# INITIAL EXPRESS TERMS FOR PROPOSED BUILDING STANDARDS OF THE OFFICE OF STATEWIDE HEALTH PLANNING AND DEVELOPMENT REGARDING THE 2022 CALIFORNIA BUILDING CODE

# CALIFORNIA CODE OF REGULATIONS, TITLE 24, PART 2, VOLUME 2

# (OSHPD 06/21)

The State agency shall draft the regulations in plain, straightforward language, avoiding technical terms as much as possible and using a coherent and easily readable style. The agency shall draft the regulation in plain English. A notation shall follow the express terms of each regulation listing the specific statutes authorizing the adoption and listing specific statutes being implemented, interpreted, or made specific (Government Code Section 11346.2(a)(1)).

If using assistive technology, please adjust your settings to recognize underline, strikeout, italic and ellipsis.

## LEGEND for EXPRESS TERMS (Based on model codes - Parts 2, 2.5, 3, 4, 5, 9, 10)

* Model Code language appears upright
* Existing California amendments appear in *italic*
* Amended model code or new California amendments appear *underlined & italic*
* Repealed model code language appears ~~upright and in strikeout~~
* Repealed California amendments appear in *~~italic and strikeout~~*
* Ellipsis ( ...) indicate existing text remains unchanged
* Note: Chapter 19 Concrete and Chapter 19*A* Concrete, shaded, underlined, and *italic* text represents existing California amendment(s) not in ACI 318-19.
* Publisher notes for “Formerly”, “Relocated to”, and “Relocated from” text appears in () with gray highlight.

# INITIAL EXPRESS TERMS

# Item 1 CHAPTER 16 STRUCTURAL DESIGN

Adopt 2021 International Building Code (IBC) Chapter 16 for OSHPD 3. Adopt 2021 International Building Code (IBC) Chapter 16 for OSHPD 1R, 2 and 5 and carry forward existing amendments of the 2019 California Building Code (CBC).

**SECTION 1605 LOAD COMBINATIONS**

…

**1605*.*2** (Formerly 1605.3.2) **Alternative allowable stress design load combinations.** In lieu of the load combinations in ASCE 7, Section 2.4, structures and portions thereof shall be permitted to be designed for the most critical effects resulting from the following combinations. Where using these alternative allowable stress 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 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. Where using these alternative basic *load* combinations for proportioning foundations for loadings, which include seismic *loads*, the vertical seismic *load effect*, *Ev*, in Equation 12.4-4 of ASCE 7 is permitted to be taken equal to zero. Where required by ASCE 7, Chapters 12, 13 and 15, the load combinations including overstrength of ASCE 7, Section 2.3.6 shall be used. ***[OSHPD 1R, 2B & 5]***  *Each load combination shall be investigated with one or more of the variable loads set to zero.*

…

**SECTION 1613 EARTHQUAKE LOADS**

…

**TABLE 1613.2.3(1) *[OSHPD 1R, 2 & 5]***

**VALUES OF SITE COEFFICIENT Faa**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **SITE CLASS** | **MAPPED RISK TARGETED MAXIMUM CONSIDERED EARTHQUAKE (MCER) SPECTRAL RESPONSE ACCELERATION PARAMETER AT SHORT PERIOD** | | | | | |
| ***S***  **0.25** | ***Ss* = 0.50** | ***Ss* = 0.75** | ***Ss* = 1.00** | ***Ss* = 1.25** | ***Ss***  **1.5** |
| A | 0.8 | 0.8 | 0.8 | 0.8 | 0.8 | 0.8 |
| B | 0.9 | 0.9 | 0.9 | 0.9 | 0.9 | 0.9 |
| C | 1.3 | 1.3 | 1.2 | 1.2 | 1.2 | 1.2 |
| D | 1.6 | 1.4 | 1.2 | 1.1 | 1.0 | 1.0 |
| E | 2.4 | 1.7 | 1.3 | ~~Note b~~ *1.2c* | ~~Note b~~ *1.2c* | ~~Note b~~ *1.2c* |
| F | Note b | Note b | Note b | Note b | Note b | Note b |

1. Use straight-line interpolation for intermediate values of mapped spectral response acceleration at short period, *Ss*.
2. Values shall be determined in accordance with Section 11.4.8 of ASCE 7.
3. *See requirements for site-specific ground motions in Section 11.4.8 of ASCE 7. These values of Fa shall only be used for calculation of Ts, determination of Seismic Design Category, linear interpolation for intermediate values of Ss, and when taking the exception under Item 2 within Section 11.4.8 of ASCE 7.*

**TABLE 1613.2.3(2)**

**VALUES OF SITE COEFFICIENT Fva**

...

c. See requirements for site-specific ground motions in Section 11.4.8 of ASCE 7. ***[OSHPD 1R, 2 & 5]*** *These values of Fv shall only be used for calculation of TS, determination of Seismic Design Category, linear interpolation for intermediate values of S1, and when taking the exceptions under Items 1 and 2 of Section 11.4.8 for the calculation of SD1.*

**Notation:**

Authority: Health and Safety Code, Sections 1275, 18928, 129790, and 129850

Reference(s): Health and Safety Code, Section 129850

# Item 2 CHAPTER 16*A* STRUCTURAL DESIGN

Adopt 2021 International Building Code (IBC) Chapter 16A for OSHPD 1 and 4 as amended below in each Item. All existing California amendments that are not revised below shall continue without change.

**SECTION 1605*A* LOAD COMBINATIONS**

…

**1605*A.*2** (Formerly 1605*A*.3.2) **Alternative allowable stress design load combinations.** In lieu of the load combinations in ASCE 7, Section 2.4, structures and portions thereof shall be permitted to be designed for the most critical effects resulting from the following combinations. Where using these alternative allowable stress 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 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. Where using these alternative basic *load* combinations for proportioning foundations for loadings, which include seismic *loads*, the vertical seismic *load effect*, *Ev*, in Equation 12.4-4 of ASCE 7 is permitted to be taken equal to zero. Where required by ASCE 7, Chapters 12, 13 and 15, the load combinations including overstrength of ASCE 7, Section 2.3.6 shall be used. *Each load combination shall be investigated with one or more of the variable loads set to zero.*

...

***~~1605A.4~~ 1605A.3 Modifications to load combinations in ICC 300.*** *Modify the text of ICC 300~~,~~ as follows:*

***~~1606A.4.1~~ 1605A.3.1 ICC 300, Section 303.5.2.*** *Modify Section 303.5.2 by adding Equation 3-5a as follows:*

*D + 0.4L + Z (Equation 3-5a)*

***~~1605A.4.3~~ 1605A.3.2 ICC 300, Section 303.5.3.*** *Modify Section 303.5.3 as follows:*

*The uniform live load L used in Equation 3-2 and 3-4 may be taken as zero when…*

…

**SECTION 1606*A* DEAD LOADS**

...

***1606A.~~3~~6 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 ~~1511~~ 1512.*

...

**SECTION 1607*A* LIVE LOADS**

...

**~~1607.13.5.4~~ 1607*A*14.4.5 Ballasted photovoltaic panel systems.**

Roof structures that provide support for ballasted photovoltaic panel systems shall be designed, or analyzed, in accordance with **{ Section 1604.4 }**; checked in accordance with **{ Section 1604.3.6 }** for deflections; and checked in accordance with **{ Section 1611 }** for ponding.

***~~1607A.13.6~~ 1607A.14.5 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/m2) of the total area encompassed by the framework.*

...

**1607*A*.~~15~~16 Interior walls and partitions.** Interior walls and partitions that exceed 6 feet (1829 mm) in height, including their finish materials, shall have adequate strength and stiffness to resist the loads to which they are subjected but not less than a horizontal load of 5 psf (0.240 kN/m2). *The 5 psf (0.24 kN/m2) ~~service~~ allowable stress design 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/m2) shall not exceed the limits in Table 1604A.3.*

…

**1607*A*.19 Seating for assembly uses.** Bleachers, folding and telescopic seating and grandstands shall be designed for the loads specified in ICC 300 *as modified by Section 1605A.3 load combinations*. Stadiums and arenas with fixed seats shall be designed for the horizontal sway loads in Section 1607.19.1.

...

**SECTION 1613*A* EARTHQUAKE LOADS**

…

**TABLE 1613*A*.2.3(1)**

**VALUES OF SITE COEFFICIENT Faa**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **SITE CLASS** | **MAPPED RISK TARGETED MAXIMUM CONSIDERED EARTHQUAKE (MCER) SPECTRAL RESPONSE ACCELERATION PARAMETER AT SHORT PERIOD** | | | | | |
| ***Ss***  **0.25** | ***Ss* = 0.50** | ***Ss* = 0.75** | ***Ss* = 1.00** | ***Ss* = 1.25** | ***Ss***  **1.5** |
| A | 0.8 | 0.8 | 0.8 | 0.8 | 0.8 | 0.8 |
| B | 0.9 | 0.9 | 0.9 | 0.9 | 0.9 | 0.9 |
| C | 1.3 | 1.3 | 1.2 | 1.2 | 1.2 | 1.2 |
| D | 1.6 | 1.4 | 1.2 | 1.1 | 1.0 | 1.0 |
| E | 2.4 | 1.7 | 1.3 | ~~Note b~~ *1.2c* | ~~Note b~~ *1.2c* | ~~Note b~~ *1.2c* |
| F | Note b | Note b | Note b | Note b | Note b | Note b |

1. Use straight-line interpolation for intermediate values of mapped spectral response acceleration at short period, *Ss*.
2. Values shall be determined in accordance with Section 11.4.8 of ASCE 7.
3. *See requirements for site-specific ground motions in Section 11.4.8 of ASCE 7. These values of Fa shall only be used for calculation of Ts, determination of Seismic Design Category, linear interpolation for intermediate values of Ss, and when taking the exception under Item 2 within Section 11.4.8 of ASCE 7.*

**TABLE 1613*A*.2.3(2)**

**VALUES OF SITE COEFFICIENT Fva**

...

c. See requirements for site-specific ground motions in Section 11.4.8 of ASCE 7. *These values of Fv shall only be used for calculation of TS, determination of Seismic Design Category, linear interpolation for intermediate values of S1, and when taking the exceptions under Items 1 and 2 of Section 11.4.8 for the calculation of SD1.*

**Notation:**

Authority: Health and Safety Code, Sections 1275, 18928, 129790, and 129850

Reference(s): Health and Safety Code, Section 129850

# Item 3 CHAPTER 16*A* STRUCTURAL DESIGN

**SECTION *1617A* MODIFICATIONS TO ASCE 7**

…

***1617A.1.3 ~~Reserved~~ ASCE 7, Section 11.4. Modify ASCE 7, Section 11.4 to include the following:***

*Seismic ground motion values shall include updated subsections in Supplement 3.* ***[OSHPD 1 & 4]*** *Use of the 2020 NEHRP Provisions for multi-period spectra shall be permitted, where all of the following are included.*

*1. A detailed seismic design criterion shall be submitted to and approved by the AHJ.*

*2. Seismic Ground Motion values shall be determined using the 2020 NEHRP Provisions, Section 11.4.*

*3. Geologic Hazard and Geotechnical Investigation shall be performed using the 2020 NEHRP Provisions, Section 11.8.*

*4. Vertical Ground Motions, where required, shall be determined using the 2020 NEHRP Provisions, Section 11.9.*

*5. Site Classification shall be determined using the 2020 NEHRP Provisions, Chapter 20.*

*6. Site Specific Ground Motion Procedures shall be determined using the 2020 NEHRP Provisions, Chapter 21.*

*7. Seismic Ground Motion and Long-period Transition Maps shall be used from Chapter 22 of the 2020 NEHRP Provisions.*

*8. SDS and SD1 obtained from the multiperiod spectra determined using the 2020 NEHRP Provisions shall be used, where required in Chapter 12, 13 and 15 of ASCE 7-16.*

…

(Relocated to 1617*A*.1.5.2) ***1617A.1.5 ASCE 7, Section 12.2.3.1.*** *Replace ASCE 7, Section 12.2.3.1, Items 1 and 2, by the following:*

*The value of the response modification coefficient …*

***1617A.1.5 ASCE 7, Section 12.2.3, 12.2.3.1, and 12.2.3.2.*** *Modify ASCE 7, Sections 12.2.3, 12.2.3.1, and 12.2.3.2 as follows:*

***1617A.1.5.1 ASCE 7, Section 12.2.3.*** *Replace ASCE 7, Section 12.2.3 with the following:*

*Where different seismic force-resisting systems are used in combinations to resist seismic forces in the same direction, other than those combinations considered as dual systems the design shall comply with the requirements of this section. The most stringent applicable structural system limitations contained in Table 12.2-1 shall apply, except as otherwise permitted by this section.*

(Relocated from 1617*A*.1.5) ***1617A.1.5.2 ASCE 7, Section 12.2.3.1.*** *Replace ASCE 7, Section 12.2.3.1, Items 1 and 2, by the following:*

*The value of the response modification coefficient, R, used for design at any story shall not exceed the lowest value of R that is used in the same direction at any story above that story. Likewise, the deflection amplification factor, Cd, and the system over strength factor, Ω0 , used for the design at any story shall not be less than the largest value of these factors that are used in the same direction at any story above that story.*

***1617A.1.5.3 ASCE 7, Section 12.2.3.2.*** *Modify ASCE 7, Section 12.2.3.2 by modifying Item a and adding Items f, g, and h, as follows:*

**12.2.3.2 Two-Stage Analysis Procedure**. A two-stage equivalent lateral force procedure is permitted to be used for structures that have a flexible upper portion above a rigid lower portion, provided that the design of the structure complies with all of the following:

a. The stiffness of the lower portion shall be at least 10 times the stiffness of the upper portion. *For purposes of determining this ratio, the base shear shall be computed and distributed vertically according to Section 12.8. Using these forces, the stiffness for each portion shall be computed as the ratio of the base shear for that portion to the elastic displacement, δxe, computed at the top of that portion, considering the portion fixed at its base. For the lower portion, the applied forces shall include the reactions from the upper portion, modified as required in Item d.*

b. The period of the entire structure shall not be greater than 1.1 times the period of the upper portion considered as a separate structure supported at the transition from the upper to the lower portion.

c. The upper portion shall be designed as a separate structure using the appropriate values of R and ρ.

d. The lower portion shall be designed as a separate structure using the appropriate values of R and ρ. The reactions from the upper portion shall be those determined from the analysis of the upper portion amplified by the ratio of the R∕ρ of the upper portion over R∕ρ of the lower portion. This ratio shall not be less than 1.0.

e. The upper portion is analyzed with the equivalent lateral force or modal response spectrum procedure, and the lower portion is analyzed with the equivalent lateral force procedure.

*f.* ***[OSHPD 1 & 4]*** *Not permitted by OSHPD. The structural height of the upper portion shall not exceed the height limits of Table 12.2-1 for the seismic force-resisting system used, where the height is measured from the base of the upper portion.*

*g. Where Horizontal Irregularity Type 4 or Vertical Irregularity Type 4 exists at the transition from the upper to the lower portion, the reactions from the upper portion shall be amplified in accordance with Sections 12.3.3.3, 12.10.1.1, and 12.10.3.3 as applicable, in addition to amplification required by Item d.*

*h.* (Relocated from 1617*A*.1.6) *Where design of vertical 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.*

***1617A.1.6 ~~ASCE 7, Section 12.2.3.2.~~****~~Modify ASCE 7 Section 12.2.3.2 by adding the following additional requirement:~~* ***Reserved.***

(Relocated to 1617*A*.1.5.3.h.) *f. Where design of vertical elements …*

...

***1617A.1.10 ASCE 7, Section 12.3.3.1.*** *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.*

***Exceptions:***

*1. Structures with reinforced concrete or reinforced masonry shear wall systems and rigid or semi-rigid diaphragms, consisting of concrete slabs or concrete-filled metal deck having a span-to-depth ratio of 3 or less, having a horizontal structural irregularity Type 1b of Table 12.3-1 are permitted, provided the maximum story drift in the direction of the irregularity, computed including the torsional amplification factor from Section 12.8.4.3, is less than 10% of the allowable story drift in ASCE 7 Table 12.12-1.*

*2. Structures having a horizontal structural irregularity Type 1b of Table 12.3-1 are permitted, provided a redundancy factor, r, of 1.3 as defined in ASCE 7 12.3.4 is assigned to the seismic force-resisting system in both orthogonal directions and the structure is designed for one of the orthogonal procedures as defined in ASCE 7 12.5.3.1.*

...

***1617A.1.14 ~~[Reserved]~~*** ***~~1617A.1.15~~ ASCE 7, Section 12.12.3. [OSHPD 1 & 4]***

*Replace ASCE 7 Equation 12.12-1 by the following:*

*δM = Cdδmax (Equation 12.12-1)*

***~~1617A.1.16~~ 1617A.1.15 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 can be delivered to the foundation in a fully yielded structural system.*

*3. Forces from the load combinations with overstrength factor in accordance with ASCE 7, Section 12.4.3.1.11.*

***Exceptions:***

*1. Where referenced 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 seismic force-resisting system consists of light framed walls with shear panels, unless the reference standard specifies the use of higher design loads.*

*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.

***1617A.1.16 ASCE 7, Section 12.13.9.2.*** *Modify ASCE 7 section 12.13.9.2 by the following sentence added to the end of item b as follows:*

12.13.9.2 Shallow Foundations. Building structures shall be permitted to be supported on shallow foundations provided that the foundations are designed and detailed in accordance with Section 12.13.9.2.1 and the conditions provided in items (a) and (b) of Section 12.13.9.2 are met.

a. The geotechnical investigation report indicates that permanent horizontal ground displacement induced by lateral spreading associated with MCEG earthquake motions does not exceed the value in Table 12.13-2.

b. The foundation and superstructure are designed to accommodate differential settlements caused by liquefaction without loss of the ability to support gravity loads. For structures assigned to Risk Category II or III, residual strength of members and connections shall not be less than 67% of the undamaged nominal strength, considering the nonlinear behavior of the structure or, alternatively, demands on all members and connections shall not exceed the element’s nominal strength when subjected to differential settlements. For structures assigned to Risk Category IV, demands on all members and connections shall not exceed the element’s nominal strength when subjected to differential settlements. *Seismic load effects determined in accordance with Section 12.4 need not be considered in this check.*

…

***1617A.1.18 ASCE 7, Section 13.1.4.*** *Replace ASCE 7, Section 13.1.4, with the following:*

*…*

***13.1.4~~.a~~ [OSHPD 1, ~~1R,~~ 2, 4 & 5].*** *The following nonstructural components and equipment shall be anchored in accordance with this section. Design and detailing shall be in accordance with Chapter 13 except as modified by this section.*

*…*

*10. Wall, Roof or Floor Hung Equipment: Seismic design and seismic details shall be provided for wall, roof or floor hung nonstructural components and equipment when the component weighs more than 20 lb. or, in the case of a distributed system, more than 5 lb./ft.*

*…*

...

***1617A.1.26 ASCE 7, Section 13.6.7.3*.** *Replace ASCE 7, Section 13.6.7.3 with the following:*

***13.6.7.3 Additional provisions for piping and tubing systems*.**

*A) Design for the seismic forces of Section 13.3 shall not be required for piping systems where flexible connections, expansion loops, or other assemblies are provided to accommodate the relative displacement between component and piping, where the piping system is positively attached to the structure, and where any of the following conditions apply:*

*1. Trapeze assemblies are supported by 3/8-inch (10 mm) or ½-inch (13 mm) diameter rod hangers not exceeding 12 inches (305 mm) in length from the pipe support point to the connection at the supporting structure, ~~do not support piping with Ip greater than 1.0,~~ and no single pipe exceeds the diameter limits set forth in item 2b below or 2 inches (50 mm) ~~for Seismic Design Category D, E, or F~~ where Ip is greater than 1.0 and the total weight supported by any single trapeze is 100 pounds (445 N) or less; or …*

***1617A.1.27 ASCE 7, Section 13.6.11.1****. Modify ASCE 7, Section 13.6.11.1, by adding Section 13.6.11.1.1 as follows:*

***13.6.11.1.1 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 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 13.6.11.1, the minimum seismic forces shall be 0.5g allowable stress design load acting in any horizontal direction.*

***1617A.1.28 ASCE 7, Section 13.6.11.4.*** *Replace ASCE 7, Section 13.6.11.4, as follows:*

***13.6.11.4 Retainer plates.*** *Retainer plates are required at the top and bottom...*

*1. The seismic force shall be computed per the requirements of ASCE 7 Section 13.6.11.1. The minimum horizontal acceleration shall be 0.5g allowable stress design load for all buildings.*

...

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

…

**Notation:**

Authority: Health and Safety Code, Sections 1275, 18928, 129790, and 129850

Reference(s): Health and Safety Code, Section 129850

# Item 4 CHAPTER 17 SPECIAL INSPECTIONS AND TESTS

Adopt 2021 International Building Code (IBC) Chapter 17 and carry forward existing amendments of the 2019 California Building Code (CBC) for OSHPD 1R, 2 and 5 with the following modifications:

(Relocated from 1908.5 deleted by model code and modifying, including incorporation of 1908.4.1, and amendment in 1908.10.2.)

