thread-bar anchors conforming to ASTM A 722.*

2. *The anchors shall be placed vertical.*

3. *Design Loads shall be based upon the load combinations in Section 1605A.3.1 and shall not exceed 60 percent of the specified minimum tensile strength of the tendons.*

4. *Ultimate Load shall be based upon Section 1615A.1.10 ~~1614A.1.10~~ and shall not exceed 80 percent of the specified minimum tensile strength of the tendons.*

5. *The anchor shall be designed to fail in grout bond to the soil or rock before pullout of the soil wedge by group effect.*

6. *Foundation design shall incorporate the affect of lock-off loads.*

7. *Design shall account for as-built locations of soil anchors considering all the acceptable construction tolerances.*

8. *Design shall account for both short and long term deformation.*

9. *Enforcement agency may require consideration of anchor deformation in evaluating deformation compatibility or building drift where it may be significant.*

*(All existing amendments that are not revised above shall continue without any change)*

***Notation:***
*Authority: Health and Safety Code Section 129850*
*Reference: Health and Safety Code Sections 1275, 129850 and 129790*

## CHAPTER 19
## CONCRETE

### SECTION 1901
### GENERAL

**1901.1 Scope.** The provisions of this chapter shall govern the materials, quality control, design and construction of concrete used in structures.

**…**

### SECTION 1911
### ANCHORAGE TO CONCRETE —
### ALLOWABLE STRESS DESIGN

**…**

***1911.1.1 Power Actuated Fasteners. [OSHPD 2]*** *Power actuated fasteners qualified in accordance with ICC-ES AC 70 shall be deemed to satisfy the requirements of this section.*

*Power actuated fasteners shall be permitted for seismic shear when they are specifically listed in ICC-ES Report (ICC-ESR) for such service and for interior non-shear wall partitions. Power actuated fastener shall not be used to anchor exterior cladding or curtain wall systems.*

**…**

### SECTION 1912
### ANCHORAGE TO CONCRETE—
### STRENGTH DESIGN

**…**

***1912.1.1 Mechanical Anchors and Specialty Inserts. [OSHPD 2]*** *Mechanical anchors qualified in accordance with ICC-ES AC 193 shall be deemed to satisfy the requirements of this section.*

*Specialty inserts, including cast-in-place specialty inserts, tested in accordance with ICC-ES AC 193 shall be deemed to satisfy the requirements of this section.*

> ***Exception:*** *Anchors pre-qualified for seismic applications need not be governed by the steel strength of a ductile steel element.*

***1912.1.2 Post-Installed Adhesive Anchors. [OSHPD 2]*** *Adhesive anchors qualified in accordance with ICC-ES AC 308 shall be deemed to satisfy the requirements of this section.*

> ***Exception:***
>
> ***1)*** *Adhesive anchors shall not be permitted in overhead applications or application with sustained (continuous) tension load that can lead to creep.*
> ***2)*** *Anchors pre-qualified for seismic applications need not be governed by the steel strength of a ductile steel element.*

***1912.2 Tests for Post-Installed Anchors in Concrete. [OSHPD 2]*** *When ~~drilled-in expansion-type anchors or other~~ post-installed anchors ~~acceptable to enforcement agency~~ are used in lieu of cast-in place bolts, the ~~allowable shear and tension values and~~ installation verification test loads, frequency, and acceptance criteria shall be ~~acceptable to the enforcement agency~~ in accordance with this section.*

***1912.2.1 General.*** *Test loads or torques and acceptance criteria shall be shown on the construction documents.*

*If any anchor fails testing, all anchors of the same type shall be tested, which are installed by the same trade, not previously tested until twenty (20) consecutive anchors pass, then resume the initial test frequency.*

***1912.2.2 Test Loads.*** *Required test loads shall be determined by one of the following methods:*

*1. Twice the maximum allowable tension load or one and a quarter (1- 1/4) times the maximum design strength of anchors as provided in International Code Council – Evaluation Service Report (ICC-ESR) or determined in accordance with Appendix D of ACI 318.*

*Tension test load need not exceed 80% of the nominal yield strength of the anchor element (= 0.8 $A_{se}$ $f_{ya}$).*

*2. The manufacturer's recommended installation torque as approved in an ICC-ESR.*

***1912.2.3 Test Frequency.*** *When post-installed anchors ~~expansion-type anchors~~ are used ~~listed~~ for sill plate bolting applications, 10 percent of the anchors shall be ~~tension~~ tested.*

*When post-installed anchors ~~expansion-type anchors~~ are used for other structural applications, all such ~~expansion~~ anchors shall be ~~tension~~ tested. ~~Expansion-type anchors shall not be used as hold down bolts.~~*

*When post-installed anchors ~~expansion-type anchors~~ are used for nonstructural applications such as equipment anchorage, 50 percent or alternate bolts in a group, including at least one-half the anchors in each group, shall be ~~tension~~ tested.*

*The ~~tension~~ testing of the ~~expansion~~ post-installed anchors shall be done in the presence of the special inspector and a report of the test results shall be submitted to the enforcement agency. ~~If any anchors fail the tension-testing requirements, the additional testing requirements shall be acceptable to the enforcement agency. The above requirements shall also apply to other post-installed anchors acceptable to enforcement agency and bolts or anchors set in concrete with chemical if the long-term durability and stability of the chemical material and its resistance to loss of strength and chemical change at elevated temperatures are established to the satisfaction of the enforcement agency.~~*

*Exceptions:*

*1. Undercut anchors that allow visual confirmation of full set shall not require testing.*

*2. Where the factored design tension on anchors is less than 100 lbs. and those anchors are clearly noted on the approved construction documents, only 10 percent of those anchors shall be tested.*

*3. Where adhesive anchor systems are used to install reinforcing dowel bars in hardened concrete, only 25% of the dowels shall be tested if all of the following conditions are met:*

*a. The dowels are used exclusively to transmit shear forces across joints between existing and new concrete.*
*b. The number of dowels in any one member equals or exceeds twelve (12).*
*c. The dowels are uniformly distributed across seismic force resisting members (such as shear walls, collectors, and diaphragms).*

*Anchors to be tested shall be selected at random by the special inspector/Inspector Of Record (IOR).*

*4. Testing of shear dowels across cold joints in slabs on grade, where the slab is not part of the lateral force-resisting system shall not be required.*

*5. Testing is not required for power actuated fasteners used to attach tracks of interior non-shear wall partitions for shear only, where there are at least three fasteners per segment of track.*

***1912.2.4 Test Acceptance Criteria.*** *Acceptance criteria for post-installed anchors shall be based on ICC-ESR or manufacturers written instruction, acceptable to the enforcement agency. Field test shall satisfy following minimum requirements.*

*1.Hydraulic Ram Method:*

*Anchors tested with a hydraulic jack or spring loaded devices shall maintain the test load for a minimum of 15 seconds and shall exhibit no discernable movement during the tension test, e.g., as evidenced by loosening of the washer under the nut.*

*For adhesive anchors, where other than bond is being tested, the testing device shall not restrict the concrete shear cone type failure mechanism from occurring.*

*2. Torque Wrench Method:*

*Anchors tested with a calibrated torque wrench must attain the specified torque within ½ turn of the nut.*

*Exceptions:*

*a. Wedge or Sleeve type:*
*One-quarter (1/4) turn of the nut for a 3/8 in. sleeve anchor only.*

*b. Threaded Type:*
*One-quarter (1/4) turn of the screw after initial seating of the screw head.*

***1912.2.5. Testing Procedure.*** *Test procedure shall be as required by the ICC-ESR. Manufacturer's recommendation for testing may be approved by the enforcement agency, when ICC-ESR does not provide a testing procedure.*

*(All existing amendments that are not revised above shall continue without any change)*

***Notation:***
*Authority: Health and Safety Code Section 129850*
*Reference: Health and Safety Code Sections 1275 and 129850*

## CHAPTER 19*A*
## CONCRETE

*Italics are used for text within Sections 1903A through 1908A of this code to indicate provisions that differ from ACI 318. State of California amendments in these sections are shown in italics and underlined.*

### SECTION 1901*A*
### GENERAL

**1901*A*.1 Scope.** The provisions of this chapter shall govern the materials, quality control, design and construction of concrete used in structures.

***1901A.1.1 Application.*** *The scope of application of Chapter 19A is as follows:*

1. *(Reserved for DSA).*

2. *Applications listed in Section ~~110.1~~ 1.10.1, and ~~110.4~~ 1.10.4, regulated by the Office of Statewide Health Planning and Development (OSHPD). These applications include hospitals, skilled nursing facilities, intermediate care facilities, and correctional treatment centers.*

   ***Exception: [OSHPD 2]*** *Single-story Type V skilled nursing or intermediate care facilities utilizing wood-frame or light-steel-frame construction as defined in Health and Safety Code Section 129725, which shall comply with Chapter 19 and any applicable amendments therein.*

***1901A.1.2 Amendments in this chapter.*** *OSHPD adopt this chapter and all amendments.*

***Exception:*** *Amendments adopted by only one agency appear in this chapter preceded with the appropriate acronym of the adopting agency, as follows:*

1. *(Reserved for DSA).*

2. *Office of Statewide Health Planning and Development.*

   ***[OSHPD 1]*** *- For applications listed in Section ~~110.1~~ 1.10.1.*

   ***[OSHPD 4]*** *- For applications listed in Section ~~110.4~~ 1.10.4.*

**…**

### SECTION 1903A
### SPECIFICATIONS FOR TESTS AND MATERIALS

**1903A.1 General.** Materials used to produce concrete, concrete itself and testing thereof shall comply with the applicable standards listed in ACI 318. *Where required, special inspections and tests shall be in accordance with Chapter 17A and Section 1916A.*

**1903A.2 Glass fiber reinforced concrete.** *Glass fiber reinforced concrete (GFRC) and the materials used in such concrete shall be in accordance with the PCI MNL128 standard.*

***1903A.3 Reporting Requirements – Modify ACI 318 Section 3.2.1 by the following:***

*Each component (a) through (g), when present, as a percentage of total cementitiious materials shall be reported for each mix design.*

***1903A.4 ~~1903A.5~~ Fly Ash - Replace ACI 318 Section 3.2.2 ~~3.6.6~~ as follows:***

*Fly ash or other pozzolan can be used as a partial substitute for ASTM C 150 portland cement, as follows:*

*1. Fly ash or other pozzolan shall conform to ASTM C 618 for Class N or Class F materials (Class C is not permitted), and*

*2. More than 15 percent by weight of fly ash or other pozzolans shall be permitted to be substituted for ASTM C 150 portland cement if the mix design is proportioned per Section 1905A.3. See Section 1904A for durability requirements.*

*3. More than 40 percent by weight of ground-granulated blast-furnace slag conforming to ASTM C 989 shall be permitted to be substituted for ASTM C 150 portland cement if the mix design is proportioned per Section 1905A.3. See Section 1904A for durability requirements.*

***1903A.5 ~~1903A.3~~ Modify ACI 318 Section 3.3.2 by adding the following:***

*Aggregate size limitations waiver shall be approved by the enforcement agency.*

*Evidence that the aggregate used is not reactive in the presence of cement alkalis may be required by the enforcement agency. If new aggregate sources are to be used or if past experience indicates problems with existing aggregate sources, test the aggregate for potential reactivity according to ASTM C 289 to determine potential reactivity in the presence of cement.*

*If the results of the test are other than innocuous, selected concrete proportions using the aggregate (see Section 1905A.2) shall be tested in accordance with ASTM C 1567. If the results of this test indicate an expansion greater than 0.10 percent at 16-days age, provide mitigation with one of the cementitious material systems noted below such that an expansion of less than 0.10 percent at 16-days age is obtained:*

*1. Low-alkali portland cement containing not more than 0.6 percent total alkali when calculated as sodium oxide, as determined by the method given in ASTM C 114.*

*2. Blended hydraulic cement, Type IS or IP, conforming to ASTM C 595, except that Type IS cement shall not contain less than 40 percent slag constituent.*

*3. Replacement of not less than 15 percent by weight of the portland cement used by a mineral admixture conforming to ASTM C 618 for Class N or F materials (Class C is not permitted).*

*4. Replacement of not less than 40 percent by weight of the portland cement used by a ground granulated blast-furnace slag conforming to ASTM C 989.*

***1903A.6 Discontinuous Steel Fibers - Modify ACI 318 Section 3.5.1 by adding the following:***

*Discontinuous steel fibers are not permitted.*

***1903A.7 ~~1903A.4~~ Welding of reinforcing bars - Modify ACI 318 Section 3.5.2 by adding the following:***

*If mill test reports are not available, chemical analysis shall be made of bars representative of the bars to be welded. Bars with a carbon equivalent (C.E.) above 0.75 shall not be welded. Welding shall not be done on or within two bar diameters of any bent portion of a bar that has been bent cold. Welding of crossing bars shall not be permitted for assembly of reinforcement unless authorized by the structural engineer and approved by the enforcement agency per approved procedures.*

**...**

## SECTION 1905A
## CONCRETE QUALITY, MIXING AND PLACING

**1905A.1 General.** The required strength and durability of concrete shall be determined by compliance with the proportioning, testing, mixing and placing provisions of Sections 1905A.1.1 through 1905A.13.

**1905A.1.1 Strength.** Concrete shall be proportioned to provide an average compressive strength as prescribed in Section 1905A.3 and shall satisfy the durability criteria of Section 1904A. Concrete shall be produced to minimize the frequency of strengths below $f'_c$, as prescribed in Section 1905A.6.3. *For concrete designed and constructed in accordance with this chapter, $f'_c$,, shall not be less than 3,000 psi (20.7 MPa).* ~~*except that 2,500 psi (17.2 MPa) concrete may be used in the design of footings for light one-story wood- or steel-framed buildings or other minor structures.*~~ No maximum specified compressive strength shall apply unless restricted by a specific provision of this code or ACI 318. *Reinforced concrete with specified compressive strength higher than 8,000 psi (55 Mpa) shall require prior approval of structural design method and acceptance criteria by the enforcement agency.*

**1905A.2 Selection of concrete proportions.** Concrete proportions shall be determined in accordance with the provisions of ACI 318, Section 5.2.

*A registered civil engineer with experience in concrete mix design shall select the relative amounts of ingredients to be used as basic proportions of the concrete mixes proposed for use under this provision.* ~~*and testing shall be performed in a laboratory acceptable to the enforcement agency.*~~

**1905A.3 Proportioning on the basis of field experience and/or trial mixtures.** Concrete proportioning determined on the basis of field experience and/or trial mixtures shall be done in accordance with ACI 318, Section 5.3.

**1905A.4 Proportioning without field experience or trial mixtures.** Concrete proportioning determined without field experience or trial mixtures shall be done in accordance with ACI 318, Section 5.4.

**1905A.5 Average strength reduction.** As data become available during construction, it is permissible to reduce the amount by which the average compressive strength (*f'c*) is required to exceed the specified value of *f'c* in accordance with ACI 318, Section 5.5.

**1905A.6 Evaluation and acceptance of concrete.** The criteria for evaluation and acceptance of concrete shall be as specified in Sections 1905A.6.2 through 1905A.6.5.

**1905A.6.1 Qualified technicians.** Concrete shall be tested in accordance with the requirements in Sections 1905A.6.2 through 1905A.6.5. Qualified field testing technicians shall perform tests on fresh concrete at the job site, prepare specimens required for curing under field conditions, prepare specimens required for testing in the laboratory and record the temperature of the fresh concrete when preparing specimens for strength tests. Qualified laboratory technicians shall perform all required laboratory tests.

**1905A.6.2 Frequency of testing.** The frequency of conducting strength tests of concrete and the minimum number of tests shall be as specified in ACI 318, Section 5.6.2 *except as modified in Section 1905A.6.2.1.*

> ~~**Exception:** When the total volume of a given class of concrete is less than 50 cubic yards (38m3), strength tests are not required when evidence of satisfactory strength is submitted to and approved by the building official.~~
>
> ***1905A.6.2.1 Sample Frequency.*** *Replace ACI 318 Section 5.6.2.1 as follows:*
>
> > 5.6.2.1 *Samples for strength tests of each class of concrete placed each day shall be taken not less than once a day, or not less than once for each 50 cubic yards (345m$^3$) of concrete, or not less than once for each 2,000 square feet (186 m$^2$) of surface area for slabs or walls. Additional samples for seven-day compressive strength tests shall be taken for each class of concrete at the beginning of the concrete work or whenever the mix or aggregate is changed.*

**1905A.6.3 Strength test specimens.** Specimens prepared for acceptance testing of concrete in accordance with Section 1905.6.2 and strength test acceptance criteria shall comply with the provisions of ACI 318, Section 5.6.3.

**1905A.6.4 Field-cured specimens.** Where required by the building official to determine adequacy of curing and protection of concrete in the structure, specimens shall be prepared, cured, tested and test results evaluated for acceptance in accordance with ACI 318, Section 5.6.4.

**1905A.6.5 Low-strength test results.** Where any strength test (see ACI 318, Section 5.6.2.4) falls below the specified value of *f'c*, the provisions of ACI 318, Section 5.6.5, shall apply.

**1905A.7 Preparation of equipment and place of deposit.** Prior to concrete being placed, the space to receive the concrete and the equipment used to deposit it shall comply with ACI 318, Section 5.7.

**1905A.8 Mixing.** Mixing of concrete shall be performed in accordance with ACI 318, Section 5.8.

~~*The capacity of the mixer shall be such that it will handle one or more full sack batches. No split sack batches will be permitted, except when all materials are weighed.*~~

**1905A.9 Conveying.** The method and equipment for conveying concrete to the place of deposit shall comply with ACI 318, Section 5.9.

**1905A.10 Depositing.** The depositing of concrete shall comply with the provisions of ACI 318, Section 5.10.

***1905A.10.1 Consolidation in congested areas.***

*Where conditions make consolidation difficult, or where reinforcement is congested, a mix design with smaller size aggregates, shall be used as approved by the architect, structural engineer and the enforcement agency.*

**1905A.11 Curing.** The length of time, temperature and moisture conditions for curing of concrete shall be in accordance with ACI 318, Section 5.11.

**1905A.12 Cold weather requirements.** Concrete to be placed during freezing or near-freezing weather shall comply with the requirements of ACI 318, Section 5.12.

*When mixing concrete during cold weather, the mix shall have a temperature of at least 50°F (10.0°C), but not more than 90°F (32.2°C). The concrete shall be maintained at a temperature of at least 50°F (10.0°C) for not less than 72 hours after placing. When necessary, concrete materials shall be heated before mixing. Special precautions shall be taken for the protection of transit-mixed concrete to maintain a temperature of at least 50°F (10.0°C).*

**1905A.13 Hot weather requirements.** Concrete to be placed during hot weather shall comply with the requirements of ACI 318, Section 5.13.

## SECTION 1906A
## FORMWORK, EMBEDDED PIPES AND CONSTRUCTION JOINTS

**1906A.1 Formwork.** The design, fabrication and erection of forms shall comply with ACI 318, Section 6.1.

**1906A.2 Removal of forms, shores and reshores.** The removal of forms and shores, including from slabs and beams (except where cast on the ground), and the installation of reshores shall comply with ACI 318, Section 6.2.

*No portion of the forming and shoring system may be removed less than 12 hours after placing. When stripping time is less than the specified curing time, measures shall be taken to provide adequate curing and thermal protection of the stripped concrete.*

**1906A.3 Conduits and pipes embedded in concrete.** Conduits, pipes and sleeves of any material not harmful to concrete and within the limitations of ACI 318, Section 6.3, are permitted to be embedded in concrete with approval of the registered design professional.

***1906A.3.1 Large Openings.*** *Openings larger than 12 inches (305 mm) in any dimension shall be detailed on the structural plans. Nothing in this section shall be construed to permit work in violation of fire and panic or other safety standards*

***1906A.3.2 Adequate Support.*** *Pipes and conduits shall be adequately supported and secured against displacement before concrete is placed.*

**1906A.4 Construction joints.** Construction joints, including their location, shall comply with the provisions of ACI 318, Section 6.4.

*Typical details and proposed locations of construction joints shall be indicated on the plans.*

***1906A.4.1 Surface Preparation.*** *The surface of all horizontal construction joints shall be cleaned and roughened by exposing clean aggregate solidly embedded in mortar matrix.*

*In the event that the contact surface becomes coated with earth, sawdust, etc., after being cleaned, the entire surface so coated shall be recleaned.*

## SECTION 1907*A*
## DETAILS OF REINFORCEMENT

**1907*A*.1 Hooks.** Standard hooks on reinforcing bars used in concrete construction shall comply with ACI 318, Section 7.1.

**1907*A*.2 Minimum bend diameters.** Minimum reinforcement bend diameters utilized in concrete construction shall comply with ACI 318, Section 7.2.

**1907*A*.3 Bending.** The bending of reinforcement shall comply with ACI 318, Section 7.3.

**1907*A*.4 Surface conditions of reinforcement.** The surface conditions of reinforcement shall comply with the provisions of ACI 318, Section 7.4.

**1907*A*.5 Placing reinforcement.** The placement of reinforcement, including tolerances on depth and cover, shall comply with the provisions of ACI 318, Section 7.5. Reinforcement shall be accurately placed and adequately supported before concrete is placed.

***1907A.5.1 Prestressing tendons.*** *Prestressing tendons shall be placed within plus or minus 1/4-inch (6.4mm) tolerance for member depths equal to and less than 8 inches (203 mm) and not to exceed the lesser of 3/8 inch (9.5 mm) or one third the minimum concrete cover for member depths greater than 8 inches (203 mm).*

**1907*A*.6 Spacing limits for reinforcement.** The clear distance between reinforcing bars, bundled bars, tendons and ducts shall comply with ACI 318, Section 7.6.

**1907*A*.7 Concrete protection for reinforcement.** The minimum specified concrete cover for reinforcement shall comply with Sections 1907.7.1 through 1907.7.8.

**1907*A*.7.1 Cast-in-place concrete (nonprestressed).** Minimum specified concrete cover shall be provided for reinforcement in nonprestressed, cast-in-place concrete construction in accordance with ACI 318, Section 7.7.1.

~~*Concrete tilt-up panels cast against a rigid horizontal surface, such as a concrete slab, exposed to the weather shall have 1" (25 mm) concrete cover for No. 8 or smaller bar and 2" (51 mm) cover for No. 9 or larger bars.*~~

**1907*A*.7.2 Cast-in-place concrete (prestressed).** The minimum specified concrete cover for prestressed and nonprestressed reinforcement, ducts and end fittings in cast-in-place prestressed concrete shall comply with ACI 318, Section 7.7.2.

**…**

**SECTION 1908*A***
**MODIFICATIONS TO ACI 318**

**1908*A*.1 General.** The text of ACI 318 shall be modified as indicated in Sections 1908*A*.1.1 through ~~1908.1.10~~ *1908A.1.32*.

**1908*A*.1.1 ACI 318, Section 2.2.** Modify existing definitions and add the following definitions to ACI 318, Section 2.2.

**DESIGN DISPLACEMENT.** Total lateral displacement expected for the design ~~basis~~ earthquake, *as specified by Section 12.8.6 of ASCE 7.*

***DETAILED PLAIN CONCRETE STRUCTURAL WALL.*** *A wall complying with the requirements of Chapter 22, including 22.6.7.*

***ORDINARY PRECAST STRUCTURAL WALL.*** *A precast wall complying with the requirements of Chapters 1 through 18.*

**ORDINARY REINFORCED CONCRETE STRUCTURAL WALL.** A *cast-in-place* wall complying with the requirements of Chapters 1 through 18.

**ORDINARY STRUCTURAL PLAIN CONCRETE WALL.** A wall complying with the requirements of Chapter 22, *excluding 22.6.7*.

**SPECIAL STRUCTURAL WALL**. A cast-in-place or precast wall complying with the requirements of 21.1.3 through 21.1.7, 21.9 and 21.10, as applicable, in addition to the requirements for ordinary reinforced concrete structural walls *or ordinary precast structural walls, as applicable. Where ASCE 7 refers to a "special reinforced concrete structural wall," it shall be deemed to mean a "special structural wall."*

***WALL PIER.*** *A wall segment with a horizontal length-to-thickness ratio of at least 2.5, but not exceeding 6, whose clear height is at least two times its horizontal length.*

***1908A.1.2 ~~1908A.1.1~~ ACI 318, Section ~~8.11.5~~ 8.13.5.*** *Replace ACI 318 Section ~~8.11.5~~ 8.13.5 as follows:*

*8.13.5 ~~8.11.5~~ - Permanent burned clay or concrete tile fillers shall be considered only as forms and shall not be included in the calculations involving shear or bending moments.*

*The thickness of the concrete slab on the permanent fillers shall be designed as described in ACI Section 8.13.6 ~~8.11.6~~ as modified in Section 1908A.1.3 ~~1908A.1.2~~.*

***1908A.1.3 ~~1908A.1.2~~ ACI 318, Section ~~8.11.6~~ 8.13.6***. *Replace ACI 318 Section ~~8.11.6~~ 8.13.6 as follows:*

*8.13.6 ~~8.11.6~~ - Where removable forms or fillers are used, the thickness of the concrete slab shall not be less than 1/12 of the clear distance between joists and in no case less than 2 1/2 inches (64 mm). Such slab shall be reinforced at right angles to the joists with at least the amount of reinforcement required for flexure, considering load concentrations, if any, but in no case shall the reinforcement be less than that required by ACI 318 Section 7.12.*

***1908A.1.4 ~~1908A.1.3~~ ACI 318, Section ~~8.11~~ 8.13.*** *Add Section ~~8.11.9~~ 8.13.9 to ACI 318 as follows:*

*8.13.9 ~~8.11.9~~ Concrete bridging. Concrete bridging shall be provided as follows: one near the center of spans for 20 to 30 feet (6096 mm to 9144 mm) spans and two near the third points of spans over 30 feet (9144 mm). Such bridging shall be either:*

*(a) A continuous concrete web having a depth equal to the joist and a width not less than 3 1/2 inches (89 mm) reinforced with a minimum of one No. 4 bar in the top and bottom; or*

*(b) Any other concrete element capable of transferring a concentrated load of 1,000 pounds (4.5 kN) from any joist to the two adjacent joists.*

*Such bridging shall not be required in roof framing if an individual member is capable of carrying dead load plus a concentrated load of 1,500 pounds (6.7 kN) at any point.*

***1908A.1.5*** ***~~1908A.1.4~~*** ***ACI 318, Section 10.5.3****. Modify ACI 318 Section 10.5.3 by adding the following:*

*This section shall not be used for members that resist seismic loads, except that reinforcement provided for foundation elements for one-story wood-frame or one-story light steel buildings need not be more than one-third greater than that required by analysis for all loading conditions.*

***1908A.1.6*** ***~~1908A.1.5~~*** ***ACI 318, Section 12.14.3.*** *Add Section 12.14.3.6 to ACI 318 as follows:*

*12.14.3.6 - Welded splices and mechanical connections shall maintain the clearance and coverage requirements of ACI Sections 7.6 and 7.7.*

***~~1908A.1.6 ACI 318, Section 13.5.3.3.~~*** *~~Modify ACI 318 Section 13.5.3.3 by adding the following:~~*

*~~Provision of ACI 318 Section 13.5.3.3 shall not be used, unless approved otherwise by the enforcement agent.~~*

***1908A.1.7 ACI 318, Section 14.2.6.*** *Replace ACI 318 Section 14.2.6 as follows:*

*14.2.6 - Walls shall be anchored to intersecting elements such as floors or roofs or to columns, pilasters, buttresses, and intersecting walls and footings with reinforcement at least equivalent to No. 4 bars at 12 inches (305 mm) on center for each layer of reinforcement.*

***1908A.1.8*** *Reserved.* ***~~ACI 318, Section 14.3.5.~~*** *~~Replace ACI 318 Section 14.3.5 as follows:~~*

*~~14.3.5 - Vertical and horizontal reinforcement shall not be spaced farther apart than three times the wall thickness, nor 18 inches (457 mm). Unless otherwise required by the engineer, the upper- and lowermost horizontal reinforcement shall be placed within one-half of the specified spacing at the top and bottom of the wall.~~*

***1908A.1.9*** *Reserved.* ***~~ACI 318, Section 14.3.8.~~*** *~~Add Section 14.3.8 to ACI 318 as follows:~~*

*~~14.3.8 - The minimum requirements for horizontal and vertical steel of ACI 318 Sections 14.3.2 and 14.3.3 may be interchanged for precast panels which are not restrained along vertical edges to inhibit temperature expansion or contraction.~~*

***1908A.1.10 ACI 318, Section 14.5 - Empirical design method.*** *Not permitted by OSHPD.*

***1908A.1.11 ACI 318, Section 14.6.1.*** *Replace ACI 318 Section 14.6.1 as follows:*

*14.6.1 - Nonbearing walls or nonbearing shear walls shall have a thickness of not less than 4 inches (102 mm) nor a thickness less than 1 / 30 of the shorter unsupported distance between vertical or horizontal stiffening elements.*

*Where walls are supported laterally by vertical elements, the stiffness of each vertical element shall exceed that of the tributary area of the wall.*

***1908A.1.12 ACI 318, Section 14.9.*** *Modify ACI 318 by adding Section 14.9 as follows:*

*14.9 - Foundation Walls. Horizontal reinforcing of concrete foundation walls for wood-frame or light-steel buildings shall consist of the equivalent of not less than one No. 5 bar located at the top and bottom of the wall. Where such walls exceed 3 feet (914 mm) in height, intermediate horizontal reinforcing shall be provided at spacing not to exceed 2 feet (610 mm) on center. Minimum vertical reinforcing shall consist of No. 3 bars at 24 inches (610 mm) on center.*

*Where concrete foundation walls or curbs extend above the floor line and support wood-frame or light-steel exterior, bearing or shear walls, they shall be doweled to the foundation wall below with a*

*minimum of No. 3 bars at 24 inches (610 mm) on center. Where the height of the wall above the floor line exceeds 18 inches (457 mm), the wall above and below the floor line shall meet the requirements of ACI 318 Section 14.3.*

***~~1908A.1.13 ACI 318, Section 15.2.1.~~*** *~~Modify ACI 318 Section 15.2.1 by adding the following:~~*

*~~The appropriate induced reactions for strength design may be computed as those due to a factor of 1.4 times the soil pressures from gravity load combinations and the seismic load combinations of Section 1605A.3.~~*

***~~1908A.1.14 ACI 318, Section 15.2.2. Modify~~*** *~~ACI 318 Section 15.2.2 by adding the following:~~*

*~~External forces and moments are those resulting from the load combinations of Section 1605A.3~~*

***~~1908A.1.15 ACI 318, Section 15.8.3.2.~~*** *~~Replace ACI 318 Section 15.8.3.2 as follows:~~*

*~~15.8.3.2 - Connection between pre-cast walls and supporting members shall meet the requirements of ACI 318 Sections 16.5.1.3(b) & (c) but not less than required by Section 1604A.~~*

***~~EXCEPTION:~~*** *~~In tilt-up construction, this connection may be to an adjacent floor slab. In no case shall the connection provided be less than that required by Section 1604A.~~*

***1908A.1.13*** *Reserved.*

***1908A.1.14*** ***~~1908A.1.17~~*** ***ACI 318 Section 16.*** *Add Section 16.11 to ACI 318 as follows:*

*16.11 - Reinforcement. Perimeters of precast walls shall be reinforced continuously with a minimum of one No. 5 bar extending the full height and width of the wall panel. Bars shall be continuous around corners. Where wall panels do not abut columns or other wall panels, perimeter bars shall be retained by hooked wall bars. Edges of openings in precast walls shall be reinforced with a minimum of one No. 5 bar continuous past corners sufficient to develop the bar.*

*A continuous tie or bond beam shall be provided at the roof line either as a part of the roof structure or part of the wall panels as described in the next paragraph below. This tie may be designed as the edge member of the roof diaphragm but, in any case, shall not be less than equivalent to two No. 6 bars continuous. A continuous tie equivalent to two No. 5 bars minimum shall also be provided either in the footing or with an enlarged section of the floor slab.*

*Wall panels of shear wall buildings shall be connected to columns or to each other in such a manner as to develop at least 75 percent of the horizontal wall steel. Half of this continuous horizontal reinforcing may be concentrated in bond or tie beams at the top and bottom of the walls and at points of intermediate lateral support. If possible, cast in-place joints with reinforcing bars extending from the panels into the joint a sufficient distance to meet the splice requirements of ACI 318 Section 12.15 for Class A shall be used. The reinforcing bars or welded tie details shall not be spaced over eight times the wall thickness vertically nor fewer than four used in the wall panel height. Where wall panels are designed for their respective overturning forces, the panel connections need not comply with the requirements of this paragraph.*

*Where splicing of reinforcement must be made at points of maximum stress or at closer spacing than permitted by ACI 318 Section 7.6, welding may be used when the entire procedure is suitable for the particular quality of steel used and the ambient conditions. Unless the welds develop 125 percent of the specified yield strength of the steel used, reinforcement in the form of continuous bars or fully anchored dowels shall be added to provide 25 percent excess steel area and the welds shall develop not less than the specified yield strength of the steel.*

***Exception:*** ***~~1908A.1.16 ACI 318, Section 16.3.~~*** *~~Add Section 16.3.3 to ACI 318 as follows:~~*
*~~Exception: 16.3.3 -~~ Nonbearing, nonshear panels such as nonstructural architectural cladding panels or column covers are not required to meet the provisions of this Section.*
*~~1908A.1.17.~~*

~~*Where reinforcing bars are used to transfer shear across a joint the shear value for bolts set forth in Table 1912A.2 may be used.*~~

~~*Wall panels shall be positively connected to all floors and roofs as specified in CBC Sections 1604A, 1607A.13 and ASCE 7 Section 13.5. They shall be connected to the foundations when not anchored to the floor slab or otherwise properly anchored.*~~

~~*See ACI 318 Sections 10.10, 10.11, 10.12 and 10.13 for design of compression forces in the precast walls.*~~

~~***1908A.1.18 ACI 318, Section 16.*** *Add Section 16.12 to ACI 318 as follows:*~~

~~*16.12 - On-site Cast Precast Wall Panels.*~~

~~*16.12.1 - The provisions of ACI 318 Sections 16.1, 16.2, 16.3, 16.4, 16.5, 16.6 and 16.11 shall apply to precast wall panels cast on site.*~~

~~*16.12.2 - Precast bearing and nonbearing walls shall be designed in accordance with the provisions of ACI 318 Chapter 14. Panel concrete shall have attained the specified compressive strength ($f'_c$) before erection unless calculations provided by the structural engineer or architect demonstrate adequate serviceability during handling and erection for concrete panels of lesser strength.*~~

~~*16.12.3 - In lieu of unsupported height limitations, the panel may be supported laterally by vertical elements provided the panel thickness is not less than 1 / 36 the distance between the panel edges and the stiffness of the vertical elements exceeds that of the tributary area of the wall panels. See ASCE 7 Section 13.5 for exterior elements.*~~

~~*16.12.4 -All embedded items shall be securely anchored in place prior to placing the concrete.*~~

~~*16.12.5 - Panels shall be allowed as much time as possible in the erect position before making longitudinal connections with an elapsed time of 28 days minimum between casting and connecting the panels.*~~

~~*16.12.6 - All details of reinforcement, connections, bearing seats, inserts, anchors, concrete cover, openings, fabrication and erection tolerances shall be shown on contract drawings.*~~

***1908A.1.15*** ~~***1908A.1.19***~~ ***ACI 318, Section 17.5.1****. Modify ACI 318 Section 17.5.1 by adding Sections 17.5.1.1 and 17.5.1.2 as follows:*

*17.5.1.1 - Full transfer of horizontal shear forces may be assumed when all of the following are satisfied:*

1. *Contact surfaces are clean, free of laitance, and intentionally roughened to full amplitude of approximately 1/4 inch (6.4 mm).*

2. *Minimum ties are provided in accordance with ACI 318 Section 17.6,*

3. *Web members are designed to resist total vertical shear, and*

4. *All shear reinforcement is fully anchored into all interconnected elements.*

*17.5.1.2 - If all requirements of ACI 318 Section 17.5.1.1 are not satisfied, horizontal shear shall be investigated in accordance with ACI 318 Section 17.5.3 or 17.5.4.*

***1908A.1.16*** ~~***1908A.1.20***~~ ***ACI 318, Section 18.2.3.*** *Modify ACI 318 Section 18.2.3 by adding the following:*

*For prestressed concrete members with recessed or dapped ends, an analysis of the connections shall be made in accordance with procedures given in ~~Part 6 of the~~ PCI Design Handbook, ~~6th~~ 7TH Edition.*

***1908A.1.17 ~~1908A.1.21~~ ACI 318 Section 18.2.4.*** *Modify ACI 318 Section 18.2.4 by adding the following:*

*Where prestressed concrete elements are restrained from movement, an analysis of the stresses in the prestressed elements and loads in the adjoining structural system induced by the above-described effects shall be made in accordance with ~~Part 3 of the~~ PCI Design Handbook, ~~6th~~ 7TH Edition.*

***1908A.1.18 ~~1908A.1.22~~ ACI 318, Section 18.2.*** *Add Section 18.2.7 to ACI 318 as follows:*

*18.2.7 - Span to Depth Ratio. Span to depth ratios for prestressed concrete members shall not exceed the following, except when calculations of deflections prove that greater values may be used without adverse effects:*

*Beams ……30*
*One-way Slabs ……..40*
*Two-way Floor Slabs…….. 40*
*Two-way Roof Slabs ……..44*
*Flat Slabs……See CBC Section ~~1908A.1.28~~ 1908A.1.21*

*These ratios should be decreased for special conditions such as heavy loads and simple spans.*

*Maximum deflection criteria shall be in accordance with ACI 318 Section 9.5*

***~~1908A.1.23 ACI 318, Section 18.6.~~*** *~~Add Section 18.6.4 to ACI 318 as follows:~~*

*~~18.6.4 - **Presumptive** Loss of Prestress. In lieu of an analysis to determine the loss of prestress from the above sources the loss may be assumed to be 35,000 psi (241 MPa) for pretensioned prestressed members. For posttensioned prestressed members the loss due to elastic shortening of concrete, creep of concrete, shrinkage of concrete, and relaxation of steel stress may be assumed to be 25,000 psi (172 MPa).~~*

***~~1908A.1.24 ACI 318, Section 18.9.2.2.~~*** *~~Modify ACI 318 Section 18.9.2.2 by adding the following:~~*

*~~One-way, unbonded, posttensioned slabs and beams shall be designed to carry the dead load of the slab or beam plus 25 percent of the unreduced superimposed live load by some method other than the primary unbonded posttensioned reinforcement. Design shall be based on the strength method of design with a load factor and capacity reduction factor of one. All reinforcement other than the primary unbonded reinforcement provided to meet other requirements of this section may be used in the design.~~*

***~~1908A.1.25 ACI 318, Section 18.9.2.~~*** *~~Modify ACI 318 Section 18.9.2 by adding Section 18.9.2.3 as follows:~~*

*~~18.9.2.3 - Maximum spacing limitations of ACI 318 Sections 7.6.1 and 8.10.5.2, for bonded reinforcement in slabs are not applicable to spacing of bonded reinforcement in members with unbonded tendons.~~*

***1908A.1.19*** *Reserved.* ***~~1908A.1.26 ACI 318, Section 18.12.~~*** *~~Add Section 18.12.7 to ACI 318 as follows:~~*

*~~18.12.7 - Openings in Flat Plates. The requirements of ACI 318 Section 13.4 apply in principle to openings in posttensioned flat plates. Tendons should be continuous and splayed horizontally to get around smaller openings. If tendons are terminated at edges of larger openings, such as at stairwells, an analysis shall be made to ensure sufficient strength and proper behavior. Edges around openings may be reinforced in a manner similar to conventionally reinforced slabs, or, in the~~*

~~case of larger openings, supplementary, posttensioning tendons may be used to strengthen the edges.~~

***1908A.1.20 ~~1908A.1.27~~ ACI 318, Section 18.21.*** *Add Section 18.21.5 to ACI 318 as follows:*

*18.21.5 - Prequalification of anchorages and coupler. Posttensioned anchorages and couplers for unbonded tendons shall be prequalified for use in prestressed concrete. Data shall be submitted by the posttensioning materials fabricator from an approved independent testing agency to show compliance with the following dynamic test requirements:*

*A dynamic test shall be performed on a representative specimen and the tendon shall withstand, without failure, 500,000 cycles from 60 percent to 66 percent of its minimum specified ultimate strength and 50 cycles from 40 percent to 80 percent of its minimum specified ultimate strength. The period of each cycle involves the change from the lower stress level to the upper stress level and back to the lower. The specimen used for the second dynamic test need not be the same used for the first dynamic test. Systems utilizing multiple strands, wires or bars may be tested utilizing a test tendon of smaller capacity than the full-size tendon. The test tendon shall duplicate the behavior of the full-size tendon and generally shall not have less than 10 percent of the capacity of the full-size tendon.*

*The above test data must be on file at the enforcement agency for posttensioning systems to be used. General approval will be based on satisfactory performance. Tests shall be required for pre-stressing steel and anchorages.*

*The average bearing stress, $P/A_b$, on the concrete created by the anchorage plates shall not exceed the following:*

*At service load*

$f_{cp} = 0.6\, f'_c \sqrt{( A'_b / A_b )}$

*but not greater than $f'_c$*

*At transfer load*

$f_{cp} = 0.8\, f'_{ci} \sqrt{( A'_b / A_b - 02)}$

*but not greater than $1.25\, f'_{ci}$ where:*

*$f_{cp}$ = permissible compressive concrete stress.*

*$f'_c$ = compressive strength of concrete.*

*$f'_{ci}$ = compressive strength of concrete at time of initial prestress.*

*$A'_b$ = maximum area of the portion of the concrete anchorage surface that is geometrically similar to and concentric with the area of the anchorage.*

*$A_b$ = bearing area of the anchorage.*

*P = prestress force in tendon.*

***1908A.1.21 ~~1908A.1.28~~ ACI 318, Section 18.*** *Add Section 18.23 to ACI 318 as follows:*

*18.23 - Prestressed Flat Slab.*

*18.23.1 - Span depth ratio. The ratio of the span to depth of the slab continuous over at least three supports with cantilevers at the ends shall not be greater than 40 for floor slabs or 44 for roof slabs.*

*18.23.2 - Distribution of tendons. The use of banded tendons is acceptable. Maximum tendon spacing shall be six times the slab thickness, not to exceed 42 inches (1067 mm). A minimum prestress level of 125 psi (861 kPa) on the local slab section tributary to the tendon or tendon group is required. A minimum of two tendons in flat slabs shall be placed over columns in each direction. Tendons at slab edges shall be placed 6 inches (152 mm) clear of the slab edge. Tendons shall be firmly supported at intervals not exceeding 42 inches (1067 mm) to prevent displacement during concrete placement. Tendons shall not be bundled in groups greater than five monostrand tendons. At horizontal plane deviations grouped tendons at curved portions must be separated with 1-inch-minimum (25 mm) clear between each tendon.*

*18.23.3 - Slab edge reinforcement. The slab edges, including interior openings with anchorages, shall be reinforced with two No. 5 bars, one top and one bottom, minimum, with a No. 3 hairpin placed each side of each anchorage or tendon carrying an effective prestressing force of 50,000 pounds (223 kN) or less. These hairpins shall be increased to No. 4 hairpins if the effective force per anchorage or tendon is greater than 50,000 pounds (223 kN).*

***1908A.1.30*** *(Chapter 19, Section 1908.1.4)* **ACI 318, Section 21.2.1.** Modify ACI 318 Sections 21.2.1.2, and *21.2.1.4*, to read as follows:

*21.2.1.2 - The provisions of ACI 318 Chapters 1 through 18 shall apply except as modified by the provisions of ACI 318 Chapter 21 and this Chapter.*

*21.2.1.4 - For structures assigned to Seismic Design Category D, E or F*, special moment frames, *special reinforced concrete structural walls*, diaphragms and trusses *and foundations* complying with 21.2 through 21.10 *or intermediate precast structural walls complying with* 21.13 shall be used to resist forces induced by earthquake motions. Members not proportioned to resist earthquake forces shall comply with 21.11.

