REVISION RECORD
FOR THE STATE OF CALIFORNIA

ERRATA

January 1, 2023

2022 Title 24, Part 2, Vol. 2, California Building Code

General Information:

1. The date of this erratum is for identification purposes only. See the History Note Appendix on the back side or accompanying page.
2. This erratum is issued by the California Building Standards Commission to correct nonsubstantive printing errors or omissions in the 2022 *California Building Code*, California Code of Regulations, Title 24, Part 2. Instructions are provided below.
3. Health and Safety Code Section 18938.5 establishes that only building standards in effect at the time of the application for a building permit may be applied to the project plans and construction. This rule applies to both adoptions of building standards for Title 24 by the California Building Standards Commission, and local adoptions and ordinances imposing building standards. An erratum to Title 24 is a nonregulatory correction because of a printing error or omission that does not differ substantively from the official adoption by the California Building Standards Commission. Accordingly, the corrected code text provided by this erratum may be applied on and after the stated effective date.
4. You may wish to retain the superseded material with this revision record so that the prior wording of any section can be easily ascertained.

Title 24, Part 2, Vol. 2

Remove Existing Pages	Insert Buff-Colored Pages
16-51 and 16-52	16-51 and 16-52
17-1 and 17-2	17-1 and 17-2
18A-29 and 18A-30	18A-29 and 18A-30
19-7 and 19-8	19-7 and 19-8
19A-1 through 19A-4	19A-1 through 19A-4
21A-3 through 21A-6	21A-3 through 21A-6
27-3 and 27-4	27-3 and 27-4
35-7 through 35-10	35-7 through 35-10
35-13 and 35-14	35-13 and 35-14
35-19 through 35-22	35-19 through 35-22
35-29 and 35-30	35-29 and 35-30
HIST-1 and HIST-2	HIST-1 and HIST-2

Item No. 5520S221

T028365

vertical live load of not less than 10 pounds per square foot (0.48 kN/m^2) of the total area encompassed by the framework.

1617.5.3 Seating for assembly uses. *Replace Section 1607.19 with the following:*

Bleachers, folding and telescopic seating and grandstands shall be designed for the loads specified in ICC 300 as modified by Section 1617.3.3 load combinations. Stadiums and arenas with fixed seats shall be designed for the horizontal sway loads in Section 1607.19.1.

1617.6 Determination of snow loads. *The ground snow load or the design snow load for roofs shall conform with the adopted ordinance of the city, county, or city and county in which the project site is located, and shall be approved by DSA. See Section 106.1.2 for snow load posting requirements.*

1617.7 Wind loads.

1617.7.1 Story drift for wind loads. *The calculated story drift due to wind pressures with ultimate design wind speed, V_{ult}, shall not exceed 0.008 times the story height for buildings less than 65 feet (19 812 mm) in height or 0.007 times the story height for buildings 65 feet (19 812 mm) or greater in height.*

Exception: *This story drift limit need not be applied for single-story open structures in Risk Categories I and II.*

1617.8 Establishment of flood hazard areas. *Flood hazard maps shall include, at a minimum, areas of special flood hazard as identified by the Federal Emergency Management Agency's Flood Insurance Study (FIS) adopted by the local authority having jurisdiction where the project is located, as amended or revised with the accompanying Flood Insurance Rate Map (FIRM) and Flood Boundary and Floodway Map (FBFM) and related supporting data along with any revisions thereto.*

1617.9 Earthquake loads.

1617.9.1 Modifications to Table 1613.2.3(1). *Replace Table 1613.2.3(1) with Table 1613A.2.3(1).*

1617.9.2 Modifications to Table 1613.2.3(2). *Replace Table 1613.2.3(2) with Table 1613A.2.3(2).*

1617.9.3 Seismic design category. *The seismic design category for a structure shall be determined in accordance with Section 1613.*

1617.9.4 Mapped acceleration parameters. *Seismic Design Category shall be determined in accordance with Section 1613.2.5.*

1617.9.5 Determination of seismic design category. *Structures not assigned to Seismic Design Category E or F, in accordance with Section 1613.2, shall be assigned to Seismic Design Category D.*

1617.9.5.1 Alternative seismic design category determination. *The alternative Seismic Design Category determination procedure of Section 1613.2.5.1 is not permitted by DSA-SS/CC.*

1617.9.5.2 Simplified design procedure. *The simplified design procedure of Section 1613.2.5.2 is not permitted by DSA-SS/CC.*

1617.9.6 Ballasted photovoltaic panel systems. *Ballasted, roof-mounted photovoltaic panel systems shall comply with ASCE 7, Section 13.6.12.*

1617.10 Tsunami loads. *The design and construction of Risk Category III or IV buildings and structures located in the ASCE Tsunami Design Zones defined in the ASCE Tsunami Design Geodatabase, or other data determined applicable by the enforcement agency, shall be in accordance with Section 1615.1 except as modified by this code. Tsunami Risk Category for community college buildings and structures shall be identified and submitted for acceptance by DSA. Determination of Tsunami Risk Category shall be proposed by the design professional in general responsible charge in coordination with the owner and local community based upon the relative importance of that facility to provide vital services, provide important functions and protect special populations. The determination of relative importance shall include consideration of a tsunami warning and evacuation plan and procedure when adopted by the local community.*

1617.11 Modifications to ASCE 7. *The text of ASCE 7 shall be modified as indicated in Sections 1617.11.1 through 1617.11.24.*

1617.11.1 ASCE 7, Section 1.3. *Modify ASCE 7, Section 1.3 by adding Section 1.3.8 as follows:*

1.3.8 Structural design criteria. *Where design is based on ASCE 7, Chapters 16, 17, 18 or 31, the ground motion, wind tunnel design recommendations, analysis and design methods, material assumptions, testing requirements and acceptance criteria proposed by the engineer shall be submitted to the enforcement agency in the form of structural design criteria for approval.*

Peer review requirements in Section 322 of the California Existing Buildings Code shall apply to design reviews required by ASCE 7, Chapters 17 and 18.

1617.11.2 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.

1617.11.3 ASCE 7, Table 12.2-1. *Modify ASCE 7, Table 12.2-1 as follows:*

A. BEARING WALL SYSTEMS

17. Light-framed walls with shear panels of all other materials—*Not permitted by DSA-SS/CC.*

B. BUILDING FRAME SYSTEMS

24. Light-framed walls with shear panels of all other materials—*Not permitted by DSA-SS/CC.*

C. MOMENT RESISTING FRAME SYSTEMS

12. Cold-formed steel — special bolted moment frame—*Not permitted by DSA-SS/CC.*

Exceptions:

1. *Systems listed in this section can be used as an alternative system when pre-approved by the enforcement agency.*
2. *Rooftop or other supported structures not exceeding two stories in height and 10 percent of the total structure weight can use the systems in this section when designed as components per ASCE 7, Chapter 13.*
3. *Systems listed in this section can be used for seismically isolated buildings when permitted by ASCE 7, Section 17.2.5.4.*

1617.11.4 ASCE 7, Sections 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:*

1617.11.4.1 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.

1617.11.4.2 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, C_d, and the system over strength factor, Ω_0, 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.

1617.11.4.3 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:*

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, δ_{xe}, 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.*

f. 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. 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 portions.

1617.11.5 Reserved.

1617.11.6 ASCE 7, Section 12.2.5.6.1. *The exception in Item a is not permitted by DSA-SS/CC.*

1617.11.7 ASCE 7, Section 12.2.5.7.1. *The exception in Item a is not permitted by DSA-SS/CC.*

1617.11.8 ASCE 7, Section 12.2.5.7.2. *The exception in Item a is not permitted by DSA-SS/CC.*

1617.11.9 ASCE 7, Section 12.3.3.1. *Modify 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 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. Structures assigned to Seismic Design Category D having vertical irregularity Type 1b 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 that 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 percent 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, ρ, of 1.3 as defined in ASCE 7, Section 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, Section 12.5.3.1.*

CALIFORNIA BUILDING CODE – MATRIX ADOPTION TABLE
CHAPTER 17 – SPECIAL INSPECTIONS AND TESTS

(Matrix Adoption Tables are nonregulatory, intended only as an aid to the code user.
See Chapter 1 for state agency authority and building applications.)