**SECTION 1705 REQUIRED SPECIAL INSPECTIONS AND TESTS**

…

***~~1705.19~~1705.3.9 Shotcrete. [OSHPD 1R, 2B & 5]*** *All shotcrete work shall be continuously inspected during placing by an approved agency. The special shotcrete inspector shall check the materials, placing equipment, details of construction and construction procedure. The approved agency 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.*

***~~1705.19.1~~1705.3.9.1 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.*

***1705.3.9.2******Preconstruction tests.*** *A shotcrete mockup panel shall be shot, cured, cored or sawn, examined and tested prior to commencement of the project. The mockup panel shall be representative of the project and simulate job conditions as closely as possible. The mockup panel thickness and reinforcing shall reproduce the thickest and most congested area specified in the structural design. Adequate encasement of bars larger than No. 5 shall be demonstrated by the mockup panels. 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. Reports of preconstruction tests shall be submitted to the building official as specified in Section 1704.5.*

…

***1705.5.~~4~~5 Structural glued laminated and cross-laminated timber. [OSHPD 1R, 2B & 5]*** *Manufacture of all structural glued laminated and cross-laminated timber shall be continuously inspected by an approved agency.*

*The approved agency 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 approved agency with an identification mark.*

***Exception:*** *Special Inspection is not required for non-custom prismatic glued laminated members identified on drawings and sourced from stock or general inventory of 5 1/2-inch maximum width and 18-inch maximum depth, and with a maximum clear span of 32 feet, manufactured and marked in accordance with ANSI~~/APA~~ A190.1 Section 13.1 for non-custom members.*

…

**Notation:**

Authority: Health and Safety Code, Sections 1275, 18928, 129790, and 129850

Reference(s): Health and Safety Code, Section 129850

# Item 5 CHAPTER 17*A* SPECIAL INSPECTIONS AND TESTS

Adopt 2021 International Building Code (IBC) Chapter 17A for OSHPD 1 and 4 as amended below in each Item. All existing California amendments that are not revised below shall continue without change.

**SECTION 1704*A* SPECIAL INSPECTIONS AND TESTS, CONTRACTOR RESPONSIBILITY AND STRUCTURAL OBSERVATION**

…

**1704*A*.5 Submittals to the building official.** In addition to the submittal of reports of special inspections and tests in accordance with **{ Section 1704*A*.2.4 }**, reports and

certificates shall be submitted by the owner or the owner’s authorized agent to the building official for each of the following:

1. Certificates of compliance for the fabrication of structural, load-bearing or lateral load-resisting members or assemblies on the premises of an approved fabricator in accordance with **{ Section 1704*****A*.2.5.1 }**.

2. Certificates of compliance for the seismic qualification of nonstructural components, supports and attachments in accordance with **{ Section 1705*A*.14.2 }**.

3. Certificates of compliance for designated seismic systems in accordance with **{ Section 1705*A*.14.3 }**.

4. Reports of preconstruction tests for shotcrete in accordance with **{ ACI 318 }** *and 1705A.3.9.2*.

5. Certificates of compliance for open web steel joists and joist girders in accordance with **{ Section 2207*A*.5 }**.

6. Reports of material properties verifying compliance with the requirements of **{ AWS D1.4 }** for weldability as specified in Section 26.6.4 of **{ ACI 318 }** for reinforcing bars in concrete complying with a standard other than **{ ASTM A706 }** that are to be welded.

7. Reports of mill tests in accordance with Section 20.2.2.5 of **{ ACI 318 }** for reinforcing bars complying with **{ ASTM A615 }** and used to resist earthquake-induced flexural or axial forces in the special moment frames, special structural walls orcoupling beams connecting special structural walls of seismic force-resisting systems in structures assigned to SeismicDesign Category ~~B, C,~~ D, E or F.

…

**SECTION 1705*A* REQUIRED SPECIAL INSPECTIONS AND TESTS**

…

**1705*A*.2.1 Structural steel.** Special inspections and nondestructive testing of structural steel elements in buildings, structures and portions thereof shall be in accordance with the quality assurance ~~inspection~~ requirements ~~of AISC 360~~ *of this section, Chapter 22A and quality control requirements of AISC 360, AISC 341 and AISC 358.*

…

***TABLE 1705A.2.1***

***REQUIRED SPECIAL INSPECTIONS AND TESTS OF STEEL CONSTRUCTION***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***TYPE*** | ***CONTINUOUS SPECIAL INSPECTION*** | ***PERIODIC SPECIAL INSPECTION*** | ***REFERENCED***  ***STANDARD****~~a~~* | ***CBC***  ***REFERENCEa*** |
| *1. Material identification and testing of high-strength bolts, nuts and washers:* | | | | |
| *…* |  |  |  |  |
| *c. Testing of high-strength bolts, nuts and washers.* | *─* | *─* | *RCSC: 7.2, Applicable ASTM material standards* | *2213A.1,1705A.2.6* |
| *…* |  |  |  |  |
| *4. Material identification of welding consumables and testing of welded elements:* | | | | |
| *c. Nondestructive testing of welded joints.* | *─* | *─* | *AISC 360:*  *N5.5* | *─ (Add dash here)* |
| *…* |  |  |  |  |
| *5. Inspection of welding:* | | | | |
| *a. Structural steel and cold-formed steel deck:* |  |  |  |  |
| *…* |  |  |  |  |
| *7) End-welded studs.* | *─* | *X* | *AWS D1.1* | *1705A.2.5, 2213A.2* |
| *…* |  |  |  |  |
| *b. Reinforcing steel~~:~~* | *─* | *─* | *─* | *Table 1705A.3, Item 2* |
| (Relocating remaining rows with sub-items 1-5 to Table 1705A.3.)*1) Verification of weldability of reinforcing steel other than ASTM A706.* | *─* | *X* | *AWS D1.4, ACI 318: 18.2.8, 25.5.7.4, 26.6.4.1* | *1705A.3.1, 1903A.8* |
| *2) Reinforcing steel resisting flexural and axial forces in intermediate and special moment frames, and boundary elements of special structural walls of concrete and shear reinforcement.* | *X* | *─* |
| *3) Shear reinforcement.* | *X* | *─* |
| *4) Other reinforcing steel.* | *─* | *X* |
| *5) Tests of reinforcing bars.* | *─* | *─* | *─* | *1910A.2* |
| *…* |  |  |  |  |

*For SI: 1 inch = 25.4 mm.*(The following item is an existing amendment that was missed in the printed version of the 2019 CBC and should be added back into the 2022 CBC with the renumbering modification shown.) *a. Where applicable, see also Section 1705A.~~12~~13, Special inspection for seismic resistance.*

…

***TABLE 1705A.2.3***

***REQUIRED SPECIAL INSPECTIONS OF OPEN-WEB STEEL JOISTS AND JOIST GIRDERS***

…

*a. Where applicable, see also Section 1705A.~~12~~13, Special inspection for seismic resistance.*

…

***1705A.2.5 Inspection and tests of structural welding.*** *Inspection and testing (including non-destructive testing) of all shop and field welding operations shall be in accordance with this section, Section 1705A.2.1, and Table 1705A.2.1. Inspections shall be made by a qualified welding inspector approved by the enforcement agency. 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.*

*The welding inspector shall make a systematic daily record of all welds. In addition to other records, 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, details of construction and procedure, as well as workmanship of the welds. The inspector shall verify that the installation and tests of end-welded stud shear connectors is in accordance with the requirements of Section 2213A.2 and the approved plans and specifications. The approved agency shall furnish the architect, structural engineer, and the enforcement agency with a verified report that the welding has been done in conformance with AWS D1.1, D1.3, D1.4, D1.8, and the approved construction documents.*

***1705A.2.6 Special inspection and tests of high-strength fastener assemblies.*** *Special inspections and tests for high-strength fasteners shall be in accordance with this section, Section 1705A.2.1, and Table 1705A.2.1. ~~Tests of h~~High-strength bolts, nuts, and washers shall be sampled and tested by an approved agency for conformance with the requirements of applicable ASTM standards and in accordance with Section2213A.1.*

…

**TABLE 1705*A*.3**

**REQUIRED SPECIAL INSPECTIONS AND TESTS OF CONCRETE CONSTRUCTION**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **TYPE** | **CONTINUOUS SPECIAL INSPECTION** | **PERIODIC SPECIAL INSPECTION** | **REFERENCED**  **STANDARD**a | **~~IBC~~*CBC* REFERENCE** |
| 1. Inspect *and test* reinforcement, including prestressing tendons, and verify placement.  *a. Reinforcement in special moment frames, boundary elements of special structural wall, and coupling beams.*  *b. All other reinforcement* | X  ─ | ─  X | ACI 318: Ch. 20, 25.2, 25.3, *25.5.1,* 26.6.1- 26.6.3, *26.13.1, 26.13.3.2, 26.13.3.3* | *1705A.3.9, 1908A.1, ~~1908A.3, 1908A.4,~~* *1910A.2, 1910A.3;* |
| 2. Reinforcing bar welding:  a. Verify weldability of reinforcing bars other than ASTM A706.  b. Inspect single pass fillet welds, maximum 5/16”, *not defined in 2.d or 2.e.* ~~and~~  c. Inspect all other welds.  (Relocated from Table 1705*A*.2.1 items 1 and 2 to new items d and e.)  *d.*  *Reinforcing steel resisting flexural and axial forces in intermediate and special moment frames, and boundary elements and coupling beams of special structural* *walls of concrete and shear reinforcement.*  *e. Shear reinforcement.* | ─  ─  X  *X*  *X* | X  X  ─  *─*  *─* | (Relocated ACI 318 references 18.2.8, 25.5.7 from Table 1705*A*.2.1 item b1 and b2.)  AWS D1.4  ACI 318: *18.2.8, 25.5.7,* 26.6.4,  *26.13.1.4, 26.13.3.2, 26.13.3.3* | *1705A.3.1,*  *1903A.8* |
| 3. Inspect anchors cast in concrete. | ─ | X | ACI 318: 17.8.2*, 26.7.2, 26.8.2, 26.13.1, 26.13.3.3* | ─ |
| 4. Inspect *and test* anchors post-installed in hardened concrete members.b, c  a. Adhesive anchors installed horizontally or upwardly inclined orientations to resist sustained tension loads.  b. Mechanical anchors and adhesive anchors not defined in 4.a. | X  ─ | ─  X | ACI 318: 17.8.2.4*26.7.2, 26.13.1, 26.13.3.2*  ACI 318: 17.8.2*26.7.2, 26.13.1, 26.13.3.3* | *1705A.3.8, 1910A.5,*  *1705A.3.8, 1910A.5,* |
| 5. Verify use of required design mix. | ~~─~~X | ~~X~~─ | ACI 318: Ch.19, *26.4,* ~~26.4.3, 26.4.4~~ *26.13.3.2* | *1903A.5, 1903A.6, 1903A.7,* 1904*A*.1, 1904*A*.2, *~~1908A.2, 1908A.3,~~ 1910A.1, 1908A.1* |
| 6. Prior to *and during* concrete placement, fabricate specimens for strength tests, perform slump and air content tests, and determine the temperature of the concrete. | X | ─ | ASTM C31  ASTM C172  ACI 318: *26.4,* 26.5, 26.12 | *1705A.3.5, 1705A.3.6, 1705A.3.9, 1905A.1.~~16~~17, ~~1908A.5, 1908A.10,~~* |
| 7. Inspect concrete and shotcrete for proper application techniques. | X | ─ | ACI 318: 26.5*, 26.13*  *ACI 506: 3.4* | *1705A.3.9, 1905A.1.15, 1905A.1.16, ~~1908A.5, 1908A.6, 1908A.7, 1908A.8, 1908A.10, 1908A.12,~~* |
| 8. Verify maintenance of specific curing temperature and techniques. | ─ | X | ACI 318: 26.5.3–26.5.5, *26.13.3.3* | *~~1908A.9~~* |
| 9. Inspect prestressed concrete for:  a. Application of prestressing forces; and  b. Grouting of bonded prestressing tendons. | X  X | ─  ─ | ACI 318: 26.10*.2, 26.13.1, 26.13.3.2* | *1705A.3.4* |
| 10. Inspect erection of precast concrete members. | ─ | X | ACI 318: 26.9*.2,26.13.1, 26.13.3.3* | ─ |
| 11. For precast concrete diaphragm connections or reinforcement at joints classified as moderate or high deformability elements (MDE or HDE) in structures assigned to Seismic Design Category *~~C,~~* D, E or F, inspect such connections and reinforcement in the field for:  a. Installation of the embedded parts  b. Completion of the continuity of reinforcement across joints.  c. Completion of connections in the field. | X  X  X | —  —  — | ACI 318:  26.13.1.3  ACI 550.5 | — |
| 12. Inspect installation tolerances of precast concrete diaphragm connections for compliance with ACI 550.5. | — | X | ACI 318:  26.13.1.3 | — |
| 13. Verify in-situ concrete strength, prior to stressing of tendons in post-tensioned concrete and prior to removal of shores and forms from beams and structural slabs. | ─ | X | ACI 318: *26.10.2,* 26.11.2, *26.13.3.3* | *~~1911A.1,~~* |
| 14. Inspect formwork for shape, location and dimensions of the concrete member being formed | ─ | X | ACI 318: 26.11.1.2(b), *26.13.3.3* | *1908A.~~11~~1* |

…

**1705*A*.3.2 Material tests.** In the absence of sufficient data or documentation providing evidence of conformance to quality standards for materials in Chapters 19*,* ~~and~~ 20*, and 26* of ACI 318, *as modified by Chapter 19A,* the building official shall require testing of materials in accordance with the appropriate standards and criteria for the material in Chapters 19*,* ~~and~~ 20*, and 26* of ACI 318 *as modified by Chapter 19A*. *Cementitious materials shall be in accordance with 1910A.1. Tests of reinforcing bars shall be in accordance with 1910A.2.*

…

***~~1705A.19~~1705A.3.9 Shotcrete.*** *All shotcrete work shall be continuously inspected during placing by an approved agency. The special shotcrete inspector shall check the materials, placing equipment, details of construction and construction procedure. The approved agency 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.*

***~~1705A.19.1~~1705A.3.9.1 Visual examination for structural soundness of in-place shotcrete.*** *Completed shotcrete work shall be …*

(Relocated from 1908.5/1908*A*.5 deleted by model code and modifying, including incorporation of 1908.4.1/1908*A*.4.1, and amendment in 1908*A*.10.2.)

***1705A.3.9.2******Preconstruction tests.*** *A shotcrete mockup panel shall be shot, cured, cored or sawn, examined and tested prior to commencement of the project. The mockup panel shall be representative of the project and simulate job conditions as closely as possible. The mockup panel thickness and reinforcing shall reproduce the thickest and most congested area specified in the structural design. Adequate encasement of bars larger than No. 5 shall be demonstrated by the mockup panel. 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. Reports of preconstruction tests shall be submitted to the building official as specified in Section 1704A.5. Approval from the enforcement agency must be obtained prior to performing shotcrete mockup panels.*

…

**1705*A*.5.3 Mass timber construction.** *Special inspections* of *mass timber* elements in Types IV-A, IV-B and IV-C construction shall be in accordance with Table 1705*A*.5.3.

**TABLE 1705*A*.5.3**

**REQUIRED SPECIAL INSPECTIONS OF MASS TIMBER CONSTRUCTION**

(Relocating 3.1-3.5 item numbering from repealed Table 1705*A*.5.7 below.)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **TYPE** | | | **CONTINUOUS SPECIAL**  **INSPECTION** | **PERIODIC SPECIAL INSPECTION** | |
|  | … | |  |  |
| **3.** | Inspection of connections where installation methods are required to meet design loads. | |  |  | |
|  | (Relocating 3.1-3.5 item numbering from former *Table 1705A.5.7*)  *3.1.* Threaded fasteners | *3.1.1.* Verify use of proper installation equipment. | — | X | |
| *3.1.2.* Verify use of pre-drilled holes where required. | — | X | |
| *3.1.3.* Inspect screws, including diameter, length, head type, spacing, installation angle and depth. | — | X | |
| *3.2.* Adhesive anchors installed in horizontal or upwardly inclined orientation to resist sustained tension loads. | | X | — | |
| *3.3.* Adhesive anchors not defined in preceding cell. | | — | X | |
| *3.4.* Bolted connections. | | — | X | |
| *3.5.* Concealed connections. | | — | X | |

Renumber remaining subsections 1705*A*.5.X due to model code insertion of Section 1705*A*.5.3.

…

***1705A.5.~~4~~5 Structural glued laminated and cross-laminated timber.*** *Manufacture of all structural glued laminated and cross-laminated timber shall be continuously inspected by an approved agency.*

*The approved agency 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 approved agency with an identification mark.*

***Exception:*** *Special Inspection is not required for non-custom prismatic glued laminated members identified on drawings and sourced from stock or general inventory of 5 1/2-inch maximum width and 18-inch maximum depth, and with a maximum clear span of 32 feet, manufactured and marked in accordance with ANSI~~/APA~~ A190.1 Section 13.1 for non-custom members.*

…

***~~1705A.5.7 Mass timber construction.~~*** *~~Special inspections of Mass Timber elements in Types IV-A, IV-B and IV-C construction shall be in accordance with Table 1705A.5.7.~~*

***~~TABLE 1705A.5.7~~***

***~~REQUIRED SPECIAL INSPECTIONS OF MASS TIMBER CONSTRUCTION~~***

| **~~TYPE~~** | **~~CONTINUOUS SPECIAL INSPECTION~~** | **~~PERIODIC SPECIAL INSPECTION~~** |
| --- | --- | --- |
| *~~1. Inspection of anchorage and connections of mass timber construction to timber deep foundation systems.~~* |  | *~~X~~* |
| *~~2. Inspect erection of mass timber construction.~~* |  | *~~X~~* |
| *~~3. Inspection of connections where installation methods are required to meet design loads:~~* |  |  |
| (Relocating 3.1-3.5 item numbering to Table 1705*A*.5.3)  *3.1. ~~Threaded fasteners:~~* |  |  |
| *3.1.1. ~~Verify use of proper installation equipment.~~* |  | *~~X~~* |
| *3.1.2. ~~Verify use of pre-drilled holes where required.~~* |  | *~~X~~* |
| *3.1.3. ~~Inspect screws, including diameter, length, head type, spacing, installation angle, and depth.~~* |  | *~~X~~* |
| *3.2. ~~Adhesive anchors installed in horizontal or upwardly inclined orientation to resist sustained tension loads~~* | *~~X~~* |  |
| *3.3. ~~Adhesive anchors not defined in 3.2.~~* |  | *~~X~~* |
| *3.4. ~~Bolted connections~~* |  | *~~X~~* |
| *3.5. ~~Concealed connections~~* |  | *~~X~~* |

…

…

***1705A.6.3******Vibro stone columns.*** *Special inspections and tests of vibro stone columns for ground improvement shall be in accordance with ~~applicable portions of~~ Section 1813A.5.*

…

***1705A.8.1 Micropile tests.*** *Micropile preproduction and production load tests shall be in accordance with Section 1810A.3.10.4.*

…

***1705A.9.1 Helical pile tests.***  *Helical pile preproduction and production load tests shall be in accordance with Section 1810A.3.1.5.1.*

…

**1705*A*.10 Structural Integrity of deep foundation elements.** Whenever there is a reasonable doubt as to the structural integrity of a *deep foundation* element, an engineering assessment shall be required. The engineering assessment shall include tests for defects performed in accordance with ASTM D4945, ASTM D5882, ASTM D6760 or ASTM D7949, or other *approved method*.

(Renumber remaining sections and subsections within text)

…

**1705*A*.~~12~~13.4 *Special inspection for special seismic certification.***

For structures assigned to Seismic Design Category D, E or F, the special inspector shall examine *equipment and components* requiring *special* seismic *certification* in accordance with *Section 1705A.~~13~~14.3 or* ASCE 7, *Section 13.2.2* and verify that the label, anchorageand mounting conform to the certificate of compliance.

…

**1705*A*.~~12~~13.5 Architectural components.** Periodic special inspection is required for the erection and fastening of exterior cladding, interior and exterior nonbearing walls,

*ceilings* and interior and exterior veneer in structures assigned to Seismic Design Category D, E or F.

***[OSHPD 1] E*x*ception:*** *Periodic special inspection is not required where continuous inspection of the work is performed in accordance with Section 7-145 of the CAC*.

**1705*A*.~~12~~13.5.1 Access floors.** Periodic special inspection is required for the anchorage of access floors in structures assigned to Seismic Design Category D, E or F.

***1705A.13.5.2* *Structural sealant glazing.*** *Special inspection shall be in accordance with Section 2410.2 item 9.*

…

**1705*A*.14 Testing for seismic resistance.**

…

**1705*A*.~~13~~14.2 Nonstructural components.** For structures assigned to Seismic Design Category D, E or F, where the requirements of Section 13.2.1 of ASCE 7 for nonstructural components, supports or attachments are met by *manufacturer's certification* as specified in Item 2 therein, the registered design professional shall specify on the approved construction documents the requirements for seismic *certification* by analysis *or* testing. *Certificates* of compliance for the *manufacturer's certification* shall be submitted to the building official as specified in Section 1704.5.