***1908A.1.33*** **ACI 318, Section 21.3.** Modify ACI 318, Section 21.3, by adding new Section 21.3.2.5 to read as follows:

*21.3.2.5 - Unless the special moment frame is qualified for use through structural testing as required by 21.6.3, for flexural members prestressing steel shall not provide more than one-quarter of the strength for either positive or negative moment at the critical section in a plastic hinge location and shall be anchored at or beyond the exterior face of a joint.*

*Shear strength provided by prestressing tendons shall not be considered in design.*

***1908A.1.34 ACI 318, Section 21.4.4.1.*** *Modify ACI 318 section 21.4.4.1 as follows:*

*Where the calculated point of contraflexure is not within the middle half of the member clear height, provide transverse reinforcement as specified in ACI 318 Sections 21.4.4.1, Items (a) through (c), over the full height of the member.*

***1908A.1.35 ACI 318, Section 21.4.4.*** *Modify ACI 318 by adding Section 21.4.4.7 as follows:*

*21.4.4.7- At any section where the design strength, $\varphi P_n$, of the column is less than the sum of the shears $V_e$, computed in accordance with ACI 318 Sections 21.3.4.1 and 21.4.5.1 for all the beams framing into the column above the level under consideration, transverse reinforcement as specified in ACI 318 Sections 21.4.4.1 through 21.4.4.3 shall be provided. For beams framing into opposite sides of the column, the moment components may be assumed to be of opposite sign. For the determination of the design strength, $\varphi P_n$, of the column, these moments may be assumed to result from the deformation of the frame in any one principal axis.*

***1908A.1.36 ACI 318, Section 21.5.4.*** *Modify ACI 318 by adding Section 21.5.4.5 as follows:*

*21.5.4.5 - Splices shall be based on the development length, $\ell_d$, for a straight bar as determined by ACI 318 Sections 21.5.4.1 and 21.5.4.2 and modified by the factors in ACI 318 Chapter 12.*

***1908A.1.22*** *(Chapter 19, Section 1908.1.2)* ~~**1908.1.2**~~ **ACI 318, Section 21.1.1.** Modify ACI 318 Sections 21.1.1.3 and 21.1.1.7 to read as follows:

*21.1.1.3 – Structures* ~~*assigned to Seismic Design Category A*~~ shall satisfy requirements of Chapters 1 to 19. ~~and 22; Chapter 21 does not apply.~~ Structures assigned to *Seismic Design Category* ~~B, C,~~ D, E or F also shall satisfy 21.1.1.4 through 21.1.1.8, as applicable. ~~*Except for structural elements of plain concrete complying with Section 1908.1.8 of the International Building Code, s*~~ *Structural elements of plain concrete are prohibited in structures assigned to Seismic Design Category* ~~*C,*~~ *D, E or F.*

21.1.1.7 – Structural systems designated as part of the seismic-force-resisting system shall be restricted to those *permitted by ASCE 7*. ~~Except for *Seismic Design Category* A, for which Chapter 21 does not apply, t~~ *T*he following provisions shall be satisfied for each structural system designated as part of the seismic-force-resisting system, regardless of the *Seismic Design Category*:

~~(a) Ordinary moment frames shall satisfy 21.2.~~
~~(b) Ordinary reinforced concrete structural walls *and ordinary precast structural walls* need not satisfy any provisions in Chapter 21.~~
~~(c) Intermediate moment frames shall satisfy 21.3.~~
~~(d) Intermediate precast *structural* walls shall satisfy 21.4.~~
*(a) (Reserved for DSA-SS).*
(b) ~~(e)~~ Special moment frames shall satisfy 21.5 through 21.8.
(c) ~~(f)~~ Special structural walls shall satisfy 21.9.
(d) ~~(g)~~ Special structural walls constructed using precast concrete shall satisfy 21.10.

All special moment frames and special structural walls shall also satisfy 21.1.3 through 21.1.7.

***1908A.1.23*** *(Chapter 19, Section 1908.1.3) (Reserved for DSA-SS).* ~~**1908.1.3 ACI 318, Section 21.4.** Modify ACI 318, Section 21.4, by renumbering Section 21.4.3 to become 21.4.4 and adding new Sections 21.4.3, 21.4.5 and 21.4.6 to read as follows:~~

~~*21.4.3 – Connections that are designed to yield shall be capable of maintaining 80 percent of their design strength at the deformation induced by the design displacement or shall use Type 2 mechanical splices.*~~

~~21.4.4 – Elements of the connection that are not designed to yield shall develop at least 1.5 *Sy*.~~

~~*21.4.5 – Wall piers not designed as part of a moment frame shall have transverse reinforcement designed to resist the shear forces determined from 21.3.3. Spacing of transverse reinforcement shall not exceed 8 inches (203 mm). Transverse reinforcement shall be extended beyond the pier clear height for at least 12 inches (305 mm).*~~

> ~~***Exceptions:***~~
>
> ~~*1. Wall piers that satisfy 21.13.*~~
> ~~*2. Wall piers along a wall line within a story where other shear wall segments provide lateral support to the wall piers and such segments have a total stiffness of at least six times the sum of the stiffnesses of all the wall piers.*~~

~~*21.4.6 – Wall segments with a horizontal length-to-thickness ratio*~~ *less than 2.5 shall be designed as columns.*

***1908A.1.24*** ~~***1908A.1.37***~~ ***ACI 318, Section 21.9.2.2*** ~~***21.7.2.2***~~*. Modify ACI 318, Section 21.9.2.2* ~~*21.7.2.2*~~ *by adding the following:*

> *Where boundary members are not required by ACI 318 Section 21.9.6* ~~*21.7.6*~~*, minimum reinforcement parallel to the edges of all structural walls and the boundaries of all openings shall consist of twice the cross-sectional area of the minimum shear reinforcement required per lineal foot of wall. Horizontal extent of boundary element shall be per ACI 318 Section* ~~*21.7.6.4*~~ *21.9.6.4 (a) & (b).*

***1908A.1.25*** ~~***1908A.1.38***~~ ***ACI 318, Section*** ~~***21.7.4***~~ ***21.9.4.*** *Modify ACI 318 by adding Section* ~~*21.7.4.6*~~ *21.9.4.6 as follows:*

*21.9.4.6 ~~21.7.4.6~~ - Walls and portions of walls with $P_u > 0.35P_o$ shall not be considered to contribute to the calculated strength of the structure for resisting earthquake-induced forces. Such walls shall conform to the requirements of ACI 318 Section ~~21.11~~ 21.13.*

***1908A.1.26*** *(Chapter 19, Section 1908.1.4)* **~~1908.1.4~~ ACI 318, Section 21.9.** Modify ACI 318, Section 21.9, by adding new Section 21.9.10 to read as follows:

*21.9.10 – Wall piers and wall segments.*

*21.9.10.1 –Wall piers not designed as a part of a special moment frame shall have transverse reinforcement designed to satisfy the requirements in 21.9.10.2.*

***Exceptions:***
*1. Wall piers that satisfy 21.13.*
*2. Wall piers along a wall line within a story where other shear wall segments provide lateral support to the wall piers and such segments have a total stiffness of at least six times the sum of the stiffnesses of all the wall piers.*

*21.9.10.2 – Transverse reinforcement with seismic hooks at both ends shall be designed to resist the shear forces determined from 21.6.5.1. Spacing of transverse reinforcement shall not exceed 6 inches (152 mm). Transverse reinforcement shall be extended beyond the pier clear height for at least 12 inches (305 mm).*

*21.9.10.3 – Wall segments with a horizontal length-to-thickness ratio less than 2.5 shall be designed as column.*

***1908A.1.27*** *(Chapter 19, Section 1908.1.5)* **~~1908.1.5~~ ACI 318, Section 21.10.** Modify ACI 318, Section 21.10.2, to read as follows:

21.10.2 – Special structural walls constructed using precast concrete shall satisfy all the requirements of 21.9 for cast-in-place special structural walls in *addition* to Sections 21.4.2 *through 21.4.4*.

***1908A.1.28 ~~1908A.1.41~~ ACI 318, Section 21.9.4.*** *Modify ACI 318 Section 21.11.4 ~~21.9.4~~ by adding the following:*

*Collector and boundary elements in topping slabs placed over precast floor and roof elements shall not be less than 3 inches (76 mm) or 6 $d_b$ thick, where $d_b$ is the diameter of the largest reinforcement in the topping slab.*

***1908A.1.29 ~~1908A.1.42~~ ACI 318, Section 21.11.7.*** *Modify ACI 318 Section 21.11.7 by adding Section 21.11.7.7 ~~21.9.5.6~~ as follows:*

*~~21.9.5.6~~ 21.11.7.7 - Where boundary members are not required by ACI 318 Section 21.11.7.5 ~~21.9.5.3,~~ minimum reinforcement parallel to the edges of all diaphragms and the boundaries of all openings shall consist of twice the cross-sectional area of the minimum shear reinforcement required per linear foot of diaphragm.*

***1908A.1.30*** *(Chapter 19, Section 1908.1.6)* **~~1908.1.6~~ ACI 318, Section 21.12.1.1.** Modify ACI 318, Section 21.12.1.1, to read as follows:

21.12.1.1 – Foundations resisting earthquake-induced forces or transferring earthquake-induced forces between a structure and ground shall comply with the requirements of Section 21.12 and other applicable provisions of ACI 318 *unless modified by Chapter 18A of the California ~~International~~ Building Code.*

~~**1908.1.7 ACI 318, Section 22.6.** Modify ACI 318, Section 22.6, by adding new Section 22.6.7 to read as follows:~~

~~*22.6.7 – Detailed plain concrete structural walls.*~~
~~*22.6.7.1 – Detailed plain concrete structural walls are walls conforming to the requirements of ordinary structural plain concrete walls and 22.6.7.2.*~~

~~*22.6.7.2 – Reinforcement shall be provided as follows:*~~
~~*(a) Vertical reinforcement of at least 0.20 square inch (129 mm2) in cross-sectional area shall be provided continuously from support to support at each corner, at each side of each opening and at the ends of walls. The continuous vertical bar required beside an opening is permitted to substitute for one of the two No. 5 bars required by 22.6.6.5.*~~
~~*(b) Horizontal reinforcement at least 0.20 square inch (129 mm2) in cross-sectional area shall be provided:*~~

~~*1. Continuously at structurally connected roof and floor levels and at the top of walls;*~~
~~*2. At the bottom of load-bearing walls or in the top of foundations where doweled to the wall; and*~~
~~*3. At a maximum spacing of 120 inches (3048 mm).*~~
~~*Reinforcement at the top and bottom of openings, where used in determining the maximum spacing specified in Item 3 above, shall be continuous in the wall*~~
.
~~**1908.1.8 ACI 318, Section 22.10.** Delete ACI 318, Section 22.10, and replace with the following:~~
~~*22.10 – Plain concrete in structures assigned to Seismic Design Category C, D, E or F.*~~
~~*22.10.1 – 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 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 CategoryDor E, the height of the wall shall not exceed 8 feet (2438 mm), the thickness shall not be less than 71/2 inches (190 mm), and the wall shall retain no more than 4 feet (1219 mm) of unbalanced fill. Walls shall have reinforcement in accordance with 22.6.6.5.*~~
~~*(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, aminimum 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 detached one- and two-family dwellings three stories or less in height and constructed with stud-bearing walls, plain concrete footings without longitudinal reinforcement supporting walls are permitted.*~~
> ~~*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.*~~

***1908A.1.31*** *(Chapter 19, Section 1908.1.9)* ~~**1908.1.9**~~ **ACI 318, Section D.3.3.** Modify ACI 318, Sections D.3.3.1, D.3.3.4, ~~and~~ D.3.3.5, *and add D.3.3.7* to read as follows:

D.3.3.1 – The provisions of Appendix D do not apply to the design of anchors in plastic hinge zones of concrete structures under earthquake forces *or to anchors that meet the requirements of Section D.3.3.7.*

***...***

D.3.3.4 – Anchors shall be designed to be governed by the steel strength of a ductile steel element as determined in accordance with D.5.1 and D.6.1, unless either D.3.3.5 or D.3.3.6 is satisfied.

***Exceptions:***
~~*1. Anchors in concrete designed to support nonstructural components in accordance with ASCE 7 Section 13.4.2 need not satisfy Section D.3.3.4.*~~
~~*2.*~~ *Anchors designed to resist wall out-of-plane forces with design strengths equal to or greater than the force determined in accordance with ASCE 7 Equation 12.11-1 or 12.14-10 need not satisfy Section D.3.3.4.*

D.3.3.5 – Instead of D.3.3.4, the attachment that the anchor is connecting to the structure shall be designed so that the attachment will undergo ductile yielding at a force level corresponding to anchor forces no greater than the design strength of anchors specified in D.3.3.3.

***Exceptions:***
~~*1. Anchors in concrete designed to support nonstructural components in accordance with ASCE 7 Section 13.4.2 need not satisfy Section D.3.3.5.*~~
~~*2.*~~ *Anchors designed to resist wall out-of-plane forces with design strengths equal to or greater than the force determined in accordance with ASCE 7 Equation 12.11-1 or 12.14-10 need not satisfy Section D.3.3.5.*

***...***

*D.3.3.7 – For wood sill plates a minimum of 1 ½ inches (38 mm) in net thickness, the allowable lateral design values of cast-in anchors in shear parallel to the grain of the wood sill plate are permitted to be determined in accordance with Section 2305 of the California Building Code, provided they comply with all of the following:*

1. *Their maximum nominal diameter is 5/8 inches (16 mm);*
2. *They are embedded into the concrete a minimum of 7 inches (178 mm);*
3. *They are located a minimum of 2 ½ anchor diameters from the edges of the concrete parallel to the grain of the wood sill plate; and*
4. *They are located a minimum of 15 anchor diameters from the end of the concrete perpendicular to the grain of the wood sill plate,*

***1908A.1.32*** *(Chapter 19, Section 1908.1.10)* ~~**1908.1.10**~~ **ACI 318, Section D.4.2.2.** Delete ACI 318, Section D.4.2.2, and replace with the following:

*D.4.2.2 – The concrete breakout strength requirements for anchors in tension shall be considered satisfied by the design procedure of D.5.2 provided Equation D-8 is not used for anchor embedments exceeding 25 inches. The concrete breakout strength requirements for anchors in shear with diameters not exceeding 2 inches shall be considered satisfied by the design procedure of D.6.2. For anchors in shear with diameters exceeding 2 inches, shear anchor reinforcement shall be provided in accordance with the procedures of D.6.2.9.*

~~***1908A.1.47*** **ACI 318, Section D.3.3.** Modify ACI 318, Sections D.3.3.2 through D.3.3.5, to read as follows:~~

~~D.3.3.2 *In structures assigned to Seismic Design Category D, E or F,* post-installed anchors for use under D.2.3 shall have passed the Simulated Seismic Tests of ACI 355.2.~~

~~D.3.3.3 *In structures assigned to Seismic Design Category D, E or F,* the design strength of anchors shall be taken as $0.75\varphi N_n$ and $0.75\varphi V_n$, where φ is given in D.4.4 or D.4.5, and $N_n$ and $V_n$ are determined in accordance with D.4.1.~~

~~D.3.3.4 *In structures assigned to Seismic Design Category D, E or F,* anchors shall be designed to be governed by tensile or shear strength of a ductile steel element, unless D.3.3.5 is satisfied.~~

~~*Exception: Anchors in concrete designed to support non-structural components in accordance with ASCE 7 Section 13.4.2 need not satisfy Section D.3.3.4.*~~

~~D.3.3.5 Instead of D.3.3.4, the attachment that the anchor is connecting to the structure shall be designed so that the attachment will undergo ductile yielding at a load level corresponding to anchor forces no greater than the design strength of anchors specified in D.3.3.3*, or the minimum design strength of the anchors shall be at least 2.5 times the factored forces transmitted by the attachment*.~~

~~*Exception: Anchors in concrete designed to support non-structural components in accordance with ASCE 7 Section 13.4.2 need not satisfy Section D.3.3.5.*~~

**SECTION 1909*A***
**STRUCTURAL PLAIN CONCRETE**

***NOT PERMITTED BY OSHPD***

~~**1909*A*.1 Scope.** *Plain concrete shall not be used other than as fill. The minimum specified compression strength of concrete used as fill shall be 1,500 psi (10.3 MPa) at 28 days.* The design and construction of structural plain concrete, both cast in place and precast, shall comply with the minimum requirements of Section 1909 and ACI 318, Chapter 22, as modified in Section 1908.~~

~~**1909.1.1 Special structures.** For special structures, such as arches, underground utility structures, gravity walls and shielding walls, the provisions of this section shall govern where applicable.~~

~~**1909.2 Limitations.** The use of structural plain concrete shall be limited to:~~
~~1. Members that are continuously supported by soil, such as walls and footings, or by other structural members capable of providing continuous vertical support.~~
~~2. Members for which arch action provides compression under all conditions of loading.~~
~~3. Walls and pedestals.~~

~~The use of structural plain concrete columns and structural plain concrete footings on piles is not permitted. See Section 1908.1.8 for additional limitations on the use of structural plain concrete.~~

~~**1909.3 Joints.** Contraction or isolation joints shall be provided to divide structural plain concrete members into flexurally discontinuous elements in accordance withACI 318, Section 22.3.~~

~~**1909.4 Design.** Structural plain concrete walls, footings and pedestals shall be designed for adequate strength in accordance with ACI 318, Sections 22.4 through 22.8.~~

~~**Exception:** For Group R-3 occupancies and buildings of other occupancies less than two stories above *grade plane* of light-frame construction, the required edge thickness of ACI 318 is permitted to be reduced to 6 inches (152 mm), provided that the footing does not extend more than 4 inches (102 mm) on either side of the supported wall.~~

~~**1909.5 Precast members.** The design, fabrication, transportation and erection of precast, structural plain concrete elements shall be in accordance with ACI 318, Section 22.9.~~

~~**1909.6 Walls.** In addition to the requirements of this section, structural plain concrete walls shall comply with the applicable requirements of ACI 318, Chapter 22.~~

~~**1909.6.1 Basement walls.** The thickness of exterior basement walls and foundation walls shall be not less than 71/2 inches (191 mm).~~
~~**1909.6.2 Other walls.** Except as provided for in Section 1909.6.1, the thickness of bearing walls shall be not less than 1/24 the unsupported height or length, whichever is shorter, but not less than 51/2 inches (140 mm).~~

~~**1909.6.3 Openings in walls.** Not less than one No. 5 bar shall be provided around window, door and similar sized openings. The bar shall be anchored to develop *fy* in tension at the corners of openings.~~

**...**

**SECTION 1911*A***

**ANCHORAGE TO CONCRETE—**
**ALLOWABLE STRESS DESIGN**

**…**

***1911A.1.1 Power Actuated Fasteners:*** *Power actuated fasteners qualified in accordance with ICC-ES AC 70 shall be deemed to satisfy the requirements of this section.*

*Power actuated fasteners shall be permitted for seismic shear when they are specifically listed in ICC-ES Report (ICC-ESR) for such service and for interior non-shear wall partitions. Power actuated fastener shall not be used to anchor exterior cladding or curtain wall systems.*

**…**

**SECTION 1912*A* - ANCHORAGE TO CONCRETE— STRENGTH DESIGN**

**1912.1 Scope.** The provisions of this section shall govern the strength design of anchors installed in concrete for purposes of transmitting structural loads from one connected element to the other. Headed bolts, headed studs and hooked (J- or L-) bolts cast in concrete and expansion anchors and undercut anchors installed in hardened concrete shall be designed in accordance with Appendix D of ACI 318 as modified by Sections *1908.1.30* ~~1908.1.9~~ and ~~1908.1.10~~ *1908.1.31*, provided they are within the scope of Appendix D.

The strength design of anchors that are not within the scope of Appendix D of ACI 318, and as amended in Sections *1908.1.30* ~~1908.1.9~~ and ~~1908.1.10~~ *1908.1.31*, shall be in accordance with an approved procedure.

***1912A.1.1 Specialty Inserts:*** *Specialty inserts, including cast-in-place specialty inserts, tested in accordance with ICC-ES AC 193 shall be deemed to satisfy the requirements of this section.*

**…**

**SECTION 1913*A***
**SHOTCRETE**

**1913*A*.1 General.** Shotcrete is mortar or concrete that is pneumatically projected at high velocity onto a surface. Except as specified in this section, shotcrete shall conform to the requirements of this chapter for ~~plain or~~ reinforced concrete *and the provisions of ACI 506. The specified compressive strength of shotcrete shall not be less than 3,000 psi (20.69 MPa).*

*Concrete or masonry to receive shotcrete shall have the entire surface thoroughly cleaned and roughened by sand blasting, and just prior to receiving shotcrete, shall be thoroughly cleaned of all debris, dirt and dust. Concrete and masonry shall be wetted before shotcrete is deposited, but not so wet as to overcome suction. Sand for sand blasting shall be clean, sharp and uniform in size, with no particles that will pass a 50-mesh screen.*

**…**

**1913*A*.3 Aggregate.** Coarse aggregate, if used, shall not exceed $^3/_4$ inch (19.1 mm).

*For shear walls, when total rebar in any direction is more than 0.31 in$^2$ / ft. or rebar size is larger than # 5, shotcrete shall conform to course aggregate grading No. 2 per Table 1.1 of ACI 506.*

**…**

**1913*A*.5 Preconstruction tests.** ~~When required by the building official, a~~ *A* test panel shall be shot, cured, cored or sawn, examined and tested prior to commencement of the project. The sample panel shall be representative of the project and simulate job conditions as closely as possible. The panel thickness and

reinforcing shall reproduce the thickest and most congested area specified in the structural design. It shall be shot at the same angle, using the same nozzleman and with the same concrete mix design that will be used on the project. The equipment used in preconstruction testing shall be the same equipment used in the work requiring such testing, unless substitute equipment is approved by the building official.

**...**

**1913*A*.7 Joints.** Except where permitted herein, unfinished work shall not be allowed to stand for more than 30 minutes unless edges are sloped to a thin edge. For structural elements that will be under compression and for construction joints shown on the approved construction documents, square joints are permitted. Before placing additional material adjacent to previously applied work, sloping and square edges shall be cleaned and wetted.

*The film of laitance which forms on the surface of the shotcrete shall be removed within approximately two hours after application by brushing with a stiff broom. If this film is not removed within two hours, it shall be removed by thorough wire brushing or sand blasting. Construction joints over eight hours old shall be thoroughly cleaned with air and water prior to receiving shotcrete.*

**...**

**1913*A*.10 Strength tests.** Strength tests for shotcrete shall be made *in accordance with ASTM standards* by an approved agency on specimens that are representative of the work and which have been water soaked for at least 24 hours prior to testing. When the maximum-size aggregate is larger than $^3/_8$ inch (9.5 mm), specimens shall consist of not less than three 3-inch-diameter (76 mm) cores or 3-inch (76 mm) cubes. When the maximum-size aggregate is $^3/_8$ inch (9.5 mm) or smaller, specimens shall consist of not less than 2-inch-diameter (51 mm) cores or 2-inch (51 mm) cubes.

**1913*A*.10.1 Sampling.** Specimens shall be taken from the in-place work or from test panels, and shall be taken at least once each shift, but not less than one for each 50 cubic yards (38.2 $m^3$) of shotcrete.

**1913*A*.10.2 Panel criteria.** When the maximum-size aggregate is larger than $^3/_8$ inch (9.5 mm), the test panels shall have minimum dimensions of 18 inches by 18 inches (457 mm by 457 mm). When the maximum size aggregate is $^3/_8$ inch (9.5 mm) or smaller, the test panels shall have minimum dimensions of 12 inches by 12 inches (305 mm by 305 mm). Panels shall be shot in the same position as the work, during the course of the work and by the nozzlemen doing the work. The conditions under which the panels are cured shall be the same as the work. *Approval from the enforcement agency shall ~~must~~ be obtained prior to performing the test panel method.*

**...**

~~***1913A.11 Equipment.*** *The equipment used in preconstruction testing shall be the same equipment used in the work requiring such testing, unless substitute equipment is approved by the enforcement agency.*~~

***1913A.11*** ~~***1913A.12***~~ ***Forms and Ground Wires for Shotcrete.*** *Forms for shotcrete shall be substantial and rigid. Forms shall be built and placed so as to permit the escape of air and rebound.*

*Adequate ground wires, which are to be used as screeds, shall be placed to establish the thickness, surface planes and form of the shotcrete work. All surfaces shall be rodded to these wires.*

***1913A.12*** ~~***1913A.13***~~ ***Placing.*** *Shotcrete shall be placed in accordance with ACI 506.*

**SECTION 1914A**
**REINFORCED GYPSUM CONCRETE**

**1914*A*.1 General.** Reinforced gypsum concrete shall comply with the requirements of ASTM C 317 and ASTM C 956. *Reinforced gypsum concrete shall be considered as an alternative system.*

**...**

## *SECTION 1916A*
## *CONCRETE, REINFORCEMENT AND ANCHOR TESTING*

***1916A.1 Cementitious material.*** *The concrete supplier shall furnish to the enforcement agency certification that the cement proposed for use on the project has been manufactured and tested in compliance with the requirements of ASTM C 150 for portland cement and ASTM C 595 or ASTM C 1157 for blended hydraulic cement, whichever is applicable. When a mineral admixture or ground granulated blast-furnace slag is proposed for use, the concrete supplier shall furnish to the enforcement agency certification that they have been manufactured and tested in compliance with ASTM C 618 or ASTM C 989, whichever is applicable.~~.~~ The concrete producer shall provide copies of the cementitious material supplier's Certificate of Compliance that represents the materials used by date of shipment for concrete. Cementitious materials without Certification of Compliance shall not be used.*

***1916A.2 Tests of reinforcing bars****. Where samples are taken from bundles as delivered from the mill, with the bundles identified as to heat number and provided the mill analyses accompany the report, one tensile test and one bend test shall be made from a specimen from each 10 tons (9080 kg) or fraction thereof of each size of reinforcing steel.*

*Where positive identification of the heat number cannot be made or where random samples are to be taken, one series of tests shall be made from each 2 1/2 tons (2270 kg) or fraction thereof of each size of reinforcing steel. ~~See Section 1916A.4 for waiver of tests.~~*

*Tests of reinforcing bars may be waived by the structural engineer with the approval of the Building Official for one-story buildings provided certified mill test reports are provided for each shipment of such reinforcement.*

***1916A.3 Tests for prestressing steel and anchorage****. All wires or bars of each size from each mill heat and all strands from each manufactured reel to be shipped to the site shall be assigned an individual lot number and shall be tagged in such a manner that each lot can be accurately identified at the jobsite. Each lot of tendon and anchorage assemblies and bar couplers to be installed shall be likewise identified.*

*The following samples of materials and tendons selected by the engineer or the designated testing laboratory from the prestressing steel at the plant or jobsite shall be furnished by the contractor and tested by an approved independent testing agency:*

1. *For wire, strand or bars, 7-foot-long (2134 mm) samples shall be taken of the coil of wire or strand reel or rods. A minimum of one random sample per 5,000 pounds (2270 kg) of each heat or lot used on the job shall be selected.*

2. *For prefabricated prestressing tendons other than bars, one completely fabricated tendon 10 feet (3048 mm) in length between grips with anchorage assembly at one end shall be furnished for each size and type of tendon and anchorage assembly.*

   *Variations of the bearing plate size need not be considered.*

   *The anchorages of unbonded tendons shall develop at least 95 percent of the minimum specified ultimate strength of the pre-stressing steel. The total elongation of the tendon under ultimate load shall not be less than 2 percent measured in a minimum gage length of 10 feet (3048 mm).*

   *Anchorages of bonded tendons shall develop at least 90 percent of the minimum specified strength of the prestressing steel tested in an unbonded state. All couplings shall develop at least 95 percent of the minimum specified strength of the prestressing steel and shall not reduce the elongation at rupture below the requirements of the tendon itself.*

3. *If the prestressing tendon is a bar, one 7-foot (2134 mm) length complete with one end anchorage shall be furnished and, in addition, if couplers are to be used with the bar, two 4-foot (1219 mm) lengths of bar fabricated to fit and equipped with one coupler shall be furnished.*

4. *Mill tests of materials used for end anchorages shall be furnished. In addition, at least one Brinnell hardness test shall be made of each thickness of bearing plate.*

~~***1916A.4 Waiver of Material Testing.*** *Tests of reinforcing bars may be waived by the architect or structural engineer with the approval of the enforcement agency for one-story buildings where the specified compressive strength of the concrete $f'_c$, delivered to the jobsite is 3,500 psi (24.13 MPa) and where the $f'_c$ used in design is 2,500 psi (17.24 MPa).*~~

***1916A.4*** ~~***1916A.5***~~ ***Composite construction cores****. Cores of the completed composite concrete construction shall be taken to demonstrate the shear strength along the contact surfaces. The cores shall be tested when the cast-in-place concrete is approximately 28 days old and shall be tested by a shear loading parallel to the joint between the precast concrete and the cast-in-place concrete. The minimum unit shear strength of the contact surface area of the core shall not be less than 100 psi (689 kPa).*

*At least one core shall be taken from each building for each 5,000 square feet (465m2) of area of composite concrete construction and not less than three cores shall be taken from each project. The architect or structural engineer in responsible charge of the project or his or her representative shall designate the location for sampling.*

***1916A.5*** ~~***1916A.6***~~ ***Tests of shotcrete.*** *Testing of shotcrete shall follow the provisions of Section 1913A and the general requirements of ACI 318 Section 5.6.*

***1916A.6*** ~~***1916.7***~~ ***Gypsum field tests.*** *Field tests shall be made during construction to verify gypsum strength. One sample consisting of three specimens shall be made for each 5,000 square feet (465 m2) or fraction thereof of all gypsum poured, but not less than one sample shall be taken from each half day's pour.*

***1916A.7*** ~~***1916A.8***~~ ***Tests for Post-Installed Anchors in Concrete.*** *When ~~drilled-in expansion-type anchors or other~~ post-installed anchors ~~acceptable to enforcement agency~~ are used in lieu of cast-in place bolts, the ~~allowable shear and tension values and~~ installation verification test loads, frequency, and acceptance criteria shall be ~~acceptable to the enforcement agency~~ in accordance with this section.*

***1916A.7.1 General.*** *Test loads or torques and acceptance criteria shall be shown on the construction documents.*

*If any anchor fails testing, all anchors of the same type shall be tested, which are installed by the same trade, not previously tested until twenty (20) consecutive anchors pass, then resume the initial test frequency.*

***1916A.7.2 Test Loads.*** *Required test loads shall be determined by one of the following methods:*

1. *Twice the maximum allowable tension load or one and a quarter (1- 1/4) times the maximum design strength of anchors as provided in International Code Council – Evaluation Service Report (ICC-ESR) or determined in accordance with Appendix D of ACI 318.*

*Tension test load need not exceed 80% of the nominal yield strength of the anchor element (= 0.8 $A_{se}$ $f_{ya}$).*

2. *The manufacturer's recommended installation torque as approved in an ICC-ESR.*

***1916A.7.3 Test Frequency.*** *When post-installed anchors ~~expansion-type anchors~~ are used ~~listed~~ for sill plate bolting applications, 10 percent of the anchors shall be ~~tension~~ tested.*

*When post-installed anchors ~~expansion-type anchors~~ are used for other structural applications, all such ~~expansion~~ anchors shall be ~~tension~~ tested. ~~Expansion-type anchors shall not be used as hold down bolts.~~*

*When post-installed anchors ~~expansion-type anchors~~ are used for nonstructural applications such as equipment anchorage, 50 percent or alternate bolts in a group, including at least one-half the anchors in each group, shall be ~~tension~~ tested.*

*The ~~tension~~ testing of the ~~expansion~~ post-installed anchors shall be done in the presence of the special inspector and a report of the test results shall be submitted to the enforcement agency. ~~If any anchors fail~~*

~~the tension-testing requirements, the additional testing requirements shall be acceptable to the enforcement agency. The above requirements shall also apply to other post-installed anchors acceptable to enforcement agency and bolts or anchors set in concrete with chemical if the long-term durability and stability of the chemical material and its resistance to loss of strength and chemical change at elevated temperatures are established to the satisfaction of the enforcement agency.~~

*Exceptions:*

1. *Undercut anchors that allow visual confirmation of full set shall not require testing.*

2. *Where the factored design tension on anchors is less than 100 lbs. and those anchors are clearly noted on the approved construction documents, only 10 percent of those anchors shall be tested.*

3. *Where adhesive anchor systems are used to install reinforcing dowel bars in hardened concrete, only 25% of the dowels shall be tested if all of the following conditions are met:*

   a. *The dowels are used exclusively to transmit shear forces across joints between existing and new concrete.*
   b. *The number of dowels in any one member equals or exceeds 12.*
   c. *The dowels are uniformly distributed across seismic force resisting members (such as shear walls, collectors and diaphragms).*

   *Anchors to be tested shall be selected at random by the special inspector/Inspector Of Record (IOR).*

4. *Testing of shear dowels across cold joints in slabs on grade, where the slab is not part of the lateral force-resisting system shall not be required.*

5. *Testing is not required for power actuated fasteners used to attach tracks of interior non-shear wall partitions for shear only, where there are at least three fasteners per segment of track.*

***1916A.7.4 Test Acceptance Criteria.*** *Acceptance criteria for post-installed anchors shall be based on ICC-ESR or manufacturers written instruction, acceptable to the enforcement agency. Field test shall satisfy following minimum requirements.*

*1. Hydraulic Ram Method:*

*Anchors tested with a hydraulic jack or spring loaded devices shall maintain the test load for a minimum of 15 seconds and shall exhibit no discernable movement during the tension test, e.g., as evidenced by loosening of the washer under the nut.*

*For adhesive anchors, where other than bond is being tested, the testing device shall not restrict the concrete shear cone type failure mechanism from occurring.*

*2. Torque Wrench Method:*

*Anchors tested with a calibrated torque wrench must attain the specified torque within ½ turn of the nut.*

*Exceptions:*

a. *Wedge or Sleeve type:*
   *One-quarter (1/4) turn of the nut for a 3/8 in. sleeve anchor only.*

b. *Threaded Type:*
   *One-quarter (1/4) turn of the screw after initial seating of the screw head.*

***1916A.7.5. Testing Procedure.*** *Test procedure shall be as required by the ICC-ESR. Manufacturer's recommendation for testing may be approved by the enforcement agency, when ICC-ESR does not provide a testing procedure.*

## *SECTION 1917A*
## *EXISTING CONCRETE STRUCTURES*

### *1917A.1. EXISTING CONCRETE STRUCTURES.*

*The structural use of existing concrete with a core strength less than 1,500 psi (10.3MPa) is not permitted in rehabilitation work.*

*For existing concrete structures, sufficient cores shall be taken at representative locations throughout the structure, as designated by the architect or structural engineer, so that knowledge will be had of the in-place strength of the concrete. At least three cores shall be taken from each building for each 4,000 square feet (372 m2) of floor area, or fraction thereof. Cores shall be at least 4 inches (102 mm) in diameter. Cores as small as 2.75 inches (70 mm) in diameter may be allowed by the enforcement agency when reinforcement is closely spaced and the coarse aggregate does not exceed 3/4 inch (19 mm).*

***1917A.2. Crack Repair By Epoxy Injection. [OSHPD 1 & 4]*** *Crack repair by epoxy injection of concrete and masonry member shall conform to all requirements of ACI 503.7.*

***1917A.3. Concrete Strengthening by Externally Bonded Fiber Reinforced Polymer (FRP).*** *Design and construction of externally bonded FRP systems for strengthening concrete structures shall be in accordance with ACI 440.2R.*

*Exceptions:* *1) Near-Surface Mounted (NSM) FRP bars shall not be permitted.*
*2) Strengthening of shear walls and diaphragms (including chords and collectors) shall be considered as an alternative system.*

*Design capacities, reliability, serviceability of FRP materials shall be permitted to be established in accordance with ICC-ES AC 125. Minimum inspection requirements of FRP composite systems shall be in accordance with ICC-ES AC 178.*

*(All existing amendments that are not revised above shall continue without any change)*

NOTATION:

- *Authority: Health and Safety Code Section 130005(g) & 130021*
- *Reference: Health and Safety Code Section 1275, 129790, 129850 & 130005(g)*

## CHAPTER 20
## ALUMINUM

### SECTION 2001
### GENERAL

**2001.1 Scope.** This chapter shall govern the quality, design, fabrication and erection of aluminum.

### SECTION 2002
### MATERIALS

**2002.1 General.** Aluminum used for structural purposes in buildings and structures shall comply with AA ASM 35 and AA ADM 1. The nominal loads shall be the minimum design loads required by Chapter 16.

### *SECTION 2003 - INSPECTION*

***2003.1 Inspection. [OSHPD 1 & 4]*** *Inspection of Aluminum shall be required in accordance with the requirements for steel in Chapter 17A.*

*(All existing amendments are continued without any change)*

***Notation:***
*Authority: Health and Safety Code Section 129850*
*Reference: Health and Safety Code Sections 1275,129850 and 129790*

**CHAPTER 21**
**MASONRY**

*(All existing amendments that are not revised shall continue without any change)*

***Notation:***
*Authority: Health and Safety Code Section 129850*
*Reference: Health and Safety Code Sections 1275 and 129850*

**CHAPTER 21*A***
**MASONRY**

**SECTION 2101*A***
**GENERAL**

**2101*A*.1 Scope.** This chapter shall govern the materials, design, construction and quality of masonry.

***2101A.1.1 Application.*** *The scope of application of Chapter 21A is as follows:*

*1. (Reserved for DSA).*

*2. Applications listed in Section ~~110.1~~ 1.10.1, and ~~110.4~~ 1.10.4 regulated by the Office of Statewide Health Planning and Development (OSHPD).These applications include hospitals, skilled nursing facilities, intermediate care facilities and correctional treatment centers.*

***Exception: [OSHPD 2]*** *Single-story Type V skilled nursing or intermediate care facilities utilizing wood-frame or light-steel-frame construction as defined in Health and Safety Code Section 129725, which shall comply with Chapter 21 and any applicable amendments therein.*

***2101A.1.2 Amendments in this chapter.*** *OSHPD adopt this chapter and all amendments.*

***Exception:*** *Amendments adopted by only one agency appear in this chapter preceded with the appropriate acronym of the adopting agency, as follows:*

***1.*** *(Reserved for DSA).*

***2****. Office of Statewide Health Planning and Development:*

***[OSHPD 1]*** *- For applications listed in Section ~~110.1~~ 1.10.1.*

***[OSHPD 4]*** *- For applications listed in Section ~~110.4~~ 1.10.4.*

***2101A.1.3 Prohibition:*** *The following design methods, systems, and materials are not permitted by OSHPD:*

1. *Unreinforced Masonry.*
2. *Autoclaved Aerated Concrete (AAC) Masonry.*
3. *Empirical Design of Masonry.*
4. *Adobe Construction.*
5. *Ordinary Reinforced Masonry Shear Walls.*
6. *Intermediate Reinforced Masonry Shear Walls.*
7. *Prestressed Masonry Shear Walls.*

**2101*A*.2 Design methods.** Masonry shall comply with the provisions of one of the following design methods in this chapter as well as the requirements of Sections 2101*A* through 2104*A*. Masonry designed by the allowable stress design provisions of Section 2101*A*.2.1, the strength design provisions of Section 2101*A*.2.2 or the prestressed masonry provisions of Section 2101*A*.2.3 shall comply with Section 2105*A*.

**2101*A*.2.1 Allowable stress design.** Masonry designed by the *allowable stress design* method shall comply with the provisions of Sections 2106*A* and 2107*A*.

**2101*A*.2.2 Strength design.** Masonry designed by the strength design method shall comply with the provisions of Sections 2106*A* and 2108*A*. ~~,except that autoclaved aerated concrete (AAC) masonry shall comply with the provisions of Section 2106, Section 1613.6.4 and Chapter 1 and Appendix A of TMS 402/ACI 530/ASCE 5.~~

**2101*A*.2.3 Prestressed masonry.** *Not permitted by OSHPD.* ~~Prestressed masonry shall be designed in accordance with Chapters 1 and 4 of TMS 402/ACI 530/ASCE 5 and Section 2106. *Special inspection* during construction shall be provided as set forth in Section 1704.5.~~

**2101*A*.2.4 Empirical design.** *Not permitted by OSHPD.* ~~Masonry designed by the empirical design method shall comply with the provisions of Sections 2106 and 2109 or Chapter 5 of TMS 402/ACI 530/ASCE 5.~~

**2101*A*.2.5 Glass unit masonry.** Glass unit masonry shall comply with the provisions of Section 2110*A*. ~~or Chapter 7 of TMS 402/ACI 530/ASCE 5.~~

**...**

**SECTION 2102*A***
**DEFINITIONS AND NOTATIONS**

**2102*A*.1 General.** The following words and terms shall, for the purposes of this chapter and as used elsewhere in this code, have the meanings shown herein.

**...**

**WALL. ...**

**. . . .**

***Hollow-unit Masonry Wall***. *Type of construction made with hollow masonry units in which the units are laid and set in mortar, reinforced, and grouted solid except as provided in Section 2114A.*

**...**

**SECTION 2103*A***
**MASONRY CONSTRUCTION MATERIALS**

**2103*A*.1 Concrete masonry units.** Concrete masonry units shall conform to the following standards: ASTM C 55 for concrete brick; ASTM C 73 for calcium silicate face brick; ASTM C 90 for load-bearing concrete masonry units or ASTM C 744 for prefaced concrete and calcium silicate masonry units.

**...**

**2103*A*.3 AAC masonry.** *Not permitted by OSHPD.* ~~AAC masonry units shall conform to ASTM C 1386 for the strength class specified.~~

**...**

**2103*A*.8 Mortar.** Mortar for use in masonry construction shall conform to ASTM C 270 *Type S* *or M*, ~~and Articles 2.1 and 2.6 A of TMS 602/ACI 530.1/ASCE 6,~~ except for mortars listed in Sections 2103*A*.9~~,~~ *and* 2103*A*.10. ~~and 2103.11.~~ Type S ~~or N~~ mortar conforming to ASTM C 270 shall be used for glass unit masonry.