Adopting agency	BSC	BSC-CG	SFM	HCD			DSA			OSHPD						BSCC	DPH	AGR	DWR	CEC	CA	SL	SLC
				1	2	1/AC	AC	SS	SS/CC	1	1R	2	3	4	5								
Adopt entire chapter													**X**										
Adopt entire chapter as amended (amended sections listed below)	**X**			**X**	**X**						**X**	**X**			**X**								
Adopt only those sections that are listed below			**X**																				
Chapter / Section																							
1701			X																				
1701.1.1											X	X			X								
1701.1.2											X	X			X								
1701.1.3											X	X			X								
1702			X																				
1703			X																				
1703.4											X	X			X								
1704.2, *Exception 5*				X	X																		
1704.2, *Exceptions 3 & 4*											X	X			X								
1704.2.3	X																						
1704.2.3 Exception											X	X			X								
1704.2.4											X	X			X								
1704.2.5.1											X	X			X								
1704.3.2											X	X			X								
1705.1			X																				
1705.2.1											X	X			X								
1705.2.3.1											X	X			X								
1705.2.4.1											X	X			X								
1705.2.5											X	X			X								
1705.2.6											X	X			X								
1705.3			X																				
1705.3 Exception											X	X			X								
1705.3.3											X	X			X								
1705.3.3.1											X	X			X								
Table 1705.3											X	X			X								
1705.3.4											X	X			X								
1705.3.5											X	X			X								
1705.3.6											X	X			X								
1705.3.7											X	X			X								
1705.3.8											X	X			X								
1705.3.9											X	B			X								
1705.3.9.1											X	B			X								
1705.3.9.2											X	B			X								
1705.4											X	X			X								
1705.4.1											X	X			X								
1705.5.3			X																				
Table 1705.5.3			X																				
1705.5.5											X	B			X								
1705.5.6											X	X			X								
1705.6.1											X	X			X								

(continued)

CALIFORNIA BUILDING CODE – MATRIX ADOPTION TABLE
CHAPTER 17 – SPECIAL INSPECTIONS AND TESTS—continued

Adopting agency	BSC	BSC-CG	SFM	HCD			DSA			OSHPD						BSCC	DPH	AGR	DWR	CEC	CA	SL	SLC
				1	2	1/AC	AC	SS	SS/CC	1	1R	2	3	4	5								
Adopt entire chapter													**X**										
Adopt entire chapter as amended (amended sections listed below)	**X**			**X**	**X**						**X**	**X**			**X**								
Adopt only those sections that are listed below			**X**																				
Chapter / Section																							
1705.7.1											X	X			X								
1705.12.1			X																				
1705.12.2			X																				
1705.13.1.1 Exception											X	X			X								
1705.13.1.2 Exception											X	X			X								
1705.13.2			X																				
1705.13.3			X																				
1705.13.3.1											X	X			X								
1705.15			X																				
1705.16			X																				
1705.17											X	X			X								
1705.18			X																				
1705.19			X																				
1707.1	X			X	X																		

The state agency does not adopt sections identified with the following symbol: †

The Office of the State Fire Marshal's adoption of this chapter or individual sections is applicable to structures regulated by other state agencies pursuant to Section 1.11.

(A & B) – OSHPD (HCAI) delineates that OHSPD 2 is either designated as an OSHPD 2A or 2B. See Ch. 1, Div. I, Section 1.10 for additional information.

completed and capable of transmitting lateral loads to the permanent structure. Thereafter, readings can be monthly.

d. Where the building has been designed to resist lateral earth pressures, the periodic monitoring of the soldier piles and adjacent structure can be discontinued once the ground floor diaphragm and subterranean portion of the structure is capable of resisting lateral soil loads and approved by the shoring design engineer, geotechnical engineer and building official.

e. 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 $^1/_2$ 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 $^3/_4$ inch or soldier piles reaches $1^1/_2$ 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:

a. 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.

b. Load cell readings shall be taken once a day during excavation and once a week during the remainder of construction.

c. Load cell readings shall be submitted to the geotechnical engineer, shoring design engineer, engineer in responsible charge and building official.

d. Load cell readings can be terminated once the temporary shoring no longer provides support for the buildings.

1812A.7 Monitoring of existing structures.

1. The contractor shall complete a written and photographic log of all existing 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.

3. The contractor shall monitor existing walls for movement or cracking that may result from adjacent shoring.

4. If excessive movement or visible cracking occurs, the contractor shall stop work and shore/reinforce excavation and contact the shoring design engineer and building official.

5. Monitoring of the existing structure shall be at reasonable intervals as required by the registered design professional subject to approval of the building official. Monitoring shall be performed by a licensed surveyor and shall consist of vertical and lateral movement of the existing structures. Prior to starting shoring installation a preconstruction meeting shall take place between the contractor, shoring design engineer, surveyor, geotechnical engineer and building official to identify monitoring locations on existing buildings.

6. If in the opinion of the building official or shoring design engineer, monitoring data indicate excessive movement or other distress, all excavation shall cease until the geotechnical engineer and shoring design engineer investigate the situation and make recommendations for remediation or continuing.

7. All readings and measurements shall be submitted to the building official and shoring design engineer.

1812A.8 Tolerances. *The following tolerances shall be specified on the construction documents.*

1. Soldier piles:

i. Horizontal and vertical construction tolerances for the soldier pile locations.

ii. Soldier pile plumbness requirements (angle with vertical line).

2. Tie-back anchors:

i. Allowable deviation of anchor projected angle from specified vertical and horizontal design projected angle.

ii. Anchor clearance to the existing/new utilities and structures.

SECTION 1813A
VIBRO STONE COLUMNS FOR GROUND IMPROVEMENT

1813A.1 General. *This section shall apply to vibro stone columns (VSCs) for ground improvement using unbounded aggregate materials. Vibro stone column provisions in this section are intended to increase bearing capacity, reduce settlements and mitigate liquefaction for shallow foundations. These requirements shall not be used for grouted or bonded stone columns, ground improvement for deep foundation elements or changing site class. VSCs shall not be considered a deep foundation element. Ground improvement shall be*

installed under the entire building/structure footprint and not under isolated foundation elements only. Design, construction, testing and inspection shall satisfy the requirements of this code except as modified in Sections 1813A.2 through 1813A.5.

1813A.2 Geotechnical report. *The geotechnical report shall specify vibro stone column requirements to ensure uniformity in total and differential immediate settlement, long term settlement and earthquake induced settlement.*

1. *Soil compaction shall be in accordance with California Geological Survey (CGS) Special Publication 117A (SP-117A): Guidelines for Evaluating and Mitigating Seismic Hazard in California.*
2. *Area replacement ratio for the compaction elements and the basis of its determination shall be explained. Minimum factor of safety for soil compaction shall be in accordance with SP-117A.*
3. *Depth of soil compaction elements and extent beyond the footprint of structures/foundation shall be defined. Extent beyond the foundation shall be half the depth of the VSCs with a minimum of 10 ft or an approved alternative.*
4. *Minimum diameter and maximum spacing of soil compaction elements shall be specified. VSCs shall not be less than 2 feet in diameter, and center to center spacing shall not exceed 8 feet.*
5. *The modulus of subgrade reactions for shallow foundations shall account for the presence of compaction elements.*
6. *The modulus of subgrade reactions, long-term settlement and post-earthquake settlement shall be specified along with expected total and differential settlements for design.*
7. *The acceptance criteria for Friction Cone and Piezocone Penetration Testing in accordance with ASTM D5778 complemented by the standard penetration test (SPT) in accordance with ASTM D1586, if necessary, to verify soil improvement shall be specified.*
8. *The requirements for special inspection and observation by the geotechnical engineer shall be specified.*
9. *A final verified report (FVR) documenting the installation of the ground improvement system and confirming that the ground improvement acceptance criteria have been met shall be prepared by the geotechnical engineer and submitted to the enforcement agency for review and approval.*

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 shall not be used to resist tension or overturning uplift from the shallow foundations.*
3. *The foundation design for the shallow foundation shall consider the increased vertical stiffness of the VSCs as point supports for analysis, unless it is substantiated that the installation of the VSCs result in improvement of the surrounding soils such that the modulus of subgrade reaction, long term settlement and post-earthquake settlement can be considered uniform throughout.*

1813A.4 Installation. *VSCs shall be installed with vibratory probes. Vertical columns of compacted unbounded aggregate shall be formed through the soils to be improved by adding gravel near the tip of the vibrator and progressively raising and repenetrating the vibrator which will results in the gravel being pushed into the surrounding soil. Gravel aggregate for VSCs shall be well graded with a maximum size of 6 inches and not more than 10 percent smaller than $^3/_8$ inch after compaction.*

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

1. *Size, depth and location of VSCs.*
2. *Extent of soil improvements along with building/structure foundation outlines.*
3. *Field verification requirements and acceptance criteria using CPT/SPT.*
4. *The locations where CPT/SPT shall be performed.*
5. *The testing, inspection and observation (TIO) program shall indicate the inspection and observation required for the VSCs.*
6. *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.*

elements of plain concrete are prohibited in structures assigned to Seismic Design Category C, D, E or F.

- 18.2.1.6 – Structural systems designated as part of the *seismic force-resisting system* shall be restricted to those *permitted by ASCE 7.* Except for *Seismic Design Category* A, for which Chapter 18 does not apply, the following provisions shall be satisfied for each structural system designated as part of the *seismic force-resisting system*, regardless of the *seismic design category*:
  (a) Ordinary moment frames shall satisfy 18.3.
  (b) *Ordinary reinforced concrete structural walls and ordinary precast structural walls* need not satisfy any provisions in Chapter 18.
  (c) Intermediate moment frames shall satisfy 18.4.
  (d) Intermediate precast *structural* walls shall satisfy 18.5.
  (e) Special moment frames shall satisfy 18.6 through 18.9.
  (f) Special structural walls shall satisfy 18.10.
  (g) Special structural walls constructed using precast concrete shall satisfy 18.11.