*Seismic sway bracing components satisfying requirements of FM 1950 or using an alternative testing protocol approved by the building official shall be deemed to satisfy the requirements of this section.*

***1705A.14.2.1* *Structural sealant glazing testing.*** *Testing and the manufacturer’s certification shall be in accordance with Section 2410.1.2.*

…

***~~1705A.20 Sealing of mass timber.~~*** *~~Periodic special inspections of sealants or adhesives shall be conducted where sealant or adhesive required by Section 703.9 is applied to mass timber building elements as designated in the approved construction documents.~~*

…

**Notation:**

Authority: Health and Safety Code, Sections 1275, 18928, 129790, and 129850

Reference(s): Health and Safety Code, Section 129850

# Item 6 CHAPTER 18 SOILS AND FOUNDATIONS

Adopt 2021 International Building Code (IBC) Chapter 18 and carry forward existing amendments of the 2019 California Building Code (CBC) for OSHPD 1R, 2 and 5 with the following modifications:

…

**SECTION 1810 DEEP FOUNDATIONS**

…

***1810.3.1.5.1 Helical piles seismic requirements.*** ***[OSHPD 1R, 2B & 5]*** *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 preproduction 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 ASCE 7 Section 2.3.6 ~~1605.2.1~~.*

…

**1810.3.3.1.9 Helical piles.**

The allowable axial design load, *Pa*, of helical piles shall be determined as follows:

*Pa = 0.5 Pu*

where *Pu* is the least value of:

1. Base capacity plus shaft resistance of the helical pile. The base capacity is equal to the sum of the areas of the helical bearing plates times the ultimate bearing capacity of the soil or rock comprising the bearing stratum. The shaft resistance is equal to the area of the shaft above the uppermost helical bearing plate times the ultimate skin resistance.
2. Ultimate capacity determined from well-documented correlations with installation torque.
3. Ultimate capacity determined from load tests where required by { Section 1810.3.3.1.2 }. ***[OSHPD 1R, 2B & 5]***  *Load tests are required to determine the ultimate capacity.*
4. Ultimate axial capacity of pile shaft.
5. Ultimate axial capacity of pile shaft couplings.
6. Sum of the ultimate axial capacity of helical bearing plates affixed to pile.

…

**1810.3.8 Precast concrete Piles.**

Precast concrete piles shall be designed and detailed in accordance with **{ ACI 318 }**.

Exceptions:

1. For precast prestressed piles in Seismic Design Category C, the minimum volumetric ratio of spirals or circular hoops required by Section 18.13.5.10.4 of **{ ACI 318 }** shall not apply in cases where the design includes full consideration of load combinations specified in **{ ASCE 7 }**, Section 2.3.6 or Section 2.4.5 and the applicable overstrength factor, Ω0. In such cases, minimum transverse reinforcement index shall be as specified in Section 13.4.5.6 of **{ ACI 318 }**.***[OSHPD 1R, 2B & 5]*** *not permitted by OSHPD.*
2. For precast prestressed piles in Seismic Design Categories D through F, the minimum volumetric ratio of spirals or circular hoops required by Section 18.13.5.10.5(c) of **{ ACI 318 }** shall not apply in cases where the design includes full consideration of load combinations specified in **{ ASCE 7 }**, Section 2.3.6 or Section 2.4.5 and the applicable overstrength factor, Ω0. In such cases, minimum transverse reinforcement shall be as specified in Section 13.4.5.6 of **{ ACI 318 }**.***[OSHPD 1R, 2B & 5]*** *not permitted by OSHPD.*

(Relocated from 1810.3.8.3.4) ***[OSHPD 1R, 2B & 5] Exception:*** *Where the axial load from seismic forces is amplified by the applicable overstrength factor, Ω0 the axial load limits in Section 18.13.5.10.6 of ACI 318 may be increased by two times.*

…

**~~1810.3.8.3.4 Axial load limit in Seismic Design Categories C through F.~~**

**~~…~~** (Relocated to 1810.3.8) **[OSHPD 1R, 2 & 5]** *Exception: Where the axial load from seismic forces is amplified by the applicable overstrength factor,Ω0 , the axial load limits may be increased by 2 times.*

***1810.3.10.4.1 Seismic requirements.*** ***[OSHPD 1R, 2B & 5]*** *For structures assigned to Seismic Design Category D, E or F, a permanent steel casing having a minimum thickness of 3/ 8 inch 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 preproduction 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 ASCE 7 Section 2.3.6 ~~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 ~~18.13.4.~~18.13.5.*

*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-inch corrosion allowance.*

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

…

**1810.3.11.2 Seismic Design Categories D through F.**

For structures assigned to Seismic Design Category D, E or F, deep foundation element resistance to uplift forces or rotational restraint shall be provided by anchorage into the pile cap, designed considering the combined effect of axial forces due to uplift and bending moments due to fixity to the pile cap. Anchorage shall develop not less than 25 percent of the strength of the element in tension. Anchorage into the pile cap shall comply with the following:

1. In the case of uplift, the anchorage shall be capable of developing the least of the following:

1.1 The nominal tensile strength of the longitudinal reinforcement in a concrete element.

1.2 The nominal tensile strength of a steel element.

1.3 The frictional force developed between the element and the soil multiplied by 1.3.

**Exception:** The anchorage is permitted to be designed to resist the axial tension force resulting from the seismic load effects including overstrength factor in accordance with Section 2.3.6 or 2.4.5 of **{ ASCE 7 }**.

1. In the case of rotational restraint, the anchorage shall be designed to resist the axial and shear forces, and moments resulting from the seismic load effects including overstrength factor in accordance with Section 2.3.6 or 2.4.5 of **{ ASCE 7 }** or the anchorage shall be capable of developing the full axial, bending and shear nominal strength of the element.
2. The connection between the pile cap and the steel H-piles or unfilled steel pipe piles in structures assigned to Seismic Design Category D, E or F shall be designed for a tensile force of not less than 10 percent of the pile compression capacity.

Exceptions:

* 1. Connection tensile capacity need not exceed the strength required to resist seismic load effects including overstrength of **{ ASCE 7 }** Section 12.4.3 or 12.14.3.2.
  2. Connections need not be provided where the foundation or supported structure does not rely on the tensile capacity of the piles for stability under the design seismic force. ***[OSHPD 1R, 2B & 5]*** *not permitted by OSHPD.*

Where the vertical lateral-force-resisting elements are columns, the pile cap flexural strengths shall exceed the column flexural strength. The connection between batter piles and pile caps shall be designed to resist the nominal strength of the pile acting as a short column. Batter piles and their connection shall be designed to resist forces and

moments that result from the application of seismic load effects including overstrength factor in accordance with Section 2.3.6 or 2.4.5 of **{ ASCE 7 }**.

…

**1810.3.12 Grade beams.**

Grade beams shall comply with the provisions of { ACI 318 }.

Exception: Grade beams designed to resist the seismic load effects including overstrength factor in accordance with Section 2.3.6 or 2.4.5 of **{ ASCE 7}** ***[OSHPD 1R, 2B & 5]*** *need not comply with Section 18.13.3 of ACI 318*.

…

***SECTION 1811 PRESTRESSED ROCK AND SOIL FOUNDATION ANCHORS [OSHPD 1R, 2B & 5]***

…

***1811.3 Geotechnical requirements.*** *Geotechnical report for the prestressed rock and 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 ~~C~~corrosion ~~P~~protection is required for all permanent and extended temporary anchors in service more than 2 years. A minimum of Class II ~~C~~corrosion ~~P~~protection is required for temporary anchors in service less than or equal to 2 years.*

…

***1811.4 Structural Requirements.***

1. *Tendons shall be thread-bar anchors conforming to ASTM A722.*
2. *The anchors shall be placed vertical.*
3. *Design loads shall be based upon the load combinations in Section 2.4 of ASCE 7 ~~1605.3.1~~ and shall not exceed 60 percent of the specified minimum tensile strength of the tendons.*

…

***SECTION 1812 EARTH RETAINING SHORING [OSHPD 1R, 2B & 5]***

…

***1812.4.1 Geotechnical requirements:*** *The geotechnical report for the earth retaining shoring shall address the following:*

*…*

* 1. *Class I corrosion protection is required for all permanent and extended temporary anchors in service more than 2 years. A minimum of Class II ~~C~~corrosion ~~P~~protection is required for temporary anchors in service less than or equal to 2 years.*

…

***1812A.4.2 Structural requirements****:*

1. *Tendons shall be thread-bar anchors conforming to ASTM A722.*
2. *Anchor design loads shall be based upon the load combinations in Section 2.4 of ASCE 7 ~~1605.3.1~~ and shall not exceed 60 percent of the specified minimum tensile strength of the tendons.*

…

**Notation:**

Authority: Health and Safety Code, Sections 1275, 18928, 129790, and 129850

Reference(s): Health and Safety Code, Section 129850

# Item 7 CHAPTER 18*A* SOILS AND FOUNDATIONS

Adopt 2021 International Building Code (IBC) Chapter 18*A* for OSHPD 1 and 4 with the following modifications:

**SECTION 1807*A* FOUNDATION WALLS, RETAINING WALLS AND EMBEDDED POSTS AND POLES**

…

***1807A.2.~~4~~5 Freestanding cantilever walls.*** *Freestanding cantilever walls shall comply with Section 15.6.8 of ASCE 7.* ***[OSHPD 1 & 4]*** *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*.8.2 Concrete cover.**

The concrete cover provided for prestressed and nonprestressed reinforcement in foundations shall be not less than the largest applicable value specified in { Table 1808*A*.8.2 }. Longitudinal bars spaced less than 11/2 inches (38 mm) clear distance apart shall be considered to be bundled bars for which the concrete cover provided shall be not less than that required by Section 20.5.1.3.5 ~~20.6.1.3.4~~ of { ACI 318 }. Concrete cover shall be measured from the concrete surface to the outermost surface of the steel to which the cover requirement applies. Where concrete is placed in a temporary or permanent casing or a mandrel, the inside face of the casing or mandrel shall be considered to be the concrete surface.

…

**TABLE 1808*A*.8.2**

**MINIMUM CONCRETE COVER**

|  |  |
| --- | --- |
| **FOUNDATION ELEMENT OR CONDITION** | **MINIMUM COVER** |
| 1. Shallow foundations | In accordance with Section 20.~~6~~5 of { ACI 318 } |
| 2. Precast nonprestressd deep foundation elements  Exposed to seawater  Not manufactured under plant conditions  Manufactured under plant control conditions | 3 inches  2 inches  In accordance with Section 20.~~6~~5.1.3.~~34~~ of { ACI 318 } |
| 3. Precast prestressed deep foundation elements  Exposed to seawater  Other | 2.5 inches  In accordance with Section 20.~~6~~5.1.3.~~3~~ 4of { ACI 318 } |
| 4. Cast-in-place deep foundation elements not enclosed by a steel pipe, tube or permanent casing | 2.5 inches |
| 5. Cast-in-place deep foundation elements enclosed by a steel pipe, tube or permanent casing | 1 inch |
| 6. Structural steel core within a steel pipe, tube or permanent casing | 2 inches |
| 7. Cast-in-place drilled shafts enclosed by a stable rock socket | 1.5 inches |

In accordance with Section 20.6.1.3.3 of { ACI 318 }

For SI: 1 inch = 25.4 mm.

…

**Notation:**

Authority: Health and Safety Code, Sections 1275, 18928, 129790, and 129850

Reference(s): Health and Safety Code, Section 129850

# Item 8 CHAPTER 18*A* SOILS AND FOUNDATIONS

**SECTION 1810*A* DEEP FOUNDATIONS**

…

***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 preproduction 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 1617A.1.~~16~~15. …*

…

**1810*A*.3.3.1.9 Helical piles.**

The allowable axial design load, *Pa*, of helical piles shall be determined as follows:

*Pa = 0.5 Pu*

where *Pu* is the least value of:

1. Base capacity plus shaft resistance of the helical pile. The base capacity is equal to the sum of the areas of the helical bearing plates times the ultimate bearing capacity of the soil or rock comprising the bearing stratum. The shaft resistance is equal to the area of the shaft above the uppermost helical bearing plate times the ultimate skin resistance.
2. Ultimate capacity determined from well-documented correlations with installation torque.
3. Ultimate capacity determined from load tests ~~where required by { Section 1810.3.3.1.2 }.~~
4. Ultimate axial capacity of pile shaft.
5. Ultimate axial capacity of pile shaft couplings.
6. Sum of the ultimate axial capacity of helical bearing plates affixed to pile.

…

**1810*A*.3.6 Splices.**

Splices shall be constructed so as to provide and maintain true alignment and position of the component parts of the deep foundation element during installation and subsequent thereto and shall be designed to resist the axial and shear forces and moments occurring at the location of the splice during driving and for design load combinations. Where deep foundation elements of the same type are being spliced, splices shall develop not less than 50 percent of the bending strength of the weaker section. Where deep foundation elements of different materials or different types are being spliced, splices shall develop the full compressive strength and not less than 50 percent of the tension and bending strength of the weaker section. Where structural steel cores are to be spliced, the ends shall be milled or ground to provide full contact and shall be full-depth welded.

~~Exception: For buildings assigned to Seismic Design Category A or B, splices need not comply with the 50-percent tension and bending strength requirements where justified by supporting data.~~

Splices occurring in the upper 10 feet (3048 mm) of the embedded portion of an element shall be designed to resist at allowable stresses the moment and shear that would result from an assumed eccentricity of the axial load of 3 inches (76 mm), or the element shall be braced in accordance with **{ Section 1810.2.2 }** to other deep foundation elements that do not have splices in the upper 10 feet (3048 mm) of embedment.

…

**1810*A*.3.8 Precast concrete piles.**

Precast concrete piles shall be designed and detailed in accordance with **{ ACI 318 }**.

~~Exceptions:~~

1. ~~For precast prestressed piles in Seismic Design Category C, the minimum volumetric ratio of spirals or circular hoops required by Section 18.13.5.10.4 of~~ **~~{ ACI 318 }~~** ~~shall not apply in cases where the design includes full consideration of load combinations specified in~~ **~~{ ASCE 7 }~~**~~, Section 2.3.6 or Section 2.4.5 and the applicable overstrength factor, Ω~~~~0~~~~. In such cases, minimum transverse reinforcement index shall be as specified in Section 13.4.5.6 of~~ **~~{ ACI 318 }~~**~~.~~
2. ~~For precast prestressed piles in Seismic Design Categories D through F, the minimum volumetric ratio of spirals or circular hoops required by Section 18.13.5.10.5(c) of~~ **~~{ ACI 318 }~~** ~~shall not apply in cases where the design includes full consideration of load combinations specified in~~ **~~{ ASCE 7 }~~**~~, Section 2.3.6 or Section 2.4.5 and the applicable overstrength factor, Ω0. In such cases, minimum transverse reinforcement shall be as specified in Section 13.4.5.6 of~~ **~~{ ACI 318 }~~**~~.~~

(Relocated from 1810*A*.3.8.3.4) ***Exception:*** *Where the axial load from seismic forces is amplified by the applicable overstrength factor, Ω0 the axial load limits Section 18.13.5.10.6 of ACI 318 may be increased by two times.*

~~1810.3.8.1 Reinforcement.~~

~~Longitudinal steel shall be arranged in a symmetrical pattern and be laterally tied with steel ties or wire spiral spaced center to center as follows:~~

…

**~~1810~~*~~A~~*~~.3.8.3.4 Axial load limit in Seismic Design Categories C through F.~~**

**~~…~~** (Relocated to 1810*A*.3.8) *Exception: Where the axial load from seismic forces is amplified by the applicable overstrength factor,Ω0 , the axial load limits may be increased by 2 times.*

**1810*A*.3.9.4 Seismic reinforcement.** ~~Where a structure is assigned to Seismic Design Category C, reinforcement shall be provided in accordance with Section 1810~~*~~A~~*~~.3.9.4.1.~~ Where a structure is assigned to Seismic Design Category D, E or F, reinforcement shall be provided in accordance with Section 1810*A*.3.9.4.2.

…

**1810*A*.3.9.4.1 Seismic reinforcement in Seismic Design Category C.** *Not permitted by OSHPD.* ~~For structures assigned to Seismic Design Category C, cast-in-place deep foundation elements shall be reinforced as specified in this section. Reinforcement shall be provided where required by analysis.~~

…

***1810A.3.10.4 Seismic requirements.*** *For structures assigned to Seismic Design Category D, E or F, a permanent steel casing having a minimum thickness of 3/ 8 inch 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 preproduction 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 1617A.1.~~16~~15.*

*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 ~~18.13.4.~~18.13.5.*

*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-inch corrosion allowance.*

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

…

**1810*A*.3.11.2 Seismic Design Categories D through F.**

For structures assigned to Seismic Design Category D, E or F, deep foundation element resistance to uplift forces or rotational restraint shall be provided by anchorage into the pile cap, designed considering the combined effect of axial forces due to uplift and bending moments due to fixity to the pile cap. Anchorage shall develop not less than 25 percent of the strength of the element in tension. Anchorage into the pile cap shall comply with the following:

1. In the case of uplift, the anchorage shall be capable of developing the least of the following:

1.1 The nominal tensile strength of the longitudinal reinforcement in a concrete element.

1.2 The nominal tensile strength of a steel element.

1.3 The frictional force developed between the element and the soil multiplied by 1.3.

**Exception:** The anchorage is permitted to be designed to resist the axial tension force resulting from the seismic load effects including overstrength factor in accordance with Section 2.3.6 or 2.4.5 of **{ ASCE 7 }**.

1. In the case of rotational restraint, the anchorage shall be designed to resist the axial and shear forces, and moments resulting from the seismic load effects including overstrength factor in accordance with Section 2.3.6 or 2.4.5 of **{ ASCE 7 }** or the anchorage shall be capable of developing the full axial, bending and shear nominal strength of the element.
2. The connection between the pile cap and the steel H-piles or unfilled steel pipe piles in structures assigned to Seismic Design Category D, E or F shall be designed for a tensile force of not less than 10 percent of the pile compression capacity.

Exceptions:

1. Connection tensile capacity need not exceed the strength required to resist seismic load effects including overstrength of **{ ASCE 7 }** Section 12.4.3 or 12.14.3.2.
2. ~~Connections need not be provided where the foundation or supported structure does not rely on the tensile capacity of the piles for stability under the design seismic force.~~

Where the vertical lateral-force-resisting elements are columns, the pile cap flexural strengths shall exceed the column flexural strength. The connection between batter piles and pile caps shall be designed to resist the nominal strength of the pile acting as a short column. Batter piles and their connection shall be designed to resist forces and

moments that result from the application of seismic load effects including overstrength factor in accordance with Section 2.3.6 or 2.4.5 of **{ ASCE 7 }**.

…

**1810*A*.3.12 Grade beams.**

Grade beams shall comply with the provisions of **{ ACI 318 }**.

Exception: Grade beams designed to resist the seismic load effects including overstrength factor in accordance with Section 2.3.6 or 2.4.5 of **{ ASCE 7 }** *need not comply with Section 18.13.3 of ACI 318*.