~~*Lime shall be the last material added to the mixer. Materials for mortar and grout shall be measured in suitable calibrated devices. Shovel measurements will not be accepted. Aggregates for mortar shall conform to the provisions set forth in ASTM C 144, Aggregates for Masonry Mortar.*~~

**...**

**2103A.11 Mortar for AAC masonry.** *Not permitted by OSHPD.* ~~Thin-bed mortar for AAC masonry shall comply with Article 2.1 C.1 of TMS 602/ACI 530.1/ASCE 6. Mortar used for the leveling courses of AAC masonry shall comply with Article 2.1 C.2 of TMS 602/ACI 530.1/ASCE 6.~~

**2103A.12 Grout.** Grout shall comply with Article 2.2 of TMS 602/ACI 530.1/ASCE 6.

***2103A.12.1 Water.*** *Water content shall be adjusted to provide proper workability and to enable proper placement under existing field conditions, without segregation. The water content expressed on a saturated surface-dry basis shall not exceed 0.7 times the weight (mass) of cement.*

***2103A.12.2 Selecting Proportions.*** *Proportions of ingredients and any additives shall be based on laboratory or field experience with the grout ingredients and the masonry units to be used. For coarse grout, the coarse and fine aggregates shall be combined such that the fine aggregate part is not greater than 80 percent of the total aggregate weight (mass).* ~~*and at least 90 percent shall pass the 1/2 inch (12.7 mm) sieve.*~~ *Coarse grout proportioned by weight shall contain not less than 564 pounds of cementitious material per cubic yard (335 kg / $m^3$).*

***2103A.12.3 Aggregate.*** ~~*Aggregate for grout shall conform to the requirements set forth in ASTM C 404, Aggregates for Grout.*~~ *Coarse grout shall be used in grout spaces 2 inches (51 mm) or more in width and in all filled-cell masonry construction.*

**2103*A*.13 Metal reinforcement and accessories.** Metal reinforcement and accessories shall conform to Article 2.4 of TMS 602/ACI 530.1/ASCE 6. Where unidentified reinforcement is *approved* for use, not less than three tension and three bending tests shall be made on representative specimens of the reinforcement from each shipment and grade of reinforcing steel proposed for use in the work.

***2103A.14 Additives and Admixtures.***

*2**103A.14.1 General.*** *Additives and admixtures to mortar or grout shall not be used unless approved by the enforcement agency.*

***2103A.14.2 Antifreeze compounds****. Antifreeze liquids, chloride salts or other such substances shall not be used in mortar or grout.*

***2103A.14.3 Air entrainment.*** *Air-entraining substances shall not be used in mortar or grout unless tests are conducted to determine compliance with the requirements of this code.*

~~***2103A.14.4 Colors.*** *Only pure mineral oxide, carbon black or synthetic colors may be used. Carbon black shall be limited to a maximum of 3 percent of the weight of the cement.*~~

**SECTION 2104*A***
**CONSTRUCTION**

**2104*A*.1 Masonry construction.** Masonry construction shall comply with the requirements of Sections 2104*A*.1.1 through 2104*A*.4 and with TMS 602/ACI 530.1/ASCE 6.

**2104*A*.1.1 Tolerances.** Masonry, except masonry veneer, shall be constructed within the tolerances specified in TMS 602/ACI 530.1/ASCE 6.

***Exception:*** *The maximum thickness of the initial bed joint in fully grouted masonry walls shall not exceed 1-1/4 in. (31.7 mm).*

**2104*A*.1.2 Placing mortar and units.** Placement of mortar, grout, and clay, concrete, *and* glass~~, and AAC~~ masonry units shall comply with TMS 602/ACI 530.1/ASCE 6. *All mortar for glass unit masonry contact surfaces shall be treated to ensure adhesion between mortar and glass.*

**2104*A*.1.3 Installation of wall ties.** Wall ties shall be installed in accordance with TMS 602/ACI 530.1/ASCE 6.

**2104*A*.1.4 Chases and recesses.** Chases and recesses shall be constructed as masonry units are laid. Masonry directly above chases or recesses wider than 12 inches (305 mm) shall be supported on lintels.

**2104*A*.1.5 Lintels.** The design for lintels shall be in accordance with the masonry design provisions of either Section 2107*A* or 2108*A*.

**2104*A*.1.6 Support on wood.** Masonry shall not be supported on wood girders or other forms of wood construction except as permitted in Section 2304*A*.12.

***2104A.1.7*** ***~~2104A.1.2.7~~*** ***Grouted masonry.*** *Grouted masonry shall be in accordance with ~~per~~ Section 2104A.5. ~~2104A.6.~~*

**2104*A*.2 Corbeled masonry.** Corbeled masonry shall comply with the requirements of Section 1.12 of TMS 402/ACI 530/ASCE 5.

**2104*A*.2.1 Molded cornices.** Unless structural support and anchorage are provided to resist the overturning moment, the center of gravity of projecting masonry or molded cornices shall lie within the middle one-third of the supporting wall. Terra cotta and metal cornices shall be provided with a structural frame of *approved* noncombustible material anchored in an *approved* manner.

**2104*A*.3 Cold weather construction.** The cold weather construction provisions of TMS 602/ACI 530.1/ASCE 6, Article 1.8 C, shall be implemented when the ambient temperature falls below 40°F (4°C).

**2104*A*.4 Hot weather construction.** The hot weather construction provisions of TMS 602/ACI 530.1/ASCE 6, Article 1.8 D, shall be implemented when the ambient air temperature exceeds 100°F (37.8°C), or 90°F (32.2°C) with a wind velocity greater than 8 mph (12.9 km/hr).

***2104A.5*** ***~~2104A.6~~*** ***Grouted Masonry.***

***2104A.5.1*** ***~~2104A.6.1~~*** ***General conditions.*** *Grouted masonry shall be constructed in such a manner that all elements of the masonry act together as a structural element. Prior to grouting, the grout space shall be clean so that all spaces to be filled with grout do not contain mortar projections greater than 1/4 inch (6.4 mm), mortar droppings and other foreign material. Grout shall be placed so that all spaces to be grouted do not contain voids.*

*Grout materials and water content shall be controlled to provide adequate fluidity for placement without segregation of the constituents, and shall be mixed thoroughly. Reinforcement shall be clean, properly positioned, and solidly embedded in the grout.*

*The grouting of any section of wall shall be completed in one day with no interruptions greater than one hour.*

*Between grout pours, a horizontal construction joint shall be formed by stopping all wythes at the same elevation and with the grout stopping a minimum of 1 1/2 inches (38 mm) below a mortar joint, except at the top of the wall. Where bond beams occur, the grout pour shall be stopped a minimum of 1/2 inch (12.7 mm) below the top of the masonry.*

***2104A.5.1.1*** ***~~2104A.6.1.1~~*** ***Reinforced grouted masonry.***

***2104A.5.1.1.1*** ***~~2104A.6.1.1.1~~*** ***General.*** *Reinforced grouted masonry is that form of construction made with clay or shale brick or made with solid concrete building brick in which interior joints of masonry are filled by pouring grout around reinforcing therein as the work progresses.*

*At the time of laying, all masonry units shall be free of dust and dirt.*

***~~NOTES:~~***

*~~1. For rate of absorption, see Section 2104A.5.~~ All units in a masonry assembly shall have a compatible absorption rate.*

*~~2. For mortar, see Section 2103A.8.~~*

*~~3. See Section 2105A.2 for assumed masonry strength.~~*

***2104A.5.1.1.2*** ***~~2104A.6.1.1.2~~*** ***Low-lift grouted construction****. Requirements for construction shall be as follows:*

1. *All units in the two outer wythes shall be laid with full-shoved head joint and bed mortar joints. Masonry headers shall not project into the grout space.*

2. *The minimum grout space for low-lift grout masonry shall be 2 1/2 inches (64 mm). Floaters shall be used where the grout space exceeds 5 inches (127 mm) in width. The thickness of grout between masonry units and floaters shall be a minimum of 1 inch (25 mm). Floaters shall be worked into fresh puddled grout using a vibrating motion until half of the floater is embedded in the grout. All reinforcing and wire ties shall be embedded in the grout. The thickness of the grout between masonry units and reinforcing shall be a minimum of one bar diameter.*

3. *One tier of a grouted reinforced masonry wall may be carried up 12 inches (305 mm) before grouting, but the other tier shall be laid up and grouted in lifts not to exceed one masonry unit in height. All grout shall be puddled with a mechanical vibrator or wood stick immediately after placing so as to completely fill all voids and to consolidate the grout. All vertical and horizontal steel shall be held firmly in place by a frame or suitable devices.*

4. *If the work is stopped for one hour or more, the horizontal construction joints shall be formed by stopping all wythes at the same elevation, and with the grout 1/2 inch (13 mm) below the top.*

5. *Toothing of masonry walls is prohibited. Racking is to be held to a minimum.*

6. *~~The wythes shall be bonded together with wall ties in accordance with Section 2104A.6.1.1.3, Item 2.~~*

***2104A.5.1.1.3*** ***~~2104A.6.1.1.3~~*** ***High-lift grouted construction****. Where high-lift grouting is used, the method shall be subject to the approval of the enforcement agency. Requirements for construction shall be as follows:*

1. *All units in the two wythes shall be laid with full head and bed mortar joints.*

2. *The two wythes shall be bonded together with wall ties. Ties shall not be less than No. 9 wire in the form of rectangles 4 inches (102 mm) wide and 2 inches (51 mm) in length less than the overall wall thickness. Kinks, water drips, or deformations shall not be permitted in the ties. One tier of the wall shall be built up not more than 16 inches (406 mm) ahead of the other tier. Ties shall be laid not to exceed 24 inches (610 mm) on center horizontally and 16 inches (406 mm) on center vertically for running bond, and not more than 24 inches (610 mm) on center horizontally and 12 inches (305 mm) on center vertically for stack bond.*

3. *Cleanouts shall be provided for each pour by leaving out every other unit in the bottom tier of the section being poured or by cleanout openings in the foundation. The foundation or other horizontal construction joints shall be cleaned of all loose material and mortar droppings before each pour. The cleanouts shall be sealed before grouting, after inspection.*

4. *The grout space in high-lift grouted masonry shall be a minimum of 3 1/2 inches (89 mm). All reinforcing and wire ties shall be embedded in the grout. The thickness of the grout between masonry units and reinforcing shall be a minimum of one bar diameter.*

5. *Vertical grout barriers or dams shall be built of solid masonry across the grout space the entire height of the wall to control the flow of the grout horizontally. Grout barriers shall not be more than 30 feet (9144 mm) apart.*

6. *An approved admixture of a type that reduces early water loss and produces an expansive action shall be used in high-lift grout.*

7. *Grouting shall be done in a continuous pour in lifts not exceeding 4 feet (1219 mm).Grout shall be consolidated by mechanical vibration only, and shall be reconsolidated after excess moisture has been absorbed, but before plasticity is lost. The grouting of any section of a wall between control barriers shall be completed in one day, with no interruptions greater than one hour.*

   ~~*NOTE: For special inspection requirements, Chapter 17A and for testing see Section 2105A.4.*~~

~~8. **Stresses.** *All reinforced grouted masonry shall be so constructed that the unit stresses do not exceed those set forth in Sections 2107A or 2108A.*~~

***2104A.5.1.2*** ~~***2104A.6.1.2***~~ ***Reinforced hollow-unit masonry.***

***2104A.5.1.2.1*** ~~***2104A.6.1.2.1***~~ ***General.*** *Reinforced hollow-unit masonry is that type of construction made with hollow-masonry units in which cells are continuously filled with grout, and in which reinforcement is embedded. All cells shall be solidly filled with grout in reinforced hollow-unit masonry, except as provided in Section 2114A.1. Construction shall be one of the two following methods: The low-lift method where the maximum height of construction laid before grouting is 4 feet (1220 mm), or the high-lift method where the full height of construction between horizontal cold joints is grouted in one operation. General requirements for construction shall be as follows:*

1. *All reinforced hollow-unit masonry shall be built to preserve the unobstructed vertical continuity of the cells to be filled. All head joints shall be solidly filled with mortar for a distance in from the face of the wall or unit not less than the thickness of the longitudinal face shells.*

2. *Mortar shall be as specified in Section 2103A.*

3. *Walls and cross webs forming such cells to be filled shall be full bedded in mortar to prevent leakage of grout.*

4. *Bond shall be provided by lapping units in successive vertical courses. Where stack bond is used in reinforced hollow-unit masonry, the open-end type of unit shall be used with vertical reinforcement spaced a maximum of 16 inches (406 mm) on center.*

5. *Vertical cells to be filled shall have vertical alignment sufficient to maintain a clear unobstructed, continuous vertical cell measuring not less than 2 inches by 3 inches (51 mm by 76 mm), except the minimum cell dimension for high-lift grout shall be 3 inches (76 mm).*

6. *At the time of laying, all masonry units shall be free of dust and dirt.*

7. *Grout shall be a workable mix suitable for placing without segregation and shall be thoroughly mixed. Grout shall be placed by pumping or an approved alternate method and shall be placed before initial set or hardening occurs. Grout shall be consolidated by mechanical vibration during placing and reconsolidated after excess moisture has*

*been absorbed, but before workability is lost. The grouting of any section of a wall shall be completed in one day, with no interruptions greater than one hour.*

~~*NOTE: For special inspection requirements, see Chapter 17A. For Testing see Section 2105A.*~~

8. *All reinforcing and wire ties shall be embedded in the grout. The space between masonry unit surfaces and reinforcing shall be a minimum of one bar diameter.*

9. *Horizontal reinforcement shall be placed in bond beam units with a minimum grout cover of 1 inch (25 mm) above steel for each grout pour. The depth of the bond beam channel below the top of the unit shall be a minimum of 1 1/2 inches (38 mm) and the width shall be 3 inches (76 mm) minimum.*

***2104A.5.1.2.2*** ~~***2104A.6.1.2.2***~~ **Low-lift grouted construction**. *Units shall be laid a maximum of 4 feet (1220 mm) before grouting, and all over-hanging mortar and mortar droppings shall be removed. Grouting shall follow each 4 feet (1220 mm) of construction laid and shall be consolidated so as to completely fill all voids and embed all reinforcing steel. When grouting is stopped for one hour or longer, horizontal construction joints shall be formed by stopping the pour of grout not less than 1/2 inch (13 mm) or more than 2 inches (51 mm) below the top of the uppermost unit grouted. Horizontal steel shall be fully embedded in grout in an uninterrupted pour.*

***2104A.5.1.2.3*** ~~***2104A.6.1.2.3***~~ **High-lift grouted construction**. *Where high-lift grouting is used, the method shall be approved by the enforcement agency. Cleanout openings shall be provided in every cell at the bottom of each pour of grout. Alternatively, if the course at the bottom of the pour is constructed entirely of inverted open-end bond beam units, cleanout openings need only be provided in every reinforced cell at the bottom of each pour of grout. The foundation or other horizontal construction joints shall be cleaned of all loose material and mortar droppings before each pour. The cleanouts shall be sealed before grouting. An approved admixture that reduces early water loss and produces an expansive action shall be used in the grout.*

~~***2104A.6.1.2.4 Stresses.*** *All reinforced hollow-unit masonry shall be so constructed that the units stressed do not exceed those set forth in 2107A or 2108A.*~~

*Vertical barriers of masonry may be built across the grout space. The grouting of any section of wall between barriers shall be completed in one day with no interruption longer than one hour.*

~~*NOTE: See Section 2105A.4 for assumed masonry strength.*~~

***2104A.5.2*** ~~***2104A.6.2***~~ **Construction requirements**. *Reinforcement and embedded items shall be placed and securely anchored against moving prior to grouting. Bolts shall be accurately set with templates or by approved equivalent means and held in place to prevent dislocation during grouting.*

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

*Grout shall be consolidated by mechanical vibration during placement before loss of plasticity in a manner to fill the grout space. Grout pours greater than 12 inches (300 mm) in height shall be reconsolidated by mechanical vibration to minimize voids due to water loss. Grout not mechanically vibrated shall be puddled.*

***2104A.6*** ~~***2104A.7***~~ **Aluminum Equipment.** *Grout shall not be handled nor pumped utilizing aluminum equipment unless it can be demonstrated with the materials and equipment to be used that there will be no deleterious effect on the strength of the grout.*

## SECTION 2105A
## QUALITY ASSURANCE

**2105*A*.1 General.** A quality assurance program shall be used to ensure that the constructed masonry is in compliance with the construction documents.

The quality assurance program shall comply with the inspection and testing requirements of Chapter 17*A*.

**2105*A*.2 Acceptance relative to strength requirements.**

**2105*A*.2.1 Compliance with *f '$_m$*, ~~and f '$_{AAC}$.~~** Compressive strength of masonry shall be considered satisfactory if the compressive strength of each masonry wythe and grouted collar joint equals or exceeds the value of f '$_m$ for clay and concrete masonry and *requirements of Section 2105A.2.2 is satisfied* ~~f '$_{AAC}$ for AAC masonry~~. For partially grouted clay and concrete masonry, the compressive strength of both the grouted and ungrouted masonry shall equal or exceed the applicable f'$_m$. ~~At the time of prestress, the compressive strength of the masonry shall equal or exceed f '$_{mi}$, which shall be less than or equal to f '$_m$.~~ *The specified compressive strength, f '$_m$, assumed in design shall be 1,500 psi (10.34 MPa) for all masonry construction using materials and details of construction required herein. Testing of the constructed masonry shall be provided in accordance with Section 2105A.4.*

> ***EXCEPTION:*** *Subject to the approval of the enforcement agency, higher values of f'$_m$ may be used in the design of reinforced grouted masonry and reinforced hollow-unit masonry. The approval shall be based on prism test results submitted by the architect or engineer which demonstrate the ability of the proposed construction to meet prescribed performance criteria for strength and stiffness. The design shall assume that the reinforcement will be placed in a location that will produce the largest stresses within the tolerances allowed in Section 2104A.1.1 and shall take into account the mortar joint depth. In no case shall the f'$_m$ assumed in design exceed 3,000 psi (20.7MPa).* ~~*2,500 psi (17.24 MPa).*~~
>
> *Where an f'$_m$ greater than 1,500 psi (10.34 MPa) is approved, the architect or structural engineer shall establish a method of quality control of the masonry construction acceptable to the enforcement agency which shall be described in the contract specifications. Compliance with the requirements for the specified compressive strength of masonry f'$_m$ shall be provided in accordance with Sections 2105A.2.2.2, 2105A.4, and 2105A.5. Substantiation for the specified compressive strength prior to the start of construction may be obtained in accordance with Section 2105A.2.2.3.*

**2105*A*.2.2 Determination of compressive strength.** The compressive strength for each wythe shall be determined by the unit strength method or by the prism test method *before construction* as specified herein.

**...**

**2105*A*.2.2.1.3 AAC masonry.** *Not permitted by OSHPD* . ~~The compressive strength of AAC masonry shall be based on the strength of the AAC masonry unit only and the following shall be met:~~

~~1. Units conform to ASTM C 1386.~~
~~2. Thickness of bed joints does not exceed 1/8 inch (3.2 mm).~~
~~3. For grouted masonry, the grout meets one of the following requirements:~~
~~3.1. Grout conforms to Article 2.2 of TMS602/ACI 530.1/ASCE 6.~~
~~3.2. Minimum grout compressive strength equals or exceeds *f_AAC* but not less than 2,000 psi (13.79 MPa). The compressive strength of grout shall be determined in accordance with ASTM C 1019.~~

***2105A.2.2.1.4*** ~~***2105A.5***~~ ***Mortar and grout tests.*** *These tests are to establish whether the masonry components meet the specified component strengths. At the beginning of all masonry work, at least one test sample of the mortar and grout shall be taken on three successive working days and at least at one-week intervals thereafter. They shall meet the minimum strength requirement given in Sections 2103A.8 and 2103A.12 for mortar and grout respectively. Additional samples shall be taken whenever any change in materials or job conditions occur, or whenever in the judgment of the architect, structural engineer or the enforcement agency such tests are necessary to determine the quality of*

*the material. When the prism test method of Section 2105A.2.2.2 is used, the tests in this section are not required.*

*Test specimens for mortar and grout shall be made as set forth in ASTM C 1586 and ASTM C 1019*

**2105*A*.2.2.2 Prism test method.**

**2105*A*.2.2.2.1 General.** The compressive strength of clay and concrete masonry shall be determined by the prism test method *prior to the start of construction and during construction*:

1. Where specified in the construction documents.

2. Where masonry does not meet the requirements for application of the unit strength method in Section 2105*A*.2.2.1.

3. *Where required by Section 2105A.2.1.*

**2105*A*.2.2.2.2 Number of prisms per test.** *Prior to the start of construction, a* ~~A~~ prism test shall consist of ~~three~~ *five* prisms constructed and tested in accordance with ASTM C 1314. *A set of three masonry prisms shall be built during construction in accordance with ASTM C 1314 for each 5,000 square feet (465m2) of wall area, but not less than one set of three prisms for the project. Each set of prisms shall equal or exceed* $f'_m$.

~~***2105A.2.2.3 Masonry Prism test record.*** *Compressive design strength verification by masonry prism test records shall meet the following:*~~

~~*1. A masonry prism test record approved by the enforcement agency of at least 30 masonry prisms which were built and tested in accordance with ASTM C 1314. Prisms shall have been constructed under the observation of an engineer or special inspector or an approved agency and shall have been tested by an approved agency.*~~

~~*2. Masonry prisms shall be representative of the corresponding construction.*~~

~~*3. The average compressive strength of the test record shall equal or exceed 1.33* $f'_m$.~~

**2105*A*.3 Testing prisms from constructed masonry.** When approved by the building official, acceptance of masonry that does not meet the requirements of Section 2105*A*.2.2.1, ~~or~~ 2105*A*.2.2.2, *2105A.4 or* ~~*2105A.5*~~ *2105A.2.2.1.4* shall be permitted to be based on tests of prisms cut from the masonry construction in accordance with Sections 2105*A*.3.1, 2105*A*.3.2 and 2105*A*.3.3.

**2105*A*.3.1 Prism sampling and removal.** A set of three masonry prisms that are at least 28 days old shall be saw cut from the masonry for each 5,000 square feet (465 $m^2$) of the wall area that is in question but not less than one set of three masonry prisms for the project. The length, width and height dimensions of the prisms shall comply with the requirements of ASTM C 1314. Transporting, preparation and testing of prisms shall be in accordance with ASTM C 1314.

**2105A.3.2 Compressive strength calculations.** The compressive strength of prisms shall be the value calculated in accordance ASTM C 1314, except that the net cross-sectional area of the prism shall be based on the net mortar bedded area.

**2105*A*.3.3 Compliance.** Compliance with the requirement for the specified compressive strength of masonry, $f'_m$, shall be considered satisfied provided the modified compressive strength equals or exceeds the specified $f'_m$. Additional testing of specimens cut from locations in question shall be permitted.

***2105A.4 Masonry core testing***. ~~*This test is to determine the quality of the masonry constructed*~~. *Not less than two cores* ~~*having a diameter of 6 inches (152 mm) shall be taken from each project. Two cores*~~ *shall be*

*taken from each building for each 5,000 square feet (465 $m^2$) of the greater of the masonry wall area or the floor area or fraction thereof. The architect or structural engineer in responsible charge of the project or his / her representative (inspector) shall select the areas for sampling. Cores shall be a minimum of 3-3/4" in diameter and shall be taken in such a manner as to exclude masonry unit webs and reinforcing steel. The inspector of record ~~or testing agency~~ shall observe ~~inspect~~ the coring of the masonry walls. ~~and shall prepare a report of coring operations for the testing laboratory files and mail one copy to the enforcement agency.~~*

*Visual examination of all cores shall be made ~~to ascertain if the joints are filled~~ and the condition of the cores reported. One half of the number of cores taken shall be tested in shear. The shear test ~~wall loadings~~ shall test both joints between the grout core and the outside wythes or face shell of the masonry. Shear testing apparatus shall be of a design approved by the enforcement agency. Core samples shall not be soaked before testing. ~~Materials and workmanship shall be such that for all masonry when tested in compression, cores shall show an ultimate strength at least equal to the $f'_m$ assumed in design, but not less than 1,500 psi (10.34 MPa). When tested in shear, t~~ The unit shear on the cross section of the core shall not be less than 2.5 $\sqrt{f'_m}$ psi.*

*All cores shall be submitted to the laboratory for examination, regardless of whether the core specimens failed during cutting operation. The laboratory shall report the location where each core was taken, the findings of their visual examination of each core, identify which cores were selected for shear testing, and the results of the shear tests. ~~Such reports shall include the total number of cores cut, the location, and the condition of all cores cut on each project.~~*

***~~2105A.6 Combination of Units.~~** ~~In walls or other structural members composed of different kinds or grades of units or materials, a full-scale test panel shall be constructed before the beginning of masonry work. The test panel will be cored and tested as approved by the enforcement agency to determine the compatibility of the materials (including bond strength between the materials). If the materials are not compatible, they will be rejected. The net thickness of any facing unit which is used to resist stress shall not be less than 1-1/2 inches (38 mm).~~*

## SECTION 2106*A*
## SEISMIC DESIGN

**2106*A*.1 Seismic design requirements for masonry.** Masonry structures and components shall comply with the requirements in Section 1.17 of TMS 402/ACI 530/ASCE 5 depending on the structure's *seismic design category* as determined in Section 1613*A*.

***2106A.1.1 ~~2106A.5.3~~ Modifications to TMS 402 / ACI 530 / ASCE 5. ~~/ TMS 402~~: ~~2106A.5.3.1 Replace~~ Modify TMS 402 / ACI 530 / ASCE 5 ~~/ TMS 402~~ Section 1.17 ~~1.14.6.3~~ as follows:***

***1.** ~~1.14.6.3~~ **- Minimum reinforcement requirements for Masonry Walls** The total area of reinforcement in reinforced masonry walls shall not be less than 0.003 times the sectional area of the wall. Neither the horizontal nor the vertical reinforcement shall be less than one third of the total. Horizontal and vertical rebars shall be spaced at not more than 24 inches (610 mm) center to center. The minimum reinforcing shall be No. 4, except that No. 3 bars may be used for ties and stirrups. Vertical wall steel shall have dowels of equal size and equal matched spacing in all footings. Reinforcement shall be continuous around wall corners and through intersections. Only reinforcement which is continuous in the wall shall be considered in computing the minimum area of reinforcement. Reinforcement with splices conforming to TMS 402 / ACI 530 / ASCE 5 ~~/ TMS 402 Section 2.1.10.7~~ as modified by Section 2107A shall be considered as continuous reinforcement.*

*Horizontal reinforcement shall be provided in the top of footings, at the top of wall openings, at roof and floor levels, and at the top of parapet walls. For walls 12 inches (nominal) (305 mm) or more in thickness, reinforcing shall be equally divided into two layers, except where designed as retaining walls. Where reinforcement is added above the minimum requirements, such additional reinforcement need not be so divided.*

*In bearing walls of every type of reinforced masonry, there shall not be less than one No. 5 bar or two No. 4 bars on all sides of, and adjacent to, every opening which exceeds 16 inches (406 mm) in either direction, and such bars shall extend not less than 48 diameters, but in no case less than 24 inches (610 mm) beyond the corners of the opening. The bars required by this paragraph shall be in addition to the minimum reinforcement elsewhere required.*

*When the reinforcement in bearing walls is designed, placed and anchored in position as for columns, the allowable stresses shall be as for columns*

*Joint reinforcement shall not be used as principal reinforcement in masonry designed by the strength design method.*

***~~2106A.5.3.2 Replace ACI 530 / ASCE 5 / TMS 402 Section 1.14.6.5 as follows:~~***

***2.*** *~~1.14.6.5~~* ***- Minimum reinforcement for masonry columns****. The spacing of column ties shall be as follows: not greater than 8 bar diameters, 24 tie diameters, or one half the least dimension of the column for the full column height. Ties shall be at least 3/8" in diameter & shall be embedded in grout. Top tie shall be within 2 inches (51 mm) of the top of the column or of the bottom of the horizontal bar in the supported beam.*

***3.*** ***~~2106A.5.4~~*** ***Lateral support.*** *Lateral support of masonry may be provided by cross walls, columns, pilasters, counterforts or buttresses where spanning horizontally or by floors, beams, girts or roofs where spanning vertically. Where walls are supported laterally by vertical elements, the stiffness of each vertical element shall exceed that of the tributary area of the wall.*

*The clear distance between lateral supports of a beam shall not exceed 32 times the least width of the compression area.*

## SECTION 2107A
## ALLOWABLE STRESS DESIGN

**2107*A*.1 General.** The design of masonry structures using *allowable stress design* shall comply with Section 2106*A* and the requirements of Chapters 1 and 2 of TMS 402/ACI 530/ASCE 5 except as modified by Sections 2107*A*.2 through ~~2107*A*.5~~ *2107A.6.*

***~~2107A.1.1 Design assumptions~~****~~. The allowable stress design procedure is based on working stresses and linear stress-strain distribution assumptions with all stresses in the elastic range as follows:~~*

*~~1. Plane sections before bending remain plane after bending.~~*

*~~2. Stress is proportional to strain.~~*

*~~3. Masonry elements combine to form a homogenous member.~~*

*~~4. Tensile forces are resisted only by the tensile reinforcement.~~*

*~~5. Reinforcement is completely surrounded by and bonded to the masonry materials so that they work together as a homogeneous material within the range of working stresses.~~*

**…**

***2107A.6 ~~2107A.4~~ Modify ~~ACI 530 / ASCE 5 / TMS 402~~ TMS 402 / ACI 530 / ASCE 5 by adding Sections ~~2.1.4.2.3~~ 2.1.4.3.4 and 2.1.4.3.5 as follows: ~~last paragraph as follows:~~***

***2.1.4.3.4 Edge Distance and Spacing.*** *Where the anchor bolt edge distance, $l_{be}$, in the direction of load is less than 12 bolt diameters, the value of $B_v$ in Formula ~~(2-5)~~ (2-7) shall be reduced by linear interpolation to zero at an $l_{be}$ distance of 1 1/2 inches (38 mm) and confining reinforcement consisting of not less than No. 3 hairpins, hooks or stirrups for end bolts and between horizontal reinforcing for other bolts shall be provided. Where adjacent anchors are spaced closer than $8d_b$, the allowable shear of the adjacent anchors determined by Formula ~~(2-5)~~ (2-7) shall be reduced by linear interpolation to 0.75 times the allowable shear value at a center-to-center spacing of four bolt diameters.*

***~~2107A.5 Modify ACI 530 / ASCE 5 / TMS 402 by adding Section 2.1.4.2.5 as follows:~~***

***2.1.4.3.5 - Anchor bolts size and materials.*** *Anchor bolts shall be hex headed bolts conforming to ASTM A 307 or F1554 with the dimensions of the hex head conforming to ANSI / ASME B18.2.1 or plain rod conforming to ASTM A 36 with threaded ends and double hex nuts at the anchored end. Bent bar anchor bolts shall not be used.*

*The maximum size anchor shall be 1/2-inch (13 mm) diameter for 6-inch (152 mm) nominal masonry, 3/4-inch (19 mm) diameter for 8-inch (203 mm) nominal masonry, 7/8-inch (22 mm) diameter for 10-inch (254 mm) nominal masonry, and 1-inch (25mm) diameter for 12-inch (304.8 mm) nominal masonry.*

***2107A.7 ~~2107A.6~~ Modify TMS 402 / ACI 530/ASCE 5 ~~/ TMS 402~~ Section 2.1.8 ~~2.1.9.1~~ by adding the following:***

*Structural members framing into or supported by walls or columns shall be securely anchored. The end support of girders, beams or other concentrated loads on masonry shall have at least 3 inches (76 mm) in length upon solid bearing not less than 4 inches (102 mm) thick or upon metal bearing plate of adequate design and dimensions to distribute the loads safely on the wall or pier, or upon a continuous reinforced masonry member projecting not less than 3 inches (76 mm) from the face of the wall or other approved methods.*

*Joists shall have bearing at least 3 inches (76 mm) in length upon solid masonry at least 2 1/2 inches (64 mm) thick, or other provisions shall be made to distribute safely the loads on the wall or pier.*

***2107A.8 ~~2107A.9~~ Modify TMS 402 / ACI 530/ASCE 5 ~~/ TMS 402~~ by adding Section 2.1.10 ~~2.1.11~~ as follows:***

***2.1.10 ~~2.1.11~~ - Walls and Piers.***

***Thickness of Walls.*** *For thickness limitations of walls as specified in this chapter, nominal thickness shall be used. Stresses shall be determined on the basis of the net thickness of the masonry, with consideration for reduction, such as raked joints.*

*The thickness of masonry walls shall be designed so that allowable maximum stresses specified in this chapter are not exceeded. Also, no masonry wall shall exceed the height or length-to-thickness ratio or the minimum thickness as specified in this chapter and as set forth in Table 2107A.8. ~~2107A.9, unless designed in accordance with ACI 530 / ASCE 5 / TMS 402 Section 3.3.5.~~*

***Piers.*** *Every pier or wall section which width is less than three times its thickness shall be designed and constructed as required for columns if such pier is a structural member. Every pier or wall section which width is between three and five times its thickness or less than one half the height of adjacent openings shall have all horizontal steel in the form of ties except that in walls 12 inches (305 mm) or less in thickness such steel may be in the form of hair-pins.*

***TABLE 2107A.8 ~~2107A.9~~ - MINIMUM THICKNESS OF MASONRY WALLS[1, 2]***

| *TYPE OF MASONRY* | *MAXIMUM RATIO UNSUPPORTED HEIGHT OR LENGTH TO THICKNESS[2,3]* | *NOMINAL MINIMUM THICKNESS (inches)* |
|---|---|---|
| *BEARING OR SHEAR WALLS:* | | |

| | | |
|---|---|---|
| *1. Stone masonry*<br>*2. Reinforced grouted masonry*<br>*3. Reinforced hollow-unit masonry* | *14*<br>*25*<br>*25* | *16*<br>*6*<br>*6* |
| *NONBEARING WALLS:*<br>*4. Exterior reinforced walls*<br>*5. Interior partitions reinforced* | <br>*30*<br>*36* | <br>*6*<br>*4* |

*[1]For walls of varying thickness, use the least thickness when determining the height or length to thickness ratio.*

*[2]In determining the height or length-to-thickness ratio of a cantilevered wall, the dimension to be used shall be twice the dimension of the end of the wall from the lateral support.*

*[3]Cantilevered walls not part of a building and not carrying applied vertical loads need not meet these minimum requirements but their design must comply with stress and overturning requirements.*

***2107A.9*** ***~~2107A.12~~*** ***[OSHPD 1 & 4] Modify TMS402/ACI 530/ASCE 5, Section 2.3.3.4 by the following:*** ~~**ACI 530/ASCE 5/TMS 402, Section 2.3.7, maximum reinforcement percentage.** Add the following text to Chapter 2:~~

~~**2.3.7 Maximum reinforcement percentage.**~~ *All reinforced masonry components that* are subjected to in-plane forces shall have a maximum reinforcement ratio, $\rho_{max}$ , not greater than that computed by equation 2-22. ~~as follows:~~

$$\rho_{\max} = \frac{nf'_m}{2f_y\left(n + \frac{f_y}{f'_m}\right)}$$

~~**(Equation 21A-3)**~~

***2107A.10*** ~~***2107A.5***~~ *(Chapter 21, Section 2107.5)* **TMS402/ACI 530/ASCE 5, Section 2.3.6, maximum bar size.** Add the following to Chapter 2:

2.3.6 Maximum bar size. The bar diameter shall not exceed one-eighth of the nominal wall thickness and shall not exceed one-quarter of the least dimension of the cell, course or collar joint in which it is placed.

~~***2107A.10 Add to ACI 530 / ASCE 5 / TMS 402 Section 2.2 as follows:***~~

~~*2.2 - **Unreinforced masonry.** Not permitted by OSHPD.*~~

~~***2107A.12*** **ACI 530/ASCE 5/TMS 402, Section 2.3.7, maximum reinforcement percentage.** Add the following text to Chapter 2:~~

~~**2.3.7 Maximum reinforcement percentage.** *All reinforced masonry components that* are subjected to in-plane forces shall have a maximum reinforcement ratio, $\rho_{max}$, not greater than that computed as follows:~~

$$\rho_{\max} = \frac{n f'_m}{2 f_y \left( n + \frac{f_y}{f'_m} \right)}$$

~~(Equation 21A-3)~~

**SECTION 2108A**
**STRENGTH DESIGN OF MASONRY**

**2108.1 General.** The design of masonry structures using strength design shall comply with Section 2106 and the requirements of Chapters 1 and 3 of TMS 402/ACI 530/ASCE 5, except as modified by Sections 2108.2 through 2108.3.

> ~~**Exception:** AAC masonry shall comply with the requirements of Chapter 1 and Appendix A of TMS 402/ACI 530/ASCE 5.~~

~~***2108A.2 Add to ACI 530 / ASCE 5 / TMS 402 Section 3.2 as follows:***~~

> ~~*3.2* ***Unreinforced (plane) masonry*** *- Not permitted by OSHPD and DSA-SS.*~~

**…**

**SECTION 2109A**
**EMPIRICAL DESIGN OF MASONRY**

***Not permitted by OSHPD.***

~~**2109.1 General.** Empirically designed masonry shall conform to the requirements of Chapter 5 of TMS 402/ACI 530/ASCE 5, except where otherwise noted in this section.~~

~~**2109.1.1 Limitations.** The use of empirical design of masonry shall be limited as noted in Section 5.1.2 of TMS 402/ACI 530/ASCE 5. The use of dry-stacked, surface bonded masonry shall be prohibited in *Occupancy Category* IV structures. In buildings that exceed one or more of the limitations of Section 5.1.2 of TMS 402/ACI 530/ASCE 5, masonry shall be designed in accordance with the engineered design provisions of Section 2101.2.1, 2101.2.2 or 2101.2.3 or the foundation wall provisions of Section 1807.1.5.~~

~~**2109.2 Surface-bonded walls.** Dry stacked, surface-bonded concrete masonry walls shall comply with the requirements of Chapter 5 of TMS 402/ACI 530/ASCE 5, except where otherwise noted in this section.~~

~~**2109.2.1 Strength.** Dry stacked, surface-bonded concrete masonrywalls shall be of adequate strength and proportions to support all superimposed loads without exceeding the allowable stresses listed in Table 2109.2.1. Allowable stresses not specified in Table 2109.2.1 shall comply with the requirements of TMS 402/ACI 530/ASCE 5.~~

~~**TABLE 2109.2.1**~~
~~**ALLOWABLE STRESS GROSS CROSS-SECTIONALAREA FOR DRY-STACKED, SURFACE-BONDED CONCRETE MASONRY WALLS**~~

~~(Table not shown for clarity)~~

~~**2109.2.2 Construction.** Construction of dry-stacked, surface-bonded masonry walls, including stacking and leveling of units, mixing and application of mortar and curing and protection shall comply with ASTM C 946.~~

**2109.3 Adobe construction.** Adobe construction shall comply with this section and shall be subject to the requirements of this code for Type V construction, Chapter 5 of TMS 402/ACI 530/ASCE 5, and this section.

**2109.3.1 Unstabilized adobe.**
**2109.3.1.1 Compressive strength.** Adobe units shall have an average compressive strength of 300 psi (2068 kPa) when tested in accordance with ASTM C 67. Five samples shall be tested and no individual unit is permitted to have a compressive strength of less than 250 psi (1724 kPa).

**2109.3.1.2 Modulus of rupture.** Adobe units shall have an average modulus of rupture of 50 psi (345 kPa) when tested in accordance with the following procedure. Five samples shall be tested and no individual unit shall have a modulus of rupture of less than 35 psi (241 kPa).

**2109.3.1.2.1 Support conditions.** A cured unit shall be simply supported by 2 inch-diameter (51 mm) cylindrical supports located 2 inches (51 mm) in from each end and extending the full width of the unit.

**2109.3.1.2.2 Loading conditions.**A2-inch-diameter (51 mm) cylinder shall be placed at midspan parallel to the supports.

**2109.3.1.2.3 Testing procedure.** A vertical load shall be applied to the cylinder at the rate of 500 pounds per
minute (37 N/s) until failure occurs.

**2109.3.1.2.4 Modulus of rupture determination.** The modulus of rupture shall be determined by the equation:
$f_r = 3PL_s / 2S_w(S_t^2)$ **(Equation 21-2)**

where, for the purposes of this section only:

$S_w$ = Width of the test specimen measured parallel to the loading cylinder, inches (mm).
$f_r$ = Modulus of rupture, psi (MPa).
$L_s$ = Distance between supports, inches (mm).
$S_t$ = Thickness of the test specimen measured parallel to the direction of load, inches (mm).
$P$ = The applied load at failure, pounds (N).

**2109.3.1.3 Moisture content requirements.** Adobe units shall have a moisture content not exceeding 4 percent by weight.

**2109.3.1.4 Shrinkage cracks.** Adobe units shall not contain more than three shrinkage cracks and any single shrinkage crack shall not exceed 3 inches (76 mm) in length or 1/8 inch (3.2 mm) in width.

**2109.3.2 Stabilized adobe.**

**2109.3.2.1 Material requirements.** Stabilized adobe shall comply with the material requirements of unstabilized adobe in addition to Sections 2109.3.2.1.1 and 2109.3.2.1.2.

**2109.3.2.1.1 Soil requirements.** Soil used for stabilized adobe units shall be chemically compatible with the stabilizing material.

**2109.3.2.1.2 Absorption requirements.** A 4-inch (102 mm) cube, cut from a stabilized adobe unit dried to a constant weight in a ventilated oven at 212°F to 239°F (100°C to 115°C), shall not absorb more than 21/2 percent moisture by weight when placed upon a constantly water-saturated, porous surface for seven days. A minimum of five specimens shall be tested and each specimen shall be cut from a separate unit.

**2109.3.3 Allowable stress.** The allowable compressive stress based on gross cross-sectional area of adobe shall not exceed 30 psi (207 kPa).