Special moment frames and special structural walls shall also satisfy 18.2.4 through 18.2.8.

1905.1.3 ACI 318, Section 18.5. Modify ACI 318, Section 18.5 by adding new Section 18.5.2.2 and renumbering existing Sections 18.5.2.2 and 18.5.2.3 to become 18.5.2.3 and 18.5.2.4, respectively.

18.5.2.2 – Connections that are designed to yield shall be capable of maintaining 80 percent of their design strength at the deformation induced by the design displacement or shall use Type 2 mechanical splices.

18.5.2.3 – Elements of the connection that are not designed to yield shall develop at least 1.5 S_y.

18.5.2.4 – In structures assigned to SDC D, E or F, wall piers shall be designed in accordance with 18.10.8 or 18.14 in ACI 318.

1905.1.4 ACI 318, Section 18.11. Modify ACI 318, Section 18.11.2.1 to read as follows:

18.11.2.1 – Special structural walls constructed using precast concrete shall satisfy all the requirements of 18.10 *for cast-in-place special structural walls* in addition to 18.5.2.

1905.1.5 ACI 318, Section 18.13.1.1. Modify ACI 318, Section 18.13.1.1 to read as follows:

18.13.1.1 – *Foundations resisting earthquake-induced forces or transferring earthquake-induced forces between a structure and ground shall comply with the requirements of 18.13 and other applicable provisions of ACI 318 unless modified by Chapter 18 of the California Building Code.*

1905.1.6 ACI 318, Section 14.6. Modify ACI 318, Section 14.6 by adding new Section 14.6.2 to read as follows:

14.6.2 – Detailed plain concrete structural walls.

14.6.2.1 – Detailed plain concrete structural walls are walls conforming to the requirements of ordinary structural plain concrete walls and 14.6.2.2.

14.6.2.2 – Reinforcement shall be provided as follows:

- *Vertical reinforcement of at least 0.20 square inch (129 mm^2) in cross-sectional area shall be provided continuously from support to support at each corner, at each side of each opening and at the ends of walls. The continuous vertical bar required beside an opening is permitted to substitute for one of the two No. 5 bars required by 14.6.1.*
- *Horizontal reinforcement at least 0.20 square inch (129 mm^2) in cross-sectional area shall be provided:*
  1. *Continuously at structurally connected roof and floor levels and at the top of walls.*
  2. *At the bottom of load-bearing walls or in the top of foundations where doweled to the wall.*
  3. *At a maximum spacing of 120 inches (3048 mm).*

Reinforcement at the top and bottom of openings, where used in determining the maximum spacing specified in Item 3 above, shall be continuous in the wall.

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

[OSHPD 1R, 2B & 5] *Plain concrete shall not be permitted for a structure assigned to Seismic Design Category (SDC) D, E and F.*

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

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

- *Structural plain concrete basement, foundation or other walls below the base as defined in ASCE 7 are permitted in detached one- and two-family dwellings three stories or less in height constructed with stud-bearing walls. In dwellings assigned to Seismic Design Category D or E, the height of the wall shall not exceed 8 feet (2438 mm), the thickness shall be not less than 7$^1/_2$ inches (190 mm), and the wall shall retain no more than 4 feet (1219 mm) of unbalanced fill. Walls shall have reinforcement in accordance with 14.6.1.*
- *Isolated footings of plain concrete supporting pedestals or columns are permitted, provided the projection of the footing beyond the face of the*

supported member does not exceed the footing thickness.

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

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

Exceptions:

1. *In Seismic Design Categories A, B and C, detached one- and two-family dwellings three stories or less in height constructed with stud-bearing walls are permitted to have plain concrete footings without longitudinal reinforcement.*
2. *For foundation systems consisting of a plain concrete footing and a plain concrete stemwall, a minimum of one bar shall be provided at the top of the stemwall and at the bottom of the footing.*
3. *Where a slab on ground is cast monolithically with the footing, one No. 5 bar is permitted to be located at either the top of the slab or bottom of the footing.*

1905.1.8 ACI 318, Section 17.10. Modify ACI 318 Sections 17.10.5.2, 17.10.5.3(d) and 17.10.6.2 to read as follows:

- 17.10.5.2 – *Where* the tensile component of the strength-level earthquake force applied to anchors exceeds 20 percent of the total factored anchor tensile force associated with the same load combination, anchors and their attachments shall be designed in accordance with 17.10.5.3. The anchor design tensile strength shall be determined in accordance with 17.10.5.4.

  Exception: *Anchors designed to resist wall out-of-plane forces with design strengths equal to or greater than the force determined in accordance with ASCE 7 Equation 12.11-1 or 12.14-10 shall be deemed to satisfy Section 17.10.5.3(d).*

- 17.10.5.3(d) – *The* anchor or group *of anchors* shall be designed for the maximum tension obtained from design load combinations that include E, with E increased by Ω_0. The anchor design tensile strength shall *be calculated from 17.10.5.4.*

- 17.10.6.2 – *Where* the shear component of the strength-level earthquake force applied to anchors exceeds 20 percent of the total factored anchor shear force associated with the same load combination, anchors and their attachments shall be designed in accordance with 17.10.6.3. The anchor design shear strength for resisting earthquake forces shall be determined in accordance with 17.7.

Exceptions:

1. *For the calculation of the in-plane shear strength of anchor bolts attaching wood sill plates of bearing or nonbearing walls of light-frame wood structures to foundations or foundation stem walls, the in-plane shear strength in accordance with 17.7.2 and 17.7.3 need not be computed and 17.10.6.3 shall be deemed to be satisfied provided all of the following are met:*

   1.1. *The allowable in-plane shear strength of the anchor is determined in accordance with ANSI/AWC NDS Table 12E for lateral design values parallel to grain.*

   1.2. *The maximum anchor nominal diameter is $^5/_8$ inch (16 mm).*

   1.3. *Anchor bolts are embedded into concrete a minimum of 7 inches (178 mm).*

   1.4. *Anchor bolts are located a minimum of $1^3/_4$ inches (45 mm) from the edge of the concrete parallel to the length of the wood sill plate.*

   1.5. *Anchor bolts are located a minimum of 15 anchor diameters from the edge of the concrete perpendicular to the length of the wood sill plate.*

   1.6. *The sill plate is 2-inch (51 mm) or 3-inch (76 mm) nominal thickness.*

2. *For the calculation of the in-plane shear strength of anchor bolts attaching cold-formed steel track of bearing or nonbearing walls of light-frame construction to foundations or foundation stem walls, the in-plane shear strength in accordance with 17.7.2 and 17.7.3 need not be computed and 17.10.6.3 shall be deemed to be satisfied provided all of the following are met:*

   2.1. *The maximum anchor nominal diameter is $^5/_8$ inch (16 mm).*

   2.2. *Anchors are embedded into concrete a minimum of 7 inches (178 mm).*

CALIFORNIA BUILDING CODE – MATRIX ADOPTION TABLE
CHAPTER 19*A* – CONCRETE

(Matrix Adoption Tables are nonregulatory, intended only as an aid to the code user.
See Chapter 1 for state agency authority and building applications.)

Adopting agency	BSC	BSC-CG	SFM	HCD			DSA			OSHPD						BSCC	DPH	AGR	DWR	CEC	CA	SL	SLC
				1	2	1/AC	AC	SS	SS/CC	1	1R	2	3	4	5								
Adopt entire chapter								X		X				X									
Adopt entire chapter as amended (amended sections listed below)																							
Adopt only those sections that are listed below																							
Chapter / Section																							

The state agency does not adopt sections identified with the following symbol: †

The Office of the State Fire Marshal's adoption of this chapter or individual sections is applicable to structures regulated by other state agencies pursuant to Section 1.11.

CHAPTER 19*A*

CONCRETE

Italics are used for text within Sections 1903A through 1905A of this code to indicate model code provisions that differ from ACI 318. State of California amendments in these sections are shown in italics and underlined.

SECTION 1901*A* GENERAL

1901*A*.1 Scope. The provisions of this chapter shall govern the materials, quality control, design and construction of concrete used in structures.

1901A.1.1 Application. *The scope of application of Chapter 19A is as follows:*

1. *Structures regulated by the Division of the State Architect-Structural Safety (DSA-SS), which include those applications listed in Section 1.9.2.1. These applications include public elementary and secondary schools, community colleges and state-owned or state-leased essential services buildings.*
2. *Applications listed in Sections 1.10.1 and 1.10.4, regulated by the Office of Statewide Health Planning and Development (OSHPD). These applications include hospitals and correctional treatment centers.*

1901A.1.2 Amendments in this chapter. *DSA-SS and OSHPD adopt this chapter and all amendments.*

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

1. *Division of the State Architect-Structural Safety:*

   [DSA-SS] *For applications listed in Section 1.9.2.1.*

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

   [OSHPD 1] *– For applications listed in Section 1.10.1.*

   [OSHPD 4] *– For applications listed in Section 1.10.4.*

1901*A*.2 *R*einforced concrete. Structural concrete shall be designed and constructed in accordance with the requirements of this chapter and ACI 318 as amended in Section 1905*A* of this code, *except that plain concrete is not permitted.* Except for the provisions of Sections 1904*A* and 1907*A*, the design and construction of slabs on grade shall not be governed by this chapter unless they transmit vertical loads or lateral forces from other parts of the structure to the soil.