…

**Notation:**

Authority: Health and Safety Code, Sections 1275, 18928, 129790, and 129850

Reference(s): Health and Safety Code, Section 129850

# Item 9 CHAPTER 18*A* SOILS AND FOUNDATIONS

***SECTION 1811A PRESTRESSED ROCK AND SOIL FOUNDATION ANCHORS***

…

***1811A.2 Adoption.*** *Except for the modifications as set forth in Sections 1811A.3 and 1811A.4, all prestressed rock and soil foundation anchors shall comply with PTI Recommendations for Prestressed Rock and Soil Anchors.*

***1811A.3 Geotechnical requirements.*** *Geotechnical report for the prestressed rock and 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 ~~C~~corrosion ~~P~~protection is required for all permanent and extended temporary anchors in service more than 2 years. A minimum of Class II ~~C~~corrosion ~~P~~protection is required for temporary anchors in service less than or equal to 2 years.*

*8. Performance test shall be at a minimum of 1.6 times the design loads, but shall not exceed 80 percent of the specified minimum tensile strength of the tendons. There shall be a minimum of two preproduction test anchors. Preproduction test anchors shall be tested to ultimate load or maximum of 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.*

…

***1811A.4 Structural Requirements.***

*1. Tendons shall be thread-bar anchors conforming to ASTM A722.*

*2. The anchors shall be placed vertical.*

*3. Design loads shall be based upon the load combinations in Section 2.4 of ASCE 7 ~~1605A.3.1~~ and shall not exceed 60 percent of the specified minimum tensile strength of the tendons.*

…

**Notation:**

Authority: Health and Safety Code, Sections 1275, 18928, 129790, and 129850

Reference(s): Health and Safety Code, Section 129850

# Item 10 CHAPTER 18*A* SOILS AND FOUNDATIONS

***SECTION 1812A EARTH RETAINING SHORING***

…

***1812A.4 Design and testing:*** …

***1812A.4.1 Geotechnical requirements:*** *The geotechnical report for the earth retaining shoring shall address the following:*

*…*

*6. Class I corrosion protection is required for all permanent and extended temporary anchors in service more than 2 years. A minimum of Class II ~~C~~corrosion ~~P~~protection is required for temporary anchors in service less than or equal to 2 years.*

…

***1812A.4.2 Structural requirements****:*

*1. Tendons shall be thread-bar anchors conforming to ASTM A722.*

*2. Anchor design loads shall be based upon the load combinations in Section 2.4 of ASCE 7 ~~1605A.3.1~~ and shall not exceed 60 percent of the specified minimum tensile strength of the tendons.*

…

***1812A.4.3 Testing of tie-back anchors****:*

…

(Relocated Items 2 and 3 to Section 1812*A*.5)

1. *~~If a tie-back …~~*
2. *~~After a satisfactory test, …~~*

…

***1812A.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 in dispensed 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 in accordance with Section 1812A.4.1 Item #7 may be performed after post-grouting operations, provided grout has reached strength of 3,000 psi as required by PTI Recommendations for Prestressed Rock and Soil Anchors 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.*

*~~2.~~15.*(Relocated from Section 1812*A*.4.3, Item 2) *If a tie-back anchor initially fails the testing requirements, the anchor shall be permitted to be regrouted and retested. If anchor continues to fail, the followings steps shall be taken:*

*~~a.~~15.1 The contractor shall determine the cause of failure – variations of the soil conditions, installation methods, materials, etc.*

*~~b.~~15.2 The contractor shall propose a solution to remedy the problem. The proposed solution will need to be reviewed and approved by the geotechnical engineer, shoring design engineer and building official.*

*16.* (Relocated from Section 1812*A*.4.3, Item 3) *After a satisfactory test, each anchor shall be locked-off in accordance with Section 8.4 of PTI Recommendations for Prestressed Rock and Soil Anchors.*

***1812A.6 Inspection, survey monitoring and observation.***

1. *The shoring design engineer or his designee shall make periodic ~~inspections of~~ visits to the job site for the purpose of observing the installation of shoring system in accordance with section 1704A.6, 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:*
   1. *Sampling and testing of concrete in soldier pile and tie-back anchor shafts.*
   2. *Fabrication of tie-back anchor pockets on soldier beams*
   3. *Installation and testing of tie-back anchors.*
   4. *Survey monitoring of soldier pile and tie-back load cells.*
   5. *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 calendar 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 minimum, shall be as follows:*
   1. *Initial monitoring shall be performed prior to any excavation.*
   2. *Once excavation has begun, the periodic readings shall be taken weekly until excavation reaches the estimated subgrade elevation and the permanent foundation is complete.*
   3. *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.*
   4. *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 building official.*
   5. *Additional readings shall be taken when requested by the special inspector, shoring design engineer, geotechnical engineer or building official.*
8. *Monitoring reading shall be submitted to the shoring design engineer, engineer in responsible charge, and building official within three 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 initial date of monitoring and reading, current monitoring date and reading and difference between the two readings.*
9. *If the total cumulative horizontal or vertical movement (from start of construction) of the existing buildings reaches ½ inch or soldier piles reaches 1 inch 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 cumulative horizontal or vertical movement (from start of construction) of the existing buildings reaches ¾ inch or soldier piles reaches 11/2 inches 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:*
    1. *Load cells shall be installed at the tie-back heads adjacent to buildings at maximum interval of 50 feet, with a minimum of one load cells per wall.*
    2. *Load cell readings shall be taken once a day during excavation and once a week during the remainder of construction.*
    3. *Load cell readings shall be submitted to the geotechnical engineer, shoring design engineer, engineer in responsible charge and building official.*
    4. *Load cell readings can be terminated once the temporary shoring no longer provides support for the buildings.*

***1812A.7 Monitoring of existing ~~DSA-SS, DSA-SS/CC, and OSHPD 1 and 4~~ structures.***

1. *The contractor shall complete a written and photographic log of all existing ~~DSA-SS, DSA-SS/CC, and 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. *The contractor shall document existing condition of wall cracks adjacent to shoring walls prior to start of construction.*

*…*

**Notation:**

Authority: Health and Safety Code, Sections 1275, 18928, 129790, and 129850

Reference(s): Health and Safety Code, Section 129850

# Item 11 CHAPTER 18*A* SOILS AND FOUNDATIONS

***SECTION 1813A VIBRO STONE COLUMNS FOR GROUND IMPROVEMENT***

…

***1813A.3 Shallow foundations.*** *VSCs under the shallow foundation shall be located symmetrically around the centroid of the footing or load.*

1. *There shall be a minimum of four stone columns under each isolated or continuous/combined footing or approved equivalent.*
2. *The VSCs ~~or deep foundation elements~~ shall not be used to resist tension or overturning uplift from the shallow foundations.*

…

***1813A.5 Construction documents.*** *Construction documents for VSCs, as a minimum, shall include the following:*

…

1. *A note indicating foundation construction shall not commence until the final verified report specified in Section 1813A.2 item 9 has been submitted to and approved by the enforcement agency.*

…

**Notation:**

Authority: Health and Safety Code, Sections 1275, 18928, 129790, and 129850

Reference(s): Health and Safety Code, Section 129850

# Item 12 CHAPTER 19 CONCRETE

Adopt 2021 International Building Code (IBC) Chapter 19 and carry forward existing amendments of the 2019 California Building Code (CBC) for OSHPD 1R, 2 and 5 with the following modifications:

**SECTION 1901 GENERAL**

…

***1901.3.4 Tests for Post-Installed Anchors in Concrete [OSHPD 1R, 2B & 5].*** *When post-installed anchors are used in lieu of cast-in place bolts, the installation verification test loads, frequency, and acceptance criteria shall be in accordance with this section.*

…

***1901.3.4.3 Test frequency.*** *…*

…

***Exceptions:***

…

*6.* ***[OSHPD 2B]*** *In State detention and correctional facilities, tension testing is not required for post-installed anchors used for attaching nonstructural components to concrete walls if the components do not contribute to security/detainment, life safety and the continuous operation of the institution following an event of extreme environmental loading from flood, wind, snow or earthquakes, such as grab bars and shower seats, as determined by the Enforcing Agency.*

…

***1901.3.4.5 Test acceptance criteria.*** *Acceptance criteria for post-installed anchors shall be based on approved evaluation report using criteria adopted in this code. 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,~~ ~~t~~The testing apparatus support locations shall not be ~~located~~ within 1.5 times the anchor’s embedment depth to avoid restricting the concrete shear cone type failure mechanism from occurring.*

***Exception:*** *When denoted accordingly on the approved construction documents, adhesive anchors complying with ACI 318 Equation 17.8.2a and for which concrete breakout does not control the design tensile strength may be tested with apparatus support locations closer than 1.5 times the anchor embedment depth.*

…

**SECTION 1905 MODIFICATIONS TO ACI 318**

Note to Publisher: The following sub-sections include text whose origin is a new adopted material standard of this code (ACI 318). Amendments previously located in Section 1908A are relocated here because of their relevance to these ACI 318 sections and the deletion of model code Section 1908 with which they were previously associated. The base language from ACI 318 is shown here in vertical text (not italicized, underlined, nor highlighted) even though it is not continued from the prior version. This text should be printed along with the amendment text, which is formatted in accordance with the legend at the beginning of this document.

…

**1905.1.7 ACI 318, Section 14.1.4 *[OSHPD 1R, 2B & 5]***

**~~Delete~~ *Modify* { ACI 318 }, Section 14.1.4 ~~and replace~~ with the following:**

**14.1.4***Plain concrete shall not be permitted for a structure assigned to Seismic Design Category (SDC) D, E and F~~, only in cases (a) and (b)~~.*

*~~(a) Footings supporting~~* ~~…~~

…

**SECTION 1908 SHOTCRETE**

…

Note to Publisher: Sections 1908.2 through 1908.10.3 of the previous version of the model code have been removed from the current version. Prior amendments associated with those deleted sections have been relocated herein to the associated sections to which they apply. Those prior amendments should no longer be printed in Section 1908 except as noted below.

**1908.1 General.** Shotcrete shall be in accordance with the requirements of ACI 318 ***[OSHPD 1R, 2B & 5]*** *and the provisions of ACI 506R. ~~The specified compressive strength of shotcrete shall not be less than 4,000 psi (27.6 MPa)~~*~~.~~*The evaluation of the shotcrete mockup panel to qualify bar clearance dimensions in accordance with ACI 318 Section 25.2.7 or contact lap splices in accordance with ACI 318 Section 25.5.1.7 shall be in accordance with the requirements of 506.4R with a core quality category of Very Good given in ACI 506.6T.*

*~~Concrete or masonry to receive shotcrete shall have the entire surface thoroughly cleaned and roughened by a mechanical method acceptable to the enforcement agency, and just prior to receiving shotcrete shall be thoroughly cleaned of all debris, dirt and dust. Concrete and masonry shall be brought to a saturated surface-dry (SSD) condition before shotcrete is deposited.~~*

…

***1908.2 Tests and Inspections.******[OSHPD 1R, 2B & 5]*** *Preconstruction tests of one or more shotcrete mockup panels prepared in accordance with Section 1705.3.9.2 are required. In addition to testing requirements in ACI 318, special inspection and testing shall be in accordance with Section 1705.3.9.*

***1908.~~11~~3 Forms and ground wires for shotcrete. [OSHPD 1R, 2B & 5]*** *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.*

***~~1908.12 Placing. [OSHPD 1R, 2 & 5]~~*** *~~Shotcrete shall be placed in accordance with ACI 506R. In addition to testing requirements in Section 1908A, special inspection and testing shall be in accordance with Section 1705A.19.~~*

…

***SECTION 1910***

***ADDITIONAL REQUIREMENTS FOR SKILLED NURSING FACILITIES, INTERMEDIATE CARE FACILITIES, ACUTE PSYCHIATRIC AND NON-GAC BUILDINGS [OSHPD 1R, 2B & 5]***

…

***1910.3.4 ACI 318, Table 21.2.2.*** *Replace Table 21.2.2 as follows:*

***TABLE 21.2.2***

***STRENGTH REDUCTION FACTOR*** f ***FOR MOMENT,***

***AXIAL FORCE, OR COMBINED MOMENT AND AXIAL FORCE***

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Net tensile strain (et) | Classification | f | | | |
| Types of transverse reinforcement | | | |
| Spirals conforming to 25.7.3 | | Other | |
| et < ety | Compression-controlled | 0.75 | (a) | 0.65 | (b) |
| ety < et < ety+0.003 | Transition[1] [*2*] | 0.75 + 0.15 | (c) | 0.65 + 0.25 | (d) |
| et > ety+0.003 | Tension-controlled[*3*] | 0.9 | (e) | 0.9 | (f) |

[1] For sections classified as transition, it shall be permitted to use f corresponding to compression-controlled sections.

[*2*] e*t\* is the greater of net tensile strain calculated for P = 0.1Agf’c and ~~0.005~~*e*ty + 0.003.*

[*3*] *For sections with factored axial compression force Pu ≥ 0.1Agf’c, f shall be calculated using equation (c) or (d) for sections classified as transition, as applicable.*

…

**Notation:**

Authority: Health and Safety Code, Sections 1275, 18928, 129790, and 129850

Reference(s): Health and Safety Code, Section 129850

# Item 13 CHAPTER 19*A* CONCRETE

Adopt 2021 International Building Code (IBC) Chapter 19A and carry forward existing amendments of the 2019 California Building Code (CBC) for OSHPD 1R, 2 and 5 with the following modifications:

…

**SECTION 1903*A* SPECIFICATION FOR TESTS AND MATERIAL**

…

**1903*A*.2 Special inspections.** *Where required,* special inspections *and tests shall be in accordance with Chapter 17A and Section 1910A.*

…

***1903A.8 Welding of reinforcing bars*** *– Modify ACI 318 Section ~~26.6.4.1(b)~~ 26.6.4.2(b) by adding the following: …*

…

**SECTION 1905*A* MODIFICATIONS TO ACI 318**

…

**1905*A*.1 General.** The text of ACI 318 shall be modified as indicated in Sections 1905*A.1.1* through *1905A.1.~~15~~16.*

…

***1905A.1.3 ACI 318, Section 9.6.1.3.*** *Modify ACI 318, Section 9.6.1.3 by adding the following:*

*This section shall not be used for members that resist seismic loads, except for either of the following conditions: ~~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~~.*

1. *Foundation ~~elements~~ members for one-story wood-frame or one-story light steel buildings.*
2. *Foundation members designed for seismic load combinations including the overstrength factor.* ***[OSHPD 1 & 4]*** *The As provided shall not be less than that required by 1.2 times the cracking load based upon fr defined in 19.2.3.*

…

**1905*A*.1.7 ACI 318, Section 14.1.4 *[OSHPD 1 & 4]***

**~~Delete~~ *Modify* { ACI 318 }, Section 14.1.4 ~~and replace~~ with the following:**

**14.1.4***Plain concrete shall not be permitted for a structure assigned to Seismic Design Category (SDC) D, E and F.*

~~14.1.4.1~~ …

**1905*A*.1.8 ACI 318, Section 17.2.3.** Modify ACI 318, Sections 17.2.3.4.2, 17.2.3.4.3(d) and 17.2.3.5.2, to read as follows:

***1905A.1.~~10~~9 ACI 318, Section 18.5.*** …

***1905A.1.~~11~~10 ACI 318, Section 18.10.6.5.*** *…*

***1905A.1.~~12~~11 ACI 318, Section 18.12.6.*** *…*

…

Note to Publisher: The following sub-section includes text and a table whose origin is a new adopted material standard of this code (ACI 318). This new standard has revised the section and table this amendment pertains to such that inclusion of the source language is necessary. The base language from ACI 318 is shown here in vertical text (not italicized, underlined, nor highlighted) even though it is not continued from the prior version. This text should be printed along with the amendment text, which is formatted in accordance with the legend at the beginning of this document.

***1905A.1.~~9~~12 ACI 318, Section 19.2.1.1 and Table 19.2.1.1.*** *Modify ACI 318, Section 19.2.1.1 and Table 19.2.1.1 as follows:*

*~~For concrete designed and constructed in accordance with this chapter, f’~~~~c~~ ~~shall not be less than 3,000 psi (20.7 MPa).~~* (Relocated to 1905A.1.12(e)) *Reinforced normal weight 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.*

19.2.1.1 The value of f’c shall be in be in accordance with (a) through *(e)*:

(a) Limits for f’c in Table 19.2.1.1. Limits apply to both normalweight and lightweight concrete.

(b) Durability requirements in Table 19.3.2.1

(c) Structural strength requirements

(d) f’c for lightweight concrete in special moment frames and special structural walls, and their foundations, shall not exceed 5000 psi, unless demonstrated by experimental evidence that members made with lightweight concrete provide strength and toughness equal to or exceeding those of comparable members made with normalweight concrete of the same strength.

*(e)* (Relocated from 1905*A*.1.9) *Reinforced normal weight 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.*

|  |  |
| --- | --- |
| **Application** | **Minimum**  **fc’, psi** |
| General (Relocated from 1905*A*.1.9) | *3000* |
| ~~Foundations for structures assigned to SDC A, B, or C~~ | ~~2500~~ |
| *~~Foundations for Residential and Utility use and occupancy classification with stud bearing wall construction two stories or less assigned to SDC D, E, or F~~* | ~~2500~~ |
| *~~Foundations for structures assigned to SDC D, E, or F other than Residential and Utility use and occupancy classification with stud bearing wall construction two stories or less~~* | ~~3000~~ |
| Special moment frames  Special structural walls with Grade 60 or 80 reinforcement | 3000 |
| Special structural walls with Grade 100 reinforcement | 5000 |
| Precast-nonprestressed driven piles  Drilled shafts | 4000 |
| Precast-prestressed driven piles | 5000 |
| *Shotcrete* (Relocated from 1908*A*.1) | *4000* |

…

***1905A.1.13 ACI 318, Table 21.2.2.*** *Replace Table 21.2.2 as follows:*

***TABLE 21.2.2***

***STRENGTH REDUCTION FACTOR*** f ***FOR MOMENT,***

***AXIAL FORCE, OR COMBINED MOMENT AND AXIAL FORCE***

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Net tensile strain (et) | Classification | f | | | |
| Types of transverse reinforcement | | | |
| Spirals conforming to 25.7.3 | | Other | |
| et < ety | Compression-controlled | 0.75 | (a) | 0.65 | (b) |
| ety < et < ety+0.003 | Transition[1] [*2*] | 0.75 + 0.15 | (c) | 0.65 + 0.25 | (d) |
| et > ety+0.003 | Tension-controlled[*3*] | 0.9 | (e) | 0.9 | (f) |

[1] For sections classified as transition, it shall be permitted to use f corresponding to compression-controlled sections.

[*2*] e*t\* is the greater of net tensile strain calculated for P = 0.1Agf’c and ~~0.005~~*e*ty + 0.003.*

[*3*] *For sections with factored axial compression force Pu ≥ 0.1Agf’c, f shall be calculated using equation (c) or (d) for sections classified as transition, as applicable.*

***1905A.1.14 ACI 318, Section 24.2.1.*** *Add Section 24.2.1.1 to ACI 318 as follows:*

*24.2.1.1 – Span to depth ratio. Prestressed beam and slab span to depth ratios for continuous prestressed concrete members shall not exceed the following,*

*except when calculations of deflections and vibration effects 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*

*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 24.2.2.*

…

Note to Publisher: The following sub-sections include text whose origin is a new adopted material standard of this code (ACI 318). Amendments previously located in Section 1908A are relocated here because of their relevance to these ACI 318 sections and the deletion of model code Section 1908 with which they were previously associated. The base language from ACI 318 is shown here in vertical text (not italicized, underlined, nor highlighted) even though it is not continued from the prior version. This text should be printed along with the amendment text, which is formatted in accordance with the legend at the beginning of this document.

…

***1905A.1.15 ACI 318, Section 25.2.10.*** *Replace ACI 318 Section 25.2.10 by the following:*

25.2.10 For ties and hoops in columns to be placed with shotcrete, minimum clear spacing shall be 3 in. *Shotcrete shall not be applied to spirally tied columns.*

***1905A.1.16 ACI 318, Section 26.5.2.*** *Modify ACI 318 Section 26.5.2.1 by replacing items (l), (m), and (n) with the following:*

(l) Shotcrete surfaces intended to receive subsequent shotcrete placement *following an interruption of 30 minutes or more* shall be roughened to a full amplitude of approximately ¼ in. before the shotcrete has reached final set. (Relocated from 1908*A*.7) *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 a mechanical method acceptable to the enforcement agency.*

(m) Before placing additional material onto hardened shotcrete, laitance shall be removed, joints shall be cleaned, and the surface shall be dampened. (Relocated from 1908*A*.7) *Construction joints over eight hours old shall be thoroughly cleaned with air and water prior to receiving shotcrete.*

(n) In-place fresh concrete that exhibits sags, sloughs, segregation, honeycombing, sand pockets, or other obvious defects shall be removed and replaced. *Shotcrete above sags and sloughs shall be removed and replaced while still plastic.*

*…*

*(q) Surface preparation:* (Relocated from 1908*A*.1) *Concrete or masonry to receive shotcrete shall have the entire surface thoroughly cleaned and roughened by a mechanical method acceptable to the enforcement agency, and just prior to receiving shotcrete shall be thoroughly cleaned of all debris, dirt and dust. Concrete and masonry shall be brought to a saturated surface-dry (SSD) condition before shotcrete is deposited.*

***1905A.1.~~15~~ 17 ACI 318, Section 26.12.2.1(a)****. Replace ACI 318 Section 26.12.2.1(a) by the following:*

*26.12.2.1(a) 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 (345 m3) of concrete, or not less than once for each 2,000 square feet (186 m2) of surface area for slabs or walls. Additional samples for 7-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.*

…

**SECTION 1908*A* SHOTCRETE**

…

Note to Publisher: Sections 1908.2 through 1908.10.3 of the previous version of the model code have been removed from the current version. Prior amendments associated with those deleted sections have been relocated herein to the associated sections to which they apply. Those prior amendments should no longer be printed in Section 1908A except as noted below.

**1908*A*.1 General.** Shotcrete shall be in accordance with the requirements of ACI 318 *and the provisions of ACI 506R. ~~The specified compressive strength of shotcrete shall not be less than~~* (Relocated to 1905A.1.12) *4,000 psi (27.6 MPa)* ***[OSHPD 1 & 4]*** *The evaluation of the shotcrete mockup panel to qualify bar clearance dimensions in accordance with ACI 318 Section 25.2.7 or contact lap splices in accordance with ACI 318 Section 25.5.1.7 shall be in accordance with the requirements of ACI 506.4R with a core quality category of Very Good given in ACI 506.6T.*

*~~Concrete or masonry to receive shotcrete shall have the entire surface thoroughly cleaned and roughened by a mechanical method acceptable to the enforcement agency, and just prior to receiving shotcrete shall be thoroughly cleaned of all debris, dirt and dust. Concrete and masonry shall be brought to a saturated surface-dry (SSD) condition before shotcrete is deposited.~~*

…

***1908A.2 Tests and Inspections.*** *Preconstruction tests of one or more shotcrete mockup panels prepared in accordance with Section 1705A.3.9.2 are required. In addition to testing requirements in ACI 318, special inspection and testing shall be in accordance with Section 1705A.3.9.*

***…***

~~1908~~*~~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.~~

(Relocated to 1905*A*.1.16, item *l*) *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 a mechanical method acceptable to the enforcement agency.* (Relocated to 1905*A*.1.16, item *m*) *Construction joints over eight hours old shall be thoroughly cleaned with air and water prior to receiving shotcrete.*

***…***

***1908A.~~11~~3 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.*

***~~1908A.12 Placing.~~*** *~~Shotcrete shall be placed in accordance with ACI 506R. In addition to testing requirements in Section 1908A, special inspection and testing shall be in accordance with Section 1705A.19.~~*

…

**SECTION 1910*A* CONCRETE, REINFORCEMENT AND ANCHOR TESTING**

…

***1910A.5 Tests for post-installed anchors in concrete.*** *When post-installed anchors are used in lieu of cast-in place bolts, the installation verification test loads, frequency, and acceptance criteria shall be in accordance with this section.*

…

***1910A.5.3 Test frequency.*** *When post-installed anchors are used for sill plate bolting applications, 10 percent of the anchors shall be tested.*

…

***Exceptions:***

*…*

*6.* ***[OSHPD 4]*** *In State detention and correctional facilities, tension testing is not required for post-installed anchors used for attaching nonstructural components to concrete walls if the components do not contribute to security/detainment, life safety and the continuous operation of the institution following an event of extreme environmental loading from flood, wind, snow or earthquakes, such as grab bars and shower seats, as determined by the Enforcing Agency.*

…

***1910A.5.5 Test acceptance criteria.*** *Acceptance criteria for post-installed anchors shall be based on an approved evaluation report using criteria adopted in this code. Field tests shall satisfy the following minimum requirements.*

*1. Hydraulic ram method:*

*Anchors tested with a hydraulic jack or spring loaded apparatus shall maintain the test load for a minimum of 15 seconds and shall exhibit no discernible 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, t~~The testing apparatus support locations shall not be located within 1.5 times the anchor’s embedment depth to avoid restricting the concrete shear cone type failure mechanism from occurring.*

***Exception:*** *When explicitly stated on the approved construction documents, adhesive anchors complying with ACI 318 Equation 17.8.2a and where concrete breakout does not control, the design tensile strength may be tested with apparatus support locations closer than 1.5 times the anchor embedment depth.*

…

**Notation:**

Authority: Health and Safety Code, Sections 1275, 18928, 129790, and 129850

Reference(s): Health and Safety Code, Section 129850

# Item 14 CHAPTER 20 ALUMINUM

Adopt 2021 International Building Code (IBC) Chapter 20 and carry forward existing amendments of the 2019 California Building Code (CBC) for OSHPD 1, 1R, 2, 4 and 5.