**2109.3.3.1 Bolts.** Bolt values shall not exceed those set forth in Table 2109.3.3.1.

**2109.3.4 Construction.**

**~~2109.3.4.1 General.~~**

**~~2109.3.4.1.1 Height restrictions.~~** ~~Adobe construction shall be limited to buildings not exceeding one *story*, except that two-*story* construction is allowed when designed by a *registered design professional*.~~

**~~2109.3.4.1.2 Mortar restrictions.~~** ~~Mortar for stabilized adobe units shall comply with Chapter 21 or adobe soil. Adobe soil used as mortar shall comply with material requirements for stabilized adobe. Mortar for unstabilized adobe shall be portland cement mortar.~~

**~~2109.3.4.1.3 Mortar joints.~~** ~~Adobe units shall be laid with full head and bed joints and in full running bond.~~

**~~2109.3.4.1.4 Parapet walls.~~** ~~Parapet walls constructed of adobe units shall be waterproofed.~~

**~~2109.3.4.2 Wall thickness.~~** ~~The minimum thickness of *exterior walls* in one-*story* buildings shall be 10 inches (254 mm). The walls shall be laterally supported at intervals not exceeding 24 feet (7315 mm). The minimum thickness of interior *load-bearing walls* shall be 8 inches (203 mm). In no case shall the unsupported height of any wall constructed of adobe units exceed 10 times the thickness of such wall.~~

**~~2109.3.4.3 Foundations.~~**

**~~2109.3.4.3.1 Foundation support.~~** ~~Walls and partitions constructed of adobe units shall be supported by foundations or footings that extend not less than 6 inches (152 mm) above adjacent ground surfaces and are constructed of solid masonry (excluding adobe) or concrete. Footings and foundations shall comply with Chapter 18.~~

**~~2109.3.4.3.2 Lower course requirements.~~** ~~Stabilized adobe units shall be used in adobe walls for the first 4 inches (102 mm) above the finished first-floor elevation.~~

**~~2109.3.4.4 Isolated piers or columns.~~** ~~Adobe units shall not be used for isolated piers or columns in a load-bearing capacity. Walls less than 24 inches (610 mm) in length shall be considered isolated piers or columns.~~
**~~2109.3.4.5 Tie beams.~~** ~~*Exterior walls* and interior *load-bearing walls* constructed of adobe units shall have a continuous tie beam at the level of the floor or roof bearing and meeting the following requirements.~~

**~~2109.3.4.5.1 Concrete tie beams.~~** ~~Concrete tie beams shall be a minimum depth of 6 inches (152 mm) and a minimum width of 10 inches (254 mm). Concrete tie beams shall be continuously reinforced with a minimum of two No. 4 reinforcing bars. The specifed compressive strength of concrete shall be at least 2,500 psi (17.2 MPa).~~

**~~TABLE 2109.3.3.1~~**
**~~ALLOWABLE SHEAR ON BOLTS IN ADOBE MASONRY~~**

~~(Table not shown for clarity)~~

**~~2109.3.4.5.2Wood tie beams.~~** ~~Wood tie beams shall be solid or built up of lumber having a minimum nominal thickness of 1 inch (25 mm), and shall have a minimum depth of 6 inches (152 mm) and a minimum width of 10 inches (254 mm). Joints in wood tie beams shall be spliced a minimum of 6 inches (152 mm). No splices shall be allowed within 12 inches (305 mm) of an opening. Wood used in tie beams shall be *approved* naturally decay resistant or preservative-treated wood.~~

**~~2109.3.4.6 Exterior finish.~~** ~~*Exterior walls* constructed of unstabilized adobe units shall have their exterior surface covered with a minimum of two coats of Portland cement plaster having a minimum thickness of 3/4 inch (19.1 mm) and conforming to ASTM C 926. Lathing shall comply with ASTM C 1063. Fasteners shall be spaced at 16 inches (406 mm) o.c. maximum. Exposed wood surfaces shall be treated with an *approved* wood preservative or other protective coating prior to lath application.~~

**~~2109.3.4.7 Lintels.~~** ~~Lintels shall be considered structural members and shall be designed in accordance with the applicable provisions of Chapter 16.~~

## SECTION 2110A
## GLASS UNIT MASONRY

**2110*A*.1 General.** ~~Glass unit masonry construction shall comply with Chapter 7 ofTMS402/ACI 530/ASCE 5 and this section.~~

*Masonry of glass blocks shall be permitted ~~may be used~~ in non-load-bearing exterior or interior walls and shall conform to the requirements of Section 2115A. Stresses in glass block shall not be utilized. Glass block may be solid or hollow and may contain inserts.*

~~**2110.1.1 Limitations.** Solid or hollow *approved* glass block shall not be used in fire walls, party walls, fire barriers, fire partitions or smoke barriers, or for load-bearing construction. Such blocks shall be erected with mortar and reinforcement in metal channel-type frames, structural frames, masonry or concrete recesses, embedded panel anchors as provided for both exterior and interior walls or other *approved* joint materials. Wood strip framing shall not be used in walls required to have a fire-resistance rating by other provisions of this code.~~

~~**Exceptions:**~~

~~1. Glass-block assemblies having a fire protection rating of not less than 3/4 hour shall be permitted as opening protectives in accordance with Section 715 in fire barriers, fire partitions and smoke barriers that have a required fire-resistance rating of 1 hour or less and do not enclose exit stairways, exit ramps or exit passageways.~~
~~2. Glass-block assemblies as permitted in Section 404.5, Exception 2.~~

**...**

## SECTION 2113A
## MASONRY CHIMNEYS

**. . . .**

**2113A.5 Corbeling.** ~~*Corbeling for masonry chimney shall be as required per Section 2104A.4.2.*~~ Masonry chimneys shall not be corbelled more than half of the chimney's wall thickness from a wall or foundation, nor shall a chimney be corbeled from a wall or foundation that is less than 12 inches (305 mm) in thickness unless it projects equally on each side of the wall, except that on the second *story* of a two-story *dwelling*, corbeling of chimneys on the exterior of the enclosing walls is permitted to equal the wall thickness. The projection of a single course shall not exceed one-half the unit height or one-third of the unit bed depth, whichever is less.

…

## *SECTION 2114A*
## *NONBEARING WALLS*

***2114A.1 General.*** *All nonbearing masonry walls shall be reinforced as specified in Section 2106A.1.1. ~~2106A.5.3.1.~~ Fences and interior nonbearing nonshear walls may be of hollow-unit masonry construction grouted in cells containing vertical and horizontal reinforcement. Nonbearing walls may be used to carry a superimposed load of not more than 200 pounds per linear foot (2.92 kN/m).*

1. ***Thickness.*** *Every nonbearing masonry wall shall be so constructed and have a sufficient thickness to withstand all vertical loads and horizontal loads, but in no case shall the thickness of such walls be less than the values set forth in Table 2107A.5. ~~2107A.9~~.*

   *Plaster shall not be considered as contributing to the thickness of a wall in computing the height-to-thickness ratio.*

2. **Anchorage.** *All nonbearing walls shall be anchored as required by Sections 1604A.8.2 and ASCE 7 Chapter 13. Suspended ceilings or other nonstructural elements shall not be used to provide anchorage for masonry walls.*

***SECTION 2115A***
***MASONRY SCREEN WALLS***

***2115A.1 General.*** *Masonry units may be used in nonbearing decorative screen walls. Units may be laid up in panels with units on edge with the open pattern of the unit exposed in the completed wall.*

1. **Horizontal Forces.** *The panels shall be capable of spanning between supports to resist the horizontal forces specified in Chapter 16A. Wind loads shall be based on gross projected area of the block.*

2. **Mortar Joints.** *Horizontal and vertical joints shall not be less than 1/4 inch (6 mm) thick. All joints shall be completely filled with mortar and shall be "shoved joint" work. The units of a panel shall be so arranged that either the horizontal or the vertical joint containing reinforcing is continuous without offset. This continuous joint shall be reinforced with a minimum of 0.03 square inch (19 $mm^2$) of reinforcing steel. Reinforcement may be embedded in mortar.*

3. **Reinforcing.** *Joint reinforcing may be composed of two wires made with welded ladder or trussed wire cross ties. In calculating the resisting capacity of the system, compression and tension in the spaced wires may be utilized. Ladder wire reinforcing shall not be spliced and shall be the widest that the mortar joint will accommodate, allowing 1/2 inch (13 mm) of mortar cover.*

4. **Size of Panels.** *The maximum size of panels shall be 144 square feet (13.4 $m^2$), with the maximum dimension in either direction of 15 feet (4572 mm).*

5. **Panel Support.** *Each panel shall be supported on all edges by a structural member of concrete, masonry or steel. Supports at the top and ends of the panel shall be by means of confinement of the masonry by at least 1/2 inch (13 mm) into and between the flanges of a steel channel. The space between the end of the panel and the web of the channel shall be filled with resilient material. The use of equivalent configuration in other steel section or in masonry or concrete is acceptable.*

*(All existing amendments that are not revised above shall continue without any change)*

**NOTATION:**

- *Authority: Health and Safety Code Section 130005(g) & 130021*
- *Reference: Health and Safety Code Section 1275, 129790, 129850 & 130005(g)*

# CHAPTER 22
# STEEL

*(This chapter is adopted without any amendments)*

***Notation:***
*Authority: Health and Safety Code Section 129850*
*Reference: Health and Safety Code Sections 1275 and 129850*

## CHAPTER 22A
## STEEL

### SECTION 2201*A*
### GENERAL

**2201*A*.1 Scope.** The provisions of this chapter govern the quality, design, fabrication and erection of steel used structurally in buildings or structures.

***2201A.1.1 Application.*** *The scope of application of Chapter 22A is as follows:*

1. *(Reserved for DSA).*

2. *Structures regulated by the Office of Statewide Health Planning and Development (OSHPD), which include those applications listed in Section ~~110.1~~ 1.10.2, and ~~110.4~~ 1.10.4.These applications include hospitals, skilled nursing facilities, intermediate care facilities and correctional treatment centers.*

   ***Exception: [OSHPD 2]*** *Single-story Type V skilled nursing or intermediate care facilities utilizing wood-frame or light-steel-frame construction as defined in Health and Safety Code Section 129725, which shall comply with Chapter 22 and any applicable amendments therein.*

***2201A.1.2 Identification of amendments.*** *OSHPD adopt this chapter and all amendments.*

***Exception:*** *Amendments adopted by only one agency appear in this chapter preceded with the appropriate acronym of the adopting agency, as follows:*

1. *(Reserved for DSA).*
2. *Office of Statewide Health Planning and Development:*

   ***[OSHPD 1]*** *- For applications listed in Section ~~110.1~~ 1.10.1.*

   ***[OSHPD 4]*** *- For applications listed in Section ~~110.4~~ 1.10.4 .*

**…**

### SECTION 2204*A*
### CONNECTIONS

**2204*A*.1 Welding.** The details of design, workmanship and technique for welding, inspection of welding and qualification of welding operators shall conform to the requirements of the specifications listed in Sections 2205*A*, 2206*A*, 2207*A*, 2209*A* and 2210*A*. *Special inspection* of welding shall be provided where required by Section 1704*A*.

***2204A.1.1 Welded Splice.*** *No welded splices shall be made except those shown on approved plans. Welded butt splices subject to tension greater than 33% of the expected yield strength under the load combinations with overstrength factor, shall have tapered transitions as required per AWS D1.8 Clause 4.2.*

***2204A.1.2 Consumables for Welding.***

***2204A.1.2.1. Seismic Force Resisting System (SFRS) Welds.***

*All welds used in members and connections in the SFRS shall be made with filler metals meeting the requirements specified in AWS D1.8 Clause 6.3. AWS D1.8 Clauses 6.3.5, 6.3.6, 6.3.7 and 6.3.8 shall apply only to demand critical welds.*

***2204A.1.2.2 Demand Critical Welds.***

*Where welds are designated as demand critical, they shall be made with filler metals meeting the requirements specified in AWS D1.8 Clause 6.3.*

***2204A.1.3*** ~~***2204A.1.2***~~ **Welded Shear Connectors.** ~~*When welded shear connectors are used for applications other than composite construction, such as for transfer of shear loads to ledgers, collectors and diaphragm chord members the allowable shear strength or design shear strength as appropriate, shall be one third of available strength. For installations where connectors are applied through formed steel decks and are used for transfer of shear loads other than for composite construction, the allowable shear strength or design shear strength as appropriate shall be one third the available strength multiplied by the appropriate reduction factor as required per Section 2206A.*~~

~~*Exceptions:*~~

~~*1. Where the required shear strength is determined using load combinations with overstrength factors per ASCE 7 Section 12.4.3.2, the connector shear strength need not be reduced to one third the available strength.*~~

~~*2. The allowable or design shear strength of welded connectors given in code evaluation reports for concrete over formed steel decks for purposes of transferring diaphragm shear may be used without reduction subject to the acceptance of the enforcement agency.*~~

*Where welded shear connectors in composite members are used as part of the seismic force resisting system, their shear and tensile strength shall be reduced by 25% from the specified strengths given in AISC 360 Chapter I.*

***Exception:*** *The 25% reduction is not necessary for collector components in structure designed for the load combinations with overstrength factor.*

…

***2204A.2.2 Column base plate.*** *When shear and / or tensile forces are intended to be transferred between column base plates and anchor bolts, provision shall be made in the design to eliminate the effects of oversized holes permitted in base plates by AISC 360 by use of shear lugs and / or welded shear transfer plates or other means acceptable to the enforcement agency, when the oversized holes are larger than the anchor bolt by more than 1/8 inch (3.2 mm). When welded shear transfer plates and shear lugs or other means acceptable to the enforcement agency are not used, the anchor bolts shall be checked for the induced bending stresses in combination with the shear stresses.*

## SECTION 2205A
## STRUCTURAL STEEL

**2205*A*.1 General.** The design, fabrication and erection of structural steel for buildings and structures shall be in accordance with AISC 360. Where required, the seismic design of steel structures shall be in accordance with the additional provisions of Section 2205*A*.2.

~~***2205A.1.1 Modify AISC 360 Section J1.8 by adding the following:***~~

~~*The welds shall be made before the bolts are tensioned.*~~

**2205*A*.2 Seismic requirements for steel structures.** The design of structural steel structures to resist seismic forces shall be in accordance with the provisions of ~~Section 2205.2.1 or~~ 2205*A*.2.2 for the appropriate seismic design category.

**2205*A*.2.1 Seismic Design Category A, B or C.** *Not permitted by OSHPD.* ~~Structural steel structures assigned to Seismic Design Category A, B or C shall be of any construction permitted in Section 2205. An *R* factor as set forth in Section 12.2.1 of ASCE 7 for the appropriate steel system is permitted where the structure is designed and detailed in accordance with the provisions of AISC 341, Part I. Systems not detailed in accordance with the above shall use the *R* factor in Section 12.2.1 of ASCE 7 designated for "structural steel systems not specifically detailed for seismic resistance."~~

**2205*A*.2.2 Seismic Design Category D, E or F.** Structural steel structures assigned to Seismic Design Category D, E or F shall be designed and detailed in accordance with AISC 341, Part I *irrespective of R values, unless approved otherwise by the enforcement agency.*

**2205*A*.3 Seismic requirements for composite construction.** The design, construction and quality of composite steel and concrete components that resist seismic forces shall conform to the requirements of the AISC 360 and ACI 318. An *R* factor as set forth in Section 12.2.1 of ASCE 7 for the appropriate composite steel and concrete system is permitted where the structure is designed and detailed in accordance with the provisions of AISC 341, Part II. In Seismic Design Category B or above, the design of such systems shall conform to the requirements of AISC 341, Part II.

**2205*A*.3.1 Seismic Design Categories D, E and F.** Composite structures are permitted in Seismic Design Categories D , E and F, subject to the limitations in Section 12.2.1 of ASCE 7, *and shall be considered as an alternative system*, where substantiating evidence is provided to demonstrate that the proposed system will perform as intended by AISC 341, Part II. The substantiating evidence shall be subject to building official approval. Where composite elements or connections are required to sustain inelastic deformations, the substantiating evidence shall be based on cyclic testing.

***2205A.4 MODIFICATIONS TO AISC 341. [OSHPD 1 & 4]***

***2205A.4.1 Part I, Structural Steel Building Provisions Modifications.***

***2205A.4.1.1 Part I, Section 9. Special Moment Frame (SMF) modifications***

***2205A.4.1.1.1*** *Part I, Section 9.2a. Requirements for Beam-to-Column Connections, Replace item (1) as follows.*

*The connection shall be capable of sustaining an interstory drift angle of at least 0.04 radians and an inelastic rotation of 0.03 radians.*

***2205A.4.1.1.2*** *Part I, Section 9.2b(a). Use of SMF connections designed in accordance with ANSI / AISC 358 shall be as modified in Section 2205A.5*

***2205A.4.1.2 Part I, Section 10. Intermediate Moment Frame (IMF)*** *– Not permitted by OSHPD.*

***2205A.4.1.3 Part I, Section 11. Ordinary Moment Frame (OMF)*** *– Not permitted by OSHPD.*

***2205A.4.1.4 Part I, Section 12. Special Truss Moment Frame (STMF)*** *– Not permitted by OSHPD.*

***2205A.4.1.5 Part I, Section 13. Special Concentrically Braced Frames (SCBF) modifications***

***2205A.4.1.5.1 Part I, 13.2 Members, Add a new section as follows.***

*AISC 341, 13.2f. Member Types*

*The use of rectangular HSS are not permitted for bracing members, unless filled solid with cement grout having a minimum compressive strength of 3000 psi at 28 days. The effects of composite action in the filled composite brace shall be considered in the sectional properties of the system where it results in the more severe loading condition or detailing.*

***2205A.4.1.5.2 Part I, Section 13: Add Section 13.7 as follows.***

*13.7 Beam to Column Connections.*

*SCBF frames shall have moment-resisting beam-column connections that can resist a moment equal to the lesser of the available flexural strength of the beam or the column in the SCBF bays. The connection shall include CJP welds from the beam flanges to the column flange, or to a plate in the case of column weak axis connections.*

***2205A.4.1.6 Part I, Section 14. Ordinary Concentrically Braced Frames (OCBF) -*** *Not permitted by OSHPD.*

***2205A.4.1.7 Part I, Section 15. Eccentrically Braced Frames (EBF) modifications***

*AISC 341, Part I, 15.4 Link-to-Column Connections, Delete the Exception.*

***2205A.4.2 Appendix S, Qualifying Cyclic Tests of Beam-to-Column and Link-to-Column Connections modifications***

***2205A.4.2.1 S3. Definitions. Replace the definition of Inelastic Rotation with the following:***

***Inelastic Rotation:*** *The permanent or plastic portion of the rotation angle between a beam and the column, or between a Link and the column of the Test Specimen, measured in radians. The Inelastic Rotation shall be computed based upon an analysis of the Test Specimen deformations. Sources of Inelastic Rotation include yielding of members and connectors, yielding of connection elements and slip between members and connection elements. For beam-to-column moment connections in Special Moment Frames, the inelastic rotation is represented by the plastic chord rotation angle calculated as the plastic deflection of the beam or girder, at the center of its span divided by the distance between the center of the beam span and the centerline of the panel zone of the beam-column connection. For link-to-column connections in Eccentrically Braced Frames, inelastic rotation shall be computed based upon the assumption that inelastic action is concentrated at a single point located at the intersection of the centerline of the link with the face of the column.*

***2205A.4.2.2 Appendix S, S3. Definitions. Add the following:***

***Rapid Strength Deterioration:*** *A mode of behavior characterized by a sudden loss of strength. In a cyclic test with constant or increasing deformation amplitude, a loss of strength of more than 50% of the strength attained in the previous excursion in the same loading direction.*

***2205A.4.2.3 Appendix S, Section S5.2. Size of Members – Replace as follows:***

*The size of the beam or Link used in the Test Specimen shall be within the following limits:*

1. *At least one of the test beams or Links shall be no less than 100% of the depth of the prototype beam or Link. For the remaining specimens, the depth of the test beam or Link shall be no less than 90 percent of the depth of the Prototype beam or Link.*

2. *At least one of the test beams or Links shall be no less than 100% of the weight per foot of the prototype beam or Link. For the remaining specimens, the weight per foot of the test beam or Link shall be no less than 75 percent of the weight per foot of the Prototype beam or Link.*

*The size of the column used in the test specimen shall properly represent the inelastic action in the column, as per the requirements in Section S5.1. In addition, the depth of the test column shall be no less than 90% of the depth of the prototype column.*

*Extrapolation beyond the limitations stated in this section shall be permitted subject to peer review and approval by the enforcement agency.*

***2205A.4.2.4 Appendix S, Section S10. Acceptance Criteria – Replace as follows:***

*The test specimens must satisfy the strength, interstory drift angle, or link rotation angle, and inelastic rotation requirements of these provisions for the Special Moment Frame and Eccentrically Braced Frame connection as applicable. The test specimen must sustain the required interstory drift angle, or link rotation angle, and inelastic rotation for at least two complete loading cycles without exhibiting rapid strength deterioration.*

***2205A.4.3 Appendix T, Qualifying Cyclic Tests of Buckling-Restrained Braces modification***

*AISC 341, T5.3 Similarity of Brace Test Specimen and Prototype, Replace (2) with the following:*

*The axial yield strength of the steel core $P_{ysc}$ of the brace prototype shall not be more than 20 percent above nor 50% less than that of the test specimen where both strengths are based on the core area, $A_{sc}$, multiplied by the yield strength as determined from a coupon test. In addition, the material of the test specimen shall be the same ASTM classification and grade as the prototype.*

***2205A.5 MODIFICATIONS TO AISC 358. [OSHPD 1 & 4]***

***2205A.5.1 2. Design Requirements, 2.1 Special and Intermediate Moment Frame Connection Types, Table 2-1 Prequalified Moment Connections modifications***

*The prequalifi<u>ed</u> ~~cation~~ ~~of~~ Bolted ~~Unstiffened Extended End Plate and Bolted Stiffened Extended End Plate~~ moment connections, <u>with bolts in flange or web of beams (except erection bolts),</u> ~~in buildings is~~ <u>are</u> not permitted <u>in buildings.</u> ~~by OSHPD.~~*

*<u>The prequalification of moment connections at orthogonal moment frames sharing common columns or moment connections attached to other than one side or two opposite sides of a column is not permitted by OSHPD.</u>*

~~***2205A.5.2 5. Reduced Beam Section (RBS) Moment Connection modifications***~~

~~*AISC 358, 5.3.1.7 Lateral Bracing of Beam shall be provided as follows: Replace the Exception with the following:*~~

~~***Exception**: For both systems, w here the beam supports a concrete structural slab that is connected between the protected zones with welded shear connectors spaced a maximum of 12 in. (300 mm) on center, supplemental top and bottom flange bracing at the reduced section may be omitted, subject to the approval of the enforcement agency. The concrete structural slab for the purposes of lateral bracing of the beam shall have a minimum of 5-1/4 inches in total thickness including metal deck, where occurs, have a minimum compressive strength of 4000 psi at 28 days and contain 6x6-W4xW4 WWF or equal.*~~

…

***SECTION 2206A***
***STEEL JOISTS***

…

**2206*A*.4 Steel joist drawings.** Steel joist placement plans shall be provided to show the steel joist products as specified on the construction documents and are to be utilized for field installation in accordance with specific project requirements as stated in Section 2206<u>*A*</u>.2. Steel placement plans shall include, at a minimum, the following:

1. Listing of all applicable loads as stated in Section 2206<u>*A*</u>.2 and used in the design of the steel joists and joist girders as specified in the construction documents.

2. Profiles for nonstandard joist and joist girder configurations (standard joist and joist girder configurations are as indicated in the SJI catalog).

3. Connection requirements for:

    3.1. Joist supports;

    3.2. Joist girder supports;

3.3. Field splices; and

3.4. Bridging attachments.

4. Deflection criteria for live and total loads for non-SJI standard joists.

5. Size, location and connections for all bridging.

6. Joist headers.

~~***Design Approval.*** *Joist and joist girder design calculations and profiles with member sizes and connection details, and joist placement plans shall be provided to the enforcement agency and approved prior to joist fabrication, in accordance with Title 24, Part 1. Joist and joist girder design calculations and profiles with member sizes and connection details shall bear the signature and stamp or seal of the registered engineer or licensed architect responsible for the joist design. Alterations to the approved joist and joist girder design calculations and profiles with member sizes and connection details, or to fabricated joists are subject to the approval of the enforcement agency.*~~

~~Steel joist placement plans do not require the seal and signature of the joist manufacturer's registered design professional.~~

**2206*A*.5 Certification.** At completion of manufacture, the steel joist manufacturer shall submit a *certificate of compliance* in accordance with Section 1704*A*.2.2 stating that work was performed in accordance with *approved construction documents* and with SJI standard specifications.

***2206A.6 Joist Chord Bracing.*** *The chords of all joists shall be laterally supported at all points where the chords change direction.*

**…**

**SECTION 2209*A***
**COLD-FORMED STEEL**

**2209*A*.1 General.** The design of cold-formed carbon and low-alloy steel structural members shall be in accordance with AISI S100. The design of cold-formed stainless-steel structural members shall be in accordance with ASCE 8. Cold-formed steel light-frame construction shall also comply with Section 2210*A*.

**2209*A*.2 Steel decks.** The design and construction of cold-formed steel decks shall be in accordance with this section.

**2209*A*.2.1 Composite slabs on steel decks.** Composite slabs of concrete and steel deck shall be designed and constructed in accordance with ASCE 3.

**2209*A*.2.2 Noncomposite steel floor decks.** Noncomposite steel floor decks shall be permitted to be designed and constructed in accordance with ANSI/SDI-NC1.0, as modified in Section 2209*A*.2.2.1.

> **2209*A*.9.2.2.1 ANSI/SDI-NC1.0 Section 2.4B1.** Replace Section 2.4B1 of ANSI/SDI-NC1.0 with the following: 1. General: The design of the concrete slabs shall be done in accordance with the ACI *Building Code Requirements for Reinforced Concrete*. The minimum concrete thickness above the top of the deck shall be 1 1/2 inches (38 mm).

**2209*A*.2.3 Steel roof deck.** Steel roof decks shall be permitted to be designed and constructed in accordance with ANSI/SBI-RD1.0.

***2209A.3 Steel Deck Diaphragms.*** *Steel deck diaphragms shall comply with the requirements of this section.* ~~*and Section 1604A.*~~ *The design of the diaphragm as well as the construction details may be based on test information acceptable to the enforcement agency. Steel deck and concrete-filled steel deck diaphragms that is tested per ICC-ES AC 43 shall be considered to meet the requirements of this section.*

*Diaphragm chord forces both compression and tension forces resulting from in-plane shear shall be resisted by flange members and not by the steel deck diaphragm.*

*The base material thickness of steel deck for diaphragms shall not be less than 0.0359 inch (0.9 mm) (20 gage), unless tests acceptable to the enforcement agency have been performed.*

~~*Welding inspection shall conform to Section 2204A.1.*~~

**SECTION 2210*A***
**COLD-FORMED STEEL**
**LIGHT-FRAME CONSTRUCTION**

**2210*A*.1 General.** The design and installation of structural members and nonstructural members utilized in cold-formed steel light-frame construction where the specified minimum base steel thickness is between 0.0179 inches (0.455 mm) and 0.1180 inches (2.997 mm) shall be in accordance with AISI S200 and Sections 2210.2 through 2210.7, as applicable.

**2210*A*.2 Header design.** Headers, including box and back-to-back headers, and double and single L-headers shall be designed in accordance with AISI S212 or AISI S100.

**2210*A*.3 Trusses.**

**2210*A*.3.1 Design.** Cold-formed steel trusses shall be designed in accordance with AISI S214, Sections 2210.3.1 through 2210.3.5 and accepted engineering practice.

*Complete engineering analysis and truss design drawings shall accompany the construction documents submitted to the enforcement agency for approval. When load testing is required, ~~per Section G of AISI-Truss,~~ the test report shall be submitted with the truss design drawings and engineering analysis to the enforcement agency.*

**2210*A*.3.2 Truss design drawings.** The truss design drawings shall conform to the requirements of Section B~~2.3~~ of AISI S214 and shall be provided with the shipment of trusses delivered to the job site. The truss design drawings shall include the details of permanent individual truss member restraint/bracing in accordance with Section B ~~6(a) or B6(c)~~ of AISI S214 where these methods are utilized to provide restraint/bracing.

**2210*A*.3.3 Deferred submittals.** ~~AISI Section B4.2 shall be deleted~~. *Not permitted by OSHPD.*

**2210*A*.3.4 Trusses spanning 60 feet or greater.** The owner shall contract with a *registered design professional* for the design of the temporary installation restraint/bracing and the permanent individual truss member restraint/bracing for trusses with clear spans 60 feet (18 288 mm) or greater. *Special inspection* of trusses over 60 feet (18 288 mm) in length shall conform to Section 1704*A*.

**2210*A*.3.5 Truss quality assurance.** Trusses not part of a manufacturing process that provides requirements for quality control done under the supervision of a third-party quality control agency, shall be manufactured in compliance with Sections 1704*A*.2 and 1704*A*.3, as applicable.

**2210*A*.4 Wall stud design.** Wall studs shall be designed in accordance with either AISI S211 or AISI S100.

**2210*A*.5 Floor and roof system design.** Framing for floor and roof systems in buildings shall be designed in accordance with either AISI S210 or AISI S100.

**2210*A*.6 Lateral design.** Light-frame shear walls, diagonal strap bracing that is part of a structural wall and diaphragms used to resist wind, seismic and other in-plane lateral loads shall be designed in accordance with AISI S213.

*Shear wall assemblies per Section C2.2.3 of AISI-~~Lateral~~ S213 are not permitted within the seismic force-resisting system of buildings. ~~or structures assigned to Occupancy Category II, III, IV, or buildings designed to be relocatable.~~*

**2210*A*.7 Prescriptive framing.** *Not permitted by OSHPD.* ~~Detached one- and two-family *dwellings* and *townhouses*, less than or equal to three stories above *grade plane*, shall be permitted to be constructed in accordance with AISI S230 subject to the limitations therein.~~

**…**

## *SECTION 2212A*
## *TESTING*

~~***2212A.1 Tests of Structural Steel.*** *All steel used for structural purposes shall be identified as required by Section 2203A.1. Manufacturer's mill analyses and test reports are acceptable for properly identified steel, but the enforcement agency may require additional testing to determine the quality of the steel if there is any doubt as to its acceptability. Any steel not properly identified shall be tested to meet the minimum chemical and mechanical requirements of the ASTM standard appropriate for the steel specified for the structure.*~~

> ~~***EXCEPTION:*** *No mechanical tests are required for unidentified steel when the minimum yield stress required by the design is less than or equal to 25 ksi (172 MPa) and the steel is not part of the designated lateral force-resisting system.*~~

***2212A.1*** ~~***2212A.2***~~ ***Tests of High-strength Bolts, Nuts and Washers****. High-strength bolts, nuts and washers shall be sampled and tested by an approved independent testing laboratory for conformance with the requirements of Section 2205A.*

***2212A.2*** ~~***2212A.3***~~ ***Tests of End-welded Studs.*** *End-welded studs shall be sampled and tested per the requirements of the AWS D1.1.*

~~***2212A.4 Tests of Beam to Column Moment Connections.*** *When testing is required in these provisions for beam-to-column moment connections in moment frames and link-to-column connections in eccentric braced frames, it shall meet the requirements of AISC – 341 Appendix S as modified in Section 2205A.*~~

*(All existing amendments that are not revised above shall continue without any change)*

**NOTATION:**

- *Authority: Health and Safety Code Section 130005(g) & 130021*
- *Reference: Health and Safety Code Section 1275, 129790, 129850 & 130005(g)*

**CHAPTER 23**
**WOOD**

**SECTION 2301**
**GENERAL**

**2301.1 Scope.** The provisions of this chapter shall govern the materials, design, construction and quality of wood members and their fasteners.

***2301.1.1 Application. [OSHPD 1, 2, & 4]*** *The scope of application of Chapter 23 is as follows:*

*1. (Reserved for DSA).*

*2. Applications listed in Section 110A, regulated by the Office of Statewide Health Planning and Development (OSHPD). These applications include hospitals, skilled nursing facilities, intermediate care facilities and correctional treatment centers.*

***Exception:*** *For applications listed in Section ~~110.3~~ 1.10.3 (Licensed Clinics), the provisions of this chapter without OSHPD amendments identified in accordance with ~~per~~ Section 2301.1.2 shall apply.*

***2301.1.2 Identification of amendments. [OSHPD 1, 2, & 4]*** *Office of Statewide Health Planning and Development amendments appear in this chapter preceded with the appropriate acronym, as follows:*

*1. (Reserved for DSA).*

*2. Office of Statewide Health Planning and Development:*

***[OSHPD 1]*** *- For applications listed in Section ~~110.1~~ 1.10.1.*

***[OSHPD 2]*** *- For applications listed in Section ~~110.2~~ 1.10.2.*

***[OSHPD 4]*** *- For applications listed in Section ~~110.4~~ 1.10.4.*

***2301.1.3 Reference to other chapters.***

*2301.1.3.1 [OSHPD 1 & 4] Where reference within this chapter is made to sections in Chapters 16, 17, 18, 19, 21, 22, and 34, the provisions in Chapters 16A, 17A, 18A, 19A, 21A, 22A, and 34A respectively shall apply instead.*

**2301.2 General design requirements.** The design of structural elements or systems, constructed partially or wholly of wood or wood-based products, shall be in accordance with one of the following methods:

1. *Allowable stress design* in accordance with Sections 2304, 2305 and 2306.

2. *Load and resistance factor design* in accordance with Sections 2304, 2305 and 2307.

3. *Conventional light-frame construction* in accordance with Sections 2304 and 2308.

   **Exception:** Buildings designed in accordance with the provisions of the AF&PA WFCM shall be deemed to meet the requirements of the provisions of Section 2308.

4. The design and construction of log structures shall be in accordance with the provisions of ICC 400.

   ***Exception: [OSHPD 1, 2, & 4]*** *Log structures are not permitted by OSHPD.*

…

## SECTION 2303
## MINIMUM STANDARDS AND QUALITY

**2303.1 General.**

**...**

**2303.1.3 Structural glued-laminated timber.** Glued-laminated timbers shall be manufactured and identified as required in ANSI/AITC A190.1 and ASTM D 3737.

> ***2303.1.3.1 Additional requirements. [OSHPD 1, 2, and 4]*** *The construction documents shall indicate the following:*
>
> 1. *Dry or wet service conditions. ~~(NDS 5.1.4.1)~~*
> 2. *Laminating combinations and stress requirements. ~~(NDS 5.1.4.1)~~*
> 3. *Species group. ~~(refer to Section 2304.11.3, Tables 2306.3.1 and 2306.3.2 footnote a., and AF&PA SDPWS Tables 4.2A and 4.2B, footnote 2).~~*
> 4. *Preservative material and retention, when preservative treatment is required. ~~(refer to Section 2304 .11.3 and NDS Section 5.3.11).~~*
> 5. *Provisions for protection during shipping and field handling, such as sealing and wrapping in accordance with AITC 111.*
>
> *When mechanical reinforcement such as radial tension reinforcement is required, such reinforcement shall comply with AITC 404 and shall be detailed accordingly in the construction documents. Construction documents shall specify that the moisture content of laminations at the time of manufacture shall not exceed 12% for dry conditions of use.*
>
> *The design of fasteners and connections shall comply with AITC 117, Section I, Item 6 (Connection Design), and NDS Appendix E.*
>
> *Refer to Section 1704A.6.3 ~~1704A.6.2~~ for special inspection requirements during fabrication of structural glued laminated timbers.*
>
> ***Exception: [OSHPD 2]*** *Special inspection shall be per Chapter 17 instead of 17A.*

**...**

**2303.4 Trusses.**

**2303.4.1 Design.** Wood trusses shall be designed in accordance with the provisions of this code and accepted engineering practice. Members are permitted to be joined by nails, glue, bolts, timber connectors, metal connector plates or other *approved* framing devices.

**2303.4.1.1 Truss design drawings.** The written, graphic and pictorial depiction of each individual truss shall be provided to the *building official* for approval prior to installation. Truss design drawings shall also be provided with the shipment of trusses delivered to the job site. Truss design drawings shall include, at a minimum, the information specified below:

1. Slope or depth, span and spacing;
2. Location of all joints and support locations;
3. Number of plies if greater than one;
4. Required bearing widths;
5. Design loads as applicable, including;
5.1. Top chord live load;
5.2. Top chord dead load;
5.3. Bottom chord live load;
5.4. Bottom chord dead load;
5.5. Additional loads and locations;
5.6. Environmental design criteria and loads (wind, rain, snow, seismic, etc.).

6. Other lateral loads, including drag strut loads.
7. Adjustments to wood member and metal connector plate design value for conditions of use;
8. Maximum reaction force and direction, including maximum uplift reaction forces where applicable;
9. Metal connector plate type, size and thickness or gage, and the dimensioned location of each metal connector plate except where symmetrically located relative to the joint interface;
10. Size, species and grade for each wood member;
11. Truss-to-truss connections and truss field assembly requirements;
12. Calculated span-to-deflection ratio and maximum vertical and horizontal deflection for live and total load as applicable;
13. Maximum axial tension and compression forces in the truss members; and
14. Required permanent individual truss member restraint location and the method and details of restraint/bracing to be used in accordance with Section 2303.4.1.2.

**2303.4.1.2 Permanent individual truss member restraint.** Where permanent restraint of truss members is required on the truss design drawings, it shall be accomplished by one of the following methods:

1. Permanent individual truss member restraint/bracing shall be installed using standard industry lateral restraint/bracing details in accordance with generally accepted engineering practice. Locations for lateral restraint shall be identified on the truss design drawing.
2. The trusses shall be designed so that the buckling of any individual truss member is resisted internally by the individual truss through suitable means (i.e., buckling reinforcement by T-reinforcement or L-reinforcement, proprietary reinforcement, etc.). The buckling reinforcement of individual members of the trusses shall be installed as shown on the truss design drawing or on supplemental truss member buckling reinforcement details provided by the truss designer.
3. A project specific permanent individual truss member restraint/bracing design shall be permitted to be specified by any *registered design professional*.

**2303.4.1.3 Trusses spanning 60 feet or greater.** The owner shall contract with any qualified *registered design professional* for the design of the temporary installation restraint/bracing and the permanent individual truss member restraint/bracing for all trusses with clear spans 60 feet (18 288 mm) or greater.

**2303.4.1.4 Truss designer.** The individual or organization responsible for the design of trusses.

**2303.4.1.4.1 Truss design drawings.** Where required by the *registered design professional*, the *building official*, or the statutes of the jurisdiction in which the project is to be constructed, each individual truss design drawing shall bear the seal and signature of the truss designer.

**Exceptions:**

1. Where a cover sheet and truss index sheet are combined into a single sheet and attached to the set of truss design drawings, the single cover/truss index sheet is the only document required to be signed and sealed by the truss designer.
2. When a cover sheet and a truss index sheet are separately provided and attached to the set of truss design drawings, the cover sheet and the truss index sheet are the only documents required to be signed and sealed by the truss designer.
*3. [OSHPD 1, 2, and 4] Exceptions 1 and 2 not permitted by OSHPD.*

**2303.4.2 Truss placement diagram.** The truss manufacturer shall provide a truss placement diagram that identifies the proposed location for each individually designated truss and references the corresponding truss design drawing. The truss placement diagram shall be provided as part of the truss submittal package, and with the shipment of trusses delivered to the job site. Truss placement diagrams that serve only as a guide for installation and do not deviate from the *permit* submittal drawings shall not be required to bear the seal or signature of the truss designer.

**2303.4.3 Truss submittal package.** The truss submittal package provided by the truss manufacturer shall consist of each individual truss design drawing, the truss placement diagram, the permanent individual truss member restraint/bracing method and details and any other structural details germane to the trusses; as applicable, the cover/truss index sheet.

***2303.4.3.1 Additional Requirements. [OSHPD 1, 2, and 4]*** *In addition to Sections 2304.1 and 2304.2, the following requirements apply:*

1. ***Construction Documents.*** *The construction documents prepared by the registered engineer or licensed architect for the project shall indicate all requirements for the truss design, including:*

   ~~*1.1 Truss profiles and layout, including girder truss locations.*~~

   *1.1~~1.2 Design loads, support reactions, uplift or lateral connection forces, and d~~ Deflection criteria.*

   *1.2 ~~1.3~~ Connection details to structural and non-structural elements (e.g. non-bearing partitions).*

   ~~*1.4 Bridging and bracing attachments to supporting structural elements.*~~

   ~~*1.5 Wood species and minimum grade (refer to Section 2304.11.3, Tables 2306.3.1 and 2306.3.2 footnote a., and AF&PA SDPWS Tables 4.2A and 4.2B, footnote 2).*~~

   ~~*1.6 For metal plate connected wood trusses, also refer to ANSI/TPI 1, Section 2.2.*~~

~~2. **Truss Design Drawings.** Each truss design drawings shall bear the signature and stamp or seal of the registered engineer or licensed architect responsible for the truss design.~~

2. ~~3.~~ ***Requirements for Approval.*** *The truss design drawings and engineering analysis shall be provided to the enforcement agency and approved prior to truss fabrication, in accordance with C.C.R.,Title 24, Part 1. Alterations to the approved truss design drawings or manufactured trusses are subject to the approval of the enforcement agency.*

3. ~~4.~~ ***Special Inspection During Truss Manufacture.*** *Refer to Section 1704A.6.2 for special inspection requirements during the manufacture of open-web trusses.*

**2303.4.4 Anchorage.** The design for the transfer of loads and anchorage of each truss to the supporting structure is the responsibility of the *registered design professional*.

**2303.4.5 Alterations to trusses.** Truss members and components shall not be cut, notched, drilled, spliced or otherwise altered in any way without written concurrence and approval of a *registered design professional*. Alterations resulting in the addition of loads to any member (e.g., HVAC equipment, piping, additional roofing or insulation, etc.) shall not be permitted without verification that the truss is capable of supporting such additional loading.

**2303.4.6 TPI 1 Specifications.** In addition to Sections 2303.4.1 through 2303.4.5, the design, manufacture and quality assurance of metal-plate-connected wood trusses shall be in accordance with TPI 1. Job-site inspections shall be in compliance with Section 110.4, as applicable.

**2303.4.7 Truss quality assurance.** Trusses not part of a manufacturing process in accordance with either Section 2303.4.6 or a standard listed in Chapter 35, which provides requirements for quality control done under the supervision of a third-party quality control agency, shall be manufactured in compliance with Sections 1704.2 and 1704.6, as applicable.

**...**

## SECTION 2304
## GENERAL CONSTRUCTION REQUIREMENTS

**2304.1 General.** The provisions of this section apply to design methods specified in Section 2301.2.

**2304.2 Size of structural members.** Computations to determine the required sizes of members shall be based on the net dimensions (actual sizes) and not nominal sizes.

**2304.3 Wall framing.** The framing of exterior and interior walls shall be in accordance with the provisions specified in Section 2308 unless a specific design is furnished.

**2304.3.1 Bottom plates.** Studs shall have full bearing on a 2-inch-thick (actual $1^1/_2$-inch, 38 mm) or larger plate or sill having a width at least equal to the width of the studs.

**2304.3.2 Framing over openings.** Headers, double joists, trusses or other approved assemblies that are of adequate size to transfer loads to the vertical members shall be provided over window and door openings in load-bearing walls and partitions.

**2304.3.3 Shrinkage.** Wood walls and bearing partitions shall not support more than two floors and a roof unless an analysis satisfactory to the building official shows that shrinkage of the wood framing will not have adverse effects on the structure or any plumbing, electrical or mechanical systems, or other equipment installed therein due to excessive shrinkage or differential movements caused by shrinkage. The analysis shall also show that the roof drainage system and the foregoing systems or equipment will not be adversely affected or, as an alternate, such systems shall be designed to accommodate the differential shrinkage or movements.

***2304.3.4 Additional requirements. [OSHPD 1, 2, and 4]*** *The following additional requirements apply:*

1. *Engineering analysis shall be furnished that demonstrates compliance of wall framing elements and connections with Section 2301.2, Item 1 or 2.*

2. *Construction documents shall include detailing of sill plate anchorage to supporting masonry or concrete for all exterior and interior bearing, non-bearing and shear walls. Unless specifically designed in accordance with item 1 above, sills under exterior walls, bearing walls and shear walls shall be bolted to masonry or concrete with 5/8" diameter by 12 inch (16 mm by 305 mm) bolts spaced not more than four (4) feet (1219 mm) on center, with a minimum of two (2) bolts for each piece of sill plate. Anchor bolts shall have a 4 inch minimum and a 12 inch maximum clearance to the end of the sill plate, and 7 inch minimum embedment into concrete or masonry.*

   *Unless specifically designed in accordance with item 1 above, sill plates under non-bearing interior partitions on concrete floor slabs shall be anchored at not more than four (4) feet (1219 mm) on center to resist a minimum allowable stress shear of 100 pounds per linear foot (1.4 kN/m) acting either parallel or perpendicular to the wall.*

3. *Construction documents shall include detailing and limitations for notches and bored holes in wall studs, plates and sills. ~~Refer to Sections 2308.9.10 and 2308.9.11 for code-prescribed limitations.~~*

**2304.4 Floor and roof framing.** The framing of wood-joisted floors and wood framed roofs shall be in accordance with the provisions specified in Section 2308 unless a specific design is furnished.