1901*A*.3 Anchoring to concrete. Anchoring to concrete shall be in accordance with ACI 318 as amended in Section 1905*A*, and applies to cast-in (headed bolts, headed studs and hooked J- or L-bolts), post-installed expansion (torque-controlled and displacement-controlled), undercut, screw, and adhesive anchors.

1901*A*.4 Composite structural steel and concrete structures. Systems of structural steel acting compositely with reinforced concrete shall be designed in accordance with Section 2206*A* of this code.

1901*A*.5 Construction documents. The construction documents for structural concrete construction shall include:

1. The specified compressive strength of concrete at the stated ages or stages of construction for which each concrete element is designed.
2. The specified strength or grade of reinforcement.
3. The size and location of structural elements, reinforcement and anchors.
4. Provision for dimensional changes resulting from creep, shrinkage and temperature.
5. The magnitude and location of prestressing forces.
6. Anchorage length of reinforcement and location and length of lap splices.
7. Type and location of mechanical and welded splices of reinforcement.
8. Details and location of contraction or isolation joints specified for plain concrete.
9. Minimum concrete compressive strength at time of posttensioning.
10. Stressing sequence for posttensioning tendons.
11. For structures assigned to Seismic Design Category D, E or F, a statement if slab on grade is designed as a structural diaphragm.
12. *Openings larger than 12 inches (305 mm) in any dimension shall be detailed on the structural drawings.*

1901*A*.6 Special inspections and tests. Special inspections and tests of concrete elements of buildings and structures and concreting operations shall be as required by Chapter *17A and Section 1910A.*

1901*A*.7 Tolerances for structural concrete. Where not indicated in construction documents, structural tolerances for concrete structural elements shall be in accordance with this section.

1901*A*.7.1 Cast-in-place concrete tolerances. Structural tolerances for cast-in-place concrete structural elements shall be in accordance with ACI 117.

Exceptions:

1. Group R-3 detached one- or two-family dwellings are not required to comply with this section.
2. Shotcrete is not required to comply with this section. ***[DSA-SS]*** *Tolerances for shotcrete construction shall be defined by the construction documents.*

1901*A*.7.2 Precast concrete tolerances. Structural tolerances for precast concrete structural elements shall be in accordance with ACI ITG-7.

Exception: Group R-3 detached one- or two-family dwellings are not required to comply with this section.

SECTION 1902*A*
COORDINATION OF TERMINOLOGY

1902*A*.1 General. Coordination of terminology used in ACI 318 and ASCE 7 shall be in accordance with Sections 1902*A*.1.1 and 1902*A*.1.2.

1902*A*.1.1 Design displacement. Design displacement at each level shall be the total lateral deflection at the level calculated for the design earthquake using the procedures defined in Section 12.8.6 of ASCE 7.

1902*A*.1.2 Special structural wall. Special structural walls made of cast-in-place or precast concrete shall comply with the requirements of Sections 18.2.4 through 18.2.8, 18.10 and 18.11 of ACI 318, as applicable, in addition to the requirements for *ordinary reinforced concrete structural walls* or *ordinary precast structural walls*, as applicable. Where ASCE 7 refers to a "special reinforced concrete shear wall," it shall be deemed to mean a "special structural wall."

SECTION 1903*A*
SPECIFICATIONS FOR TESTS AND MATERIALS

1903*A*.1 General. Materials used to produce concrete, concrete itself and testing thereof shall comply with the applicable standards listed in ACI 318.

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

1903*A*.3 Glass fiber-reinforced concrete. *Glass fiber-reinforced concrete (GFRC) and the materials used in such concrete shall be in accordance with the PCI MNL 128 standard.*

1903*A*.4 Flat wall insulating concrete form (ICF) systems. *Insulating concrete form material used for forming flat concrete walls shall conform to ASTM E2634.* ***[OSHPD 1 & 4]*** *Not Permitted by OSHPD.* ***[DSA-SS]*** *ICF systems shall be considered alternative systems. Concrete constructed using ICF systems and attachments to ICF shall be designed for loads in accordance with this code and shall comply with manufacturer's instructions and industry standards determined applicable by the enforcement agency. Calculations and drawings shall be submitted to the enforcement agency for review and approval prior to construction.*

1903A.5 Aggregates *– Modify ACI 318 Section 26.4.1.2.1(a).(1) as follows:*

(1) ***Normal weight aggregate:*** *Aggregate shall be nonreactive as determined by one of the methods in ASTM C33 Appendix XI: Methods for Evaluating Potential for Deleterious Expansion Due to Alkali Reactivity of an Aggregate. Aggregates deemed to be deleterious or potentially deleterious may be used with the addition of a material that has been shown to prevent harmful expansion in accordance with Appendix XI of ASTM C33, when approved by the building official.*

1903A.6 [OSHPD 1 & 4] Limits on cementitious materials. *Modify ACI 318 Section 26.4.2.2(b) and Table 26.4.2.2(b) as follows:*

The maximum percentage of pozzolans, including fly ash and silica fume, and slag cement in concrete assigned to all exposure categories shall be in accordance with Table 26.4.2.2(b) and Section 26.4.2.2(b) Items (1) and (2).

Where pozzolans are used as cementitious materials, duration for minimum specified compressive strength of concrete (f'_c) that exceeds 28 days shall be considered an alternative system.

1903A.7 Steel fiber reinforcement *– Not permitted*

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

Subject to prior approval of the enforcing agency, longitudinal holding wires, conforming to ASTM A1064 of maximum wire size W5, that are machine resistance welded to stirrup/tie cage (or spiral assemblies) consisting of low alloy steel reinforcing conforming to ASTM A706 are permitted when performed under continuous competent control in a fabrication shop. Tack welding of primary reinforcing bars together or to stirrups/ties is not permitted. Holding wire weld locations shall not occur on any longitudinal or primary reinforcing nor on any portion of a reinforcing bar that is or will be bent in accordance with ACI 318 Section 25.3 for the extents specified in AWS D1.4 Section 4.2.6.

[DSA-SS] Exception: *Mat reinforcing for slabs or isolated footings shall be permitted to have holding wires located no more than six bar diameters from the free end of reinforcing. Such free ends shall not be associated with any welded splices, couplers or other free-end modifications involving reinforcement development.*

Quality control tests shall be performed on shop-welded specimens by the fabricator. Reinforcing steel specimens containing the holding wire shall be tested for yield and tensile strength at the frequency required by Section 1910A.2. Test reports shall be available on request to the approved agency, design professional and enforcement agency.

CHAPTER 21*A*

MASONRY

SECTION 2101*A* GENERAL

2101*A*.1 Scope. This chapter shall govern the materials, design, construction and quality of masonry.

2101A.1.1 Application. *The scope of application of Chapter 21A is as follows:*

1. *Structures regulated by the Division of the State Architect-Structural Safety (DSA-SS), which include those applications listed in Section 1.9.2.1. These applications include public elementary and secondary schools, community colleges and state-owned or state-leased essential services buildings.*
2. *Applications listed in Sections 1.10.1 and 1.10.4 regulated by the Office of Statewide Health Planning and Development (OSHPD). These applications include hospitals and correctional treatment centers.*

2101A.1.2 Amendments in this chapter. *DSA-SS and OSHPD 1 & 4 adopt this chapter and all amendments.*

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

1. *Division of the State Architect-Structural Safety:*

   [DSA-SS] *For applications listed in Section 1.9.2.1.*

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

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

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

2101A.1.3 Prohibition. *The following design methods, systems and materials in TMS 402/602 are not permitted by DSA-SS and 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 TMS 402 or TMS 404 as well as applicable requirements of this chapter.

2101*A*.2.1 Masonry veneer. Masonry veneer shall comply with the provisions of Chapter 14.

2101*A*.3 Special inspection. The special inspection of masonry shall be as defined in Chapter 17*A*, or an itemized testing and inspection program shall be provided that meets or exceeds the requirements of Chapter 17*A*.

SECTION 2102*A* NOTATIONS

2102*A*.1 General. The following notations are used in the chapter:

NOTATIONS.

d_b = Diameter of reinforcement, inches (mm).

F_s = Allowable tensile or compressive stress in reinforcement, psi (MPa).

f_r = Modulus of rupture, psi (MPa).

f'_{AAC} = Specified compressive strength of AAC masonry, the minimum compressive strength for a class of AAC masonry as specified in TMS 602, psi (MPa).

f'_m = Specified compressive strength of masonry at age of 28 days, psi (MPa).

f'_{mi} = Specified compressive strength of masonry at the time of prestress transfer, psi (MPa).

K = The lesser of the masonry cover, clear spacing between adjacent reinforcement, or five times db, inches (mm).

L_s = Distance between supports, inches (mm).

l_d = Required development length or lap length of reinforcement, inches (mm).

P = The applied load at failure, pounds (N).