**Notation:**

Authority: Health and Safety Code, Sections 1275, 18928, 129790, and 129850

Reference(s): Health and Safety Code, Section 129850

# Item 15 CHAPTER 21 MASONRY

Adopt 2021 International Building Code (IBC) Chapter 21 and carry forward existing amendments of the 2019 California Building Code (CBC) for OSHPD 1R, 2 and 5 with the following modifications:

…

***2101.2.2 Prohibition. [OSHPD 1R, 2B & 5]*** *The following design methods, systems, and materials in TMS402/602 are not permitted by OSHPD:*

1. *Unreinforced Masonry.*
2. *Autoclaved Aerated Concrete (AAC) Masonry.*
3. *Empirical Design of Masonry and prescriptive design of masonry partition walls.*
4. *Adobe Construction.*
5. *Ordinary Reinforced Masonry Shear Walls.*
6. *Intermediate Reinforced Masonry Shear Walls.*
7. *Prestressed Masonry Shear Walls.*
8. *Direct Design of Masonry.*

…

**SECTION 2103 MASONRY CONSTRUCTION MATERIALS**

**2103*.*1 Masonry units.** Concrete masonry units, clay or shale masonry units, stone masonry units *and* glass unit masonry shall comply with Article 2.3 of TMS 602. Architectural cast stone shall conform to ASTM C 1364 and TMS 504. Adhered manufactured stone masonry veneer units shall conform to ASTM C1670. (Relocated from Section 2104.1) ***[OSHPD 1R, 2B & 5]*** *Architectural cast stone construction shall be considered as an alternative system.*

…

**2103.4 Metal reinforcement and accessories.** Metal reinforcement and accessories shall conform to Article 2.4 of TMS 602. Where unidentified reinforcement***[OSHPD 1R, 2B & 5]****,**or bar reinforcement without mill certification,* 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. ***[OSHPD 1R, 2B & 5]*** *Alternatively, the frequency of sampling for unidentifiable reinforcing bars specified in Section 1910.2 can be used.*

***2103.5******Air entrainment.******[OSHPD 1R, 2B & 5]*** *Air-entraining materials or air-entraining admixtures shall not be used in grout ~~unless tests are conducted to determine compliance with the requirements of this code~~.*

…

**SECTION 2104 CONSTRUCTION**

**2104.1 Masonry construction.** Masonry construction shall comply with the requirements of Sections 2104.1.1 through 2104.1.3 and with the requirements of either TMS 602 or TMS 604. (Relocated to Section 2103.1) ***[OSHPD 1R, 2B & 5]*** *Architectural cast stone construction shall be considered as an alternative system.*

*…*

***2104.2 Reinforced Grouted masonry. [OSHPD 1R, 2B & 5]***

**Note to Reviewer**: Existing prescriptive text is restructured and relocated as modifications to TMS 402/602 in different subsections of this Chapter. Existing amendment language with the same regulatory effect as the provisions in TMS 402/602 is deleted to avoid duplication, in conformance with the Nine-Point Criteria.

***2104.2.1 ~~General conditions.~~*** *~~Prior to grouting, the grout space shall be clean so that all spaces to be filled with grout do not contain mortar projections~~* (Relocated to new Section 2104.2.1) *greater than 1/4 inch (6.4mm)~~, mortar droppings and other foreign material~~.*

(Relocated to Section 2106.1.3) *All cells shall be solidly filled with grout.*

***~~Exception:~~*** *~~Reinforced hollow-unit masonry laid in running bond used for freestanding site walls or interior nonbearing non-shear wall partitions~~* (Relocated to Section 2106.1.3) *may be grouted only in cells containing vertical and horizontal reinforcement.*

(Relocated to Section 2104.2.1) *Reinforcement and embedded items shall be clean, properly positioned and securely anchored against movement prior to grouting.* (Relocated to Section 2104.2.3.6) *Bolts shall be accurately set with templates or by approved equivalent means and held in place to prevent dislocation during grouting.* (Relocated to Sections 2104.2.2) *Reinforcement, embedded items and bolts shall be solidly embedded in grout.* (Relocated to Section 2104.2.3) *Anchor bolts in the face shells of hollow masonry units shall be positioned to maintain a minimum of 1/2 inch of grout between the bolt and the face shell.*

(Relocated to Section 2104.2.4) *The grouting of any section of wall shall be completed in one day with no interruptions greater than one hour.* *~~At the time of laying, all masonry units shall be free of dust and dirt.~~*

*~~Grout pours shall be consolidated in accordance with the requirements of TMS 602, Article 3.5E.~~*

(Relocated to Section 2104.2.5.1) *Between grout pours or where grouting has been stopped more than an hour, a horizontal construction joint shall be formed by stopping all wythes at the same elevation and with the grout stopping a minimum of 11/2 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.*

*~~The construction documents shall completely describe grouting procedures, subject to approval of OSHPD.~~*

***2104.2.1 ~~General conditions.~~*** *~~…~~****TMS 602, Article 3.3 B Placing Mortar and Units.***  *Modify TMS 602 Article 3.3 B.2.c**as follows:*

(Note to Publisher: Shaded section for context only)

2. *Bed and head joints* - Unless otherwise required, construct 3/s-in. (9.5-mm) thick bed and head joints, except at foundation or with glass unit masonry. Provide glass unit masonry bed and head joint thicknesses in accordance with Article 3.3 B.7.c. Provide AAC masonry bed and head joint thicknesses in accordance with Article 3.3 B.9.b. Construct joints that also conform to the following:

a. Fill holes not specified in exposed and below grade masonry with mortar.

b. Unless otherwise required, tool joint with a round jointer when the mortar is thumbprint hard.

c. Remove masonry protrusions extending (Relocated from Section 2104.2.1) *greater than* *¼* ~~½~~in. (~~12.7~~ *6.4* mm) ~~or more~~ into cells or cavities to be grouted.

***2104.2.2 TMS 602,*** ***Article 3.4 B Reinforcement.***  *Modify TMS 602 Article 3.4 B.1 and Article 3.4 B.3**as follows:*

1. Support reinforcement to prevent displacement caused by construction loads or by placement of grout or mortar, beyond the allowable tolerances. (Relocated from Section 2104.2.1) *Reinforcement and embedded items shall be clean, properly positioned and securely anchored against movement prior to grouting.*

…

1. Maintain a clear distance between reinforcing bars and the interior of masonry unit or formed surface of at least 1/4 in. (6.4 mm) for fine grout and 1/2 in. (12.7 mm) for coarse grout, *and the space between masonry unit surfaces and reinforcement shall be a minimum of one bar diameter*, except where cross webs of hollow units are used as supports for horizontal reinforcement. (Relocated from Section 2104.2.1) *Reinforcement and embedded items shall be solidly embedded in grout.*

…

***2104.2.3 TMS 602, Article 3.4 D Anchor Bolts.***  *Replace TMS 602 Article 3.4 D.3 and add Articles 3.4 D.5 and 3.4D.6 as follows:*

…

*3.* (Relocated from Section 2104.2.1) *Anchor bolts in the wythe or face shells of hollow masonry units shall be positioned to maintain a minimum of ½ in. of grout between the bolt circumference, the wythe or ~~and~~ the face shell.* *For the portion of the bolt that is within the grouted cell, maintain a clear distance between the bolt and the face of masonry unit and between the head of the bolt and the formed surface of grout of at least 1/4 in. (6.4 mm) when using fine grout and at least 1/2 in. (12.7 mm) when using coarse grout.* (Relocated from Section 2104.2.1) *Bolts shall be solidly embedded in grout.*

…

*5.* (Relocated from Section 2106.1.1) *Bent bar anchor bolts shall not be allowed. 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.*

*6.* (Relocated from Section 2104.2.1) *Bolts shall be accurately set with templates or by approved equivalent means and held in place to prevent dislocation during grouting.*

***2104.2.******4 TMS 602, Article 3.5 C Grout pour height*** *Add to TMS 602, Article 3.5 C**the following:*

1. *For grout pours not greater than 4 feet (1219 mm) or 5 feet-4 inches (1651 mm) for 10-inch (254 mm) nominal or wider hollow unit masonry, the top of grout pour shall be at the top of constructed masonry, or within 8 inches (200 mm) of the top of the constructed masonry. After construction of each grout lift height of wall, column, pier or beam, masonry cells or cavities shall be inspected prior to placement of grout. Grout pours not terminated at the top of constructed masonry shall comply with TMS 602 Articles 3.5 C.3.a through 3.5 C.3.e.*
2. *Grout pours in excess of 4 feet (1219 mm) or 5 feet-4 inches (1651 mm) for 10-inch (254 mm) nominal or wider hollow unit masonry shall be subject to approval of the enforcement agency.*
3. *Grout pours in excess of 4 feet (1219 mm) or 5 feet-4 inches (1651 mm) for 10-inch (254 mm) nominal or wider hollow unit masonry shall be subject to the following:*
4. *Grouting shall be done in a continuous pour in lifts not exceeding 4 feet (1219 mm) or 5 feet-4 inches (1651 mm) for 10-inch (254 mm) nominal or wider hollow unit masonry.*
5. *An approved admixture of a type that reduces early water loss and produces an expansive action shall be used.*
6. (Relocated from Section 2104.2.1) *The grouting of any section of a wall between control barriers shall be completed in one day with no interruptions greater than one hour.*
7. *For multiple grout lifts within a grout pour, each grout lift height of wall, column, pier or beam shall be inspected before placement of additional units.*
8. *Cleanout openings shall be provided at the bottom of each pour of grout.*

***2104.2.******5 TMS 602, Article 3.5 F.1 Grout key.*** *Replace TMS 602, Article 3.5 F.1**as follows:*

1.(Relocated from Section 2104.2.1) *Between grout pours or where grouting has been stopped more than an hour, a horizontal construction joint shall be formed by ~~stopping all wythes at the same elevation and with the grout stopping~~* *terminating grout 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~~ terminated a minimum of 1/2 inch (12.7 mm) below the ~~top of the masonry~~ mortar joint.*  *Horizontal reinforcement shall be placed in bond beam units with a minimum grout cover of 1 inch (25 mm) above reinforcing steel for each grout pour.*

…

**SECTION 2105 QUALITY ASSURANCE**

…

***2105.2 Compressive Strength, f*** *′****m*. *[OSHPD 1R, 2B & 5]*** *The minimum specified compressive strength, f'm, in the design shall be ~~2000~~ 1500 psi (~~13.79~~10.34 MPa) for all structural masonry construction using materials and details of construction required herein. Testing of ~~the constructed~~ masonry shall be provided in accordance with Section ~~2105.5 or Section 2105.6~~ TMS 602, Article 1.4 B.*

***EXCEPTION:*** *Higher values of f'm may be used in the design of reinforced grouted multi-wythe masonry and reinforced hollow-unit masonry based on prism test results in accordance with TMS 602 Article 1.4 B.3 submitted by the architect or engineer to the enforcement agency which demonstrate the ability of the proposed construction to meet prescribed performance criteria for strength. ~~In no case shall the f'~~~~m~~ ~~assumed in design~~* (Relocated to Sections 2107.7 and 2108.4) *exceed 3,000 psi (20.7MPa).*

*~~Where an f'~~~~m~~ ~~greater than 2000 psi (13.79MPa) is approved, t~~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~~ documents. Verification of c~~C~~ompliance with the requirements for the specified strength of ~~constructed~~ masonry during construction shall be provided using prism test method ~~and core shear testing~~ in accordance with ~~Section 2105.5 and Section 2105.4~~ TMS 602 Article 1.4 B.3. ~~Substantiation for~~Verification of compliance with the specified compressive strength prior to the start of construction shall be obtained by using prism test method ~~in Section 2105.5~~  in accordance with TMS 602 Article 1.4 B.3.*

***2105.3 Mortar and grout tests. [OSHPD 1R, 2B & 5]*** *~~These tests are to establish whether the masonry components meet the specified component strengths.~~* ***TMS 602, Article 1.4 B Compressive Strength Determination.***  *Modify TMS 602 Article 1.4 B as follows by adding:*

*5. Additional testing requirements:*

*a. At the beginning of all masonry work, at least one test sample of the mortar shall be taken on three successive working days and at least at one-week intervals thereafter. Where mortar is based on a proportion specification, mortar shall be sampled and tested during construction in accordance with ASTM C780, including Annex 4, to verify the proportions specified in ASTM C270, Table 2. Where mortar is based on a property specification, mortar shall be laboratory prepared and tested prior to construction in accordance with ASTM C780 to verify the properties specified in ASTM C270, Table 1 and field sampled and tested during construction in accordance with ASTM C780 to verify the proportions with the laboratory tests.*

*b. Samples of grout shall be taken for each mix design, each day grout is placed, and not less than every 5,000 square feet of masonry wall area. They shall meet the minimum strength requirement given in ~~ASTM C270 Table 1 for mortar and~~ ASTM C476/TMS 602 Section 2.2 ~~for grout~~, or greater as specified. Additional samples shall be taken whenever any change in materials or job conditions occur, as determined by the building official.*

*c. Test specimens for mortar and grout shall be made as set forth in ASTM C780/C1586 and ASTM C1019. When the prism test method is used in accordance with ~~Section 2105.5 is used~~ TMS 602 Article 1.4 B.3 during construction, the tests in this section are not required.*

***Exception:*** *For non-bearing non-shear masonry walls not exceeding total wall height of 12 feet above top of foundation, mortar tests shall be permitted to be limited to those at the beginning of masonry work for each mix design.*

***2105.4******Masonry core testing****.* ***[OSHPD 1R, 2B & 5]*** *Not less than two cores shall be taken from each building for each 5,000 square feet (465 m2) of the masonry wall area or fraction thereof. The approved agency shall perform or observe the coring of the masonry walls and sample locations shall be subject to approval of the registered design professional.*

…

***Exceptions:***

1. *Core sampling and testing is not required for non-bearing non-shear masonry walls, not exceeding total wall height of 12’ above top of foundation, built with single-wythe hollow unit concrete masonry that attaches opposite face shells using webs cast as single unit, when designed using an f’m not exceeding ~~2000~~ 1500 psi (~~13.79~~10.34 MPa).*

…

***~~2105.5~~******~~Masonry prism method testing~~****~~.~~* ***~~[OSHPD 1R, 2 & 5]~~*** *~~Prism test method performed prior to the start or during construction shall be in accordance with TMS 602 Section 1.4 B.3. Prism test method performed on constructed walls shall be in accordance with TMS 602 Section 1.4 B.4.~~*

***~~2105.6~~******~~Unit strength method testing~~****~~.~~* ***~~[OSHPD 1R, 2 & 5]~~*** *~~Unit strength method testing shall be performed in accordance with TMS 602 Section 1.4 B.2.~~*

**SECTION 2106 SEISMIC DESIGN**

**2106.1 Seismic design requirements for masonry.** Masonry structures and components shall comply with the requirements in Chapter 7 of TMS 402 depending on the structure’s *Seismic Design Category.*

**Note to Reviewer**: Existing prescriptive text is restructured and relocated as modifications to TMS 402/602 in different subsections of this Chapter. Existing amendment language with the same regulatory effect as the provisions in TMS 402/602 is deleted to avoid duplication, in conformance with the nine-point criteria.

***~~2106.1.1 Modifications to TMS 402.~~*** ***~~[OSHPD 1R, 2 & 5]~~*** *~~Modify TMS 402 Section 7.4.4 as follows:~~*

***~~1.~~*** (Relocated to Section 2106.1.3) ***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 reinforcement shall be spaced at not more than 24 inches (610 mm) center to center.*

***Exception:*** *Reinforced hollow-unit masonry used for freestanding site walls or interior non-bearing non-shear wall partitions shall have horizontal reinforcing spaced not more than 4’-0” on center, except as required by TMS 402 Section 7.4.5 when applicable.*

(Relocated to Section 2106.1.3) *The minimum reinforcing shall be No. 4, except that No. 3 bars may be used for ties and stirrups. Vertical wall reinforcement 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 shall be considered as continuous reinforcement.*

(Relocated to Section 2106.1.3) *Horizontal reinforcing bars in bond beams 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, horizontal and vertical reinforcement 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.*

(Relocated to Section 2106.1.3) *In bearing walls of every type of reinforced masonry, there shall be trim reinforcement of not 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.*

(Relocated to Section 2106.1.3) *When the reinforcement in bearing walls is designed, placed and anchored in position as for columns, the allowable stresses shall be as for columns.*

(Relocated to Section 2106.1.3) *Joint reinforcement shall not be used as principal reinforcement in masonry.*

***~~2.~~******~~Minimum reinforcement for masonry columns~~****~~.~~* (Relocated to new Section 2106.1.1) *The spacing of column ties shall be as follows: not greater than 8 bar diameters, one half the least dimension of the column for the full column height, or 8 inches (203 mm).* (Relocated to new Section 2106.1.1) *Ties shall be at least 3/8” in diameter and 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. Lateral support.~~*** (Relocated to Section 2106.1.2) *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.*

***~~4. Anchor Bolts.~~***(Relocated to Section 2104.2.3) *Bent bar anchor bolts shall not be allowed. 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.*

***2106.1.1*** ***~~Modifications to TMS 402. …~~ [OSHPD 1R, 2B & 5] TMS 402 Sections*** ***5.3.1.4(a) and 5.3.1.4(b).*** *Replace**TMS 402 Sections 5.3.1.4(a) and 5.3.1.4(b) as follows:*

(a)(Relocated from Section 2106.1.1) *Ties shall be at least 3/8” in diameter and 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.*

(b)(Relocated from Section 2106.1.1) *The spacing of column ties shall be as follows: not greater than eight bar diameters, one half the least dimension of the column for the full column height, or 8 inches (203 mm).*

***2106.1.2 [OSHPD 1R, 2B & 5] TMS 402 Chapter 5.*** *Add TMS 402 Section 5.6 as follows:*

***5.6 – Lateral Support of Members***

*5.6.1* (Relocated from Section 2106.1.1) *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.*

***2106.1.3*** ***[OSHPD 1R, 2B & 5]*** ***TMS 402 Sections 7.4.4.1, and 7.4.5.1.*** *Replace TMS 402 Section 7.4.4.1 as follows and delete Section 7.4.5.1:*

***7.4.4.1*** (Relocated from Section 2106.1.1) ***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 reinforcement shall be spaced at not more than 24 inches (610 mm) center to center. 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.*

(Relocated from Section 2104.2.1) *All cells shall be solidly filled with grout.*

(Relocated from Section 2106.1.1)

***Exception:*** *Reinforced hollow-unit masonry used for freestanding site walls or interior non-bearing non-shear wall partitions shall have horizontal reinforcing spaced not more than 4’-0” on center, except for locations in Seismic Design Category F ~~as required by TMS 402 Section 7.4.5 when applicable~~, and* (Relocated from Section 2104.2.1) *may be grouted only in cells containing vertical and horizontal reinforcement.*

***7.4.4.1.1*** (Relocated from Section 2106.1.1) *The minimum reinforcing shall be No. 4, except that No. 3 bars may be used for ties and stirrups. Vertical wall reinforcement 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 shall be considered as continuous reinforcement.*

***7.4.4.1.2*** (Relocated from Section 2106.1.1) *Horizontal reinforcing bars in bond beams 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, horizontal and vertical reinforcement 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.*

***7.4.4.1.3*** (Relocated from Section 2106.1.1) *In bearing walls of every type of reinforced masonry, there shall be trim reinforcement of not 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.*

***7.4.4.1.4*** (Relocated from Section 2106.1.1) *When the reinforcement in bearing walls is designed, placed and anchored in position as for columns, the allowable stresses shall be as for columns.*

***7.4.4.1.5*** (Relocated from Section 2106.1.1) *Joint reinforcement shall not be used as principal reinforcement in masonry.*

…

**SECTION 2107 ALLOWABLE STRESS DESIGN**

**2107.1 General. *[OSHPD 1R, 2B & 5]*** The design of masonry structures using *allowable stress design* shall comply with Section 2106 and the requirements of Chapters 1 through 8 of TMS 402 except as modified by Sections 2107.2 through *~~2107.6~~ 2107.7*.