***2304.4.1 Additional requirements. [OSHPD 1, 2, and 4]*** *The following additional requirements apply:*

1. *Engineering analysis shall be furnished that demonstrates compliance of floor, roof and ceiling framing elements and connections with Section 2301.2, Items 1 or 2.*

2. *Construction documents shall include detailing and limitations for notches and bored holes in floor and roof framing members. ~~Refer to Section 2308.10.4.2 and NDS Section 4.4.3.~~*

**...**

**2304.6.1 Wood structural panel sheathing.** Where wood structural panel sheathing is used as the exposed finish on the exterior of outside walls, it shall have an exterior exposure durability classification. Where wood structural panel sheathing is used elsewhere, but not as the exposed finish, it shall be of a type manufactured with exterior glue (Exposure 1 or Exterior). Wood structural panel wall sheathing or siding used as structural sheathing shall be capable of resisting wind pressures in accordance with Section 1609. Maximum wind speeds for wood structural panel sheathing used to resist wind pressures shall be in accordance with Table 2304.6.1 for enclosed buildings with a mean roof height not greater than 30 feet (9144 mm), an importance factor (*I*) of 1.0 and a topographic factor (*Kz t*) of 1.0.

*[OSHPD 1 & 4] Wind pressure shall be calculated in accordance with Section 1609A.*

**...**

**2304.9 Connections and fasteners.**

**2304.9.1 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 2304.9.1.

***2304.9.1.1 Additional requirements. [OSHPD 1, 2, and 4]*** *Fasteners used for the attachment of exterior wall coverings shall be of hot-dipped zinc-coated galvanized steel, mechanically deposited zinc-coated steel, stainless steel, silicon bronze or copper. The coating weights for hot-dipped zinc-coated fasteners shall be in accordance with ASTM A 153. The coating weights for mechanically deposited zinc coated fasteners shall be in accordance with ASTM B 695, Class 55 minimum.*

**…**

**2304.11 Protection against decay and termites.**

**2304.11.1 General.** Where required by this section, protection from decay and termites shall be provided by the use of naturally durable or preservative-treated wood.

**2304.11.2 Wood used above ground.** Wood used above ground in the locations specified in Sections 2304.11.2.1 through 2304.11.2.7, 2304.11.3 and 2304.11.5 shall be naturally durable wood or preservative-treated wood using water-borne preservatives, in accordance with AWPA U1 (Commodity Specifications A or F) for above-ground use.

**2304.11.2.1 Joists, girders and subfloor.** Where wood joists or the bottom of a wood structural floor without joists are closer than 18 inches (457 mm), or wood girders are closer than 12 inches (305 mm) to the exposed ground in crawl spaces or unexcavated areas located within the perimeter of the building foundation, the floor construction (including posts, girders, joists and subfloor) shall be of naturally durable or *preservative-treated wood*.

**2304.11.2.2 Wood supported by exterior foundation walls.** Wood framing members, including wood sheathing, that rest on exterior foundation walls and are less than 8 inches (203 mm) from exposed earth shall be of naturally durable or preservative-treated wood.

***Exception: [OSHPD 1, 2, and 4]*** *At exterior walls where the earth is paved with an asphalt or concrete slab at least 18 inches (457 mm) wide and draining away from the building, the bottom of sills are permitted to be 6 inches (152 mm) above the top of such slab. Other equivalent means of termite and decay protection may be accepted by the enforcement agency.*

**2304.11.2.3 Exterior walls below grade.** Wood framing members and furring strips attached directly to the interior of exterior masonry or concrete walls below grade shall be of approved naturally durable or preservative-treated wood.

**2304.11.2.4 Sleepers and sills.** Sleepers and sills on a concrete or masonry slab that is in direct contact with earth shall be of naturally durable or preservative-treated wood.

***2304.11.2.4.1 Additional Requirements. [OSHPD 1, 2, and 4]*** *Stud walls or partitions at shower or toilet rooms with more than two fixtures, and stud walls adjacent to unroofed paved areas shall rest on a concrete curb extending at least 6 inches (152 mm) above finished floor or pavement level.*

**…**

## SECTION 2305
## GENERAL DESIGN REQUIREMENTS FOR LATERAL-FORCE-RESISTING SYSTEMS

**2305.1 General.** Structures using wood shear walls and diaphragms to resist wind, seismic and other lateral loads shall be designed and constructed in accordance with AF&PA SDPWS and the provisions of Sections 2305, 2306 and 2307.

**2305.1.1 Openings in shear panels.** Openings in shear panels that materially affect their strength shall be detailed on the plans, and shall have their edges adequately reinforced to transfer all shearing stresses.

***2305.1.2 ~~2305.1.7~~ Additional Requirements. [OSHPD 1, 2, and 4]*** *The following limitations shall apply:*

1. *Straight-sheathed horizontal lumber diaphragms are not permitted.*
2. *Gypsum-based sheathing shear walls and portland cement plaster shear walls are not permitted.*
3. *Shear wall foundation anchor bolt washers shall be provided in accordance with AF & PA SDPWS Section 4.3.6.4.3. The exception to AF & PA Section 4.3.6.4.3 shall not apply. ~~(refer to Section 4.3.6.4.3 of the SDPWS) shall conform with the requirements of Section 2305.3.11.~~*
4. *~~The engineering analysis shall include a statement indicating whether the lateral force-resisting system has been designed in accordance with Section 2305, or in accordance with the AF&PA SDPWS and the limitations of this code.~~ Wood structural panel shear walls and diaphragms using staples as fasteners are not permitted.*
5. *Unblocked shear walls are not permitted.*

***2305.1.3 Diaphragms and Shear Walls. ~~2305.2.4.2 Additional Requirements.~~ [OSHPD 1, 2, and 4]*** *Any wood structural panel sheathing used for diaphragms and shear walls that are part of the seismic force-resisting system shall be applied directly to framing members.*

> ***Exception:*** *Wood structural panel sheathing in a diaphragm is permitted to be fastened over solid lumber planking or laminated decking, provided the panel joints and lumber planking or laminated decking joints do not coincide.*

***2305.1.4 Sill plate anchor bolts.*** *As specified in Section 1908A.1.31 modifications to ACI 318, the allowable lateral design strength for sill plate anchor bolts in shear parallel to grain is permitted to be determined using the lateral design value for a bolt attaching a wood sill plate to concrete, as specified in AF&PA NDS Table 11E, provided the anchor bolts comply with all of the following:*

1. *The maximum anchor bolt diameter is 5/8 inches (16 mm).*
2. *The anchor bolt is embedded at least 7 inches (178 mm) into concrete.*
3. *The anchor bolt is located a minimum of 2-1/2 anchor diameters from any concrete edge that is parallel to the sill plate; and*
4. *The anchor bolt is located a minimum of 15 anchor diameters from any concrete end that is perpendicular to the sill plate.*

**2305.2 Diaphragm deflection.** The deflection (Δ) of a blocked wood structural panel diaphragm uniformly fastened throughout with staples is permitted to be calculated by using the following equation. If not uniformly fastened, the constant 0.188 (For SI: 1/1627) in the third term shall be modified accordingly.

> ***Exception: [OSHPD 1, 2, & 4]*** *Section 2305.2 is not permitted by OSHPD.*

**…**

**2305.3 Shear wall deflection.** The deflection (Δ) of a blocked wood structural panel shear wall uniformly fastened throughout with staples is permitted to be calculated by the use of the following equation:

> ***Exception: [OSHPD 1, 2, & 4]*** *Section 2305.3 is not permitted by OSHPD.*

**…**

**SECTION 2306**
**ALLOWABLE STRESS DESIGN**

**2306.1 Allowable stress design.** The structural analysis and construction of wood elements in structures using *allowable stress design* shall be in accordance with the following applicable standards:

**…**

**2306.3 Wood structural panel shear walls.** Wood structural panel shear walls, wood structural panel shear walls shall be designed and constructed in accordance with AF&PASDPWS. Wood structural panel shear walls are permitted to resist horizontal forces using the allowable capacities set forth in Table 2306.3. Allowable capacities in Table 2306.3 are permitted to be increased 40 percent for wind design.

***2306.3.1. Additional requirements. [OSHPD 1, 2, & 3]*** *Any wood structural panel sheathing used for diaphragms and shear walls that are part of the seismic force-resisting system shall be applied directly to framing members, unless installed in accordance with Section 2305.1.3.*

**TABLE 2306.3 ALLOWABLE SHEAR (POUNDS PER FOOT) FOR WOOD STRUCTURAL PANEL SHEAR WALLS WITH FRAMING OF DOUGLAS FIR-LARCH OR SOUTHERN PINE [a] FOR WIND OR SEISMIC LOADING [b, h, i, j, l, m]**

| PANEL GRADE | MINIMUM NOMINAL PANEL THICKNESS (inch) | MINIMUM FASTENERPENETRATIONIN FRAMING (inches) | PANELS APPLIED DIRECT TO FRAMING | | | | | PANELS APPLIED OVER 1/2″ OR 5/8″ GYPSUM SHEATHING [m] | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | NAIL (common or galvanized box) or staple size[k] | Fastener spacing at panel edges (inches) | | | | NAIL (common or galvanized box) or staple size[k] | Fastener spacing at panel edges (inches) | | | |
| | | | | 6 | 4 | 3 | 2[e] | | 6 | 4 | 3 | 2[e] |
| Structural I Sheathing | 5/16 | 1 1/4 | 6d (2×0.113″common, 2″ ×0.099″galvanized box) | 200 | 300 | 390 | 510 | 8d (2 1/2″ ×0.131″common, 2 1/2″ ×0.113″galvanized box) | 200 | 300 | 390 | 510 |
| | | 1 | 1 1/2 16 Gage | 165 | 245 | 325 | 415 | 2 16 Gage | 125 | 185 | 245 | 315 |
| | 3/8 | 1 3/8 | 8d (2 1/2″ ×0.131″common, 2 1/2″ ×0.113″galvanized box) | 230[d] | 360[d] | 460[d] | 610[d] | 10d (3″ ×0.148″common, 3″ ×0.128″galvanized box) | 280 | 430 | 550[f] | 730 |
| | | 1 | 1 1/2 16 Gage | 155 | 235 | 315 | 400 | 2 16 Gage | 155 | 235 | 310 | 400 |
| | 7/16 | 1 3/8 | 8d (2 1/2″ ×0.131″common, 2 1/2″ ×0.113″galvanized box) | 255[d] | 395[d] | 505[d] | 670[d] | 10d (3″ ×0.148″common, 3″ ×0.128″galvanized box) | 280 | 430 | 550[f] | 730 |
| | | 1 | 1 1/2 16 Gage | 170 | 260 | 345 | 440 | 2 16 Gage | 155 | 235 | 310 | 400 |
| | 15/32 | 1 3/8 | 8d (2 1/2″ ×0.131″common, 2 1/2″ ×0.113″galvanized box) | 280 | 430 | 550 | 730 | 10d (3″ ×0.148″common, 3″ ×0.1218″galvanized box) | 280 | 430 | 550[f] | 730 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1 | $1^1/_2$16 Gage | 185 | 280 | 375 | 475 | 2 16 Gage | 155 | 235 | 300 | 400 |
| | | $1^1/_2$ | 10d (3″ ×0.148″common, 3″ ×0.128″galvanized box) | 340 | 510 | 665[f] | 870 | 10d (3″ ×0.148″common, 3″ ×0.128″galvanized box) | — | — | — | — |
| Sheathing, plywood siding[g] except Group 5 Species | $^5/_{16}$or$^1/_4$[c] | $1^1/_4$ | 6d (2″ ×0.113″common, 2″ ×0.099″galvanized box) | 180 | 270 | 350 | 450 | 8d ($2^1/_2$″ ×0.131″common, $2^1/_2$″ ×0.113″galvanized box) | 180 | 270 | 350 | 450 |
| | | 1 | $1^1/_2$16 Gage | 145 | 220 | 295 | 375 | 2 16 Gage | 110 | 165 | 220 | 285 |
| | $^3/_8$ | $1^1/_4$ | 6d (2″ ×0.113″common, 2″ ×0.099″galvanized box) | 200 | 300 | 390 | 510 | 8d ($2^1/_2$″ ×0.131″common, $2^1/_2$″ ×0.113″galvanized box) | 200 | 300 | 390 | 510 |
| | | $1^3/_8$ | 8d ($2^1/_2$″ ×0.131″common, $2^1/_2$″ ×0.113″galvanized box) | 220[d] | 320[d] | 410[d] | 530[d] | 10d (3″ ×0.148″common, 3″ ×0.128″galvanized box) | 260 | 380 | 490[f] | 640 |
| | | 1 | $1^1/_2$16 Gage | 140 | 210 | 280 | 360 | 2 16 Gage | 140 | 210 | 280 | 360 |
| | $^7/_{16}$ | $1^3/_8$ | 8d ($2^1/_2$″ ×0.131″common, $2^1/_2$″ ×0.113″galvanized box) | 240[d] | 350[d] | 450[d] | 585[d] | 10d (3″ ×0.148″common, 3″ ×0.128″galvanized box) | 260 | 380 | 490[f] | 640 |
| | | 1 | $1^1/_2$16 Gage | 155 | 230 | 310 | 395 | 2 16 Gage | 140 | 210 | 280 | 360 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $^{15}/_{32}$ | $1^{3}/_{8}$ | 8d ($2^{1}/_{2}$″ ×0.131″common, $2^{1}/_{2}$″ ×0.113″galvanized box) | 260 | 380 | 490 | 640 | 10d (3″ ×0.148″common, 3″ ×0.128″galvanized box) | 260 | 380 | 490[f] | 640 |
| | | $1^{1}/_{2}$ | 10d (3″ ×0.148″common, 3″ ×0.128” galvanized box) | 310 | 460 | 600[f] | 770 | — | — | — | — | — |
| | | 1 | $1^{1}/_{2}$16 Gage | 170 | 255 | 335 | 430 | 2 16 Gage | 140 | 210 | 280 | 360 |
| | $^{19}/_{32}$ | $1^{1}/_{2}$ | 10d (3″ ×0.148″common, 3″ ×0.128″galvanized box) | 340 | 510 | 665[f] | 870 | — | — | — | — | — |
| | | 1 | $1^{3}/_{4}$16 Gage | 185 | 280 | 375 | 475 | — | — | — | — | — |
| | | | Nail Size (galvanized casing) | | | | | Nail Size (galvanized casing) | | | | |
| | $^{5}/_{16}$[c] | $1^{1}/_{4}$ | 6d (2″ ×0.099″) | 140 | 210 | 275 | 360 | 8d ($2^{1}/_{2}$″ ×0.113″) | 140 | 210 | 275 | 360 |
| | $^{3}/_{8}$ | $1^{3}/_{8}$ | 8d ($2^{1}/_{2}$″ ×0.113″) | 160 | 240 | 310 | 410 | 10d (3″ ×0.128″) | 160 | 240 | 310[f] | 410 |

*(continued)*

**Notes to Table 2306.3**

For SI: 1 inch = 25.4 mm, 1 pound per foot = 14.5939 N/m.

a. For framing of other species: (1) Find specific gravity for species of lumber in AF&PA NDS. (2) For staples find shear value from table above for Structural I panels (regardless of actual grade) and multiply value by 0.82 for species with specific gravity of 0.42 or greater, or 0.65 for all other species. (3) For nails find shear value from table above for nail size for actual grade and multiply value by the following adjustment factor: Specific Gravity Adjustment Factor = [1-(0.5 - SG)], where SG = Specific Gravity of the framing lumber. This adjustment factor shall not be greater than 1.

b. Panel edges backed with 2-inch nominal or wider framing. Install panels either horizontally or vertically. Space fasteners maximum 6 inches on center along intermediate framing members for $^{3}/_{8}$-inch and $^{7}/_{16}$-inch panels installed on studs spaced 24 inches on center. For other conditions and panel thickness, space fasteners maximum 12 inches on center on intermediate supports.

c. $^{3}/_{8}$-inch panel thickness or siding with a span rating of 16 inches on center is the minimum recommended where applied direct to framing as exterior siding.

d. Allowable shear values are permitted to be increased to values shown for $^{15}/_{32}$-inch sheathing with same nailing provided (a) studs are spaced a maximum of 16 inches on center, or (b) panels are applied with long dimension across studs.

e. Framing at adjoining panel edges shall be 3 inches nominal or wider, and nails shall be staggered where nails are spaced 2 inches on center.

f. Framing at adjoining panel edges shall be 3 inches nominal or wider, and nails shall be staggered where both of the following conditions are met: (1) 10d (3″ × 0.148″) nails having penetration into framing of more than 1 $^{1}/_{2}$ inches and (2) nails are spaced 3 inches on center.

g. Values apply to all-veneer plywood. Thickness at point of fastening on panel edges governs shear values.

h. Where panels applied on both faces of a wall and nail spacing is less than 6 inches o.c. on either side, panel joints shall be offset to fall on different framing members, or framing shall be 3-inch nominal or thicker at adjoining panel edges and nails on each side shall be staggered.

i. In Seismic Design Category D, E or F, where shear design values exceed 350 pounds per linear foot, all framing members receiving edge nailing from abutting panels shall not be less than a single 3-inch nominal member, or two 2-inch nominal members fastened together in accordance with Section 2306.1 to transfer the design shear value between framing members. Wood structural panel joint and sill plate nailing shall be staggered in all cases. See Section 2305.3.11 for sill plate size and anchorage requirements.

j. Galvanized nails shall be hot dipped or tumbled.

k. Staples shall have a minimum crown width of $^{7}/_{16}$ inch and shall be installed with their crowns parallel to the long dimension of the framing members.

l. For shear loads of normal or permanent load duration as defined by the AF&PA NDS, the values in the table above shall be multiplied by 0.63 or 0.56, respectively.

*m.* ***[OSHPD 1, 2, and 4]*** *Refer to Section 2305.1.3 ~~2305.2.4.2~~, which requires any wood structural panel sheathing used for diaphragms and shear walls that are part of the seismic force-resisting system to be applied directly to framing members.*

**...**

**2306.4 Lumber sheathed shear walls.** Single and double diagonally sheathed lumber shear walls shall be designed and constructed in accordance with AF&PA SDPWS. Single and double diagonally sheathed lumber walls shall not be used to resist seismic forces in structures assigned to *Seismic Design Category* E or F.

***Additional Requirements: [O]*** *Single and double diagonally sheathed lumber walls shall not be used to resist seismic forces in structures assigned to Seismic Design Category D.*

**2306.5 Particleboard shear walls.** Particleboard shear walls shall be designed and constructed in accordance with AF&PA SDPWS. Particleboard shear walls shall be permitted to resist horizontal forces using the allowable shear capacities set forth in Table 2306.5. Allowable capacities in Table 2306.5 are permitted to be increased 40 percent for wind design. Particleboard shall not be used to resist seismic forces in structures assigned to *Seismic Design Category* D, E or F.

**2306.6 Fiberboard shear walls.** Fiberboard shear walls shall be designed and constructed in accordance with AF&PA SDPWS. Fiberboard shear walls are permitted to resist horizontal forces using the allowable shear capacities set forth in Table 2306.6. Allowable capacities in Table 2306.6 are permitted to be increased 40 percent for wind design. Fiberboard shall not be used to resist seismic forces in structures assigned to *Seismic Design Category* D, E or F.

**2306.7 Shear walls sheathed with other materials.** Shear walls sheathed with portland cement plaster, gypsum lath, gypsum sheathing or gypsum board shall be designed and constructed in accordance with AF&PA SDPWS. Shear walls sheathed with these materials are permitted to resist horizontal forces using the allowable shear capacities set forth in Table 2306.7. Shear walls sheathed with portland cement plaster, gypsum lath, gypsum sheathing or gypsum board shall not be used to resist seismic forces in structures assigned to Seismic Design Category E or F.

***Exception: [OSHPD 1, 2, and 4]*** ~~*Section 2306.4.5 not permitted by OSHPD.*~~ *Shear walls sheathed with portland cement plaster, gypsum lath, gypsum sheathing or gypsum board shall not be used to resist seismic forces in structures assigned to Seismic Design Category D.*

**…**

**SECTION 2308**
**CONVENTIONAL LIGHT-FRAME CONSTRUCTION**

**2308.1 General.** The requirements of this section are intended for conventional light-frame construction. Other methods are permitted to be used, provided a satisfactory design is submitted showing compliance with other provisions of this code. Interior nonload-bearing partitions, ceilings and curtain walls of conventional light-frame construction are not subject to the limitations of this section. Alternatively, compliance with AF&PA WFCM shall be permitted subject to the limitations therein and the limitations of this code. Detached one- and two-family dwellings and multiple single-family dwellings (townhouses) not more than three stories above grade plane in height with a separate means of egress and their accessory structures shall comply with the *International Residential Code*.

**2308.1.1 Portions exceeding limitations of conventional construction.** When portions of a building of otherwise conventional construction exceed the limits of Section 2308.2, these portions and the supporting load path shall be designed in accordance with accepted engineering practice and the provisions of this code. For the purposes of this section, the term “portions” shall mean parts of buildings containing volume and area such as a room or a series of rooms.

**2308.2 Limitations.** Buildings are permitted to be constructed in accordance with the provisions of *conventional light-frame construction*, subject to the following limitations, and to further limitations of Sections 2308.11 and 2308.12.

1. Buildings shall be limited to a maximum of three *stories above grade plane*. For the purposes of this section, for buildings in *Seismic Design Category* D or E as determined in Section 1613, cripple stud walls shall be considered to be a *story*.

**Exception:** Solid blocked cripple walls not exceeding 14 inches (356 mm)in height need not be considered a *story*.

2. Maximum floor-to-floor height shall not exceed 11 feet 7 inches (3531 mm). Bearing wall height shall not exceed a stud height of 10 feet (3048 mm).

3. Loads as determined in Chapter 16 shall not exceed the following:

3.1. Average dead loads shall not exceed 15 psf (718 N/m2) for combined roof and ceiling, exterior walls, floors and partitions.

**Exceptions:**

1. Subject to the limitations of Sections 2308.11.2 and 2308.12.2, stone or masonry veneer up to the lesser of 5 inches (127 mm) thick or 50 psf (2395 N/m2) and installed in accordance with Chapter 14 is permitted to a height of 30 feet (9144 mm) above a noncombustible foundation, with an additional 8 feet (2438 mm) permitted for gable ends.
2. Concrete or masonry fireplaces, heaters and chimneys shall be permitted in accordance
with the provisions of this code.

3.2. Live loads shall not exceed 40 psf (1916 N/m2) for floors.
3.3. Ground snow loads shall not exceed 50 psf (2395 N/m2).

4. Wind speeds shall not exceed 100 miles per hour (mph) (44 m/s) (3-second gust).

**Exception:** Wind speeds shall not exceed 110 mph (48.4 m/s) (3-second gust) for buildings in Exposure Category B that are not located in a *hurricane-prone region*.

5. Roof trusses and rafters shall not span more than 40 feet (12 192 mm) between points of vertical support.

6. The use of the provisions for *conventional light-frame construction* in this section shall not be permitted for *Occupancy Category* IV buildings assigned to *Seismic Design Category* B, C, D, E or F, as determined in Section 1613.

7. *Conventional light-frame construction* is limited in irregular structures in *Seismic Design Category* D or E, as specified in Section 2308.12.6.

*8.* ***[OSHPD ~~1,~~ 2 ~~and 4~~]*** *The use of conventional light-frame construction provisions in this section is permitted, subject to the following conditions:*

*8.1. The design and construction shall also comply with Section 2304 and Section 2305.*

*8.2. In conjunction with the use of provisions in Section 2308.3 (Braced Wall Lines), engineering analysis shall be furnished that demonstrates compliance of lateral-force-resisting systems with Section 2305.*

*8.3. In addition to the use of provisions in Section 2308.8 (Floor Joists), engineering analysis shall be furnished that demonstrates compliance of floor framing elements and connections with Section 2301.2, Item 1 or 2.*

*8.4. In addition to the use of provisions in Section 2308.9 (Wall Framing), engineering analysis shall be furnished that demonstrates compliance of wall framing elements and connections with Section 2301.2, Item 1 or 2.*

*8.5. In addition to the use of provisions in Section 2308.10 (Roof and Ceiling Framing), engineering analysis shall be furnished demonstrating compliance of roof and ceiling framing elements and connections with Section 2301.2, Item 1 or 2.*

*(All existing amendments that are not revised above shall continue without any change)*

**NOTATION:**

- *Authority: Health and Safety Code Section 130005(g) & 130021*

- *Reference: Health and Safety Code Section 1275, 129790, 129850 & 130005(g)*

## CHAPTER 24
## GLASS AND GLAZING

### SECTION 2401
### GENERAL

**2401.1 Scope.** The provisions of this chapter shall govern the materials, design, construction and quality of glass, light- transmitting ceramic and light-transmitting plastic panels for exterior and interior use in both vertical and sloped applications in buildings and structures.

***…***

### SECTION 2403
### GENERAL REQUIREMENTS FOR GLASS

**2403.1 Identification.** Each pane shall bear the manufacturer's mark designating the type and thickness of the glass or glazing material. The identification shall not be omitted unless approved and an affidavit is furnished by the glazing contractor certifying that each light is glazed in accordance with approved construction documents that comply with the provisions of this chapter. Safety glazing shall be identified in accordance with Section 2406.2.

Each pane of tempered glass, except tempered spandrel glass, shall be permanently identified by the manufacturer. The identification mark shall be acid etched, sand blasted, ceramic fired, laser etched, embossed or of a type that, once applied, cannot be removed without being destroyed.

Tempered spandrel glass shall be provided with a removable paper marking by the manufacturer.

> ~~***2403.1.1 Additional Requirements.*** ***[OSHPD 1 and 4]*** *Each light of safety glazing material installed in hazardous locations as defined in Section 2406 of this chapter shall be identified by a label which will specify the labeler, whether the manufacturer or installer, and state that safety glazing material has been utilized in such installations. The label shall be legible and visible from the inside of the building after installation and shall specify that the label shall not be removed.*~~

**2403.2 Glass supports.** Where one or more sides of any pane of glass are not firmly supported, or are subjected to unusual load conditions, detailed construction documents, detailed shop drawings and analysis or test data assuring safe performance for the specific installation shall be prepared by a registered design professional.

> ***2403.2.1 Additional Requirements. [OSHPD 1 and 4]*** *In addition to the requirements of Section 2403.2, glass supports shall comply with the following:*
>
> 1. *The construction documents and analysis or test data required per Section 2403.2 shall be submitted to the enforcement agency for approval.*
>
> *2. Glass firmly supported on all four edges shall be glazed with minimum laps and edge clearances set forth in Table 2403.2.1.*

***TABLE 2403.2.1 [OSHPD 1 and 4]***
***MINIMUM GLAZING REQUIREMENTS***

| ***Fixed Windows and Openable Windows Other Than Horizontal Siding*** | | | | | |
|---|---|---|---|---|---|
| ***GLASS AREA*** | ***UP TO 6 SQ. FT.*** | ***6 TO 14 SQ. FT.*** | ***14 TO 32 SQ. FT.*** | ***32 TO 50 SQ. FT.*** | ***OVER 50 SQ. FT.*** |
| ***× 0.0929 for m$^2$, × 25.4 for mm*** | | | | | |
| *1.Minimum Frame Lap* | *1/4"* | *1/4"* | *5/16"* | *3/8"* | *1/2"* |
| *2.Minimum Glass Edge Clearance* | *1/8"[1,2]* | *1/8"[1,2]* | *3/16"[1]* | *1/4"* | *1/4"[1]* |
| *3. Continuous Glazing Rabbet and Glass Retainer[3]* | *Required* | | | | |
| *4. Resilient Setting Material[4]* | *Not Required* | *Required* | | | |
| *Sliding Doors and Horizontal Sliding Windows* | | | | | |
| *GLASS AREA* | | *UP TO 14 SQ. FT.* | *14 TO 32 SQ. FT.* | *32 TO 50 SQ. FT.* | *OVER 50 SQ. FT.* |
| *× 0.0929 for m$^2$, × 25.4 for mm* | | | | | |
| *5.Minimum Glass Frame Lap* | | *1/4"* | *5/16"* | *3/8"* | *1/2"* |
| *6.Minimum Glass Edge Clearance* | | *1/8"[2]* | *3/16"* | *1/4"* | *1/4"* |
| *7. Continuous Glazing Rabbet and Glass Retainer[3]* | | *Required above third story* | *Required* | | |
| *8. Resilient Setting Material[4]* | | *Not Required* | | *Required* | |

*[1] Glass edge clearance in fixed openings shall not be less than required to provide for wind and earthquake drift.*

*[2] Glass edge clearance at all sides of pane shall be a minimum of 3/16 inch (4.8 mm) where height of glass exceeds 3 feet (914 mm).*

*[3] Glass retainers such as metal, wood or vinyl face stops, glazing beads, gaskets, glazing clips and glazing channels shall be of sufficient strength and fixation to serve this purpose.*

*[4] Resilient setting material shall include preformed rubber or vinyl plastic gaskets or other materials which are proved to the satisfaction of the building official to remain resilient.*

**...**

***~~2403.6 Additional Requirements. [OSHPD 1 and 4]~~*** *~~Glazing materials shall meet the requirements of Table 2403.6.~~*

***~~TABLE 2403.6 [OSHPD 1 and 4]~~***
***~~ADDITIONAL REQUIREMENTS FOR GLAZING MATERIALS~~***

| ***~~GLAZING MATERIALS~~*** | ***~~SIZE OF INDIVIDUAL GLAZED AREA~~*** | ***~~REQUIREMENTS~~*** |
|---|---|---|
| *~~Annealed glass (regular plate, float, sheet, rolled or obscure)~~* | *~~Over 6 square feet (0.56 m$^2$)~~* | *~~Not less than 3/16 inch (4.8 mm) nominal thickness. Each glazed area must be protected by protective grille or push bar[1] firmly attached to stiles on each exposed side.~~* |
| *~~Annealed glass (regular plate, float, sheet, rolled or obscure) face sandblasted, etched or otherwise Depreciated~~* | *~~Over 6 square feet (0.56 m$^2$)~~* | *~~Not less than 7/32 inch (5.6 mm) nominal thickness. Each glazed area must be protected by protective grille or push bar1 firmly attached to stiles on each exposed side.~~* |
| *~~Fully tempered glass~~*<br>*~~Laminated glass~~*<br>*~~Wire glass (obscure, patterned or transparent)~~* | *~~All sizes~~* | *~~Shall pass the text requirements of ANSI Z97.1.~~* |

| | | |
|---|---|---|
| ~~Transparent rigid plastic~~ | | |

~~[4] Shall be constructed and attached in such a manner so as to limit or prevent human impact from being delivered to glass surface.~~

**…**

***SECTION 2406***
***SAFETY GLAZING***

**2406.1 Human impact loads.** Individual glazed areas, including glass mirrors, in hazardous locations as defined in Section 2406.3 shall comply with Sections 2406.1.1 through 2406.1.5.

**…**

~~**2406.1.5 Additional Requirements. [OSHPD 1 and 4]** In additional to the requirements of Section 2406.1, glazing shall also comply with Tables 2403.6 and 2406.1.5.~~

~~**TABLE 2406.1.5 [OSHPD 1 and 4]**~~
~~**IMPACT LOADS - GLAZING**~~

| ~~**SPECIFIC HAZARDOUS LOCATIONS**~~ | ~~**SIZE OF INDIVIDUAL GLAZED AREA**~~ | ~~**REQUIREMENTS [1,2]**~~ |
|---|---|---|
| ~~Glazing in exit and entrance doors and fixed glazed panels~~ | ~~Over 6 square feet (0.56 $m^2$)~~ | ~~Each glazed area shall pass the test requirements of ANSI Z97.1 if not protected by a protective grille or push bar[3] firmly attached to stiles on each exposed side~~ |
| ~~Glazing in storm doors~~ | ~~Over 2 square feet (0.186 $m^2$)~~ | ~~Each glazed area shall pass the test requirements of ANSI Z97.1 if not protected by a protective grille firmly attached to stiles on each exposed side.~~ |
| ~~Glazing in sliding doors (both fixed and sliding panels)~~ | ~~Over 6 square feet (0.56 $m^2$)~~ | ~~Each glazed area shall pass the test requirements of ANSI Z97.1.~~ |
| ~~Glass in all unframed doors (swinging)~~ | ~~All sizes~~ | ~~Shall be fully tempered glass and pass the test requirements of ANSI Z97.1.~~ |
| ~~Glazing in shower doors and tub enclosures~~ | ~~All sizes~~ | ~~Shall pass the test requirements of ANSI Z97.1.~~ |

~~[1] Annealed glass less than single strength (SS) in thickness shall not be used.~~

~~[2] If short dimension is larger than 24 inches (610 mm), annealed glass must be doubled strength (DS) or thicker.~~

~~[3] Shall be constructed and attached in such a manner so as to limit or prevent human impact from being delivered to glass surface.~~

**…**

*(All existing amendments that are not revised above shall continue without any change)*

***Notation:***
*Authority: Health and Safety Code Section 129850*
*Reference: Health and Safety Code Sections 1275, 129850 and 129790*

## CHAPTER 25
## GYPSUM BOARD AND PLASTER

### SECTION 2501
### GENERAL

**2501.1 Scope.**

**2501.1.1 General.** Provisions of this chapter shall govern the materials, design, construction and quality of gypsum board, lath, gypsum plaster and cement plaster.

**2501.1.2 Performance.** Lathing, plastering and gypsum board construction shall be done in the manner and with the materials specified in this chapter, and when required for fire protection, shall also comply with the provisions of Chapter 7.

**2501.1.3 Other materials.** Other approved wall or ceiling coverings shall be permitted to be installed in accordance with the recommendations of the manufacturer and the conditions of approval.

***2501.2 Additional Requirements. [OSHPD 1 and 4]*** *Details of attachment for wall and ceiling coverings which are not provided for in these regulations shall be detailed in the approved construction documents. ~~plans and specifications.~~*

**…**

### SECTION 2503
### INSPECTION

**2503.1 Inspection.** Lath and gypsum board shall be inspected in accordance with Section 109.3.5.

***2503.2 Additional requirements for inspection and testing. [OSHPD 1 and 4]***

*1. Lath and gypsum board shall be inspected in accordance with ~~Appendix~~ Chapter 17A and Title 24, Part 1.*

*2. No lath or gypsum wallboard or their attachments shall be covered or finished until it has been inspected and approved by the inspector of record and/or special inspector.*

*3. The enforcement agency may require tests ~~to be made~~ in accordance with Table 2506.2 ~~approved standards~~ to determine compliance with the provisions of these regulations.*

*4. The testing of gypsum and gypsum products shall conform with standards listed in Table 2506.2.*

**…**

### SECTION 2504
### VERTICAL AND HORIZONTAL ASSEMBLIES

**2504.1 Scope.** The following requirements shall be met where construction involves gypsum board, lath and plaster in vertical and horizontal assemblies.

**2504.1.1 Wood framing.** Wood supports for lath or gypsum board, as well as wood stripping or furring, shall not be less than 2 inches (51 mm) nominal thickness in the least dimension.

**Exception:** The minimum nominal dimension of wood furring strips installed over solid backing shall not be less than 1 inch by 2 inches (25 mm by 51 mm).

**2504.1.2 Studless partitions.** The minimum thickness of vertically erected studless solid plaster partitions of $^{3}/_{8}$-inch (9.5 mm) and $^{3}/_{4}$-inch (19.1 mm) rib metal lath or $^{1}/_{2}$-inch-thick (12.7 mm) long-length gypsum lath and gypsum board partitions shall be 2 inches (51 mm).

***2504.2 Additional Requirements. [OSHPD 1 and 4]*** *In addition to the requirements of this section, the horizontal and vertical assemblies of plaster or gypsum board shall be designed to resist the loads specified in Chapter 16A of this code. For wood framing, see Chapter 23. For metal framing, see Chapter 22A. For suspended acoustical ceiling systems, see Section 2506. For gypsum construction see Section 2508.*

***2504.2.1 Wood Furring Strips.*** *Wood furring strips for ceilings fastened to floor or ceiling joist shall be nailed at each bearing with two common wire nails, one of which shall be a slant nail and the other a face nail, or by one nail having spirally grooved or annular grooved shanks approved by the enforcement agency for this purpose. All stripping nails shall penetrate not less than 1 3/4 inches (44.5 mm) into the member receiving the point. Holes in stripping at joints shall be subdrilled to prevent splitting.*

*Where common wire nails are used to support horizontal wood stripping for plaster ceilings, such stripping shall be wire tied to the joists 4 feet (1219 mm) on center with two strands of No. 18 W&M gage galvanized annealed wire to an 8d common wire nail driven into each side of the joist 2 inches (51 mm) above the bottom of the joist or to each end of a 16d common wire nail driven horizontally through the joist 2 inches (51 mm) above the bottom of the joist, and the ends of the wire secured together with three twists of the wire.*

## SECTION 2505
## SHEAR WALL CONSTRUCTION

**2505.1 Resistance to shear (wood framing).** Wood-framed shear walls sheathed with gypsum board, lath and plaster shall be designed and constructed in accordance with Section 2306.4 and are permitted to resist wind and seismic loads. Walls resisting seismic loads shall be subject to the limitations in Section 12.2.1 of ASCE 7.

**2505.2 Resistance to shear (steel framing).** Cold-formed steel-framed shear walls sheathed with gypsum board and constructed in accordance with the materials and provisions of Section 2210.5 are permitted to resist wind and seismic loads. Walls resisting seismic loads shall be subject to the limitations in Section 12.2.1 of ASCE 7.

***2505.3 [OSHPD 1, 2, and 4]*** *Section 2505.1 and 2505.2 are not permitted by OSHPD.*

## SECTION 2506
## GYPSUM BOARD MATERIALS

**2506.1 General.** Gypsum board materials and accessories shall be identified by the manufacturer's designation to indicate compliance with the appropriate standards referenced in this section and stored to protect such materials from the weather.

**…**

**2506.2.1 Other materials.** Metal suspension systems for acoustical and lay-in panel ceilings shall conform with ASTM C 635 listed in Chapter 35 and Section 13.5.6 of ASCE 7 for installation in high seismic areas.

~~***2506.2.1.1 Additional Requirements. [OSHPD 1 and 4]*** *In addition to the requirements of Section 2506.2.1 metal suspension systems shall comply with Section 13.5.6 of ASCE 7 as modified in Section 1614A.*~~

## SECTION 2507
## LATHING AND PLASTERING

**2507.1 General.** Lathing and plastering materials and accessories shall be marked by the manufacturer's

designation to indicate compliance with the appropriate standards referenced in this section and stored in such a manner to protect them from the weather.

**2507.2 Standards.** Lathing and plastering materials shall conform to the standards listed in Table 2507.2 and Chapter 35 and, where required for fire protection, shall also conform to the provisions of Chapter 7.

**…**

***2507.3 Lath attachment to horizontal wood supports. [OSHPD 1 and 4]*** *Where interior or exterior lath is attached to horizontal wood supports, either of the following attachments shall be used in addition to the methods of attachment described in referenced standards listed in Table 2507.2.*

1. *Secure lath to alternate supports with ties consisting of a double strand of No. 18 W & M gage galvanized annealed wire at one edge of each sheet of lath. Wire ties shall be installed not less than 3 inches (76 mm) back from the edge of each sheet and shall be looped around stripping, or attached to an 8d common wire nail driven into each side of the joist 2 inches (51 mm) above the bottom of the joist or to each end of a 16d common wire nail driven horizontally through the joist 2 inches (51 mm) above the bottom of the joist and the ends of the wire secured together with three twists of the wire.*

2. *Secure lath to each support with 1/2-inch-wide (12.7 mm), 1 1/2-inch-long (38mm) No. 9 W & M gage, ring shank, hook staple placed around a 10d common nail laid flat under the surface of the lath not more than 3 inches (76 mm) from edge of each sheet. Such staples may be placed over ribs of 3/8-inch (9.5 mm) rib lath or over back wire of welded wire fabric or other approved lath, omitting the 10d nails.*

## SECTION 2508
## GYPSUM CONSTRUCTION

**2508.1 General.**

**…**

**2508.5.4 Fasteners.** Fasteners used for the attachment of gypsum board to a horizontal diaphragm ceiling shall be as defined in Table 2508.5. Fasteners shall be spaced not more than 7 inches (178 mm) on center (o.c.) at all supports, including perimeter blocking, and not more than $^{3}/_{8}$ inch (9.5 mm) from the edges and ends of the gypsum board.

**2508.5.5 Lateral force restrictions.** Gypsum board shall not be used in diaphragm ceilings to resist lateral forces imposed by, masonry or concrete construction.

***2508.5.6 Diaphragm ceiling connection to partitions. [OSHPD 1 and 4]*** *Gypsum board shall not be used in diaphragm ceilings to resist lateral forces imposed by partitions. Connection of diaphragm ceiling to the vertical lateral force resisting elements shall be designed and detailed to transfer lateral forces.*

## SECTION 2510
## LATHING AND FURRING FOR CEMENT PLASTER (STUCCO)

**2510.1 General.**

**…**

**2510.7 Preparation of masonry and concrete.** Surfaces shall be clean, free from efflorescence, sufficiently damp and rough for proper bond. If the surface is insufficiently rough, approved bonding agents or a portland cement dash bond coat mixed in proportions of not more than two parts volume of sand to one part

volume of portland cement or plastic cement shall be applied. The dash bond coat shall be left undisturbed and shall be moist cured not less than 24 hours.

***2510.7.1 Additional Requirements. [OSHPD 1 and 4]*** *Bonding agents shall conform with the provisions of United States Government Military Specifications MIL-B-19235.*

**…**

*(All existing amendments are continued without any change)*

***Notation:***
*Authority: Health and Safety Code Section 129850*
*Reference: Health and Safety Code Sections 1275, 129850 and 129790*

## CHAPTER 33
## SAFEGUARD DURING CONSTRUCTION

***…***

### SECTION 3301 - GENERAL

**3301.1 Scope.** The provisions of this chapter shall govern safety during construction and the protection of adjacent public and private properties.