S_t = Thickness of the test specimen measured parallel to the direction of load, inches (mm).

S_w = Width of the test specimen measured parallel to the loading cylinder, inches (mm).

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 C1364 and TMS 504. Adhered manufactured stone masonry veneer units shall conform to ASTM C1670. *Architectural cast stone construction shall be considered as an alternative system.*

Exception: Structural clay tile for nonstructural use in fireproofing of structural members and in wall furring shall not be required to meet the compressive strength specifications. The fire-resistance rating shall be deter-

mined in accordance with ASTM E119 or UL 263 and shall comply with the requirements of Table 705.5.

2103*A*.1.1 Second-hand units. Second-hand masonry units shall not be reused unless they conform to the requirements of new units. The units shall be of whole, sound materials and free from cracks and other defects that will interfere with proper laying or use. Old mortar shall be cleaned from the unit before reuse.

2103*A*.2 Mortar. Mortar for masonry construction shall comply with Section 2103*A*.2.1, 2103*A*.2.2, 2103*A*.2.3 or 2103*A*.2.4.

2103*A*.2.1 Masonry mortar. Mortar for use in masonry construction shall conform to Articles 2.1 and 2.6 A of TMS 602.

2103*A*.2.2 Surface-bonding mortar. Surface-bonding mortar shall comply with ASTM C887. Surface bonding of concrete masonry units shall comply with ASTM C946.

2103*A*.2.3 Mortars for ceramic wall and floor tile. Portland cement mortars for installing ceramic wall and floor tile shall comply with ANSI A108.1A and ANSI A108.1B and be of the compositions indicated in Table 2103*A*.2.3.

TABLE 2103*A*.2.3
CERAMIC TILE MORTAR COMPOSITIONS

LOCATION	MORTAR	COMPOSITION
Walls	Scratchcoat	1 cement; $^1/_5$ hydrated lime; 4 dry or 5 damp sand
	Setting bed and leveling coat	1 cement; $^1/_2$ hydrated lime; 5 damp sand to 1 cement; 1 hydrated lime, 7 damp sand
Floors	Setting bed	1 cement; $^1/_{10}$ hydrated lime; 5 dry or 6 damp sand; or 1 cement; 5 dry or 6 damp sand
Ceilings	Scratchcoat and sand bed	1 cement; $^1/_2$ hydrated lime; $2^1/_2$ dry sand or 3 damp sand

2103*A*.2.3.1 Dry-set Portland cement mortars. Premixed prepared Portland cement mortars, which require only the addition of water and are used in the installation of ceramic tile, shall comply with ANSI A118.1. The shear bond strength for tile set in such mortar shall be as required in accordance with ANSI A118.1. Tile set in dry-set Portland cement mortar shall be installed in accordance with ANSI A108.5.

2103*A*.2.3.2 Latex-modified Portland cement mortar. Latex-modified Portland cement thin-set mortars in which latex is added to dry-set mortar as a replacement for all or part of the gauging water that are used for the installation of ceramic tile shall comply with ANSI A118.4. Tile set in latex-modified Portland cement shall be installed in accordance with ANSI A108.5.

2103*A*.2.3.3 Epoxy mortar. Ceramic tile set and grouted with chemical-resistant epoxy shall comply with ANSI A118.3. Tile set and grouted with epoxy shall be installed in accordance with ANSI A108.6.

2103*A*.2.3.4 Furan mortar and grout. Chemical-resistant furan mortar and grout that are used to install ceramic tile shall comply with ANSI A118.5. Tile set and grouted with furan shall be installed in accordance with ANSI A108.8.

2103*A*.2.3.5 Modified epoxy-emulsion mortar and grout. Modified epoxy-emulsion mortar and grout that are used to install ceramic tile shall comply with ANSI A118.8. Tile set and grouted with modified epoxy-emulsion mortar and grout shall be installed in accordance with ANSI A108.9.

2103*A*.2.3.6 Organic adhesives. Water-resistant organic adhesives used for the installation of ceramic tile shall comply with ANSI A136.1. The shear bond strength after water immersion shall be not less than 40 psi (275 kPa) for Type I adhesive and not less than 20 psi (138 kPa) for Type II adhesive when tested in accordance with ANSI A136.1. Tile set in organic adhesives shall be installed in accordance with ANSI A108.4.

2103*A*.2.3.7 Portland cement grouts. Portland cement grouts used for the installation of ceramic tile shall comply with ANSI A118.6. Portland cement grouts for tile work shall be installed in accordance with ANSI A108.10.

2103*A*.2.4 Mortar for adhered masonry veneer. Mortar for use with adhered masonry veneer shall conform to ASTM C270 for Type N or S, or shall comply with ANSI A118.4 for latex-modified Portland cement mortar.

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 of 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.*

2103*A*.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.*

SECTION 2104*A*
CONSTRUCTION

2104*A*.1 Masonry construction. Masonry construction shall comply with the requirements of Sections 2104*A*.1.1 *through* 2104*A*.1.3 and with the requirements of either TMS 602 or TMS 604.

2104*A*.1.1 Support on wood. Masonry shall not be supported on wood girders or other forms of wood construction except as permitted in Section 2304.13.

2104*A*.1.2 Molded cornices. Unless structural support and anchorage are provided to resist the overturning moment, the center of gravity of projecting masonry or molded cornices shall lie within the middle one-third of the supporting wall. Terra cotta and metal cornices shall be provided with a structural frame of approved noncombustible material anchored in an approved manner.

2104A.1.3 Reinforced grouted masonry.

2104A.1.3.1 TMS 602, Article 3.2 F Cleanouts. *Replace TMS 602, Article 3.2 F with the following:*

1. *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. *Cleanouts in multi-wythe masonry shall be provided for each pour by leaving out every other unit in the bottom wythe of the section being poured or by cleanout openings in the foundation.*
3. *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 *greater than* $^1/_4$ inch (*6.4* mm) 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. *Reinforcement and embedded items shall be clean, properly positioned and securely anchored against moving prior to grouting.*
3. Maintain a clear distance between reinforcing bars and the interior of masonry unit or formed surface of at least $^1/_4$ inch (6.4 mm) for fine grout and $^1/_2$ inch (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. *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 3.4 D.6 as follows:*

3. *Anchor bolts in the wythe or face shells of hollow masonry units shall be positioned to maintain a minimum of $^1/_2$ inch (12.7 mm) of grout between the bolt circumference and the wythe or 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 $^1/_4$ inch (6.4 mm) when using fine grout and at least $^1/_2$ inch (12.7 mm) when using coarse grout. Bolts shall be solidly embedded in grout.*
5. *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 (25 mm) diameter for 12-inch (304.8 mm) nominal masonry.*
6. *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. 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.* ***[OSHPD 1 & 4]*** *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.*
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:*
    a. *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.*

b. An approved admixture of a type that reduces early water loss and produces an expansive action shall be used.

c. The grouting of any section of wall shall be completed in one day with no interruptions greater than one hour.

d. 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.

e. Cleanout openings shall be provided 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.

Exception: *The 4 feet (1219 mm) maximum lift height may be increased to 5 feet 4 inches (1625.6 mm) for 10-inch (254 mm) 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 inch (305 mm) in height by mechanical vibration, and reconsolidate by mechanical vibration after initial water loss and settlement has occurred, *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. Between grout pours or where grouting has been stopped more than an hour, a horizontal construction joint shall be formed by 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 terminated a minimum of $^1/_2$ inch (12.7 mm) below the 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.

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. Grout shall be placed by pumping or an approved alternate method before initial set of hardening occurs.

2. Grout shall be placed so that all spaces to be grouted do not contain voids.

3. 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 Reinforced grouted multi-wythe masonry.

2104A.1.3.10.1 General. *Reinforced grouted multi-wythe masonry is that form of composite construction made with clay or shale brick or made with solid concrete building brick in which interior 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 *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. 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. 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 wythe of the wall shall be built up not more than 16 inches (406 mm) ahead of the other 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. 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 (9144 mm) 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. The minimum clear width of grout space for multi-wythe masonry for pours not exceeding 4 feet (1.2 m) shall be $2^1/_2$ inches (64 mm). The clear width of grout space for pours exceeding 4 feet (1.2 m) shall be a minimum of $3^1/_2$ inches (89 mm).

CHAPTER 27
ELECTRICAL

User note:

About this chapter: *Electrical systems and components are integral to most structures; therefore, it is necessary for the code to address their installation and protection. Structures depend on electricity for the operation of many life safety systems including fire alarm, smoke control and exhaust, fire suppression, fire command and communication systems. Since power supply to these systems is essential, Chapter 27 addresses where standby and emergency power must be provided.*

SECTION 2701
GENERAL

2701.1 Scope. The provisions of this chapter and *the California Electrical Code* shall govern the design, construction, erection and installation of the electrical components, appliances, equipment and systems used in buildings and structures covered by this code. The *California Fire Code*, the *International Property Maintenance Code* and *the California Electrical Code* shall govern the use and maintenance of electrical components, appliances, equipment and systems. The *California Existing Building Code* and *the California Electrical Code* shall govern the alteration, repair, relocation, replacement and addition of electrical components, appliances, or equipment and systems.