…

***~~2107.5~~*** ***~~[OSHPD 1R, 2 & 5] Modify TMS 402 by adding Section 8.3.8 as follows:~~***

***~~8.3.8 - Walls and Piers. …~~***

***2107.5*** ***[OSHPD 1R, 2B & 5] TMS 402, Section 8.3.4.4 Walls.*** *Modify TMS 402, Section 8.3.4.4 as follows by adding:*

***8.3.4.4.1*** *The minimum thickness of walls is given in this section. ~~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 themasonry, with consideration for reduction, such as raked joints.*

***8.3.4.4.2*** *The thickness of masonry walls shall be designed so that allowable maximum stresses specified in this chapter are not exceeded. ~~Also, no m~~Masonry walls shall not exceed the height or length-to-thickness ratio nor be less than the minimum thickness as specified in this chapter and as set forth in Table ~~2107.5~~ 8.3.4.4.*

***8.3.4.4.3 ~~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 ~~2107.5~~ 8.3.4.4***  ***MINIMUM THICKNESS OF MASONRY WALLS1,2*** | | |
| ***TYPE OF MASONRY*** | ***MAXIMUM RATIO UNSUPPORTED HEIGHT OR LENGTH TO THICKNESS2,3*** | ***NOMINAL MINIMUM THICKNESS (inches)*** |
| *BEARING OR SHEAR WALLS:*  *1. Stone masonry*  *2. Reinforced grouted masonry*  *3. Reinforced hollow-unit masonry* | *14*  *25*  *25* | *16*  *6*  *6* |
| *NONBEARING WALLS:*  *4. Exterior reinforced walls*  *5. Interior partitions reinforced* | *30*  *36* | *6*  *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.*

…

***2107.7 Masonry Compressive Strength.*** ***[OSHPD 1R, 2B & 5]*** *The specified compressive strength of structural masonry, f’m, shall be equal to or exceed 1,500 psi (10.34 MPa). The value of f’m used to determine nominal strength value in this chapter shall not* (Relocated from Section 2105.2) *exceed 3,000 psi (20.7 MPa) for concrete masonry and shall not exceed 4,500 psi (31.03 MPa) for clay masonry.*

…

**SECTION 2108 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 through 7 and Chapter 9 of TMS 402, except as modified by Sections 2108.2 through 2108.~~3~~*4*.

**~~Exception:~~**~~AAC masonry shall comply with the requirements of Chapters 1 through 7 and Chapter 11 of TMS 402/ACI 530/ASCE 5.~~

…

***2108.4 [OSHPD 1R, 2B & 5] TMS 402, Section 9.1.9.1.1.*** *Modify TMS 402, Section 9.1.9.1.1 as follows:*

**9.1.9.1.1**Masonry Compressive Strength*.* The specified compressive strength of *structural* masonry, f’m, shall be equal to or exceed 1,500 psi (10.34 MPa). The value of f’m used to determine nominal strength values in this chapter shall not exceed ~~4,000~~ ~~(41.37 MPa)~~ (Relocated from Section 2105.2) *3,000* psi *(20.7 MPa)* for concrete masonry and shall not exceed ~~6000~~ *4,500* psi (~~41.37~~ *31.03* MPa) for clay masonry.

…

**Notation:**

Authority: Health and Safety Code, Sections 1275, 18928, 129790, and 129850

Reference(s): Health and Safety Code, Section 129850

# Item 16 CHAPTER 21*A* MASONRY

Adopt 2021 International Building Code (IBC) Chapter 21A and carry forward existing amendments of the 2019 California Building Code (CBC) for OSHPD 1 and 4 with the following modifications:

…

***2101A.1.3 Prohibition:*** *The following design methods, systems, and materials in TMS402/602 are not permitted by OSHPD:*

1. *Unreinforced Masonry.*
2. *Autoclaved Aerated Concrete (AAC) Masonry.*
3. *Empirical Design of Masonry and prescriptive design of masonry partition walls.*
4. *Adobe Construction.*
5. *Ordinary Reinforced Masonry Shear Walls.*
6. *Intermediate Reinforced Masonry Shear Walls.*
7. *Prestressed Masonry Shear Walls.*
8. *Direct Design of Masonry.*

…

**2101*A*.2 Design methods.** Masonry shall comply with the provisions of TMS402 or TMS 404 as well as applicable requirements of this chapter.

…

**SECTION 2103*A* MASONRY CONSTRUCTION MATERIALS**

**2103*A*.1 Masonry units.** Concrete masonry units, clay or shale masonry units, stone masonry units *and* glass unit masonry shall comply with Article 2.3 of TMS 602. Architectural cast stone shall conform to ASTM C 1364 and TMS 504. Adhered manufactured stone masonry veneer units shall conform to ASTM C1670. (Relocated from Section 2104*A*.1) *Architectural cast stone construction shall be considered as an alternative system.*

…

**2103*A*.3 Grout.** Grout shall comply with Article 2.2 of TMS 602.

***2103A.3.1******Aggregate.*** *Coarse grout shall be used in grout spaces between wythes 2 inches (51 mm) or more in width as determined in accordance with TMS 602 Table 6, footnote 3, and in all grouted cells of hollow unit masonry construction.*

…

***2103A.4 Metal reinforcement and accessories.*** Metal reinforcement and accessories shall conform to Article 2.4 of TMS 602. Where unidentified reinforcement*, or bar reinforcement without mill certification,* 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. *Alternatively, the frequency of sampling for unidentifiable reinforcing bars specified in Section 1910A.2 can be used.*

***2103A.5******Air entrainment.*** *Air-entraining substances shall not be used in grout ~~unless tests are conducted to determine compliance with the requirements of this code~~.*

**SECTION 2104*A* CONSTRUCTION**

**2104*A*.1 Masonry construction.** Masonry construction shall comply with the requirements of Sections 2104*A*.1.1 *through 2104A.1.3* and with the requirements of TMS 602 or TMS 604. (Relocated to Section 2103*A*.1) *Architectural cast stone construction shall be considered as an alternative system.*

…

***2104A.1.3 Reinforced Grouted Masonry.***

**Note to Reviewer**: Existing prescriptive text is restructured and relocated as modifications to TMS 402/602 in different subsections of this Chapter. Existing amendment language with the same regulatory effect as the provisions in TMS 402/602 is deleted to avoid duplication, in conformance with the Nine-Point Criteria.

***~~2104A.1.3.1 General conditions.~~*** *~~Grouted masonry shall be constructed in such a manner that all elements of the masonry act together as a structural element. At the time of laying, all masonry units shall be free of dust and dirt. Prior to grouting, the grout space shall be clean so that all spaces to be filled with grout do not contain mortar projections~~* (Relocated to Section 2104A.1.3.2) *greater than 1/4 inch (6.4 mm)~~, mortar droppings and other foreign material~~.* (Relocated to Section 2104A.1.3.9) *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. Segregation of the grout materials and damage to the masonry shall be avoided during the grouting process.~~*

(Relocated to Section 2104A.1.3.3) *Reinforcement and embedded items shall be clean, properly positioned and securely anchored against movement prior to grouting.* (Relocated to Section 2104A.1.3.4) *Bolts shall be accurately set with templates or by approved equivalent means and held in place to prevent dislocation during grouting.* (Relocated to Section 2104A.1.3.3 and Section 2104A.1.3.4) *Reinforcement, embedded items and bolts shall be solidly embedded in grout.* (Relocated to Section 2104A.1.3.4) *Anchor bolts in the face shells of hollow masonry units shall be positioned to maintain a minimum of ½ in. of grout between the bolt and the face shell.*

(Relocated to Section 2104A.1.3.5) *The grouting of any section of wall shall be completed in one day with no interruptions greater than one hour.*

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

(Relocated to Section 2104A.1.3.8) *Between grout pours or where grouting has been stopped more than an hour, 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.*

(Relocated to Section 2104A.1.3.9) *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.*

***~~2104A.1.3.1.1~~*** (Relocated to Section 2104A.1.3.10) ***Reinforced grouted multi-wythe masonry.***

***~~2104A.1.3.1.1.1~~*** (Relocated to Section 2104A.1.3.10.1) ***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 reinforcement therein as the work progresses.*

***~~2104A.1.3.1.1.1.1 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.~~* (Relocated to Section 2104A.1.3.10.2) *Masonry headers shall not project into the grout space.*

*~~2.~~*(Relocated to Section 2104A.1.3.10.6) *The minimum clear width of grout space for low-lift grout masonry shall be 2 1/2 inches (64 mm). ~~All reinforcement and wire ties shall be embedded in the grout.~~* *~~Clear width is defined in TMS 602, Table 6, footnote 3. The thickness of the grout between masonry units~~* (Relocated to Section 2104A.1.3.3) *and reinforcement 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.~~*(Relocated to Section 2104A.1.3.10.3) *Toothing of masonry walls is prohibited. Racking is to be held to a minimum.*

***~~2104A.1.3.1.1.1.2 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~~.*(Relocated to Section 2104A.1.3.10.4) *The two wythes shall be bonded together with wall ties. Ties shall not be less than No. 9 (W1.7) 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.~~*(Relocated to Section 2104A.1.3.1) *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 after inspection and before grouting.*

*~~4~~*~~.~~(Relocated to Section 2104A.1.3.10.6) *The clear width of grout space in high-lift grouted masonry shall be a minimum of 3 1/2 inches (89 mm). ~~Clear width is defined in TMS 602, Table 6, footnote 3. All reinforcement and wire ties shall be embedded in the grout. The thickness of the grout between masonry units and reinforcement shall be a minimum of one bar diameter.~~*

*~~5.~~*(Relocated to Section 2104A.1.3.10.5) *Vertical grout barriers or dams of solid masonry shall be built across the grout space the entire height of the wall to control the flow of the grout horizontally. Grout barriers shall not more than 30 feet (9144 mm) apart.*

*~~6.~~*(Relocated to Section 2104A.1.3.5(b)) *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,~~* (Relocated to Section 2104A.1.3.7) *but before plasticity is lost.* (Relocated to Section 2104A.1.3.5) *The grouting of any section of a wall between control barriers shall be completed in one day, with no interruptions greater than one hour.*

***~~2104A.1.3.1.2 Reinforced hollow-unit masonry.~~***

***~~2104A.1.3.1.2.1 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.~~* (Relocated to Section 2104A.1.3.11.2) *All cells shall be solidly filled with grout in reinforced hollow-unit masonry [OSHPD 1 & 4] and shall be constructed using single or double open-end units, except single open-end units shall be used at wall intersections, corners and similar conditions.*

***Exception:*** *Reinforced hollow-unit masonry laid in running bond used for freestanding site walls or interior nonbearing non-shear wall partitions may be grouted only in cells containing vertical and horizontal reinforcement.*

*~~Construction shall be one of the two following methods: The low-lift method per Section 2104A.1.3.1.2.2, or the high-lift method per Section 2104A.1.3.1.2.3.General requirements for construction shall be as follows:~~*

1. *~~Bond shall be provided by lapping units in successive vertical courses.~~* (Relocated to Section 2106A.1.3) *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.*
2. (Relocated to Section 2104A.1.3.11.2) *Vertical cells to be filled shall have vertical alignment sufficient to maintain a clear grout space dimension of 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), as determined in accordance with TMS 602 Table 7, footnote 3~~.*
3. *~~Grout shall be a workable mix suitable for placing without segregation and shall be thoroughly mixed.~~* (Relocated to Section 2104A.1.3.9) *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.~~*
4. *~~All reinforcement and wire ties shall be embedded in the grout.~~* (Relocated to Section 2104A.1.3.3) *The space between masonry unit surfaces and reinforcement shall be a minimum of one bar diameter.*
5. (Relocated to Section 2104A.1.3.8) *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.* (Relocated to Section 2104A.1.3.11.1) *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.1.3.1.2.2 Low-lift grouted construction~~****~~. Units shall be laid a maximum of 4 feet (1220 mm) before grouting. 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. Horizontal reinforcement shall be fully embedded in grout in an uninterrupted pour.~~*

(Relocated to Section 2104A.1.3.6) ***Exception:*** *The 4 feet maximum wall construction may be increased to 5 feet 4 inches for 10-inch nominal and larger hollow-unit masonry.*

***~~2104A.1.3.1.2.3 High-lift grouted construction~~****~~. Where high-lift grouting is used, the method shall be approved by the enforcement agency.~~* (Relocated to Sections 2104A.1.3.1 and 2104A.1.3.5) *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 double open-end bond beam units, cleanout openings need only be provided for access to every reinforced cell at the bottom of each pour of grout. ~~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.1.3.1*** ***~~General Conditions. …~~TMS 602, Article 3.2 F Cleanouts.*** *Replace TMS 602, Article 3.2 F**with the following:*

*1.* (Relocated from Section 2104*A*.1.3.1.2.3) *Cleanout openings in hollow unit masonry 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 double open-end bond beam units, cleanout openings need only be provided for access to every reinforced cell at the bottom of each pour of grout.*

*2.* (Relocated from Section 2104*A*.1.3.1.1.1.2) *Cleanouts in multi-wythe masonry shall be provided for each pour by leaving out every other unit in the bottom ~~tier~~ wythe of the section being poured or by cleanout openings in the foundation.*

*3.* (Relocated from Section 2104*A*.1.3.1.1.1.2) *The foundation or other horizontal construction joints at the cleanouts shall be cleaned of all loose material and mortar droppings before each pour. The cleanouts shall be sealed after inspection and before grouting.*

***2104A.1.3.2 TMS 602, Article 3.3 B Placing Mortar and Units.***  *Modify TMS 602 Article 3.3 B.2.c**as follows:*

c. Remove masonry protrusions extending (Relocated from Section 2104A.1.3.1) *greater than* 1/4~~½~~inches (~~12.7~~ *6.4* mm) ~~or more~~ into cells or cavities to be grouted.

***2104A.1.3.3 TMS 602, Article 3.4 B Reinforcement.***  *Modify TMS 602 Article 3.4 B.1 and Article 3.4 B.3**as follows:*

1. Support reinforcement to prevent displacement caused by construction loads or by placement of grout or mortar, beyond the allowable tolerances. (Relocated from Section 2104*A*.1.3.1) *Reinforcement and embedded items shall be clean, properly positioned and securely anchored against movement prior to grouting.*

…

3. Maintain a clear distance between reinforcing bars and the interior of masonry unit or formed surface of at least 1/4 in. (6.4 mm) for fine grout and 1/2 in. (12.7 mm) for coarse grout, *and* (Relocated from Section 2104*A*.1.3.1.2.1.4) *~~T~~the space between masonry unit surfaces and reinforcement shall be a minimum of one bar diameter*, except where cross webs of hollow units are used as supports for horizontal reinforcement. (Relocated from Section 2104*A*.1.3.1) *Reinforcement and embedded items shall be solidly embedded in grout.*

…

***2104A.1.3.4 TMS 602, Article 3.4 D Anchor Bolts.***  *Replace TMS 602 Article 3.4 D.3 and add Articles 3.4 D.5 and 3.4D.6 as follows:*

…

*3.* (Relocated from Section 2104*A*.1.3.1) *Anchor bolts in the wythe or face shells of hollow masonry units shall be positioned to maintain a minimum of ½ in. of grout between the bolt circumference, the wythe or ~~and~~ the face shell. For the portion of the bolt that is within the grouted cell, maintain a clear distance between the bolt and the face of masonry unit and between the head of the bolt and the formed surface of grout of at least 1/4 in. (6.4 mm) when using fine grout and at least 1/2 in. (12.7 mm) when using coarse grout.* (Relocated from Section 2104*A*.1.3.1) *Bolts shall be solidly embedded in grout.*

…

*5.* (Relocated from Section 2106*A*.1.1) *Bent bar anchor bolts shall not be allowed. 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.*

*6.* (Relocated from Section 2104*A*.1.3.1) *Bolts shall be accurately set with templates or by approved equivalent means and held in place to prevent dislocation during grouting.*

***2104A.1.3.5 TMS 602, Article 3.5 C Grout pour height*** *Add to TMS 602, Article 3.5 C**the following:*

1. *For grout pours not greater than 4 feet (1219 mm) or 5 feet-4 inches (1651 mm) for 10-inch (254 mm) nominal or wider hollow unit masonry, the top of grout pour shall be at the top of constructed masonry, or within 8 inches (200 mm) of the top of the constructed masonry. After construction of each grout lift height of wall, column, pier or beam, masonry cells or cavities shall be inspected prior to placement of grout. Grout pours not terminated at the top of constructed masonry shall comply with TMS 602 Articles 3.5 C.3.a through 3.5 C.3.e.*
2. *Grout pours in excess of 4 feet (1219 mm) or 5 feet-4 inches (1651 mm) for 10-inch (254 mm) nominal or wider hollow unit masonry shall be subject to approval of the enforcement agency.*
3. *Grout pours in excess of 4 feet (1219 mm) or 5 feet-4 inches (1651 mm) for 10-inch (254 mm) nominal or wider hollow unit masonry shall be subject to the following:*
4. *Grouting shall be done in a continuous pour in lifts not exceeding 4 feet (1219 mm) or 5 feet-4 inches (1651 mm) for 10-inch (254 mm) nominal or wider hollow unit masonry.*
5. (Relocated from Section 2104*A*.1.3.1.1.1.2) *An approved admixture of a type that reduces early water loss and produces an expansive action shall be used.*
6. (Relocated from Section 2104*A*.1.3.1.1.1.2) *The grouting of any section of a wall between control barriers shall be completed in one day with no interruptions greater than one hour.*
7. *For multiple grout lifts within a grout pour, each grout lift height of wall, column, pier or beam shall be inspected before placement of additional units.*
8. (Relocated from Section 2104*A*.1.3.1.2.3) *Cleanout openings shall be provided ~~in every cell~~ at the bottom of each pour of grout.*

***2104A.1.3.6 TMS 602, Article 3.5 D Grout lift height.***  *Modify TMS 602, Article 3.5 D**as follows:*

*3. In no case shall lifts exceed 4 feet (1219 mm) in height.*

(Relocated from Section 2104*A*.1.3.1.2.2) ***Exception:*** *The 4 feet maximum ~~wall construction~~ lift height may be increased to 5 feet 4 inches for 10-inch nominal and larger hollow-unit masonry.*

***2104A.1.3.7 TMS 602, Article 3.5 E Consolidation.***  *Modify TMS 602, Article 3.5 E.1.b**as follows:*

b. Consolidate pours exceeding 12 in. (305 mm) in height by mechanical vibration, and reconsolidate by mechanical vibration after initial water loss and settlement has occurred~~.~~*,* (Relocated from Section 2104*A*.1.3.1.1.1.2) *but before plasticity is lost*.