***…***

### SECTION 3307 - PROTECTION OF ADJOINING PROPERTY

***…***

***3307.2 Protection of Adjoining Property. [OSHPD 1, 2 and 4]*** *The requirements for protection of adjacent property and depth to which protection is required shall be as defined in Section 832, Civil Code.*

*The owner or governing board shall be responsible to retain the services of a structural engineer and a geotechnical engineer to review the design of the support system for foundations of the existing buildings, or soil supporting any portion of the building. Where the underpinning or support system provides for the stability of the foundations of an existing hospital, or essential services building, the system shall be designed and constructed to conform to all requirements of these regulations.*

***3307.3 Protection of Existing Buildings. [OSHPD 1, 2 and 4]*** *Where excavation for new construction affects the stability of the foundations or any portion of such existing building, a support system shall be provided. Such systems shall be considered a structural alteration to the existing building and shall be designed and constructed to conform to these regulations.*

***…***

*(All existing amendments that are not revised above shall continue without any change)*

***Notation:***
*Authority: Health and Safety Code Section 129850*
*Reference: Health and Safety Code Sections 1275, 129850 and 129790*

## CHAPTER 34
## EXISTING STRUCTURES

### SECTION 3401
### GENERAL

**3401.1 Scope.** The provisions of this Chapter shall control the alteration, repair, addition and change of occupancy of existing structures.

**…**

**3401.4 Alternative compliance.** Work performed in accordance with the *International Existing Building Code* shall be deemed to comply with the provisions of this chapter.

***Exception: [OSHPD 2 & 3]*** *Section 3401.4 not permitted by OSHPD.*

***3401.5*** ***~~3403.2.3.3~~*** **Adoption of ASCE 41: [OSHPD 2 & 3]** *All additions, alterations, repairs and seismic retrofit to the existing structures or portions thereof may be designed ~~and constructed~~ in accordance with the provisions of ASCE 41, as modified herein.*

***3401.5.1*** ***~~3403.2.3.3.1~~*** **Referenced Standards.** *All reference standards listed in ASCE 41 shall be replaced by referenced standards listed in Chapter 35 of this code and shall include all amendments to the reference standards in this code.*

***3401.5.2*** ***~~3403.2.3.3.2~~*** **ASCE 41 Section 1.4 –Rehabilitation Objectives.** *Target building performance level shall be Life Safety (LS) Building Performance Level (3-C) as defined in Section 1.5.3.3 at Basic Safety Earthquake 1 (BSE-1) Seismic Hazard Level as defined in section 1.6.1.2 for Occupancy Category II Structures and Basic Safety Objective (BSO) Level as defined in Section 1.4.1 for Occupancy Category III Structures.*

*Occupancy Category IV structures shall satisfy Immediate Occupancy (IO) Building Performance Level of (1-B) as defined in Section 1.5.3.2 at Basic Safety Earthquake 1 (BSE-1) Seismic Hazard Level as defined in Section 1.6.1.2 and Collapse Prevention (CP) building performance level (5-E) per Section 1.5.3.4 at Basic Safety Earthquake 2 (BSE-2) Seismic Hazard Level as defined in Section 1.6.1.1.*

***3401.5.3*** ***~~3403.2.3.3.3~~*** **ASCE 41 Section 1.6 - Seismic Hazard.** *- Response spectra and acceleration time histories shall be constructed in accordance with sections 1613~~,~~ and 1803.7. ~~1802.7, & 1802.8.~~*

***3401.5.4*** ***~~3403.2.3.3.4~~*** **Analysis Procedure.** *The selection of a particular analysis procedure from ASCE 41 may be subject to the approval of the enforcement agent.*

***3401.5.5*** ***~~3403.2.3.3.5~~*** **Structural Design Criteria.** *Prior to implementation of ASCE 41 non-linear dynamic procedures – the ground motion, analysis and design methods, material assumptions and acceptance criteria proposed by the engineer shall be reviewed by the enforcement agent.*

***3401.5.6*** ***~~3403.2.3.3.6~~*** **Structural observation, testing, and inspections.** *Construction, testing, inspection, and structural observation requirements shall be as required for new construction.*

### SECTION 3402
### DEFINITIONS

**3402.1 Definitions.**

**…**

**SECTION 3412**
**COMPLIANCE ALTERNATIVES**

**….**

**3410.2 Applicability.** Structures existing prior to *January 1, 2011* ~~*2008*~~, in which there is work involving additions, alterations or changes of occupancy shall be made to conform to the requirements of this section or the provisions of Sections 3403 through 3409. The provisions in Sections 3412.2.1 through 3412.2.5 shall apply to existing occupancies that will continue to be, or are proposed to be, in Groups A, B, E, F, M, R, S and U. These provisions shall not apply to buildings with occupancies in Group H or I.

**...**

*(All existing amendments that are not revised above shall continue without any change)*

***Notation:***
*Authority: Health and Safety Code Section 129850*
*Reference: Health and Safety Code Sections 1275 and 129850*

## CHAPTER 34A
## EXISTING STRUCTURES

### SECTION 3401A
### GENERAL

**3401*A*.1 Scope.** The provisions of this chapter shall control the alteration, repair, addition and change of occupancy of existing structures *for applications listed in Sections ~~110.1~~ 1.10.1 (OSHPD 1), and ~~110.4~~ 1.10.4 (OSHPD 4) regulated by the Office of Statewide Health Planning and Development (OSHPD).*

*These applications include hospitals, skilled nursing facilities, intermediate care facilities, and correctional treatment centers.*

> ***Exception: [OSHPD 2]*** *Single-story Type V skilled nursing or intermediate care facilities utilizing wood-frame or light-steel-frame construction as defined in Health and Safety Code Section 129725, which shall comply with Chapter 34 and any applicable amendments therein.*

**...**

~~**3401.4 Alternative compliance.** Work performed in accordance with the *International Existing Building Code* shall be deemed to comply with the provisions of this chapter.~~

**...**

### SECTION 3402*A*
### DEFINITIONS

**3402*A*.1 Definitions.** The following words and terms shall, for the purposes of this chapter and as used elsewhere in the code, have the meanings shown herein. *Definition provided in section 1613A.2, ASCE 7 Section 11.2 and ASCE 41 shall apply when appropriate in addition to terms defined in this section*:

~~***APPROVED EXISTING BUILDING****. Any building originally constructed in compliance with the requirements of 1973 or subsequent edition of California Building Code.*~~

***ASSOCIATED STRUCTURAL ALTERATIONS*** *means any change affecting existing structural elements or requiring new structural elements for vertical or lateral support of an otherwise nonstructural alteration.*

**DANGEROUS.** Any building or structure or portion thereof that meets any of the conditions described below shall be deemed dangerous:

> 1. The building or structure has collapsed, partially collapsed, moved off its foundation or lacks the support of ground necessary to support it.
> 2. There exists a significant risk of collapse, detachment or dislodgment of any portion, member, appurtenance or ornamentation of the building or structure under service loads.

***GENERAL ACUTE CARE HOSPITAL*** *as used in this chapter means a hospital building as defined in Section 129725 of the Health and Safety Code and that is also licensed pursuant to subdivision (a) of Section 1250 of the Health and Safety Code, but does not include these buildings if the beds licensed pursuant to subdivision (a) of Section 1250 of the Health and Safety Code, comprise 10 percent or less of the total licensed beds of the total physical plant, and does not include facilities owned or operated, or both, by the Department of Corrections. It also precludes hospital buildings that may be licensed under the above mentioned code sections, but provide skilled nursing, intermediate care, or acute psychiatric services only.*

***INCIDENTAL STRUCTURAL ALTERATIONS, ~~OR~~ ADDITIONS, OR REPAIRS*** *are alterations, ~~or~~ additions or repairs which would not reduce the story lateral shear force-resisting capacity by more than 5 percent or increase the story shear by more than 5 percent in any existing story.*

***MAJOR STRUCTURAL ALTERATIONS, ~~OR~~ ADDITIONS, OR REPAIRS*** *are those alterations, ~~or~~ additions or repairs of greater extent than minor structural alterations or additions.*

***MINOR STRUCTURAL ALTERATIONS, ~~OR~~ ADDITIONS, OR REPAIRS*** *are alterations, ~~or~~ additions or repairs of greater extent than incidental structural additions or alterations which would not reduce the story shear lateral-force-resisting capacity by more than 10 percent or increase base shear by more than 10 percent.*

***NONSTRUCTURAL ALTERATION*** *is any alteration which neither affects existing structural elements nor requires new structural elements for vertical or lateral support and which does not increase the lateral shear force in any story by more than 5 percent.*

***NPC 1, NPC 2, NPC 3/NPC 3R, NPC 4, and NPC 5*** *are the building nonstructural performance categories for Hospital Buildings defined in Table 11.1 of California ~~Building Standards~~ Administrative Code (Part 1, Title 24 CCR), Chapter 6.*

***PEER REVIEW*** *refers to procedure contained in Section 3414A.*

**PRIMARY FUNCTION.** A *primary function* is a major activity for which the facility is intended. Areas that contain a *primary function* include, but are not limited to, the customer service lobby of a bank, the dining area of a cafeteria, the meeting rooms in a conference center, as well as offices and other work areas in which the activities of the public accommodation or other private entity using the facility are carried out. Mechanical rooms, boiler rooms, supply storage rooms, employee lounges or locker rooms, janitorial closets, entrances, corridors and restrooms are not areas containing a *primary function*.

~~***RECONSTRUCTION*** *means rebuilding of any existing building to bring it into full compliance with these regulations.*~~

***REPAIR*** *as used in this chapter ~~division~~ means all the design and construction work affecting existing or requiring new structural elements undertaken to restore or enhance the structural and nonstructural load resisting system participating in vertical or lateral response of a structure primarily intended to correct the effects of deterioration or impending or actual failure, regardless of cause.*

***SPC 1, SPC 2, SPC 3, SPC 4, and SPC 5*** *are the building structural performance categories for Hospital Buildings defined in Table 2.5.3 of California ~~Building Standards~~ Administrative Code (Part 1, Title 24 CCR), Chapter 6.*

**SUBSTANTIAL STRUCTURAL DAMAGE.** A condition where:

1. In any *story*, the vertical elements of the lateral force-resisting system have suffered damage such that the lateral load-carrying capacity of the structure in any horizontal direction has been reduced by more than ~~20~~ *10* percent from its pre-damage condition; or
2. The capacity of any vertical gravity load-carrying component, or any group of such components, that supports more than 30 percent of the total area of the structure's floor(s) and roof(s) has been reduced more than ~~20~~ *10* percent from its pre-damage condition and the remaining capacity of such affected elements, with respect to all dead and live loads, is less than 75 percent of that required by this code for new buildings of similar structure, purpose and location.

**TECHNICALLY INFEASIBLE.** An *alteration* of a building or a facility that has little likelihood of being accomplished because the existing structural conditions require the removal or *alteration* of a load-bearing member that is an essential part of the structural frame, or because other existing physical or site constraints prohibit modification or addition of elements, spaces or features which are in full and strict compliance with the minimum requirements for new construction and which are necessary to provide accessibility.

***VOLUNTARY ~~NONREQUIRED~~ STRUCTURAL ALTERATION*** *is any alteration of existing structural element or provision of new structural elements which is not necessary for vertical or lateral support of other work and is initiated by the applicant primarily for the purpose of increasing the vertical or lateral load-carrying strength or stiffness of an existing building.*

**SECTION 3403*A***

## ADDITIONS

**3403*A*.1 General.** Additions to any building or structure shall comply with the requirements of this code for new construction. Alterations to the existing building or structure shall be made to ensure that the existing building or structure together with the *addition* are no less conforming with the provisions of this code than the existing building or structure was prior to the *addition*. An existing building together with its additions shall comply with the height and area provisions of Chapter 5.

**3403*A*.2 Flood hazard areas.** For buildings and structures in flood hazard areas established in Section 1612*A*.3, any *addition* that constitutes substantial improvement of the *existing structure*, as defined in Section 1612*A*.2, shall comply with the flood design requirements for new construction, and all aspects of the *existing structure* shall be brought into compliance with the requirements for new construction for flood design. For buildings and structures in flood hazard areas established in Section 1612*A*.3, any additions that do not constitute substantial improvement or substantial damage of the *existing structure*, as defined in Section 1612*A*.2, are not required to comply with the flood design requirements for new construction.

**3403*A*.3 Existing structural elements carrying gravity load.** Any existing gravity load-carrying structural element for which an *addition* and its related alterations cause an increase in design gravity load of more than 5 percent shall be strengthened, supplemented, replaced or otherwise altered as needed to carry the increased load required by this code for new structures. Any existing gravity load-carrying structural element whose gravity load-carrying capacity is decreased shall be considered an altered element subject to the requirements of Section 3404*A*.3. Any existing element that will form part of the lateral load path for any part of the *addition* shall be considered an existing lateral load-carrying structural element subject to the requirements of Section 3403*A*.4.

> **3403*A*.3.1 Design live load.** Where the *addition* does not result in increased design live load, existing gravity load-carrying structural elements shall be permitted to be evaluated and designed for live loads *approved* prior to the *addition*. If the *approved* live load is less than that required by Section 1607*A*, the area designed for the nonconforming live load shall be posted with placards of *approved* design indicating the *approved* live load. Where the *addition* does result in increased design live load, the live load required by Section 1607*A* shall be used.

**3403*A*.4 Existing structural elements carrying lateral load.** Where the *addition* is structurally independent of the *existing structure*, existing lateral load-carrying structural elements shall be permitted to remain unaltered. Where the *addition* is not structurally independent of the *existing structure*, the *existing structure* and its *addition* acting together as a single structure shall be shown to meet the requirements of Sections 1609*A* and 1613*A*.

> **Exception:** Any existing lateral load-carrying structural element whose demand-capacity ratio with the *addition* considered is no more than 10 percent greater than its demand-capacity ratio with the *addition* ignored shall be permitted to remain unaltered. For purposes of calculating demand-capacity ratios, the demand shall consider applicable load combinations with design lateral loads or forces in accordance with Sections 1609*A* and 1613*A*. For purposes of this exception, comparisons of demand-capacity ratios and calculation of design lateral loads, forces and capacities shall account for the cumulative effects of additions and alterations since original construction.
>
> **3403A.4.1 Seismic.** Seismic requirements for alterations shall be in accordance with this section. Where the existing seismic force-resisting system is a type that can be designated ordinary *or is a welded steel moment frame constructed under a permit issued prior to October 25, 1994*, values of $R$, $\Omega_0$ and $C_d$ for the existing seismic force-resisting system shall be those specified by this code for an ordinary system unless it is demonstrated that the existing system will provide performance equivalent to that of a detailed intermediate or special system.

## SECTION 3404*A*
## ALTERATIONS

**3404*A*.1 General.** Except as provided by ~~Section 3401.4 or~~ this section, alterations to any building or structure shall comply with the requirements of the code for new construction. Alterations shall be such that the existing building or structure is no less conforming with the provisions of this code than the existing

building or structure was prior to the *alteration*.

**Exceptions:**

1. An existing *stairway* shall not be required to comply with the requirements of Section 1009 where the existing space and construction does not allow a reduction in pitch or slope.
2. Handrails otherwise required to comply with Section 1009.10 shall not be required to comply with the requirements of Section 1012.5 regarding full extension of the handrails where such extensions would be hazardous due to plan configuration.

**3404*A*.2 Flood hazard areas.** For buildings and structures in flood hazard areas established in Section 1612*A*.3, any *alteration* that constitutes substantial improvement of the *existing structure*, as defined in Section 1612*A*.2, shall comply with the flood design requirements for new construction, and all aspects of the *existing structure* shall be brought into compliance with the requirements for new construction for flood design. For buildings and structures in flood hazard areas established in Section 1612*A*.3, any alterations that do not constitute substantial improvement or substantial damage of the *existing structure*, as defined in Section 1612*A*.2, are not required to comply with the flood design requirements for new construction.

**3404*A*.3 Existing structural elements carrying gravity load.** Any existing gravity load-carrying structural element for which an *alteration* causes an increase in design gravity load of more than 5 percent shall be strengthened, supplemented, replaced or otherwise altered as needed to carry the increased gravity load required by this code for new structures. Any existing gravity load-carrying structural element whose gravity load-carrying capacity is decreased as part of the *alteration* shall be shown to have the capacity to resist the applicable design gravity loads required by this code for new structures.

**3404*A*.3.1 Design live load.** Where the *alteration* does not result in increased design live load, existing gravity load-carrying structural elements shall be permitted to be evaluated and designed for live loads *approved* prior to the *alteration*. If the *approved* live load is less than that required by Section 1607*A*, the area designed for the nonconforming live load shall be posted with placards of *approved* design indicating the *approved* live load. Where the *alteration* does result in increased design live load, the live load required by Section 1607*A* shall be used.

**3404*A*.4 Existing structural elements carrying lateral load.** Except as permitted by Section 3404*A*.5, where the *alteration* increases design lateral loads in accordance with Section 1609*A* or 1613*A*, or where the *alteration* results in a structural irregularity as defined in ASCE 7, or where the *alteration* decreases the capacity of any existing lateral load-carrying structural element, the structure of the altered building or structure shall be shown to meet the requirements of Sections 1609*A* and 1613*A*.

**Exception:** Any existing lateral load-carrying structural element whose demand-capacity ratio with the *alteration* considered is no more than 10 percent greater than its demand-capacity ratio with the *alteration* ignored shall be permitted to remain unaltered. For purposes of calculating demand-capacity ratios, the demand shall consider applicable load combinations with design lateral loads or forces per Sections 1609*A* and 1613*A*. For purposes of this exception, comparisons of demand-capacity ratios and calculation of design lateral loads, forces, and capacities shall account for the cumulative effects of additions and alterations since original construction.

**3404*A*.4.1 Seismic.** Seismic requirements for alterations shall be in accordance with this section. Where the existing seismic force-resisting system is a type that can be designated ordinary *or is a welded steel moment frame constructed under a permit issued prior to October 25, 1994*, values of $R$, $\Omega_0$ and $C_d$ for the existing seismic force-resisting system shall be those specified by this code for an ordinary system unless it is demonstrated that the existing system will provide performance equivalent to that of a detailed intermediate or special system.

**3404*A*.5 Voluntary seismic improvements.** Alterations to existing structural elements or additions of new structural elements that are not otherwise required by this chapter and are initiated for the purpose of improving the performance of the seismic force-resisting system of an *existing structure* or the performance of seismic bracing or anchorage of existing nonstructural elements shall be permitted, provided that an engineering analysis is submitted demonstrating the following:

1. The altered structure, and the altered *structural and* non structural elements are no less conforming with the provisions of this code with respect to earthquake design than they were prior to the *alteration*.
2. New structural elements are *designed,* detailed and connected to the existing structural elements as required by Chapter 16*A*. *Alterations of existing structural elements shall be based on design demand required by Chapter 16A but need not exceed the maximum load effect that can be transferred to the elements by the system.*

*Exception: Seismic design in accordance with Sections 3411A and 3412A shall be permitted.*

3. New or relocated nonstructural elements are *designed,* detailed and connected to existing or new structural elements as required by Chapter 16*A*.
4. The alterations do not create a structural irregularity as defined in ASCE 7 or make an existing structural irregularity more severe.

**3404*A*.6 Means of egress capacity factors.** Alterations to any existing building or structure shall not be affected by the egress width factors in Table 1005.1 for new construction in determining the minimum egress widths or the minimum number of exits in an existing building or structure. The minimum egress widths for the components of the *means of egress* shall be based on the *means of egress* width factors in the building code under which the building was constructed, and shall be considered as complying *means of egress* for any *alteration* if, in the opinion of the building code official, they do not constitute a distinct hazard to life.

## SECTION 3405*A*
## REPAIRS

**3405*A*.1 General.** Buildings and structures, and parts thereof, shall be repaired in conformance with Section 3401*A*.2. Work on nondamaged components that is necessary for the required repair of damaged components shall be considered part of the repair and shall not be subject to the requirements for alterations in this chapter. Routine maintenance required by Section 3401*A*.2, ordinary repairs exempt from *permit* in accordance with Section 105.2, and abatement of wear due to normal service conditions shall not be subject to the requirements for repairs in this section.

**3405*A*.1.1 Dangerous conditions.** Regardless of the extent of structural or nonstructural damage, the building code official shall have the authority to require the elimination of conditions deemed dangerous.

**3405*A*.2 Substantial structural damage to vertical elements of the lateral-force-resisting system.** A building that has sustained substantial structural damage to the vertical elements of its lateral-force-resisting system shall be evaluated and repaired in accordance with the applicable provisions of Sections 3404*A*.2.1 through 3404*A*.2.3.

**3405*A*.2.1 Evaluation.** The building shall be evaluated by a *registered design professional*, and the evaluation findings shall be submitted to the code official. The evaluation shall establish whether the damaged building, if repaired to its pre-damage state, would comply with the provisions of this code for wind and earthquake loads. Evaluation for earthquake loads shall be required if the substantial structural damage was caused by or related to earthquake effects or if the building is in Seismic Design Category ~~C,~~ D, E or F. Wind loads for this evaluation shall be those prescribed in Section 1609*A*. Earthquake loads for this evaluation, if required, shall be permitted to be 75 percent of those prescribed in Section 1613*A*. *Where the existing seismic force-resisting system is a type that can be designated ordinary or is a welded steel moment frame constructed under a permit issued prior to October 25, 1994*, ~~Values~~ *values* of $R$, $\Omega_0$, and $C_d$ for the existing seismic force-resisting system shall be those specified by this code for an ordinary system unless it is demonstrated that the existing system will provide performance equivalent to that of an intermediate or special system.

**3405*A*.2.2 Extent of repair for compliant buildings.** If the evaluation establishes compliance of the pre-damage building in accordance with Section 3404*A*.2.1, then repairs shall be permitted that

restore the building to its pre-damage state using materials and strengths that existed prior to the damage.

**3405*A*.2.3 Extent of repair for noncompliant buildings.** If the evaluation does not establish compliance of the pre-damage building in accordance with Section 3404*A*.2.1, then the building shall be rehabilitated to comply with applicable provisions of this code for load combinations, including wind or seismic loads. The wind loads for the repair shall be as required by the building code in effect at the time of original construction, unless the damage was caused by wind, in which case the wind loads shall be as required by the code in effect at the time of original construction or as required by this code, whichever are greater. Earthquake loads for this rehabilitation design shall be those required for the design of the pre-damage building, but not less than ~~seventy-five~~ *ninety* percent of those prescribed in Section 1613*A*. New structural members and connections required by this rehabilitation design shall comply with the detailing provisions of this code for new buildings of similar structure, purpose and location.

**3405*A*.3 Substantial structural damage to gravity load-carrying components.** Gravity load-carrying components that have sustained substantial structural damage shall be rehabilitated to comply with the applicable provisions of this code for dead and live loads. Snow loads shall be considered if the substantial structural damage was caused by or related to snow load effects. Existing gravity load-carrying structural elements shall be permitted to be designed for live loads *approved* prior to the damage. Nondamaged gravity load-carrying components that receive dead, live or snow loads from rehabilitated components shall also be rehabilitated or shown to have the capacity to carry the design loads of the rehabilitation design. New structural members and connections required by this rehabilitation design shall comply with the detailing provisions of this code for new buildings of similar structure, purpose and location.

**3405*A*.3.1 Lateral force-resisting elements.** Regardless of the level of damage to vertical elements of the lateral force-resisting system, if substantial structural damage to gravity load-carrying components was caused primarily by wind or earthquake effects, then the building shall be evaluated in accordance with Section 3404*A*.2.1 and, if noncompliant, rehabilitated in accordance with Section 3404*A*.2.3.

**3405*A*.4 Less than substantial structural damage.** For damage less than substantial structural damage, repairs shall be allowed that restore the building to its pre-damage state using materials and strengths that existed prior to the damage. New structural members and connections used for this repair shall comply with the detailing provisions of this code for new buildings of similar structure, purpose and location.

**3405*A*.5 Flood hazard areas.** For buildings and structures in flood hazard areas established in Section 1612*A*.3, any repair that constitutes substantial improvement of the *existing structure*, as defined in Section 1612*A*.2, shall comply with the flood design requirements for new construction, and all aspects of the *existing structure* shall be brought into compliance with the requirements for new construction for flood design. For buildings and structures in flood hazard areas established in Section 1612*A*.3, any repairs that do not constitute substantial improvement or substantial damage of the *existing structure*, as defined in Section 1612*A*.2, are not required to comply with the flood design requirements for new construction.

**…**

## SECTION 3408*A*
## CHANGE OF OCCUPANCY

**3408*A*.1 Conformance.** No change shall be made in the use or occupancy of any building that would place the building in a different division of the same group of occupancy or in a different group of occupancies, unless such building is made to comply with the requirements of this code for such division or group of occupancy. Subject to the approval of the *building official*, the use or occupancy of existing buildings shall be permitted to be changed and the building is allowed to be occupied for purposes in other groups without conforming to all the requirements of this code for those groups, provided the new or proposed use is less hazardous, based on life and fire risk, than the existing use.

**3408*A*.2 Certificate of occupancy.** A certificate of occupancy shall be issued where it has been determined that the requirements for the new occupancy classification have been met.

**3408*A*.3 Stairways.** Existing stairways in an *existing structure* shall not be required to comply with the requirements of a new *stairway* as outlined in Section 1009 where the existing space and construction will not allow a reduction in pitch or slope.

**3408*A*.4 Change of occupancy.** When a change of occupancy results in a structure being reclassified to a higher occupancy category, the structure shall conform to the seismic requirements for a new structure of the higher occupancy category. Where the existing seismic force-resisting system is a type that can be designated ordinary *or is a welded steel moment frame constructed under a permit issued prior to October 25, 1994*, values of $R$, $\Omega_0$ and $C_d$ for the existing seismic force-resisting system shall be those specified by this code for an ordinary system unless it is demonstrated that the existing system will provide performance equivalent to that of a detailed, intermediate or special system.

**Exceptions:**

~~1.~~ Specific seismic detailing requirements of this code or Section 1613*A* for a new structure shall not be required to be met where it can be shown that the level of performance and seismic safety is equivalent to that of a new structure. Such analysis shall consider the regularity, over strength, redundancy and ductility of the structure within the context of the existing and retrofit (if any) detailing provided.

~~2. When a change of use results in a structure being reclassified from Occupancy Category I or II to Occupancy Category III and the structure is located in a seismic map area where *SDS* ≥ 0.33, compliance with the seismic requirements of this code and Section 1613 are not required.~~

**……**

~~**SECTION 3411**~~
~~**ACCESSIBILITY FOR EXISTING BUILDINGS**~~

~~**3411.1 Scope.** The provisions of Sections 3409.1 through 3409.9 3411.1 through 3411.9 apply to maintenance, change of occupancy, additions and alterations to existing buildings, including those identified as *historic buildings*.~~

~~**Exception:** Type B *dwelling* or sleeping units required by Section 1107 of this code are not required to be provided in existing buildings and facilities being altered or undergoing a change of occupancy.~~

~~**3411.2 Maintenance of facilities.** A building, facility or element that is constructed or altered to be *accessible* shall be maintained *accessible* during occupancy.~~

~~**3411.3 Extent of application.** An *alteration* of an existing element, space or area of a building or facility shall not impose a requirement for greater accessibility than that which would be required for new construction. Alterations shall not reduce or have the effect of reducing accessibility of a building, portion of a building or facility.~~

~~**3411.4 Change of occupancy.** Existing buildings that undergo a change of group or occupancy shall comply with this section.~~

~~**3411.4.1 Partial change in occupancy.** Where a portion of the building is changed to a new occupancy classification, any alterations shall comply with Sections 3411.6, 3411.7 and 3411.8.~~

~~**3411.4.2 Complete change of occupancy.** Where an entire building undergoes a change of occupancy, it shall comply with Section 3411.4.1 and shall have all of the following *accessible* features:~~
~~1. At least one *accessible* building entrance.~~
~~2. At least one *accessible* route from an *accessible* building entrance to *primary function* areas.~~
~~3. Signage complying with Section 1110.~~
~~4. Accessible parking, where parking is being provided. 5. At least one *accessible* passenger loading zone, when loading zones are provided.~~
~~6. At least one *accessible* route connecting *accessible* parking and *accessible* passenger loading zones to an *accessible* entrance. Where it is *technically infeasible* to comply with the new construction standards for~~

~~any of these requirements for a change of group or occupancy, the above items shall conform to the requirements to the maximum extent technically feasible.~~

~~**3411.5 Additions.** Provisions for new construction shall apply to additions. An *addition* that affects the accessibility to, or contains an area of, a primary function shall comply with the requirements in Section 3411.7.~~

~~**3411.6 Alterations.** A building, facility or element that is altered shall comply with the applicable provisions in Chapter 11 of this code and ICC A117.1, unless *technically infeasible*. Where compliance with this section is *technically infeasible*, the *alteration* shall provide access to the maximum extent technically feasible.~~

> ~~**Exceptions:**~~
> ~~1. The altered element or space is not required to be on an *accessible* route, unless required by Section 3411.7. 2. *Accessible means of egress* required by Chapter 10 are not required to be provided in existing buildings and facilities.~~
> ~~3. The *alteration* to TypeAindividually owned *dwelling* units within a Group R-2 occupancy shall meet the provision for a Type B *dwelling* unit and shall comply with the applicable provisions in Chapter 11 and ICC A117.1.~~

~~**3411.7 Alterations affecting an area containing a primary function.** Where an *alteration* affects the accessibility to, or contains an area of *primary function*, the route to the *primary function* area shall be *accessible*. The *accessible* route to the *primary function* area shall include toilet facilities or drinking fountains serving the area of *primary function*.~~

> ~~**Exceptions:**~~
> ~~1. The costs of providing the *accessible* route are not required to exceed 20 percent of the costs of the *alterations* affecting the area of *primary function*.~~
> ~~2. This provision does not apply to *alterations* limited solely to windows, hardware, operating controls, electrical outlets and signs.~~
> ~~3. This provision does not apply to *alterations* limited solely to mechanical systems, electrical systems, installation or *alteration* of fire protection systems and abatement of hazardous materials.~~
> ~~4. This provision does not apply to *alterations* undertaken for the primary purpose of increasing the accessibility of an existing building, facility or element.~~

~~**3411.8 Scoping for alterations.** The provisions of Sections 3411.8.1 through 3411.8.12 shall apply to *alterations* to existing buildings and facilities.~~

~~**3411.8.1 Entrances.** *Accessible* entrances shall be provided in accordance with Section 1105.~~

~~**Exception:** Where an *alteration* includes alterations to an entrance, and the building or facility has an *accessible* entrance, the altered entrance is not required to be *accessible*, unless required by Section 3411.7. Signs complying with Section 1110 shall be provided.~~

~~**3411.8.2 Elevators.** Altered elements of existing elevators shall comply with ASME A17.1 and ICC A117.1. Such elements shall also be altered in elevators programmed to respond to the same hall call control as the altered elevator.~~

~~**3411.8.3 Platform lifts.** Platform (wheelchair) lifts complying with ICC A117.1 and installed in accordance with ASME A18.1 shall be permitted as a component of an *accessible* route.~~

~~**3411.8.4 Stairs and escalators in existing buildings.** In *alterations*, change of occupancy or *additions* where an escalator or *stair* is added where none existed previously and major structural modifications are necessary for installation, an *accessible* route shall be provided between the levels served by the escalator or *stairs* in accordance with Sections 1104.4 and 1104.5.~~

~~**3411.8.5 Ramps.** Where steeper slopes than allowed by Section 1010.2 are necessitated by space limitations, the slope of ramps in or providing access to existing buildings or facilities shall comply with Table 3411.8.5.~~

~~**TABLE 3411.8.5**~~

**RAMPS**

| SLOPE | MAXIMUM RISE |
|---|---|
| Steeper than 1:10 but not steeper than 1:8 | 3 inches |
| Steeper than 1:12 but not steeper than 1:10 | 6 inches |

For SI: 1 inch = 25.4 mm.

**3411.8.6 Performance areas.** Where it is *technically infeasible* to alter performance areas to be on an *accessible* route, at least one of each type of performance area shall be made *accessible*.

**3411.8.7 Accessible dwelling or sleeping units.** Where Group I-1, I-2, I-3, R-1, R-2 or R-4 *dwelling* or *sleeping units* are being altered or added, the requirements of Section 1107 for *Accessible* units apply only to the quantity of spaces being altered or added.

**3411.8.8 Type A dwelling or sleeping units.** Where more than 20 Group R-2 *dwelling* or *sleeping units* are being added, the requirements of Section 1107 for *Type A* units apply only to the quantity of the spaces being added.

**3411.8.9 Type B dwelling or sleeping units.** Where four or more Group I-1, I-2, R-1, R-2, R-3 or R-4 *dwelling* or *sleeping units* are being added, the requirements Section 1107 for *Type B units* apply only to the quantity of the spaces being added.

**3411.8.10 Jury boxes and witness stands.** In *alterations*, *accessible* wheelchair spaces are not required to be located within the defined area of raised jury boxes or witness stands and shall be permitted to be located outside these spaces where the ramp or lift access restricts or projects into the *means of egress*.

**3411.8.11 Toilet rooms.** Where it is *technically infeasible* to alter existing toilet and bathing facilities to be *accessible*, an *accessible* family or assisted-use toilet or bathing facility constructed in accordance with Section 1109.2.1 is permitted. The family or assisted-use facility shall be located on the same floor and in the same area as the existing facilities.

**3411.8.12 Dressing, fitting and locker rooms.** Where it is *technically infeasible* to provide *accessible* dressing, fitting or locker rooms at the same location as similar types of rooms, one *accessible* room on the same level shall be provided. Where separate sex facilities are provided, *accessible* rooms for each sex shall be provided. Separate sex facilities are not required where only unisex rooms are provided.

**3411.8.13 Fuel dispensers.** Operable parts of replacement fuel dispensers shall be permitted to be 54 inches (1370 mm) maximum measured from the surface of the vehicular way where fuel dispensers are installed on existing curbs.

**3411.8.14 Thresholds.** The maximum height of thresholds at doorways shall be 3/4 inch (19.1 mm). Such thresholds shall have beveled edges on each side.

**3411.9 Historic buildings.** These provisions shall apply to buildings and facilities designated as historic structures that undergo alterations or a change of occupancy, unless *technically infeasible*. Where compliance with the requirements for *accessible* routes, entrances or toilet facilities would threaten or destroy the historic significance of the building or facility, as determined by the applicable governing authority, the alternative requirements of Sections 3411.9.1 through 3411.9.4 for that element shall be permitted.

**3411.9.1 Site arrival points.** At least one *accessible* route from a site arrival point to an *accessible* entrance shall be provided.

**3411.9.2 Multilevel buildings and facilities.** An *accessible* route from an *accessible* entrance to public spaces on the level of the *accessible* entrance shall be provided.

~~**3411.9.3 Entrances.** At least one main entrance shall be *accessible*.~~

~~**Exceptions:**~~
~~1. If a main entrance cannot be made *accessible*, an *accessible* nonpublic entrance that is unlocked while the building is occupied shall be provided; or~~
~~2. If a main entrance cannot be made *accessible*, a locked *accessible* entrance with a notification system or remote monitoring shall be provided. Signs complying with Section 1110 shall be provided at the primary entrance and the *accessible* entrance.~~

~~**3411.9.4 Toilet and bathing facilities.** Where toilet rooms are provided, at least one *accessible* family or assisted-use toilet room complying with Section 1109.2.1 shall be provided.~~

## *SECTION 3411A*
## *ADDITIONS, ALTERATIONS, REPAIRS, AND SEISMIC RETROFIT TO EXISTING BUILDINGS OR STRUCTURES DESIGNED IN ACCORDANCE WITH PRE-1973 BUILDING CODE.*

~~*Existing hospital buildings (as defined in Section 7-111 Part 1, Title 24, Building Standards Administrative Code).*~~

~~***NOTE:** Alterations to lateral shear force-resisting capacity and story lateral shear forces shall be considered to be cumulative for purposes of defining incidental or minor alterations or additions. The percentage of cumulative changes shall be based on as built conditions existing on March 7, 1973 or since the original construction if built after March 7, 1973.*~~

~~***3411A.1 Alterations.** For this section, alterations include any additions, alterations, repairs, and / or seismic retrofit to a hospital building or portions thereof. The provision of Section 3403A shall apply for Hospital Buildings.*~~

***3411A.1*** ~~***3411A.2***~~ ***Seismic Retrofit.*** *Any seismic retrofit of hospital building required by Article 2 or* ~~*and*~~ *Article 11, Chapter 6, Part 1, Title 24, shall meet the requirements of Section* ~~*3403A.2.3.4*~~ *3412A.2.*

> ***EXCEPTION:*** *Hospital buildings evaluated to SPC 1 due to deficiencies identified by Article 10, Chapter 6, Part 1, Title 24, may be upgraded to SPC 2 by altering, repairing or seismically retrofitting these conditions in accordance with the requirements of Sections* ~~*3403A.2.3.*~~ *3404A or 3412A.2.*

***3411A.2*** ~~***3411A.3***~~ ***Alterations, additions, and repairs to existing buildings or structures not required by Chapter 6, Part 1, Title 24.***

***3411A.2.1 General.*** *Provisions of this section shall apply to hospital buildings which were originally designed to pre-1973 building code and not designated as SPC 3 or higher in accordance with Chapter 6, Part 1, Title 24.*

~~***3411A.3.1 Approved existing buildings.** Structural alterations or repairs may be made to approved building provided the entire building, as modified, including structural alterations or repairs, conform to Sections 3403A.2.3, except that requirements for the seismic structural performance category (SPC) of the building as determined by Chapter 6, Part 1, Title 24 shall apply. Additions shall conform to the requirements of these regulations for new construction.*~~

~~***3411A.3.2 Pre-1973 buildings.***~~

***3411A.2.2*** ~~***3411A.3.2.1***~~ ***Incidental structural alterations, additions or repairs.*** ~~*The existing structural elements affected by the alteration, addition or repair shall conform or shall be made to conform to the vertical load requirements of these regulations.*~~ *Incidental structural additions shall* ~~*will*~~ *be permitted provided the additions meet this code* ~~*these regulations*~~ *for new construction using importance factor, I,*

*equal to or greater than 1.0. Alterations or repairs to the existing affected lateral load-resisting elements shall ~~must~~ meet the requirements of Sections ~~3403A.2.3.~~, 3404A or 3405A respectively.*

***3411A.2.3 ~~3411A.3.2.2~~ Minor structural alteration, additions or repairs.*** *Minor structural additions shall be permitted provided the additions meet this code for new construction using importance factor, I, equal to or greater than 1.0. ~~Minor structural alterations, additions or repairs shall be permitted provided they meet the following:~~ Alterations, or repair to existing gravity and ~~/ or~~ lateral load-resisting systems shall be made to conform~~s~~ to the requirements of Sections 3404A or 3405A respectively. ~~3403A.2.3; and additions shall meet all of the requirements of these regulations for new construction using an importance factor, I, equal to or greater than 1.0.~~*

***3411A.2.4 ~~3411A.3.2.3~~ Major structural alteration, additions or repairs.*** *Major structural alterations, additions, or repairs shall be ~~permitted~~ in accordance with Sections 3403A, 3404A, or 3405A respectively.*

*~~provided the entire building, as modified, including the structural alterations or repairs, conforms to the requirements of Sections 3403A.2.3. Additions shall meet the requirements of these regulations for new construction.~~*

*~~It shall also be demonstrated by a written report submitted by the structural engineer, acceptable to the enforcement agency, that an investigation of the existing building structure shows it to be constructed in a reasonable conformance with the submitted drawings and specifications.~~*

*~~**3411A.3.2.4 Removal of Stories**. An alteration which involves the removal of one or more entire stories will be permitted if the lateral-load-resisting capacity of the remaining structure is not reduced.~~*

*~~An alteration which involves the removal of other than one or more entire stories will be permitted provided that entire building conforms to Sections 3403A.2.3.~~*

**SECTION 3412*A***
**COMPLIANCE ALTERNATIVES**
***FOR ADDITIONS, ALTERATIONS, REPAIRS, AND SEISMIC RETROFIT***
***TO EXISTING STRUCTURES***

~~**3412.1 Compliance.** The provisions of this section are intended to maintain or increase the current degree of public safety, health and general welfare in existing buildings while permitting repair, *alteration*, *addition* and change of occupancy without requiring full compliance with Chapters 2 through 33, or Sections 3401.3, and 3403 through 3409, except where compliance with other provisions of this code is specifically required in this section.~~

~~**3412.2 Applicability.** Structures existing prior to [DATE TO BE INSERTED BY THE JURISDICTION. NOTE: IT IS RECOMMENDED THAT THIS DATE COINCIDE WITH THE EFFECTIVE DATE OF BUILDING CODES WITHIN THE JURISDICTION], in which there is work involving additions, alterations or changes of occupancy shall be made to conform to the requirements of this section or the provisions of Sections 3403 through 3409. The provisions in Sections 3412.2.1 through 3412.2.5 shall apply to existing occupancies that will continue to be, or are proposed to be, in Groups A, B, E, F, M, R, S and U. These provisions shall not apply to buildings with occupancies in Group H or I.~~

~~**3412.2.1 Change in occupancy.** Where an existing building is changed to a new occupancy classification and this section is applicable, the provisions of this section for the new occupancy shall be used to determine compliance with this code.~~

~~**3412.2.2 Partial change in occupancy.** Where a portion of the building is changed to a new occupancy classification, and that portion is separated from the remainder of the building with fire barriers or horizontal assemblies having a *fire-resistance rating* as required by Table 508.3.3 for the separate occupancies, or with *approved* compliance alternatives, the portion changed shall be made to conform to the provisions of this section. Where a portion of the building is changed to a newoccupancy classification, and that portion is not separated from the remainder of the building with *fire barriers* or *horizontal assemblies* having a *fire-resistance rating* as required by Table 508.3.3 for the separate occupancies, or with *approved* compliance alternatives, the provisions of this section which apply to each~~

~~occupancy shall apply to the entire building. Where there are conflicting provisions, those requirements which secure the greater public safety shall apply to the entire building or structure.~~

~~**3412.2.3 Additions.** *Additions* to existing buildings shall comply with the requirements of this code for new construction. The combined height and area of the existing building and the new *addition* shall not exceed the height and area allowed by Chapter 5. Where a *fire wall* that complies with Section 705 is provided between the *addition* and the existing building, the *addition* shall be considered a separate building.~~

~~**3412.2.4 Alterations and repairs.** An existing building or portion thereof, which does not comply with the requirements of this code for new construction, shall not be altered or repaired in such a manner that results in the building being less safe or sanitary than such building is currently. If, in the *alteration* or repair, the current level of safety or sanitation is to be reduced, the portion altered or repaired shall conform to the requirements of Chapters 2 through 12 and Chapters 14 through 33.~~

~~**3412.2.4.1 Flood hazard areas.** For existing buildings located in flood hazard areas established in Section 1612.3, if the *alterations* and repairs constitute substantial improvement of the existing building, the existing building shall be brought into compliance with the requirements for new construction for flood design.~~

~~**3412.2.5 Accessibility requirements.** All portions of the buildings proposed for change of occupancy shall conform to the accessibility provisions of Section 3411.~~

~~**3412.3 Acceptance.** For repairs, alterations, additions and changes of occupancy to existing buildings that are evaluated in accordance with this section, compliance with this section shall be accepted by the *building official.*~~

~~**3412.3.1 Hazards.** Where the *building official* determines that an unsafe condition exists, as provided for in Section 115, such unsafe condition shall be abated in accordance with Section 115.~~

~~**3412.3.2 Compliance with other codes.** Buildings that are evaluated in accordance with this section shall comply with the *International Fire Code* and *International Property Maintenance Code*.~~