SECTION 2702
EMERGENCY AND STANDBY POWER SYSTEMS

[F] 2702.1 General. Emergency power systems and standby power systems shall comply with Sections 2702.1.1 through 2702.1.8.

[F] 2702.1.1 Stationary generators. Stationary emergency and standby power generators required by this code shall be listed in accordance with UL 2200.

[F] 2702.1.2 Fuel-line piping protection. Fuel lines supplying a generator set inside a high-rise building *or new Group I-2 occupancy having occupied floors located more than 75 feet (23 m) above the lowest level of fire department vehicle access* shall be separated from areas of the building other than the room the generator is located in by one of the following methods:

1. A fire-resistant pipe-protection system that has been tested in accordance with UL 1489. The system shall be installed as tested and in accordance with the manufacturer's installation instructions, and shall have a rating of not less than 2 hours. Where the building is protected throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.1, the required rating shall be reduced to 1 hour.
2. An assembly that has a fire-resistance rating of not less than 2 hours. Where the building is protected throughout with an automatic sprinkler system installed in accordance with Section 903.3.1.1, the required fire-resistance rating shall be reduced to 1 hour.
3. Other approved methods.

[F] 2702.1.3 Installation. Emergency power systems and standby power systems required by this code or the *California Fire Code* shall be installed in accordance with the *California Fire Code*, *the California Electrical Code*, NFPA 110 and NFPA 111.

[F] 2702.1.4 Load transfer. Emergency power systems shall automatically provide secondary power within 10 seconds after primary power is lost, unless specified otherwise in this code. Standby power systems shall automatically provide secondary power within 60 seconds after primary power is lost, unless specified otherwise in this code.

[F] 2702.1.5 Load duration. Emergency power systems and standby power systems shall be designed to provide the required power for a minimum duration of 2 hours without being refueled or recharged, unless specified otherwise in this code.

[F] 2702.1.6 Uninterruptable power source. An uninterrupted source of power shall be provided for equipment where required by the manufacturer's instructions, the listing, this code or applicable referenced standards.

[F] 2702.1.7 Interchangeability. Emergency power systems shall be an acceptable alternative for installations that require standby power systems.

[F] 2702.1.8 Group I-2 occupancies. In Group I-2 occupancies located in flood hazard areas established in Section 1612.3, where new essential electrical systems are installed, and where new essential electrical system generators are installed, the systems and generators shall be located and installed in accordance with ASCE 24. Where connections for hookup of temporary generators are provided, the connections shall be located at or above the elevation required in ASCE 24.

[F] 2702.2 Where required. Emergency and standby power systems shall be provided where required by Sections 2702.2.1 through 2702.2.19.

[F] 2702.2.1 Ambulatory care facilities. Essential electrical systems for ambulatory care facilities shall comply with Section 422.6.

[F] 2702.2.2 Elevators and platform lifts. Standby power shall be provided for elevators and platform lifts as

required in Sections 1009.4.1, 1009.5, 3003.1, 3007.8 and 3008.8.

[F] 2702.2.3 Emergency responder communication coverage systems. Standby power shall be provided for in-building 2-way emergency responder communication coverage systems required in Section 918 and the *California Fire Code*. The standby power supply shall be capable of operating the in-building 2-way emergency responder communication coverage system at 100-percent system operation capacity for a duration of not less than 12 hours.

[F] 2702.2.4 Emergency voice/alarm communication systems. Standby power shall be provided for emergency voice/alarm communication systems in accordance with NFPA 72.

[F] 2702.2.5 Exhaust systems. Standby power shall be provided for common exhaust systems for domestic kitchens located in multistory structures as required in Section 505.5 of the *California Mechanical Code*. Standby power shall be provided for common exhaust systems for clothes dryers located in multistory structures as required in Section 504.11 of the *California Mechanical Code* and Section 614.11 of the *International Fuel Gas Code*.

[F] 2702.2.6 Exit signs. Emergency power shall be provided for exit signs as required in Section 1013.6.3. The system shall be capable of powering the required load for a duration of not less than 90 minutes.

[F] 2702.2.7 Gas detection system. Emergency or standby power shall be provided for gas detection systems in accordance with the *California Fire Code*.

[F] 2702.2.8 Group I-2 occupancies. Essential electrical systems for Group I-2 occupancies shall be in accordance with Section 407.11.

[F] 2702.2.9 Group I-3 occupancies. Emergency power shall be provided for power-operated doors and locks in Group I-3 occupancies as required in Section 408.4.2.

[F] 2702.2.10 Hazardous materials. Emergency or standby power shall be provided in occupancies with hazardous materials where required by the *California Fire Code*.

[F] 2702.2.11 High-rise buildings *and Group I-2 Occupancies having occupied floors located more than 75 feet above the lowest level of fire department vehicle access.* Emergency and standby power shall be provided in high-rise buildings *and Group I-2 occupancies having occupied floors located more than 75 feet above the lowest level of fire department vehicle access* as required in Section 403.4.8.

[F] 2702.2.12 Hydrogen fuel gas rooms. Standby power shall be provided for hydrogen fuel gas rooms as required by the *California Fire Code*.

2702.2.12.1 Group L Occupancy. *Secondary power shall be provided in Group L occupancies in accordance with this chapter and Section 453.4.6 and 453.4.6.1.*

[F] 2702.2.13 *Reserved*.

[F] 2702.2.14 Means of egress illumination. Emergency power shall be provided for means of egress illumination as required in Section 1008.3. The system shall be capable of powering the required load for a duration of not less than 90 minutes.

[F] 2702.2.15 Membrane structures. Standby power shall be provided for auxiliary inflation systems in permanent membrane structures as required in Section 3102.8.2. Standby power shall be provided for a duration of not less than 4 hours. Auxiliary inflation systems in temporary air-supported and air-inflated membrane structures shall be provided in accordance with Section 3103.10.4 of the *California Fire Code*.

[F] 2702.2.16 Semiconductor fabrication facilities. Emergency power shall be provided for semiconductor fabrication facilities as required in Section 415.11.11.

[F] 2702.2.17 Smoke control systems. Standby power shall be provided for smoke control systems as required in Sections 404.7, 909.11, 909.20.7.2 and 909.21.5.

[F] 2702.2.18 Special purpose horizontal sliding, accordion or folding doors. Standby power shall be provided for special purpose horizontal sliding, accordion or folding doors as required in Section 1010.3.3. The standby power supply shall have a capacity to operate not fewer than 50 closing cycles of the door.

[F] 2702.2.19 Underground buildings. Emergency and standby power shall be provided in underground buildings as required in Section 405.

[F] 2702.3 Critical circuits. Required critical circuits shall be protected using one of the following methods:

1. Cables, used for survivability of required critical circuits, that are listed in accordance with UL 2196 and have a fire-resistance rating of not less than 1 hour.
2. Electrical circuit protective systems having a fire-resistance rating of not less than 1 hour. Electrical circuit protective systems are installed in accordance with their listing requirements.
3. Construction having a fire-resistance rating of not less than 1 hour.

[F] 2702.4 Maintenance. Emergency and standby power systems shall be maintained and tested in accordance with the *California Fire Code*.

AISI

American Iron and Steel Institute
25 Massachusetts Avenue, NW Suite 800
Washington, DC 20001

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ALI

Automotive Lift Institute, Inc.
P.O. Box 85
Cortland, NY 13045

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AMCA

Air Movement and Control Association International
30 West University Drive
Arlington Heights, IL 60004

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ANSI

American National Standards Institute
25 West 43rd Street, Fourth Floor
New York, NY 10036

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2103.2.3

A108.4—09: Installation of Ceramic Tile with Organic Adhesives or Water-cleanable Tile-setting Epoxy Adhesive
2103.2.3.6

A108.5—20: Installation of Ceramic Tile with Dry-set Portland Cement Mortar or Latex-Portland Cement Mortar
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2103.2.3.3

A108.8—99 (reaffirmed 2019): Installation of Ceramic Tile with Chemical-resistant Furan Resin Mortar and Grout
2103.2.3.4

A108.9—99 (reaffirmed 2019): Installation of Ceramic Tile with Modified Epoxy Emulsion Mortar/Grout
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A108.10—17: Installation of Grout in Tilework
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A118.3—13: American National Standard Specifications for Chemical-resistant, Water-cleanable Tile-setting and -grouting Epoxy and Water Cleanable Tile-setting Epoxy Adhesive
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APA

APA - Engineered Wood Association
7011 South 19th Street
Tacoma, WA 98466-7400

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2306.1

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ASABE

American Society of Agricultural and Biological Engineers
2950 Niles Road
St. Joseph, MI 49085

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ASCE/SEI

American Society of Civil Engineers
Structural Engineering Institute
1801 Alexander Bell Drive
Reston, VA 20191

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ASHRAE

ASHRAE
1791 Tullie Circle NE
Atlanta, GA 30329USA

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ASME

American Society of Mechanical Engineers
Two Park Avenue
New York, NY 10016

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ASSP

American Society of Safety Professionals
520 N. Northwest Highway
Park Ridge, IL 60068