***2104A.1.3.8 TMS 602, Article 3.5 F.1 Grout key.*** *Replace TMS 602, Article 3.5 F.1**as follows:*

1.(Relocated from Section 2104*A*.1.3.1) *Between grout pours or where grouting has been stopped more than an hour, a horizontal construction joint shall be formed by ~~stopping all wythes at the same elevation and with the grout stopping~~ terminating grout 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~~ terminated a minimum of 1/2 inch (12.7 mm) below the ~~top of the masonry~~ mortar joint.* (Relocated from Section 2104*A*.1.3.1.2.1) *Horizontal reinforcement shall be placed in bond beam units with a minimum grout cover of 1 inch (25 mm) above reinforcing steel for each grout pour.*

***2104A.1.3.9 TMS 602, Article 3.5 Grout placement.*** *Add the following to TMS 602, Article 3.5:*

***3.5 I.*** *Additional Grouting Requirements:*

*1.* (Relocated from Section 2104*A*.1.3.1.2.1) *Grout shall be placed by pumping or an approved alternate method ~~and shall be placed~~ before initial set of hardening occurs.*

*2.* (Relocated from Section 2104*A*.1.3.1) *Grout shall be placed so that all spaces to be grouted do not contain voids.*

*3.* (Relocated from Section 2104*A*.1.3.1) *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.*

***2104A.1.3.10*** ***~~2104A.1.3.1.1~~ Reinforced grouted multi-wythe masonry.***

***2104A.1.3.10.1******~~2104A.1.3.1.1.1~~ General.*** *Reinforced grouted masonry is that form of composite construction made with clay or shale brick or made with solid concrete building brick in which interior ~~joints~~ spaces of masonry are filled by pouring grout around reinforcement therein as the work progresses.*

***2104A.1.3.10.2 TMS 402 Section 5.1.4.2.2 Masonry headers.*** *Replace TMS 402 Section 5.1.4.2.2 as follows:*

**5.1.4.2.2**(Relocated from Section 2104*A*.1.3.1.1.1.1) *Masonry headers shall not project into the grout space and shall not be permitted to bond wythes of masonry.*

***2104A.1.3.10.3 TMS 602, Article 3.3 B.5 Placing masonry units – Solid units.*** *Add the following to TMS 602, Article 3.3 B.5:*

*d.* (Relocated from Section 2104*A*.1.3.1.1.1.1) *Toothing of masonry walls is prohibited. Racking is to be held to a minimum.*

***2104A.1.3.10.4 TMS 602, Article 3.4 C.2 Wall ties*** *Replace TMS 602, Article 3.4 C.2 as follows:*

2.(Relocated from Section 2104*A*.1.3.1.1.1.2) *The two wythes shall be bonded together with wall ties. Ties shall not be less than No. 9 (W1.7) 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~~ wythe of the wall shall be built up not more than 16 inches (406 mm) ahead of the other ~~tier~~ wythe. 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.*

***2104A.1.3.10.5 TMS 602, Article 3.5 B Confinement*** *Add the following to TMS 602, Article 3.5 B:*

*1.* (Relocated from Section 2104*A*.1.3.1.1.1.2) *Vertical grout barriers or dams of solid masonry shall be built across the grout space the entire height of the wall to control the flow of the grout horizontally. Grout barriers shall be spaced not more than 30 feet (9.1 m) apart.*

***2104A.1.3.10.6 TMS 602, Article 3.5 C Grout pour******height.*** *Add the following to TMS 602, Article 3.5 C:*

*4.* (Relocated from Section 2104*A*.1.3.1.1.1.1.2) *The minimum clear width of grout space for multiwythe masonry* *~~low-lift grout masonry~~ for pours not exceeding 4 feet (1.2 m) shall be 2½ inches (64 mm).* (Relocated from Section 2104*A*.1.3.1.1.1.2.4) *The clear width of grout space ~~in high-lift grouted masonry~~ for pours exceeding 4 feet (1.2 m) shall be a minimum of 3½ inches (89 mm).*

***2104A.1.3.11 ~~2104A.1.3.1.2~~ Reinforced hollow unit masonry.***

***2104A.1.3.11.1 TMS 602, Article 2.3 A & 2.3 B Masonry unit materials.*** *Add the following to TMS 602, Articles 2.3 A and 2.3 B:*

*1.* (Relocated from Section 2104*A*.1.3.1.2.1) *The depth of the bond beam channel below the top of the unit in hollow-unit masonry shall be ~~a minimum of~~ 1 ½ inches (38 mm) minimum and the width shall be 3 inches (76 mm) minimum.*

***2104A.1.3.11.2 TMS 602, Article 3.5 B Confinement.***  *Add the following to TMS 602, Article 3.5 B:*

*2.* (Relocated from Section 2104*A*.1.3.1.2.1) *All cells shall be solidly filled with grout in reinforced hollow unit masonry.*  ***[OSHPD 1 & 4]*** *and shall be constructed using open end units except single open-end units shall be used at wall intersections, corners and similar conditions.*

***Exception:*** *Reinforced hollow-unit masonry laid in running bond for freestanding site walls or interior nonbearing non-shear wall partitions may be grouted only in cells containing vertical and horizontal reinforcement.*

*3.* (Relocated from Section 2104*A*.1.3.1.2.1) *Vertical cells to be filled shall have vertical alignment sufficient to maintain a clear grout space dimension of not less than ~~2 inches by 3 inches (51 mm by 76 mm)~~ that given in Section 2103A.3.1.*

**SECTION 2105A QUALITY ASSURANCE**

…

***2105A.2 Compressive strength, f’m.*** *The minimum specified compressive strength, f'm, ~~assumed~~ in the design shall be ~~2000~~ 1500 psi (~~13.79~~10.34 MPa) for all structural masonry construction using materials and details of construction required herein. Testing of ~~the constructed~~ masonry shall be provided in accordance with Section ~~2105A.5 or Section 2105A.6.~~ TMS 602, Article 1.4 B.*

***Exception:*** *~~Subject to the approval of the enforcement agency, h~~Higher values of f'm may be used in the design of reinforced grouted multi-wythe masonry and reinforced hollow-unit masonry~~. The approval shall be~~ based on prism test results in accordance with TMS 602 Article 1.4 B.3 submitted by the architect or engineer to the enforcement agency which demonstrate the ability of the proposed construction to meet prescribed performance criteria for strength ~~and stiffness~~. ~~The design shall take into account the mortar joint depth. In no case shall the f'~~~~m~~ ~~assumed in design~~* (Relocated to Sections 2107A.6 and 2108A.4) *exceed 3,000 psi (20.7MPa).*

*~~Where an f'~~~~m~~ ~~greater than 2000 psi (13.79MPa) is approved, t~~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~~ documents. Verification of c~~C~~ompliance with the requirements for the specified strength of ~~constructed~~ masonry during construction shall be provided using prism test method in accordance with ~~Section 2105A.5~~ TMS 602 Article 1.4 B.3. ~~Substantiation for~~Verification of compliance with the specified compressive strength prior to the start of construction shall be obtained by using prism test method ~~in Section 2105A.5 and Section 2105A.3~~ in accordance with TMS 602 Article 1.4 B.3.*

***2105A.3 Mortar and grout tests.*** *~~These tests are to establish whether the masonry components meet the specified component strengths.~~* ***TMS 602, Article 1.4 B Compressive Strength Determination.***  *Modify TMS 602 Article 1.4 B as follows by adding:*

*5. Additional testing requirements:*

*a. At the beginning of all masonry work, at least one test sample of the mortar shall be taken on three successive working days and at least at one-week intervals thereafter. Where mortar is based on a proportion specification, mortar shall be sampled and tested during construction in accordance with ASTM C780, including Annex 4, to verify the proportions specified in ASTM C270, Table 2. Where mortar is based on a property specification, mortar shall be laboratory prepared and tested prior to construction in accordance with ASTM C780 to verify the properties specified in ASTM C270, Table 1 and field sampled and tested during construction in accordance with ASTM C780 to verify the proportions with the laboratory tests.*

*b. Samples of grout shall be taken for each mix design, each day grout is placed, and not less than every 5,000 square feet of masonry wall area. They shall meet the minimum strength requirement given in ~~ASTM C270 Table 1 and~~ ASTM C476/TMS 602 Section 2.2 ~~for mortar and grout respectively~~, or greater as specified. Additional samples shall be taken whenever any change in materials or job conditions occur, as determined by the building official.*

*c. Test specimens for mortar and grout shall be made as set forth in ASTM C780/C1586 and ASTM C1019. When the prism test method is used in accordance with TMS 602 Article 1.4 B.3 during construction, the tests in this section are not required.*

***Exception:***

*1. For nonbearing nonshear masonry walls not exceeding total wall height of 12 feet above top of foundation, mortar tests shall be permitted to be limited to those at the beginning of masonry work for each mix design.*

***2105A.4******Masonry core testing****.**Not less than two cores shall be taken from each building for each 5,000 square feet (465 m2) of the masonry wall area or fraction thereof. The approved agency shall perform or observe the coring of the masonry walls and sample locations shall be subject to approval of the registered design professional.*

…

***Exceptions:***

1. *Core sampling and testing is not required for non-bearing non-shear masonry walls, not exceeding total wall height of 12’ above top of foundation, built with single-wythe hollow unit concrete masonry that attaches opposite face shells using webs cast as single unit, when designed using an f’m not exceeding ~~2000~~ 1500 psi (~~13.79~~10.34 MPa).*

…

***~~2105A.5 Masonry prism method testing.~~*** *~~Prism test method performed prior to the start or during construction shall be in accordance with TMS 602 Section 1.4 B.3. Prism test method performed on constructed walls shall be in accordance with TMS 602 Section 1.4 B.4.~~*

***~~2105A.6 Unit strength method testing.~~*** *~~Unit strength method testing shall be performed in accordance with TMS 602 Section 1.4 B.2.~~*

…

**SECTION 2106*A* SEISMIC DESIGN**

**2106*A*.1 Seismic design requirements for masonry.** Masonry structures and components shall comply with the requirements in Chapter 7 of TMS 402 depending on the structure’s *Seismic Design Category.*

***~~2106A.1.1~~*** ***~~Modifications to TMS 402.~~*** *~~Modify TMS 402 Section 7.4.4 as follows:~~*

***~~1.~~*** (Relocated to Section 2106A.1.3) ***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 reinforcement shall be spaced at not more than 24 inches (610 mm) center to center.*

(Relocated to Section 2106A.1.3) ***Exception:*** *Reinforced hollow-unit masonry used for freestanding site walls or interior non-bearing non-shear wall partitions shall have horizontal reinforcing spaced not more than 4’-0” on center, except as required by TMS 402 Section 7.4.5 when applicable.*

(Relocated to Section 2106A.1.3) *The minimum reinforcing shall be No. 4, except that No. 3 bars may be used for ties and stirrups. Vertical wall reinforcement 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 shall be considered as continuous reinforcement.*

(Relocated to Section 2106A.1.3) *Horizontal reinforcing bars in bond beams 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, horizontal and vertical reinforcement 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.*

(Relocated to Section 2106A.1.3) *In bearing walls of every type of reinforced masonry, there shall be trim reinforcement of not 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.*

(Relocated to Section 2106A.1.3) *When the reinforcement in bearing walls is designed, placed and anchored in position as for columns, the allowable stresses shall be as for columns.*

(Relocated to Section 2106A.1.3) *Joint reinforcement shall not be used as principal reinforcement in masonry.*

***~~2.~~*** ***~~Minimum reinforcement for masonry columns~~****~~.~~* (Relocated to new Section 2106A.1.1) *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.* (Relocated to new Section 2106A.1.1) *Ties shall be at least 3/8” in diameter and 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. Lateral support.~~*** (Relocated to Section 2106A.1.2) *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.*

*~~4.~~* ***~~Anchor Bolts.~~***(Relocated to Section 2104A.1.3.4) *Bent bar anchor bolts shall not be allowed. 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.*

***2106A.1.1 ~~Modifications to TMS 402. …~~ TMS 402 Sections 5.3.1.4(a) and 5.3.1.4(b).*** *Replace**TMS 402 Sections 5.3.1.4(a) and 5.3.1.4(b) as follows:*

(a)(Relocated from Section 2106*A*.1.1) *Ties shall be at least 3/8” in diameter and 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.*

(b)(Relocated from Section 2106*A*.1.1) *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, or 8 inches (203 mm) for the full column height.*

***2106A.1.2 TMS 402 Chapter 5.*** *Add TMS 402 Section 5.6 as follows:*

***5.6 – Lateral Support of Members***

*5.6.1* (Relocated from Section 2106*A*.1.1) *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.*

***2106A.1.3 TMS 402 Sections 7.4.4.1, and 7.4.5.1.*** *Replace TMS 402 Section 7.4.4.1 as follows and delete Section 7.4.5.1:*

***7.4.4.1*** (Relocated from Section 2106*A*.1.1) ***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 reinforcement shall be spaced at not more than 24 inches (610 mm) center to center. (Relocated from Section 2104A.1.3.1.2.1)* *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.*

(Relocated from Section 2106*A*.1.1)

***Exception:*** *Reinforced hollow-unit masonry used for freestanding site walls or interior non-bearing non-shear wall partitions shall have horizontal reinforcing spaced not more than 4’-0” on center, except for locations in Seismic Design Category F ~~as required by TMS 402 Section 7.4.5 when applicable~~.*

***7.4.4.1.1*** (Relocated from Section 2106*A*.1.1) *The minimum reinforcing shall be No. 4, except that No. 3 bars may be used for ties and stirrups. Vertical wall reinforcement 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 shall be considered as continuous reinforcement.*

***7.4.4.1.2*** (Relocated from Section 2106*A*.1.1) *Horizontal reinforcing bars in bond beams 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, horizontal and vertical reinforcement 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.*

***7.4.4.1.3*** (Relocated from Section 2106*A*.1.1) *In bearing walls of every type of reinforced masonry, there shall be trim reinforcement of not 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.*

***7.4.4.1.4*** (Relocated from Section 2106*A*.1.1) *When the reinforcement in bearing walls is designed, placed and anchored in position as for columns, the allowable stresses shall be as for columns.*

***7.4.4.1.5*** (Relocated from Section 2106*A*.1.1) *Joint reinforcement shall not be used as principal reinforcement in masonry.*

…

**SECTION 2107*A* ALLOWABLE STRESS DESIGN**

…

***~~2107A.4 TMS 402.~~*** *~~Modify by adding Section 8.3.8 as follows:~~*

*~~8.3.8- Walls and piers.~~*

***2107A.4 TMS 402, Section 8.3.4.4 Walls.*** *Modify TMS 402, Section 8.3.4.4 as follows by adding:*

***8.3.4.4.1*** *The minimum ~~T~~thickness of walls is given in this section. ~~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 themasonry, with consideration for reduction, such as raked joints.*

***8.3.4.4.2*** *The thickness of masonry walls shall be designed so that allowable maximum stresses specified in this chapter are not exceeded. ~~Also, no m~~Masonry walls shall not exceed the height or length-to-thickness ratio nor be less than the minimum thickness as specified in this chapter and as set forth in Table ~~2107A.4~~ 8.3.4.4.*

***8.3.4.4.3 ~~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.4~~ 8.3.4.4***  ***MINIMUM THICKNESS OF MASONRY WALLS1,2*** | | |
| ***TYPE OF MASONRY*** | ***MAXIMUM RATIO UNSUPPORTED HEIGHT OR LENGTH TO THICKNESS2,3*** | ***NOMINAL MINIMUM THICKNESS (inches)*** |
| *BEARING OR SHEAR WALLS:*  *1. Stone masonry*  *2. Reinforced grouted masonry*  *3. Reinforced hollow-unit masonry* | *14*  *25*  *25* | *16*  *6*  *6* |
| *NONBEARING WALLS:*  *4. Exterior reinforced walls*  *5. Interior partitions reinforced* | *30*  *36* | *6*  *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.6 Masonry Compressive Strength.***  *The specified compressive strength of structural masonry, f’m, shall be equal to or exceed 1,500 psi (10.34 MPa). The value of f’m used to determine nominal strength value in this chapter shall not* (Relocated from Section 2105*A*.2) *exceed 3,000 psi (20.7 MPa) for concrete masonry and shall not exceed 4,500 psi (31.03 MPa) for clay masonry.*

…

**SECTION 2108*A* STRENGTH DESIGN OF MASONRY**

**2108*A*.1 General.** The design of masonry structures using strength design shall comply with Section 2106*A* and the requirements of Chapters 1 through 7 and Chapter 9 of TMS 402, except as modified by Sections 2108*A*.2 through 2108*A*.~~3~~*4*.

**~~Exception:~~**~~AAC masonry shall comply with the requirements of Chapters 1 through 7 and Chapter 11 of TMS 402/ACI 530/ASCE 5.~~

…

***2108A.4 TMS 402, Section 9.1.9.1.1.*** *Modify TMS 402, Section 9.1.9.1.1 as follows:*

**9.1.9.1.1**Masonry Compressive Strength*.* The specified compressive strength of *structural* masonry, f’m, shall be equal to or exceed 1,500 psi (10.34 MPa). The value of f’m used to determine nominal strength values in this chapter shall not exceed ~~4,000~~ ~~(41.37 MPa)~~ (Relocated from Section 2105*A*.2) *3,000* psi *(20.7 MPa)* for concrete masonry and shall not exceed ~~6000~~ *4,500* psi (~~41.37~~ *31.03* MPa) for clay masonry.

…

**SECTION 2109*A* EMPIRICAL DESIGN OF ADOBE MASONRY**

*Not permitted by OSHPD*.

*(Existing amendment deleting Section 2109 of IBC is retained and deleted Section 2109 is not shown here for clarity.)*

**Notation:**

Authority: Health and Safety Code, Sections 1275, 18928, 129790, and 129850

Reference(s): Health and Safety Code, Section 129850

# Item 17 CHAPTER 22STEEL

Adopt 2021 International Building Code (IBC) Chapter 22 and carry forward existing amendments of the 2019 California Building Code (CBC) for OSHPD 1R, 2 and 5.

**Notation:**

Authority: Health and Safety Code, Sections 1275, 18928, 129790, and 129850

Reference(s): Health and Safety Code, Section 129850

# Item 18 CHAPTER 22*A* STEEL

Adopt 2021 International Building Code (IBC) Chapter 22A for OSHPD 1 and 4 with the following modifications:

**SECTION 2211*A* COLD-FORMED STEEL LIGHT-FRAME CONSTRUCTION**

…

**2211*A*.1.3 Truss design.** Cold-formed steel trusses shall comply with the additional provisions of Sections 2211*A*.1.3.1 through 2211*A*.1.3.3.

(The following item is an existing amendment that was missed in the printed version of the 2019 CBC and should be added back into the 2022 CBC.) *Complete engineering analysis and truss design drawings shall accompany the construction documents submitted to the enforcement agency for approval. When load testing is required, the test report shall be submitted with the truss design drawings and engineering analysis to the enforcement agency.*

…

***SECTION 2213A TESTING AND FIELD VERIFICATION***

...

***2213A.1 Tests of High-strength Bolts, Nuts and Washers****. High-strength bolts, nuts and washers shall be sampled and tested ~~by an approved agency for conformance with the requirements of applicable ASTM standards~~ in accordance with Section 1705A.2.6 and this section.*

***[OSHPD 1 & 4]*** *A minimum of nine samples per lot, as defined in the ASTM standards for bolts [not nuts and washers], shall be tested for tensile properties in accordance with ASTM F606, but need not exceed three samples per 400 bolts.*

***2213A.2 Tests of end-welded studs.*** *End-welded studs shall be tested in accordance with* ***[OSHPD 1 & 4]*** *the requirements of the AWS D1.1, Sections 7.7 and 7.8.*

**Notation:**

Authority: Health and Safety Code, Sections 1275, 18928, 129790, and 129850

Reference(s): Health and Safety Code, Section 129850

# Item 19 CHAPTER 23 WOOD

Adopt 2021 International Building Code (IBC) Chapter 23 and carry forward existing amendments of the 2019 California Building Code (CBC) for OSHPD 1, 1R, 2, 4 and 5 with the following modifications:

***2303.1.3.1 Additional requirements. [DSA-SS, DSA-SS/CC AND OSHPD 1, 1R, 2B, 4 & 5]*** *The construction documents shall indicate the following:…*

*Refer to Section 1705A.5.4 for special inspection requirements during fabrication of structural glued laminated timbers.*

…

**2304.10.1 Connection fire-resistance rating.** Fire-resistance ratings for connections in Type IV-A, IV-B or IV-C construction shall be determined by one of the following:

1. Testing in accordance with Section 703.2 where the connection is part of the fire-resistance test.
2. Engineering analysis that demonstrates that the temperature rise at any portion of the connection is limited to an average temperature rise of 250°F (139°C), and a maximum temperature rise of 325°F (181°C), for a time corresponding to the required fire-resistance rating of the structural element being connected. For the purposes of this analysis, the connection includes connectors, fasteners and portions of wood members included in the structural design of the connection.

…

***~~2304.10.1.2 Connection fire-resistance rating~~****~~. Fire-resistance ratings for connections in Type IV-A, IV-B, or IV-C construction shall be determined by one of the following:~~*

*~~1. Testing in accordance with Section 703.2 where the connection is part of the fire-resistance test.~~*

*~~2. Engineering analysis that demonstrates that the temperature rise at any portion of the connection is limited to an average temperature rise of 250°F (139°C) and a maximum temperature rise of 325° F (181°C) for a time corresponding to the required fire-resistance rating of the structural element being connected. For the purposes of this analysis, the connection includes connectors, fasteners and portions of wood members included in the structural design of the connection.~~*

…

***2304.10.~~1~~2.1 Additional requirements*. *[OSHPD 1, 1R, 2B, 4 & 5]*** *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 A153. The coating weights for mechanically deposited zinc coated fasteners shall be in accordance with ASTM B695, Class 55 minimum.*

**Notation:**

Authority: Health and Safety Code, Sections 1275, 18928, 129790, and 129850

Reference(s): Health and Safety Code, Section 129850

# Item 20 CHAPTER 24 GLASS AND GLAZING

Adopt 2021 International Building Code (IBC) Chapter 24 for OSHPD 2. Adopt 2021 International Building Code (IBC) Chapter 24 for OSHPD 1, 1R, 4 and 5 and carry forward existing amendments of the 2019 California Building Code (CBC) with the following modifications:

***SECTION 2410 [OSHPD 1, 1R, 2B, 4 & 5] STRUCTURAL SEALANT GLAZING (SSG)***

Adopt Chapter 24 of the 2021 IBC as amended below. All existing California amendments that are not revised below shall continue without change.