~~**3412.4 Investigation and evaluation.** For proposed work covered by this section, the building owner shall cause the existing building to be investigated and evaluated in accordance with the provisions of this section.~~

~~**3412.4.1 Structural analysis.** The owner shall have a structural analysis of the existing building made to determine adequacy of structural systems for the proposed *alteration*, *addition* or change of occupancy. The analysis shall demonstrate that the building with the work completed is capable of resisting the loads specified in Chapter 16.~~

~~**3412.4.2 Submittal.** The results of the investigation and evaluation as required in Section 3412.4, along with proposed compliance alternatives, shall be submitted to the *building official.*~~

~~**3412.4.3 Determination of compliance.** The *building official* shall determine whether the existing building, with the proposed *addition*, *alteration* or change of occupancy, complies with the provisions of this section in accordance with the evaluation process in Sections 3412.5 through 3412.9.~~

~~**3412.5 Evaluation.** The evaluation shall be comprised of three categories: fire safety, means of egress and general safety, as defined in Sections 3412.5.1 through 3412.5.3.~~
~~**3412.5.1 Fire safety.** Included within the fire safety category are the structural *fire resistance*, automatic fire detection, fire alarm and fire suppression system features of the facility.~~

~~**3412.5.2 Means of egress.** Included within the means of egress category are the configuration, characteristics and support features for *means of egress* in the facility.~~

~~**3412.5.3 General safety.** Included within the general safety category are the fire safety parameters and the means of egress parameters.~~

~~**3412.6 Evaluation process.** The evaluation process specified herein shall be followed in its entirety to evaluate existing buildings. Table 3412.7 shall be utilized for tabulating the results of the evaluation. References to other sections of this code indicate that compliance with those sections is required in~~

~~order to gain credit in the evaluation herein outlined. In applying this section to a building with mixed occupancies, where the separation between the mixed occupancies does not qualify for any category indicated in Section 3412.6.16, the score for each occupancy shall be determined and the lower score determined for each section of the evaluation process shall apply to the entire building.~~
~~Where the separation between the mixed occupancies qualifies for any category indicated in Section 3412.6.16, the score for each occupancy shall apply to each portion of the building based on the occupancy of the space.~~

~~**3412.6.1 Building height.** The value for building height shall be the lesser value determined by the formula in Section 3412.6.1.1. Chapter 5 shall be used to determine the allowable height of the building, including allowable increases due to automatic sprinklers as provided for in Section 504.2. Subtract the actual *building height* from the allowable and divide by 12 1/2 feet. Enter the height value and its sign (positive or negative) in Table 3412.7 under Safety Parameter 3412.6.1, Building Height, for fire safety, means of egress and general safety. The maximum score for a building shall be 10.~~

~~**3412.6.1.1 Height formula.** The following formulas shall be used in computing the building height value.~~

$$\text{Height value, feet} = \frac{(AH) - (EBH)}{12.5} \times CF$$

$$\text{Height value, stories} = (AS - EBS) \times CF$$

~~**(Equation 34A-1)**~~

~~where:~~
~~*AH* = Allowable height in feet from Table 503.~~
~~*EBH* = Existing *building height* in feet.~~
~~*AS* = Allowable height in stories from Table 503.~~
~~*EBS* = Existing building height in stories.~~
~~*CF* = 1 if (*AH*) – (*EBH*) is positive.~~
~~*CF* = Construction type factor shown in Table 3412.6.6(2) if (*AH*) – (*EBH*) is negative.~~

~~**Note:** Where mixed occupancies are separated and individually evaluated as indicated in Section 3412.6, the values AH, AS, EBH and EBS shall be based on the height of the occupancy being evaluated.~~

~~**3412.6.2 Building area.** The value for building area shall be determined by the formula in Section 3412.6.2.2. Section 503 and the formula in Section 3412.6.2.1 shall be used to determine the allowable area of the building. This shall include any allowable increases due to frontage and automatic sprinklers as provided for in Section 506. Subtract the actual *building area* from the allowable area and divide by 1,200 square feet (112 m2). Enter the area value and its sign (positive or negative) in Table 3412.7 under Safety Parameter 3412.6.2, Building Area, for fire safety, means of egress and general safety. In determining the area value, the maximum permitted positive value for area is 50 percent of the fire safety score as *listed* in Table 3412.8, Mandatory Safety Scores.~~

~~**3412.6.2.1 Allowable area formula.** The following formula shall be used in computing allowable area:~~

~~*Aa*=(1 + If + Is) ×*At* **(Equation 34-2)**~~

~~where:~~
~~Aa = Allowable area.~~
~~At = Tabular area per *story* in accordance with Table 503 (square feet)~~

~~Is = Area increase factor for sprinklers (Section 506.3).~~
~~If = Area increase factor for frontage (Section 506.2).~~

**~~3412.6.2.2 Area formula.~~** ~~The following formula shall be used in computing the area value. Determine the area value for each occupancy floor area on a floor by floor basis. For each occupancy, choose the minimum area value of the set of values obtained for the particular occupancy.~~

$$\text{Area value } i = \frac{\text{Allowable area}_i}{1{,}200 \text{ square feet}}\left[1 - \left(\frac{\text{Actual area}_i}{\text{Allowable area}_i} + \ldots + \frac{\text{Actual area}_n}{\text{Allowable area}_n}\right)\right]$$

**~~(Equation 34A 3)~~**

~~where:~~
~~*i* = Value for an individual separated occupancy on a floor.~~
~~*n* = Number of separated occupancies on a floor.~~

**~~3412.6.3 Compartmentation.~~** ~~Evaluate the compartments created by *fire barriers* or *horizontal assemblies* which comply with Sections 3412.6.3.1 and 3412.6.3.2 and which are exclusive of the wall elements considered under Sections 3412.6.4 and 3412.6.5. Conforming compartments shall be figured as the net area and do not include shafts, chases, stairways, walls or columns. Using Table 3412.6.3, determine the appropriate compartmentation value (*CV*) and enter that value into Table 3412.7 under Safety Parameter 3412.6.3, Compartmentation, for fire safety, means of egress and general safety.~~

**~~3412.6.3.1Wall construction.~~**~~Awall used to create separate compartments shall be a *fire barrier* conforming to Section 706 with a *fire-resistance rating* of not less than 2 hours. Where the building is not divided into more than one compartment, the compartment size shall be taken as~~

**~~TABLE 3412.6.3~~**
**~~COMPARTMENTATION VALUES~~**

| ~~OCCUPANCY~~ | ~~CATEGORIES[a]~~ | | | | |
|---|---|---|---|---|---|
| | ~~a Compartment size equal to or greater than 15,000 square feet~~ | ~~b Compartment size of 10,000 square feet~~ | ~~c Compartment size of 7,500 square feet~~ | ~~d Compartment size of 5,000 square feet~~ | ~~e Compartme size of 2,500 square~~ |
| ~~A-1, A-3~~ | ~~0~~ | ~~6~~ | ~~10~~ | ~~14~~ | ~~18~~ |
| ~~A-2~~ | ~~0~~ | ~~4~~ | ~~10~~ | ~~14~~ | ~~18~~ |
| ~~A-4, B, E, S-2~~ | ~~0~~ | ~~5~~ | ~~10~~ | ~~15~~ | ~~20~~ |
| ~~F, M, R, S-1~~ | ~~0~~ | ~~4~~ | ~~10~~ | ~~16~~ | ~~22~~ |

~~For SI: 1 square foot = 0.093 m$^2$.~~

~~a. For areas between categories, the compartmentation value shall be obtained by linear interpolation.~~

~~the total floor area on all floors. Where there is more than one compartment within a *story*, each compartmented area on such *story* shall be provided with a horizontal *exit* conforming to Section 1022. The *fire door* serving as the horizontal *exit* between compartments shall be so installed, fitted and gasketed that such *fire door* will provide a substantial barrier to the passage of smoke.~~

**3412.6.3.2 Floor/ceiling construction.** A floor/ceiling assembly used to create compartments shall conform to Section 711 and shall have a *fire-resistance rating* of not less than 2 hours.

**3412.6.4 Tenant and dwelling unit separations.** Evaluate the *fire-resistance rating* of floors and walls separating tenants, including *dwelling* units, and not evaluated under Sections 3412.6.3 and 3412.6.5. Under the categories and occupancies in Table 3412.6.4, determine the appropriate value and enter that value in Table 3412.7 under Safety Parameter 3412.6.4, Tenant and Dwelling Unit Separation, for fire safety, means of egress and general safety.

**TABLE 3412.6.4**
**SEPARATION VALUES**

| OCCUPANCY | CATEGORIES | | | | |
|---|---|---|---|---|---|
| | a | b | c | d | e |
| A-1 | 0 | 0 | 0 | 0 | 1 |
| A-2 | -5 | -3 | 0 | 1 | 3 |
| R | -4 | -2 | 0 | 2 | 4 |
| A-3, A-4, B, E, F, M, S-1 | -4 | -3 | 0 | 2 | 4 |
| S-2 | -5 | -2 | 0 | 2 | 4 |

**3412.6.4.1 Categories.** The categories for tenant and *dwelling* unit separations are:
1. Category a – No *fire partitions*; incomplete *fire partitions*; no doors; doors not self-closing or automatic closing.
2. Categoryb – *Fire partitions* or floor assembly less than 1-hour *fire-resistance rating* or not constructed in accordance with Sections 708 or 711, respectively.
3. Category c – *Fire partitions* with 1-hour or greater *fire-resistance rating* constructed in accordance with Section 708 and floor assemblies with 1-hour but less than 2-hour *fire-resistance rating* constructed in accordance with Section 711, or with only one tenant within the floor area.
4. Category d – *Fire barriers* with 1-hour but less than 2-hour *fire-resistance rating* constructed in accordance with Section 706 and floor assemblies with 2-hour or greater *fire-resistance rating* constructed in accordance with Section 711.
5. Category e – *Fire barriers* and floor assemblies with 2-hour or greater *fire-resistance rating* and constructed in accordance with Sections 706 and 711, respectively.

**3412.6.5 Corridor walls.** Evaluate the *fire-resistance rating* and degree of completeness of walls which create corridors serving the floor, and constructed in accordance with Section 1017. This evaluation shall not include the wall elements considered under Sections 3412.6.3 and 3412.6.4. Under the categories and groups in Table 3412.6.5, determine the appropriate value and enter that value into Table 3412.7 under Safety Parameter 3412.6.5, Corridor Walls, for fire safety, means of egress and general safety.

**TABLE 3412.6.5**
**CORRIDOR WALL VALUES**

| OCCUPANCY | CATEGORIES | | | |
|---|---|---|---|---|
| | a | b | c[a] | d[a] |
| A-1 | -10 | -4 | 0 | 2 |
| A-2 | -30 | -12 | 0 | 2 |
| A-3, F, M, R, S-1 | -7 | -3 | 0 | 2 |
| A-4, B, E, S-2 | -5 | -2 | 0 | 5 |

a. Corridors not providing at least one-half the travel distance for all occupants on a floor shall use Category b.

**3412.6.5.1 Categories.** The categories for Corridor Walls are:
1. Category a—No fire partitions; incomplete fire partitions; no doors; or doors not self-closing.
2. Category b—Less than 1-hour *fire-resistance rating* or not constructed in accordance with Section 708.4.
3. Category c—1-hour to less than 2-hour *fire-resistance rating*, with doors conforming to Section 715 or without corridors as permitted by Section 1017.
4. Category d—2-hour or greater *fire-resistance rating*, with doors conforming to Section 715.

**3412.6.6 Vertical openings.** Evaluate the *fire-resistance rating* of *exit* enclosures, hoistways, escalator openings and other shaft enclosures within the building, and openings between two or more floors. Table 3412.6.6(1) contains the appropriate protection values. Multiply that value by the construction type factor found in Table 3412.6.6(2). Enter the vertical opening value and its sign (positive or negative) in Table 3412.7 under Safety Parameter 3412.6.6, Vertical Openings, for fire safety, means of egress, and general safety. If the structure is a one-story building or if all the unenclosed vertical openings within the building conform to the requirements of Section 707, enter a value of 2. The maximum positive value for this requirement shall be 2.

**3412.6.6.1 Vertical opening formula.** The following formula shall be used in computing vertical opening value.

$VO = PV \times CF$ **(Equation 34-4)**
$VO$ = Vertical opening value
$PV$ = Protection value [Table 3412.6.6(1)]
$CF$ = Construction type factor [Table 3412.6.6(2)]

**TABLE 3412.6.6(1)**
**VERTICAL OPENING PROTECTION VALUE**

| PROTECTION | VALUE |
|---|---|
| None (unprotected opening) | -2 times number floors connected |
| Less than 1 hour | -1 times number floors connected |
| 1 to less than 2 hours | 1 |
| 2 hours or more | 2 |

**TABLE 3412.6.6(2)**
**CONSTRUCTION TYPE FACTOR**

| | TYPE OF CONSTRUCTION | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | IA | IB | IIA | IIB | IIIA | IIIB | IV | VA | VB |
| FACTOR | 1.2 | 1.5 | 2.2 | 3.5 | 2.5 | 3.5 | 2.3 | 3.3 | 7 |

**3412.6.7 HVAC systems.** Evaluate the ability of the HVAC system to resist the movement of smoke and fire beyond the point of origin. Under the categories in Section 3412.6.7.1, determine the appropriate value and enter that value into Table 3412.7 under Safety Parameter 3412.6.7, HVAC Systems, for fire safety, means of egress and general safety.

**3412.6.7.1 Categories.** The categories for HVAC systems are:

1. Category a—Plenums not in accordance with Section 602 of the *International Mechanical Code*. -10 points.
2. Category b—Air movement in egress elements not in accordance with Section 1017.4. -5 points.
3. Category c—Both categories a and b are applicable. -15 points.
4. Category d—Compliance of the HVAC system with Section 1017.4 and Section 602 of the *International Mechanical Code*. 0 points.
5. Category e—Systems serving one *story*; or a central boiler/chiller system without ductwork connecting two or more stories. 5 points.

**3412.6.8 Automatic fire detection.** Evaluate the smoke detection capability based on the location and operation of automatic fire detectors in accordance with Section 907 and the *International Mechanical Code*. Under the categories and occupancies in Table 3412.6.8, determine the appropriate value and enter that value into Table 3412.7 under Safety Parameter 3412.6.8, Automatic Fire Detection, for fire safety, means of egress and general safety.

**TABLE 3412.6.8**
**AUTOMATIC FIRE DETECTION VALUES**

| OCCUPANCY | CATEGORIES | | | | |
|---|---|---|---|---|---|
| | a | b | c | d | e |
| A-1, A-3, F, M, R, S-1 | -10 | -5 | 0 | 2 | 6 |
| A-2 | -25 | -5 | 0 | 5 | 9 |
| A-4, B, E, S-2 | -4 | -2 | 0 | 4 | 8 |

**3412.6.8.1 Categories.** The categories for automatic fire detection are:
1. Category a—None.
2. Category b—Existing smoke detectors in HVAC systems and maintained in accordance with the *International Fire Code*.
3. Category c—Smoke detectors in HVAC systems. The detectors are installed in accordance with the requirements for new buildings in the *International Mechanical Code*.
4. Category d—Smoke detectors throughout all floor areas other than individual sleeping units, tenant spaces and *dwelling* units.
5. Category e—Smoke detectors installed throughout the floor area.

**3412.6.9 Fire alarm systems.** Evaluate the capability of the fire alarm system in accordance with Section 907. Under the categories and occupancies in Table 3412.6.9, determine the appropriate value and enter that value into Table 3412.7 under Safety Parameter 3412.6.9, fire alarm, for fire safety, means of egress and general safety.

**TABLE 3412.6.9**
**FIRE ALARM SYSTEM VALUES**

| OCCUPANCY | CATEGORIES | | | |
|---|---|---|---|---|
| | a | b[a] | c | d |
| A-1, A-2, A-3, A-4, B, E, R | -10 | -5 | 0 | 5 |
| F, M, S | 0 | 5 | 10 | 15 |

a. For buildings equipped throughout with an automatic sprinkler system, add 2 points for activation by a sprinkler water flow device.

**3412.6.9.1 Categories.** The categories for fire alarm systems are:
1. Category a—None.
2. Category b—Fire alarm system with manual fire alarm boxes in accordance with Section 907.3 and

~~alarm notification appliances in accordance with Section 907.9.~~
~~3. Category c—Fire alarm system in accordance with Section 907.~~
~~4. Category d—Category c plus a required emergency voice/alarm communications system and a fire command center that conforms to Section 403.8 and contains the emergency voice/alarm communications system controls, fire department communication system controls and any other controls specified in Section 911 where those systems are provided.~~

~~**3412.6.10 Smoke control.** Evaluate the ability of a natural or mechanical venting, exhaust or pressurization system to control the movement of smoke from a fire. Under the categories and occupancies in Table 3412.6.10, determine the appropriate value and enter that value into Table 3412.7 under Safety Parameter 3412.6.10, Smoke Control, for means of egress and general safety.~~

~~**TABLE 3412.6.10**~~
~~**SMOKE CONTROL VALUES**~~

| ~~OCCUPANCY~~ | ~~CATEGORIES~~ | | | | | |
|---|---|---|---|---|---|---|
| | ~~a~~ | ~~b~~ | ~~c~~ | ~~d~~ | ~~e~~ | ~~f~~ |
| ~~A-1, A-2, A-3~~ | ~~0~~ | ~~1~~ | ~~2~~ | ~~3~~ | ~~6~~ | ~~6~~ |
| ~~A-4, E~~ | ~~0~~ | ~~0~~ | ~~0~~ | ~~1~~ | ~~3~~ | ~~5~~ |
| ~~B, M, R~~ | ~~0~~ | ~~2[a]~~ | ~~3[a]~~ | ~~3[a]~~ | ~~3[a]~~ | ~~4[a]~~ |
| ~~F, S~~ | ~~0~~ | ~~2[a]~~ | ~~2[a]~~ | ~~3[a]~~ | ~~3[a]~~ | ~~3[a]~~ |

~~a. This value shall be 0 if compliance with Category d or e in Section 3410.6.8.1 has not been obtained.~~

~~**3412.6.10.1 Categories.** The categories for smoke control are:~~
~~1. Category a—None.~~
~~2. Category b—The building is equipped throughout with an *automatic sprinkler system*. Openings are provided in exterior walls at the rate of 20 square feet (1.86 m2) per 50 linear feet (15 240 mm) of *exterior wall* in each *story* and distributed around the building perimeter at intervals not exceeding 50 feet (15 240 mm). Such openings shall be readily openable from the inside without a key or separate tool and shall be provided with ready access thereto. In lieu of operable openings, clearly and permanently marked tempered glass panels shall be used.~~
~~3. Category c—One enclosed *exit stairway*, with ready access thereto, from each occupied floor of the building. The *stairway* has operable exterior windows and the building has openings in accordance with Category b.~~
~~4. Category d—One smokeproof enclosure and the building has openings in accordance with Category b.~~
~~5. Category e—The building is equipped throughout with an *automatic sprinkler system*. Each floor area is provided with a mechanical air-handling system designed to accomplish smoke containment. Return and exhaust air shall be moved directly to the outside without recirculation to other floor areas of the building under fire conditions. The system shall exhaust not less than six air changes per hour from the floor area. Supply air by mechanical means to the floor area is not required. Containment of smoke shall be considered as confining smoke to the *fire area* involved without migration to other floor areas. Any other tested and *approved* design which will adequately accomplish smoke containment is permitted.~~
~~6. Category f—Each *stairway* shall be one of the following: a smokeproof enclosure in accordance with Section 1020.1.7; pressurized in accordance with Section 909.20.5 or shall have operable exterior windows.~~

~~**3412.6.11 Means of egress capacity and number.** Evaluate the *means of egress* capacity and the number of exits available to the building occupants. In applying this section, the *means of egress* are required to conform to the following sections of this code: 1003.7, 1004, 1005.1, 1014.2, 1014.3, 1015.2, 1021, 1024.1, 1027.2, 1027.6, 1028.2, 1028.3, 1028.4 and 1029 [except that the minimum width required by this section shall be determined solely by the width for the required capacity in accordance with Table~~

~~3412.6.11(1)]. The number of exits credited is the number that is available to each occupant of the area being evaluated. Existing fire escapes shall be accepted as a component in the *means of egress* when conforming to Section 3406. Under the categories and occupancies in Table 3412.6.11(2), determine the appropriate value and enter that value into Table 3412.7 under Safety Parameter 3412.6.11, Means of Egress Capacity, for means of egress and general safety.~~

**~~TABLE 3412.6.11(1)~~**
**~~EGRESS WIDTH PER OCCUPANT SERVED~~**

~~(Table Stricken)~~

**~~TABLE 3412.6.11(2)~~**
**~~MEANS OF EGRESS VALUES~~**

~~(Table Stricken)~~

**~~3412.6.11.1 Categories.~~** ~~The categories for Means of Egress Capacity and number of exits are:~~
~~1. Category a—Compliance with the minimum required *means of egress* capacity or number of exits is achieved through the use of a fire escape in accordance with Section 3404.~~
~~2. Category b—Capacity of the *means of egress* complies with Section 1004 and the number of exits complies with the minimum number required by Section 1019.~~
~~3. Category c—Capacity of the *means of egress* is equal to or exceeds 125 percent of the required *means of egress* capacity, the *means of egress* complies with the minimum required width dimensions specified in the code and the number of exits complies with the minimum number required by Section 1019.~~
~~4. Category d—The number of exits provided exceeds the number of exits required by Section 1019. Exits shall be located a distance apart from each other equal to not less than that specified in Section 1015.2.~~
~~5. Category e—The area being evaluated meets both Categories c and d.~~

**~~3412.6.12 Dead ends.~~** ~~In spaces required to be served by more than one *means of egress*, evaluate the length of the *exit* access travel path in which the building occupants are confined to a single path of travel. Under the categories and occupancies in Table 3412.6.12, determine the appropriate value and enter that value into Table 3412.7 under Safety Parameter 3412.6.12, Dead Ends, for means of egress and general safety.~~

**~~TABLE 3412.6.12~~**
**~~DEAD-END VALUES~~**

| ~~OCCUPANCY~~ | ~~CATEGORIES[a]~~ | | |
|---|---|---|---|
| | ~~a~~ | ~~b~~ | ~~c~~ |
| ~~A-1, A-3, A-4, B, E, F, M, R, S~~ | ~~2~~ | ~~0~~ | ~~2~~ |
| ~~A-2, E~~ | ~~2~~ | ~~0~~ | ~~2~~ |

**~~3412.6.12.1 Categories.~~** ~~The categories for dead ends are:~~
~~1. Category a—Dead end of 35 feet (10 670 mm) in nonsprinklered buildings or 70 feet (21 340 mm) in sprinklered buildings.~~
~~2. Category b—Dead end of 20 feet (6096 mm); or 50 feet (15 240 mm) in Group B in accordance with Section 1017.3, exception 2.~~
~~3. Category c—No dead ends; or ratio of length to width (l/w) is less than 2.5:1.~~

**~~3412.6.13 Maximum exit access travel distance.~~** ~~Evaluate the length of *exit* access travel to an *approved exit*. Determine the appropriate points in accordance with the following equation and enter that value into Table 3412.7 under Safety Parameter 3412.6.13, Maximum *Exit* Access Travel Distance, for means of egress and general safety. The maximum allowable *exit* access travel distance shall be determined in accordance with Section 1016.1.~~

$$\text{Points} = 20 \times \frac{\text{Maximum allowable travel distance} - \text{Maximum actual travel distance}}{\text{Max. allowable travel distance}}$$

**3412.6.14 Elevator control.** Evaluate the passenger elevator equipment and controls that are available to the fire department to reach all occupied floors. Elevator recall controls shall be provided in accordance with the *International Fire Code*. Under the categories and occupancies in Table 3412.6.14, determine the appropriate value and enter that value into Table 3412.7 under Safety Parameter 3412.6.14, Elevator Control, for fire safety, means of egress and general safety. The values shall be zero for a single-story building.

**TABLE 3412.6.14**
**ELEVATOR CONTROL VALUES**

| ELEVATOR TRAVEL | CATEGORIES | | | |
|---|---|---|---|---|
| | a | b | c | d |
| Less than 25 feet of travel above or below the primary level of elevator access for emergency fire-fighting or rescue personnel | -2 | 0 | 0 | +2 |
| Travel of 25 feet or more above or below the primary level of elevator access for emergency fire-fighting or rescue personnel | -4 | NP | 0 | +4 |

For SI: 1 foot = 304.8 mm.

**3412.6.14.1 Categories.** The categories for elevator controls are:
1. Category a—No elevator.
2. Category b—Any elevator without Phase I and II recall.
3. Category c—All elevators with Phase I and II recall as required by the *International Fire Code*.
4. Category d—All meet Category c; or Category b where permitted to be without recall; and at least one elevator that complies with new construction requirements serves all occupied floors.

**3412.6.15 Means of egress emergency lighting.** Evaluate the presence of and reliability of *means of egress* emergency lighting. Under the categories and occupancies in Table 3412.6.15, determine the appropriate value and enter that value into Table 3412.7 under Safety Parameter 3412.6.15, Means of Egress Emergency Lighting, for means of egress and general safety.

**TABLE 3412.6.15**
**MEANS OF EGRESS EMERGENCY LIGHTING VALUES**

| NUMBER OF EXITS REQUIRED BY SECTION 1010 | CATEGORIES | | |
|---|---|---|---|
| | a | b | c |
| Two or more exits | NP | 0 | 4 |
| Minimum of one exit | 0 | 1 | 1 |

**3412.6.15.1 Categories.** The categories for means of egress emergency lighting are:

~~1. Category a—*Means of egress* lighting and *exit* signs not provided with emergency power in accordance with Section 2702.~~
~~2. Category b—*Means of egress* lighting and *exit* signs provided with emergency power in accordance with Section 2702.~~
~~3. Category c—Emergency power provided to *means of egress* lighting and *exit* signs which provides protection in the event of power failure to the site or building.~~

~~**3412.6.16 Mixed occupancies.** Where a building has two or more occupancies that are not in the same occupancy classification, the separation between the mixed occupancies shall be evaluated in accordance with this section. Where there is no separation between the mixed occupancies or the separation between mixed occupancies does not qualify for any of the categories indicated in Section 3412.6.16.1, the building shall be evaluated as indicated in Section 3412.6 and the value for mixed occupancies shall be zero. Under the categories and occupancies in Table 3410.6.16, determine the appropriate value and enter that value into Table 3412.7 under Safety Parameter 3412.6.16, Mixed Occupancies, for fire safety and general safety. For buildings without mixed occupancies, the value shall be zero.~~

~~**TABLE 3412.6.16**~~
~~**MIXED OCCUPANCY VALUESa**~~

| ~~OCCUPANCY~~ | ~~CATEGORIES~~ | | |
|---|---|---|---|
| | ~~a~~ | ~~b~~ | ~~c~~ |
| ~~A-1, A-2, R~~ | ~~-10~~ | ~~0~~ | ~~10~~ |
| ~~A-3, A-4, B, E, F, M, S~~ | ~~-5~~ | ~~0~~ | ~~5~~ |

~~a. For fire resistance ratings between categories, the value shall be obtained by linear interpolation.~~

~~**3412.6.16.1 Categories.** The categories for mixed occupancies are:~~

~~1. Category a—Occupancies separated by minimum~~
~~1-hour fire barriers or minimum 1-hour horizontal assemblies, or both.~~
~~2. Category b—Separations between occupancies in accordance with Section 508.3.3.~~
~~3. Category c—Separations between occupancies having a *fire-resistance rating* of not less than twice that required by Section 508.3.3.~~

~~**3412.6.17 Automatic sprinklers.** Evaluate the ability to suppress a fire based on the installation of an *automatic sprinkler system* in accordance with Section 903.3.1.1. "Required sprinklers" shall be based on the requirements of this code. Under the categories and occupancies in Table 3412.6.17, determine the appropriate value and enter that value into Table 3412.7 under Safety Parameter 3412.6.17, Automatic Sprinklers, for fire safety, *means of egress* divided by 2 and general safety.~~

~~**TABLE 3412.6.17**~~
~~**SPRINKLER SYSTEM VALUES**~~

| ~~OCCUPANCY~~ | ~~CATEGORIES~~ | | | | | |
|---|---|---|---|---|---|---|
| | ~~a~~ | ~~b~~ | ~~c~~ | ~~d~~ | ~~e~~ | ~~f~~ |
| ~~A-1, A-3, F, M, R, S-1~~ | ~~-6~~ | ~~-3~~ | ~~0~~ | ~~2~~ | ~~4~~ | ~~6~~ |
| ~~A-2~~ | ~~-4~~ | ~~-2~~ | ~~0~~ | ~~1~~ | ~~2~~ | ~~4~~ |
| ~~A-4, B, E, S-2~~ | ~~-12~~ | ~~-6~~ | ~~0~~ | ~~3~~ | ~~6~~ | ~~12~~ |

~~**3412.6.17.1 Categories.** The categories for automatic sprinkler system protection are:~~
~~1. Category a—Sprinklers are required throughout; sprinkler protection is not provided or the sprinkler system design is not adequate for the hazard protected in accordance with Section 903.~~
~~2. Category b—Sprinklers are required in a portion of the building; sprinkler protection is not provided~~

~~or the sprinkler system design is not adequate for the hazard protected in accordance with Section 903.~~
~~3. Category c—Sprinklers are not required; none are provided.~~
~~4. Category d—Sprinklers are required in a portion of the building; sprinklers are provided in such portion; the system is one which complied with the code at the time of installation and is maintained and supervised in accordance with Section 903. 5. Category e—Sprinklers are required throughout; sprinklers are provided throughout in accordance with Chapter 9.~~
~~6. Category f—Sprinklers are not required throughout; sprinklers are provided throughout in accordance with Chapter 9.~~

~~**3412.6.18 Standpipes.** Evaluate the ability to initiate attack on a fire by making a supply of water available readily through the installation of standpipes in accordance with Section 905. Required standpipes shall be based on the requirements of this code. Under the categories and occupancies in Table 3412.6.18, determine the appropriate value and enter that value into Table 3412.7 under Safety Parame-~~

~~**3412.6.18**~~
~~**STANDPIPE SYSTEM VALUES**~~

~~(Table Stricken)~~

~~**3412.6.18.1 Standpipe.** The categories for standpipe systems are:~~
~~1. Category a—Standpipes are required; standpipe is not provided or the standpipe system design is not in compliance with Section 905.3.~~
~~2. Category b—Standpipes are not required; none are provided.~~
~~3. Category c—Standpipes are required; standpipes are provided in accordance with Section 905.~~
~~4. Category d—Standpipes are not required; standpipes are provided in accordance with Section 905.~~

~~**3412.6.19 Incidental accessory occupancy.** Evaluate the protection of incidental accessory occupancies in accordance with Section 508.2.5. Do not include those where this code requires suppression throughout the buildings, including covered mall buildings, high-rise buildings, public garages and unlimited area buildings. Assign the lowest score from Table 3412.6.19 for the building or floor area being evaluated. If there are no specific occupancy areas in the building or floor area being evaluated, the value shall be zero.~~

~~**3412.7 Building score.** After determining the appropriate data from Section 3412.6, enter those data in Table 3412.7 and total the building score.~~

~~**3412.8 Safety scores.** The values in Table 3412.8 are the required mandatory safety scores for the evaluation process *listed* in Section 3412.6.~~

~~**3412.9 Evaluation of building safety.** The mandatory safety score in Table 3412.8 shall be subtracted from the building score in Table 3412.7 for each category. Where the final score for any category equals zero or more, the building is in compliance with the requirements of this section for that category. Where the final score for any category is less than zero, the building is not in compliance with the requirements of this section.~~

~~**TABLE 3412.6.19**~~
~~**INCIDENTAL USE AREA VALUESa**~~

| ~~**PROTECTION REQUIRED BY TABLE 302.1.1**~~ | ~~**PROTECTION PROVIDED**~~ | | | | | | |
|---|---|---|---|---|---|---|---|
| | ~~**None**~~ | ~~**1 Hour**~~ | ~~**AFSS**~~ | ~~**AFSS with SP**~~ | ~~**1 Hour and AFSS**~~ | ~~**2 Hours**~~ | ~~**2 Hours and AFSS**~~ |
| ~~2 Hours and AFSS~~ | ~~4~~ | ~~3~~ | ~~2~~ | ~~2~~ | ~~1~~ | ~~2~~ | ~~0~~ |
| ~~2 Hours, or 1 Hour and AFSS~~ | ~~3~~ | ~~2~~ | ~~1~~ | ~~1~~ | ~~0~~ | ~~0~~ | ~~0~~ |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| ~~1 Hour and AFSS~~ | ~~-3~~ | ~~-2~~ | ~~-1~~ | ~~-1~~ | ~~0~~ | ~~-1~~ | ~~0~~ |
| ~~1 Hour~~ | ~~-1~~ | ~~0~~ | ~~-1~~ | ~~0~~ | ~~0~~ | ~~0~~ | ~~0~~ |
| ~~1 Hour, or AFSS with SP~~ | ~~-1~~ | ~~0~~ | ~~-1~~ | ~~0~~ | ~~0~~ | ~~0~~ | ~~0~~ |
| ~~AFSS with SP~~ | ~~-1~~ | ~~-1~~ | ~~-1~~ | ~~0~~ | ~~0~~ | ~~-1~~ | ~~0~~ |
| ~~1 Hour or AFSS~~ | ~~-1~~ | ~~0~~ | ~~0~~ | ~~0~~ | ~~0~~ | ~~0~~ | ~~0~~ |

~~a. AFSS = Automatic fire suppression system; SP = Smoke partitions (See Section 508.2.2).~~

~~NOTE: For Table 3410.7, see next page.~~

**~~TABLE 3412.8~~**
**~~MANDATORY SAFETY SCORESa~~**

**~~MANDATORY SAFETY SCORES~~[a]**

| ~~OCCUPANCY~~ | ~~FIRE SAFETY (MFS)~~ | ~~MEANS OF EGRESS (MME)~~ | ~~GENERAL SAFETY (MGS)~~ |
|---|---|---|---|
| ~~A-1~~ | ~~16~~ | ~~27~~ | ~~27~~ |
| ~~A-2~~ | ~~19~~ | ~~30~~ | ~~30~~ |
| ~~A-3~~ | ~~18~~ | ~~29~~ | ~~29~~ |
| ~~A-4, E~~ | ~~23~~ | ~~34~~ | ~~34~~ |
| ~~B~~ | ~~24~~ | ~~34~~ | ~~34~~ |
| ~~F~~ | ~~20~~ | ~~30~~ | ~~30~~ |
| ~~M~~ | ~~19~~ | ~~36~~ | ~~36~~ |
| ~~R~~ | ~~17~~ | ~~34~~ | ~~34~~ |
| ~~S-1~~ | ~~15~~ | ~~25~~ | ~~25~~ |
| ~~S-2~~ | ~~23~~ | ~~33~~ | ~~33~~ |

~~a. MFS = Mandatory Fire Safety;~~

~~MME = Mandatory Means of Egress;~~

~~MGS = Mandatory General Safety.~~

**~~TABLE 3412.9~~**
**~~EVALUATION FORMULASa~~**

| ~~FORMULA~~ | ~~T.3410.7~~ | ~~-~~ | ~~-~~ | ~~T.3410.8~~ | ~~SCORE~~ | ~~PASS~~ | ~~FAIL~~ |
|---|---|---|---|---|---|---|---|
| ~~FS-MFS ≥ 0~~ | _____ | ~~(FS)~~ | ~~-~~ | _____ ~~(MFS) =~~ | _____ | _____ | _____ |
| ~~ME-MME ≥ 0~~ | _____ | ~~(ME)~~ | ~~-~~ | _____ ~~(MME) =~~ | _____ | _____ | _____ |
| ~~GS-MGS ≥ 0~~ | _____ | ~~(GS)~~ | ~~-~~ | _____ ~~(MGS) =~~ | _____ | _____ | _____ |

~~a. FS = Fire Safety MFS = Mandatory Fire Safety~~

~~ME = Means of Egress MME = Mandatory Means of Egress~~

~~GS = General Safety MGS = Mandatory General Safety~~

~~**3412.9.1 Mixed occupancies.** For mixed occupancies, the following provisions shall apply:~~
~~1. Where the separation between mixed occupancies does not qualify for any category indicated in Section 3412.6.16, the mandatory safety scores for the occupancy with the lowest general safety score in Table 3412.8 shall be utilized (see Section 3412.6.)~~
~~2. Where the separation between mixed occupancies qualifies for any category indicated in Section 3412.6.16, the mandatory safety scores for each occupancy shall be placed against the evaluation scores for the appropriate occupancy.~~

**~~TABLE 3412.7~~**
**~~SUMMARY SHEET — BUILDING CODE~~**

| | | | |
|---|---|---|---|
| ~~Existing occupancy~~ _____ | | ~~Proposed occupancy~~ _____ | |
| ~~Year building was constructed~~ _____ | | ~~Number of stories~~ _____ ~~Height in feet~~ _____ | |
| ~~Type of construction~~ _____ | | ~~Area per floor~~ _____ | |
| ~~Percentage of open perimeter~~ _____ ~~%~~ | | ~~Percentage of height reduction~~ _____ ~~%~~ | |
| ~~Completely suppressed:~~ | ~~Yes~~ ____ ~~No~~ ____ | ~~Corridor wall rating~~ _____ | |
| ~~Compartmentation:~~ | ~~Yes~~ ____ ~~No~~ ____ | ~~Required door closers:~~ | ~~Yes~~ ____ ~~No~~ ____ |
| ~~Fire resistance rating of vertical opening enclosures~~ _____ | | | |
| ~~Type of HVAC system~~ _____, | | ~~serving number of floors~~ _____ | |
| ~~Automatic fire detection:~~ | ~~Yes~~ ____ ~~No~~ ____, | ~~type and location~~ _____ | |
| ~~Fire alarm system:~~ | ~~Yes~~ ____ ~~No~~ ____, | ~~type~~ _____ | |
| ~~Smoke control:~~ | ~~Yes~~ ____ ~~No~~ ____, | ~~type~~ _____ | |
| ~~Adequate exit routes:~~ | ~~Yes~~ ____ ~~No~~ ____, | ~~Dead ends:~~ | ~~Yes~~ ____ ~~No~~ ____ |
| ~~Maximum exit access travel distance~~ _____ | | ~~Elevator controls:~~ | ~~Yes~~ ____ ~~No~~ ____ |
| ~~Means of egress emergency lighting:~~ | ~~Yes~~ ____ ~~No~~ ____ | ~~Mixed occupancies:~~ | ~~Yes~~ ____ ~~No~~ ____ |

| ~~SAFETY PARAMETERS~~ | ~~FIRE SAFETY (FS)~~ | ~~MEANS OF EGRESS (ME)~~ | ~~GENERAL SAFETY (GS)~~ |
|---|---|---|---|
| ~~3410.6.1 Building Height~~<br>~~3410.6.2 Building Area~~<br>~~3410.6.3 Compartmentation~~ | | | |
| ~~3410.6.4 Tenant and Dwelling Unit Separations~~<br>~~3410.6.5 Corridor Walls~~<br>~~3410.6.6 Vertical Openings~~ | | | |
| ~~3410.6.7 HVAC Systems~~<br>~~3410.6.8 Automatic Fire Detection~~<br>~~3410.6.9 Fire Alarm System~~ | | | |
| ~~3410.6.10 Smoke control~~<br>~~3410.6.11 Means of Egress~~<br>~~3410.6.12 Dead ends~~ | ~~* * * *~~<br>~~* * * *~~<br>~~* * * *~~ | | |
| ~~3410.6.13 Maximum Exit Access Travel Distance~~<br>~~3410.6.14 Elevator Control~~<br>~~3410.6.15 Means of Egress Emergency Lighting~~ | ~~* * * *~~<br>~~-~~<br>~~* * * *~~ | | |
| ~~3410.6.16 Mixed Occupancies~~<br>~~3410.6.17 Automatic Sprinklers~~<br>~~3410.6.18 Incidental Use~~ | | ~~* * * *~~<br>~~÷2 =~~ | |
| ~~**Building score — total value**~~ | | | |

~~* * * *No applicable value to be inserted.~~

***3412A.1*** ~~***3403A.2.3.3***~~ **Adoption *of ASCE 41*.** *Except for the modifications as set forth in Sections ~~3411A through~~ 3412A and 3413A all additions, alterations, repairs and seismic retrofit to existing structures or portions thereof ~~may~~ shall be permitted to be designed ~~and constructed~~ in accordance with the provisions of ASCE 41.*

***3412A.1.1*** ~~***3403A.2.3.3.1***~~ **Referenced Standards.** *All reference standards listed in ASCE 41 shall be replaced by referenced standards listed in Chapter 35 of this code and shall include all amendments to the reference standards in this code.*

***3412A.1.2*** ~~***3403A.2.3.3.2***~~ **ASCE 41 Section 1.4 –Rehabilitation Objectives.** *Target building performance level shall be as follows:*

a. ***For general acute care hospitals along with all structures required for their continuous operation ~~and~~ or access/egress*** *- Immediate Occupancy (IO) Structural Performance Level (S-1) as defined in Section 1.5.1.1 at Basic Safety Earthquake 1 (BSE-1) Seismic Hazard Level as defined in Section 1.6.1.2 and Collapse Prevention Structural performance level (S-5) per Section 1.5.1.5 at Basic Safety Earthquake 2 (BSE-2) Seismic Hazard Level as defined in Section 1.6.1.1. The nonstructural performance level shall satisfy the requirements of this code for new hospital buildings.*

   ***Exceptions:*** *Buildings satisfying requirements of Sections 3411A ~~3403A.2.3.4, 3411A.2~~ or 3412A.2 ~~3411A.3~~.*

b. ***For pre-1973 Buildings which will not be used for general acute care services after January 1, 2030*** *– Basic Safety Objective (BSO) Level as defined in Section 1.4.1. BSO level includes Life Safety Building Performance (3-C) Level as defined in*

*Section 1.5.3.3 at the Basic Safety Earthquake 1 (BSE-1) Seismic Hazard Level as defined in section 1.6.1.2 and Collapse Prevention (CP) building performance level (5-E) per Section 1.5.3.4 at the Basic Safety Earthquake 2 (BSE-2) Seismic Hazard Level as defined in Section 1.6.1.1.*

***Exceptions:*** *Buildings satisfying requirements of Sections 3411A ~~3403A.2.3.4, 3411A.3.2.1 and~~ or 3412A.2 ~~3411A.3.2.2~~.*

**c. All Others** *- Immediate Occupancy (IO) Building Performance Level of (1-B) as defined in Section 1.5.3.2 at Basic Safety Earthquake 1 (BSE-1) Seismic Hazard Level as defined in Section 1.6.1.2 and Collapse Prevention (CP) building performance level (5-E) per Section 1.5.3.4 at Basic Safety Earthquake 2 (BSE-2) Seismic Hazard Level as defined in Section 1.6.1.1.*

***3412A.1.3 ~~3403A.2.3.3.3~~* Material Testing Required.** *Use of material properties based on historical information as default values shall not be permitted.*

***3412A.1.4 ~~3403A.2.3.3.4~~* Analysis Procedure.** *The selection of a particular analysis procedure from ASCE 41 shall be subject to the approval of the enforcement agent.*