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ASTM

ASTM International
100 Barr Harbor Drive, P.O. Box C700
West Conshohocken, PA 19428

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C843—2017: Specification for Application of Gypsum Veneer Plaster
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C844—2015: Specification for Application of Gypsum Base to Receive Gypsum Veneer Plaster
Table 2508.1

C847—2018: Specification for Metal Lath
Table 2507.2

C887—13: Specification for Packaged, Dry Combined Materials for Surface Bonding Mortar
1805.2.2, 2103.2.2

C897—15: Specification for Aggregate for Job-mixed Portland Cement-based Plaster
Table 2507.2

C920—2018: Standard for Specification for Elastomeric Joint Sealants
703.7, Table 2506.2

C926—2018B: Specification for Application of Portland Cement-based Plaster
2109.2.4.8.6, 2109.2.4.8.8, 2510.3, Table 2511.1.1, 2511.3, 2511.4, 2512.1, 2512.1.2, 2512.2, 2512.6, 2512.8.2, 2512.9, 2513.7

C932—06(2013): Specification for Surface-applied Bonding Compounds for Exterior Plastering
Table 2507.2

C933—2018: Specification for Welded Wire Lath
Table 2507.2

C946—2018: Specification for Construction of Dry-stacked, Surface-bonded Walls
2103.2.2, 2114.5

ASTM—continued

D4637/D4637M—2015: Specification for EPDM Sheet Used in Single-ply Roof Membrane
Table 1507.12.2

D4829—11: Test Method for Expansion Index of Soils
1803.5.3

D4869/D4869M—2016A: Specification for Asphalt-saturated (Organic Felt) Underlayment Used in Steep Slope Roofing
1507.1.1, Table 1507.1.1(1), 1507.17.3, 1507.17.4.1

D4897/D4897M—2016: Specification for Asphalt-coated Glass Fiber Venting Base Sheet Used in Roofing
Table 1507.10.2

D4945—2017: Test Method for High-strain Dynamic Testing of Deep Foundations
1705.10, 1810.3.3.1.2

D4990—97a(2013): Specification for Coal Tar Glass Felt Used in Roofing and Waterproofing
Table 1507.10.2

D5019—07a: Specification for Reinforced Nonvulcanized Polymeric Sheet Used in Roofing Membrane
Table 1507.12.2

D5055—2016: Specification for Establishing and Monitoring Structural Capacities of Prefabricated Wood I-joists
2303.1.2

D5456—2018: Specification for Evaluation of Structural Composite Lumber Products
2303.1.10

D5516—2018: Test Method of Evaluating the Flexural Properties of Fire-retardant Treated Softwood Plywood Exposed to Elevated Temperatures
2303.2.5.1

D5643/D5643M—2006(2018): Specification for Coal Tar Roof Cement, Asbestos-free
Table 1507.10.2

D5664—2017: Standard Test Method for Evaluating the Effects of Fire-retardant Treatment and Elevated Temperatures on Strength Properties of Fire-retardant Treated Lumber
2303.2.5.2

D5665/D5665M—99a(2014)e1: Specification for Thermoplastic Fabrics Used in Cold-applied Roofing and Waterproofing
Table 1507.10.2

D5726—98(2013): Specification for Thermoplastic Fabrics Used in Hot-applied Roofing and Waterproofing
Table 1507.10.2

D5778—20: Standard Test Method for Electronic Friction Cone and Piezocone Penetration Testing of Soils
1813, 1813A.2

D5882—16: Standard Test Method for Low Strain Impact Integrity Testing of Deep Foundations
1705.10

D6083/D6083M—2018: Specification for Liquid Applied Acrylic Coating Used in Roofing
Table 1507.10.2, Table 1507.13.3

D6162/D6162M—2016: Specification for Styrene-butadiene-styrene (SBS) Modified Bituminous Sheet Materials Using a Combination of Polyester and Glass Fiber Reinforcements
1507.11.2

D6163/D6163M—2016: Specification for Styrene-butadiene-styrene (SBS) Modified Bituminous Sheet Materials Using Glass Fiber Reinforcements
1507.11.2

D6164/D6164M—2016: Specification for Styrene-butadiene-styrene (SBS) Modified Bituminous Sheet Metal Materials Using Polyester Reinforcements
1507.11.2

D6222/D6222M—2016: Specification for Atactic Polypropylene (APP) Modified Bituminous Sheet Materials Using Polyester Reinforcements
1507.11.2

D6223/D6223M—2016: Specification for Atactic Polypropylene (APP) Modified Bituminous Sheet Materials Using a Combination of Polyester and Glass Fiber Reinforcements
1507.11.2

ASTM—continued

D6298—2016: Specification for Fiberglass Reinforced Styrene-butadiene-styrene (SBS) Modified Bituminous Sheets with a Factory Applied Metal Surface
1507.11.2

D6305—08(2015)e1: Practice for Calculating Bending Strength Design Adjustment Factors for Fire-retardant-treated Plywood Roof Sheathing
2303.2.5.1

D6380/D6380M—2003(2018): Standard Specification for Asphalt Roll Roofing (Organic) Felt
Table 1507.1.1(1), 1507.2.8.2, 1507.3.3, 1507.6.5

D6464—2003A(2017): Standard Specification for Expandable Foam Adhesives for Fastening Gypsum Wallboard to Wood Framing
Table 2506.2, 2508.4

D6509/D6509M—2016: Standard Specification for Atactic Polypropylene (APP) Modified Bituminous Base Sheet Materials Using Glass Fiber Reinforcements
1507.11.2

D6694/D6694M—15: Standard Specification for Liquid-applied Silicone Coating Used in Spray Polyurethane Foam Roofing Systems
Table 1507.13.3

D6754/D6754M—2015: Standard Specification for Ketone Ethylene Ester Based Sheet Roofing
Table 1507.12.2

D6757—2018: Specification for Underlayment Felt Containing Inorganic Fibers Used in Steep Slope Roofing
1507.1.1, Table 1507.1.1(1), 1507.17.3, 1507.17.4.1

D6760—16: Standard Test Method for Integrity Testing of Concrete Deep Foundations by Ultrasonic Crosshole Testing
1705.10

D6841—2016: Standard Practice for Calculating Design Value Treatment Adjustment Factors for Fire-retardant Treated Lumber
2303.2.5.2

D6878/D6878M—2017: Standard Specification for Thermoplastic Polyolefin Based Sheet Roofing
Table 1507.12.2

D6947/D6947M—2016: Standard Specification for Liquid Applied Moisture Cured Polyurethane Coating Used in Spray Polyurethane Foam Roofing System
Table 1507.13.3

D7032—2017: Standard Specification for Establishing Performance Ratings for Wood, Plastic Composite Deck Boards and Guardrail Systems (Guards or Rails)
705.2.3.1, 2612.2, 2612.4, 2612.5.1

D7147—2011(2018): Specification for Testing and Establishing Allowable Loads of Joist Hangers
2303.5, 2304.10.4

D7158/D7158M—2019: Standard Test Method for Wind Resistance of Asphalt Shingles (Uplift Force/Uplift Resistance Method)
1504.2 , Table 1504.2

D7254—2017: Standard Specification for Polypropylene (PP) Siding
1403.12

D7425/D7425M—13: Standard Specification for Spray Polyurethane Foam Used for Roofing Applications
1507.13.2

D7655/D7655M—2012(2017): Standard Classification for Size of Aggregate Used as Ballast for Roof Membrane Systems
1507.12.3

D7672—14E1: Standard Specification for Evaluating Structural Capacities of Rim Board Products and Assemblies
2303.1.13

D7949—14: Standard Test Methods for Thermal Integrity Profiling of Concrete Deep Foundations
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E84—2018B: Standard Test Methods for Surface Burning Characteristics of Building Materials
202, 402.6.4.4, 406.7.2, 424.2, 602.4.1.1, 602.4.2.1, 602.4.3.1, 720.1, 720.4, 803.1.2, 803.5.2, 803.10, 803.11, 803.12, 803.13, 806.7, 1402.5, 1403.12.1, 1406.9, 1406.10.1, 1408.9, 1408.10.1, 1511.6.2, 1511.6.3, 2303.2, 2603.3, 2603.4.1.13, 2603.5.4, 2603.5.5, 2603.7, 2604.2.4, 2606.4, 2612.3, 2614.3, 3105.3

ASTM—continued

E90—2009(2016): Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements
1206.2, 1206.2.1

E96/E96M—2016: Standard Test Methods for Water Vapor Transmission of Materials
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E108—2017: Standard Test Methods for Fire Tests of Roof Coverings
1505.1, 2603.6, 2610.2, 2610.3

E119—2018B: Standard Test Methods for Fire Tests of Building Construction and Materials
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E136—2019: Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C
703.3.1

E283—04(2012): Standard Test Method for Determining Rate of Air Leakage through Exterior Windows, Curtain Walls and Doors Under Specified Pressure Differences across the Specimen
202

E330/E330M—14: Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference
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E331—2000(2016): Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors and Curtain Walls by Uniform Static Air Pressure Difference
1402.2, 1403.2