…

***2410.1.2 Testing and inspection.*** *Testing and inspection of SSG shall satisfy the following requirements:*

*~~a.~~1. The seismic drift capability of SSG shall be determined by tests in accordance with AAMA 501.6~~,~~ and AAMA 501.4 ~~and ASCE 7, Section 13.5.9.2~~.* (Relocated from 2410.1.2.f) *Analysis as an alternative to testing is not acceptable for the purposes of satisfying the seismic drift requirements of the SSG system.*

*~~b.~~2. The applicability of the specific AAMA 501.6 and AAMA 501.4 testing shall be subject to approval by the building official.*

*~~c.~~3. The panel test specimens used in the AAMA 501.6 and AAMA 501.4 testing shall include all glass types (annealed, heat strengthened, laminated, tempered) and insulated glass units that comprise more than 5 percent of the total glass curtain wall area used in the building.*

*~~d.~~4. AAMA 501.4 test specimen shall include the same materials, sections, connections, and attachment details to the test apparatus as used in the building.*

*~~e.~~5. Serviceability tests of SSG test specimen shall be performed in accordance with AAMA 501.4 after seismic displacement tests to the design story drift.*

*~~f.~~6. The window wall system using structural sealant by different manufacturer/product category shall be qualified in accordance with AAMA 501.6 and AAMA 501.4 testing for the seismic drift required. ~~Analysis as an alternative to testing is not acceptable for the purposes of satisfying the seismic drift requirements of the SSG system.~~*

*~~g.~~7. Where unitized SSG is used with horizontal stack joints at each floor level and split vertical mullions that can move independently, only a story height single unit need ~~to~~ be tested under AAMA 501.6. Where continuous horizontal bands of SSG are used in the building, either two or four sided, the aspect ratio (height-to-length) of the test specimen shall be less than 1.0, contain not less than two interior vertical joints and all joints (vertical in the case of two sided), including the perimeter of the glass, shall be glazed with SSG.*

*~~h.~~8. Where SSG continues around corners, the AAMA 501.4 test specimen shall include one corner panel to verify the kinematics of the corner condition under seismic drift.*

*~~I~~9. Quality assurance and inspection requirements shall include formalized post-installation tests using the point load testing procedure in accordance with ASTM C1392. The point load tests shall be done after the initial installation.*

*~~j.~~10. Where the SSG is field assembled, hand pull tab tests in accordance with ASTM C1401, Section X2.1, one test every 100 linear feet, but not less than one test for each building elevation view shall be required.*

*Existing AAMA 501.4 and 501.6 test results satisfying the requirements of this section shall be permitted, in lieu of project specific tests, when approved by the building official.*

***2410.1.3 Monitoring.*** *Short- and long-term periodic performance monitoring shall be provided in accordance with ASTM C1401, C1392 and C1394. Inspection frequencies recommended in ASTM C~~1392~~1394 ~~Section 5.1~~ shall be followed.*

***2410.1.4 Construction documents.*** *Complete design of the SSG system for gravity, wind and seismic forces shall be subject to review by the enforcement agency. Construction documents shall show descriptive notes and structural details of glass and curtain wall system including:*

*…*

*15. Monitoring requirements per Section 2410.1.3.*

…

**Notation:**

Authority: Health and Safety Code, Sections 1275, 18928, 129790, and 129850

Reference(s): Health and Safety Code, Section 129850

# Item 21 CHAPTER 25 GYPSUM BOARD, GYPSUM PANEL PRODUCTS AND PLASTER

Adopt 2021 International Building Code (IBC) Chapter 25 and carry forward existing amendments of the 2019 California Building Code (CBC) for OSHPD 1, 1R, 2, 4 and 5.

**Notation:**

Authority: Health and Safety Code, Sections 1275, 18928, 129790, and 129850

Reference(s): Health and Safety Code, Section 129850

# Item 22 CHAPTER 26 PLASTIC

Adopt 2021 International Building Code (IBC) Chapter 26 and carry forward existing amendments of the 2019 California Building Code (CBC) for OSHPD 1, 1R, 2, 3, 4 and 5.

**Notation:**

Authority: Health and Safety Code, Sections 1275, 18928, 129790, and 129850

Reference(s): Health and Safety Code, Section 129850

# Item 23 CHAPTERS 27, 28, AND 29

Entire Chapters 27, 28, and 29 not adopted by OSHPD.

**Notation:**

Authority: Health and Safety Code, Sections 1275, 18928, 129790, and 129850

Reference(s): Health and Safety Code, Section 129850

# Item 24 CHAPTER 30 ELEVATORS AND CONVEYING SYSTEMS

Adopt 2021 International Building Code (IBC) Chapter 30 for OSHPD 1R, 2, 3, 4 and 5. Adopt 2021 International Building Code (IBC) Chapter 30 for OSHPD 1 and carry forward existing amendments of the 2019 California Building Code (CBC).

**Notation:**

Authority: Health and Safety Code, Sections 1275, 18928, 129790, and 129850

Reference(s): Health and Safety Code, Section 129850

# Item 25 CHAPTER 31 SPECIAL CONSTRUCTION

Adopt 2021 International Building Code (IBC) Chapter 31 for OSHPD 1, 1R, 2, 3, 4 and 5 as Amended.

**SECTION 3115 INTERMODAL SHIPPING CONTAINERS**

*Not Permitted by OSHPD*

*…*

**Notation:**

Authority: Health and Safety Code, Sections 1275, 18928, 129790, and 129850

Reference(s): Health and Safety Code, Section 129850

# Item 26 CHAPTERS 31*A*, 31*B*, and 31*C*

Entire Chapters 31A, 31B, and 31C not adopted by OSHPD.

**Notation:**

Authority: Health and Safety Code, Sections 1275, 18928, 129790, and 129850

Reference(s): Health and Safety Code, Section 129850

# Item 27 CHAPTER *31D FOOD ESTABLISHMENTS*

Adopt entire Chapter 31D for OSHPD 1 and 4.

**Notation:**

Authority: Health and Safety Code, Sections 1275, 18928, 129790, and 129850

Reference(s): Health and Safety Code, Section 129850

# Item 28 CHAPTER *31F MARINE OIL TERMINALS*

Entire Chapter 31F not adopted by OSHPD.

**Notation:**

Authority: Health and Safety Code, Sections 1275, 18928, 129790, and 129850

Reference(s): Health and Safety Code, Section 129850

# Item 29 CHAPTER32 ENCROACHMENTS INTO THE PUBLIC RIGHT-OF-WAY

Adopt 2021 International Building Code (IBC) Chapter 32 for OSHPD 1 and 4.

**Notation:**

Authority: Health and Safety Code, Sections 1275, 18928, 129790, and 129850

Reference(s): Health and Safety Code, Section 129850

# Item 30 CHAPTER 33 SAFEGUARDS DURING CONSTRUCTION

Adopt 2021 International Building Code (IBC) Chapter 33 for OSHPD 1, 1R, 2, 3, 4 and 5.

**Notation:**

Authority: Health and Safety Code, Sections 1275, 18928, 129790, and 129850

Reference(s): Health and Safety Code, Section 129850

# Item 31 CHAPTER35 REFERENCED STANDARDS

Adopt 2021 International Building Code (IBC) Chapter 35 for OSHPD 3. Adopt 2021 International Building Code (IBC) Chapter 35 for OSHPD 1, 1R, 2, 4 and 5 and carry forward existing amendments of the 2019 California Building Code (CBC) with the following modifications:

…

|  |  |  |
| --- | --- | --- |
| **AAMA** | American Architectural Manufacturing Association  1827 Waldon Office Square, Suite 550  Schaumburg, IL 60173 |  |
| Standard  reference  number | Title | Referenced  in code  section number |
| … |  |  |
| *501.4-18~~09~~* | *Recommended Static Test Method for Evaluating Curtain Wall and Storefront Systems Subjected to Seismic and Wind Induced Interstory Drifts* | *2410.1* |
| *501.6-18~~09~~* | *Recommended Dynamic Test Method For Determining The Seismic Drift Causing Glass Fallout From A Wall* | *2410.1* |

|  |  |  |
| --- | --- | --- |
| **ACI** | American Concrete Institute  38800 Country Club Drive  Farmington Hills, MI 48333-9094 |  |
| Standard  reference  number | Title | Referenced  in code  section number |
| … |  |  |
| *355.2-19~~07~~* | *Qualification of Post-Installed Mechanical Anchors in Concrete and Commentary* | *1617A.1.19,1901.3.2* |
| *355.4-19~~11~~* | *Qualification of Post-Installed Adhesive Anchors in Concrete and Commentary* | *1617A.1.19, 1901.3.3* |
| … |  |  |
| *506R-16* | *Guide to Shotcrete* | *1908.1, ~~1908.3, 1908.12,~~ 1908A.1, ~~1908A.3 1908A.12~~* |
| *506.4R-94* | *Guide for the Evaluation of Shotcrete* | *1908.1, 1908A.1* |
| *506.6T-17* | *Visual Shotcrete Core Quality Evaluation* | *1908.1, 1908A.1* |
| … |  |  |

...

|  |  |  |
| --- | --- | --- |
| **AISC** | American Institute of Steel Construction  Construction One East Wacker Drive, Suite 700  Chicago, IL 60601-2001 |  |
| Standard  reference  number | Title | Referenced  in code  section number |
| 358- 16/s1-18 | Prequalified Connections for Special and Intermediate Steel Moment Frames for Seismic Applications including Supplement No. 1 | 1705*A*.2.1, *2205A, 2206A.2*  *2205.4, 2206.2.1, ~~3413A~~* |

…

|  |  |  |
| --- | --- | --- |
| **APA** | APA - Engineered Wood Association  7011 South 19th Street  Tacoma, WA 98466 |  |
| Standard  reference  number | Title | Referenced  in code  section number |
| ANSI/APA PRG 320-2019: *~~ANSI/APA PRG 320-18:~~* | Standard for Performance-rated Cross-Laminated Timber *~~Standard for Performance-rated Cross-Laminated Timber~~* | 602.4, 2303.1.4 *~~2303.1.4, 602.4~~* |

…

|  |  |  |
| --- | --- | --- |
| **ASCE/SEI** | American Society of Civil Engineers  Structural Engineering Institute  1801 Alexander Bell Drive  Reston, VA 20191-4400 |  |
| Standard  reference  number | Title | Referenced  in code  section number |
| … |  |  |
| 7-16 with Supplement*s* 1*, 2 and 3* | Minimum Design Loads for Buildings and Other Structures *~~with Supplement No. 1~~* | *104.11, 202, 1603A.2 1613A, 1617A, 1803A.6, 2210A.2, 2410.1.1, 2410.1.2* |
| 49—12*~~12~~* | Wind Tunnel Testing for Buildings and Other Structures | 1609.1.1 |
| … |  |  |

…

|  |  |  |
| --- | --- | --- |
| **ASTM** | ASTM International  100 Barr Harbor Drive  West Conshohocken, PA 19428-2959 |  |
| Standard  reference  number | Title | Referenced  in code  section number |
| … |  |  |
| A 153/A 153M-2016A *~~16a~~* | Specification for Zinc Coating (Hot-dip) on Iron and Steel Hardware | *2304.10.2~~1~~.1,* |
| … |  |  |
| A 722/A722M- ~~12~~ *15* | Specifications for Uncoated High-strength Steel Bar for Prestressing Concrete | *1812A.4.2, 1811A.4*  *1812.4.2, 1811.4* |
| … |  |  |
| *A1064-17* | *Standard Specification for Carbon steel wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete* | *1903A.8*  *1903.8* |
| … |  |  |
| B 695 *(~~2016~~*2016*)* | Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel Strip for Building Construction | *2304.10.2~~1~~.1,* |
| … |  |  |
| C 94/C94M-2017 *~~17~~* | Specifications for Ready Mix Concrete | *1705A.3.3.1* |
| … |  |  |
| C150-2018 *~~17~~* | Specification for Portland Cement | *1910.2.1,1910A.1* |
| … |  |  |
| C270-14a*~~14a~~* | Specifications for Mortar for Unit Masonry | *2105A.3*  *2105.3* |
| … |  |  |
| C595-*~~17~~* 2018 | Specification for Blended Hydraulic Cement | *1910A.1* |
| … |  |  |
| *C618 –15* | *Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete* | *1910A.1* |
| … |  |  |
| C635/C 635M-13*a* | Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel ceilings | *1617A.1.21* |
| … |  |  |
| *C989-16e1* | *Standard Specification for Slag Cement for Use in Concrete and Mortars* | *1910.2.1, 1910A.1* |
| … |  |  |
| *C1019-16* | *Test Method of Sampling and Testing Grout* | *2105A.3,*  *2105.3* |
| … |  |  |
| *C1157/C1157M-~~17~~*2017 | ASTM Standard Performance Specification for Hydraulic Cement | *1910A.1* |
| … |  |  |
| *C 1249-18~~06a (2010)~~* | *Standard Guide for Secondary Seal for Sealed Insulated Glass Units for Structural Sealant Glazing Applications* | *2410.1.1* |
| … |  |  |
| … |  |  |
| *C 1392-20~~00 (2014)~~* | *Standard Guide for Evaluating Failure of Structural Sealant Glazing* | *2410.1.3* |
| *C 1394-20~~03 (2012)~~* | *Standard Guide for In-Situ Structural Silicone Glazing Evaluation* | *2410.1.3* |
| … |  |  |
| *D1586 –~~11~~20* | *Standard Test Method for Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils* | *1813A*  *1813* |
| … |  |  |
| *D5778-~~12~~20* | *Standard Test Method for Electronic Friction Cone and Piezocone Penetration Testing of Soils* | *1813A*  *1813* |
| … |  |  |
| *E580- 17* | *Standard Practice for Installation of Ceiling Suspension Systems of Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions* | *1617A.1.21* |
| … |  |  |

…

|  |  |  |
| --- | --- | --- |
| **AWPA** | American Wood Products Association  P.O. Box 361784  Birmingham. AL 35236-1784 |  |
| Standard  reference  number | Title | Referenced  in code  section number |
| … |  |  |
| U1-*~~17~~* 20 | USE CATEGORY SYSTEM: User Specification for Treated Wood Except Commodity Specification H | *1812A.2*  *1812.2* |

…

|  |  |  |
| --- | --- | --- |
| **AWS** | American Welding Society  550 N.W. LeJeune Road  Miami, FL 33126 |  |
| Standard  reference  number | Title | Referenced  in code  section number |
| *D1.1*-*15* | *Structural Welding Code-Steel* | *Table 1705A.2.1, 1705A.2.5, 2212.6.2, 2213A.2*  *2213.2*  *2204.1.1, 2204A.1.1* |
| *D1.2-1~~4~~ ~~5~~* | *Structural Welding Code-Aluminum* | *2003.1* |
| D1.4-2018 | Structural Welding Code – Reinforcing Steel | *1705.2.5, Table 1705A.2.1, 1705A.2.5,*  *1705A.3.1, 1903A.8, ~~1704A.5~~, 1903.8* |
| *D1.8-2016* | *Structural Welding Code – Seismic Supplement* | *1705.2.5, 1705A.2.5* |
| *QC1-2016* | *Standard for AWS Certification of Welding Inspectors* | *1705.2.5, 1705A.2.5* |

…

|  |  |  |
| --- | --- | --- |
| **FM** | Factory Mutual Global Research  Standards Laboratories Department  1301 Atwood Avenue, P.O. Box 7500  Johnston, RI 02919 |  |
| Standard  reference  number | Title | Referenced  in code  section number |
| *ANSI/FM 1950-16* | *American National Standard for Seismic Sway Braces for Pipe, Tubing and Conduit* | *1705.14~~3~~.2, 1705A.14~~3~~.2* |
| … |  |  |

…

|  |  |  |
| --- | --- | --- |
| **ICC** | International Code Council, Inc.  500 New Jersey Ave, NW  6th Floor  Washington, DC 20001 |  |
| Standard  reference  number | Title | Referenced  in code  section number |
| … |  |  |
| *ICC-ES AC 01 – ~~18~~ 21\** | *Acceptance criteria for expansion anchors in Masonry elements* | *1617A.1.19* |
| *ICC-ES AC 58 - ~~18~~ 21\** | *Acceptance criteria for Adhesive anchors in Masonry elements* | *1617A.1.19* |
| *ICC-ES AC 70 - ~~18~~ 21\** | *Acceptance criteria for fasteners power-driven into Concrete, Steel and Masonry elements* | *1617A.1.20* |
| *ICC-ES AC 106 - ~~18~~ 21\** | *Acceptance criteria for predrilled fasteners (screw anchors) in Masonry* | *1617A.1.19* |
| *ICC-ES AC 125 - ~~18~~ 21\*\** | *Acceptance criteria for Concrete, and Reinforced and Unreinforced Masonry strengthening using externally bonded Fiber-Reinforced Polymer (FRP) composite systems.* | *1911A.3*  *1911.3* |
| *ICC-ES AC 156 - ~~18~~ 21\** | *Acceptance criteria for Seismic Certification by Shake-Table Testing of Nonstructural Components* | *1705A.1~~3~~4.3* |
| *ICC-ES AC 178 - ~~18~~ 21\** | *Acceptance criteria for inspection and verification of Concrete, and Reinforced and Unreinforced Masonry strengthening using Fiber-Reinforced Polymer (FRP) composite systems.* | *1911A.3*  *1911.3* |
| *ICC-ES AC 193 - ~~18~~ 21\** | *Acceptance criteria for mechanical anchors in Concrete elements* | *1617A.1.19, 1901.3.2* |
| *ICC-ES AC 232 - ~~18~~ 21\** | *Acceptance criteria for anchor channels in Concrete elements* | *1617A.1.19, 1901.3.2* |
| *ICC-ES AC 308 - ~~18~~ 21\** | *Acceptance criteria for post-installed adhesive anchors in Concrete elements* | *1617A.1.19, 1901.3.3* |
| *ICC-ES AC 358 - ~~18~~ 21\** | *Acceptance criteria for Helical*  *foundation systems and devices* | *1810A.3.1.5.1*  *1810.3.1.5.1* |
| *ICC-ES AC 446 - ~~18~~ 21\** | *Acceptance criteria for headed cast-in specialty inserts in Concrete* | *1617A.1.19, 1901.3.2* |
| *\* Refers to International Building Code, ~~2018~~ 2021 as a reference standard.* | | |

…

|  |  |  |
| --- | --- | --- |
| **ISO** | International Organization for Standardization  ISO Central Secretariat  1 ch, de la Voie-Creuse, Case Postale 56  CH-1211 Geneva 20, Switzerland |  |
| Standard  reference  number | Title | Referenced  in code  section number |
| … |  |  |
| *ISO 9001- 15* | *Quality management systems – Requirements* | *1705A.1~~3~~4.3* |

…

|  |  |  |
| --- | --- | --- |
| ***NEHRP*** | *Building Seismic Safety Council*  *National Institute of Building Sciences*  *Washington, D.C.* |  |
| Standard Reference Number | Title | *Referenced in code section number* |
| *FEMA P-2082-1* | *Recommended Seismic Provisions for New Building and Other Structures, Volume 1, September 2020.* | *1617A.1.3* |

…

|  |  |  |
| --- | --- | --- |
| **TMS** | The Masonry Society  3970 Broadway, Unit 201-D  Boulder, CO 80304-1135 |  |
| Standard  reference  number | Title | Referenced  in code  section number |
| … |  |  |
| 402-2016 | Building Code Requirements for Masonry Structures | *2101.2.2, 2101A.1.3, 2104A.1.3, 2107.4, 2107A.4, 2107.5, 2107A.5, 2107.6, 2106.1, ~~2107A.6~~, 2108.4, 2108A.4,*  *~~2105A.3~~, 2106A.1~~.1~~* |
| 602-2016 | Specification for Masonry Structures | *2101.2.2, 2101A.1.3, 2104.2, 2105A.3, 2104A.1.3, 2105A.2*  *1705.4, 1705A.4,2105.2, 2105.3, 2103.4, 2104.1, 2105.3, ~~2105.5, 2105A.5,~~ ~~2105A.6, 2105.6~~*  *~~2105A.1.3.1.2,~~ ~~2104A.1.3.1.1~~* |

…

|  |  |  |
| --- | --- | --- |
| **UL** | UL LLC  333 Pfingsten Road  Northbrook, IL 60062-2096 |  |
| Standard  reference  number | Title | Referenced  in code  section number |
| … |  |  |
| *857— 13* | *Busways* | *1705A.14~~3~~.3.1* |
| … |  |  |
| 61730-1—2017: | Photovoltaic (PV) Module Safety Qualification - Part 1: Requirements for Construction | *1511.9* |
| 61730-2—2017: | Photovoltaic (PV) Module Safety Qualification - Part 2: Requirements for Testing | *1511.9* |

…

**Notation:**

Authority: Health and Safety Code, Sections 1275, 18928, 129790, and 129850

Reference(s): Health and Safety Code, Section 129850

# Item 32 APPENDIX A, B, C, D, E, F, G, H, I, and J

Entire Appendices A, B, C, D, E, F, G, H, I, and J not adopted by OSHPD.

**Notation:**

Authority: Health and Safety Code, Sections 1275, 18928, 129790, and 129850

Reference(s): Health and Safety Code, Section 129850

# Item 33 APPENDIX K

Adopt entire 2021 International Building Code (IBC) Appendix K for OSHPD 2.

**Notation:**

Authority: Health and Safety Code, Sections 1275, 18928, 129790, and 129850

Reference(s): Health and Safety Code, Section 129850

# Item 34 APPENDIX L

Adopt entire 2021 International Building Code (IBC) Appendix L and carry forward existing amendments of the 2019 California Building Code (CBC) for OSHPD 1 and 4.

**Notation:**

Authority: Health and Safety Code, Sections 1275, 18928, 129790, and 129850

Reference(s): Health and Safety Code, Section 129850

# Item 35 APPENDIX M, N, O, and P and RESOURCE A

Entire Appendices M, N, O, and P and Resource A not adopted by OSHPD.

**Notation:**

Authority: Health and Safety Code, Sections 1275, 18928, 129790, and 129850

Reference(s): Health and Safety Code, Section 129850