***3412A.1.5 ~~3403A.2.3.3.5~~* Structural Design Criteria.** *Prior to implementation of ASCE 41 Nonlinear Dynamic Procedure, the ground motion, analysis and design methods, material assumptions and acceptance criteria proposed by the engineer shall be ~~peer reviewed in accordance with Section 3414A and~~ reviewed by the enforcement agent.*

***3412A.1.6 ~~3403A.2.3.3.6~~* Structural observation, testing, and inspections.** *Construction, testing, inspection, and structural observation requirements shall be as required for new construction.*

***3412A.2 ~~3403A.2.3.4~~* Seismic Evaluation and Retrofit of General Acute Care Hospitals***. Not withstanding any other requirements of this code, all existing general acute care hospitals shall comply with the requirements specified in Chapter 6, Part 1, Title 24.*

***3412A.2.1 ~~3403A.2.3.4.1~~* SPC 5 and NPC 4 / NPC 5.** *Structures and nonstructural components and systems satisfying the requirements of this Code for new buildings for Occupancy Category IV shall be considered to satisfy the requirements of SPC 5 and NPC 4. NPC 4 buildings satisfying operational requirements for NPC 5 of Table 11.1, Chapter 6, Part 1, Title 24, shall be placed in non-structural performance category NPC 5.*

***3412A.2.2 ~~3403A.2.3.4.2~~* SPC 5 using ASCE 41.** *Structures satisfying the requirements of immediate occupancy structural performance level (S-1) per Section 1.5.1.1 of ASCE 41 at BSE-1, Collapse prevention performance level S-5 per Section 1.5.1.5 of ASCE 41 at BSE-2 and items identified in Chapter 6, Article 10, Part 1, Title 24, satisfying the requirements of Immediate Occupancy Nonstructural performance level (N-B) per Section 1.5.2.2 of ASCE 41 at BSE-1 shall be considered to comply with SPC 5 requirements of Table 2.5.3, Chapter 6, Part 1, Title 24.*

***3412A.2.3 ~~3403A.2.3.4.3~~* SPC 2 using ASCE 41.** *Structures satisfying the requirements of life safety structural performance level (S-3) per Section 1.5.1.3 of ASCE 41 at BSE-1 and items identified in Chapter 6, Article 10, Title 24, Part 1 satisfying the requirements of life safety Nonstructural performance level (N-C) per Section 1.5.2.3 of ASCE 41 at BSE-1, shall be considered to comply with SPC 2 requirements of Table 2.5.3, Chapter 6, Part 1, Title 24.*

***3412A.2.4 ~~3403A.2.3.4.4~~* NPC.** *Non-structural components for Immediate Occupancy Nonstructural performance level (N-B) in Section 1.5.2.2 shall meet the requirements of this Code for new buildings. Non-structural components for Operational Nonstructural performance level (N-A) in Section 1.5.2.1 shall meet performance level N-B and Section 3413A.1.30. Building satisfying the requirements of non-structural performance level N-A and N-B as described in this section shall be considered to satisfy the requirements of NPC 5 & NPC 4 of Table 11.1, Chapter 6, Part 1, Title 24 respectively.*

*Immediate Occupancy Nonstructural performance level (N-B) in Section 1.5.2.2 and Life Safety Nonstructural performance level (N-C) in Section 1.5.2.3 of ASCE 41 at BSE-1 shall be considered*

*equivalent to NPC 3 / NPC 2 and NPC 3R requirements respectively of Table 11.1, Chapter 6, Part 1, Title 24. For NPC 3 / NPC 3R / NPC 2, only components listed in Table 11.1, Chapter 6, Part 1, Title 24, for NPC 3 / NPC 3R / NPC 2 need to satisfy the requirements specified above.*

*Exceptions: 1) Evaluation procedure in Article 11, Chapter 6, Part 1, Title 24 shall be used for seismic evaluation of NPC 2, NPC 3 / NPC 3R, NPC 4 and NPC 5, where specific procedure is not outlined in ASCE 41. Administrative and permitting provisions outlined in Article 11, Chapter 6, Part 1, Title 24 shall apply.*

*2) Anchorage and bracing of nonstructural components in buildings in seismic performance categories SPC 1 and SPC 2 with a performance level of NPC 3R may comply with the provisions of Section 1630A of the 1995 California Building Code using an importance factor $I_p$=1.0. The capacity of welds, anchors and fasteners shall be determined in accordance with requirements of this Code.*

*3) Anchorage and bracing of nonstructural components in buildings in seismic performance categories SPC 1 or SPC 2 with a performance level of NPC 3 or higher, and SPC 3 or SPC 4, may comply with the provisions of Section 1630B of the 1998 California Building Code using an importance factor $I_p$=1.5. The capacity of welds, anchors and fasteners shall be determined in accordance with requirements of this code.*

*A continuous load path of sufficient strength and stiffness between the component and the supporting structure shall be verified. Local elements of the supporting structure shall be verified for the component loads where they control the design of the elements or their connections. Increases in $F_p$ due to anchorage conditions (for example shallow anchors) need not be considered. For NPC 3R, the adequacy of load path for nonstructural elements need only be verified when the total reaction at the point of support (including the application of $F_p$) exceeds the following limits:*

1. *250 pounds for components or equipment attached to light frame walls. For the purposes of this requirement, the sum of the absolute value of all reactions due to component loads on a single stud shall not exceed 250 pounds.*
2. *1,000 pounds for components or equipment attached to roofs, or walls of reinforced concrete or masonry construction.*
3. *2,000 pounds for components or equipment attached to floors or slabs-on-grade.*

***Exception:*** *If the anchorage or bracing is configured in a manner that results in significant torsion on a supporting structural element, the effects of the nonstructural reaction force on the structural element shall be considered in the anchorage design.*

~~***3403A.2.3.5 Repair of Earthquake Damage.*** *Repair of Earthquake Damage shall comply with Article 20, Chapter 7, Part 1, Title 24.*~~

**SECTION 3413*A***
**MODIFICATIONS TO ASCE 41**

***3413A.1 GENERAL.*** *The text of ASCE 41 shall be modified as indicated in Sections 3413A.1.1 through 3413A.1.32.*

*Reference to sections of International Building Code (IBC) in ASCE 41 shall comply with requirements of Sections 110A.1 & 110A.4.*

***3413A.1.1 ASCE 41 Section 1.1.*** *Modify ASCE 41 Section 1.1 with the following:*

*Seismic evaluations shall be performed using procedure and criteria of ASCE 41 except for general acute care hospitals, which shall be evaluated per Chapter 6, Part 1, Title 24 when required per provision of that chapter.*

***3413A.1.2 ASCE 41 Section 1.6 Seismic Hazard.*** *Modify ASCE 41 Section 1.6 with the Following:*

*Response spectra and acceleration time histories shall be constructed in accordance with Sections 1613A, ~~1614A~~ 1615A and ~~1802A.6~~ 1803A.6. Basic Safety Earthquake 2 (BSE-2) in ASCE 41 shall be same as Maximum Considered Earthquake (MCE) in ASCE 7.*

***3413A.1.3 ASCE 41 Section 2.2.6.*** *Modify ASCE 41 Section 2.2.6 with the Following:*

***Data Collection Requirements.*** *The extent of data collection shall be at Comprehensive level for all structures except that data collection at Usual level shall be permitted for structures with BSO or lower target performance objective. Materials properties testing program shall be pre-approved by the enforcement agent.*

*For buildings~~,~~ built under an OSHPD permit based on the 1976 or later edition of the CBC, where materials properties are shown on design drawings and original materials test data are available, no materials testing shall be required when approved by the enforcement agent.*

***3413A.1.4 ASCE 41 Section 2.4.1.1.*** *Modify ASCE 41 Section 2.4.1.1 with the following:*

1. *If one or more component DCRs exceed 1.5 for the Immediate Occupancy Structural Performance Level (S-1) or 2.0 for the Life Safety Structural Performance level (S-3) and any irregularity described in Section 2.4.1.1.1 through 2.4.1.1.4 is present, then linear procedures are not applicable and shall not be used.*
2. *Linear procedures are not applicable to moment resisting frames where plastic hinges do not form in either the beam at the face of column or in the column panel zone.*

***3413A.1.5 ASCE 41 Section 2.4.2.1*** *Modify ASCE 41 Section 2.4.2.1 with the following:*

***Nonlinear Static Procedure.*** *If higher mode effects are significant and building is taller than 75 feet above the base, the Nonlinear Dynamic Procedure shall be used.*

***3413A.1.6 ASCE 41 Section 2.4.4.5.*** *Modify ASCE 41 Section 2.4.4.5 by the following:*

***Material Properties.*** *Expected material properties are not permitted to be determined by multiplying lower bound values by the assumed factors specified in Chapters 5 through 8.*

***3413A.1.7 ASCE 41 Section 3.2.10.1.*** *Modify ASCE 41 Section 3.2.10.1 with the Following:*

***Linear Procedures.*** *Equation 3-5 is not permitted by OSHPD.*

***3413A.1.8 ASCE 41 Section 3.3.1.3.5.*** *Replace ASCE 41 Section 3.3.1.3.5 as follows:*

***Unreinforced Masonry Buildings.*** *Unreinforced Masonry not permitted by OSHPD.*

***3413A.1.9 ASCE 41 Section 3.3.3.2.2*** *Modify ASCE 41 Section 3.3.3.2.2 with the following:*

***Simplified NSP Analysis.*** *Not permitted by OSHPD.*

***3413A.1.10 ASCE 41 Section 3.4.2.2.*** *Modify ASCE 41 Section 3.4.2.2 with the Following:*

***Acceptance Criteria for Linear Procedures – Drift Limitations.*** *The interstory drift ratio shall not exceed the drift limits for Occupancy Category IV buildings in ASCE 7 Table 12.12-1 due to forces corresponding to BSE-1, except that buildings designed to BSO or lower performance levels are permitted to meet the drift limits for Occupancy Category II buildings. For dual systems, the least interstory drift ratio shall control.*

> ***EXCEPTION:*** *Larger interstory drift ratios shall be permitted where justified by rational analysis that both structural and non-structural elements can tolerate such drift and approved by the enforcement agent.*

***3413A.1.11 ASCE 41 Section 3.4.3.2.1.*** *Modify ASCE 41 Section 3.4.3.2.1 with the following:*

***Deformation-Controlled Actions.*** *For any building required to meet the Operational Building Performance level, 1-A or Immediate Occupancy Building Performance Level, 1-B, primary components shall be within the acceptance criteria for primary components and secondary components shall be within the acceptance criteria for secondary components.*

***3413A.1.12 ASCE 41 Section 4.4.*** *Modify ASCE 41 Section 4.4 with the followings:*

***Foundation Strength and Stiffness.*** *Foundation and soil strength shall be used to evaluate potential overturning, uplift and sliding for fixed base assumptions, and stiffness for flexible base assumptions, including deformations associated with those actions.*

***3413A.1.13 ASCE 41 Section 4.4.1.1.*** *Replace ASCE 41 Section 4.4.1.1 as follows:*

***Presumptive Capacities.*** *Not permitted by OSHPD.*

***3413A.1.14 ASCE 41 Section 4.4.1.2.*** *Replace ASCE 41 Section 4.4.1.2 as follows:*

***Prescriptive Expected Capacities.*** *Not permitted by OSHPD.*

***3413A.1.15 ASCE 41 Section 4.4.3.2.2.*** *Modify ASCE 41 Section 4.4.3.2.2 with the following:*

***Flexible Base Assumption.*** *The soil strength shall be evaluated.*

***3413A.1.16 ASCE 41 Section 4.5.*** *Modify ASCE 41 Section 4.5 with the following:*

***Seismic Earth Pressure.*** *Where the grade difference from one side of the building to another exceeds one-half story height, the seismic increment of earth pressure shall be added to the gravity lateral earth pressure to evaluate the building overturning and sliding stability and the lateral force resisting system below grade in combination with the building seismic forces.*

***3413A.1.17 ASCE 41 Table 5.6.*** *Modify ASCE 41 Table 5.6 with the following:*

***Acceptance Criteria for Nonlinear Procedures - Structural Steel Components.***
*For fully and partially restrained moment connections designed to 1989 or prior edition of Part 2, Title 24 shall be verified for the presence of welds using E70T-4 electrodes <u>or other electrodes with equivalent aluminum content.</u> Where E70T-4 <u>or equivalent</u> electrodes are present, the plastic rotation angles and residual strength ratios used shall be substantiated by the statistical analysis of three or more applicable cyclic test results subject to the approval of the enforcement agent.*

***3413A.1.18 ASCE 41 Section 6.7.1.1.*** *Modify ASCE 41 Section 6.7.1.1 with the following:*

***Monolithic Reinforced Concrete Shear Walls and Wall Segments.*** *For nonlinear procedures, shear walls or wall segments with axial loads greater than 0.35 $P_o$ shall be included in the model as primary elements with appropriate strength and stiffness degrading properties assigned to those components subject to the approval of the enforcement agent. For linear procedures, the effects of deformation compatibility shall be investigated using moment-curvature section analyses and cyclic testing results of similar components to determine whether strengthening is necessary to maintain the gravity load carrying capacity of that component.*

*<u>Horizontal wall segments or spandrels reinforced similar to vertical wall segments or piers shall be classified as wall segments, not shear wall coupling beams, in Tables 6-18 through 6-21.</u>*

***3413A.1.19 ASCE 41 Section 7.3.2****. Replace ASCE 41 Section 7.3.2 as follows:*

***Unreinforced Masonry Walls and Piers In-plane.*** *Not permitted by OSHPD.*

***3413A.1.20 ASCE 41 Section 7.3.3.*** *Replace ASCE 41 Section 7.3.3 as follows:*

***Unreinforced Masonry Walls Out-of-plane.*** *Not permitted by OSHPD.*

***3413A.1.21 ASCE 41 7.3.4.2.2. Shear Strength of Walls and Piers.*** *Modify ASCE 41 Section 7.3.4.2.2 with the following:*

*The spacing of shear reinforcing, S, shall be less than or equal to the wall pier clear height divided by 2 or the story height divided by 2, whichever is smaller.*

***3413A.1.22 ASCE 41 Section 9.2.4.*** *Modify ASCE 41 Section 9.2.4 with the following:*

***Linear Procedures.*** *Verification of the interstory lateral displacements, isolator displacements, the strength adequacy of the seismic force resisting system and isolation system, and anchorage to the foundation shall be accomplished using the Nonlinear Dynamic Procedure.*

***3413A.1.23 ASCE 41 Section 9.2.5.1.*** *Modify ASCE 41 Section 9.2.5.1 with the following:*

***Nonlinear Static Procedure.*** *Verification of the interstory lateral displacements, isolator displacements, the strength adequacy of the seismic force resisting system and isolation system, and anchorage to the foundation shall be accomplished using the Nonlinear Dynamic Procedure.*

***3413A.1.24*** Reserved. ~~***ASCE 41 Section 9.2.9.*** *Modify ASCE 41 Section 9.2.9 with the following:*~~

~~***Isolation System Testing and Design Properties - Production Tests.*** *Production testing and associated acceptance criteria shall be as approved by the enforcement agent.*~~

***3413A.1.25*** Reserved. ~~***ASCE 41 Section 9.2.9.2.9.*** *Modify ASCE 41 Section 9.2.9.2.9 with the following:*~~

~~***Testing Similar Units.*** *The testing exemption shall require approval by the enforcement agent.*~~

***3413A.1.26 ASCE 41 Section 9.3.4.*** *Modify ASCE 41 Section 9.3.4 with the following:*

***Linear Procedures.*** *Verification of the interstory lateral displacements, damper relative velocities and displacements, the strength adequacy of the seismic force resisting system and damping system, and anchorage to the foundation shall be accomplished using the Nonlinear Dynamic Procedure.*

***3413A.1.27 ASCE 41 Section 9.3.5.1.*** *Modify ASCE 41 Section 9.3.5.1 with the following:*

***Nonlinear Static Procedure.*** *Verification of the interstory lateral displacements, damper relative velocities and displacements, the strength adequacy of the seismic force resisting system and damping system, and anchorage to the foundation shall be accomplished using the Nonlinear Dynamic Procedure.*

***3413A.1.28*** Reserved. ~~***ASCE 41 Section 9.3.8.*** *Modify ASCE 41 Section 9.3.8 with the following:*~~

~~***Required Tests of Energy Dissipation Devices - Production Tests.*** *Production testing and associated acceptance criteria shall be as approved with the enforcement agent.*~~

***3413A.1.29 ASCE 41 Chapter 10.*** *Replace ASCE 41 Chapter 10 as follows:*

***Simplified Rehabilitation.*** *Not permitted by OSHPD.*

***3413A.1.30 ASCE 41 Section 11.3.2.*** *Modify ASCE 41 Section 11.3.2 with the following:*

***Operational Nonstructural Performance Level (N-A) Requirements.*** *All Structures shall meet Immediate Occupancy Nonstructural Performance Level (N-B) and facility shall have on-site supplies of water and holding tanks for wastewater, sufficient for 72 hours emergency operations, are integrated into the building plumbing systems. As an alternative, hook-ups to allow for the use of transportable sources of water and sanitary waste water disposal have been provided. An on-site emergency system as defined within Part 3, Title 24 is incorporated into the building electrical system for critical care areas. Additionally, the system shall provide for radiological service and an onsite fuel supply for 72 hours of acute care operation.*

***3413A.1.31 ASCE 41 Section 11.9.4.3.1.*** *Modify ASCE 41 Section 11.9.4.3.1 with the following:*

*Ceilings in all Categories shall satisfy requirements for ceilings in Category C specified in this section.*

***3413A.1.32 ASCE 41 Section 11.10.2.4.*** *Modify ASCE 41 Section 11.10.2.4 by the following:*

*For general acute care hospital, Nonstructural Evaluation shall comply with requirements of Section 11.2, Chapter 6, Part 1, Title 24.*

***SECTION 3414A***

## *PEER REVIEW REQUIREMENTS*

***3414A.1 General.*** *Independent peer review is an objective technical review by knowledgeable reviewer(s) experienced in structural design, analysis and performance issues involved. The reviewer(s) shall examine the available information on the condition of building, basic engineering concept employed and recommendations for action.*

***3414A.2 Timing of Independent Review.*** *The independent reviewer (s) shall be selected prior to initiation of substantial portion of the design and analysis work that is to be reviewed, and review shall start as soon as practical and sufficient information defining the project is available.*

***3414A.3 Qualifications and Terms of Employment.*** *The reviewer shall be independent from the design and construction team.*

***3414A.3.1*** *The reviewer(s) shall have no other involvement in the project before, during or after the review, except in a review capacity.*

***3414A.3.2*** *The reviewer shall be selected and paid by owner and shall have technical expertise in repair of buildings similar to the one being reviewed, as determined by enforcement agent.*

***3414A.3.3*** *The reviewer (in case of review team, the chair) shall be a California-licensed structural engineer who is familiar with technical issues and regulations governing the work to be reviewed.*

***3414A.3.4*** *The reviewer shall serve through completion of the project and shall not be terminated except for failure to perform the duties specified herein. Such termination shall be in writing with copies to enforcement agent, owner, and the engineer of record. When a reviewer is terminated or resigns, a qualified replacement shall be appointed within 10 working days.*

***3414A.4 Scope of Review.*** *Review activities shall include, where appropriate, available construction documents, design criteria, observation of the condition of structure, all new and original inspection reports, including methods of sampling, analyses prepared by the engineer of record and consultants, and the retrofit or repair design. Review shall include consideration of the proposed design approach, method, materials and details.*

***3414A.5 Reports.*** *The reviewer(s) shall prepare a written report to the owner and responsible enforcement agent that covers all aspect of the review performed including conclusions reached by the reviewer. Report shall be issued after the schematic phase, during design development, and at the completion of construction documents, but prior to their issuance of permit. Such report shall include, at the minimum, statement of the following.*

1. *Scope of engineering design peer review with limitations defined.*
2. *The status of the project documents at each review stage.*
3. *Ability of selected materials and framing systems to meet the performance criteria with given loads and configuration.*
4. *Degree of structural system redundancy and the deformation compatibility among structural and non-structural elements.*
5. *Basic constructability of the retrofit or repair system.*
6. *Other recommendation that will be appropriate for the specific project.*
7. *Presentation of the conclusions of the reviewer identifying any areas that need further review, investigation and / or clarification.*
8. *Recommendations.*

**3414A.6 *Responses and Corrective Actions.*** *The engineer of record shall review the report from the reviewer(s) and shall develop corrective actions and other responses as appropriate. Changes observed during construction that affect the seismic-resisting system shall be reported to the reviewer in writing for review and recommendations. All reports, responses and corrective actions prepared pursuant to this section shall be submitted to the responsible enforcement agent and the owner along with other plans, specifications and calculations required. If the reviewer resigns or is terminated by the owner prior to completion of the project, then the reviewer shall submit copies of all reports, notes, and the correspondence to the responsible enforcement agent, the owner, and the engineer of record within 10 working days of such termination.*

## ***SECTION 3415A***

## ***EARTHQUAKE MONITORING INSTRUMENTS FOR EXISTING BUILDINGS***

***3415A.1 Earthquake recording instrumentation of existing buildings.*** *All owners of existing structures, selected by the enforcement agency for the installation of earthquake-recording instruments, shall provide space for the installation and access to such instruments. Location of said instruments shall be determined by the enforcement agency. The enforcement agency shall make arrangements to provide, maintain, and service the instruments. Data shall be the property of the enforcement agency, but copies of individual records shall be made available to the public on request and the payment of an appropriate fee.*

*(All existing amendments that are not revised above shall continue without any change)*

**NOTATION:**

- *Authority: Health and Safety Code Section 130005(g) & 130021*
- *Reference: Health and Safety Code Section 1275, 129790, 129850 & 130005(g)*

## CHAPTER 35
## REFERENCED STANDARDS

This chapter lists the standards that are referenced in various sections of this document. The standards are listed herein by the promulgating agency of the standard, the standard identification, the effective date and title, and the section or sections of this document that reference the standard. The application of the referenced standards shall be as specified in Section 102.4.

***[OSHPD 1 & 4] Reference to other chapters.*** *In addition to the code sections referenced, the standards listed in this chapter are applicable to the respective code sections in Chapters 16A, 17A, 18A, 19A, 21A, 22A, and 34A.*

**...**

| ACI | American Concrete Institute<br>38800 Country Club Drive<br>Farmington Hills, MI 48333-9094 | |
|---|---|---|
| Standard reference number | Title | Referenced in code section number |
| *503.7-07* | *Specification for Crack Repair by Epoxy Injection.* | *1917A.2* |
| *506-05* | *Guide to Shotcrete* | *1913A* |
| *440.2R-08* | *Guide for the Design and Construction of Externally Bonded FRP Systems for Strengthening Concrete Structures* | *1917A.3* |

**...**

| AISC | American Institute of Steel Construction<br>One East Wacker Drive, Suite 3100<br>Chicago, IL 60601-2001 | |
|---|---|---|
| Standard reference number | Title | Referenced in code section number |
| *358-05* | *Prequalified Connections for Special and Intermediate Steel Moment Frames for Seismic Applications including Supplement No. 1* | *2205A,3413A* |

**...**

| AITC | American Institute of Timber Construction<br>Suite 140<br>7012 S. Revere Parkway<br>Englewood, CO 80112 | |
|---|---|---|
| Standard reference number | Title | Referenced in code section number |
| *AITC 111-05* | *Recommended Practice for Protection of Structural Glued Laminated Timber During Transit, Storage and Erection* | *2303.1.3.1* |
| *AITC 404-05* | *Standard for Radially Reinforcing Curved Glued Laminated Timber Members to* | |

| | | |
|---|---|---|
| | *Resist Radial Tension* | *2303.1.3.1* |

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| ASCE/SEI | American Society of Civil Engineers<br>Structural Engineering Institute<br>1801 Alexander Bell Drive<br>Reston, VA 20191-4400 | |
|---|---|---|
| Standard reference number the | Title | Referenced in code section number |
| *41-06* | *Seismic Rehabilitation of Existing Buildings including Supplement No. 1* | *~~3403.2.3, 3403A.13,~~ 3401.5, 3412A, 3413A* |

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| ASTM | ASTM International<br>100 Barr Harbor Drive<br>West Conshohocken, PA 19428-2959 | |
|---|---|---|
| Standard reference number | Title | Referenced in code section number |
| ... | | |
| *ASTM C618 - 08a* | *Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete* | *1903A.3* |
| *ASTM C989 - 09* | *Standard Specification for Slag Cement for Use in Concrete and Mortars* | *1903A.3* |
| *C 1567-~~04~~ 08* | *Standard Test Method for Determining the Potential Alkali-Silica Reactivity of the Cementicious Materials and aggregate (Accelerated Mortar-Bar Method)* | *1903A.5* |
| *C 1586-05* | *Standard Guide for Quality Assurance of Mortars* | *2105A.2.2.1.4* |
| *E 580-08* | *Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions* | *1615A.1.16* |

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| AWS | American Welding Society<br>550 N.W. LeJeune Road<br>Miami, FL 33126 | |
|---|---|---|
| Standard reference number | Title | Referenced in code section number |
| D1.1-08 *~~06~~* | Structural Welding Code-Steel | Table 1704.3, *1704A.3.1.4* |
| D1.3-*08* ~~98~~ | Structural Welding Code-Sheet Steel | 1704.3.1.2, Table 1704.3 |
| D1.4-*05* | Structural Welding Code-Reinforcing | 1704.3.1.3, Table 1704.3, Table 1704.4, |

| | | |
|---|---|---|
| | Steel | 2107.4, 2107A.7 |
| *D1.8-09* | *Structural Welding Code – Seismic Supplement* | *1704A.3.1.4, 2204A.1.1, 2204A.1.3* |
| *QC1-06* | *Standard for AWS Certification of Welding Inspectors.* | *~~1704A.3.1.1~~ 1704A.3.1.4* |

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| ICC | International Code Council, Inc.<br>500 New Jersey Ave, NW<br>6th Floor<br>Washington, DC 20001 | |
|---|---|---|
| Standard reference number | Title | Referenced in code section number |
| *ICC-ES AC 01-09** | *Acceptance criteria for expansion anchors in Masonry elements* | *1615A.1.14* |
| *ICC-ES AC 43-~~06~~ 09** | *Acceptance criteria for steel deck roof and floor systems* | *2209A.3* |
| *ICC-ES AC 58-09** | *Acceptance criteria for adhesive anchors in Masonry elements* | *1615A.1.14* |
| *ICC-ES AC 70-09** | *Acceptance criteria for fasteners power-driven into Concrete, Steel and Masonry elements* | *1911A.1.1* |
| *ICC-ES AC 106-09** | *Acceptance criteria for predrilled fasteners (screw anchors) in Masonry* | *1615A.1.14* |
| *ICC-ES AC 125-09** | *Acceptance criteria for Concrete, and Reinforced and Unreinforced Masonry strengthening using externally bonded Fiber-Reinforced Polymer (FRP) composite systems.* | *1917A.3* |
| *ICC-ES AC 178-09** | *Acceptance criteria for inspection and verification of Concrete, and Reinforced and Unreinforced Masonry strengthening using Fiber-Reinforced Polymer (FRP) composite systems.* | *1917A.3* |
| *ICC-ES AC 193-09** | *Acceptance criteria for mechanical anchors in Concrete elements* | *1615A.1.14, 1912A.1.1* |
| *ICC-ES AC 308-09** | *Acceptance criteria for post-installed adhesive anchors in Concrete elements* | *1615A.1.14, 1912A.1.1* |
| *ICC-ES AC 358-09** | *Acceptance criteria for Helical foundation systems and devices* | *1810A.3.1.5.1* |

** Refers to International Building Code, 2009 as a reference standard.*

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| PCI | Precast Prestressed Concrete Institute<br>209 W. Jackson Boulevard, Suite 500<br>Chicago, IL 60604-6938 |
|---|---|

| Standard reference number | Title | Referenced in code section number |
|---|---|---|
| *PCI 120-10 ~~04~~* | *PCI Design Handbook, 7th ~~6th~~ Edition* | *1908A.1* |

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PTI Post-Tensioning Institute
8601 North Black Canyon Highway, Suite 201
Phoenix, AZ 85021

| Standard reference Number | Title | Referenced in code section number |
|---|---|---|
| *PTI-2004* | *Recommendations for Prestressed Rock and Soil Anchors (4th Edition)* | *1811A.2, ~~1813A.2~~, 1810A.3.10.4, J106.2.5* |

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*(All existing amendments that are not revised above shall continue without any change)*

**NOTATION:**

- *Authority: Health and Safety Code Section 130005(g) & 130021*
- *Reference: Health and Safety Code Section 1275, 129790, 129850 & 130005(g)*

## APPENDIX J
## GRADING

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### SECTION J104
### PERMIT APPLICATION AND SUBMITTALS

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**J104.4 Liquefaction study.** For sites with mapped maximum considered earthquake spectral response accelerations at short periods ($S_s$) greater than 0.5g as determined by Section 1613, a study of the liquefaction potential of the site shall be provided, and the recommendations incorporated in the plans.

**Exception:**

*1.* A liquefaction study is not required where the building official determines from established local data that the liquefaction potential is low.

*2. [OSHPD 1, 2, & 4] Exception 1 not permitted by OSHPD.*

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### SECTION J106
### EXCAVATIONS

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***J106.2 Earth Retaining Shoring. [OSHPD 1 & 4]***

***J106.2.1 General.*** *The requirements of this section shall apply to temporary and permanent earth retaining shoring using soldier piles and lagging with or without tie-back anchors in soil or rock, only when existing or new OSHPD 1 or 4 facilities are affected. Shoring used as construction means and methods only, which does not affect existing or new OSHPD 1 or 4 facilities, are not regulated by OSHPD and shall satisfy the requirements of the authorities having jurisdiction.*

*Design, construction, testing, and inspection shall satisfy the requirements of this code except as modified in Sections J106.2.2 through J106.2.8.*

***J106.2.2 Duration.*** *Shoring shall be considered temporary when elements of the shoring will be exposed to site conditions for a period of less than one (1) year, and shall be considered permanent otherwise. Permanent shoring shall account for the increase in lateral soil pressure due to earthquake. At the end of the construction period, the existing and new structures shall not rely on the temporary shoring for support in anyway. Wood components shall not be used for permanent shoring lasting more than two (2) years. Wood components of the temporary shoring that may affect the performance of permanent structure shall be removed after the shoring is no longer required.*

*All components of the shoring shall have corrosion protection or preservative treatment for their expected duration. Wood components of the temporary shoring that will not be removed shall be treated in accordance with AWPA U1 (Commodity Specification A, Use Category 4B and Section 5.2), and shall be identified in accordance with Section 2303.1.8.1.*

***J106.2.3 Surcharge:*** *Surcharge pressure due to footings, traffic, or other sources shall be considered in design. If the footing surcharge is located within the semi-circular distribution or bulb of earth pressure (when shoring is located close to a footings), lagging shall be designed for lateral earth pressure due to footing surcharge. Soil arching effects may be considered in the design of lagging. Underpinning of the footing may be used in lieu of designing the shoring and lagging for surcharge pressure. Alternatively, continuously contacting drilled pier shafts near the footings shall be permitted. The lateral surcharge design pressure shall be derived using Boussinesq equations modified for the distribution of stresses in an elastic medium due to a uniform, concentrated or line surface load as appropriate and soil arching effects.*

***J106.2.4 Design and Testing:*** *Except for the modifications as set forth in Sections J106.2.4.1 and J106.2.4.2 below, all Prestressed Rock and Soil Tie-back Anchors shall be designed and tested in accordance with PTI Recommendations for Prestressed Rock and Soil Anchors (PTI-2004).*

***J106.2.4.1 Geotechnical Requirements**: The geotechnical report for the earth retaining shoring shall address the following:*

12. *Minimum diameter and minimum spacing for the anchors including consideration of group effects.*

13. *Maximum unbonded length and minimum bonded length of the tie-back anchors.*

14. *Maximum recommended anchor tension capacity based upon the soil or rock strength / grout bond and anchor depth / spacing.*

15. *Allowable bond stress at the ground / grout interface and applicable factor of safety for ultimate bond stress for the anchor. For permanent anchors, a minimum factor of safety of 2.0 shall be applied to ground soil interface as required by PTI-2004 Section 6.6.*

16. *Minimum grout pressure for installation and post-grout pressure for the anchor. The presumptive post grout pressure of 300 psi may be used for all soil type.*

17. *Class I Corrosion Protection is required for all permanent anchors. The geotechnical report shall specify the corrosion protection recommendations for temporary anchors.*

18. *Performance test for the anchors shall be at a minimum of two (2) times the design loads and shall not exceed 80% of the specified minimum tensile strength of the anchor rod. A creep test is required for all prestressed anchors that are performance tested. All production anchors shall be tested at 150% of design loads and shall not be greater than 70% of the specified minimum tensile strength of the anchor rod.*

19. *Earth pressure, surcharge pressure, and the seismic increment of earth pressure loading, when applicable.*

20. *Maximum recommended lateral deformation at the top of the soldier pile, at the tie-back anchor locations, and the drilled pier concrete shafts at the lowest grade level.*

21. *Allowable vertical soil bearing pressure, friction resistance, and lateral passive soil resistance for the drilled pier concrete shafts and associated factors of safety for these allowable capacities.*

22. *Soil-pier shaft / pile interaction assumptions and lateral soil stiffness to be used in design for drilled pier concrete shaft or pile lateral loads.*

23. *Acceptable drilling methods.*

24. *Geotechnical observation and monitoring recommendations.*

***J106.2.4.2 Structural Requirements**:*

10. *Tendons shall be thread-bar anchors conforming to ASTM A 722.*

11. *Anchor design loads shall be based upon the load combinations in Section 1605A.3.1 and shall not exceed 60 percent of the specified minimum tensile strength of the tendons.*

12. *The anchor shall be designed to fail in grout bond to the soil or rock before pullout of the soil wedge.*

13. *Design of shoring system shall account for as-built locations of soil anchors considering all specified construction tolerances in Section J106.2.8.*

14. *Design of shoring system shall account for both short and long term deformation.*

***J106.2.4.3 Testing of Tie-back Anchors:***

1. *The geotechnical engineer shall keep a record at job site of all test loads, total anchor movement, and report their accuracy.*

2. *If a tie-back anchor initially fails the testing requirements, the anchor shall be permitted to be re-grouted and retested. If anchor continues to fail, the followings steps shall be taken:*

    a. *The contractor shall determine the cause of failure – variations of the soil conditions, installation methods, materials, etc.*
    b. *Contractor shall propose a solution to remedy the problem. The proposed solution will need to be reviewed and approved by geotechnical engineer, shoring design engineer, and the building official.*

3. *After a satisfactory test, each anchor shall be locked-off in accordance with Section 8.4 of PTI 2004.*

4. *The shoring design engineer shall specify design loads for each anchor.*

***J106.2.5 Construction:*** *The construction procedure shall address the following:*

1. *Holes drilled for piles / tie-back anchors shall be done without detrimental loss of ground, sloughing or caving of materials and without endangering previously installed shoring members or existing foundations.*
2. *Drilling of earth anchor shafts for tie-backs shall occur when the drill bench reaches two to three feet below the level of the tie-back pockets.*
3. *Casing or other methods shall be used where necessary to prevent loss of ground and collapse of the hole.*
4. *The drill cuttings from earth anchor shaft shall be removed prior to anchor installation.*
5. *Unless tremie methods are used, all water and loose materials shall be removed from the holes prior to installing piles / tie-backs.*
6. *Tie-back anchor rods with attached centralizing devices shall be installed into the shaft or through the drill casing. Centralizing device shall not restrict movement of the grout.*
7. *After lagging installation, voids between lagging and soil shall be backfilled immediately to the full height of lagging.*
8. *The soldier piles shall be placed within specified tolerances in the drilled hole and braced against displacement during grouting. Fill shafts with concrete up to top of footing elevation, rest of the shaft can generally be filled with lean concrete. Excavation for lagging shall not be started until concrete has achieved sufficient strength for all anticipated loads as determined by the shoring design engineer.*
9. *Where boulders and / or cobbles have been identified in the geotechnical reports, contractor shall be prepared to address boulders and / or cobbles that may be encountered during the drilling of soldier piles and Tie-back anchors.*
10. *The grouting equipment shall produce grout free of lumps and indispensed cement. The grouting equipment shall be sized to enable the grout to be pumped in continuous operation. The mixer shall be capable of continuously agitating the grout.*
11. *The quantity of grout and grout pressure shall be recorded. The grout pressure shall be controlled to prevent excessive heave in soils or fracturing rock formations.*
12. *If post-grouting is required, post grouting operation shall be performed after initial grout has set for 24-hours in the bond length only. Tie-backs shall be grouted over a sufficient length (anchor bond length) to transfer the maximum anchor force to the anchor grout.*
13. *Testing of anchors may be performed after post-grouting operations provided grout has reached strength of 3,000 psi as required by PTI-2004 Section 6.11.*

14. *Anchor rods shall be tensioned straight and true. Excavation directly below the anchors shall not continue before those anchors are tested.*

***J106.2.6 Inspection, Survey Monitoring, and Observation***

1. *The shoring design engineer or his designee shall make periodic inspections of the job site for the purpose of observing the installation of shoring system, testing of tie-back anchors, and monitoring of survey.*

2. *Testing, inspection, and observation shall be in accordance with testing, inspection and observation requirements approved by the building official. The following activities and materials shall be tested, inspected, or observed by the special inspector and geotechnical engineer:*
   a. *Sampling and testing of concrete in soldier pile and tie-back anchor shafts.*
   b. *Fabrication of tie-back anchor pockets on soldier beams*
   c. *Installation and testing of tie-back anchors.*
   d. *Survey monitoring of soldier pile and tie-back load cells.*
   e. *Survey Monitoring of existing buildings.*

3. *A complete and accurate record of all soldier pile locations, depths, concrete strengths, tie-back locations and lengths, tie-back grout strength, quantity of concrete per pile, quantity of grout per tie-back and applied tie-back loads shall be maintained by the special inspector and geotechnical engineer. The shoring design engineer shall be notified of any unusual conditions encountered during installation.*

4. *Calibration data for each test jack, pressure gauge, and master pressure gauge shall be verified by the special inspector and geotechnical engineer. The calibration tests shall be performed by an independent testing laboratory and within 120 calender days of the data submitted.*

5. *Monitoring points shall be established at the top and at the anchor heads of selected soldier piles and at intermediate intervals as considered appropriate by the geotechnical engineer.*

6. *Control points shall be established outside the area of influence of the shoring system to ensure the accuracy of the monitoring readings.*

7. *The periodic basis of shoring monitoring, as a minumum, shall be as follows:*
   a. *Intitial monitoring shall be performed prior to any excavation.*
   b. *Once excavation has begun, the periodic readings shall be taken weekly until excavation reaches the estimated subgrade elevation and the permanent foundation is complete.*
   c. *If performance of the shoring is within established guidelines, shoring design engineer may permit the periodic readings to be bi-weekly. Once initiated, bi-weekly readings shall continue until the building slab at ground floor level is completed and capable of transmitting lateral loads to the permanent structure. Thereafter, readings can be monthly.*
   d. *Where the building has been designed to resist lateral earth pressures, the periodic monitoring of the soldier piles and adjacent structure can be discontinued once the ground floor diaphragm and subterranean portion of the structure is capable of resisting lateral soil loads and approved by the shoring design engineer, geotechnical engineer, and the building official.*
   e. *Additional readings shall be taken when requested by special inspector, shoring design engineer, geotechnical engineer, or the building official.*

8. *Monitoring reading shall be submitted to shoring design engineer, engineer in responsible charge, and the building official within 3 working days after they are conducted. Monitoring readings shall be accurate to within 0.01 feet. Results are to be submitted in tabular form showing at least the intial date of monitoring and reading, current monitoring date and reading and difference between the two readings.*

9. *If the total cummulative horizontal or vertical movement (from start of construction) of the existing buildings reaches ½" or soldier piles reaches 1" all excavation activities shall be suspended. The geotechnical and shoring design engineer shall determine the cause of*

*movement, if any, and recommend corrective measures, if necessary, before excavation continues.*

10. *If the total cummulative horizontal or vertical movement (from start of construction) of the existing buildings reaches 3/4" or soldier piles reaches 1 ½" all excavation activities shall be suspended until the causes, if any, can be determined. Supplemental shoring shall be devised to eliminate further movement and the building official shall review and approve the supplemental shoring before excavation continues.*

11. *Monitoring of Tie-back Anchor Loads:*
    a. *Load cells shall be installed at the tie-back heads adjacent to buildings at maximum interval of 50', with a minimum of one load cells per wall.*
    b. *Load cell readings shall be taken once a day during excavation and once a week during the remainder of construction.*
    c. *Load cell readings shall be submitted to the geotechnical engineer, shoring design engineer, engineer in responsible charge, and the building official.*
    d. *Load cell readings can be terminated once the temporary shoring no longer provides support for the buildings.*

***J106.2.7 Monitoring of Existing OSHPD 1 and 4 Structures***

1. *The contractor shall complete a written and photographic log of all existing OSHPD 1 & 4 structures within 100 ft or three times depth of shoring, prior to construction. A licensed surveyor shall document all existing substantial cracks in adjacent existing structures.*
2. *Contractor shall document existing condition of wall cracks adjacent to shoring walls prior to start of construction.*
3. *Contractor shall monitor existing walls for movement or cracking that may result from adjacent shoring.*
4. *If excessive movement or visible cracking occurs, contractor shall stop work and shore / reinforce excavation and contact shoring design engineer and the building official.*
5. *Monitoring of the existing structure shall be at reasonable intervals as required by the registered design professional subject to approval of the building Official. Monitoring shall be performed by a licensed surveyor and shall consist of vertical and lateral movement of the existing structures. Prior to starting shoring installation a pre-construction meeting shall take place between the contractor, shoring design engineer, surveyor, geotechnical engineer, and the building official to identify monitoring locations on existing buildings.*
6. *If in the opinion of the building official or shoring design engineer, monitoring data indicate excessive movement or other distress, all excavation shall cease until the geotechnical engineer and shoring design engineer investigates the situation and makes recommendations for remediation or continuing.*
7. *All reading and measurements shall be submitted to the building official and shoring design engineer.*

***J106.2.8 Tolerances.*** *Following tolerances shall be specified on the construction documents.*

1. *Soldier Piles:*
    i. *Horizontal and vertical construction tolerances for the soldier pile locations.*
    ii. *Soldier pile plumbness requirements (angle with vertical line).*

2. *Tie-back Anchors:*
    i. *Allowable deviation of anchor projected angle from specified vertical and horizontal design projected angle.*
    ii. *Anchor clearance to the existing/new utilities and structures.*

## SECTION J107
## FILLS

**J107.1 General.** Unless otherwise recommended in the soils report, fills shall conform to provisions of this section.

**…**

**J107.5 Compaction.** All fill material shall be compacted to 90 percent of maximum density as determined by ASTM D 1557, Modified Proctor, in lifts not exceeding 12 inches (305 mm) in depth.

***[OSHPD 1, 2, & 4]*** *This section establishes minimum requirements only.*

*(All existing amendments that are not revised above shall continue without any change)*

***Notation:***
*Authority: Health and Safety Code Section 129850*
*Reference: Health and Safety Code Sections 1275, 129850 and 129790*