E336—19a: Standard Test Method for Measurement of Airborne Sound Attenuation between Rooms in Buildings
1206.2

E492—2009(2016)E1: Test Method for Laboratory Measurement of Impact Sound Transmission Through Floor-ceiling Assemblies Using the Tapping Machine
1206.3

E580/E580M—17: Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions
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E605/E605M—93(2015)e1: Test Method for Thickness and Density of Sprayed Fire-resistive Material (SFRM) Applied to Structural Members
1705.15

E648—2017A: Standard Test Method for Critical Radiant Flux of Floor-covering Systems Using a Radiant Heat Energy Source
406.2.4, 424.2, 804.2, 804.3, *804.4.1, 804.4.2*

E662—17a: Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials
804.4.1, 804.4.2

E681—09(2015): Test Methods for Concentration Limits of Flammability of Chemical Vapors and Gases
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704.13.3.2, 1705.15.6

E814—2013A(2017): Test Method for Fire Tests of Penetration Firestop Systems
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E970—2017: Standard Test Method for Critical Radiant Flux of Exposed Attic Floor Insulation Using a Radiant Heat Energy Source
720.3.1

E1007—19: Test Method f or Field Measurement of Tapping Machine Impact Sound Transmission Through Floor-Ceiling Assemblies and Associated Support Structures
1206.3

E1300—2016: Practice for Determining Load Resistance of Glass in Buildings
2404.1, 2404.2, 2404.3.1, 2404.3.2, 2404.3.3, 2404.3.4, 2404.3.5

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E1354—2017: Standard Test Method for Heat and Visible Smoke Release Rates for Materials and Products Using an Oxygen Consumption Calorimeter
424.2, 602.4.1.1, 602.4.2.1, 602.4.3.1, 1402.5

E1592—2005(2017): Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference
1504.4.2

E1602—2003(2017): Guide for Construction of Solid Fuel-burning Masonry Heaters
2112.2

E1886—2013A: Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors and Impact Protective Systems Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials
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E1966—2015: Standard Test Method for Fire-resistive Joint Systems
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E2072—14: Standard Specification for Photoluminescent (Phosphorescent) Safety Markings
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E2174—2018: Standard Practice for On-site Inspection of Installed Fire Stops
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E2273—2018: Standard Test Method for Determining the Drainage Efficiency of Exterior Insulation and Finish Systems (EIFS) Clad Wall Assemblies
1407.4.1, 2510.6.2

E2307—15BE1: Standard Test Method for Determining Fire Resistance of Perimeter Fire Barriers Using the Intermediate-scale, Multistory Test Apparatus
715.4

E2353—2016: Standard Test Methods for Performance of Glazing in Permanent Railing Systems, Guards and Balustrades
2407.1.2

E2392 / E2392M—10(2016): Standard Guide for Design of Earthen Wall Building Systems
2109.2.4.8.9.2

E2393—10a(2015): Standard Practice for On-site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers
1705.18.2

E2404—2017: Practice for Specimen Preparation and Mounting of Textile, Paper or Polymeric (Including Vinyl) and Wood Wall or Ceiling Coverings, Facing and Veneers to Assess Surface Burning Characteristics
803.5.2, 803.12, 1402.5

E2556/E2556M—2010(2016): Standard Specification for Vapor Permeable Flexible Sheet Water-resistive Barriers Intended for Mechanical Attachment
1403.2, 2510.6.1

E2568—2017A: Standard Specification for PB Exterior Insulation and Finish Systems
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E2570/E2570M—07(2014)e1: Standard Test Method for Evaluating Water-resistive Barrier (WRB) Coatings Used under Exterior Insulation and Finish Systems (EIFS) for EIFS with Drainage
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E2573—2017: Standard Practice for Specimen Preparation and Mounting of Site-fabricated Stretch Systems to Assess Surface Burning Characteristics
803.10

E2579—2015: Standard Practice for Specimen Preparation and Mounting of Wood Products to Assess Surface Burning Characteristics
803.11

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ICC-ES AC 178—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—21*: Acceptance Criteria for Mechanical Anchors in Concrete Elements
1617A.1.19, 1901.3.2

ICC-ES AC 232—21*: Acceptance Criteria for Anchor Channels in Concrete Elements
1617A.1.19, 1901.3.2

ICC-ES AC 308—21*: Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements
1617A.1.19, 1901.3.3

ICC-ES AC 331: Acceptance Criteria for Smoke and Heat Vents
910.3.1

ICC-ES AC 358—21*: Acceptance Criteria for Helical Foundation Systems and Devices
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ICC-ES AC 446—21*: Acceptance Criteria for Headed Cast-in Specialty Inserts in Concrete
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ICC 1100—18: Standard for Spray-applied Foam Plastic Insulation
2603.1.1

SBCCI SSTD 11—97: Test Standard for Determining Wind Resistance of Concrete or Clay Roof Tiles
1504.3.1.1, 1504.3.1.2, 1504.3.1.3

** Refers to International Building Code, 2021 as a reference standard.*

ISO

International Organization for Standardization
Chemin de Blandonnet 8
CP 401 1214 Vernier
Geneva, Switzerland

ISO 668—2013: Series 1 Freight Containers—Classifications, Dimensions and Ratings
Table 3115.8.5.3

ISO 1496-1—2013: Series 1 Freight Containers—Specification and Testing - Part 1: General Cargo Containers for General Purposes
3115.8, Table 3115.8.5.3

ISO 6346—1995: Freight Containers—Code, Identification and Marking with Amendment 3 - 2012
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ISO 8115—86: Cotton Bales—Dimensions and Density
Table 307.1(1), Table 415.11.1.1.1

ISO 8336—09: Fiber-cement Flat Sheets—Product Specification and Test Methods
1403.10, 1404.16.1, 1404.16.2, Table 2509.2

ISO 9001—15: Quality Management Systems - Requirements
1705A.14.3

MHI

Material Handling Institute
8720 Red Oak Blvd. Suite 201
Charlotte, NC 28217

ANSI MH29.1—2012: Safety Requirements for Industrial Scissors Lifts
Table 3001.3

ANSI/MH16.1—12: Specification for the Design, Testing and Utilization of Industrial Steel Storage Racks
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NAAMM

National Association of Architectural Metal Manufacturers
800 Roosevelt Road, Bldg. C, Suite 312
Glen Ellyn, IL 60137

FP 1001—07: Guide Specifications for Design of Metal Flag Poles
1609.1.1

NCMA

National Concrete Masonry Association
13750 Sunrise Valley
Herndon, VA 20171

TEK 5—8B(2005): Details for Concrete Masonry Fire Walls
Table 721.1(2)

NEHRP

Building Seismic Safety Council
National Institute of Building Sciences
1090 Vermont Avenue NW
Suite 700
Washington, DC 20005

FEMA P-2082—1: Recommended Seismic Provisions for New Building and Other Structures, Volume 1, September 2020
1617A.1.3

NFPA

National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169-7471

04—21: Standard for Integrated Fire Protection and Life Safety System Testing
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10—2018: Standard for Portable Fire Extinguishers
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11—16: Standard for Low-, Medium, and High Expansion Foam
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12—15: Standard on Carbon Dioxide Extinguishing Systems
904.8, 904.13

12A—18: Standard on Halon 1301 Fire Extinguishing Systems
904.9

13—*22*: Standard for Installation of Sprinkler Systems *as amended**
403.3.3, 712.1.3.1, 903.3.1.1, 903.3.2, 903.3.8.2, 903.3.8.5, 904.13, 905.3.4, 907.6.4, 1019.3

**NFPA 13, Amended Sections as follows:*

Revise Section 2.2 and add publications as follows:
2.2 NFPA Publications.

NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems, 2013 California edition.*

Revise Section 6.4.3.1.1* as follows:

6.4.3.1.1* *Pipe joints shall not be located under foundation footings. The pipe under the building or building foundation shall not contain mechanical joints.*

Exceptions:

2. Where allowed in accordance with Section 6.4.3.1.
3. Alternate designs may be utilized where designed by a registered professional engineer and approved by the enforcing agency.

Delete Sections 8.15.5.1 and 8.15.5.2

8.15.5.1* Reserved.

8.15.5.2 Reserved.

HISTORY NOTE APPENDIX

2022 California Building Code
California Code of Regulations, Title 24, Part 2 Volume 2

HISTORY:

For prior code history, see the History Note Appendix to the *California Building Code* 2019 Triennial Edition, effective January 1, 2020.

1. (BSC 05/21, CEC 03/21, HCD 05/21, DSA/AC 01/21, DSA-SS/CC 05/21, SFM 04/21, OSHPD 04/21 and OSHPD 06/21)—Adoption by reference of the 2021 *International Building Code* with necessary amendments to become the 2022 *California Building Code,* and repeal of the 2018 edition of the *International Building Code*; effective on January 1, 2023.
2. Erratum to correct editorial errors in Matrix Adoption Tables and miscellaneous corrections throughout chapters 1, 2, 4, 5, 7, 7A, 9, 10, 12, 14, 16, 17, 18A, 19, 19A, 21A, 27, and 35, effective January 1, 2023.

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